

**WATERSHED RESTORATION PROGRAM
BABINE WEST DRAINAGES OVERVIEW ASSESSMENT
OVERVIEW FISH AND
FISH HABITAT ASSESSMENT
FRBC CONTRACT #CSK3079
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Babine Forest Products

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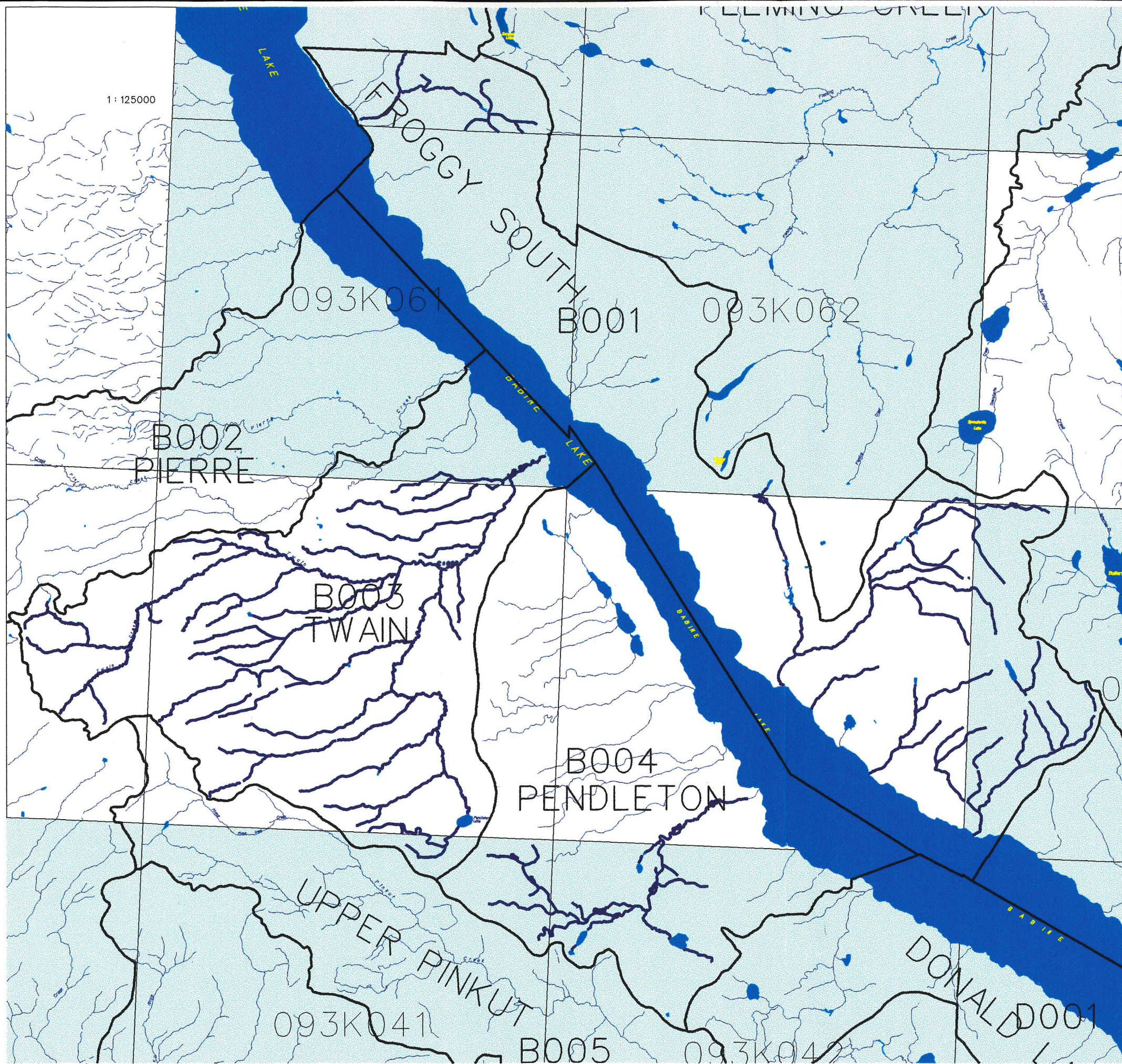
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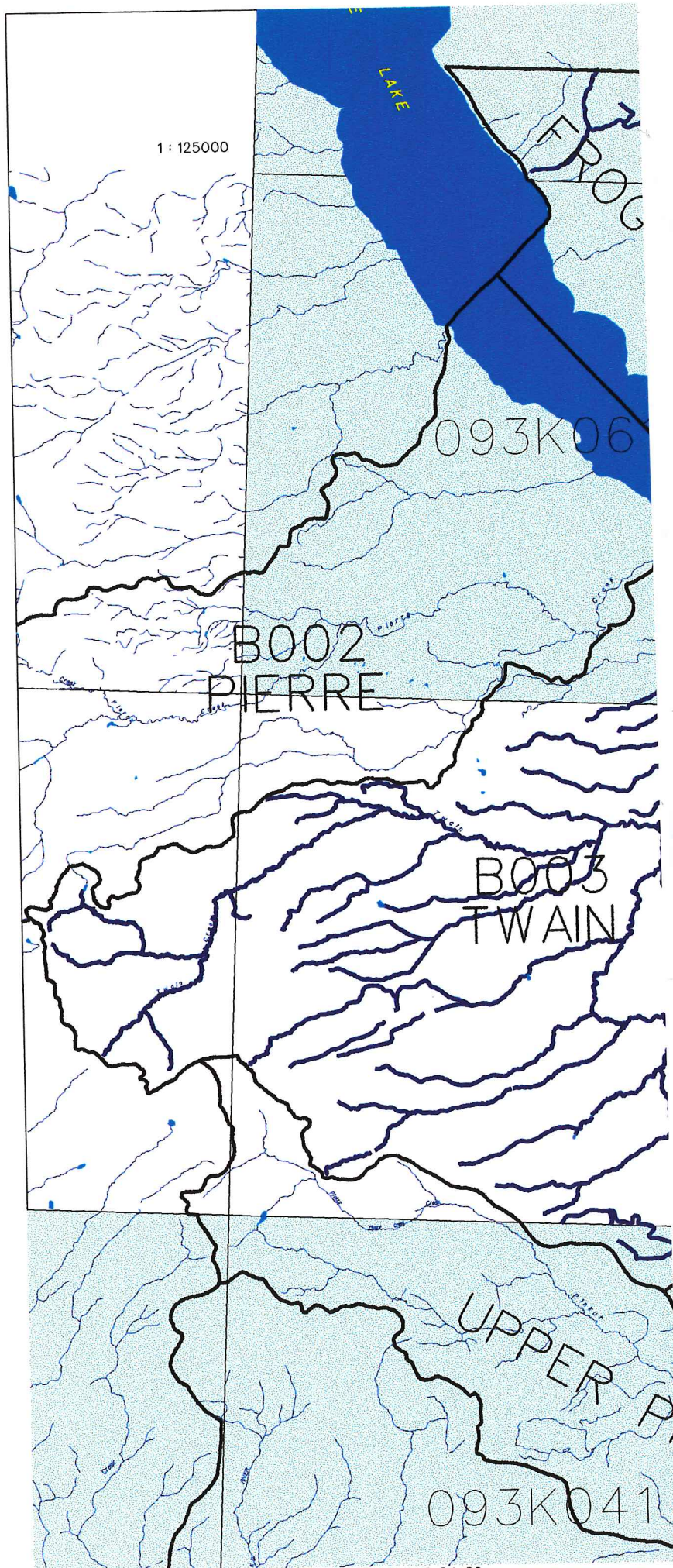
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Study area is indicated by the dark blue streams.

1.0 EXECUTIVE SUMMARY

Seven drainages of the Babine West Landscape Unit (Twain Creek, Cross Creek, Deep Creek, and four Froggy South drainages) were assessed in the summer of 1997 for forestry related impacts to fish and fish habitat. Sockeye spawning in the lower reaches of Twain Creek, Cross Creek, Deep Creek, and Creek B is confirmed while gaps exist for fish distribution information for upper reaches and 'unnamed creek'. While forest development is uncommon in lower reaches, fisheries values are vulnerable to upstream forestry activities.

