

S Thompson  
River

Watershed Code: 03-0000-000-000-000-000-991

Drainage Area(ha):

196100

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Thompson Plateau  
Shuswap Highlands

Biogeoclimatic Zone: Bunch Grass  
Ponderosa Pine  
Interior Douglas Fir

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	311.0	930.0	62.2		103 102	South Thompson River annual and seasonal fluctuations in water level are lower than those for the North Thompson and Thompson. Flows are buffered by large surface areas of Adams and Shuswap Lakes.

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Sockeye	x	123,874	1958	11,461	73,603	2,680	Increase	High
Chinook	x	12,000	1992	7,375	12,000	5,083	Increase	Mod
Coho	x	75	1968				NA	NA
Pink	x	1,560	1981	265	1,560	141	Increase	Mod
Steelhead	No							

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Logging in tributaries ie Chase Creek have resulted in increased sediments into the South Thompson River.	
- Percent Total Logging	High	28.5%	Logging is concentrated in headwater areas of tributaries to the S. Thompson River from Little Shuswap Lake to Kamloops.	101
- Percent Recent Logging	High	9.5%	Recent logging in Chase Creek has resulted in sediment inputs into the South Thompson River which can impact important spawning beds at Chase riffle.	101
- ECA Status				
- Riparian Condition				
Agriculture	High		Cattle grazing, crops (Ginseng) on mainstem and tribs. (Chase, Monte Crk., Campbell Crk, Petersen Crk.) are all sources of non point pollution and also contribute nutrients to the system.	

- Extent	High	31%	31% of the shoreline from Kamloops to Monte Creek is adjacent to agricultural lands.	102
- Riparian Condition	High		Agricultural, residential and industrial land uses have impacted a significant amount of the natural riparian zone plant communities. Rip rap armouring and eroding banks also impact and disturb the natural communities in upper riparian and upslope areas.	102
- Water Withdrawal	Low		Water demand is low relative to the size of the river.	
- Water Quality	Low		Non point pollution occurs from various agricultural operations.	101 155
Urbanization	High		Settlement occurs along the length of the S. Thompson. Population density is high around the City of Kamloops and the Village of Chase.	101 139
- Population Level	High	25,001- 30,000	Future encroachment of urbanization can potentially occur as the City of Kamloops grows.	101
- Extent	High		Urban and rural development is associated with most of the length of the S. Thompson River. New residential developments are proposed around Pritchard and on Reserve lands.	102
- Riparian Condition	High	23%	Shrubs and trees along the river margins have been removed to provide unrestricted access to the river. Encroachments in the upper riparian zone are common and have fragmented and degraded the the natural vegetation types in many streambank	102 179
- Water Withdrawal	Low		There are 200 water licenses approved for the drainage. Most of the licenses are for domestic purposes, however the majority of the water withdrawn is for crop irrigation.	155
- Water Quality	Low		Septic tanks from developments along the shores may contribute to higher levels of coliforms. The numerous Municipal discharges appear to be having minor effects. Storm drain runoff occurs from the Village of Chase and the City of Kamloops.	101 155
Recreation	Low		Direct recreational activity is mainly boating. Mobile homepark/ campground activity along with golf course development and operation occur along the S. Thompson River.	155
- Extent	Low		Golf courses are located near Kamloops and the Village of Chase. Fishing and boating are extensive during the summer months. The navigation channel is marked from Kamloops to Little Shuswap Lake.	102 155
- Riparian Condition	High		Clearing of riparian areas for recreational access reduces habitat values associated with vegetated river margins.	102 115
- Water Quality	Low		Golf courses may contribute increased levels of fertilizer and nutrients to the S. Thompson River. Wake wash from boat traffic may increase erosion of unprotected banks.	102
Placer Mining	Low			101

- Extent	Low	Nil		
- Water Quality				
- Riparian Condition				
Other Mining	Low			101
- Extent	Low		Limestone quarry located at LaFarge cement plant.	176
- Water Quality				
Industrial Development	High		Although, industrial development is limited along the S. Thompson River, concerns are related to toxic spills.	
- Extent	Low	5% Kam. to Monte Ck	Industrial operations are located on both sides of the S. Thompson River and are generally in proximity of urban centres.	102
- Water Quality	High		The numbers of waste discharge permits are small. Toxic spills from industrial activity can impact fisheries resources in the S. Thompson River.	155
- Riparian Condition	High		Industrial activities contribute to degraded riparian zones through bank stabilization activities and rip rap placement.	102
Linear Development	High		The valley bottom associated with the S. Thompson River is a major corridor for linear developments, including roads, railways and transmission lines.	
- Extent	High	32% Kam. to Monte Ck	Linear development occurs along on both shorelines and includes the Trans Canada Highway and CNR, CPR.	102
- Riparian Condition	High		Significant impacts have occurred on riparian communities through activities related to road and railway construction and maintenance including clearing, filling, erosion and subsequent armoring of banks.	102
Hydro Development	Low		No Hydro developments currently exist along the S. Thompson River or tributaries.	
- Extent	Low			

- Riparian Condition				
Other Development	Low			
- Extent	Low			
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Continued encroachment from urban, residential, industrial developments and pressure from agricultural operations and recreational activities and tributary logging (ie Chase Cr).	111

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Lacustrine silts along benches and banks. Materials erodible however dry climate reduces risks from erosion. Substrates are typically made up of fines and gravels.	102 155
Terrain	Low	Low relief	101
Hydrology	Low	Upstream lakes provide moderating effects. Climate is hot and dry.	101 102
Channel Stability	Low	73 % of total streambank, from Kamloops to Monte Cr., is classified as stable, of which 7% is armored with man-made materials. The remaining 27% of streambank is eroding.	102

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features	x	Silt banks of adjacent benchlands are susceptible to erosion from extreme rain events.	
Sensitive Biological Features	x	The emergent plant communities are well developed , extensive and have a high salmonid habitat value rating.	102
Significant Environmental Variables	x	Major upstream and downstream migration corridor for pink, sockeye and coho, spawning and rearing for chinook salmon. Impacts can occur as sediment from tributary systems (Chase Creek) is deposited on important spawning grounds.	102 128
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Sockeye, coho, chinook harvested by ocean troll. Sockeye Fraser River gillnet.	
Recreational Fishery	x	Sockeye, coho, chinook ocean sport fishery.	
Native Fishery	x	Fraser River Aboriginal Fishery, Some interest by Shuswap Nation in re-establishing trap for sockeye (Adams Run), in the South Thompson River.	152

Restoration Activity			
Restoration Opportunity	x	Potential riparian restoration through revegetation along banks altered by residential development from the confluence of the North Thompson River to Campbell Creek.	102
Enhancement Activity			
Enhancement Opportunity		No specific sites are identified. Channelization has restricted the opportunity for side channel development.	102

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	6	0	0	1

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Land and Resource Management Plan	The South Thompson River is included in the Kamloops Land Resource Management Plan (LRMP). The portion of the river from Pritchard downstream is designated a Recreation and Tourism Resource Management Zone.	115
Other	Chase Creek Community Association made up of landowners, Forestry reps., FRBC, Village of Chase, and MLA's. The objective is improvement of water quality in the tributaries and the S. Thompson River.	128

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Identify and protect salmon habitats	
	Map Riparian Areas upstream of Monte Creek/Pritchard. Classify habitat and develop guidelines for use. Protect undisturbed riparian habitat and undertake restoration where values have been lost or reduced.
	Protect and restore small tributary streams along the S. Thompson, including those flowing through the City of Kamloops. Initiatives include stream cleanups, sediment control measures and habitat development where appropriate.
Restore and enhance habitat	
	Promote stream stewardship and public awareness (through funding, demonstration projects, expertise and assistance), on the importance of riparian zones to facilitate a program of re-vegetation on private lands.
Maintain/enhance water quality	Continue to monitor water quality from non point sources ie. agricultural run-off. Monitor impacts of railway side casting and road wash on riparian vegetation and water quality.
	Ensure emergency and containment facilities are available for accidental spills from railways and highways. Develop contingency plans with municipalities, developers and land users to respond to emergencies. (105)
Maintain/enhance watershed and stream channel integrity and stability	Explore opportunities outlined in Envirowest (102) study for restoring riparian areas in lower, middle and upland areas. Management prescriptions and habitat classifications in the Envirowest (1994) report provide a guideline for this process.

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Maintain/enhance fish and habitat diversity
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Apply DFO /MoELP Land Development guidelines for future developments to protect existing values and ensure proper stormwater management. Future municipal work should be planned with DFO to explore the ability to reclaim prior lost riparian vegetation.
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Little  
River

Watershed Code: 03-0000-000-000-000-992

Drainage Area(ha):

14100

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone: Interior Douglas Fir

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	0.0	0.0	0.0	0.0		There is no gauging station on the Little River. Streamflows are similar to values recorded for the South Thompson River.

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Sockeye	x	409,480	1958	78,787	360,000	34,590	Increase	Mod
Chinook	x	1,500	1958	321	600	340	Static	High
Coho	x,	450	1985	75	450		Unk	Mod
Pink	x	2,730	1977	126	865	309	Decrease	High
Steelhead	No							

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	Low		Although logging activity in the drainage is > 20%, the activity is taking place in upstream tributaries. Due to the buffering capacity of Shuswap Lake logging related impacts on Little River are minimized.	101
- Percent Total Logging	Low	25%	Logging is concentrated in upstream tributaries. Lake buffering within Shuswap Lake reduces potential impacts.	101
- Percent Recent Logging	Low	5%	Recent logging is in upstream tributaries.	101
- ECA Status				
- Riparian Condition				
Agriculture	Low			

- Extent	Low			101
- Riparian Condition				
- Water Withdrawal	Low			101
- Water Quality				
Urbanization	Low			
- Population Level	Low	100		101
- Extent	Low		Mainly rural settlements. There is a high potential for development on Indian Reserve.	139
- Riparian Condition	Low		There is presently minor encroachment of the riparian zone from developments. The potential increase in development, particularly on reserve lands, requires monitoring.	139
- Water Withdrawal	Low			
- Water Quality	Low		No waste discharge permits issued.	101
Recreation	Low			
- Extent	Low		Quaaout Lodge on Little Shuswap Lake	101
- Riparian Condition	Low		Potential for future development to encroach on the riparian zone as local native bands explore the recreational opportunities associated with band lands.	139
- Water Quality	Low		Water quality is generally good due to the size of the river. Water quality can be influenced by development upstream along the Shuswap Lake system.	
Placer Mining	Low		No placer mining is recorded in the vicinity of Little River.	

- Extent	Low			101
- Water Quality				
- Riparian Condition				
Other Mining	Low		No mining activity is noted.	101
- Extent	Low			101
- Water Quality				
Industrial Development	Low			
- Extent	Low			
- Water Quality	Low		No discharge permits issued.	101
- Riparian Condition				
Linear Development	Low			
- Extent	Low			
- Riparian Condition				
Hydro Development	Low			
- Extent	Low			

- Riparian Condition				
Other Development	Low			
- Extent	Low			101
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	Low		Potential for development on Indian Reserve lands.	139

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial drift	101
Terrain	Low	Terrain around Little River is low gradient. The Little River is a stable low to moderate gradient system.	111
Hydrology	Low	Shuswap Lake acts as a buffer.	101
Channel Stability	Low	No evidence of significant bank erosion, valley wall failures or channel movement.	101

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features			
Sensitive Biological Features	x	Heavy concentrations of chinook and sockeye spawn at the confluence of Shuswap Lake. Migration corridor.	111
Significant Environmental Variables			
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Sockeye and Pink - Incidental harvesting of this stock. Ocean fishery takes place on this stock. Ocean exploitation is currently unknown.	106
Recreational Fishery	x	Sockeye, Chinook and Pink - Incidental harvesting of this stock. Coho - No harvesting of this stock or unknown.	106
Native Fishery	x	Sockeye and Pink - Incidental harvesting takes place on this stock. The native fishery in the Fraser River and Thompson River is active during the migration of this stock. There is Native interest in re-establishing chinook harvest.	106 124

Restoration Activity			
Restoration Opportunity			
Enhancement Activity			
Enhancement Opportunity	x	Enhancement potential for chinook due to under- utilization of spawning areas.	111

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	0	0	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Land and Resource Management Plan	The Okanagan Shuswap LRMP was initiated in 1995 and will outline resource management zones for the area.	

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Identify and protect salmon habitats	Monitor habitat conditions closely as any impact in this area could have extremely negative effects on the salmon stocks of the Shuswap system. Protect integrity of spawning area.(105)
Maintain/enhance watershed and stream channel integrity and stability	Develop Riparian Management Plan to protect important riparian corridor.
	Apply DFO Land Development Guidelines, and any future Shuswap Lake specific development guidelines, to activities along Little River and the shores of Shuswap and Little Shuswap Lakes. Monitor development activities on reserve lands.

Chase  
River

Watershed Code: 03-1500

Drainage Area(ha):

29700

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone: Montane Spruce  
 Interior Douglas Fir  
 Engelmann Spruce-Subalpine Fir

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	1.4	13.5	0.1	0.3	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Pink	x						NA	NA

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Forest harvesting activities have resulted in destabilization of upslope areas resulting in high bedload movement, and suspended sediments.	129 105 139
- Percent Total Logging	High	20%	Logging activity is occurring in the upper areas of the watershed.	101 122
- Percent Recent Logging			Salmon Arm Forest District has temporarily agreed to stop greenwood harvesting due to water quality concerns.	180
- ECA Status	High	17.4%		103
- Riparian Condition	High		Past logging practices have resulted in removal of streamside vegetation causing bank erosion to increase.	105
Agriculture				
- Extent	High		Heavy agricultural use in the watershed destabilize banks and affect hydrology contributing to high bedload and suspended sediments.	111 129

- Riparian Condition	High		Removal of riparian vegetation has resulted in bank destabilization particularly in lower reaches.	105 139 178
- Water Withdrawal	High		High summer water use (113% of August mean 7 day low flow), and low summer flows (6% of mean annual discharge). Fully licensed for all domestic purposes.	101 103
- Water Quality	High		High water quality concerns result from sedimentation and nutrient inputs due to grazing and ranching activities.	111
Urbanization	Low		Primarily rural.	
- Population Level	Low	900		101
- Extent	Low		Mainly rural settlements and small holdings.	105
- Riparian Condition	High		Riparian vegetatipon has been removed by landowners resulting in erosion of strteambanks.	178
- Water Withdrawal			Water is licensed for domestic and waterworks purposes.	103
- Water Quality	High		Stormwater runoff adds to problems identified from other resource uses (forestry and agriculture).	101
Recreation	Low		Recreation activities on Chase Creek are limited.	
- Extent	Low			
- Riparian Condition				
- Water Quality				
Placer Mining	Low		No placer activity is currently recorded and future potential is nil to low.	
- Extent	Low			101

- Water Quality				
- Riparian Condition				
Other Mining	Low		Hardrock mine potential is low.	101
- Extent	Low			
- Water Quality				
Industrial Development	Low		No waste discharge permits issued.	101
- Extent	Low			101
- Water Quality				
- Riparian Condition				
Linear Development	Low		Linear development is restricted to local roads.	111
- Extent	Low		There is a secondary road located adjacent to Chase Creek.	111
- Riparian Condition				
Hydro Development	Low			
- Extent	Low	Nil		
- Riparian Condition				

Other Development				
- Extent				
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Logging, agriculture and settlement have resulted in removal of riparian vegetation increased erosion of streambanks and steamchannel destabilization. .	

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Lacustrine silt; glacial drift.	101
Terrain	High	Upslope areas moderately steep, slope instability, slide areas identified.	111 103
Hydrology	High	High water demand (113% of mean Aug. 7 day low flow) and low summer and winter flows (6 % and 4% of mean annual flows respectively).	103
Channel Stability	High	The stream channel is prone to bank erosion and siltation. Bedload movement has reduced channel complexity and has increased erosion problems.	135 129

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features	x	Slope instability in upper watershed increase the risks that resource use activity will result in downstream stream channel impacts.	129
Sensitive Biological Features	x	Important chinook spawning grounds at confluence with South Thompson. Sediment inputs from Chase Creek can affect fisheries resources of the S. Thompson.	111
Significant Environmental Variables	x	Riparian degradation, high bedload movement and suspended sediments, which cause siltation of gravels downstream, can cause negative impacts, however, gravel recruitment from the system may be beneficial.	103 129
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			111
Commercial Fishery			
Recreational Fishery			
Native Fishery			

Restoration Activity			
Restoration Opportunity			
Enhancement Activity			
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	2	3	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Local Resource Use Plan	Chase Creek Community Association. Working on water quality concerns in Chase Creek.	
Watershed Assessment Procedure	IWAP is being conducted by Riverside Forest Products.	105

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Maintain/enhance water quantity for instream uses	Develop a water use plan between agencies and stakeholders that allows for adequate instream flows for fish use. Monitor water withdrawals.
Maintain/enhance water quality	Restore riparian areas and fence cattle from streambank to reduce sediment from entering the system.
Maintain/enhance watershed and stream channel integrity and stability	Follow recommendations for erosion control by re-establishment of riparian trees along Chase Creek outlined in a study on the South Thompson watershed by Northwest Hydraulic Consultants and Urban Systems.
	Apply the DFO/MoELP Land Development guidelines for future developments to protect existing values and ensure proper stormwater management.
	Restore stream channel values in Chase Creek. Through IWAP, upslope problems associated with logging, such as loss of riparian areas, sediment contribution and terrain stability problems leading to downstream loss of channel integrity will be identified.
Maintain/enhance fish and habitat diversity	Involve stakeholders in land and water use planning directed at restoring habitat values to the system. Restore stream channel integrity in Chase Creek to protect spawning areas in the S. Thompson R.
	Develop stewardship programs with landowners to implement riparian management schemes that positively affect fish and fish habitat. Incorporate stakeholders into the restoration processes such as riparian planting, cattle exclosures and tree revetments.

Adams  
River

Watershed Code: 03-1800-000-000-000-991

Drainage Area(ha):

23400

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone: Interior Douglas Fir

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	76.4	0.0	0.0	10.5	101	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-'92 to '69-'80 Ave.	Rebuild Potential
Sockeye	x	3,287,678	1958	626,977	2,075,192	377,845	Increase	Mod
Chinook	x	5,000	1969	1,375	3,000	1,642	Static	High
Coho	x	3,500	1955	242	500	250	Static	High
Pink	x	3,951	1975	958	3,450	421	Increase	Mod

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Forestry activities are taking place in tributary systems. Impacts that occur in Hiuihill and Nikwikwaia Creeks can put the extremely valuable fisheries resources of the Adams River at risk.	
- Percent Total Logging	High	32%	Logging related impacts such as increased peak flows and sediment contribution from roads and hill slopes, from past logging, create potential risks to water quality downstream in the Adams River.	101 117
- Percent Recent Logging	High	11%	Recent logging and future logging continue to increase the potential for downstream impacts related to changes in hydrology and sedimentation.	101 117
- ECA Status				
- Riparian Condition	Low		Riparian condition along the Adams is not directly affected by logging activities.	
Agriculture	Low		Agricultural activities are limited along the Adams River. Activities in tributaries have the potential to affect fisheries values in the Adams.	
- Extent	Low		Concentrated in tributary watersheds, particularly in Hiuihill Creek.	101

- Riparian Condition				
- Water Withdrawal	Low		Water demand is low relative to the size of the river.	103
- Water Quality				
Urbanization	Low		Settlement is mainly rural residential and Indian reserve.	139
- Population Level	Low		Although the current population is low, there is some interest in developing Reserve Lands adjacent to the Adams River.	139
- Extent			Potential for development on Indian Reserve lands. Mainly Rural settlements.	139
- Riparian Condition				
- Water Withdrawal	Low		Water licenses issued for domestic and waterworks.	103
- Water Quality	Low		No waste discharge permits issued for this river.	101
Recreation	Low		Recreational activities, while relatively high in and around the Adams, are low impact. Activities include rafting, kayaking, fishing, hiking and viewing of spawning fish at the Roderick Haig-Brown Conservation Area.	132
- Extent	Low		Haig-Brown Conservation (988ha) for viewing fish during spawning. The viewing takes place in the lower 2 km. below the highway bridge.	132
- Riparian Condition	Low		The high volume of pedestrian traffic during spawning season, particularly in dominant years, can result in some degradation of riparian zones. On-site public education of the value of streamside riparian values can reduce these human impacts.	132
- Water Quality				
Placer Mining	Low		No placer mining activity is taking place in the Adams River area.	
- Extent	Low			101

- Water Quality				
- Riparian Condition				
Other Mining	Low		Mining activity is limited in this area.	
- Extent	Low		1 developed mine and 1 abandoned mine. There is high potential for development.	101
- Water Quality				
Industrial Development	Low		There is currently no industrial development in the Adams Lake area.	
- Extent	Low	Nil		
- Water Quality	Low		No waste discharge permits issued.	101
- Riparian Condition				
Linear Development	Low		Linear development is limited to secondary roads and private services.	
- Extent	Low			
- Riparian Condition				
Hydro Development	Low		There are no hydroelectric developments in the Adams area. An historic development at the outlet of Adams Lake was rejected in the 1940's.	
- Extent	Low			
- Riparian Condition				

Other Development	Low			
- Extent	Low			
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	Low		Potential for development on Indian Reserve along the west bank of the Adams River. Logging activities in Hiuihill and Nikwikwaia risk fisheries resources in the Adams River.	139

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial Drift.	101
Terrain	Low	The lower reaches of the Adams River are surrounded by low relief, while the slope gradients increase to moderate in the upstream reaches towards Adams Lake.	111
Hydrology	Low	The Adams River has a relatively stable hydrograph due to the buffering capacity of Adams Lake.	
Channel Stability	Low	Braided channel on fan.	101 150

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features			
Sensitive Biological Features	x	Important spawning area for the Adams River sockeye run, which is the second largest in the Fraser River drainage.	105
Significant Environmental Variables			
Unique Features	x	Haig-Brown conservation area and fish viewing area. The world famous Adams River sockeye run attracts tens of thousands of visitors during the dominant run, and lesser numbers of visitors during non dominant years.	111

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Chinook and Coho- Ocean fishery likely harvests this stock. Pink - Incidental harvesting of this stock.	106
Recreational Fishery	x	Chinook and Coho- No harvesting of this stock or Unknown. Pink - Incidental harvesting of this stock.	106
Native Fishery	x	Chinook and Coho- No known harvesting of this stock likely some incidental harvest in the Fraser and Thompson fishery. Pink - Incidental harvesting of this stock. Natives would like to restore traditional fishery at the Adams River.	106 124

Restoration Activity			
Restoration Opportunity			
Enhancement Activity	x	A side channel has been developed up by the viewing platform. This channel is currently utilized by sockeye, coho and chinook.	111
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	1	0	0	1

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Land and Resource Management Plan	The Adams River has been included in the Shuswap LRMP process.	

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Identify and protect salmon habitats	Protect the Adams River sockeye run against risks to water quality that may affect productivity.
Restore and enhance habitat	Restore riparian values and follow Forest Practices Code guidelines in tributary systems to reduce risks to downstream values in the Adams River.
Maintain/enhance fish and habitat diversity	Develop additional spawning and rearing channels, complex existing channels with LWD.

