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Smithers BC

Enhancing Environmental Values

Torkelson Watershed Restoration Plan

(2001-2005)

Submitted to:

Forest Renewal BC
Skeena Bulkley Region

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Prepared for:

Pacific Inland Recourses
(a Division of West Fraser Mills Ltd)

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This report would not have been possible without the previous work of various other professionals and technicians that have produced the reports from which this Restoration Plan was developed. The specific reports used as reference to develop this Restoration Plan are listed in section 11 of this report.

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ENHANCING ENVIRONMENTAL VALUES
TORKELSON WATERSHED RESTORATION PLAN

1. Introduction

Forest Renewal BC implemented its Watershed Restoration Program in 1994. This program, now referred to as the Enhancing Environmental Values (EEV) Program, was established to provide an important opportunity to improve water quality and reverse fish habitat impairment occurring as a result of past forest harvesting practices.

In its first five years, Forest Renewal BC invested more than $300 million in watershed restoration activities. These investments were directed at identified high priority sites in various watersheds throughout the province. In its second five years beginning with the 1999/2000-business year, the corporation expects to complete restoration in a further 130 of the highest priority watersheds within the province. To date, the definition of a "completed watershed" has presented Forest Renewal BC with an inability to report on past successes as well as posing problems with regard to the level of investment required within planning units to meet the goals established. Therefore, a planning mechanism is required to identify the level of investment needed over time to complete all of the high priority treatments eligible for funding within the targeted watersheds through the EEV envelope. The mechanism to achieve this objective is this document: "Restoration Plan". Within this document planning is done at a sub-basin level in order to direct funding at key targeted areas. Large watersheds have been broken down into sub-basins and only the high priority sub-basins are targeted. The twelve targeted watershed sub-basins within the Bulkley TSA are shown in figure 1 and are as follows:

- Lower Telkwa
- Babine
- Nilkitkwa Lake
- Tsezakwa
- West Babine
- Cumming
- Goathorn
- Jonas
- Toboggan
- Blunt
- Lower Harold Price
- John Brown

Figure 1
Bulkley Watersheds

Scale: 1:750 000

Bulk_lak.shp
Bulk_pu.shp
- Key - Targeted (20%)
- Key (Not targeted)
- Medium Priority
- Transition
- Completed