The two 'high' priorities for restoration and further assessment are not directly forestry-related: a public road culvert barrier on Reach 1 of Cross Creek and a gravel sill at the mouth of Deep Creek can both be barriers to spawning sockeye salmon. Detailed assessments are proposed for the lower reaches of Cross, Deep and Twain Creeks and for five reaches in creeks A and B. 'Medium' priorities include culvert repair, replacement, or assessment, erosion control at crossings, and riparian rehabilitation in clearcuts.

2.0 INTRODUCTION

In May 1997, Cliff Manning Forestry Services was contracted by Babine Forest Products Ltd. to perform an overview watershed assessment for the Taltapin West Watershed Unit. This project has been funded by Forest Renewal British Columbia.

2.1 Study Area

Seven separate drainages were selected for this overview assessment. These were Twain Watershed, Cross Creek, Deep Creek, Unnamed Creek, Creek A, Creek B, and Creek E. All of these flow into Babine Lake which is a part of the Skeena watershed.

Twain Watershed

The Twain watershed is located just east of the South Babine Lake barge site. It is a fourth order stream that drains directly into Babine Lake from the east and drains an area of about 13,890 ha. The mainstem of Twain Creek is 18.82 km long, while its tributaries amount to more than 100 km. Topography ranges from 720 m at Babine Lake to 1260 m at its upper reaches. Being a canyoned creek in portions, there are extensive areas of potentially unstable soils and some areas of unstable soils along the mainstem creek. In the upper reaches, the terrain consists of rolling hills. Numerous swamps feed this watershed.

There is only one lake within this watershed (Pendleton Lake) which is 11.7 hectares. Coho, sockeye, and kokanee all spawn regularly in the lower reaches of this creek, while pink salmon have also been seen spawning in this area in past years (Jantz et.al. 1989). Escapement numbers for sockeye have averaged 7,400 in the past ten years (Table 1, p.4) and the period between 1964 and 1973 averaged 10,596 sockeye (Graham et.al., 1974). Two biogeoclimatic zones are found within the Twain watershed. A large proportion of the area consists of the Sub-boreal Spruce moist-cold (SBSmc). The most southerly portions of this watershed are the Engelmann Spruce-Sub-alpine Fir cool (ESSFk) type.

Land Use

Three registered traplines (606T009, 606T010, and 606T011) and one registered guiding area (605G001) are found within this watershed.

Cross Creek

The mouth of Cross Creek is located in the Pendleton Bay area within the Pendleton watershed. It drains directly into Babine Lake from the east and drains an area of approximately 4,093.75 ha. This creek is 12.4 km long and is a second order stream. The elevation of Cross Creek is 720 m at its mouth and 1080 m at its head. Except for its upper reaches, the area surrounding Cross Creek consists of potentially unstable soils. In its lower reaches, Cross Creek flows through a gully, going through some sections of steep rocky terrain. The drainage is fed by Pacman Lake and two other smaller lakes as well as by wetlands around the head of mainstem Cross Creek.

There are numerous rainbow trout up to the falls at 6.4 km and sockeye and kokanee also use the lower reaches for spawning (David Bustard and Associates, 1989). Small amounts of coho parr may also be present. Sockeye escapement numbers have averaged 460 for the past 10 years (Table 1, p. 4).

Cross Creek falls entirely within the SBSmc biogeoclimatic zone.

Land Use

There are two registered traplines (0606T005, 0606T011) and one guiding area (605G001) within this drainage. In addition, there is one private resort (Babine Lake Resort), one provincial park (Pendleton Bay Provincial Park) and some privately owned land, all within the first two reaches of Cross Creek.

Deep Creek

This third order creek is located on the north side of Babine Lake and flows directly into it. It drains an area of 2,640 ha within the Froggy South watershed. The mainstem is approximately 7.6 km long, with tributaries accounting for another 5.0 km. Elevation starts at 720 m at Babine Lake and is 1220 m at the end of the mainstem. This stream flows within a gully with potentially unstable soils and is deeply entrenched within reach 2 (3.8 km). It is fed by one lake and a number of wetlands.

Escapement numbers for sockeye averaged 110 in the past three years (Table 1, p. 4). Pink salmon were also seen by the Ned'u'ten Fisheries crew in 1996. Spawning in this creek is probably sporadic due to frequent years of dewatering at the mouth (Leanne Olinyk, pers. com.). Escapement numbers have only been counted for the past three years as it was unknown before this that the stream was a spawning area for salmon.

This drainage falls almost entirely within the SBSdk (dry cool) biogeoclimatic zone except for the upper portion, which is SBSmc.

Land Use

There is one registered trapline (606T008) and one guiding area (6005G001) within this drainage.

Unnamed Creek

Unnamed Creek is a second order stream located on the north side of Babine Lake and drains directly into it. It drains an area of approximately 756 ha. The stream itself is 2.4 km long. Elevation starts at 720 m at Babine Lake and finishes at 900 m. Topography around the area is relatively constant and the stream flows unconfined.

This stream falls within the SBSdk for the most part except for the upper portion, which is SBSmc.

This stream is not thought to be fish bearing though it may be in the spring with higher water levels.

Land Use

This area falls within the same trapline and guiding area as Deep Creek

Creek A

This is a third order creek located within the Froggy South Watershed and draining directly into Babine Lake. The mainstem is about 8 km long, draining an area of approximately 1,268 ha. Topography ranges from 720 m to 830 m. It falls entirely within the SBSmc.

Coho, rainbow trout, and lake chub are all known to be present within this system, but kokanee and sockeye also used this stream historically.

Land Use

This area falls within trapline 606T011

Creek B

This third order creek also drains directly into Babine Lake from the Froggy South watershed. The mainstem is 7 km long and is fed by four small lakes. There is a large tributary that consists of most of the creek. Reach 1 of this tributary consists of unstable soils and Reach 2 of the mainstem consists of potentially unstable soils. The drainage area is 4,141 ha and topography ranges from 720 m to 920 m. This creek is entirely within the SBSmc biogeoclimatic zone.

Sockeye, rainbow trout, and lake chub can be found in this creek.

Land Use

There is one registered trapline (606T008) within this drainage.

Creek E

This is a second order creek that drains an area of 923 ha. It is 3.4 km long and is lake fed. Topography reaches 1,270 m. This creek falls within the SBSmc zone.

Rainbow trout are the only species known to be in this creek.

Land Use

There is one registered trapline (606T008) within this drainage.

TABLE 1: SOCKEYE SALMON ESCAPEMENT DATA FOR 1987-1996 (Ned'u'ten Fisheries Commission)

YEAR	TWAIN	CROSS	DEEP
1987	7,500	700	--
1988	6,500	600	--
1989	4,300	80	--
1990	8,000	200	--
1991	9,500	400	--
1992	7,000	1,100	--
1993	3,574	800	--
1994	7,000	100	330
1995	9,600	0	0
1996	11,000	650	340

2.2 Study Objectives

The main objectives for this Overview Assessment included:

- Assemble any existing information regarding fish presence and habitat use.
- Break streams into reaches using the methods outlined in the Fish Habitat Assessment Procedures Technical Circular #8 on 1:20,000 maps.
- Conduct an overview flight for each of the selected drainages to determine any potential stream habitats that have been affected by logging activities.
- Take photographs of representative sites for each reach as well as of any areas of site degradation.
- Determine sites that have potentially negative impacts on fish or fish habitat.
- Prioritize sites relative to each other based on impacts, potential risks, and ability to rehabilitate.
- Identify areas that require a Level I assessment.