Upper  
Adams River

Watershed Code: 03-1800-000-000-000-992

Drainage Area(ha):

308660

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone: Interior Cedar-Hemlock

Interior Douglas Fir

Engelmann Spruce-Subalpine Fir

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	136.0	0.0	0.0	9.0	101 130	
				Jan		

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Sockeye	x	7,169	1988	1,262	7,196	58	Increase	Mod
Chinook	x	150	1993	1	12		Unk	High
Coho	x	3,500	1961	436	1,100	158	Increase	High

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	Low		Logging is the major resource use. Modified hydrology may have resulted in channel changes or erosion in lower reaches. Most impacts are noted above Tum Tum Lake.	101 130 164
- Percent Total Logging	Low	17%	Several tributaries have been harvested close to or exceeding 20% of the watershed.	130 101
- Percent Recent Logging	Low	5.8%		101
- ECA Status	Low	<10%		
- Riparian Condition	Low		Some blowdown of 30 metre leave strip areas. Logging road maintenance ie. ditches and culverts has been poor and has contributed to slope instability and increased sediments.	164 130
Agriculture	Low		There is limited settlement and agricultural activity in the Upper Adams Watershed.	
- Extent	Low		Some grazing upstream of Adams Lake and along Burton Creek.	164

- Riparian Condition	Low			
- Water Withdrawal	Low		Upper Adams River has been designated reserved, which means no more water licenses will be granted, by water management.	101 103
- Water Quality				
Urbanization	Low		Settlement in the Upper Adams area is very limited.	
- Population Level	Low	110		101
- Extent	Low		Individual land holdings with houses.	101 163
- Riparian Condition				
- Water Withdrawal	Low		Water licenses issued for domestic purposes	103
- Water Quality				
Recreation	Low		Recreation is low impact, hiking and fishing.	
- Extent	Low		3 Forest Service Recreation sites near Mica Lake and Tum Tum Lake.	142
- Riparian Condition				
- Water Quality				
Placer Mining	Low			
- Extent	Low	Nil	No recorded placer interests. Potential is low to nil.	101 163

- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low			101
- Water Quality				
Industrial Development	Low			
- Extent	Low			101
- Water Quality				
- Riparian Condition				
Linear Development	High		Primarily logging roads.	164
- Extent	High		Secondary road parallels system. Existing road system is a result of previous logging initiatives. Spur logging roads cross several small streams.	142 164
- Riparian Condition	High		Road maintenance, (ie. ditches and culverts), of logging roads, now public, and newer logging roads, has been poor in the past. Unstable, highly erodible soils contribute to maintenance problems, and impacts.	130
Hydro Development	Low			
- Extent	Low	Nil		
- Riparian Condition				

Other Development	Low			
- Extent	Low	Nil		
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Logging activity, primarily related to road building and operation for access, have contributed to slope instability problems. Road maintenance problems have resulted in erosion and sediment inputs to streams.	130

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	The upper Adams River mainstem flows through recent alluvial deposits.	130
Terrain	High	The Upper Adams valley is relatively steep terrain. Some slope stability problems occur along the valley walls in the Upper Adams.	
Hydrology	High	Tributary watersheds harvested in the past have modified flood hydrology that may have resulted in channel changes or erosion in lower reaches. Tumtum lake intercepts much of the sediment transported from the upstream watershed.	130
Channel Stability	Low	Below Tumtum Lk. almost all the sediment is derived from tributary inflows and bank erosion along the main river. Goat and Harbour are unstable on fan. The main river channel is moderately stable.	130

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features	x	Stream channel and valley wall instability.	101 130
Sensitive Biological Features	x	Main sockeye spawning area extends for about 5 km downstream of Harbour Creek and coho spawn mainly upstream of Tumtum.	130 164
Significant Environmental Variables	x	There is good gravel in this system however it is compacted and sediment is a problem.	131 164
Unique Features	x	Designated a protected area in the Kamloops Land Resource Management Plan. This excludes the river valley bottom from any future development.	115 130

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Chinook and Coho-Ocean fishery likely harvests this stock. Sockeye- Incidental harvesting of this stock.	106
Recreational Fishery	x	Sockeye, Chinook and Coho-No harvesting of this stock or unknown	106
Native Fishery	x	Chinook and Coho-No known harvesting of this stock . Sockeye- Incidental harvesting of this stock. Interception of some Adams salmon in Fraser and Thompson River is probable. This River is of interest to SNFC to re-establish the historic fishery.	106 159

Restoration Activity			
Restoration Opportunity	x	Re-vegetate areas where road failures have occurred or where clearcuts are adjacent to river. Continue to upgrade road systems, deactivate old logging roads, maintain existing roads and culverts.	130
Enhancement Activity	x	Chinook fry have been transplanted to the Upper Adams. Continue to rebuild upper sockeye stocks through transplant from Momich. Sockeye salmon are incubated and then pen reared and subsequently released to rear in Adams Lake.	130
Enhancement Opportunity	x	This system is viewed as having one of the major enhancement potentials for sockeye in the Fraser River Watershed.	130

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	1	2	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Land and Resource Management Plan	Designated protected area in the Kamloops LRMP.	115
Watershed Assessment Procedure	Level I Watershed Assessment was initiated in 1995. A Level 2 fish and fish habitat assessment was conducted by MELP in 1995/96.	164

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Restore and enhance habitat	Review and develop programs for remediating site specific impacts on the Upper Adams and tributaries described in (NHC 1995). Restoration techniques include restoration of riparian vegetation, landslide rehabilitation, improvement to bridges or crossings
	Use results of Level 2 Fish and Fish Habitat Assessments to develop habitat restoration plans.
	Restore riparian vegetation through planting in site specific areas, particularly Burton Creek.
Maintain/enhance watershed and stream channel integrity and stability	Through IWAP process identify riparian impacts, road inventories and problems, channel and terrain instability. Develop treatments to restore the watershed to pre-logging values.
	Develop road access plan, under WRP, that identifies roads that can be deactivated.
Rebuild and enhance salmon stocks	This system is viewed as one of the major enhancement potentials in the Fraser watershed (130). Continue sockeye enhancement efforts. Continue to monitor chinook transplanted stocks.

Hiulhill  
Creek

Watershed Code: 03-1800-010

Drainage Area(ha):

10960

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone: Interior Cedar-Hemlock

Interior Douglas Fir

Engelmann Spruce-Subalpine Fir

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	1.4	11.1	0.1	0.2	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Sockeye	x							
Chinook	No							
Coho	x							

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Logging activity has modified hydrologic regimes and has caused increased sediment inputs due to logging road construction and operation.	101 105
- Percent Total Logging	High	35%	The distribution of harvest openings has had substantial influence on peak flow timing. Channel destabilization has been induced by past logging practices in the headwaters.	101 111 117
- Percent Recent Logging	High	10%	Logging has been deferred pending Integrated Management Plan results	101 181
- ECA Status	Low	18%	Approximately 18% of total watershed is in a hydrologic state of clearcut. This value reflects the fact that historic logged areas have regenerated to a certain extent.	117
- Riparian Condition	High	20%	20% of the riparian zone bank length has been affected by logging. Channel destabilization and sediment accumulation has been induced by past logging and logging road construction. Riparian removal has resulted in an increase in bank erosion.	117 103 139
Agriculture	High		High agricultural activity has resulted in stream channel changes and downstream impacts due to sediment inputs.	
- Extent	High	1.51 AU/km.	The lower reaches of Hiuihill Creek have been subjected to heavy agricultural land use including grazing and crop production.	117 129

- Riparian Condition	High	3.7%	3.7% of the length of streambank has had vegetation removed. Stream channel complexity has been reduced due to removal of LWD channelization and armouring of sections of the stream.	103 129 139
- Water Withdrawal	High		High water demand. Water use is noted as being 116% of summer 7 day low flows.	101 103
- Water Quality	High		Increase in sediment load. Sediment concentrations generally increase downstream with the highest concentrations observed in agricultural areas below Hiuihill Canyon.	117
Urbanization	Low			
- Population Level	Low		Mainly rural, confined to lower reaches.	101
- Extent	Low	7.6% (watershed)	7.6% of the Hiuihill watershed is privately owned.	117
- Riparian Condition	High	9.3% (streamlength)	9.3% of the streamlength has been affected by the reduction of riparian streamside vegetation along private lands.	117
- Water Withdrawal	Low		Water is withdrawn for domestic and waterworks purposes.	103
- Water Quality				
Recreation	Low			
- Extent	Low			
- Riparian Condition				
- Water Quality				
Placer Mining	Low			
- Extent	Low	Nil	No recorded interests.	101

- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low		There is some development potential in the watershed although no interest has been noted to date.	101
- Water Quality				
Industrial Development	Low			
- Extent	Low			
- Water Quality	Low		No waste discharge permits issued for this stream.	101
- Riparian Condition				
Linear Development	High		Impacts associated with linear development are almost exclusively from road alignments.	117
- Extent	High		Secondary logging roads. Historical road maintenance is poor resulting in increased sedimentation to the system.	117
- Riparian Condition	High	.9% (streamlength)	.9% of the stream has had riparian zones affected due to highway construction. A road crossing at 19.5 km has resulted in localized bank erosion. In the headwaters there are small road related slides.	117
Hydro Development	Low			
- Extent	Low	Nil		
- Riparian Condition				

Other Development	Low		Fish farm, storage dam	117
- Extent				117
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High	19%	19% of the streambanks are presently eroding. Forest removal has contributed to hydrological change in the watershed. Road construction, settlement and agriculture have also contributed to increased sedimentation and flooding.	117 129

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Upland areas consist of rock deposits. The upstream reaches of Hiuihill Creek are incised in rocky material.	117
Terrain	Low	Gentle to moderate sloping relief.	101
Hydrology	High	Peak streamflows are increased because snowmelt is coincidental in the upper and lower portions of the watershed due to logging activities. South facing cutblock openings in the upper watershed melt earlier than normal.	117 103 129
Channel Stability	High	Destabilization of the middle reaches of Hiuihill Creek has occurred as a result of streambank erosion and undercutting of banks. Debris jam formation and aggradation from sediment and bedload has contributed to channel widening and shifting.	117 129

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features	x	Channel instability. Two steep chutes or waterfalls (near the Adams River confluence) obstruct upstream fish movement.	117
Sensitive Biological Features			
Significant Environmental Variables	x	Serious bedload and erosion problems. Stability problems may lead to materials, especially sands and silts, being transported downstream and deposited in spawning gravels (Adams River). Beaver dams in system may help reduce downstream sediment movements.	117 111
Unique Features			117

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery			
Recreational Fishery			
Native Fishery			

Restoration Activity			
Restoration Opportunity	x	Deactivate roads, remove culverts and restore pre-existing drainage patterns. Agricultural areas should be fenced to protect riparian areas. Riparian zones along the creek should be protected and restored. Re-establish riparian corridor.	117
Enhancement Activity			
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	3	2	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Watershed Assessment Procedure	A Hydrotechnical Assessment was completed in 1995 and terrain stability mapping is being conducted in 1995/96.	117
Other	Logging has been deferred pending the results of and Integrated Management Plan.	182

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Identify and protect salmon habitats	Continue to defer logging until Integrated mangement Plan is complete.
	Apply DFO/MoELP Land Development Guidelines for future developments in the area to protect instream values.
	Continue to assess activities in Hiuihill Creek for the risk they impose on the gravel and water quality of the lower Adams River.
Restore and enhance habitat	Develop stewardship programs whereby landowners participate and are educated in streamside restoration practices (117).
	Establish riparian corridor or "Streamside Management Zone" along all presently unvegetated or sparsely vegetated areas and fence agricultural areas. Maintain and protect areas of existing vegetation.(117)
	Incorporate findings from IWAP to protect riparian areas from further degradation and enhance areas where degradation has already occurred.
Maintain/enhance water quantity for instream uses	Define instream use and develop water management plan through dialogue between stakeholders and agencies.
Maintain/enhance watershed and stream channel integrity and stability	Initiate Level 2 Channel Assessment on Hiuihill Creek.
	Deactivate roads, remove culverts and restore pre-existing drainage patterns(117).
	Use of appropriate bioengineering techniques to stabilize eroding banks. Avoid rip rap so that permanent river constrictions are not formed. Allow river to migrate except where rapid erosion is occurring or houses exist (117)

**Nikwikwaia  
Creek**

Watershed Code: 03-1800-020

Drainage Area(ha):

97100

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone: Interior Cedar-Hemlock

**STREAMFLOW CHARACTERISTICS**

Stream Flows  (m3/s)	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
	1.2	9.8	0.1	0.1	103 111	Low water levels at confluence of lower Adams River may present access problem for fish in dry years.

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Sockeye	x							
Coho	x							

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Road networks have encircled the basin. Harvesting has taken place on the slopes above the creek and on the plateau in the headwaters.	119
- Percent Total Logging	High	35%	The main logging activity has occurred on the west side of the drainage. The IDF Biogeoclimatic Zone in the drainage, located in the lower to mid elevations, has been selectively logged.	119 111 101
- Percent Recent Logging	High	12%	Logging has been deferred pending the results of an Integrated Management Plan.	101 182
- ECA Status				
- Riparian Condition				
Agriculture	Low		Current agricultural use is low however, trends are towards increasing use.	
- Extent	Low		Range use primarily occurs in the lower elevations and open range in Hustalen Indian Reserve. Cattle use is increasing in the upper watershed as logging use intensifies and range area increases.	119

- Riparian Condition				
- Water Withdrawal	Low		No recorded summer water use for Nikwikwaia Creek.	103
- Water Quality				
Urbanization	Low			
- Population Level	Low		Mainly rural.	101
- Extent				
- Riparian Condition				
- Water Withdrawal				
- Water Quality				
Recreation	Low			
- Extent	Low	Nil		
- Riparian Condition				
- Water Quality				
Placer Mining	Low			
- Extent	Low	Nil	No recorded interest.	101

- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low		1 abandoned mine.	101
- Water Quality				
Industrial Development	Low			
- Extent	Low	Nil		
- Water Quality	Low		No waste discharge permits issued for this stream.	101
- Riparian Condition				
Linear Development	Low			
- Extent	Low		No major existing developments.	101
- Riparian Condition				
Hydro Development	Low			
- Extent	Low			
- Riparian Condition				

Other Development	Low			
- Extent	Low	Nil		
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Primarily forestry.	101

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial lacustrine. Materials are eroded during large rain events.	101 119
Terrain	High	Moderate to steep relief in upslope areas. Slide activity in upper drainage. Low stability along valley walls and moderate stability in the valley bottom. Requires terrain stability mapping.	119 111
Hydrology	Low	Hydrologic regime relatively stable. Low Summer lows (11% Mean Annual Flows (MAF) and low winter flows (7% MAF).	103
Channel Stability	Low	Wide variety of debris flows along colluvial slopes and cutbanks of this creek and its tributaries. Steep gradient and deeply incised.	129 101

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features	x	Channel and valley wall instability is contributing sediment to the creek.	101
Sensitive Biological Features	x	Potential for downstream impacts to the Lower Adams River spawning area from sediment contribution out of Nikwikwaia Creek.	111
Significant Environmental Variables			
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Incidental ocean harvest of coho. Fishery directed at Adams River sockeye.	
Recreational Fishery	x	Ocean harvest of coho. Recreational fishery directed at Adams sockeye at the mouth of the Fraser River.	
Native Fishery			

Restoration Activity			
Restoration Opportunity			
Enhancement Activity			
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	1	1	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Watershed Assessment Procedure	An IWAP is scheduled for this Creek. Terrain stability mapping has been undertaken by Dobson Engineering.	119
Other	Harvesting has been deferred pending the results of an Integrated Management Plan.	183

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Identify and protect salmon habitats	Continue to assess activities in Hiuihill Creek for the risks they impose on the gravel and water quality of the Lower Adams river.
Restore and enhance habitat	Apply DFO/MOELP Land Development Guidelines for future developments in the areas to protect instream values.
	Allow no further development on Nikwikwaia Cr. until an Integrated Management Plan is completed.
Maintain/enhance watershed and stream channel integrity and stability	Use results from IWAPs conducted to initiate further assessments as well to identify restorative treatments that could be implemented through the WRP.

Simmax  
Creek

Watershed Code: 03-1800-070

Drainage Area(ha):

19100

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone: Interior Douglas Fir  
 Montane Spruce  
 Engelmann Spruce-Subalpine Fir

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	0.8	3.0	0.2	0.3	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Sockeye	x	7,300	1983	986	7,300	100	Increase	Mod
Coho	x	750	1962	47	120	114	Decrease	High

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Logging activity is extensive in Sinmax Creek.	101 164
- Percent Total Logging	High	35%	The majority of logging is concentrated North of Sinmax Creek mainly on Crown lands. There is also extensive logging on private lands on both sides of the creek.	101 164
- Percent Recent Logging	High	15%	Current logging plans identify the the South side of the creek for harvesting activities.	101 164
- ECA Status				
- Riparian Condition	High		Bank instability has resulted from the loss of streamside vegetation and sediment inputs to the creek have increased due to increased erosion.	135
Agriculture	High		Agricultural activity takes place along the entire length of the creek.	164
- Extent	High	3.63 AU/Km <sup>2</sup>	Extensive ranching and hay production.	101 118 164

- Riparian Condition	High		Vegetation removal has occurred along much of the creek. In some areas cutbanks are six metres high where sloughing of sidebanks has occurred. Numerous bridge crossings on private lands constrict flows and contribute to riparian loss.	135 164
- Water Withdrawal	High		High summer water is noted as being 75% of summer 7 day low flow. Approximately one-half of total irrigation licences are compensated for by attached storage licences.	131 129 103
- Water Quality	High		Water quality is affected by siltation from agricultural activity, barnyard run-off, fertilizer and chemical use.	164
Urbanization	Low			
- Population Level	Low	10		101
- Extent	Low		Mainly rural developments. There is a potential for increased settlement (summer recreational dwellings) particularly at mouth of Sinmax Creek.	101 164
- Riparian Condition	High		Increasing encroachment onto riparian areas from increased settlements.	164
- Water Withdrawal	Low		Community watershed.	115
- Water Quality	Low			
Recreation	High		Recreational activity is concentrated along the lower reaches of the creek and is associated with recreational use of Adams Lake.	
- Extent	High		Anticipated increase in recreational activities particularly summer use. There are many cabins on the first 200-300 metres of the creek.	101 164
- Riparian Condition	High		Streambank clearing and encroachment into the riparian zone by cabin owners has resulted in removal of vegetation along the lower reaches of the creek, the areas with highest anadromous fisheries values.	164
- Water Quality				
Placer Mining	Low			
- Extent	Low	Nil	No recorded interests.	101

- Water Quality				
- Riparian Condition				
Other Mining	Low		3 abandoned mines.	103 174
- Extent	Low		Mining Activity has ceased and reclamation activities are currently underway.	101
- Water Quality	Low		There is still some concern related to inputs from mining spoil.	129 101 164
Industrial Development	Low			
- Extent	Low	Nil		164
- Water Quality				
- Riparian Condition				
Linear Development	High		Roads parallel Sinmax Creek.	
- Extent	High		Road networks are extensive due to past and present logging activity.	142 164
- Riparian Condition	High		The riparian zone has been impacted by road development particularly bridges. Many of these bridges on private land have resulted in flow restrictions and degraded riparian zones.	164
Hydro Development	Low			
- Extent	Low			
- Riparian Condition				

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Other Development	Low			
- Extent	Low			
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Forestry and agriculture are the main developments causing riparian degradation to the Sinmax watershed and its tributaries. Mining, settlement and recreation have added to the cumulative pressure on the resource.	

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial drift.	101
Terrain	Low	Mountainous terrain - gentle to moderate sloping relief.	101
Hydrology			
Channel Stability	High	Some side channel development; major fan development.	101 164

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features	x	Major fan development in conjunction with low flows can inhibit fish movement into the creek, particularly during the fall spawning period.	164
Sensitive Biological Features	x	Sediment contribution from Sinmax Creek can impact on Kokanee populations spawning in Skwaam Bay.	118
Significant Environmental Variables			
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Sockeye- incidental harvesting of this stock. Coho - harvesting of this stock is unknown, likely some ocean interception.	106
Recreational Fishery	x	Sockeye and coho -Harvesting of this stock unknown.	106
Native Fishery	x	Sockeye- incidental harvesting of this stock. Coho - harvesting of this stock unknown. Native interest in Sockeye, Chinook and Coho with the goal of re-establishment of traditional fisheries.	106

Restoration Activity	x	Some landowners are starting to revegetate areas where riparian degradation has occurred.	164
Restoration Opportunity	x	Stabilize creek to reduce development and restore riparian values. Any opportunity to enhance instream values should ensure that nearby shore spawning areas used by kokanee are not affected. Gravel recruitment may be important for kokanee spawning.	118 164
Enhancement Activity			
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	4	1	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Watershed Assessment Procedure	Watershed Assessment by Interfor in progress. Initiated in 1996	164

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**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Identify and protect salmon habitats	Prior to reclamation work inventory existing values to develop restoration plans.
	Apply Land Development Guidelines to developments occurring at mouth of the river.
Restore and enhance habitat	Reclaim areas by planting streamside vegetation. May have to incorporate a buy-back program to enhance riparian corridor.
Maintain/enhance water quantity for instream uses	Reject all requests for water withdrawals and reserve water for instream uses. Develop a water management plan to allow for instream flows for fish.
Maintain/enhance water quality	Develop stewardship program involving landowners and other stakeholders and educate in riparian management and restoration as well as ways to mitigate effects of road and bridge building. Build fences to keep cattle away from streambanks.
Maintain/enhance watershed and stream channel integrity and stability	Continue to support the IWAP already in progress by Interfor. Use results of IWAP to direct future assessments (FHAP, CAP, Teraain Stability), and restorative treatments. Develop Access Plan for road deactivation.
Maintain/enhance fish and habitat diversity	Ensure that kokanee spawning grounds are unaffected by restoration activities.(118)

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Momich  
River

Watershed Code: 03-1800-150

Drainage Area(ha):

47400

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone: Interior Cedar-Hemlock

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	21.1	152.2	1.9	3.6	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Sockeye	x	5,846	1984	806	5,854	538	Increase	Mod
Coho	x	750	1962	57	225	53	Static	High

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Terrain stability problems create risks of increasing sediment contribution from logging road construction and operation.	129 130 135
- Percent Total Logging	High	18.7%	Roads have contributed to gully failures. Old roads from previous logging activities require maintenance.	130 183
- Percent Recent Logging	Low	5.7%	New logging has occurred on the North side of the watershed.	101 183
- ECA Status				
- Riparian Condition	High		Recent cutblocks along Reach 4 have been created without adequate buffer areas along the river.	183
Agriculture	Low			
- Extent	Low	0 AU/Km <sup>2</sup>		101

- Riparian Condition				
- Water Withdrawal				
- Water Quality				
Urbanization	Low			164
- Population Level	Low			
- Extent	Low			
- Riparian Condition				
- Water Withdrawal				
- Water Quality				
Recreation	Low		Designated as a Protected Area under the Kamloops LRMP.	115
- Extent	Low		3 Recreation sites including Momich River, Momich Lake and Momich Lake East with 30, 3 and 5 units respectively. Sportfishing and camping are the main activities.	142 146
- Riparian Condition	Low			
- Water Quality				
Placer Mining	Low			
- Extent	Low			101

- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low			101
- Water Quality				
Industrial Development	Low			
- Extent	Low			
- Water Quality	Low		No waste discharge permits issued for this system.	101
- Riparian Condition				
Linear Development	Low		Logging roads	
- Extent	Low			142
- Riparian Condition			Logging road construction has followed the river course closely resulting in areas with inadequate buffering and weakened riparian zones.	183
Hydro Development	Low			
- Extent	Low			
- Riparian Condition				

Other Development	Low			
- Extent	Low			
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	Low		Some concerns with logging road construction and operation on unstable terrain.	130 135 129

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial fluvial terrace.	130
Terrain	Low	Steep mountainous terrain. System has been eroded into a glacialfluvial terrace.	130 101
Hydrology			
Channel Stability	High	Banks are moderately unstable with coarse debris armouring toe. Bridge constricts unstable channel part way up the system. High degree of instability on valley walls and bottom. Channel pattern is mainly sinuous.	130 101

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features	x	Bottom and valley walls unstable	101
Sensitive Biological Features			
Significant Environmental Variables			
Unique Features	x	Sockeye brood stock from the Momich is used for the upper Adams River.	

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Sockeye - incidental harvesting of this stock. Coho- harvesting of this stock is unknown.	106
Recreational Fishery	x	Sockeye and Coho- incidental harvesting of this stock.	106
Native Fishery	x	Sockeye - incidental harvesting of this stock in Fraser and Thompson River native fisheries. Coho - harvesting of this stock is unknown. There is native interest to develop a fishery for this stock.	106

Restoration Activity			
Restoration Opportunity			
Enhancement Activity			
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	2	1	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Watershed Assessment Procedure	FRBC fish habitat work initiated in 1995. IWAP to be done 1996.	143

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**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Maintain/enhance watershed and stream channel integrity and stability	Identify problems associated with terrain stability, road inventory, stream channel integrity and associated problems through IWAP process. Identify restoration opportunities.
Rebuild and enhance salmon stocks	Continue efforts to rebuild stocks through fisheries management.