Data Source: MOF Bulkley

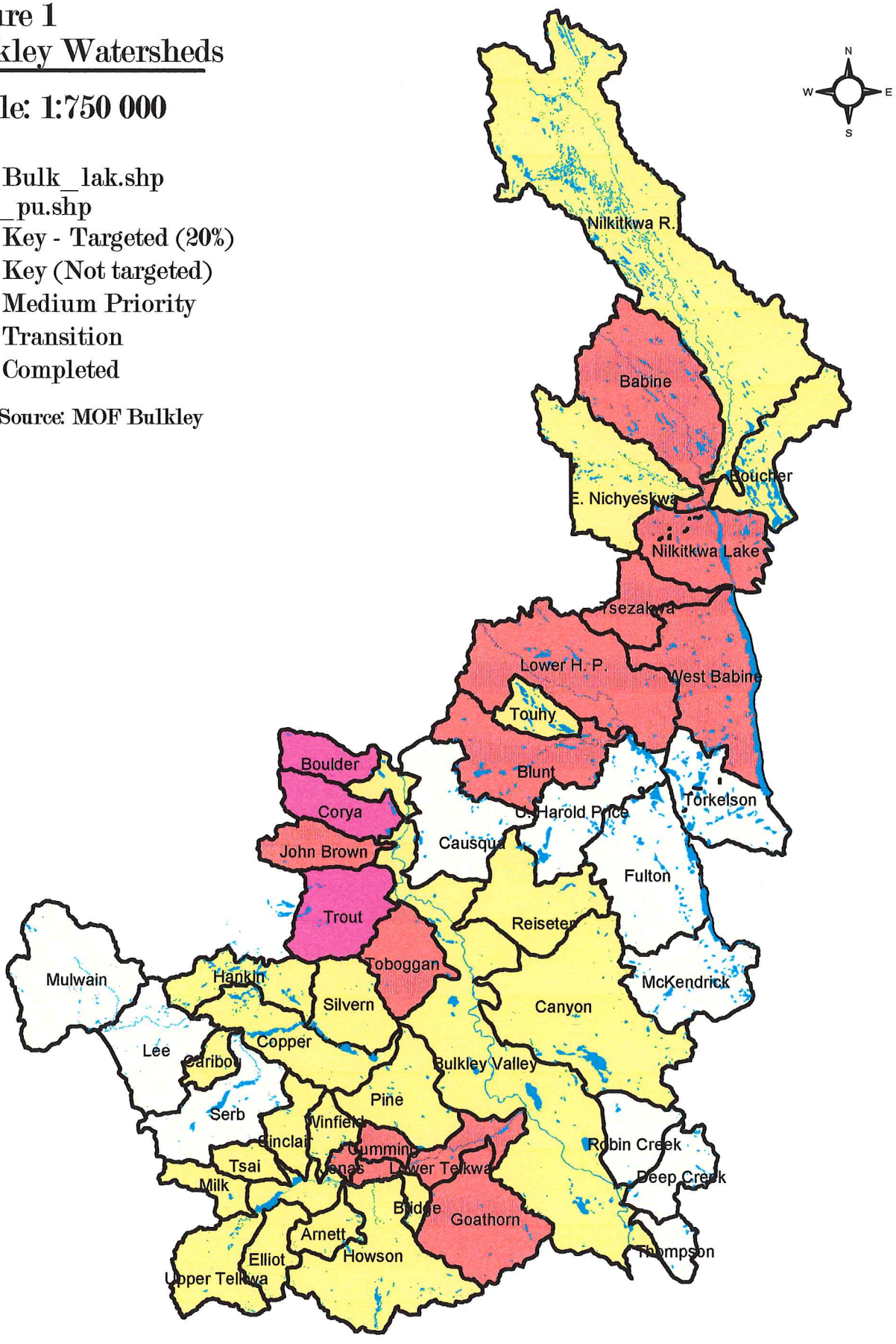


Table 1 below provides the current status of the twelve targeted watershed sub-basins within the Bulkley TSA.

Table 1. Targeted Watershed sub-basin Status

Watershed Sub-basin	Watershed	Watershed Restoration Plan Status	Estimated Level of Completion	Licensee Operating Area
Lower Telkwa	Telkwa	Interim Completion report (2002)	51-99%	PIR
Babine	Babine	Interim	1-50%	PIR
Nilkitkwa Lake	Babine	Interim	1-50%	PIR
Tsezakwa	Torkelson	Full	1-50%	PIR
West Babine	Torkelson	Full	1-50%	PIR
Cumming	Telkwa	Completion report (2002)	Complete	PIR
Goathorn	Telkwa	Completion report (2002)	Complete	PIR
Jonas	Telkwa	Completion report (2002)	Complete	PIR
Toboggan	Trout	Completion report (2001)	Complete	PIR
Blunt	Blunt	N/A	N/A	SCI
Lower Harold Price	Harold Price	N/A	N/A	SCI
John Brown	Corya	N/A	N/A	Canfor

Out of the twelve targeted watershed sub-basins mentioned above, nine fall within Pacific Inland Resources' (PIR) traditional operating areas (chart) and therefore PIR will be focusing its Watershed Restoration Planning in these areas.

As of November 1, 2000, interim Watershed Restoration Plans have been completed for five out of the nine watershed sub-basins that PIR will initiate, or has already initiated, restoration activities on. This document provides a full Watershed Restoration Plan for the Torkelson Watershed, which includes two (Tsezakwa and West Babine) of the five sub-basins that have completed interim plans.

The purpose of this restoration plan is to outline the EEV issues and priorities within this Priority Key Targeted Watershed and provide a budget and plan for the completion of the highest priority restoration activities within the watershed over the next five years. As this report is targeted towards restoration funded by Forest Renewal BC, important watershed restoration projects may not have been identified within areas where typically Forest Renewal BC funding is not eligible, such as reserve land, private land and provincial parks. Further research within these areas may be required to adequately identify all restoration activities within this watershed.