3.0 METHODS

3.1 Existing Information Search

Existing information sources that yielded information for this study area included:

- The Ministry of Environment, Lands, and Parks Skeena Regional Library. This source had reports on rainbow trout recruitment for the Twain and Cross Creeks (David Bustard and Associates) and on biophysical stream surveys for Twain Creek (Graham et al 1974).
- Fisheries Information Summary System (FISS). Reports were available for Twain and Cross Creeks.
- Babine Forest Products Forest Development Plan maps.
- Ned'u'ten Fisheries Commission stream surveys. Enumeration data was available for Cross Creek, Deep Creek, and Twain Creek.
- FINS Consulting Stream Inventory cards/reports provided information for all Froggy South drainages.

3.2 Overview Helicopter Flight

Before the flight, streams were broken down into reaches using aerial photographs and 1:20,000 topographical maps. These were compared and modified with reports by David Bustard and Associates and by R.J.A. Forestry Ltd. These reaches were then confirmed during the helicopter flight.

The flight occurred on October 5, 1997 with Northern Mountain Helicopters. Flight altitude varied, remaining as low as possible. Mainstems and any visible tributaries were flown up to the point where any forestry activities stopped. Photographs were taken in most of the reaches showing representative sites and impacts.

3.3 Ground Checks

Ground checks were conducted in areas where there were potential impacts that could not be adequately assessed from the helicopter. These consisted of culvert and bank erosion problems. In addition, Deep and Unnamed creeks were examined in conjunction with an overview fish and fish habitat inventory.

3.4 Office Review

For creeks A, B, and D, neither the overview flight or ground checks were conducted. Information was gathered from recent inventories and sites will need to be visited in the summer to determine potential restoration work.

3.5 Mapping

Reach breaks, fish information, barriers, stream classifications, and watershed codes were all mapped on 1:20,000 Forest Cover basemaps. These maps were created from forest cover data.

4.0 RESULTS

4.1 Twain Creek

4.1.1 Habitat Descriptions

Twain Creek consists of eight reaches and two impassable falls.

Reach T1

This reach extends from Babine Lake to 1.1 km upstream. It is irregular meandering and occasionally confined with gradients ranging around 0.5%.

Twain Creek is reportedly one of the largest natural spawning areas on the lake (Leanne Olinyk, pers. com.), and this reach represents most of the available spawning habitat for this creek. It has a channel width of 17.0 m and thus is classified as an S2 under the Forest Practices Code. Spawning sockeye and kokanee use this reach extensively and numerous rainbow trout parr can also be found. It is also used by coho on a smaller scale, and in some years, by pink salmon (Jantz et.al., 1989). Floodwaters from the spring of 1997 have caused a lot of changes within this reach. Excess debris, bank erosion, and course changes have resulted (Leanne Olinyk, pers.comm.) According to David Bustard and Associates (1988), this reach provides good fry habitat at the top but does not contain good cover. Table 2 below summarizes information for Reach T1.

Due to the importance of Reach T1 to the fisheries resource, it is recommended for a Level 1 Fish Habitat Assessment.

TABLE 2: STREAM PROFILE FOR REACH T1 (Source: Ned'u'ten Fisheries Commission, 1992)

Stream Classification	Class 1	Braided	Yes
Channel Width	17m	%Bars	60%
Wetted Width	12m	Confinement	Occasionally Unconfined
Max Depth: Riffle	0.45m	Flow Stage	Medium
Pool	1.3m	Water Temp.	9°C
Unstable Banks	15%	Turbidity	Low
Habitat Units: Pool	25%	Water Level	Unknown
Riffle	60%	Substrate % of 100:	
Run	15%	%Boulder	5%
		%Bedrock	10%
%Side Channel	30%	%Cobble	40%
%Channel Debris	40%	%Gravel	30%
%Stable Debris	30%	%Sand	10%
%Unstable Debris	10%	%Silt	4%
%Instream Cover	45%	%Organics	1%
%Overstream Cover:		Compaction	Medium
%Crown Cover	60%	Flow Measurement	2.62 cubic m
%Overhang	70%		

Reach T2

This reach is 3.0 km long. It is sinuous and frequently confined with gradients around 4%. There are two sets of falls (~10m) within this reach, both being impassable to fish. Biophysical data for reaches 2,6, and Tt1 are outlined in Table 3 (page 8). This area is characterized by extensive bank erosion. This section is expected to be a FPC classification of S2. The area above the falls was shocked in August of 1988 and was found to be barren. In order to confirm this, this area should be inventoried.

Reach T3

This reach is 1.2 km long. Though this reach is not thought to contain any fish, it has excellent rainbow trout habitat and was suggested as an outplanting site by David Bustard and Associates (1988). There is an average wetted width of 8.7 m suggesting an S5 classification though this needs to be confirmed (Bustard, 1988). Mean depth is 25 cm and maximum depth is 35 cm. Pool area is low at only 10%, riffles accounting for the next 90%. The reach runs through an area of potentially unstable soils, and as such is characterized by numerous eroding banks. Surrounding forest is a pine/spruce type. It is an unconfined meandering stream with several gravel bars and log jams. It is crossed with a bridge on Augier road and flows adjacent to blocks 113-03 and 195-02.

Reach T4

This reach is irregular wandering and confined with gradients around 2%. It has a length of 1.5 km and extends to the junction with Tt1 (Twain tributary #1) where the input from this tributary significantly increases flow through the stream. The surrounding forest is mostly pine dominated. There is no forest development adjacent to this reach. This reach is expected to have a FPC classification of S5.

Reach T5

This reach is 1.7 km long extending from the junction with Tt1 to a set of ± 10 m falls. It is characterized by extensive steep, rocky banks. Flows are heavier here than in reach T6 because of a large tributary running in at the reach break. It runs adjacent to block 114-03, which is cut above the bank. It is surrounded by a spruce and pine forest.

Reach T6

Reach T6 is 2.6 km long with gradients around 2%. It is irregular wandering and partially confined. Bottom substrate consists of boulder/cobble. Channel width is 3.0 m suggesting a FPC classification of S6.

Reach T7

This is an unconfined and irregular wandering reach with gradients around 2%. The total length is 6.6 km. According to C.C. Graham et.al. (1974), this reach has discontinuous flows, disappearing in sections. It is crossed with a bridge on a branch road off of the Twain and flows adjacent to blocks 106-02 and 106-01. There were no impacts noted during the aerial survey.

Reach T8

Reach T8 is 1.7 km long and is an irregular meandering, unconfined reach. Gradients are around 2%. There is not any forestry activity near this reach.

Reach T9

There isn't any forestry activity occurring within the vicinity of this reach. It is fed by numerous wetlands and has low gradients (0.5%). Reach T9 is characterized by a tortuous meandering and unconfined channel.

Tributary Tt1

This tributary makes up a large portion of Twain Creek. It consists of several reaches and extends to Pendleton Lake. Forestry activity in this area is generally located on first order tributaries and little impact was noted. Some small bank erosions were noted, but these were not associated with cutblocks and restoration would not provide any significant improvements on fish habitat.

Table 3: Biophysical Features For Twain Creek Reaches T2,Tt1, and T6 (modified from C.C Graham et. al, 1974)

Parameter	Reach T2	Tt1	Reach T6
Substrate	boulder/cobble, large gravel	gravel	boulder/cobble
Channel width: Wetted Dry	3.7 m 10.7m	1 m 1 m	3.0 m 3.0 m
Gradient	8.46%	3.55%	2.72%
Obstructions	waterfall 10m	none	none
Bank Interface	bedrock, clay	boulder, gravel	bedrock, boulder, cobble
Riparian Vegetation	80% coniferous 20% deciduous	coniferous	90%coniferous 10%deciduous
Amnt. of Cover	continuous	intermittent	continuous
Sec. Flood Chan.	none	none	none
Comments	-waterfall impassable -canyon area with potential clay slumps	-meandering in meadow and swamp -tributaries not visible, probably dry	-meandering stream -hard to follow as it disappears at times
Section Length	1.79 km	5.12 km	11.14 km

4.1.2 Summary of Logging Activities

Existing Development

About 1,467.5 hectares have been logged to date in the Twain watershed. In addition, 31.5 km (47.25 ha) of roads have been built. Together, this represents approximately 11% of the watershed's landbase. Development is scattered throughout the watershed. Four blocks are adjacent to the mainstem Twain but do not seem to have any significant impacts on it. Several blocks encompass smaller tributaries, but many of these could not be seen during the flight and no impacts were noted. There are nineteen stream crossings within this watershed, three of which are bridges. There weren't any significant problems noted with the stream crossings.