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Cayenne  
Creek

Watershed Code: 03-1800-150-500

Drainage Area(ha):

36800

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone: Interior Cedar-Hemlock  
Engelmann Spruce-Subalpine Fir  
Alpine Tundra

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	16.3	117.4	1.5	2.7	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Sockeye	x	5,912	1988	1,014	5,912	0	Unk	Mod
Coho	x	100	1986	52	100	0	Unk	Mod

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Past logging activities may have resulted in increased sediment inputs.	101 131
- Percent Total Logging	High	20%	Most logging activities have occurred on the West side of the watershed. Large quantities of LWD has been introduced into reaches 4,5 and 6.	130 101 183
- Percent Recent Logging	High	6%	New logging development is planned for this watershed.	101
- ECA Status				
- Riparian Condition	High		Blowdown has occurred in leave strips adjacent to the creek and in some reaches there is no vegetation left adjacent to creek.	130 183
Agriculture	Low			
- Extent	Low	0 AU/Km <sup>2</sup>		101

- Riparian Condition				
- Water Withdrawal				
- Water Quality				
Urbanization	Low			101
- Population Level	Low		Mainly rural.	101
- Extent				
- Riparian Condition				
- Water Withdrawal				
- Water Quality				
Recreation	Low			
- Extent	Low		There is a forest Recreation Site at Stukemaptern Lake with 3 camping units.	142
- Riparian Condition				
- Water Quality				
Placer Mining	Low			
- Extent	Low			

- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low	Nil		
- Water Quality				
Industrial Development	Low			
- Extent	Low			
- Water Quality	Low		No waste discharge permits issued for this stream.	101
- Riparian Condition				
Linear Development	High		Logging roads	
- Extent	Low		An active logging road runs alongside the river for 29 km.	130 183
- Riparian Condition				
Hydro Development	Low			
- Extent	Low			
- Riparian Condition				

Other Development	Low			
- Extent	Low			
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Resource use impacts primarily concerned with logging activities, particularly in areas close to riparian zone.	130

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial Drift.	101
Terrain	Low	Gentle to moderate sloping relief	101
Hydrology	Low	Cayenne Creek has a relatively stable hydrologic regime.	103
Channel Stability	Low	Moderate instability along valley walls and valley bottom. A fan separates Momich Lake from Third Momich Lake.	101

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features	x	Debris jams at mouth of river. Impassable barrier located 2.1 km upstream of the mouth.	130
Sensitive Biological Features			
Significant Environmental Variables			
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Sockeye- Incidental harvesting of this stock. Coho - No known harvesting of this stock.	106
Recreational Fishery	x	Sockeye and Coho- No known harvesting of this stock.	106
Native Fishery	x	Sockeye- Incidental harvesting of this stock in the Thompson and Fraser Rivers. Coho- No known harvesting of this stock.	106

Restoration Activity			
Restoration Opportunity			
Enhancement Activity			
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	2	0	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Watershed Assessment Procedure	Fish and fish habitat survey partially completed in 1995. IWAP to be conducted on the system.	143

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Restore and enhance habitat	Assessment by biologist where blowdown has entered stream will determine remediation techniques best suited for these sites. (130)
	Investigate possibility of re-vegetating areas where riparian vegetation has been removed. (130)
Maintain/enhance watershed and stream channel integrity and stability	Identify problems associated with terrain stability, road stability, stream channel integrity and riparian assessments through IWAP. Develop restoration plans based on information gathered in the IWAP.
Rebuild and enhance salmon stocks	Assess fish barriers that may be restricting upstream access in Cayenne Creek to determine if construction of fish bypass facilities is feasible.

Scotch  
Creek

Watershed Code: 03-2000

Drainage Area(ha):

61100

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone: Interior Cedar-Hemlock

Engelmann Spruce-Subalpine Fir

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	7.7	61.7	1.9	3.6	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Sockeye	x	83,388	1990	15,350	86,286	3,401	Increase	Mod
Chinook	x	25	1968	0	0	0		
Coho	x	200	1953	46	100	32	Increase	High
Pink	x	109		14	109	0	Unk	Mod

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Logging activity has been concentrated in the area west of Scotch Creek. High concern over extensive logging in the past. Increased mass wasting can be attributed to logging activity.	144 154
- Percent Total Logging	High	40%	Large area of recent and past logging has resulted in increased channel erosion and sedimentation particularly on the fan. Logging roads are in need of maintenance or deactivation.	101 154
- Percent Recent Logging	High	10%	Federated Co-ops 5 yr dev plan includes a planned cut of 1,543 hectares. (.24% of the watershed). Cable yarding and hell logging will be used in some areas to minimize site degradation.	154
- ECA Status	High	19.6%	Over 95% of harvesting method is clearcut.	154
- Riparian Condition	High		Loss of streamside buffers contributes to bank erosion and sedimentation. Historic logging practices has resulted in logging to the streamside in many areas, reaches 5 and 6 are of particular concern.	103 184 154
Agriculture	Low			
- Extent	Low	0.11 AU/Km <sup>2</sup>		101

- Riparian Condition				
- Water Withdrawal	Low		August water use is 1% of August 7 day low flow.	103
- Water Quality				
Urbanization			Recreation development/rural settlement.	
- Population Level	Low	25		101
- Extent	High		Developed for cabins and recreation sites. Most of the development is on the fan.	150
- Riparian Condition			It is recommended that no more development occur on western portion of the fan.	
- Water Withdrawal	Low		Lower Scotch Creek runs through Adams Lake Indian Reserve and is a source of domestic water.	154
- Water Quality				
Recreation	Low			
- Extent	Low		Small timbered campsite located at Kwikoit Creek. Cabins located on the fan.	133
- Riparian Condition				
- Water Quality				
Placer Mining	Low		Past placer mining, recent activity is negligible.	
- Extent	Low		Historical interest in Kwikoit Creek. This mine has not been actively worked since the 1980's. Portions of the watershed show high degrees of mineralization and potential exists for significant deposits and interest by mining community.	154

- Water Quality				
- Riparian Condition				
Other Mining	Low		High levels of mineralization in portions of the watershed has created mining interest.	
- Extent	Low		Area between Scotch Creek and Adams Lake contains deposits of lead, silver and has good potential for development.	144
- Water Quality				
Industrial Development	Low			
- Extent	Low		Columbia Shuswap Regional District Landfill; Milling operation contaminated site.	111
- Water Quality	Low		No waste discharge permits have been issued.	101
- Riparian Condition				
Linear Development	Low		Primarily logging road development.	111
- Extent	Low		Mud Creek has the potential to wash-out roads during high flood years. The system has approximately 1/2 the culverts in place for adequate water management.	154 129
- Riparian Condition				
Hydro Development	Low			
- Extent	Low		BC Hydro cleared a Right-of-Way and put in a transmission line in the 1960's.	154
- Riparian Condition				

Other Development				
- Extent				
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Logging is the major resource activity in the watershed. Development on the fan, near the mouth of the Creek, has the potential to impact fisheries values.	

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial drift. Silty loams with varying degrees of clay content.	154
Terrain	Low	Mountainous. Valley walls are steep. Some terrain instability leading to mass wasting.	101
Hydrology	High	System subject to extreme freshet.	129 154 150
Channel Stability	High	Log jams in lower river restrict bedload movement. Scotch Creek near the mouth is braided with a clearly defined fan. There has been an attempt to re-route flows below the bridge at the Indian Reserve.	129 154

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features	x	Mass wasting (debris slides and slumps) which occurs naturally high elevation scars and slides, has been exacerbated by logging activity.	154
Sensitive Biological Features			
Significant Environmental Variables	x	Siltation, debris loads and scouring are serious problems that can affect spawning gravels.	111
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Sockeye and Pink - Incidental harvest of this stock. Coho - No harvesting of this stock or unknown.	106
Recreational Fishery	x	Pink - Incidental harvest of this stock. Coho and Sockeye -No harvesting of this stock or unknown.	106
Native Fishery	x	Sockeye and Pink - Incidental harvest of this stock. Coho - No harvesting of this stock or unknown. There is Native interest in this Creek.	106 159

Restoration Activity	x	Stabilization of large organic debris.	159
Restoration Opportunity		Open up old side channels on Scotch Creek Fan.	
Enhancement Activity			
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	1	2	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Watershed Assessment Procedure	Road and terrain assessment completed by Borrett Engineering. Level 2 Fish and Fish habitat assessment conducted by MELP in 1994, report completed in late 1995. Additional assessments scheduled for 1996. Development of Access Plan to follow assessments	154

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Restore and enhance habitat	Identify problems associated with terrain stability, roads, stream channel integrity and riparian condition through the Watershed Assessment Process. Prescribe treatments to restore watershed values.
Maintain/enhance fish and habitat diversity	Develop a plan to maintain/enhance fisheries values in the lower reaches below the bridge through interaction with agencies and stakeholders. Explore opportunities to develop old side channel on the fan.
Rebuild and enhance salmon stocks	Monitor and maintain good fish access into upper Scotch Creek.

Onyx  
Creek

Watershed Code: 03-2500

Drainage Area(ha): 5740

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone: Interior Cedar-Hemlock  
Interior Douglas Fir  
Engelmann Spruce-Subalpine Fir

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	1.0	9.6	0.1	0.1	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Sockeye	x	110	1990	39	110		Unk	Mod
Coho	x	60	1988	22	60		Unk	Mod

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Logging is extensive. Mass wasting that is occurring is primarily a result of logging road construction and operation.	120 150
- Percent Total Logging	High	40%	The highest density of cutblocks occurs in the southern part of the watershed. The % total logged value includes a large fire that burned through the area.	101
- Percent Recent Logging	High	10%		101
- ECA Status	High	22.2%	ECA level is currently at a threshold where streamflow increases may be significant and could affect stream channel integrity.	120
- Riparian Condition				
Agriculture	High		Agricultural activity is degrading the riparian zone and impacting water resources.	150
- Extent	High	4.72 AU/Km <sup>2</sup>	Agricultural use (grazing and crop production) is extensive and concentrated in middle reaches.	101

- Riparian Condition	High		Armouring of streambanks, removal of streamside vegetation, and cattle access have contributed to increased erosion and reduction of channel complexity.	129
- Water Withdrawal	High		August use is 49% of 7 day low flow values. Both summer and winter low flows are 9% of Mean Annual Flows.	103
- Water Quality	High		Non-point source nutrient inputs.	101
Urbanization	Low		Development activity is concentrated in the lower reaches.	150
- Population Level	Low			
- Extent	Low		Mainly rural. Development activity is concentrated mostly along the lower reaches.	150
- Riparian Condition	High		Residential and commercial settlements encroach on the creek. Further development on the fan is not recommended.	139 105
- Water Withdrawal				
- Water Quality				
Recreation	Low			
- Extent	Low			
- Riparian Condition				
- Water Quality				
Placer Mining	Low		No recorded interests.	101
- Extent	Low			

- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low			
- Water Quality				
Industrial Development	Low			
- Extent	Low			
- Water Quality	Low		No waste discharge permits issued for this system.	101
- Riparian Condition				
Linear Development	Low			
- Extent	Low		Secondary roads.	120
- Riparian Condition				
Hydro Development	Low			
- Extent	Low			
- Riparian Condition				

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Other Development	Low			
- Extent				
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Cumulative impacts from forestry activities, agricultural land use, water withdrawals rural encroachment, and the large 1969 fire.	131 150

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial Drift.	101
Terrain	Low	Mountainous terrain, slope instability along valley walls. Debris avalanches occur in the system	101, 120
Hydrology	High	Summer water use exacerbates summer low flow problems. Winter low flows.	101, 150
Channel Stability	Low	The watershed is steep and confined in the upper section and generally stable throughout its length. Multiple channels are present in the lower end. The channel is unstable on the fan.	129, 120

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features	x	Some portions of the watershed are subject to erosion from old roads and natural landslides.	120
Sensitive Biological Features			
Significant Environmental Variables	x	Agricultural water withdrawals result in low flows.	131
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Sockeye - Incidental harvest of this stock. Coho - No known harvest of this stock, ocean interception is likely.	106
Recreational Fishery	x	Sockeye and Coho - No known harvest of this stock.	106
Native Fishery	x	Sockeye - Incidental harvest of this stock, in the Fraser and Thompson Native Fishery. Coho - No known harvesting of this stock, ocean interception is likely.	106, 159

Restoration Activity			
Restoration Opportunity			
Enhancement Activity			
Enhancement Opportunity	x	Good habitat for only a few hundred metres. Limited enhancement potential.	111

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	2	1	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Watershed Assessment Procedure	Level 1 Watershed Assessment Completed in 1994. The procedures used in this report were interim as the Watershed Assessment Procedures were being revised at the time.	120

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**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Restore and enhance habitat	Restore riparian vegetation through partnerships with private landowners and application of Land Development Guidelines. Develop an education program to inform local residents of the importance of streamside vegetation.
Maintain/enhance water quantity for instream uses	Develop instream flow values to reduce risks that future water withdrawals will result in critical summer low flows and affect spawning on the fan.
Maintain/enhance watershed and stream channel integrity and stability	IWAP process will identify areas where road construction has resulted in mass wasting particularly in the south portion of the watershed (120). IWAP treatments will address the impacts of logging and logging road construction.
Maintain/enhance fish and habitat diversity	Work with landowners to reduce channelization initiatives which can reduce channel complexity particularly in the lower gradient reaches. No more development should take place on the fan.(150).

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Ross  
Creek

Watershed Code: 03-2600

Drainage Area(ha):

10580

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone: Engelmann Spruce-Subalpine Fir  
Interior Cedar-Hemlock

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	1.9	17.8	0.2	0.2	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Sockeye	x	1,477	1982	295	1,477	0	Unk	Mod
Coho	x							

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Although logging activity is taking place, stream channel impacts are likely a combination of logging and forest fires.	129 150 135
- Percent Total Logging	High	40%	The 40% value for percent logging includes a large fire in 1969. The burn resulted in a disruption of the hydrologic regime creating higher peak discharge, flooding, increased erosion and siltation.	101 129 135
- Percent Recent Logging	High	10%	There is presently extensive logging taking place in the headwater areas.	101
- ECA Status				
- Riparian Condition				
Agriculture	Low			
- Extent	Low	0 AU/Km <sup>2</sup>		

- Riparian Condition				
- Water Withdrawal				
- Water Quality				
Urbanization	Low			
- Population Level	Low	25		101
- Extent	Low		Mainly rural population. Residential (summer cottages) development on the fan.	101 150
- Riparian Condition	High		Channelization has reduced riparian vegetation.	105 139
- Water Withdrawal	Low		Domestic water withdrawal.	101
- Water Quality	Low		Nutrient input from septic tanks.	135
Recreation	Low			
- Extent	Low		Summer cottages on the fan.	150
- Riparian Condition				
- Water Quality				
Placer Mining	Low			
- Extent	Low			101

- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low	Nil		101
- Water Quality				
Industrial Development	Low			
- Extent	Low			
- Water Quality	Low		No waste discharge permits issued for this creek.	101
- Riparian Condition				
Linear Development	Low			
- Extent	Low			
- Riparian Condition				
Hydro Development	Low			
- Extent	Low			
- Riparian Condition				

Other Development				
- Extent				
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Forest harvesting impacts, 1969 forest fire, combined with encroachment from settlement into the riparian zone.	135 129

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial Drift.	101
Terrain	Low	Mountainous terrain, steep valley walls, some slides occur along the valley walls.	101
Hydrology	High	This system is subject to major flooding. High peak flows. Bedload movement is high in this system. Summer and winter flows are low (10% and 8% of mean annual flows).	101 103
Channel Stability	High	Occasional slides evident. Valley walls (confined) - steep single channel, lower reach flows through a well developed fan which is active. Instability in the upper watershed is due to effects of 1969 forest fire. Abandoned channels are evident.	129 101

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features	x	Slides throughout system.	129
Sensitive Biological Features			
Significant Environmental Variables	x	Slides in the watershed increase erosion and sediment to the system.	135 111
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Sockeye - Incidental harvest of this stock.	106
Recreational Fishery	x	Sockeye - No harvesting of this stock or unknown.	106
Native Fishery	x	Sockeye - Incidental harvesting of this stock.	106 159

Restoration Activity			
Restoration Opportunity			
Enhancement Activity			
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	1	2	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Land and Resource Management Plan	This Creek is included in the Shuswap LRMP which was initiated in 1996.	

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**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Restore and enhance habitat	Conduct an IWAP to identify areas where channel instability is associated with logging impacts. Identify areas where rehabilitation projects should take place.
Maintain/enhance fish and habitat diversity	Involve landowners in stewardship programs to restore riparian habitats where degradation has occurred. No more development should occur on the fan (150)

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Seymour  
River

Watershed Code: 03-3300

Drainage Area(ha):

80700

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone: Interior Cedar-Hemlock  
Engelmann Spruce-Subalpine Fir  
Alpine Tundra

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	35.7	257.4	6.7	11.7	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Sockeye	x	272,041	1990	64,311	272,194	21,815	Increase	Mod
Chinook	x	400	1962	11	50	5	Increase	High
Coho	x	50	1984	20	50	12	Increase	Mod

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Stream channel impacts, increases in sediments and bedload contribution, mainly from Ratchford Creek has put fisheries values at risk.	135 105
- Percent Total Logging	High	17%	Forestry activity is taking place in the upper watershed and along tributary systems.	101
- Percent Recent Logging	Low	5%		
- ECA Status				
- Riparian Condition	High		Loss of riparian streamside zones has resulted in an increase in sediment input which affects water quality. 35 to 38% of riparian habitat in Ratchford Creek has been affected by forestry activity contributing to problems in the Seymour River.	170
Agriculture	Low			
- Extent	Low	0.04 AU/km.	Low levels of grazing are taking place.	101

- Riparian Condition	Low			
- Water Withdrawal	Low		No summer water use.	103
- Water Quality				
Urbanization	Low			
- Population Level	Low			
- Extent	Low		Some settlement occurs at the mouth.	129
- Riparian Condition				
- Water Withdrawal				
- Water Quality				
Recreation	Low		2% of the watershed is in part of Shuswap Lake Marine Park.	101
- Extent	Low		Concentrated in lower reaches. Silver Beach Park (76ha) is located on Seymour Arm near the river mouth. A hiking trail accesses Seymour River Falls.	105 175
- Riparian Condition	Low		Future recreation development, such as summer cabins, has the potential to encroach into riparian zones.	105
- Water Quality				
Placer Mining	Low			
- Extent	Low	Nil		101

- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low		Interests in metals Cu, Ky and Pb.	101
- Water Quality				
Industrial Development	Low			
- Extent	Low			
- Water Quality	Low		No waste discharge permits issued for this river.	101
- Riparian Condition				
Linear Development	Low		Silt from culverts and roads.	170
- Extent	Low			
- Riparian Condition				
Hydro Development	Low			
- Extent	Low			
- Riparian Condition				

Other Development	Low			
- Extent	Low			
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Logging related impacts have increased sediment into the system. Recreational and urban development are also impacting system.	133

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial drift.	101
Terrain	Low	Steep mountainous terrain in upland areas valley wider U- shaped in lower portion.	111 170
Hydrology	Low	Glacial headwaters.	101 170
Channel Stability	High	There is evidence of scouring and channelization. The system is laterally unstable, especially below Ratchford Creek. The delta has a tendency to develop many channels where stream enters lake. Bank stability is very low.	129 170 131

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features	x	A 9.5m falls located 14 km from the mouth blocks stream passage for fish.	170
Sensitive Biological Features			
Significant Environmental Variables	x	Siltation and sedimentation from forest harvesting is extensive in lower reaches.	111 135 170
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Chinook and Coho - No known harvesting of this stock ocean harvest likely. Sockeye - Specific fisheries directed at harvesting this stock.	106
Recreational Fishery	x	Chinook, Coho and Sockeye - No known harvest of this stock.	106
Native Fishery	x	Chinook and Coho - No known harvest of this stock Sockeye - Specific fisheries directed at harvesting this stock. Native interest in Sockeye, Chinook and Coho. Stock rebuilding for terminal harvest purposes.	106 124 159

Restoration Activity			
Restoration Opportunity			
Enhancement Activity			
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	1	1	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Land and Resource Management Plan	The Seymour River will be included in the Okanagan Shuswap LRMP process.	
Watershed Assessment Procedure	Level I Watershed Assessment was completed in 1995. A Level 2 Fish and Fish Habitat Assessment was conducted in 1994 and the report made available in 1995.	

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**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Maintain/enhance watershed and stream channel integrity and stability	Conduct treatments (road deactivation, slope stabilization) recommended in IWAP's to address upslope problems that are affecting fish habitat values in the lower river. Restore Ratchford Creek to restore channel stability downstream in the Seymour R.
Rebuild and enhance salmon stocks	Monitor recreational/urban development along the lower reaches of the river and apply DFO/MoELP Land Development Guidelines.

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McNornie  
Creek

Watershed Code: 03-3300-010

Drainage Area(ha):

6780

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Monashee Mountains

Biogeoclimatic Zone: Interior Cedar-Hemlock  
Engelmann Spruce-Subalpine Fir  
Alpine Tundra

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	3.0	21.7	0.2	0.4	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Coho								

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Logging activity has occurred throughout the drainage; logging is proposed for the upper watershed.	131 170
- Percent Total Logging	High	40%	Logging road construction has contributed sediment to the stream and has the potential to affect the most productive reaches of the Seymour River.	101
- Percent Recent Logging	High	5%	Most recent logging occurred along the southern boundary. New logging roads and particularly road crossings are sources of sediment.	101
- ECA Status				
- Riparian Condition				
Agriculture	Low			101
- Extent	Low	0 Au/km.		101

- Riparian Condition				
- Water Withdrawal	Low		Summer low flows are 13% of mean annual flow (MAF).	103
- Water Quality				
Urbanization	Low			
- Population Level	Low			
- Extent	Low		Mainly rural settlements.	101
- Riparian Condition				
- Water Withdrawal				
- Water Quality				
Recreation	Low			
- Extent	Low		Silver Beach Provincial Park at Mouth of McNomee Creek.	132
- Riparian Condition				
- Water Quality				
Placer Mining	Low			
- Extent	Low	Nil		101

- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low	Nil		101
- Water Quality				
Industrial Development	Low			
- Extent	Low			
- Water Quality	Low	Nil	No waste discharge permits issued for this stream.	101
- Riparian Condition				
Linear Development	High		Construction and operation of logging roads	
- Extent	High		Old logging roads are creating sediment problems. New road construction is planned for the upper watershed.	170
- Riparian Condition				
Hydro Development	Low			
- Extent	Low			
- Riparian Condition				

Other Development	Low			
- Extent	Low			
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Primarily logging, concerns relate to sediment inputs from construction and operation of roads.	133

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial Drift.	101
Terrain	Low	Valley is U shaped at the lower end steeper terrain characterizes the upper sections of the drainage.	111
Hydrology	Low	Flow regime relatively stable with low flows occurring in the winter (7% of mean annual flow). There is some glacial influence.	103
Channel Stability	Low	Some valley wall and channel instability. Overall mainly stable.	111

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features	x	Gradient barrier at 8.7km. Excellent spawning and rearing habitat below barrier.	111
Sensitive Biological Features	x	Sockeye spawning at mouth; Coho rearing area; Highest potential for coho production in the Seymour watershed.	111
Significant Environmental Variables			
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Chinook and Coho - Harvesting of this stock unknown, ocean harvest is likely. Sockeye - Harvesting of this stock unknown.	106
Recreational Fishery	x	Chinook, coho and sockeye - No known harvesting of this stock.	106
Native Fishery	x	Chinook and Coho - No known harvesting of this stock or unknown. Sockeye - Harvesting of this stock unknown. Natives would like to rebuild sockeye, chinook and coho, for terminal harvest opportunities.	106 124 159

Restoration Activity			
Restoration Opportunity			
Enhancement Activity			
Enhancement Opportunity	x		

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	2	0	0	0

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Maintain/enhance watershed and stream channel integrity and stability	Rehabilitate and deactivate roads as identified in IWAP. Follow recommendations from IWAP for additional assessments (Fish Habitat, Channel, terrain stability) and treatments.
Maintain/enhance fish and habitat diversity	Apply Land Development Guidelines to any development activity in the lower reaches to protect high fisheries values.
Rebuild and enhance salmon stocks	Utilize barren habitat above the barrier by outplanting of coho fry. Reduce overall harvest pressure to ensure adequate numbers of spawners return.

Hunakwa  
Creek

Watershed Code: 03-3690

Drainage Area(ha): 3500

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Monashee Mountains

Biogeoclimatic Zone: Interior Cedar-Hemlock

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	0.9	7.0	0.1	0.1	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Sockeye	x	37,301	1982	3,658	37,301	2,008	Increase	Mod
Chinook	x	25	1978			2	Unk	Unk
Coho	x	200	1978	85	150	55	Increase	Mod

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	Low			
- Percent Total Logging	High	25%	There has been little documented impact from logging activity. Logging related impacts have been minimal.	101 105 131
- Percent Recent Logging	Low	0%		101
- ECA Status				
- Riparian Condition				
Agriculture	Low			
- Extent	Low	0 AU/km		101

- Riparian Condition				101
- Water Withdrawal	Low		No summer water use.	103
- Water Quality				
Urbanization	Low			
- Population Level	Low		Mainly rural.	101
- Extent				
- Riparian Condition				
- Water Withdrawal				
- Water Quality				
Recreation	Low			
- Extent	Low			
- Riparian Condition				
- Water Quality				
Placer Mining	Low			
- Extent	Low	Nil		101

- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low	Nil		101
- Water Quality				
Industrial Development	Low			
- Extent	Low			
- Water Quality	Low		No waste discharge permits issued.	101
- Riparian Condition				
Linear Development	Low			
- Extent	Low			
- Riparian Condition				
Hydro Development	Low			
- Extent	Low			
- Riparian Condition				

Other Development	Low			
- Extent	Low	Nil		
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	Low		Most resource use is related to forestry activities. Although activity has been relatively high, associated impacts have been minimal.	131

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial Drift.	101
Terrain	Low	Terrain in the Hunakwa area is low to moderate in relief.	101
Hydrology	Low	Low summer, 9% of mean annual flow, and winter, 8% of mean annual flow.	103
Channel Stability	Low	Stable, stream and channel. (Hunakwa Lake helps to stabilize system.)	101

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features			
Sensitive Biological Features	x	Beaver dams create potential obstructions and require annual attention.	111
Significant Environmental Variables			
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	No known harvesting, although ocean interception is likely.	
Recreational Fishery	x	No known fishery.	
Native Fishery	x	No known fishery however incidental harvest in Fraser and Thompson fishery is possible.	

Restoration Activity			
Restoration Opportunity			
Enhancement Activity			
Enhancement Opportunity	x	Enhancement potential is limited due to the lack of power, poor access, limited habitat and a small native coho stock. There is an excellent potential for rearing.	111

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	0	0	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Land and Resource Management Plan	This watershed is included in the Okanagan Shuswap LRMP initiated in 1996.	111
Other	This area has been forwarded for classification as a Protected Area In the Okanagan Shuswap LRMP Process.	131

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**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Maintain/enhance watershed and stream channel integrity and stability	Restore watershed values as identified in IWAP process. Undertake treatments of upslope areas and road rehabilitation as directed by the IWAP.
Rebuild and enhance salmon stocks	Monitor beaver activity and develop access to upstream areas.

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Anstey  
River

Watershed Code: 03-3700

Drainage Area(ha):

23800

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Monashee Mountains

Biogeoclimatic Zone: Interior Cedar-Hemlock  
Engelmann Spruce-Subalpine Fir  
Alpine Tundra

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	10.5	75.9	0.7	1.8	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Sockeye	x	30,407	0	5,156	30,407	319	Increase	Mod
Chinook	x	750	1974	55	385	70	Decrease	High
Coho	x	750	1961	45	80	24	Increase	High
Pink	x	981	1982	150	981	0	Unk	Mod

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Extensive logging has the potential to impact the lower reaches and Shuswap Lake.	111 131 150
- Percent Total Logging	High	35%	Extensive logging activity in the upper watershed in recent years has created major instability problems resulting in some slides in lower portions of the watershed.	101 111
- Percent Recent Logging	High	10%	New Forest development has been planned for the watershed. Logging in the headwaters could result in increased erosion in the tributaries and a corresponding increase in sediment contribution to the Anstey River.	101 150 131
- ECA Status				
- Riparian Condition	High		Past logging has been conducted up to stream edges in some areas. There have been major slides in the tributary Myass Creek.	105 139
Agriculture	Low			

- Extent	Low	0 AU/km.		101
- Riparian Condition				
- Water Withdrawal	Low		No water use.	
- Water Quality				
Urbanization	Low			
- Population Level	Low			
- Extent	Low		Mainly rural development.	101
- Riparian Condition				
- Water Withdrawal				
- Water Quality				
Recreation	Low			
- Extent	Low			
- Riparian Condition				
- Water Quality				
Placer Mining	Low			

- Extent	Low			
- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low			101
- Water Quality				
Industrial Development	Low			
- Extent	Low			
- Water Quality	Low		No waste discharge permits.	101
- Riparian Condition				
Linear Development	Low			
- Extent	Low			
- Riparian Condition				
Hydro Development	Low			
- Extent	Low			

- Riparian Condition				
Other Development	Low			
- Extent	Low			
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Logging activity is the major resource use in the drainage. The impacts associated with logging and the slope stability problems in Myass Creek combine to create high concern for the fisheries values in this creek.	105 131 133

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial Drift.	101
Terrain	Low	The terrain along the lower river has moderate relief as the river flows through a U-shaped valley. Upslope terrain is steep and mountainous.	101 111
Hydrology	High	Winter low flows (7% of mean annual flow). Logging activities may have contributed to increased peak flows, which in turn may have resulted in increased bedload movement in lower reaches	103 105 139
Channel Stability	High	Large frequent slides and valley wall instability, especially in upslope areas are impacting channel conditions in lower portions of the watershed. Major slides are occurring in Myass Creek a tributary of the Anstey River.	129 131 105

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features	x	Terrain stability problems and associated slide activity is occurring in the Myass Creek area.	129
Sensitive Biological Features	x	Shore spawning sockeye populations are at risk from elevated sediment levels in the Anstey River.	131
Significant Environmental Variables			
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Sockeye and Pink - Incidental harvest of these stocks. Chinook and Coho - No known harvesting of these stocks, however ocean interception is probable.	106
Recreational Fishery	x	Pink - Incidental harvest of this stock. Sockeye, Chinook and Coho - No known harvesting of these stocks	106
Native Fishery	x	Sockeye and Pink - Incidental harvest in the Fraser and Thompson River Native Fishery. Chinook and Coho - No known harvesting of these stocks. There is Native interest in rebuilding Coho, Sockeye and Chinook, for terminal harvest opportunities.	106

Restoration Activity			
Restoration Opportunity			
Enhancement Activity			
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	1	2	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Watershed Assessment Procedure	Level II Fish and Fish habitat assessment along with a level 1 IWAP is scheduled for 1996/97. The SNFC in partnership with Evans Products is involved in the WRP work.	143

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**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Maintain/enhance watershed and stream channel integrity and stability	Assess terrain stability problems that exist in the tributary Myass Creek. Stabilize failing banks where feasible to protect important shore spawning areas for sockeye salmon.(105)
Maintain/enhance fish and habitat diversity	Restore watershed values by acting on recommendations of IWAP planned for 1996. Re-vegetate riparian vegetation lost as a result of past logging practices. Develop road access plan.
Rebuild and enhance salmon stocks	Collect and collate inventory information, including data from 1996/97 Operational Inventory and use to develop fisheries management plans.

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Eagle  
River

Watershed Code: 03-4300

Drainage Area(ha): 124600

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands  
Monashee Mountains

Biogeoclimatic Zone: Interior Cedar-Hemlock  
Engelmann Spruce-Subalpine Fir  
Alpine Tundra

**STREAMFLOW CHARACTERISTICS**

Stream Flows (m3/s)	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
	37.7	236.0	10.3	18.3	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Sockeye	x	60,347	1990	4,758	32,871	2,171	Increase	Mod
Chinook	x	3,500	1962	837	1,271	392	Increase	High
Coho	x	11,015	1987	4,460	11,015	1,812	Increase	Mod
Pink	x	3			3		Unk	Mod

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Extensive activity in the upper Eagle drainage particularly in the tributaries.	103 111 105
- Percent Total Logging	High	25%	Cutblocks and road development in tributaries, particularly South Pass Creek has contributed silts and sediment to the Eagle River.	101
- Percent Recent Logging	High	13%		101
- ECA Status				
- Riparian Condition				
Agriculture	High		Stream channel modification, by landowners in reaches downstream of the Perry River has alienated some off-channel rearing habitat.	103

- Extent	High	1.09 AU/km.	Crop production and grazing especially in the lower reaches.	101 105 139
- Riparian Condition	High		Past land clearing and channelization has lead to riparian loss.	105 139
- Water Withdrawal	Low		Low summer water use.	101 103
- Water Quality	High		Non Point source pollution bank erosion and siltation.	105 101 135
Urbanization	High		Major settlement occurs along the lower reaches of the Eagle River.	
- Population Level	High	Approx. 1,305	The Village of Sicamous is located at the mouth of the river. Small settlements in watershed include Malakwa, Cambie and Three Valley Gap.	101 135 132
- Extent	High		The Village of Sicamous, small communities and rural settlements	101
- Riparian Condition	High		Continued encroachment and degradation of riparian areas by increased rural development.	105 139
- Water Withdrawal	Low		There are domestic and waterworks licenses issued for this river.	101
- Water Quality	High		Sewage treatment plant located at Sicamous.	135
Recreation	Low		Recreation along the Eagle occurs at campgrounds along the Eagle River or tributaries (Yard Creek).	
- Extent	Low		A campground is located at Yard Creek as well as another private camping area located on the Eagle approximately 10 km upstream from the mouth. The Sicamous Golf Course is located along the Eagle River just east of the Village of Sicamous.	132
- Riparian Condition	Low			
- Water Quality				
Placer Mining	Low			

- Extent	Low	Nil		101
- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low			101
- Water Quality				
Industrial Development	Low		Industrial development from the Village of Sicamous to the area around Malakwa.	
- Extent	Low		Wood waste landfills near Cambie and Malakwa, three mills along the lower Eagle including the Evans product mill near Cambie.	101 156
- Water Quality	Low		Water quality concerns relate to introduction of fly ash from the mills.	144
- Riparian Condition	Low		Riparian areas have been reduced around industrial sites such as landfills and mills.	
Linear Development	High		The Eagle River valley is the main linear corridor to Banff and Calgary Alberta.	144
- Extent	High		Trans Canada Highway parallels system. Highway expansion is a major concern for this watershed. Canadian Pacific Railroad mainline traverses the subdistrict East to West.	132 105 144
- Riparian Condition	High		Linear development has alienated some off channel rearing and encroached on riparian areas. Pesticide and herbicide use can affect water quality.	103 105
Hydro Development	Low			
- Extent	Low		Several small independent Power Projects (IPP's) are in the upper watershed. No significant impacts have been noted.	101

- Riparian Condition	Low			
Other Development	Low			
- Extent	Low			
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Multiple resource use including forestry, urbanization, linear development and agriculture and to a lesser extent recreation.	105 139 131

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial drift. Silt.	101
Terrain	Low	In the lower reaches, the Eagle River flows through a U-shaped valley where terrain is of moderate steepness. Upslope terrain is mountainous and steep.	101 111
Hydrology	Low	Glacial influence below the Perry River. Summer and winter flows are 48% and 27% of mean annual flows respectively. Flash floods can occur during freshet or periods of heavy rainfall.	101 103
Channel Stability	High	The channel is low gradient and meandering in the lower reaches with generally unstable banks. In the upper watershed the channel is frequently confined and demonstrates signs of instability.	105 139 156

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features			
Sensitive Biological Features	x	There is excellent coho and chinook rearing habitat in the lower portions of the Eagle River.	111
Significant Environmental Variables			
Unique Features	x	Tributaries of the Eagle River have a rare stock of cutthroat	131

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Sockeye and Pink - Incidental harvesting of this stock. Chinook and coho - Interception in the ocean fishery.	106
Recreational Fishery	x	Sockeye - No harvesting of this stock or unknown. Pink - Incidental harvest of this stock. Chinook - Specific fisheries directed at harvesting this stock. Coho harvest in ocean sport fishery is likely.	106
Native Fishery	x	Sockeye and pink - Incidental harvesting of this stock likely in the Fraser and Thompson Native fishery. Chinook and coho - No harvesting of this stock or unknown. Native interest in developing terminal sockeye, chinook and coho fishery.	106

Restoration Activity			
Restoration Opportunity	x	Proposed tree planting in the riparian zone.	113
Enhancement Activity	x	Eagle River Hatchery closed in 1994.	
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	4	1	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Watershed Assessment Procedure	An IWAP is scheduled for 1996/97	143

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Identify and protect salmon habitats	Inventory and classify riparian vegetation and juvenile rearing habitat (offchannel habitat, small tributaries, wetlands, groundwater fed channels) along the Eagle River and develop guidelines and restoration plan.
Maintain/enhance water quality	Monitor water quality from industrial and municipal inputs to ensure habitat values are not affected.
	Ensure that contingency plans for spills are in place.
Maintain/enhance watershed and stream channel integrity and stability	Restore watershed by treating impacts identified in IWAP process. Treat areas of bank stability and roads in need of upgrading or deactivation.
Maintain/enhance fish and habitat diversity	Develop a riparian management plan in consultation with stakeholders and educate landowners on the importance of riparian areas. Re-establish a riparian corridor.
	Assess impacts of potential highway expansion and ensure there is no encroachment and loss of rearing habitat ie. offchannel habitat, small tributaries etc.

Owlhead  
Creek

Watershed Code: 03-4300-010

Drainage Area(ha):

2350

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone: Interior Cedar-Hemlock

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	1.0	6.0	0.1	0.1	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Coho	x	40		40	40		Unk	Mod

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	Low		Some logging has taken place in the Owlhead Creek drainage.	105 139 101
- Percent Total Logging	Low	15%	Logging is occurring in the upper areas of the drainage.	
- Percent Recent Logging	Low	2%		
- ECA Status				
- Riparian Condition				
Agriculture	Low		Agriculture is primarily grazing.	
- Extent	Low	3.48 AU/km.	In lower reaches near Trans Canada Highway.	111
- Riparian Condition				

- Water Withdrawal	Low		Summer water use is rated as low, however, summer flows are only 10% of mean annual flows.	101 103
- Water Quality	High		Non-point pollution from intensive grazing activity.	
Urbanization	Low			
- Population Level	Low	25	Mainly rural.	101
- Extent				
- Riparian Condition				
- Water Withdrawal	Low		There are water licenses issued for domestic purposes	103
- Water Quality				
Recreation	Low			
- Extent	Low			
- Riparian Condition				
- Water Quality				
Placer Mining	Low			
- Extent	Low	Nil		101
- Water Quality				

- Riparian Condition				
Other Mining	Low			
- Extent	Low			
- Water Quality				
Industrial Development	Low			
- Extent	Low			
- Water Quality				
- Riparian Condition				
Linear Development	Low		Trans Canada Highway	
- Extent	Low		Concern over expansion of Highway. Stream and culvert modified to allow fish passage under Trans Canada.	111 132
- Riparian Condition				
Hydro Development	Low			
- Extent	Low			
- Riparian Condition				
Other Development	Low		Ministry of Highways gravel pit.	129

- Extent	Low		Slide activity from Ministry of Highways gravel pit.	111 129
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Forestry and agricultural activity and the presence of a MOH gravel pit.	129

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial drift	101
Terrain	Low	Gentle to moderate sloping relief.	101
Hydrology	High	Flooding and sediment deposition is occurring and is related to logging practices. Low winter flow (7% of mean annual flow).	105 139
Channel Stability	High	Lower reaches are unstable. Slides in the upper watershed.	131

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features	x	High degree of bedload movement. Streambed is aggraded.	111 139
Sensitive Biological Features			
Significant Environmental Variables			
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Coho - No known harvest of this stock.	106
Recreational Fishery	x	Coho - No known harvest of this stock.	106
Native Fishery	x	Coho - No Known harvest of this stock.	106

Restoration Activity			
Restoration Opportunity			
Enhancement Activity			
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	0	2	0	0

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**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Restore and enhance habitat	Monitor fish passage at the culvert in Owlhead Creek which has been modified through the efforts of Sicamous Rod and Gun Club to allow fish passage under the highway(144).
Maintain/enhance watershed and stream channel integrity and stability	Develop watershed restoration prescriptions to reverse impacts associated with logging activity such as loss of riparian areas, sediment impacts from logging roads and terrain stability problems as part of an IWAP process.
Maintain/enhance fish and habitat diversity	Map riparian areas and develop a plan to restore lost riparian vegetation. Develop restoration plans with input from landowners.

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Watershed Code: 03-4300-050

Drainage Area(ha):

43790

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone: Interior Cedar-Hemlock  
Engelmann Spruce-Subalpine Fir  
Alpine Tundra

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	19.4	139.7	1.7	4.9	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Sockeye	x							
Chinook	x							
Coho	x							

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Logging activity has been minimal in the past 12 years and the watershed is recovering from past logging activity.	139 156
- Percent Total Logging	High	25%	Logging is concentrated in the Southern half of the watershed. Historic logging practices have created problems in the watershed including higher turbidity.	101 139 156
- Percent Recent Logging	High	10%	There is concern that new logging planned for the watershed will contribute to destabilization of the system.	101 139
- ECA Status				
- Riparian Condition	High		Logging activity has resulted in reduction of riparian vegetation and inputs of large woody debris which has affected channel stability.	129
Agriculture	Low			
- Extent	Low	0 AU/km.		101

- Riparian Condition	Low			
- Water Withdrawal	Low		No water licenses.	103
- Water Quality				
Urbanization	Low			
- Population Level	Low		Mainly rural development	101
- Extent				
- Riparian Condition				
- Water Withdrawal				
- Water Quality				
Recreation	Low			
- Extent	Low			
- Riparian Condition				
- Water Quality				
Placer Mining	Low			
- Extent	Low	Nil		101

- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low	Nil		
- Water Quality				
Industrial Development	Low			
- Extent	Low		Sawmill at the mouth of the river.	111
- Water Quality	Low		Flyash emissions from the mill at the mouth of the Perry River may affect water quality.	144
- Riparian Condition				
Linear Development	Low			
- Extent	Low			
- Riparian Condition				
Hydro Development	Low			
- Extent	Low			
- Riparian Condition				

Other Development	Low			
- Extent	Low			
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Resource use is mainly associated with logging activity. The Perry River is currently recovering from past logging and there is concern that new logging planned for the watershed will result in stream channel and fisheries impacts.	111 133 105

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial drift.	101
Terrain	High	The terrain around the Perry River is relatively steep and mountainous. Valley walls are prone to slides and avalanches.	111
Hydrology	Low	Higher turbidity due to glacial nature. Low winter flows (9% of mean annual flow)	156 103
Channel Stability	High	Localized bank erosion occurs in the lower reach. Further up the system there are steep valley walls with slides and avalanche chutes. The channel is laterally active. The Perry contributes bedload material and sediment to the Eagle River.	129 105 139

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features	x	Channel instability.	101
Sensitive Biological Features			
Significant Environmental Variables	x	Glacial melt , cold temperatures and excessive velocities and substrate movement during high flow are possible limitations to fish production. Turbidity levels are high in the Perry River.	111 156
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery			
Recreational Fishery			
Native Fishery			

Restoration Activity			
Restoration Opportunity			
Enhancement Activity			
Enhancement Opportunity	x	Limited opportunities due to glacial melt, cold temperatures, excessive velocities and substrate movement during high flows.	111

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	1	2	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Watershed Assessment Procedure	Level 1 watershed assessment to be completed in 1996/97	143

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**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Maintain/enhance watershed and stream channel integrity and stability	Identify upslope problems associated with logging such as loss of riparian areas, sediment impacts from logging roads and terrain stability problems through IWAP process. Develop restoration options for affected areas.

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South Pass  
Creek

Watershed Code: 03-4300-090

Drainage Area(ha):

30800

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Monashee Mountains

Biogeoclimatic Zone: Interior Cedar-Hemlock  
Engelmann Spruce-Subalpine Fir  
Alpine Tundra

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	1.3	9.0	0.1	0.3	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Sockeye	x	2,725	1982	380	2,725	110	Increase	Mod
Coho	x	85		45	85	35	Increase	Mod

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Logging practices have resulted in increased sediment levels and channel changes.	131 129
- Percent Total Logging	High	35%	Most logging has occurred in the upper watershed which has numerous slides and avalanche chutes.	101
- Percent Recent Logging	High	5%		101
- ECA Status				
- Riparian Condition				
Agriculture	Low			
- Extent	Low	0 AU/km.		101

- Riparian Condition				
- Water Withdrawal	Low		No water licenses	
- Water Quality				
Urbanization	Low			
- Population Level	Low			
- Extent	Low		Rural settlements.	101
- Riparian Condition				
- Water Withdrawal				
- Water Quality				
Recreation	Low			
- Extent	Low			
- Riparian Condition				
- Water Quality				
Placer Mining	Low			
- Extent	Low	Nil		101

- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low	Nil		101
- Water Quality				
Industrial Development	Low			
- Extent	Low			
- Water Quality	Low		No waste discharge permits.	101
- Riparian Condition				
Linear Development	Low			
- Extent	High		Forest access roads and potential impacts from Trans Canada Highway expansion.	111
- Riparian Condition				
Hydro Development	Low			
- Extent	Low			
- Riparian Condition				

Other Development	Low			
- Extent	Low			
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Resource use concerns are primarily a result of logging activity and road building in unstable terrain.	

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial drift.	101
Terrain	High	The upper reaches of the stream flow through steep mountainous terrain which has numerous slides and avalanche chutes.	101 111
Hydrology	Low	Three Valley Lake acts as a buffer and contributes to a stable flow regime.	101
Channel Stability	Low	The lower section of the river consists of a single channel confined in a canyon.	101

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features			
Sensitive Biological Features			
Significant Environmental Variables	x	High water velocities may limit habitat.	111
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Probable incidental harvest in ocean fisheries.	
Recreational Fishery		No known harvest	
Native Fishery		Possible harvest in Fraser Aboriginal Fishery	

Restoration Activity			
Restoration Opportunity			
Enhancement Activity			
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	1	1	0	0

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Restore and enhance habitat	Restore stream channel values through road upgrading and deactivation, slope stabilization, where feasible, and revegetating stream side riparian zones.
Maintain/enhance watershed and stream channel integrity and stability	Identify upslope problems associated with logging such as loss of riparian areas, sediment impacts from logging roads and terrain stability problems which lead to downstream loss of channel integrity through an IWAP process.

Reinecker  
Creek

Watershed Code: 03-4700

Drainage Area(ha): 5300

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone: Interior Douglas Fir  
Interior Cedar-Hemlock

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	1.0	9.6	0.1	0.1	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Sockeye	x	214	1982	91	214		Unk	Mod

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Considerable logging activity has taken place in Reienecker Creek creating increased sediment inputs that risk gravel quality of spawning areas in lower reaches and along Shuswap Lake shoreline.	
- Percent Total Logging	High	35%	Most logging has occurred in the West portion of the watershed.	101 111
- Percent Recent Logging	High	5%		101
- ECA Status				
- Riparian Condition	High		Degraded riparian zones associated with past logging practices and construction of logging roads has resulted in increased sediments to the system.	101
Agriculture	Low			
- Extent	Low	0 AU/km.		101

- Riparian Condition				
- Water Withdrawal	Low		No summer water use.	103
- Water Quality				
Urbanization	Low			
- Population Level	Low		Mainly rural.	101
- Extent				
- Riparian Condition				
- Water Withdrawal				
- Water Quality				
Recreation	Low			
- Extent	Low		Herald Park and campground is located at the mouth of Reienecker Creek . There are 51 camping sites and a self interpretive trail along lower Reienecker Creek.	132
- Riparian Condition	Low			
- Water Quality	Low			
Placer Mining	Low			
- Extent	Low	Nil		101

- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low		3 Mineral Interests.	101
- Water Quality				
Industrial Development	Low			
- Extent	Low			
- Water Quality	Low		No waste discharge permits issued for this creek.	101
- Riparian Condition				
Linear Development	Low			
- Extent	Low			
- Riparian Condition				
Hydro Development	Low			
- Extent	Low			
- Riparian Condition				

Other Development	Low			
- Extent	Low	Nil		
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		The main resource use is logging.	101

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial Drift.	101
Terrain	Low	The terrain is moderately steep. There is potential for valley wall and channel instability throughout. Minor slide activity has been reported.	101 111
Hydrology	Low	High peak flows. Low winter flows (9% of mean annual flow)	103 101
Channel Stability	Low	The channel is generally confined with some side channel development.	101

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features			
Sensitive Biological Features	x	Sockeye spawning at mouth and along lakeshore.	111
Significant Environmental Variables	x	Limited spawning habitat potential in Reienecker Creek.	111
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Incidental harvest in ocean fishery is likely	106
Recreational Fishery		No known recreational fishery	106
Native Fishery		Harvest in Fraser River aboriginal fishery is possible.	