Future Development (1997-2002)

One small business block is planned for 1998 in this watershed. This block should not have any adverse effects on this system.



ABOVE: Twain Creek, Reach 1



**LEFT: Twain Creek, Reach 2
Slough bank**



Twain Creek: Reach 3



Twain Creek: Reach 4



Twain Creek: Reach 5, Falls



Twain Creek: Reach 7

4.2 Cross Creek

4.2.1 Habitat Descriptions

There are a total of nine reaches in Cross Creek. This creek was assigned a classification of S3 for its entire length by R.J.A. Forestry Ltd. (Redden et. al., 1997). Though fish sampling was done in the summer of 1996, it should be done again due to excessive turbidity resulting from road building at that time (Redden, pers.comm., 1997).

Reach C1

This reach extends from Babine Lake to 400 m upstream. Gradients are around 2.5%. This is an unconfined sinuous reach. The area around it is flat and vegetation surrounding the stream is dominated by deciduous species (willows, alders). Beaver dams have been a problem in this reach, sometimes completely inhibiting fish passage up the stream (i.e. 1995, Table 1, p. 4). Coho, sockeye, rainbow trout and kokanee are present in this reach (David Bustard and Associates, 1988).

At present, the culvert crossing on Pendleton Bay Road is a complete barrier to all fish species. According to the Ned'u'ten Fisheries Commission (Leanne Olinyk, pers. com.) approximately 15% of sockeye and kokanee in this stream normally spawn above this culvert. It was also noted that they normally use approximately 600 m of this stream. In order to ensure maximum reproductive success, this reach should undergo a Level I assessment in the summer of 1998 and the culvert should be repaired before the spawning season.

Reach C2

This reach is 6.0 km extending to a 10 m falls. It is characterized by an irregular wandering and confined channel with gradients around 4%. The surrounding topography consists of rolling hills. Morphology is riffle (20%) – pool (80%) with a fine gravel dominated substrate (David Bustard and Associates, 1988). This reach was shocked in 1988 with a catch of 2,728 juvenile rainbow trout. Use of this reach may be sporadic due to frequent years of low water (Hancock et. al., 1983).

This area was given a high priority rating because changes in water quality, quantity, or temperature could have detrimental effects on fish production (Hoehne).

Development in this area consists of one road crossing and some cottages. There is no forestry development in this reach. Because of the importance of this reach to this fisheries resource it is recommended for a Level I Fish Habitat Assessment.

Reach C3

This reach is 1.6 km long and flows through a section of wetland. It is unconfined and irregular wandering with gradients of 1% resulting in a slow meandering stream. Beaver dams are common in this reach. Dominating vegetation consists of alders and willows. This section was surveyed by R.J.A. Forestry Ltd. in 1996 and was found to be a run/riffle stream with several pools. Average channel width was 3.1 m. Cover was found to be abundant at 40-70% resulting in excellent rearing habitat. In addition, bed material is dominated by gravels resulting in excellent spawning habitat and several deep pools result in good winter habitat. The only species found in this reach was Lake Chub. There isn't any forestry development adjacent to this reach.

Reach C4

This reach is a canyon-like section running for 1.5 km. It is confined and has gradients around 6%. According to Redden et.al (1988), this reach has much of the same habitat attributes as in reach C3. Lake chub populations have been inferred on this reach.

Reaches C5-C8

The total length for these reaches is 2.9 km. These breaks were established by Redden et. al. (1997). Topography changes here to a swampy valley resulting in an unconfined stream channel dominated by shrubby vegetation. In the higher reaches, the channel becomes difficult to see. Lake chub presence has also been inferred for these reaches.

There is one culvert crossing within Reach 7. Blocks 111-04 and 05 are located in proximity to the creek but no adverse effects were noted.

4.2.2 Tributaries

Only those tributaries affected by logging activity will be discussed here.

CC1 (Pacman Creek)

This tributary is 3.1 km long and has an average channel width of 2.2 m (Redden et.al, 1997). It originates in a swamp and flows mostly through a marshy valley. Gradients are around 2% and the stream channel is unconfined and meandering. Redden et.al. (1997) rated this tributary as having good rearing habitat, limited spawning habitat, and poor overwintering habitat. Lake chub presence was inferred for this tributary and a FPC classification of S3 was assigned.

Pacman Creek runs adjacent to CP 111-02 and through 146-01. The area around Pacman Lake was logged right up to the shoreline. There are also two stream crossings with culverts on this tributary. Both of these culverts are experiencing erosion problems resulting in sedimentation to the creek. One of these culverts is washed out completely.

Reach CC5

This is a seasonal, intermittent creek. It was assigned a FPC classification of S6 by Redden et.al. (1997). Fish habitat was rated as poor.

This reach is crossed by a culvert, which is experiencing some erosion.

4.2.3 Summary of Logging Activities

Existing Development

There has been a total of 1,410 .0 ha logged and 15 km (22.5 ha) of roads built in the Cross Creek drainage. This represents 34 % of this area's landbase. Except for one small block, all of the cutblocks occur above the confluence with Pacman Creek.

Future Development

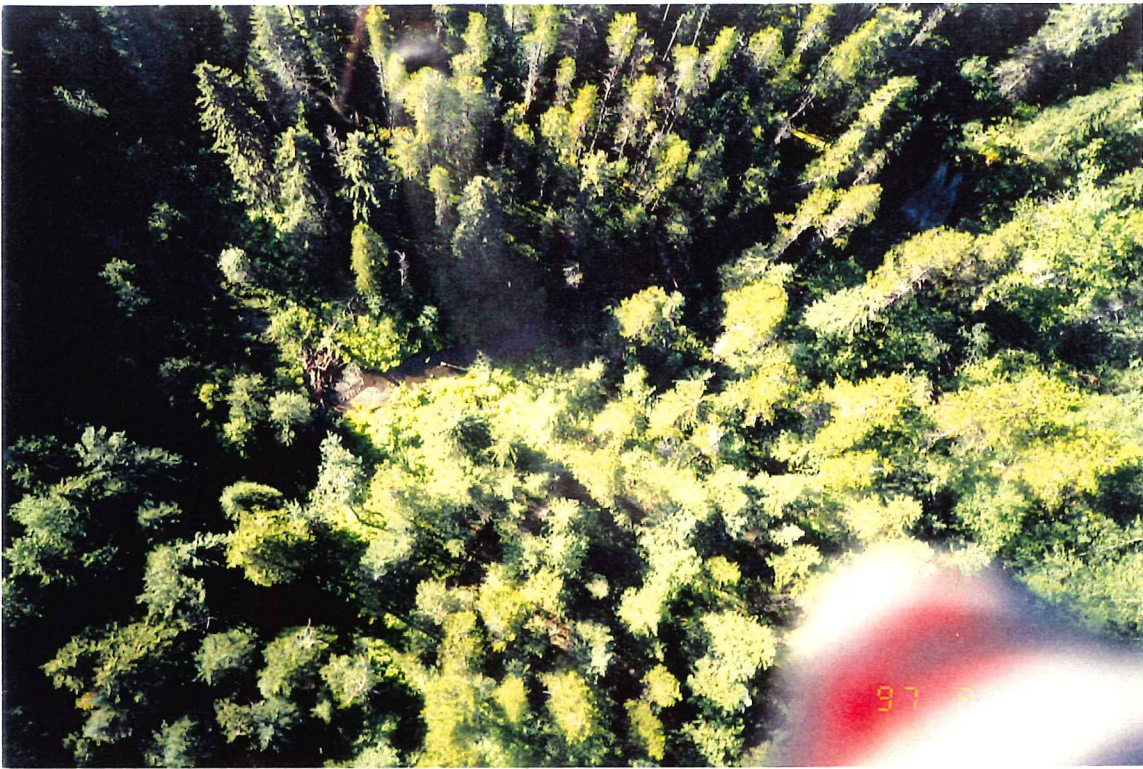
One small business block is planned for 1999. It will be located below the confluence with Pacman Creek and will be adjacent to a small tributary.