Restoration Activity			
Restoration Opportunity			
Enhancement Activity			
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	1	0	0	0

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Maintain/enhance watershed and stream channel integrity and stability	Identify logging impacts through IWAP process. Restore stream channel values through road maintenance and deactivation, stabilize failing banks, where possible restore riparian values.
Maintain/enhance fish and habitat diversity	Develop an interpretive project in association with Herald Park at the mouth of Reienecker Creek.
	Ensure milfoil control activities do not impact on sockeye beach spawning.

Tappen  
Creek

Watershed Code: 03-5000

Drainage Area(ha): 13100

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone: Interior Cedar-Hemlock  
 Montane Spruce  
 Interior Douglas Fir

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	0.3	0.8	0.2	0.2	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Sockeye	x	1,417	1990	273	1,417	0	Increase	Mod
Coho	x	750	1955	21	40	12	Increase	High

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Logging activity has been extensive in upper Tappen Creek. Risks to fisheries production in the lower reaches of the creek include increased sediment and changes in stream channel stability.	
- Percent Total Logging	High	35%	Logging concentrated in upper watershed.	101
- Percent Recent Logging	High	5%		101
- ECA Status				
- Riparian Condition	High		Upslope logging has resulted in reduction of riparian streamside vegetation and increased sediment inputs.	105
Agriculture	High		Agricultural activity is high throughout the watershed with crop production taking place on previously forested lands in the lower part of the drainage.	
- Extent	High	6.25 AUKm <sup>2</sup>	Cattle grazing activity takes place primarily in the upper part of the watershed during the warm weather period. Crop production is concentrated along the lower reaches of the creek.	101 105

- Riparian Condition	High		Localized areas of erosion along cultivated sections. There is continued encroachment of the riparian zones as private lands are developed for agriculture.	105 101
- Water Withdrawal	High		August summer water use is 68% of summer 7 day low flow.	105 139 103
- Water Quality	Low		Increases in organic nitrogen and coliforms. Agricultural operations are contributing contaminants.	101 148
Urbanization	Low			
- Population Level	Low			
- Extent	Low		Settlement is mainly rural. Some development on reserve lands	105
- Riparian Condition			There is continued encroachment into riparian zones associated with settlement. There is concern that continued development on reserve lands could impact on riparian areas.	105
- Water Withdrawal	Low		Potential conflict exists between instream uses and water withdrawal for urban purposes. This system is currently licensed for domestic purposes.	105 139 103
- Water Quality	Low		A landfill located approx. 10km away from system may be leaching contaminants to the creek.	105
Recreation	Low			
- Extent	Low			
- Riparian Condition				
- Water Quality				
Placer Mining	Low			
- Extent	Low	Nil		101

- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low	Nil		101
- Water Quality				
Industrial Development	Low			
- Extent	Low			
- Water Quality				
- Riparian Condition				
Linear Development	Low			
- Extent	Low			101
- Riparian Condition				
Hydro Development	Low			
- Extent	Low			
- Riparian Condition				

Other Development	Low			
- Extent	Low			
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Logging activity as well as development of lands for agricultural and urban uses, has degraded riparian zones and affected water quality.	133 105 139

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial Drift. Lacustrine silts mixed with sands and gravels.	101
Terrain	Low	The surrounding terrain is low to moderate relief.	101 111
Hydrology	Low	This creek is spring fed which contributes to a stable streamflow throughout the year. Summer and winter flows are 37% and 44% of mean annual flow.	129 101 103
Channel Stability	High	There are localized areas of erosion in lower reaches. A single, unconfined low gradient channel flows through a wide valley in the lower reaches on the creek. Streambanks are unstable.	111 131

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features	x	A culvert under Boulton Road is impassable during years of high flows.	111
Sensitive Biological Features			
Significant Environmental Variables	x	Siltation occurs from erosion of clay banks. Water quality is classified as good however there have been noted increases in silts, bacteria and organic nitrogen concentrations.	131 148
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Sockeye - Incidental harvest of this stock. Coho - No known harvesting of this stock, ocean harvest is likely.	106
Recreational Fishery	x	Sockeye and Coho -Harvesting of this stock is unknown.	106
Native Fishery	x	Sockeye - Incidental harvest of this stock in Fraser and Thompson River Native fishery. Coho - No known harvesting of this stock.	106 159

Restoration Activity			
Restoration Opportunity			
Enhancement Activity			
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	2	1	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Land and Resource Management Plan	Tappen Creek will be included in the planning process associated with the Shuswap LRMP.	

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Maintain/enhance water quantity for instream uses	Develop water use plan in consultation with user groups which includes instream flows for fish.
Maintain/enhance water quality	Control siltation from claybanks by incorporating the use of bioengineering techniques.
	Berm stockpiled wastes in intensive feeding areas to prevent surface run-off
Maintain/enhance watershed and stream channel integrity and stability	Conduct IWAP to assess logging impacts. Develop prescriptions to restore stream such as road rehabilitation, slope stabilization and riparian revegetation. Encourage growth of conifers along streambanks.
Maintain/enhance fish and habitat diversity	Upgrade culvert under road to allow for fish passage at all water flow levels (111)
	Develop a detailed Riparian Management Plan and using an education process and stream stewardship programs encourage restoration of banks on private lands and fencing cattle away from riparian areas. (148)

Salmon  
River

Watershed Code: 03-5200

Drainage Area(ha):

150100

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands  
Thompson Plateau

Biogeoclimatic Zone: Interior Douglas Fir  
Bunch Grass  
Montane Spruce  
Engelmann Spruce-Subalpine Fir

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	4.6	28.6	1.5	2.6	103	
			July			

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Sockeye	x	1,602	1982	307	1,602	44	Increase	Mod
Chinook	x	1,850	1993	849	1,670	255	Increase	Mod
Coho	x	7,500	1955	1,948	4,405	1,362	Increase	High

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Logging is concentrated in the upper watershed as the valley bottom has been cleared mainly for agricultural purposes.	101 103
- Percent Total Logging	High	40%	Poor harvesting operations have increased run-off and increased phosphorus levels through soil erosion.	146
- Percent Recent Logging	High	11%	Clearcut harvesting activities have been planned for 1995-98 on the western side of Weyman Creek, South of Blackwell Lake. There is some activity around Nash Creek and Sawmill Lake area.	146
- ECA Status				
- Riparian Condition	High		Removal of streamside vegetation in tributary streams has increased temperatures and suspended sediments .	146
Agriculture	High		Agricultural activity has been prevalent in the Salmon River Valley since the late 1800's.	147

- Extent	High	7.39 AU/km <sup>2</sup>	Agriculture is extensive throughout valley from Salmon Arm to Westwold. Future agricultural use is expected to be nil to minor due to extreme conflict between instream uses and consumptive uses. Beef cattle, feedlots, dairy, hay fields and hobby farms.	104 146
- Riparian Condition	High	27% of Streamlength	Loss of riparian vegetation has caused accelerated rates of bank erosion, increased sediment and a wider more unstable river channel. Residents are involved in rip rap placement contributing to riparian degradation and artificial straightening of channel.	104 129 150
- Water Withdrawal	High		Extreme water withdrawals for irrigation and watering animals has resulted in low summer stream flows. August water use is 89% of summer mean 7 day low flows. Water Management Branch no longer issues water licenses for this stream.	103 146 147
- Water Quality	High		Non-point nutrients and fertilizers from cattle operations and sheep and pig wastes, most farm runoff occurs in March. Degraded streambanks increase sediment and siltation resulting in increases in turbidity during spring runoff.	114 129 135
Urbanization	High		Rural settlements.	
- Population Level	High	Aprox. 7,800	3,400 rural and 4,400 Salmon Arm. Population will increase in larger communities however growth in rural areas will be constrained by ALR and rural zoning.	146
- Extent	High		Mainly rural settlements; small farms, ranches etc. Communities include: Salmon Arm at the mouth, Silver Creek, Falkland and Westwold.	132 101 146
- Riparian Condition	High		Riparian degradation, vegetation removal, artificial bank stabilization ie rip rap contribute to higher temperatures, increased erosion and sediment and artificial straightening of the channel.	129 104
- Water Withdrawal	High		No new licenses for surface water sources are being issued by Water Management. There are 8 community watersheds, in tributary systems, within the Salmon River drainage.	146
- Water Quality	High		Seepage from septic tanks; Village of Salmon Arm discharges chlorinated domestic sewage into Shuswap lake near the mouth of the Salmon River and is contributing to the eutrophication of Salmon Arm.	101 111 171
Recreation	Low		Recreation occurs largely in the upper drainage.	
- Extent	Low		Forest Recreation sites in the headwaters. Future growth is expected, as tourism represents one of the strongest growth potential sectors.	132 146
- Riparian Condition				
- Water Quality				
Placer Mining	Low			

- Extent	Low	Nil		101
- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low		Commodities of interest include Cu, Ae, and Ls. There is a gypsum & anhydrite quarry at Falkland.	101
- Water Quality				
Industrial Development	Low			
- Extent	Low			
- Water Quality				
- Riparian Condition				
Linear Development	High		There is a well developed road network along the Salmon River valley. There is also a railway spur line that runs down the Salmon Valley.	144
- Extent	High		Canadian National Rail runs a branch line from Kamloops to Falkland and Vernon and Lumby. This rail line crosses and is adjacent to the Salmon River. Highway 97 parallels river for approx. 40km. Secondary roads throughout.	144
- Riparian Condition	Low		Road run off from highway may affect water quality.	144
Hydro Development	Low			
- Extent	Low			

- Riparian Condition				
Other Development	Low			
- Extent	Low	Nil		
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High	35% Tot. Denudation	Forestry, agriculture and urban, and to a lesser extent linear development, have severely impacted the fisheries values of the Salmon River. Cumulative impacts include increased sediment and reduced stream flows.	133 105 139

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	High	The lower Salmon River valley consists of mainly lacustrine silts. Coarser deposits of sands and gravels occur along the length of the river valley. The headwaters supply a natural source of phosphorus from rock and soils high in apatite.	147
Terrain	Low	The lower Salmon River valley is flat. Terrain increases in steepness as the river climbs to the headwaters. The terrain in the headwater area is characterized by rolling hills with moderately steep slopes.	101
Hydrology	High	Flooding and erosion are main concerns for this system. Low flows are a critical problem during summer. The Salmon River at Westwold runs subsurface during periods of low summer flow. Flow regimes have been affected by agriculture and forestry.	104 129
Channel Stability	High	System is very laterally active particularly above Westwold. Major bank erosion contributes to increased sediments. A total of 50% of the classified channel between Salmon Arm and Westwold is either unvegetated or poorly vegetated.	129 131 104

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features	x	The Salmon River dewatered near the Village of Westwold during periods of low flow.	103
Sensitive Biological Features	x	Mouth of Silver Creek to railway bridge upstream from Falkland important for spawning chinook and coho.	147 146
Significant Environmental Variables	x	High temperatures, low flows sediments.	104 131 114
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			146
Commercial Fishery	x	Sockeye - Incidental harvest of this stock. Coho and Chinook - No known harvest of this stock, ocean interception is likely.	106
Recreational Fishery	x	Sockeye, Coho and Chinook - No known harvest of this stock.	106
Native Fishery	x	Sockeye - Incidental harvest of this stock in Native fishery in the Fraser and Thompson Rivers. Coho and Chinook - No known harvesting of this stock. Natives would like to restore fisheries values for terminal harvest. This run was harvested historically.	106 124

Restoration Activity	x	Transplanting rooted plants; spiling; fencing; rip rap installation and habitat improvements.	104 159
Restoration Opportunity	x	Construct water storage in upper watershed. Build cattle exclosures fencing. Open a series of oxbows in the lower river. Erosion control by re-establishment of a riparian corridor. Increase pool habitat to provide sanctuary and overwinter habitat.	104 114
Enhancement Activity			
Enhancement Opportunity	x	Enhance limiting habitat parameters.	

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	4	3	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Land and Resource Management Plan	The Salmon River will be included in the Okanagan Shuswap LRMP process.	
Roundtable	The top priority of the Salmon River watershed Roundtable is to restore the riparian corridor along the River. In addition the Roundtable is working on establishing a Watershed Management Plan.	146
Watershed Restoration Program	A multi-year watershed assessment initiative will begin in late 1996.	

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Restore and enhance habitat	Develop a riparian corridor of approximately three channel widths. Maintain existing riparian values, revegetate areas with sparse or no vegetation, fence livestock out of corridor. Purchase land if necessary for corridor development (104)
	Control non-point sources of nutrients from cattle and feedcrop production.
	Decrease sediment inputs through bank stabilization initiatives, where necessary, using bioengineering techniques.
Maintain/enhance water quantity for instream uses	Increase water flows - through conservation options, ground water and licensing wells. Develop a water management plan that includes groundwater. (146) Monitor water licence withdrawals to determine actual volume of water withdrawn (104).
	Continue to reject further licensing. conduct further analysis of instream flow requirements.
Maintain/enhance water quality	Use WRP initiative to identify areas that have been affected by historic logging and have resulted in alteration of hydrologic patterns and contribution of sediments to lower reaches through watershed assessment procedure. Apply restorative treatments.
Maintain/enhance fish and habitat diversity	
Rebuild and enhance salmon stocks	

**Bolean  
Creek**

Watershed Code: 03-5200-170

Drainage Area(ha):

221400

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands  
Thompson Plateau

Biogeoclimatic Zone: Engelmann Spruce-Subalpine Fir  
Interior Douglas Fir  
Montane Spruce

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	1.1	7.0	0.2	7.9	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Coho	x	100	1985	54	100	43	Increase	Mod

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Logging activity has been high in the Bolean Creek drainage.	131
- Percent Total Logging	High	40%	Most of the logging has occurred in the upper watershed. There is extensive private logging in this watershed.	101
- Percent Recent Logging	High	15%	The high amount of recent logging is likely contributing to increases of sediment input into an already degraded system.	101
- ECA Status				
- Riparian Condition	High		Riparian values have been reduced by logging practices that removed timber from streamside areas. These logging practices have reduced the available supply of mature coniferous trees that are important sources of LWD.	101 105
Agriculture	High		Bolean Creek is being impacted by agricultural activities.	
- Extent	High	1.23 AU/Km <sup>2</sup>	Small farms along length of creek. Continued development of lands for agriculture.	105 101

- Riparian Condition				
- Water Withdrawal	Low		August water use is 49% of mean 7 day low flow affecting summer flow volumes which are only 11% of mean annual flows.	103
- Water Quality	High		Non-point sources of sediment and nutrients from agricultural operations.	105 139 135
Urbanization	High		Settlement is mostly low density except for the Village of Falkland at the confluence of Bolean Creek and the Salmon River	
- Population Level				
- Extent	High		Mainly rural except for Falkland which is located where Bolean enters the Salmon River.	101 132 105
- Riparian Condition	High		Urban development is encroaching on riparian areas. Resulting in removal of streamside vegetation and channelization of the creek.	132
- Water Withdrawal	Low		Creek is licensed for domestic purposes.	103
- Water Quality				
Recreation	Low			
- Extent	Low		3 Recreation sites - camping.	132
- Riparian Condition				
- Water Quality				
Placer Mining	Low			
- Extent	Low	Nil		101

- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low	Nil		101
- Water Quality				
Industrial Development	Low			
- Extent	Low			
- Water Quality				
- Riparian Condition				
Linear Development	Low			
- Extent	Low		Highway 97 is located at the mouth of the creek. Secondary roads parallel and crosses the system.	106 132
- Riparian Condition	Low		Road run off and a potential spill of toxic substances can impact the stream.	
Hydro Development	Low			
- Extent	Low			
- Riparian Condition				

Other Development	Low			
- Extent	Low			
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Logging activities in the upper watershed, agriculture in lower reaches and to a lesser extent, linear development and settlement. Cumulative impacts lead to increases in sediment inputs.	105 139

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Lacustrine silts.	101
Terrain	Low	Gentle to moderate sloping relief.	101
Hydrology	Low	Low summer (11% of mean annual flow), and winter flows (10% of mean annual flow).	129 101 103
Channel Stability	High	Confined. This is the only Salmon River Tributary transporting sufficient quantities of coarse sediment to affect downstream stability or morphology.	101 104

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features	x	Beaver dams cause access problems.	101 111
Sensitive Biological Features	x	Rearing for chinook and coho. Coho spawning and rearing.	111
Significant Environmental Variables	x	Increased channel instability from urban and agricultural development.	105 139
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Coho - No known harvesting of this stock, ocean exploitation likely.	106
Recreational Fishery	x	Coho - No known harvesting of this stock.	106
Native Fishery	x	Coho - No known harvesting of this stock. Native interest in re-establishing creek for coho harvest.	106 124

Restoration Activity			
Restoration Opportunity		Replant streamside vegetation, restore riparian corridor.	
Enhancement Activity			
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	3	1	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Land and Resource Management Plan	Bolean Creek will be included in the Okanagan Shuswap LRMP process.	
Roundtable	Salmon River Round Table - any action related to Bolean Creek.	

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Identify and protect salmon habitats	Monitor channelization activities that are resulting in loss of habitat complexity.
Restore and enhance habitat	Develop instream flows for fish through storage and water conservation methods.
	Promote stream stewardship to restore riparian vegetation by replanting streamside vegetation and fencing livestock away from streams.
	Promote public awareness and educate user groups on the importance of riparian restoration activities to the aquatic ecosystem. (shade, nutrients, bank stability, pools).
	Develop a water management plan that includes groundwater management research opportunity for storage. Monitor water withdrawals.
Maintain/enhance watershed and stream channel integrity and stability	Initiate IWAP process to identify logging related impacts and develop prescriptions. Restoration prescriptions will address logging road condition, terrain stability, stream channel condition and riparian condition.

Canoe  
Creek

Watershed Code: 03-5300

Drainage Area(ha): 8000

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone: Interior Douglas Fir

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	0.2	1.0	0.1	0.1	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Sockeye	x	128	1990	25	128	0	Increase	Mod
Coho	x	100	1992	55	100	35	Increase	Mod

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Logging activity is high	111
- Percent Total Logging	High	25%	Upper watershed logging and roads are impacting downstream areas by increasing sediment.	101
- Percent Recent Logging	High	2%		101
- ECA Status				
- Riparian Condition			Streamside vegetation in upland areas has been reduced due to past logging practices resulting in erosion and increases in sediment.	
Agriculture	High		Agricultural activities include grazing and crop production.	
- Extent	High	19.11 AU/km	Extensive grazing. Future agriculture growth is expected to be nil to minor because of water availability.	101 131

- Riparian Condition	High		Streambanks in lower reaches are subject to livestock and farm vehicle intrusions.	131 105
- Water Withdrawal	High		August water use is potentially 393% of 7 day low flow. Summer and winter flows are 0% of winter and summer Mean annual flows. No more licenses will be issued for this creek.	103 105 131
- Water Quality	High		There is non-point source pollution from agriculture and ranching including increased nutrient inputs, herbicides and pesticides.	101 105
Urbanization	High		Settlement is generally associated with agricultural activity and semi - rural residential.	
- Population Level	High	2400		
- Extent	High		Rural and urban development.	101 132
- Riparian Condition	High		Continued encroachment from urban and rural development.	105 139
- Water Withdrawal	High		Canoe Creek is a community watershed providing the domestic water supply for Salmon Arm.	111 129
- Water Quality	Low		Septic systems are a source of non-point pollution.	111 129
Recreation	Low			
- Extent	Low			
- Riparian Condition				
- Water Quality				
Placer Mining	Low			
- Extent	Low			101

- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low		Mineral Interests in Copper.	101
- Water Quality				
Industrial Development	Low			
- Extent	Low		No waste discharge permits.	101
- Water Quality				
- Riparian Condition				
Linear Development	High		Well developed secondary roads system.	
- Extent	High		A poorly installed culvert restricts upstream access to fish.	131
- Riparian Condition				
Hydro Development	Low			
- Extent	Low			
- Riparian Condition				

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Other Development	Low			
- Extent	Low			
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Forestry, agriculture and settlement combine to create significant impacts to instream values. Impacts relate to destabilization of streambanks due to riparian removal, and associated increases in sediment inputs. Critical summer low flows also occur.	133 105 139

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial drift.	101
Terrain	Low	Gentle to moderate sloping relief.	101
Hydrology	High	Potential water withdrawals can exceed total instream flows.	103
Channel Stability			

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features			
Sensitive Biological Features			
Significant Environmental Variables	x	Low summer flows.	131 105
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Sockeye - Incidental harvest of this stock. Coho - No known harvesting of this stock, ocean interception is likely.	106
Recreational Fishery	x	Sockeye and Coho - No known harvesting of this stock.	106
Native Fishery	x	Sockeye - Incidental harvest of this stock in the Fraser and Thompson River native fishery. Coho - No known harvest of this stock.	106

Restoration Activity			
Restoration Opportunity	x	Restoration potential is moderate. Focus on accessing existing current habitat, by fixing passage through culvert. Restoration of habitat values can be accomplished by restoring riparian vegetation, and fencing cattle away from stream banks.	111
Enhancement Activity			
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	3	2	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Land and Resource Management Plan	Canoe Creek is included in the Okanagan Shuswap LRMP process.	
Watershed Assessment Procedure	A need for a watershed assessment has been identified by Forest Renewal BC.	

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Restore and enhance habitat	Protect eroding streambanks through bioengineering techniques, where appropriate.
	Develop a Riparian Management Plan to protect existing streamside vegetation and restore stream habitat in cooperation with agriculture and ranching communities.
	Conduct IWAP to assess impacts from logging in upslope areas. Areas of concern will be identified and, if necessary, restoration opportunities outlined.
	Promote stream stewardship to restore riparian vegetation by replanting streamside vegetation and fencing cattle away from the stream.
Maintain/enhance water quantity for instream uses	Monitor summer water withdrawals to ensure compliance and protect against risks associated with summer low flows. Investigate storage opportunities.
	Develop Water Management Plan and instream flows through consultation with other users.
Maintain/enhance fish and habitat diversity	Monitor channelization activities that are resulting in loss of habitat complexity.
	Upgrade culverts restricting fish passage (131) and maintain passage through beaver dams.

L. Shuswap  
River

Watershed Code: 03-5400-000-000-000-991

Drainage Area(ha):

137150

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands  
Monashee Mountains

Biogeoclimatic Zone: Interior Cedar-Hemlock  
Interior Douglas Fir  
Engelmann Spruce-Subalpine Fir

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	18.6	93.2	0.0	0.0	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Sockeye	x	983,554	1990	178,776	983,554	15,510	Increase	Mod
Chinook	x	17,500	1975	9,479	13,300	8,325	Static	Mod
Coho	x	3,500	1964	296	500	255	Static	High
Pink	x	15	1975	3	13	2	Increase	Mod

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Logging related impacts are primarily a result of sediment inputs from tributary systems.	
- Percent Total Logging	High	23%	Logging is taking place in upslope areas and is associated with tributary systems to the Lower Shuswap River. Logging of the Lower Shuswap valley occurred several decades ago	101
- Percent Recent Logging	High	8%	Some logging and clearing of private lands, has occurred recently.	101
- ECA Status				
- Riparian Condition	High		Logging to the streambank has occurred in some stream sections of tributary systems. Logging activity along the valley floor occurred several decades ago.	137
Agriculture	High		Agricultural activity is high along the Lower Shuswap River. Most of the agricultural activity takes place downstream of the majority of spawning .	