Cross Creek: Reach 1



Cross Creek: Culvert is a barrier to fish passage



ABOVE: Cross Creek, Reach 2 falls

LEFT: Cross Creek, Reach 3



Cross Creek: Pacman Lake tributary



Pacman Lake tributary culvert failure

4.3 DEEP CREEK

4.3.1 Habitat Descriptions

Photos for much of this drainage could not be taken as the channel was not visible from the helicopter. Photos were taken from the helicopter within blocks and from the ground within the lower reaches.

Reach D1

This reach is 200 m long, beginning at the mouth. The channel is unconfined and has a width of 3.4 m. As such this reach has an FPC classification of S3. Residual pool depth is 35 cm, deep pools accounting for 20% of cover within this reach. Bed material is gravel/cobble. Surrounding vegetation consists of mature deciduous forests. Rearing, spawning, overwintering, and cover habitat have all been classified as good by Redden (pers.comm., 1997). Species found within this reach in the fall of 1997 included rainbow trout (adult and juvenile), coho salmon (juvenile), longnose sucker (juvenile), and prickly sculpin. Sockeye spawn here occasionally when access is possible since the mouth of the creek is often dewatered. Cutblocks upstream have potentially worsened this condition as very little if any riparian area was left behind. In 1996 pink salmon were also seen spawning here by the Ned'u'ten Fisheries Commission.

This reach is recommended for a Level I and II assessment.

Reach D2

This reach is 3.8 km long and runs through a canyon. There are two falls within this reach (600m from the mouth) that represent a barrier to fish movement. The first set is 4m high and the second set is 12m high. Shocking above these falls confirmed fish absence (Redden, pers.comm., 1997). Rainbows were captured below the first set of falls (adult and juvenile). Channel width is 3.6m and thus this reach has an FPC classification of S3.

Rearing, overwintering, and cover habitat were classified as good for rainbow trout while spawning habitat was classified as poor by Redden (pers.comm., 1997). Gradients average 5.5% and bed materials are dominated by boulders and cobbles. This reach is sinuous and has a step pool morphology. It is entrenched and runs through a mature spruce forest.

Reach D2 is recommended for a Level 1 assessment to determine its value for sockeye and to assess if the placement of woody debris would be of value in reducing flow and sediment input.

Reach D3

This reach is 1.0 km long. It is a sinuous and occasionally confined creek with gradients of 11%. It has a channel width of 2.9 m suggesting an FPC classification of S6. Total cover within this reach is 40%. Cutbanks account for 40%, boulders for 30%, deep pools for 25% and small woody debris for 5%. Morphology is step-pool with boulder-cobble substrate. Rearing and overwintering habitat were rated as poor, spawning as poor, and cover as moderate. Shocking in this reach confirmed fish absence. Reach D3 is crossed by Gullwing Road.

Reach D4 to D9

These reaches were established by Redden et.al. (pers.comm. 1997). Total length for these reaches is 2.6 km. Gradients range from 0.5% in reach D7 to 15% in reach D9. There is not any development within these reaches.

4.3.2 Tributaries

Tributary DT1 (ILP# 53002)

Much of this tributary is encompassed by CP 190-01. The area has revegetated with alder and stream channels were not visible from the helicopter due to the vegetation.

The tributary flows into mainstem Deep Creek above the 12 m falls and as such is non-fish bearing. Reach 1 of this tributary was sampled and was found to have the following characteristics. It has a channel width of 1.9 m (FPC classification of S6) and residual pool depths of 0.1 m. Gradients are 5% with a riffle-pool morphology. Cover is 30% with boulders accounting for 30% and pools for 25%. Bed material consists of gravel-cobble. This frequently confined reach is sinuous and partially coupled. Rearing, spawning, and cover habitat have been rated as moderate while overwintering habitat is rated poor. This reach was not flowing at the time of sampling, possibly due to the effects of the cutblock.

Reach DT2 (ILP#53020)

This tributary has a total length of 2.0 km and consists of two reaches and one large tributary (ILP# 53024). Reach 2 runs through CP187-05 with no riparian buffer provided. It has a channel width of 1.2 m and thus a FPC classification of S6. Gradients are around 6.5%. It has a riffle pool morphology with a cobble-gravel substrate. Total cover is 20% with large woody debris (logging debris) accounting for 50% and small woody debris for 30%. This is a sinuous, unconfined, and decoupled creek. Cover was rated as good, but rearing was fair and spawning and overwintering were poor. Fish absence was also confirmed in this reach.

4.3.3 Summary of Logging Activities

Existing Development

Cutblocks amount for 555.0 ha of the landbase and roads for 6 ha (4 km). This represents 21% of the Deep Creek drainage.

Future Development

There are no blocks planned for this area in the 1997 - 2002 Five Year Development Plan.



Deep Creek: Dewatering at the mouth- barrier to fish passage



Deep Creek: Reach 1



ABOVE: Deep Creek, Reach 2

LEFT: Deep Creek, 4m falls in Reach 2



LEFT: Deep Creek, 12m falls, Reach

BELOW: Deep Creek, Reach 3





Deep Creek: ILP#53002 Reach 1



Deep Creek: ILP#52034 Reach 4



Deep Creek: ILP#53024 Reach 1



Deep Creek: ILP#53020 Reach 2 within CP 187-05

4.4.1 Unnamed Creek

Development within this drainage area is limited with a small portion of CP 191-01 draining into this system. The Five Year Development Plan does not include any blocks within this area.

Reach U1

Reach U1 has a total length of 200 m. The channel width is 1.6 m and gradients are around 2%. It has a riffle-pool morphology with gravel-cobble substrate. This is an irregular meandering unconfined reach. Cover is good at 60%, deep pools accounting for 40% and overstream vegetation for another 30%. Habitat quality was rated as good for all habitat types (rearing, spawning, overwintering, and cover). This reach may be fish-bearing, however, when sampling took place in September there was not any water in the channel. Therefore, this creek should be inventoried in the spring before assigning a class.

Reach U2

This reach has a total length of 1.2 km. It has an average channel width of 1.2 m and an average gradient of 5%. Cover is provided mostly by cutbanks and overstream vegetation. Morphology is riffle-pool with a cobble-fine substrate. This reach is characterized by an irregular wandering, occasionally confined channel. Cover habitat is good, while rearing and overwintering habitat is moderate. Spawning habitat is only fair. As above, this reach was dry at the time of sampling and should be checked at high water levels to determine fish presence.

Reach U3

Reach U3 is 400 m long. Channel width is 1.4m and gradients average 8%. The morphology is riffle-pool with a cobble-gravel substrate. Cover is provided by overstream vegetation and cobbles. The channel is sinuous and frequently confined. Habitat was rated as good for rearing and cover, and as fair for spawning and overwintering. Fish presence is unconfirmed.

Reach U4 and U5

These two reaches make up a total of 1 km. Gradients in both these reaches are 3%. Reach U4 is characterized by a sinuous occasionally confined channel while U5 is characterized by a sinuous and confined channel.

Reach U5 runs adjacent to CP 191-01 for approximately 100 m but this does not appear to have any adverse effects on this system.



Unnamed Creek: Reach 2



Unnamed Creek: Reach 3

4.5 CREEK A

4.5.1 Habitat Descriptions

This creek consists of five reaches and six tributaries. There are not any barriers to fish passage within this system.

Reach A1

Reach A1 extends from Babine Lake to 2.4 km upstream. It has a channel width of 4.9 m and is thus classified as an S3 creek. Pools average 0.6 m and morphology is riffle-pool. There is 50% cover which is provided mostly from deep pools and overstream vegetation. Stream substrate is composed mostly of fines and gravels. Surrounding vegetation consists of mature, mixed forest. This reach is irregular, unconfined and has gradients around 1.5%.