- Extent	High	9.59 AU/Km <sup>2</sup>	Alfalfa cultivation, dairy farming and hay production throughout.	111 160
- Riparian Condition	High		Ranching activities have resulted in removal of areas of the riparian zone resulting in bank erosion from Falls Creek downstream to Mara Lake.	134 160
- Water Withdrawal	Low		Low water use in relation to the large size of the Lower Shuswap River. Water use is high in many of the tributary systems.	103
- Water Quality	High		Non-point pollution. Sedimentation from bank erosion.	134 101
Urbanization	High		The major settlement is Enderby. Most of the length of the river is associated with some form of settlement activity.	101
- Population Level	High	Approx. 9,000		101
- Extent	High		Rural settlement is continuous along Shuswap River floodplain . Small communities in the vicinity include: Enderby, Grindrod, Ashton Creek, Kingfisher and Mara.	101 132
- Riparian Condition	High		Continued encroachment on the riparian zone is occurring from urban development along the river and around Mabel lake.	101 105 139
- Water Withdrawal	Low			
- Water Quality	High		Town of Enderby sewage discharge. Rural settlements a source of non-point source pollution from stormwater runoff	101
Recreation	Low		Recreation is generally low impact and includes canoeing boating and fishing on the River.	
- Extent	Low		A sport fishery for chinook occurs on the Middle Shuswap River in August. Fishing activity is highest in the River above Enderby with extreme fishing pressure at Skookumchuck located below Kingfisher Creek.	
- Riparian Condition				
- Water Quality				
Placer Mining	Low			

- Extent	Low	Nil		101
- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low		Mineral interests in area.	101
- Water Quality				
Industrial Development	Low			
- Extent	Low	Nil		
- Water Quality				
- Riparian Condition				
Linear Development	Low		Linear development is primarily roads; B.C. Hydro right-of-way crosses the river near Enderby	132
- Extent	Low		Highway 97A parallels system from Enderby North to Mara Lake. Secondary road parallels system from Mabel Lake to Enderby. There is a BC Hydro ROW at Enderby.	132
- Riparian Condition	Low		The road is generally set back from the river.	132
Hydro Development	Low			
- Extent	Low			

- Riparian Condition	Low			
Other Development	Low			
- Extent	Low			
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Sediment input from logging practices in tributaries and rural and agricultural development on valley floodplain.	105 134 139

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial drift.	101
Terrain	Low	The Lower Shuswap River flows through a broad flat valley where the relief is low. Tributary systems descend into the Shuswap River from steeper hilly terrain.	101
Hydrology	Low	The Lower Shuswap River is a stable lake buffered system.	
Channel Stability	Low	Low gradient meandering channel with moderate bar, island and side channel development. Moderate channel instability in lower reach.	101

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features			
Sensitive Biological Features	x	The Lower Shuswap River is a major chinook and sockeye salmon producer	
Significant Environmental Variables			
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Sockeye and Pink - Incidental harvest of these stocks. Chinook - ocean harvest of this stock. Coho - No known harvest of this stock, ocean harvest is likely.	106
Recreational Fishery	x	Sockeye and Pink - Incidental harvesting of these stocks. Coho - No known harvesting of this stock. Chinook - Specific in river fishery directed at harvesting this stock.	106
Native Fishery	x	Sockeye and Pink - Incidental harvesting of these stocks. Chinook - Some harvest by the Spallumcheen Band, the Band would like to develop a traditional fishery near to the Village of Enderby. Coho salmon interception is unknown.	106 124

Restoration Activity			
Restoration Opportunity			
Enhancement Activity	x	The Lower Shuswap River chinook stock is enhanced through broodstock collection and incubation and rearing at the Shuswap River Hatchery. The Kingfisher Creek Community Hatchery also enhances this run.	
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	3	0	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Official Community Plan	There may be some coordinated planning initiatives through the Kingfisher Community (Neil Brooks)	

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Identify and protect salmon habitats	Monitor the recreational sport fishery and reduce fishing pressure when in-river temperatures exceed 20° C. Continue operation of the Shuswap River Hatchery.
	Inventory riparian zones along the river and develop a riparian management plan with input from user groups that includes re-vegetating stream banks and fencing cattle away from streams.
	Protect Lower Shuswap habitat values by defining tributary impacts and restoring tributary watersheds through the IWAP process.
Restore and enhance habitat	Continue developing stewardship initiatives with organization such as the Kingfisher Creek Community Group, who are currently involved in a small enhancement project on the lower Shuswap River.
Maintain/enhance water quality	

M. Shuswap  
River

Watershed Code: 03-5400-000-000-000-992

Drainage Area(ha):

402900

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Monashee Mountains

Biogeoclimatic Zone: Interior Cedar-Hemlock  
 Engelmann Spruce-Subalpine Fir  
 Interior Douglas Fir  
 Montane Spruce

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	81.2	0.0	0.0	0.0	101	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Sockeye	x	96,451		19,912	96,451	1,634	Increase	Mod
Chinook	x	5,000	1992	1,828	5,000	517	Increase	Mod
Coho	x	3,500	1961	538	1,200	438	Increase	High

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Forest related impacts are associated with tributary systems. Direct impacts are minimal and generally restricted to logging on private lands.	
- Percent Total Logging	High	28%	Logging primarily in tributary systems. Sediment inputs from logging activities in areas of terrain instability are occurring in the Cherry and Ferry Creek drainages.	101
- Percent Recent Logging	High	14%		101
- ECA Status				
- Riparian Condition	High		Riparian zones in tributary systems have been reduced, leading to destabilization of banks and increases in sediments downstream.	101
Agriculture	High		Extensive pig farming and cattle ranching in the lower reaches. Crop production also occurs.	

- Extent	High	1.64 AU/Km <sup>2</sup>	Agricultural activities are high from the Wilsey Dam to Mabel Lake and less extensive from Sugar Lake to Mabel Lake.	
- Riparian Condition	High		Removal of riparian vegetation for crop production, channelization and bank protection, trampling of streambanks by livestock. Some sections along the stream have had all of the vegetation removed.	105 134 139
- Water Withdrawal	Low		Low water use relative to the size of the river.	
- Water Quality	High		Non- point pollution from cattle and pig farm operations. Siltation results from erosion of degraded riparian areas.	101 134
Urbanization	Low			
- Population Level	Low			
- Extent	Low		Primarily rural, ranches and farms.	
- Riparian Condition				
- Water Withdrawal				
- Water Quality				
Recreation	Low		Recreation is low impact; rafting, canoeing and fishing.	
- Extent	Low		Forest Recreation camping sites. 3% of the watershed is in Monashee Provincial park. A sport fishery for chinook salmon operates in the latter half of July in the Middle Shuswap River below Wilsey Dam.	101 134
- Riparian Condition				
- Water Quality				
Placer Mining	Low			

- Extent	Low	Nil		101
- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low			101
- Water Quality				
Industrial Development	Low			
- Extent	Low			
- Water Quality	Low	Nil	No waste discharge permits issued.	101
- Riparian Condition				
Linear Development	Low			
- Extent	Low		Secondary roads parallel system.	132
- Riparian Condition	Low		The road system is generally set back from the river channel and has little effect on the riparian area of the stream. Some concern relating to road run off.	
Hydro Development	High		There are two dams on the system, the Peers Dam at the outlet of Sugar Lake, and the Wilsey Dam located at Shuswap Falls approximately 27 km upstream of Mabel Lake.	
- Extent	High		Regulated flows are generally stable however extreme short term water fluctuations have occurred at times. Reaches downstream of the dam can be without water for short periods of time.	134

- Riparian Condition				
Other Development	Low			
- Extent	Low	Nil		
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Potential impacts to the system result from sediment input from agriculture in the valley bottom, logging in the upper tributary watersheds and flow regulation from hydro development.	134 105 139

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial drift.	101
Terrain	Low	Low relief in the Middle Shuswap below the Wisey Dam where the river flows through a flat valley. Relief is low to moderate gradient above the Wisey Dam. The hillslopes steepen towards the Peers Dam and in tributary systems.	101
Hydrology	Low	Flows are generally stable, some large short term flow fluctuations. Runoff is delayed until July due to storage which may be affecting incubating and newly emergent trout in Reach 4 located above Wisey Dam.	134
Channel Stability	High	Channel instability in lower reaches. The river meanders unconfined in the lower reaches. Upstream of Wisey Dam channel confinement increases	101

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features	x	Fish passage is blocked at the Wisey Dam. There is evidence that chinook historically bypassed Shuswap Falls.	134
Sensitive Biological Features	x	Important chinook and sockeye spawning run.	
Significant Environmental Variables			
Unique Features		3% of the watershed is within Monashee Provincial Park.	134

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management	x	Creel survey stock assessment. Downstream monitoring of transplanted chinook carried out in 1994.	
Commercial Fishery	x	Sockeye - incidental harvesting of this stock. Chinook - ocean harvesting of this stock. Coho no known harvesting of this stock.	106
Recreational Fishery	x	Sockeye - incidental harvesting of this stock. Coho - No known harvest of this stock. Chinook - Specific sport fishery directed at this stock with a terminal sport fishery in the Middle Shuswap River.	106
Native Fishery	x	Sockeye - incidental harvesting of this stock. Coho - No known harvest of this stock. Chinook Native harvest in terminal fishery in the Middle Shuswap River.	106 124

Restoration Activity	x	Development of minimum winter flow levels to protect incubating salmon. Development of ramping rates for Wilsey Dam to reduce stranding for system operation, study initiated in 1995.	172
Restoration Opportunity	x	Access side channels.	172
Enhancement Activity	x	Shuswap River hatchery incubates and rears both Lower and Middle Shuswap River chinook. Department of Fisheries and Oceans moved chinook above Wilsey Dam (1993,94,95).	105 159
Enhancement Opportunity	x	Development of groundwater channels.	172

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	3	1	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Watershed Assessment Procedure	WRP overview assessments scheduled for tributaries of the Middle Shuswap in 1996 and 1997.	143
Other	Development of systems ramping rates for the Wilsey Dam by BC Hydro . Also development of minimum flow releases for winter.	

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Restore and enhance habitat	Encourage private landowners to restore streamside vegetation values by educating them on the importance of riparian zones and the value of the fisheries resource.
	Conduct IWAPs on tributary systems to the Middle Shuswap River. Restore tributary systems through road restoration, riparian revegetation and slope stabilization acting on results of IWAPs.
Maintain/enhance water quantity for instream uses	Implement minimum flows for fish protection during the incubation period and ramping rates currently being developed to protect fish stocks below Wilsey Dam.
Maintain/enhance water quality	Fence cattle away from streambanks to help control input of animal wastes to the system.
Maintain/enhance fish and habitat diversity	Investigate the opportunity of opening side channel habitat.
	Inventory and map riparian zones, particularly in the Middle Shuswap River below the Wilsey Dam. Develop riparian management plan with agencies and stakeholders.
Rebuild and enhance salmon stocks	Continue hatchery operation for chinook salmon. The hatchery could be used to supplement coho production although stocks are currently extremely depressed.
	Continue chinook transplant above Wilsey Dam, monitor success of transplant. Construct fishway at Wilsey dam if monitoring indicates transplant success.

Johnson  
Creek

Watershed Code: 03-5400-050

Drainage Area(ha):

2160

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone: Interior Cedar-Hemlock  
Engelmann Spruce-Subalpine Fir

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	0.9	6.4	0.1	0.1	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Coho	x	100	1984	53	100	4	Increase	Mod

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Logging activity is high.	101
- Percent Total Logging	High	20%	Logging historically took place along the valley floor.	101 111
- Percent Recent Logging	High	5%	Logging is occurring mainly in the upper watershed.	101
- ECA Status				
- Riparian Condition				
Agriculture	Low			
- Extent	Low	2.1 AU/km <sup>2</sup>	Agricultural activity is concentrated in the lower reaches.	

- Riparian Condition				
- Water Withdrawal	Low		Summer water use (18% of mean 7 day low flow) may be affecting summer flows which are at low values (11% of mean annual flow).	103
- Water Quality				
Urbanization	Low			
- Population Level	Low	25		
- Extent	Low		Minor settlements in area.	101
- Riparian Condition				
- Water Withdrawal	Low		Domestic licenses have been issued for this creek.	103
- Water Quality				
Recreation	Low			
- Extent	Low	Nil		
- Riparian Condition				
- Water Quality				
Placer Mining	Low			
- Extent	Low	Nil		101

- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low	Nil		101
- Water Quality				
Industrial Development	Low			
- Extent	Low	Nil	No waste discharge permits issued for this stream.	101
- Water Quality				
- Riparian Condition				
Linear Development	Low			
- Extent	Low		Highway 97A crosses lower reaches of this system.	101
- Riparian Condition				
Hydro Development	Low			
- Extent	Low	Nil		
- Riparian Condition				

Other Development	Low			
- Extent	Low	Nil		
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Upslope logging combined with agricultural activity along the lower reaches.	101

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial drift.	101
Terrain	Low	Low relief along the valley floor with steep terrain in hills of upslope area.	101
Hydrology	Low	Low summer (11% of mean annual flow) and low winter 8% of mean annual flows)	103
Channel Stability	Low	Low gradient unconfined channel across Shuswap River floodplain. Confined channel in upper watershed.	101

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features			
Sensitive Biological Features			
Significant Environmental Variables			
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Coho - No known harvest of this stock.	106
Recreational Fishery	x	Coho - No known harvest of this stock.	106
Native Fishery	x	Coho - No known harvest of this stock.	106 124 159

Restoration Activity			
Restoration Opportunity			
Enhancement Activity			
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	1	0	0	0

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Identify and protect salmon habitats	Promote stewardship programs to inventory fish population and habitat utilization, to assess and restore riparian condition, and to improve instream flows and fish migration access.
Maintain/enhance watershed and stream channel integrity and stability	Conduct an IWAP to assess logging impacts in upslope areas. Future activities will be governed on information from inventory work and IWAP.

Blurton  
Creek

Watershed Code: 03-5400-060

Drainage Area(ha):

2400

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone: Interior Cedar-Hemlock

Engelmann Spruce-Subalpine Fir

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	1.0	7.0	0.1	0.1	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Coho	x	70	1988	38	70	23	NA	Mod

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Logging activity is high	101
- Percent Total Logging	High	35%	Historically timber was removed from the valley floor.	101 111
- Percent Recent Logging	High	5%	Recent logging has been extensive and concentrated in the upslope areas.	101
- ECA Status				
- Riparian Condition				
Agriculture	High		Alfalfa production, dairy farming and hog production.	
- Extent	High	1.58 AU/km <sup>2</sup>	Agriculture is concentrated in valley floor area along the lower reaches of the creek.	101 111

- Riparian Condition	High		Riparian degradation is taking place because of cattle trampling streamside vegetation.	163
- Water Withdrawal	High		Summer water use is 33% of mean 7 day low flows, straining summer flow values which are only at 8% of mean annual flow.	103
- Water Quality	Low		Non-point source inputs of nutrients from agricultural activity.	101
Urbanization	Low			
- Population Level	Low	25		
- Extent	Low		Minor settlement.	101
- Riparian Condition				
- Water Withdrawal	Low		Domestic water licenses have been issued for this creek.	103
- Water Quality				
Recreation	Low			
- Extent	Low	Nil		
- Riparian Condition				
- Water Quality				
Placer Mining	Low			
- Extent	Low	Nil		101

- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low			101
- Water Quality				
Industrial Development	Low			
- Extent	Low	Nil	No discharge permits.	101
- Water Quality				
- Riparian Condition				
Linear Development	Low			
- Extent	Low		Highway 97A crosses lower reaches of the system. Road wash has the potential to impact water quality.	101
- Riparian Condition				
Hydro Development	Low			
- Extent	Low			
- Riparian Condition				

Other Development	Low			
- Extent	Low	Nil		
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Forestry, the major resource use, is occurring in the upper watershed. Agricultural activity is occurring in the lower reaches. The cumulative impacts relate to increases in sediment inputs and reduced streamside vegetation.	133

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial drift.	101
Terrain	Low	The terrain is flat along the valley floor and moderately steep in the hilly upslope area. Some slides are evident in the upper watershed.	101
Hydrology	High	Summer and winter low flows, 8% and 7% of mean annual flows repectively.	103
Channel Stability	Low	Low gradient unconfined channel across Shuswap River floodplain. Confined channel in upper watershed.	101

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features			
Sensitive Biological Features			
Significant Environmental Variables			
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery			
Recreational Fishery			
Native Fishery			

Restoration Activity			
Restoration Opportunity			
Enhancement Activity			
Enhancement Opportunity	x	Enhancement is limited due to lack of suitable habitat and low summer and winter flows	101

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	2	1	0	0

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Identify and protect salmon habitats	Inventory and map riparian areas and fish habitat values in the lower reaches to provide information necessary to formulate restoration plans.
	Promote stewardship programs assess and restore riparian habitat conditions.
Maintain/enhance water quantity for instream uses	Monitor agricultural water withdrawals to reduce summer low flow risks.
Maintain/enhance watershed and stream channel integrity and stability	Initiate IWAP to assess logging related impacts. Conduct restoration activities as suggested through the IWAP process.

Fortune  
Creek

Watershed Code: 03-5400-120

Drainage Area(ha):

15100

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone: Interior Douglas Fir  
 Montane Spruce  
 Engelmann Spruce-Subalpine Fir

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	1.2	10.0	0.1	0.1	103 136	
			Aug/Sept			

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Chinook	x							
Coho	x							

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	Low			
- Percent Total Logging	Low	10%	Historic logging has removed timber from the valley floor. Agriculture is now the major land use.	137 101
- Percent Recent Logging	Low	2%	Most logging is occurring in the upper watershed.	101
- ECA Status	Low	9.6%		137
- Riparian Condition	Low	7.9%	7.9% the streambank has been logged.	137
Agriculture	High		Agricultural activity along Fortune Creek is very high. The main agricultural operations include beef and dairy.	134 163
- Extent	High	35.47 AU/km <sup>2</sup>	38% of the watershed is developed for agriculture. Future agricultural growth is expected to be nil due to low flow problems.	134 136 160

- Riparian Condition	High		Riparian vegetation has been reduced, very little natural tree cover remains. Temp. differences of up to 6 deg. C have been noted between streamchannel sections with good riparian cover compared to areas where there is no natural cover.	134 163
- Water Withdrawal	High		Summer water use is high (91% of mean 7 day Aug low flow) compounding the fact that summer flows are already low (5% of mean annual flow), resulting on extreme strain on the water resource. Irrigation diversions are a problem.	101 136 111
- Water Quality	High		Increased inputs of nutrients, coliforms and sediments. In the past Fortune Creek flowed through a feedlot affecting water quality.	101 134
Urbanization	Low		Low density settlement occurs throughout the valley between the Okanagan and Shuswap Lakes.	
- Population Level	Low	Approx 650		101
- Extent	Low		Mainly rural settlements.	101
- Riparian Condition				
- Water Withdrawal	High		No more water licenses will be issued for this creek. This creek is currently licensed for domestic and waterworks purposes. The Municipality of Armstrong withdraws water from Fortune Creek for storage purposes.	101 103 185
- Water Quality				
Recreation	Low			
- Extent	Low			
- Riparian Condition				
- Water Quality				
Placer Mining	Low			
- Extent	Low	Nil		101

- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low			101
- Water Quality				
Industrial Development	Low			
- Extent	Low	Nil		101
- Water Quality				
- Riparian Condition				
Linear Development	Low			
- Extent	Low		Highway 97 crosses creek. Local service roads. Water quality can be affected by road run off.	
- Riparian Condition				
Hydro Development	Low			
- Extent	Low	Nil		
- Riparian Condition				

Other Development	Low			
- Extent	Low	Nil		
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		The major land use practice in Fortune Creek is agriculture. Additional resource use such as forestry, in upslope areas, settlement, and linear development also contribute to stream impacts such as sedimentation, low flows loss of riparian	105 134

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Lacustrine silts.	101
Terrain	Low	Gentle to moderately sloping relief. Fortune Creek originates in the moderately steep hills to the east of Armstrong but flows for most of its length along the valley floor.	101
Hydrology	Low	Critically low summer and winter flows. Winter flows can be nil	101 103
Channel Stability	Low	Potential low to moderate instability along valley walls. Meandering channel along the valley floor is unstable.	101

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features	x	Good pool riffle habitat from reservoir to highway.	134
Sensitive Biological Features	x	Slow moving system in lower reaches (near Enderby) this results in substrate covered with aquatic plants which in turn accumulates silt and debris.	136
Significant Environmental Variables	x	High temperatures, riparian degradation, low flows.	136
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery			
Recreational Fishery			
Native Fishery	x	Native interest in coho. The goal of the Spallumcheen band is to restore historical coho escapements and conduct terminal harvest of this stock.	124 136 159

Restoration Activity			
Restoration Opportunity	x	Re-establish riparian corridor, increase instream flows.	
Enhancement Activity	x	Armstrong Fish and Game Club release coho.	134
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	1	0	0	0

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Restore and enhance habitat	Promote stewardship initiatives with landowners to inventory riparian vegetation and develop riparian restoration plans that include re-vegetation of streambanks and fencing cattle away from streambanks
	Educate resource users in stream impacts associated with agriculture and fisheries habitat needs.
	Under auspices of FRBC - WRP assess upslope areas for logging impacts. Restore watershed attributes through treatments such as road deactivation or maintenance, slope stabilization and riparian revegetation identified in WRP process.
Maintain/enhance water quantity for instream uses	Monitor water withdrawals.
	Establish a water management plan to allow for flows for instream use for fish. Assess the feasibility of using flow control for storage and release opportunities that will improve instream flows for fish.
Maintain/enhance water quality	
Rebuild and enhance salmon stocks	The Spallumcheen Band is interested in Fortune Creek and would like to restore fisheries values to allow for a traditional fishery.(136) Coho outplants can be used to enhance this stream (134)

Trinity  
Creek

Watershed Code: 03-5400-160

Drainage Area(ha):

19500

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone: Interior Cedar-Hemlock  
 Montane Spruce  
 Engelmann Spruce-Subalpine Fir  
 Interior Douglas Fir

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	2.0	8.5	0.1	0.3	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Chinook	x	0	0	0	0	0		
Coho	x	60	1986	33	60	20	Increase	Mod

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	Low			
- Percent Total Logging	Low	15%	Logging in the upper watershed.	137
- Percent Recent Logging	Low	7%	The stream channel in lower Trinity Creek shifted due to logging in the upper watershed.	
- ECA Status	Low	8.7%		137
- Riparian Condition	Low		Much of the logging is concentrated along Trinity Creek and has encroached into the riparian zone in places.	101
Agriculture	High		Agricultural activity includes grain and dairy farming on the valley bottom.	
- Extent	High	1.62 AU/Km <sup>2</sup>	Agricultural activity is concentrated along the lower reaches.	101 111

- Riparian Condition	High		Cattle trampling of streambanks and removal of riparian vegetation by landowners has resulted in increased erosion and sedimentation.	105 139 163
- Water Withdrawal	High		August water use is 75% of mean August 7 day low flow. Summer low flow 7% of mean annual flow.	103
- Water Quality	Low		Non point source discharges.	101
Urbanization	Low			
- Population Level	Low	Approx. 25		101
- Extent	Low		Primarily rural settlement.	101
- Riparian Condition				
- Water Withdrawal				
- Water Quality				
Recreation	Low			
- Extent	Low			
- Riparian Condition				
- Water Quality				
Placer Mining	Low			
- Extent	Low	Nil		101

- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low		Several mineral interests.	101
- Water Quality				
Industrial Development	Low			
- Extent	Low			
- Water Quality	Low		No waste discharge permits issued for this stream.	101
- Riparian Condition				
Linear Development	Low			
- Extent	Low		A secondary road parallels the watershed.	
- Riparian Condition				
Hydro Development	Low			
- Extent	Low			
- Riparian Condition				

Other Development	Low			
- Extent	Low			
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Logging in the upper watershed and agricultural activity in the lower reaches.	105 139

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial drift.	101
Terrain	Low	Terrain along the lower reaches is low to moderate. Steeper terrain is found in the upslope areas.	134 111
Hydrology	High	Extreme summer and winter low flows (7% and 5% of mean annual flow respectively)	103
Channel Stability	High	Reduced channel stability in the lower reaches due to upslope logging and agricultural activities.	137

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features			
Sensitive Biological Features			
Significant Environmental Variables			
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery			
Recreational Fishery			
Native Fishery			

Restoration Activity			
Restoration Opportunity			
Enhancement Activity			
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	1	2	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Watershed Assessment Procedure	Operational inventory scheduled for 1996/97, Licencee is Riverside Lumby.	105

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Maintain/enhance watershed and stream channel integrity and stability	Restore stream channel attributes through activities such as road rehabilitation and deactivation, terrain stabilization, and riparian re-vegetation as recommended from IWAP process.
Maintain/enhance fish and habitat diversity	Assess upstream habitat and migration blockages in Trinity Creek and develop bypass around barriers, if feasible.
	Restore riparian vegetation in the valley bottom associated with agricultural land use (105) Develop a riparian management plan involving landusers living along Trinity Creek.