Several disturbance indications were noted during the survey in the fall of 1997. These included eroded banks, small woody debris, and excessive bars. Excessive logging within this drainage is thought to have resulted in large flow fluctuations throughout the year sometimes resulting in dewatering. Sockeye and kokanee were once known to use the creek for spawning, but have not been seen coming into the creek for the past five years. These populations are thought to be extinct. Rainbow, coho, and lake chub are present in this creek. Rearing, spawning, overwintering and cover habitat for these species was rated as good.

Reaches A2-A5

These reaches have not been sampled and thus reach information and fish distributions are not known.

4.5.2 Summary of Logging Activities

Existing Development

Accounting for hydrological recovery, approximately 421.5 ha (actual area: 464.92 ha) have been removed from this drainage in the form of one large aggregate block. This represents 33% of the total area. There are four road crossings within this large block, but it is not known whether these upper reaches are fish bearing. Fish presence needs to be determined and then appropriate prescriptions made for these crossings.

Future Development

There aren't any new blocks planned for this area in the 1997 Forest Development Plan.



Creek A: Reach 1

4.6 CREEK B

4.6.1 Habitat Descriptions

Creek B consists of 18 reaches and ten tributaries. Beaver dams in reaches 6 and 8 may represent barriers to fish passage.

Reach B1

This 400 m reach has been classified as S3 as it has a channel width of 3.9 m. Pools average 0.5 m and bed substrate is composed of gravels and fines. This reach is irregular meandering and unconfined. Morphology is riffle-pool with a gradient of 2%. Cover is about 50%, deep pools accounting for 40% of this. Surrounding vegetation consists of shrubs. Habitat is good for cover, overwintering, and rearing, and fair for spawning. Sockeye, rainbow, and lake chub are found within this reach.

Forestry activities have not affected this reach.

Reach B2

Reach B2 is 600 m long. Channel width within this reach averages 7.4m and therefore a FPC classification of S2 has been assigned. Surrounding forest is mixed and mature with crown closure of 30%. This is a riffle-pool reach with gradients around 2.5%. Reach B2 is irregular and unconfined with a gravel-cobble substrate. Habitat is good for spawning, rearing, and cover, but only moderate for overwintering. Rainbow and lake chub are present in this reach.

Reach B3

This is a 3.6 km long reach. Reach B3 is an S3 reach with a channel width of 5.0 m. Gradients are around 3.5% and morphology is riffle-pool. It is sinuous and occasionally confined with a cobble-gravel substrate. Cover, rearing, and spawning cover are good, but overwintering habitat is only fair. Cover within this reach is 30%, coming mostly from overstream vegetation. Surrounding vegetation is mixed and mature. Rainbow and lake chub are present within this reach.

Development in this reach consists of one block (CP 189-03) which encompasses three tributaries off of this reach and another block (CP 189-02) which is adjacent to two of these tributaries.

Reach B4

Reach B4 is 600 m in length. This reach is also classified as S3 and has a channel width of 3.5 m. Cover comes mostly from deep pools, which average 0.45 m. Gradients within this reach are around 2.5% and morphology is riffle-pool. It is an irregular and occasionally confined reach with a gravel-cobble substrate. Surrounding vegetation is mature coniferous with a crown closure of 50%. Rearing, spawning, cover, and overwintering habitat are all good. This reach was noted as being very productive during the 1997 survey.

Development in this area consists of one road crossing which should be checked to ensure it conforms to the Stream Crossing Guidebook for Fish Streams (Poulin and Argent, 1997).

Reach B6

This is an S3 reach with a channel width of 1.9 m and a total length of 100 m. Overall cover is 70% and it is made up of small woody debris, large woody debris, cutbanks, deep pools, and overstream vegetation. It is sinuous and frequently confined. Morphology is riffle-pool with bed materials consisting of gravels and fines. Riparian vegetation consists of mature coniferous forest with crown closure of 30%. Rearing and cover habitat are good, spawning habitat is fair, and overwintering habitat is moderate. The only species found in this reach is rainbow trout. Beaver dams within this reach may represent a barrier to fish passage as fish presence has not been confirmed beyond this reach.

CP 195-01 is adjacent to this reach.

Tributaries

Tributary 52002 has two barriers within reach one. The first is a 5 m falls and the second is a set of cascades which extends for 1.2 km. There are four lakes above these barriers so fish presence is possible and should be confirmed. There is one stream crossing that needs to be assessed if fish are found in this reach.

4.6.2 Summary of Logging Activities

Existing Development

A total of 610.0 ha have been logged from this drainage area. This represents 15% of the landbase.

Future Development

CP 198 is planned in this area for the year 2000 but these should not have any adverse effects on this stream.



Creek B: Reach 1



Creek B: Reach 2



Creek B: Reach 3



Creek B: Reach 4



Creek B: Reach 6

4.7 CREEK E

4.7.1 Habitat Descriptions

There are a total of twelve reaches and five tributaries to Creek E. A rock slump in reach 3 is a barrier to fish passage.

Reach E1

Reach E1 is 200 m long. It has a FPC classification of S3 with a channel width of 3.5 m. There is 40% cover, boulders contributing to 40% of this. Bottom substrate consists of cobbles and gravels and the stream is sinuous and occasionally confined. It has a gradient of 4% and a riffle-pool morphology. The riparian area consists of deciduous mature forest with crown closure of approximately 50%. Habitat was rated as good for spawning, moderate for rearing, and fair for overwintering and cover. There are rainbow trout in this reach.

Reach E1 is affected by dewatering at the mouth for 40 m and intermittent flow for 100 m. This is not thought to be logging related.

Reach E2

This reach is 200 m long and has a FPC classification of S3. Channel width is 3.1 m and the gradient is 7.5%. Total cover is 60% with deep pools accounting for 50% of that. It is sinuous, frequently confined, and has a step-pool morphology. Riparian vegetation consists of deciduous mature forest with 50% cover. Habitat for rearing, spawning, overwintering, and cover were rated as good.

Reach E3

Reach E3 is an S3 creek with a channel width of 2.9 m. Gradients average 14% and morphology is step-pool. There is 50% cover, which comes evenly from deep pools and boulders. This reach is sinuous and confined. Bed material consists of cobble and rock. Eroding banks and avulsions are signs of recent disturbances within this reach. Riparian vegetation is a mixed, mature forest. Rearing, overwintering, and cover habitat are rated as good, while spawning habitat is rated as poor. Rainbow trout are present within this reach.

A recent rock slump has created gradients greater than 25% over 40 m that is impassable to fish.

Reach E4

This is an S6 reach with a channel width of 2.3 m. It has a gradient of 13% and a cascade-pool morphology. Cover within the stream is 60%, with deep pools accounting for 55% of this. It is sinuous and confined with bed materials dominated by rock and cobble. There is a 4 m high, 6 m long cascade within this reach that is impassable to fish. Riparian vegetation consists of mature coniferous forest on one side and a recent cutblock on the other. Fish absence in this reach is confirmed.

4.7.1 Summary of Logging Activities

Existing Development

Cutblocks amount for 49.2 ha of this drainage area. This represents 5% of this area's landbase.

Future Development

There are not any blocks planned in the 1998-2002 Forest Development Plan.



Creek E: Reach 1



Creek E: Reach 2



LEFT: Creek E: Rock slump in Reach 3

BELOW: Creek E: Cascades in Reach 4



5.0 DISCUSSION

5.1 Fish Distribution

There are a total of seven species known within the seven selected drainages. These include rainbow trout (*Oncorhynchus mykiss*), sockeye and kokanee (*O. nerka*), coho (*O. kisutch*), pink salmon (*O. gorbuscha*), lake chub (*Couesius plumbeus*), prickly sculpin (*Cottus asper*), and longnose sucker (*Catostomus catostomus*) (Table 4, p.41).