Kingfisher  
Creek

Watershed Code: 03-5400-210

Drainage Area(ha):

19170

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone: Interior Cedar-Hemlock

Engelmann Spruce-Subalpine Fir

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	8.1	55.7	0.4	0.7	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-'92 to '69-'80 Ave.	Rebuild Potential
Coho	x	150	1988	63	150	25	Increase	Mod

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High			
- Percent Total Logging	High	35%	Logging activity has been concentrated in the northern 2/3 of the watershed above BC Hydro Right-of-Way.	101 134 105
- Percent Recent Logging	High	9%	Log jams and logging debris.	101167
- ECA Status				
- Riparian Condition	Low		The floodplain in the lower reach has been logged in the past but has since regenerated.	167
Agriculture	Low			
- Extent	Low	0 AU/km <sup>2</sup>		101

- Riparian Condition				
- Water Withdrawal	High		Low summer water use (1% of mean 7 day low flow) however low flows occur in both summer (9% of mean annual flow) and winter (5% of mean annual flow).	103
- Water Quality				
Urbanization	Low			
- Population Level	Low			
- Extent	Low		Primarily rural settlements.	101
- Riparian Condition				
- Water Withdrawal	Low		Low volumes of water are licensed for domestic water withdrawal.	103
- Water Quality				
Recreation	Low			
- Extent	Low			
- Riparian Condition				
- Water Quality				
Placer Mining	Low			
- Extent	Low	Nil		101

- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low		Several mineral interests have been identified including a marble mine. No impacts have been identified.	101 167
- Water Quality				
Industrial Development	Low			
- Extent	Low			
- Water Quality	Low		No waste discharge permits.	101
- Riparian Condition				
Linear Development	Low		Logging roads.	
- Extent	Low		Lower portion of the stream is crossed by Ashton Creek Road. Logging road system is extensive in the watershed. Road wash may contribute sediment inputs to Kingfisher Creek.	
- Riparian Condition				
Hydro Development	Low			
- Extent	Low			
- Riparian Condition				

Other Development	Low			
- Extent	Low			
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Logging is the major resource use in this drainage.	133 167

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial drift.	101
Terrain	Low	Moderately steep terrain in the lower watershed. Terrain is steep in headwater areas and instability has been noted in the upper areas of the drainage.	101 167
Hydrology	High	During freshet Hunter Creek tributary moves high amount of bedload to Kingfisher Creek. Kingfisher Creek is subject to large floods. Extreme summer and winter low flows.	134 103
Channel Stability	High	Eight sediment sources were identified on Kingfisher Creek all were located in the tributaries. Debris jamming is occurring in the creek causing channel destabilization.	101 167

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features			
Sensitive Biological Features			
Significant Environmental Variables	x	Mainstem production is limited by the extreme freshet of Hunters Creek. Logjams in Kingfisher Creek are contributing to bank erosion and are creating barriers to upstream migration.	103 167
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery			
Recreational Fishery			
Native Fishery			

Restoration Activity			
Restoration Opportunity	x	Stabilize upslope disturbances contributing sediments and debris to system. Selectively remove woody debris that is contributing to excess bank erosion and is impeding fish migration.	167
Enhancement Activity	x	Kingfisher Community Club has collected coho and rainbow trout eggs from this system.	134
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	1	2	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Watershed Assessment Procedure	Level 1 and 2 watershed assessment will be completed in 1996. Initial IWAP work has been conducted by Summit Environmental Consultants.	143 167
Other	Community organizations include School District 89, Kingfisher Community Club and the Kingfisher Salmonid Enhancement Program. These groups are active in small fisheries reclamation efforts with the Kamloops Community Advisor.	

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**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Maintain/enhance watershed and stream channel integrity and stability	Restore watershed through road deactivation, stabilization of terrain where appropriate and revegetating streamside areas following recommendations from IWAP.
Maintain/enhance fish and habitat diversity	Remove barriers to upstream fish migration. Look for opportunities to develop off channel habitat.
Rebuild and enhance salmon stocks	Enhance coho and rainbow through hatchery supplementation by Kingfisher Community Club (KCC). Continue stream stewardship initiatives by the KCC.

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Danforth  
Creek

Watershed Code: 03-5400-210-130

Drainage Area(ha):

2940

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone: Interior Cedar-Hemlock

Engelmann Spruce-Subalpine Fir

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	1.2	8.4	0.1	0.1	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Coho	x	24	1977		24		Unk	NA

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Logging activity in the watershed is high.	134
- Percent Total Logging	High	35%	Logging activity is in the upper portion of the watershed.	101
- Percent Recent Logging	High	5%		
- ECA Status				
- Riparian Condition	High		Historic logging practices which logged close to stream banks have resulted in increased sediment inputs to the system.	134
Agriculture	Low			
- Extent	Low	0 AU/Km <sup>2</sup>	Primarily rural settlements.	101

- Riparian Condition				
- Water Withdrawal	Low		No summer water use.	
- Water Quality				
Urbanization	Low			
- Population Level	Low			
- Extent	Low		Primarily rural settlements.	101
- Riparian Condition				
- Water Withdrawal				
- Water Quality				
Recreation	Low			
- Extent	Low			
- Riparian Condition				
- Water Quality				
Placer Mining	Low			
- Extent	Low	Nil		101

- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low	Nil		101
- Water Quality				
Industrial Development	Low			
- Extent	Low			
- Water Quality	Low		No waste discharge permits.	101
- Riparian Condition				
Linear Development	Low			
- Extent	Low		BC Hydro line crosses lower Danforth Creek. Herbicides used to control vegetation may affect water quality.	134
- Riparian Condition				
Hydro Development	Low			
- Extent	Low			
- Riparian Condition				

Other Development	Low			
- Extent	Low	Nil		
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Forestry is the primary resource use with limited use by other sectors, however, the high rate of cut can affect fish habitat conditions.	133

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial Drift.	101
Terrain	Low	Gentle to moderate sloping relief in lower reaches with steeper terrain in upslope areas.	101
Hydrology	Low	Low summer and winter flows (5% and 4% of mean annual flow respectively).	103 134
Channel Stability	Low	Bank failures are frequent however this system is more stable than Kingfisher mainstem. Beaver dams throughout the lower reaches of the creek create a series of ponds.	134

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features			
Sensitive Biological Features	x	Numerous beaver dams in the lower reaches of Danforth Creek. These dams restrict upstream fish migration.	111 103
Significant Environmental Variables			
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Coho - No known harvest of this stock, ocean interception is likely	106
Recreational Fishery	x	Coho - No known harvest of this stock.	106
Native Fishery	x	Coho -No known harvest of this stock.	106

Restoration Activity			
Restoration Opportunity	x	Remove beaver dams, or provide upstream access around dams by engineering technique.	
Enhancement Activity	x	Coho supplementation has taken place by taking eggs from the river, incubating and early rearing at the Kingfisher Hatchery at Cooke Creek and outplanting the fry back to Danforth Creek.	
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	1	0	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Watershed Assessment Procedure	Scheduled for 1996 deferred to 1997 (Riverside Lumby).	
Other	Kingfisher Community Club (KCC) is interested in restoring fisheries values in the watershed through habitat improvement projects and outplanting of coho fry.	

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Maintain/enhance watershed and stream channel integrity and stability	Follow recommendations from IWAPs conducted in 1995 and scheduled for 1997.
Maintain/enhance fish and habitat diversity	Continue stream stewardship initiatives of the Kingfisher Community Club which include enhancement of coho by hatchery supplementation.
	Develop beaverdam bypass capability either by engineering bypass structures or beaverdam maintenance programs.

Noisy  
Creek

Watershed Code: 03-5400-230

Drainage Area(ha):

5860

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Monashee Mountains

Biogeoclimatic Zone: Interior Cedar-Hemlock

Engelmann Spruce-Subalpine Fir

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	2.5	17.1	0.2	0.3	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Sockeye	x	353	1982	119	353		Unk	Mod
Coho	x	25	1993	13	25		Unk	Mod

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Logging is intense in the Noisy Creek watershed.	
- Percent Total Logging	High	40%	Extensive logging and road development has resulted in increased sediment.	134 101 167
- Percent Recent Logging	High	10%		101
- ECA Status				
- Riparian Condition				
Agriculture	Low			
- Extent	Low			

- Riparian Condition				
- Water Withdrawal				
- Water Quality				
Urbanization	High		Cabins in lower reaches.	167
- Population Level	Low			
- Extent	High		There are cabins on the delta. Overall settlement is low but concentrated in the area of greatest fish usage.	167
- Riparian Condition	High		Dikes and other bank protection measures which result in channelization potentially reducing fisheries values.	167
- Water Withdrawal	Low		There is no documented water use.	103
- Water Quality				
Recreation	Low			
- Extent	Low			
- Riparian Condition				
- Water Quality				
Placer Mining	Low			
- Extent	Low	Nil		101

- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low	Nil		101
- Water Quality				
Industrial Development	Low			
- Extent	Low			
- Water Quality				
- Riparian Condition				
Linear Development	Low			
- Extent	Low		Secondary road parallels system.	137
- Riparian Condition				
Hydro Development	Low			
- Extent	Low	nil		
- Riparian Condition				

Other Development	Low			
- Extent	Low			
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Impacts from logging and continued development of the lower portion of the river for settlement.	134 105 139

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial drift.	101
Terrain	Low	The terrain is generally characterized as steep and mountainous. There is some alpine areas at the higher elevations.	101
Hydrology	Low	Summer and winter low flows (12% and 7% of mean annual flow respectively).	103
Channel Stability	High	The upper parts of the watershed are bounded by valley walls; slides and avalanche chutes also noted.	101

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features	x	A 12 m falls located approximately 2 km from the mouth prevents fish from further upstream migration.	
Sensitive Biological Features	x	The lower reach of Noisy Creek is utilized by spawning sockeye.	111
Significant Environmental Variables			
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Ocean fishery	
Recreational Fishery	x	Coho - No known harvest of this stock. Incidental harvest of this stock, with Shuswap River stock.	106
Native Fishery	x	Coho - No known harvest of this stock. Sockeye - Incidental harvest of this stock in Fraser and Thompson River Native fisheries.	106 124

Restoration Activity			
Restoration Opportunity			
Enhancement Activity			
Enhancement Opportunity	x	There is limited enhancement potential on this system.	111

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	2	1	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Watershed Assessment Procedure	Level I Watershed Assessment scheduled for this creek.	143

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Restore and enhance habitat	Restore degraded stream conditions using treatments prescribed through the IWAP process. Restore upslope areas and reduce sediment inputs into the system (134)
	Work with landowners to restore streamside vegetation and maintain stream channel habitat values. Apply DFO Land Development Guidelines to any land development activity.
Maintain/enhance fish and habitat diversity	Inventory stream habitat conditions in lower reaches and assess barriers to upstream migration.

Wap  
Creek

Watershed Code: 03-5400-240

Drainage Area(ha):

35420

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Monashee Mountains

Biogeoclimatic Zone: Interior Cedar-Hemlock  
Engelmann Spruce-Subalpine Fir  
Alpine Tundra

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	14.9	102.7	1.3	3.5	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Sockeye	x	1,733	1990	349	1,733		Unk	Mod
Chinook	x	100	1991	19	100		Unk	Mod
Coho	x	516	1977	211	450	233	Static	Mod

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Wap Creek was heavily impacted by logging activity in the 1940's and 1950's but natural restoration processes have at least partially restored stream productivity.	167 134
- Percent Total Logging	High	25%	Logging in the past 20 years has occurred in the upslope areas and has slowed recovery from historic valley bottom logging and associated changes in stream channel integrity.	101 167
- Percent Recent Logging	High	10%	Current logging in upper watershed. 9 sediment sources have been identified, 3 are located in the tributaries. None of the eroding banks were present on 1950's photos, suggesting forest harvest since then has contributed to bank instability.	101 167
- ECA Status				
- Riparian Condition				
Agriculture	Low			
- Extent	Low	0 AU/km.		101

- Riparian Condition				
- Water Withdrawal				
- Water Quality				
Urbanization	Low			
- Population Level	Low		Mainly rural settlements.	101
- Extent				
- Riparian Condition				
- Water Withdrawal	Low		No water licenses have been issued for this system.	103
- Water Quality				
Recreation	Low			
- Extent	Low		Small timbered campsite.	173
- Riparian Condition				
- Water Quality				
Placer Mining	Low			
- Extent	Low			

- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low			
- Water Quality				
Industrial Development	Low			
- Extent	Low			
- Water Quality	Low		No discharge permits issued for this system.	101
- Riparian Condition				
Linear Development	Low			
- Extent	Low		BC hydro transmission lines are in the area. Secondary roads parallel system.	173
- Riparian Condition				
Hydro Development	Low			
- Extent	Low		An Independant Power Project (IPP) is located near Three Valley Gap on upper Wap Creek.	101
- Riparian Condition				

Other Development	Low			
- Extent	Low	Nil		
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		The main resource use is logging.	133

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial Drift.	101
Terrain	Low	The terrain is steep and mountainous in the upslope area. The lower reaches flow through a flat valley floor.	101
Hydrology	Low	No summer low flow or peak flow problems are noted for Wap Creek. Low winter flows (9% of mean annual flow).	103
Channel Stability	High	The channel is laterally active especially in the lower reaches partly due to the effects of historic valley bottom logging and current upslope logging. Valley walls in upslope areas are unstable.	134 101

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features	x	The stream channel in the lower reaches is unstable.	134
Sensitive Biological Features			
Significant Environmental Variables	x	9 sediment sources have been identified and are related to logging.	167
Unique Features	x	Approximately 7% of the watershed is in an ecological reserve.	101

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x		106
Recreational Fishery	x		106
Native Fishery	x		106 124 159

Restoration Activity			
Restoration Opportunity	x	Side and back channel development in lower reaches.	
Enhancement Activity			
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	1	1	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Watershed Assessment Procedure	Level I overview assessmet completed in 1995 (Summit Env. Consultants Ltd.). Level 1 IWAP scheduled for 1997.	143 167

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Maintain/enhance watershed and stream channel integrity and stability	Restore watershed following recommendations of IWAP process. Additional Level II assessments recommended from the Level 1 will help to develop prescriptions to restore habitat values in Wap Creek. Try to stabilize eroding banks identified in level 1 IWAP
Rebuild and enhance salmon stocks	Develop off-channel habitat in the short term. Habitat restoration in the main channel will require time for the upslope processes to be stabilized.
	Inventory habitat conditions and fisheries resources.

Tsuius  
Creek

Watershed Code: 03-5400-260

Drainage Area(ha):

20970

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Monashee Mountains

Biogeoclimatic Zone: Interior Cedar-Hemlock

Engelmann Spruce-Subalpine Fir

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	8.8	60.9	0.6	1.2	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Sockeye	x	126	1982	23	126		Unk	Mod
Coho	x	10	1987	2	10		Unk	Mod

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Extensive logging activity.	101 134
- Percent Total Logging	High	25%	The steep nature of the terrain increases the risks of destabilization of slopes, increased erosion and sediment input.	137 101
- Percent Recent Logging	High	10%		101
- ECA Status	High	12.4%	MoF Vernon has indicated that 14.1% of the total watershed is logged. 42.1% of this logging has taken place on slopes with a gradient greater than 50% gradient.	137
- Riparian Condition	High	12.2% of streambank	12.2 % Of total streambank has been logged. 11 sediment sources were located, 6 sources are in tributaries.	137
Agriculture	Low			
- Extent	Low	0 AU/km		101

- Riparian Condition	Low			
- Water Withdrawal	Low		There is no record of summer water use.	103
- Water Quality	Low			
Urbanization	Low			
- Population Level	Low			
- Extent	Low		Primarily rural settlements. There are private cabins on the lower reaches near Mabel Lake.	101 167
- Riparian Condition	Low		Landowners have installed numerous bank protection measures resulting in stream channelization and reduction in riparian cover.	167
- Water Withdrawal				
- Water Quality				
Recreation	Low			
- Extent	Low		Recreation activity includes Tsuius mountain hiking trails area.	173
- Riparian Condition				
- Water Quality				
Placer Mining	Low			
- Extent	Low	Nil		101

- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low			101
- Water Quality				
Industrial Development	Low			
- Extent	Low	Nil	No waste discharge permit.	101
- Water Quality				
- Riparian Condition				
Linear Development	Low			
- Extent	Low		Logging roads throughout system.	173
- Riparian Condition				
Hydro Development	Low			
- Extent	Low	Nil		
- Riparian Condition				

Other Development	Low			
- Extent	Low	Nil		
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Logging is the main resource use activity. The amount of logging and the steep terrain increases the risk that downstream impacts can result from upslope activities.	105 139

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial drift.	101
Terrain	Low	Steep mountainous terrain.	134
Hydrology	High	Low winter flows (6% of mean annual flow) Peak flows are not noted as extreme, however, anecdotal comments suggest that there are extreme freshets on this system.	103 134
Channel Stability	High	Moderate to high instability from logging practices.	101 105

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features			
Sensitive Biological Features			
Significant Environmental Variables			
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Sockeye - Incidental harvest of this stock.	106
Recreational Fishery	x	Sockeye - Incidental harvest of this stock.	106
Native Fishery	x	Sockeye - Fraser and Thompson River Native fishery.	106 124

Restoration Activity			
Restoration Opportunity			
Enhancement Activity			
Enhancement Opportunity	x	Enhancement opportunities are very limited due to low habitat values, barrier to upstream migration and extreme freshets.	111 134

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	1	2	0	0

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**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Maintain/enhance watershed and stream channel integrity and stability	Initiate IWAP process to define areas of impacts from past logging which may have affected stream channel stability. Restore watershed values following recommendations of IWAP
Maintain/enhance fish and habitat diversity	Maintain existing habitat values. Reduce erosion of slopes by hydroseeding or use of geotextiles(167)

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Ireland  
Creek

Watershed Code: 03-5400-320

Drainage Area(ha):

10420

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone: Interior Cedar-Hemlock

Engelmann Spruce-Subalpine Fir

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	4.4	30.2	0.2	0.2	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Sockeye	x	2	1985		2		Unk	Mod
Coho	x	45	1979	24	40	31	Decrease	Mod

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High			
- Percent Total Logging	High	20%	The potential for logging activities to impact stream values by detabilization of banks and erosion creating sediment inputs is increased due to the steep nature of the terrain.	137 101
- Percent Recent Logging	High	8%		101
- ECA Status	High	14.4%	MoF District office indicates 19.2% total logged. 6.8% of the watershed that has been logged has a slope greater than 50%.	137
- Riparian Condition	High	6.9% of streambank	6.9 % of the total streambank length has been logged.	137
Agriculture	High		The main agricultural activities in this area are pig farming and cattle ranching.	
- Extent	High	0.89 AU/km	Agricultural activities are being carried out along the lower reaches which are the most important in terms of fisheries values.	111

- Riparian Condition	High		Heavy bank erosion and degraded riparian from crop production and livestock grazing. Pigs (and cattle) directly affect riparian vegetation by trampling streambank areas, during summer when they are put in pastured areas	134
- Water Withdrawal	High		Summer water use is 35% of mean 7 day low flow. Summer flows are very low (4% of mean annual flow).	111 103
- Water Quality	High		Non-point source pollution.	101
Urbanization	Low			
- Population Level	Low	Approx. 15		101
- Extent	Low		Primarily rural settlements.	101
- Riparian Condition				
- Water Withdrawal				
- Water Quality	Low		Non-point pollution from septic tanks.	101
Recreation	Low			
- Extent	Low			
- Riparian Condition				
- Water Quality				
Placer Mining	Low			
- Extent	Low	Nil		101

- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low			101
- Water Quality				
Industrial Development	Low			
- Extent	Low	Nil	No waste discharge permits.	101
- Water Quality				
- Riparian Condition				
Linear Development	Low			
- Extent	Low		Secondary road parallels system. Mabel Main logging road crosses system.	132
- Riparian Condition				
Hydro Development	Low			
- Extent	Low		Small hydroelectric project.	101
- Riparian Condition				

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Other Development	Low			
- Extent	Low	Nil		
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Cumulative impacts result from logging in upslope areas and agriculture in the lower reaches.	134

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial drift.	101
Terrain	Low	The relief along the lower reaches is low to moderate as the stream flows through the Middle Shuswap Valley floor. Upslope areas are characterized by steep mountainous terrain.	101
Hydrology	High	Low summer and winter flows (4% of mean annual flow)	
Channel Stability	High	Channel instability is noted in the lower reaches.	101

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features	x	Culvert at mouth may restrict access.	134
Sensitive Biological Features			
Significant Environmental Variables			
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Sockeye - Incidental harvesting of this stock with Shuswap sockeye target fisheries.	106
Recreational Fishery	x	Sockeye - Incidental harvesting of this stock.	106
Native Fishery	x	Sockeye - Fraser and Thompson River Native fisheries.	106 124

Restoration Activity			
Restoration Opportunity	x	Ensuring access for fish will provide the opportunity for fry produced in the mainstem to access habitat in the lower reaches of Ireland Creek. Re-vegetate lower reaches where the riparian zone has been removed.	
Enhancement Activity			
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	2	2	0	0

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Maintain/enhance water quantity for instream uses	Assess requirements for instream flows for fish and work with landowners to ensure adequate flows during critical periods. Monitor water withdrawals.
Maintain/enhance watershed and stream channel integrity and stability	Initiate IWAP to reduce the effects of logging especially on upslope areas with slopes greater than 50%. Incorporate results of IWAP to develop restoration procedures directed at speeding up time to recover stream channel values.
Maintain/enhance fish and habitat diversity	Ensure good access to habitat in the lower reaches of Ireland Creek.
	Work with landowners to restore streamside vegetation in lower reaches of the creek

Bessette  
Creek

Watershed Code: 03-5400-350

Drainage Area(ha):

79480

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone: Interior Cedar-Hemlock  
 Interior Douglas Fir  
 Montane Spruce  
 Engelmann Spruce-Subalpine Fir

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	4.5	34.3	1.0	3.3	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Chinook	x	250	1993	86	250	24	Increase	Mod
Coho	x	2,500	1965	43	100	674	Decrease	High
Pink	x	20	1983	3	20		Unk	Mod

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High		Logging activity occurs mainly in headwater areas. Direct logging impacts in Bessette Creek are minimal and are mainly concerned with logging on private lands. Upslope logging activities result in sediment inputs downstream to Bessette Creek.	111 144 177
- Percent Total Logging	High	24%	Logging is concentrated in upslope areas. Historic logging removed timber from the valley bottom.	101
- Percent Recent Logging	High	14%		101
- ECA Status				
- Riparian Condition				
Agriculture	High		Agricultural activity includes cattle and pig farming as well as crop production.	134

- Extent	High	5.73 AU/km	Major agricultural use throughout.	134 105 139
- Riparian Condition	High		Riparian vegetation has been removed during agricultural activity and by trampling from pigs and cattle. Vegetative removal contributes to water temperature increases, high nutrient inputs and heavy erosion and sedimentation along the stream length.	111 134 139
- Water Withdrawal	High		Water use is documented as high, August use 110% of mean 7 day low flow. Interviews with agency personnel suggests that low summer flows are a problem in most years.	101 103 153
- Water Quality	High		Non point source inputs contribute increased; levels of fecal coliforms, suspended solids and turbidity.	105 134 153
Urbanization	High		The Village of Lumby is located on Bessette Creek. Low density settlement occurs along the total length of the Creek.	
- Population Level	High	2,610 Approx.	The majority of the population is concentrated in Lumby.	101
- Extent	High		Primarily rural settlements, Village of Lumby.	111 134
- Riparian Condition	High		Landclearing has reduced streamside vegetation. Diking has resulted in channelization and reduction in habitat complexity.	111
- Water Withdrawal	Low		Domestic water supply.	101
- Water Quality	Low		Village of Lumby - chlorinated treated effluent from municipal waste water and storm water discharge.	101 105 139
Recreation	Low			
- Extent	Low	12%	12 % of the watershed is within Silverstar Provincial Park expansion.	101
- Riparian Condition				
- Water Quality	Low		Silver Star Ski Resort discharges treated sewage into an exfiltration reservoir that drains into Vance Creek a tributary of Bessette Creek. No impacts from this discharge have been noted.	101
Placer Mining	Low			

- Extent	Low	Nil		101
- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low		Mining interest in the Bessette drainage include Zn, Lead and Molybdenum. A mine/mill operation north of Lumby is no longer in operation.	105 101 153
- Water Quality				
Industrial Development	Low			
- Extent	Low		Bell Pole, a chlorophenolate thermal wood perserving plant for utility poles, is located upstream of Lumby. Weyerhauser has a log yard and a concentrate mill on Bessette Creek.	101
- Water Quality	Low		Potential leachates from log yard refuse. Bell pole has recently developed a remediation plan to reduce inputs of PCB's into Bessette Creek.	101
- Riparian Condition				
Linear Development	Low			
- Extent	Low		A secondary road parallels the system however it generally does not run along the creek.	101
- Riparian Condition				
Hydro Development	Low			
- Extent	Low	Nil		

- Riparian Condition				
Other Development	Low			
- Extent	Low	Nil		
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		The effects of upslope logging, agriculture, settlement, and industrial development combine to create extreme risks to instream values of Besette Creek.	134 105 145

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial drift.	101
Terrain	Low	Terrain along the valley floor is generally low relief. In the headwaters the terrain steepens and can be characterized as moderately steep rolling hills.	101
Hydrology	High	Moderate summer and winter low flows, and peak flows. Irrigation dam on Duteau Creek. Low summer flows, due to high water use, have been noted.	144 103
Channel Stability	Low	Instability is noted throughout watershed. The streamchannel in the lower reaches is aggraded and pool to riffle ratios are generally low.	105 139

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features			
Sensitive Biological Features	x	Coho, and to a limited extent, chinook use the system for spawning and rearing.	
Significant Environmental Variables	x	Water quality concerns from telephone pole treatment plant, woodwaste landfill and agriculture. Some water quality objectives fecal coliforms, E. coli, suspended solids, turbidity, colour, pH, dissolved oxygen, and resin acids not being met.	145 134
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management	x	Coho stocks are depressed throughout the drainage, adult returns are low. A counting fence has been run by the SNFC for coho in 1995 and 1996.	
Commercial Fishery	x	Chinook and coho - No known harvest of these stocks	106
Recreational Fishery	x	Coho - No known harvest of this stock or unknown. Chinook salmon are susceptible to incidental harvest in the Middle Shuswap River terminal recreational fishery.	106
Native Fishery	x	Chinook and Coho - No known harvest of these stocks or unknown. The SNFC would like to restore the Bessette Creek coho run with the ultimate objective of establishing a terminal fishery.	106 124 159

Restoration Activity			
Restoration Opportunity	x	The major restoration activity deals with establishing suitable instream flows and habitat quality for salmonids.	
Enhancement Activity			
Enhancement Opportunity	x	Enhancement is possible through increasing adult returns to the system followed by restoring watershed habitat values.	

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	2	1	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Watershed Assessment Procedure	IWAP's are being carried out in upstream tributaries (Duteau, Harris and Creighton).	

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Restore and enhance habitat	Restore riparian zones along creek through the development of a Riparian Management Plan in cooperation with stakeholders. Include fencing livestock away from the stream and an education component.
	Inventory and map riparian areas and instream habitat.
Maintain/enhance water quantity for instream uses	Develop a Water Management Plan with all user groups to ensure adequate flows for instream use. Monitor water withdrawals.
Maintain/enhance water quality	Ensure compliance to waste management permits to prevent pollutants from industrial developments. (101)
Maintain/enhance watershed and stream channel integrity and stability	Use results from IWAP's conducted in upstream tributaries to help develop restoration initiatives in Bessette Creek.
Maintain/enhance fish and habitat diversity	Explore the possibility of coho supplementation through incubation and rearing at the existing Shuswap Hatchery. Develop stream stewardship arrangements with user groups following format being developed for the urban streams program.
	Work with landowners to reclaim lost habitat values and reduce sediment inputs (145)

Creighton  
Creek

Watershed Code: 03-5400-350-030

Drainage Area(ha):

15380

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone:

Interior Douglas Fir  
 Montane Spruce  
 Engelmann Spruce-Subalpine Fir

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	0.9	7.8	0.2	0.3	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Coho	x	150	1992	77	200	27	Increase	Mod

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry				
- Percent Total Logging	High	25%	Logging activity in Creighton Creek is primarily in the upslope areas.	137 177 101
- Percent Recent Logging	High	10%		101
- ECA Status	High	6.7%	7.6% total logged. Logging in the Aberdeen Hills area could be a source of recent problems from streamside and valley wall erosion as timber is extracted to reduce a Mountain Pine Beetle concern.	137
- Riparian Condition	High	12.5%	12.5% of the streambank of Creighton Creek has been logged.	137
Agriculture	High		Animal grazing and crop production.	
- Extent	High	8.27 AU/km	Heavy agricultural use throughout area. Extensive beef cattle operations.	160

- Riparian Condition	High		In some areas banks are unstable due to removal of riparian vegetation. Animal grazing contributes to erosion and increased sedimentation.	134 139 105
- Water Withdrawal	High		Summer water use is high (74% of Aug mean 7 day low flow). Extreme summer low flow problems have been noted, due to water extractions for irrigation.	153 103
- Water Quality	High		Non point sources. Ranchers sometimes use machinery in the creek for damming and dredging to increase flows to fields. There is a possibility of pesticides entering creek. Summer low flows can result in increases in temperatures.	134 153
Urbanization	Low			
- Population Level	Low	Approx. 200		101
- Extent	Low		Primarily rural settlements.	101
- Riparian Condition	Low		Bank stability problems related to rural development.	105 139
- Water Withdrawal	Low		Water licensed for domestic purposes.	103
- Water Quality	Low		Rural Non-point.	101
Recreation	Low			
- Extent	Low		Campsite at Denison Lake.	173
- Riparian Condition				
- Water Quality				
Placer Mining	Low			101
- Extent	Low	Nil		101

- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low	Nil		101
- Water Quality				
Industrial Development	Low			
- Extent	Low			
- Water Quality	Low		No waste discharge permits	101
- Riparian Condition				
Linear Development	Low			
- Extent	Low		Road parallels system with several bridge crossings.	101 111
- Riparian Condition				
Hydro Development	Low			
- Extent	Low	Nil		
- Riparian Condition				

Other Development	Low			
- Extent	Low	Nil		
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Upslope logging activities combined with high agricultural land use and urbanization in the valley bottom have impacted fish and fish habitat values in Creighton Creek by the introduction of sediments, reducing channel complexity and riparian vegetation.	105

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial drift.	101
Terrain	Low	Flat terrain along the valley floor and rolling hills with moderate relief in upslope areas.	101
Hydrology	Low	Although summer low flows are 18% of mean annual flow observation by agency personnel indicate that summer low flow conditions may result form high water use.	103
Channel Stability	High	There is channel instability throughout Creighton Creek. Channel instability is due to riparian vegetation removal.	101 134

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features			
Sensitive Biological Features			
Significant Environmental Variables	x	Summer low flows.	134 105 139
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Coho - ocean fishery.	106
Recreational Fishery	x	Coho - ocean sportfishery.	106
Native Fishery	x	Coho - Fraser and Thompson Native Fishery.	106 124

Restoration Activity			
Restoration Opportunity	x	Restoration of riparian corridor. Provide upstream fish access around weirs.	111
Enhancement Activity			
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	2	1	0	0

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Restore and enhance habitat	Restore habitat values in the creek through a stream stewardship program. Develop fish bypass potential around areas of difficult passage. Monitor restoration projects.
	Explore the opportunity to augment coho production through the Shuswap Hatchery.
	Inventory riparian and instream habitat values as well as fish resources.
Maintain/enhance water quantity for instream uses	Develop a water use plan with the cooperation from user groups that allows for adequate instream flows for fisheries purposes. Public education will be a necessary component of this process. Monitor water withdrawals.
Maintain/enhance watershed and stream channel integrity and stability	Develop a Riparian Management plan with the cooperation of user groups.
	Conduct an IWAP to define impacts from past logging in upslope areas(139) Prescribe treatments to restore downstream values after identifying areas of impact through the IWAP.

Duteau  
Creek

Watershed Code: 03-5400-350-040

Drainage Area(ha): 21720

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone: Interior Douglas Fir  
 Montane Spruce  
 Engelmann Spruce-Subalpine Fir

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	1.2	11.0	0.2	0.3	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Chinook	x	120	0	23	120		Unk	Mod
Coho	x	750	1987	513	800	377	Increase	Mod

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	High			101
- Percent Total Logging	High	35%	Logging activity concentrated in the southern two thirds of the watershed.	101
- Percent Recent Logging	High	25%	There are indications that the large amount of recent logging has affected the hydrologic regime in tributaries above the reservoir.	101 103 177
- ECA Status	High	21%	MoF Vernon indicates that 23.6 % total logging. Logging activity is primarily taking place in upslope areas.	137
- Riparian Condition				
Agriculture	High		Livestock and crop production, extensive beef operations.	
- Extent	High	6.26 AU/km.	Agriculture is extensive in the valley along the lower reaches of Duteau Creek.	160

- Riparian Condition	High		Riparian degradation due to cattle trampling stream banks.	111
- Water Withdrawal	High		Summer water use extremely high (760%) of Aug. mean 7 day low flow. There is storage at an irrigation dam operated by the Vernon Irrigation District. Although rule curves have been proposed there is no satisfactory flow agreement with the VID.	134 105 139
- Water Quality	High		Non-point pollution. Large beef operations situated close to Duteau increase nutrient inputs during spring run off and periods of flooding.	160
Urbanization	High		Settlement is low density through most of Duteau Creek with higher density at the Village of Lumby.	
- Population Level	High	Approx. 2000		101
- Extent	High		Village of Lumby. Primarily rural settlements.	101
- Riparian Condition				
- Water Withdrawal	High		Headwaters of Duteau are controlled by VID. The VID has several first priority licences, the water withdrawn leaves reduced flow for other instream users. During years of low inflow flows to Duteau Cr. are curtailed to maintain storage.	134 105 103
- Water Quality	Low		Storm drain run-off from Village of Lumby.	111 153
Recreation	Low			
- Extent	Low		Numerous Forest Service Recreation sites in the headwaters ie Haddo Lake, Aberdeen Lake and others.	173
- Riparian Condition				
- Water Quality				
Placer Mining	Low			
- Extent	Low	Nil		101

- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low	Nil		101
- Water Quality				
Industrial Development	Low			
- Extent	Low		Lumby Arena; landfill operation for wastes from a sawmill/veneer plant including flyash.	101 144
- Water Quality	Low		Leachates from landfill operation may increase dissolved solids and nitrogen constituents. Cooling water spills from the Lumby Arena can put fisheries resources at risk. Flyash emissions from sawmills can affect water quality.	101
- Riparian Condition	High		Encroachment onto riparian areas by sawmills is a concern.	144
Linear Development	Low			
- Extent	Low		There are several bridge crossings by road networks and the CN railway parallels stream. There is also an extensive natural gas pipeline network.	111
- Riparian Condition				
Hydro Development	Low			
- Extent	Low	Nil		
- Riparian Condition				

Other Development	Low			
- Extent	Low	Nil		
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Cumulative impacts from logging, agriculture, settlement, industry and linear development affect fisheries values in Duteau Creek from loss of riparian vegetation, increased levels of sediment, low flows, and reduced water quality.	

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Lacustrine silts.	101
Terrain	Low	Low relief along the valley floor and moderate relief in the rolling hills of the upper reaches of Duteau Creek.	101
Hydrology	High	Flows are regulated by the Vernon Irrigation District (VID) through storage reservoirs in the upper watershed. Conflict occurs in years of low snowpack and low reservoir inflows when flows to Duteau Cr. are curtailed to maintain storage in the reservoir.	134 103
Channel Stability	High	Banks are unstable causing erosion and sediment accumulation problems.	105 134

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features			
Sensitive Biological Features	x	Approximately 8km of the stream provide about 90% of the rainbow trout for Mabel Lk. It is also an important area for coho and chinook.	134
Significant Environmental Variables			
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Chinook and coho - Ocean fishery	106
Recreational Fishery	x	Chinook - Ocean sport fishery.	106
Native Fishery	x	Chinook and coho - Fraser and Thompson River Aboriginal Fishery.	106 124

Restoration Activity	x	Ranchers in the area have installed cattle exclosures to provide limited access to creek. Small ground water fed creek (that flows into Duteau) diverted away from cattle pen to prevent nutrient load. Dredged creek in 1994 to create more ground water flow.	160 113
Restoration Opportunity	x	Resolution of instream flow issues will ensure adequate habitat for spawning and rearing fish.	
Enhancement Activity			
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	3	1	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Watershed Assessment Procedure	Level I Watershed Assessment to be completed in 1996.	143

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Maintain/enhance water quantity for instream uses	Develop Water Use Plan allowing for instream flows and assess opportunities for storage. DFO and the Vernon Irrigation District (VID) should complete the agreement regarding instream flows. Monitor water withdrawals.
Maintain/enhance water quality	Monitor storm-run off from Village of Lumby. Monitor industrial development from sawmill /veneer plant and leachates from landfill to assess water quality risks. (101) (144)
	Develop Riparian Management Plan and educate public on the importance of riparian vegetation and involve stakeholders. Fence livestock away from creek.
Maintain/enhance watershed and stream channel integrity and stability	Inventory riparian and instream habitat values.
	Restore watershed characteristics following recommendations from IWAP process which will identify impacts from upslope logging and prescribe treatments to restore downstream values.
Rebuild and enhance salmon stocks	Continue monitoring restoration projects.
	Explore the opportunity to open up sidechannel from Harris Cr. to Duteau Cr. and install Neuberry weirs to recreate pool and riffle habitat in Harris Creek.
	Develop stream stewardship program including user groups, natives, Village of Lumby and Schools to restore habitat values. Duteau Creek is important for coho and rainbow trout production(134). Consider using the Shuswap facility to supplement stocks.

Harris  
Creek

Watershed Code: 03-5400-350-060

Drainage Area(ha):

21170

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Shuswap Highlands

Biogeoclimatic Zone: Interior Douglas Fir

Montane Spruce

Engelmann Spruce-Subalpine Fir

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	1.2	10.7	0.4	0.7	103	

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Coho	x	300	1989	0	0	0		

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	Low		Logging activity is concentrated in the northern half of the watershed. Bank instability and increase in sediments appear to have increased as a result of logging activities.	101 134 177
- Percent Total Logging	Low	15%	Logging activity occurs mainly in the upper portion of the watershed.	101
- Percent Recent Logging	Low	10%	There is some concern that Mountain Pine Beetle control programs will result in extensive clearing and possible impacts to the stream.	101
- ECA Status				
- Riparian Condition				
Agriculture	High		Extensive crop production	
- Extent	High		Agricultural activity is mainly along the valley floor.	

- Riparian Condition	Low		Riparian zone degraded from agricultural developments.	
- Water Withdrawal	High		High summer water use (132% of Aug. mean 7 day low flow). Summer flows are 12% of mean annual flow.	101 103
- Water Quality	High		Nitrate and phosphate levels are elevated in late summer.	134 153
Urbanization	Low			
- Population Level		10		
- Extent	Low		Primarily rural settlements.	101
- Riparian Condition	Low		Land clearing by private landowners has reduced the amount of streamside vegetation.	134 153
- Water Withdrawal				
- Water Quality				
Recreation	Low			
- Extent	Low		Limited recreation, forest service roads throughout.	
- Riparian Condition	Low			
- Water Quality	Low			
Placer Mining	Low			
- Extent	Low		There has been a history of placer mining on this system. This has resulted in erosion problems which in some cases still exist.	134

- Water Quality	Low		The potential for erosion problems leading to increased sedimentation still exist.	134
- Riparian Condition				
Other Mining	Low			
- Extent	Low	Nil		101
- Water Quality				
Industrial Development	High		Sawmills and Bell Pole telephone pole treatment area.	134
- Extent	High		Sawmills, Bell Pole	
- Water Quality	High		Bell Pole treats hydro and telephone poles. Leaching of PCB's has been a problem. Site remediation has been undertaken to reduce inputs of leachates into Harris Creek. Flyash from sawmills located at Lumby can affect a water quality.	134 144
- Riparian Condition				
Linear Development	Low			
- Extent	Low		Logging road parallels system. Sediments may be contributed to the system from road wash.	173
- Riparian Condition				
Hydro Development	Low			
- Extent	Low	Nil		
- Riparian Condition				

Other Development	Low			
- Extent	Low	Nil		
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		Forestry, agriculture, and industrial development have combined to impact instream values. Impacts are related to high sediment inputs and water withdrawals.	105 134

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils	Low	Glacial drift.	101
Terrain	Low	The lower reaches of Harris Creek flow through a flat valley bottom. Upslope areas have low to moderate relief with rolling hills. Some slide areas are present in the upper watershed.	101 134
Hydrology	High	Moderate summer low flows (12% mean annual flows. High summer water use may create low flows downstream of water users.	134 101 103
Channel Stability	High	Instability throughout watershed. Natural slides contribute to high bedload movement.	105 139 103

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features			
Sensitive Biological Features			
Significant Environmental Variables	x	Low flows, unstable slopes resulting in increased sediment and high bedload movement.	103 134
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Coho - Ocean fishery	
Recreational Fishery	x	Coho - Ocean sport fishery.	
Native Fishery	x	Native interest in re- establishing coho.	124

Restoration Activity			
Restoration Opportunity		Restore riparian corridor.	
Enhancement Activity			
Enhancement Opportunity			

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
No	2	2	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Watershed Assessment Procedure	Level I Watershed Assessment to be completed in 1996.	143

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**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Restore and enhance habitat	Restore stream through stewardship programs and involve community groups. Inventory riparian and stream habitat values.
Maintain/enhance water quantity for instream uses	Develop water management plan that provides instream flows for fish. Monitor water withdrawals.
Maintain/enhance water quality	Monitor flyash from sawmills (144). Monitor Bell Pole and the chemical treatment of hydro and telephone poles.
Maintain/enhance watershed and stream channel integrity and stability	Restore watershed conditions through road deactivation and maintenance, riparian re-vegetation and slope stabilization as defined by IWAP process.
Rebuild and enhance salmon stocks	Explore the opportunity to augment coho production through the Shuswap hatchery.

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Okanagan  
River

Watershed Code: 31-0000

Drainage Area(ha): 0

Habitat Management Area: South Thompson - Shuswap

Physiographic Area(s): Thompson Plateau

Biogeoclimatic Zone: Bunch Grass  
 Ponderosa Pine  
 Interior Douglas Fir  
 Montane Spruce  
 Engelmann Spruce-Subalpine Fir

**STREAMFLOW CHARACTERISTICS**

Stream Flows	Mean Annual	Mean Flood	Mean 7 Day Low Flow		Ref.	Comment:
			Summer	Winter		
(m3/s)	0.0	0.0	0.0	0.0		

**SALMON ESCAPEMENT**

Species	Present	Historical Max	Historical Max Year	1981-1992 Ave.	1981-1992 Max.	1969-1980 Ave.	Trend For '81-92 to '69-80 Ave.	Rebuild Potential
Sockeye	x							
Chinook	x							
Steelhead	x							

**DEVELOPMENT ACTIVITY**

Type	Level of Concern	Values	Comment	Ref.
Forestry	Low		Tributaries to the Okanagan River have been logged.	111
- Percent Total Logging	Low		Logging in McIntyre Creek and upslope areas has caused water quality problems mainly related to increased sediments to the stream.	111
- Percent Recent Logging				
- ECA Status				
- Riparian Condition				
Agriculture	High		Intensive agricultural use including crop production, orchards, vineyards and farming. Beef cattle feedlots near Oliver	

- Extent	High		Agricultural use throughout valley.	111
- Riparian Condition	High		River has been channelized and is controlled by dams and drop structures for agricultural use and flood protection. Riparian zone has been degraded through livestock grazing, and landowners removing vegetation.	
- Water Withdrawal	Low		McIntyre Dam impounds water for agricultural use, numerous (13) drop structures between Oliver and Osoyoos Lake.	111
- Water Quality	High		Run-off from agricultural operations include nutrients, fertilizers and pesticides.	
Urbanization	High		Extensive settlements throughout the Okanagan River valley.	
- Population Level				
- Extent	High		Communities include: Osoyoos, Oliver, Vaseux Lake and Okanagan Falls. Rural and hobby farms throughout valley.	111
- Riparian Condition	High		Increases in population and development will continue to encroach into riparian zones.	
- Water Withdrawal				
- Water Quality	High		Storm drain run-off, as well as, risks of introduction of toxic substance is a concern related to high levels of urbanization.	
Recreation	High		The area is used extensively for recreational opportunities including camping and swimming.	
- Extent	High		There are several sites for observing wildlife. Campsites are located at Okanagan Falls, Inkaneeep and Vaseux Lake. Fishing is a popular recreational activity in the area.	132
- Riparian Condition				
- Water Quality				
Placer Mining	Low			

- Extent	Low			
- Water Quality				
- Riparian Condition				
Other Mining	Low			
- Extent	Low		Some mining in tributary watersheds.	111
- Water Quality				
Industrial Development	Low		Some limited industrial development along the Okanagan River	
- Extent	Low		Industrial development is mainly small industries to serve the local population base.	
- Water Quality	Low		Potential risks of introduction of deleterious substances is a concern.	
- Riparian Condition				
Linear Development	Low		Major highway and road network.	
- Extent	Low		Highway 97 parallels system. Extensive road system developed around communities.	132
- Riparian Condition	High		Road wash can contribute sands and salts. There is a potential for spills of toxic substances.	
Hydro Development				
- Extent				

- Riparian Condition				
Other Development	Low			
- Extent	Low			
- Riparian Condition				

**CUMULATIVE DEVELOPMENT**

Type	Level of Concern	Values:	Comment	Ref.
Cumulative Development	High		High urbanization and agricultural activity has caused the river to be extensively channelized and has resulted in the loss of streamside vegetation and side channel habitats.	

**BIOPHYSICAL CONDITIONS**

Type	Level of Concern	Comment	Ref.
Soils			
Terrain	High	The Okanagan River flows through the flat valley bottom of the Okanagan. Tributaries enter the mainstem from moderately sloped hills which occur to the east and west of the river.	
Hydrology	Low	The Southern Okanagan Land Irrigation District and the Ministry of Environment and Parks control the flow of the Okanagan River.	144
Channel Stability	Low	The Okanagan R. is heavily channelized particularly in the section from Oliver to Osoyoos Lk. The only natural habitat remaining is the 10 km stretch of river below McIntyre Dam, and even some of this area has been subjected to bank armouring.	

**SENSITIVE WATERSHED and HABITAT FEATURES**

Type	Present	Comments	Ref.
Sensitive Physical Features	x	There are 13 vertical drop structures between Osoyoos and McIntyre Dam.	111
Sensitive Biological Features	x	There is a remaining Columbia River sockeye run. Some chinook spawning also occurs.	
Significant Environmental Variables			
Unique Features			

**SPECIAL CONSIDERATIONS**

Type	Present	Comments	Ref.
Stock Management			
Commercial Fishery	x	Columbia River stock	
Recreational Fishery	x	Columbia River Stock	
Native Fishery	x	Columbia River Stock.	

Restoration Activity	x	Improved passage has been afforded this sockeye stock by upgrading of the dam below Osoyoos Lake, in the State of Washington.	
Restoration Opportunity	x	Stream improvement in the section of river from the McIntyre Dam to the Village of Oliver.	
Enhancement Activity			
Enhancement Opportunity	x	Improved upstream and downstream passage in the Columbia River would likely increase Okanagan River anadromous fish stocks. Access of chinook and steelhead to the Similkemeen River	

**SUMMARY OF HABITAT CONCERNS (no. of high ratings)**

Salmon Present	Development Activity	Biophysical Conditions	Sensitive Watershed and Habitat Features	Special Considerations
Yes	3	1	0	0

**RECENT WATERSHED PLANNING/PROJECT INITIATIVES**

Type	Comments	Ref.
Land and Resource Management Plan	The Okanagan River is included in the Okanagan Shuswap LRMP process.	

**SPECIFIC OBJECTIVES AND STRATEGIES**

Specific Objectives	Specific Strategies
Restore and enhance habitat	Ensure that the development in tributary streams does not impact the water quality of the Okanagan River below McIntyre Dam.
	Develop Riparian Management Plan with user groups to educate and work together in re-establishing riparian vegetation.
Maintain/enhance water quality	Monitor foreshore development on Osoyoos Lake to ensure that sockeye rearing in the lake is not impacted.
	Monitor water quality below industrial sites and large urban centres.
Maintain/enhance fish and habitat diversity	Continue to participate in Osoyoos Lake Advisory Committee on strategy for water management. Ensure adequate spawning and incubation flows for sockeye considering kokanee lakeshore spawning needs.
	Develop awareness through an education process and maintain existing habitat values between McIntyre Dam and Oliver. Access historic oxbows, that are currently isolated, for rearing. Develop channel complexity with instream structures.

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