There are several information gaps for fish distribution within these seven drainages. Watershed codes have not been assigned for tributaries of Twain Creek or Cross Creek. Within the Twain watershed, the entire area above the falls (reaches T2-T8) has inadequate information to determine fish presence or absence. In addition, there is no biophysical information available for reaches T5-T8. For Cross Creek, lake chub presence has been inferred for reaches C4-C8, CC1, and CC6 and needs to be confirmed. Absence of any other species also needs to be confirmed. Fish absence needs to be confirmed within Unnamed Creek at a time when water is present within this system. Only reach 1 of Creek A has been sampled and fish presence needs to be confirmed upstream. Creek B has been sampled up to reach 6 where beaver dams may be a barrier to fish passage. Fish presence needs to be confirmed upstream of this.

5.2 Recommendations

Table 8 (p.47) lists and prioritizes impacts by reach.

Twain Creek

Because the lower reaches of Twain Creek have a high fisheries value and because of the already high naturally occurring sedimentation within this creek, it is recommended that the bridges on reaches T4 and T7 have erosion control prescriptions developed.

Though reach T1 has not been directly affected by forestry activity, a Level I Fish and Fish Habitat Assessment is recommended due to its high fisheries value.

Cross Creek

The most important impact found during the Overview Assessment was a culvert representing a complete barrier to fish passage in Cross Creek. Though this is a Ministry of Transportation and Highways road, this reach is recommended for rehabilitation, as it does not conform to the Stream Crossing Guidebook for Fish Streams (1997). This states that there must be safe passage for fish on all fish streams. A level I assessment should be conducted in reaches C1 and C2. An engineered crossing should also be developed to determine the most acceptable type of crossing for this stream.

Rehabilitation to this site needs to occur before sockeye and kokanee begin to spawn in order to maximize reproductive success for this species. The window for this stream is likely in mid July to early August. Cost breakdowns are presented in Table 5 (p.42).

Fish presence within CC1 and C7 needs to be determined with another inventory to determine the type of crossings required. If fish absence is determined then erosion control prescriptions at the culverts should still be developed to reduce sedimentation

downstream. If the reaches are fish bearing then the culverts will have to conform to the Stream Crossing Guidebook for Fish Streams (1997). In addition, a Road Assessment may be done to determine any other problem culverts within this watershed.

Deep Creek

It has been noted that Deep Creek is only used in years of high water by salmon for spawning. Low lake levels and lower levels of flow within the creek result in mouth dewatering. Though this is a natural occurrence, it may be possible to significantly increase fish production by establishing a permanent channel. This would also be an opportunity to develop a method of rehabilitating several other tributaries to Babine Lake which have this same problem. Reach I and II up to the first falls should therefore undergo a Level I and Level II assessment in the summer of 1998. Before rehabilitation work is begun, it needs to be determined if this dewatering is caused by excessive sedimentation from the creek and if logging impacts upstream have caused greater fluctuations in flow. This will determine the type of work that needs to be done.

Rehabilitation work would be completely manual and would involve digging out a channel approximately ten meters long by one meter wide. Geotextiles and substrate may need to be laid down if water continues to seep through the substrate. If excessive sedimentation from the creek is contributing to the problem then large woody debris may be added to slow down flow and decrease sediment transport. This work should take up to a week with a three-man crew. Public involvement (i.e. boy scouts) may also be possible in this project with digging out the channel or laying down substrate. Access to this site would be by boat. This work is only a temporary solution, and the cause for the mouth dewatering needs to be addressed.

Creek A

For this creek, fish presence needs to be determined before future work can be determined. If fish presence is confirmed in the block aggregate and if the riparian areas are dominated by shrubby growth, then riparian restoration may be a possibility in this area. If this is the case then reach 2 and tributary 71001 should undergo a Level 1 Fish and Fish Habitat Assessment in the summer of 1998. In addition, if the stream crossings are fish bearing then the crossings will need to conform to the Stream Crossing Guidebook for Fish Streams (Poulin and Argent, 1997).

Though sockeye spawning habitat has been degraded, restoration is impossible as the sockeye population is gone. Mitigative work is a good option in this case, with Deep Creek being an ideal candidate.

Creek B

There are two stream crossings in fish bearing sections where culverts must be examined to ensure they conform to the Stream Crossing Guidebook for Fish Streams (Poulin and Argent, 1997). In addition, CP 189-03 encompasses fish streams that may be candidates for riparian rehabilitation if the area is dominated by shrubby growth. Reach 3 of tributary 52015, reach 2 of tributary 52008, and reach 2 of tributary 52010 should all undergo a Level I Fish and Fish Habitat Assessment to determine if this would be valuable to the fisheries resource.

Creek E

No work is recommended for this creek as habitat improvement would not be significant.

TABLE 4: FISH DISTRIBUTION FOR TWAIN, CROSS CREEK, AND FROGGY SOUTH DRAINAGES

DRAINAGE	REACH	KNOWN FISH DISTRIBUTION
Twain	T1	Sockeye (<i>Oncorhynchus nerka</i>)
		Kokanee (<i>O. nerka</i>)
		Coho (<i>O. kisutch</i>)
		Rainbow trout (<i>O. mykiss</i>)
		Pink Salmon (<i>O. gorbuscha</i>)
	T2-T8	NON-FISH BEARING (Unconfirmed -need inventory)
Cross Creek	C1-C2	Sockeye
		Kokanee
		Coho
		Rainbow trout
	C3	Lake Chub (<i>Couesius plumbeus</i>)
	C4-C8, Trib CC1&CC6	Lake Chub (INFERRED -need inventory)
Deep Creek	D1	Sockeye
		Pink Salmon
		Rainbow
		Coho
		Prickly Sculpin (<i>Cottus asper</i>)
		Longnose sucker(<i>Catostomus catostomus</i>)
	D2	Rainbow
	D3-D9	NON-FISH BEARING
Unnamed Creek	U1-U2	Unknown -need inventory
Creek A	A1	Rainbow
		Coho
		Lake chub
		Sockeye and kokanee (HISTORICAL)
	A2-A5	Unknown -need inventory
Creek B	B1	Sockeye
		Rainbow
		Lake chub
	B2-B3	Rainbow
		Lake chub
	B4-B6	Rainbow
	B7	Unknown -need inventory
Creek E	D1-D3	Rainbow
	D4	NON-FISH BEARING

TABLE 5: COST ESTIMATE FOR WORK TO BE DONE IN SUMMER 1998

REACH	TIME	WORK TYPE	UNIT	# UNITS (a)	UNIT RATE (b)	COST (aXb)
C1	Late July	Engineer				\$4,000
	Early July	Level I	km	1.4km	~\$2,500	\$3,500
CC1+C7	July	Inventory	crewday	0.5	~\$700	\$350
D1	June-July	Level I	km	600m	~\$2,500	\$1,500
	July	Level II	*	*	*	*
	July	Manual	crewdays	5	~\$1,125	\$5,625
T1	Late June	Level I	km	1.1km	~\$2,500	\$2,750
Creek A	July	Inventory	crewdays	1	~\$700	\$700
A2	July-Aug	Level I	km	2.2km	~\$2,500	\$5,500
Trib71001	July-Aug	Level 1	km	1.4km	~\$2,500	\$3,500
52015-R3	July-Aug	Level 1	km	1.2km	~\$2,500	\$3,000
52008-2	July-Aug	Level 1	km	1.5km	~\$2,500	\$3,750
52010-2	July-Aug	Level 1	km	0.7km	~\$2,500	\$1,750
					Total:	\$35,925.00

*Costs for Level II assessments were not known and therefore not included here.

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Personal Communication

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APPENDIX 1: FISH HABITAT OVERVIEW FORMS 1-3

TABLE 6: Form 1-Fish Distribution Summary Form

Watershed Name	Watershed Code	Reach No	Data Source	Survey Method		SK			KO			CO			PK			RB		
				juv	ad	ju	ad	sp	ju	ad	sp	ju	ad	sp	ju	ad	sp	ju	ad	sp
Twain	480-8164	1	TG	MT	VO	N	N	K	N	N	K	N	N	N	N	N	-	-	-	-
		1	MELP	EL	-	-	-	-	-	-	-	-	-	-	-	-	-	K	U	-
		1	SISS	-	VO	-	-	-	-	-	-	-	-	-	-	-	K	-	-	-
		3	MELP	EL	EL	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Cross	480-8633	1+2	TG	-	VO	N	N	K	N	N	K	N	N	N	N	N	-	-	-	-
		1+2	MELP	EL	-	-	-	-	-	-	-	-	-	-	-	-	-	K	U	-
		3	FOR	EL	-	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
		1	TG		VO	N	N	K	N	N	K	-	N	N	N	N	K	-	-	-
Deep	480-8867	1	FOR	EL	VO	N	N	K	N	N	K	K	N	N	N	N	-	K	K	-
		2	FOR	EL	-	N	N	N	N	N	N	N	N	N	N	N	N	K	K	-
		3	FOR	EL	EL	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
		1	FOR	EL	EL	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Unnamed Creek A	480-8616	1	FOR	EL	VO	N	N	H	N	N	H	K	N	N	N	N	N	K	U	-
		2-5	FOR	EL	-	N	N	N	N	N	N	U	N	N	N	N	N	U	U	-
Creek B		1	FOR	EL	-	N	N	K	N	N	U	U	N	N	N	N	N	K	U	-
		2	FOR	EL	-	N	N	N	N	N	N	N	N	N	N	N	N	K	U	-
		3	FOR	EL	-	N	N	N	N	N	N	N	N	N	N	N	N	K	U	-
		4	FOR	EL	-	N	N	N	N	N	N	N	N	N	N	N	N	K	U	-
		6	FOR	EL	-	N	N	N	N	N	N	N	N	N	N	N	N	K	U	-
		8	FOR	EL	-	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Creek E		1	EL	EL	FOR	N	N	N	N	N	N	N	N	N	N	N	N	K	S	-
		2	EL	EL	FOR	N	N	N	N	N	N	N	N	N	N	N	N	K	K	-
		3	EL	EL	FOR	N	N	N	N	N	N	N	N	N	N	N	N	K	K	-
		4	EL	EL	FOR	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

TABLE 7: Form 2- Habitat Condition Summary Form

Reach #	Length (m)	Elevation (m)		Gradient (%)	Wb (m)	Channel Types	Disturbance Types		Barriers	Pools Code	LWD Codes	Riparian Type	Stand Structure	Canopy Closure	Offchannel Habitats
		Upper	Lower				PD	EB							
T1	1,100	720	700	0.5	17.0	RPew			N	I	U	U		3	U
T2	3,000	815	720	4.0	10.7	-			F	-	-	-	MF	3	U
T3	1,200	840	815		8.7	RPew	FP	JM	N	I	F	C	MF	2	U
T4	1,500	875	840	2.0	-	-	-	-	N	-	-	-	MF	3	U
T5	1,700	985	875		-	-	-	-	F	-	-	-	MF	3	U
T6	2,600	1040	985	2.0	3.0	-	-	-	N	-	-	-	MF	2	U
T7	6,600	1200	1040	2.0	-	-	-	-	N	-	-	-	SHR	1	U
T8	1,700	1230	1200	2.0	-	-	-	-	N	-	-	-	SHR	1	U
T9		1260	1230	0.5	-	-	-	-	N	-	-	-	SHR	1	U
C1	400	730	710	2.5	-	RPew	-	-	CV	-	F	C	MF	4	U
C2	6,000	935	730	4.0	-	RPew	-	-	F	4	F	C	MF	2	U
C3	1,600	960	935	1.0	3.1	RPew	N	N	N	-	F	E	SHR	1	U
C4	1,500	1015	960	6.0	3.1	RPew	N	N	N	-	F	E	MF	4	U
C5-C8	2,900	955	1015		-	-	-	-	N	-	F	E	SHR	1	U
CC1	3,100	710	955	2.0	2.2	-	-	-	N	-	-	-	SHR	1	U
D1	200	730	710	2.5	3.4	RPew	*		*	2	F	C	MF	3	U
D2	3,800	1120	730	5.5	3.6	SPb	-	-	F	2	F	E	MF	2	U
D3	1,000	1220	1120	11.0	2.9	SPb	-	-	N	2	F	E	MF	2	U
D4-D9	2,600	1350	1220	7.0	-	-	-	-	N	-	-	-	MF	-	U
U1	200	730	710	2.0	1.6	RPew	-	-	N	3	F	E	MF	3	U
U2	1,200	810	730	5.0	1.2	RPew	-	-	N	1	A	E	INIT	0	U
U3	400	815	810	8.0	1.4	RPew	-	-	N	1	-	-	MF	-	U
A1	2,400	790	710	1.5	4.9	RPgw	EB	DW	N	-	F	E	MF	3	U
B1	400	730	710	2.0	3.9	RPgw	EB	-	N	-	N	N	SHR	2	U
B2	600	750	730	2.5	7.4	RPg	JM	DW	N	-	F	C	SHR	2	U
B3	3,600	840	750	3.5	5.0	RPc	EB	-	N	-	F	C	SHR	2	U
B4	600	860	840	2.5	3.5	RPg	WG	-	N	-	N	N	MF	3	U
B6	100	890	890	0.5	1.9	RPgw	-	-	BD	-	A	E	MF	2	U
B8	100	890	890	0.0	5.0	L	-	-	N	-	N	N	SHR	0	U
E1	200	735	710	4.0	3.5	RPc	LR	-	*	-	N	N	MF	3	U
E2	200	760	735	7.5	3.1	SPc	EB	-	N	-	N	N	MF	3	U
E3	100	820	760	13.5	2.9	SPc	EB	-	G	-	N	N	MF	2	U
E4	1,600	930	820	13.0	2.3	CPw	PD	-	C	-	F	C	MF/SHR	1	U

*Indicates mouth dewatering

TABLE 8: Form 3- Preliminary Habitat Assessment Form

DRAINAGE	REACH	HABITAT VALUE	MAJOR IMPACTS	RESTORATION OPPORTUNITIES	PRIORITY
TWIN	T1	High	Debris accumulation, bank erosion, and course changes due to spring flooding.	Medium	High
	T2	Unknown	A 10m falls prevents fish passage Large natural slope failures introducing sediment.	Low Low	Low Low
	T4	Unknown	Bridge crossing a source of sediment.	Medium	High
	T5	Unknown	NONE	N/A	Low
	T6	Unknown	NONE	N/A	Low
	T7	Unknown	Bridge crossing may be a source of sediment.	Medium	High
	T8	Unknown	NONE	N/A	Low
CROSS	C1	High	Beaver dams barrier to fish migration in some years	Medium	Medium
	C2	High	Culvert complete barrier to fish passage Road crossing source of sediment	High Low	High Low
	C3-C8	Low	10m falls prevents fish passage.	Low	Low
	CC1	Low	NONE	N/A	Low
	CC5	Low	Eroding and wash out culvert a source of sediment.	High	Medium
DEEP	D1	High	Erosion around culvert a source of sediment. Dewatering at the mouth.	High High	Medium High
	D2	High	Falls prevent fish passage.	Low	Low
	D3	Low	Culvert source of sediment.	Medium	Medium
	D4-D9	Low	NONE	N/A	Low
	U1-U5	Unknown	NONE	N/A	Low
UNKNOWN CREEK A	A1	High	Logging induced dewatering of creek.	Medium	Medium
	A2-A5	Unknown	Lack of LOD due to logging?	High	Medium
	B1	High	None	N/A	Low
	B2	Medium	None	N/A	Low
	B3 trib	Medium	Lack of LOD due to logging?	High	Medium
CREEK B	B4	High	Culvert conform to FPC?	High	High
	B6	Medium	Beaver dams may be barrier to fish.	Medium	Low
	Trib 52002	Unknown	Falls and cascades prevent fish passage.	Low	Low
	E1	Medium	Dewatering at the mouth.	High	Medium
	E2	High	NONE	N/A	Low
CREEK E	E3	High	Rock slump impassable to fish.	Medium	Low
	E4	Low	Cascades impassable to fish.	Low	Low

7.1 APPENDIX 2: 1:20,000 FISH HABITAT OVERVIEW MAPS