Much of the information acquired about the Torkelson Watershed was taken from a Level I Integrated Watershed Restoration Plan (IWRP) (see section 4. Restoration Activities Completed To Date). The watershed and sub-basin boundaries used to develop the (IWRP) may differ from the watershed boundaries developed by the Ministry of Water, Land and Air Protection (WLAP) and the Ministry of Forests (MOF); therefore there may be inconsistencies between this restoration plan and the IWRP. Also, new development in the area between the time the IWRP was completed in 1997 and the present may cause projected budget estimates to be inaccurate. Furthermore, many funding estimates are given for the completion of projects within the watershed. These estimates are rough predictions and may vary greatly from the final costs. The estimated costs for these projects will become more accurate as final site assessments, which are a part of this restoration plan, are completed.

2. Rational For Selection As A Key Targeted Watershed

The Ministry of Water, Land and Air Protection (WLAP) and the Ministry of Forests (MOF), has identified the Torkelson Watershed as a Priority Key Targeted Watershed due to its designation in the 2001-2005 Resource Management Plan (RMP) for the Prince Rupert Forest Region, as having a High Regional Priority for fish within two out of its three sub-basins. The Torkelson Watershed is also listed as a category 1 watershed and will potentially benefit from restoration activities.

The Torkelson Watershed contains an abundance of very significant fish habitat throughout its lakes, streams and wetlands. Targeted species found within the lakes and streams of this watershed are; Dolly Varden, rainbow trout, bull trout, sockeye salmon, coho salmon and other resident and anadromous fish. Triton Environmental Consultants Ltd (Triton) has conducted a Reconnaissance Level Fish and Fish Habitat Inventory within the Bulkley TSA including the Torkelson Watershed and is currently in the process of completing a second sample 1:20 000 fish inventory to confirm fish presence or absence within inferred stream reaches. This inventory uses historical records and data collected from sample sites to list the numerous fish species found within Babine Lake and its tributaries and indicates numerous streams containing good to excellent habitat and spawning beds. Many of the tributaries within the Torkelson Watershed are classified as S2 to S4 fish bearing streams. There is a good chance that restoration activities throughout the watershed will help to re-establish fish access to habitats that have been isolated due to pre-code forest development activities. Restoration may also improve water quality and improve existing habitat and spawning grounds currently available.

3. Description of the Torkelson Watershed

Located in the northern region of the Bulkley TSA and within PIRs operating area, the Torkelson Watershed is an interior watershed situated along a portion of Babine Lake's western shoreline. Approximately 28km of shoreline, starting at the north tip of the lake, makes up the east boundary of this watershed. The surface of Babine Lake, the lowest point in the watershed, sits at roughly 710m in elevation. The Torkelson Watershed extends westward for roughly 15-20km to the height of the Babine range, which makes up the west boundary of the watershed. The highest point of the watershed is on the west boundary at the peak of Netalzul Mountain which is approximately 2286m in height.

The main access for this watershed is provided by the Nilkitkwa FSR (4000 FSR) which branches from the Babine Lake Road approximately 50km from Smithers. The south boundary of the watershed is situated at roughly 10km on the 4000 FSR. The Torkelson Watershed is approximately 60km from Smithers.

The Torkelson Watershed contains generally flat to rolling terrain growing steeper and mountainous to the west as the watershed approaches the Babine Range. Soil maps for this watershed area indicate the terrain to be generally stable with localized occurrences of sensitive or erodible soils.

The Torkelson Watershed is roughly 58 640ha in total area and is separated into three sub-basins. From north to south, the three sub-basins are Tsezakwa, West Babine and Torkelson sub-basins (see figure 2). This restoration plan will focus on the Tsezakwa and West Babine sub-basins. The Torkelson sub-basin is not a targeted sub-basin and therefore does not require the immediate attention of the EEV program.

3.1. Babine Lake

The most significant feature of this watershed is Babine Lake, which lies on the east boundary of the watershed. As previously mentioned numerous large and small tributaries flow directly into Babine Lake from the Torkelson Watershed. Babine Lake is a very important lake for fish, as it provides a link between the Babine River and many important streams used for spawning and rearing for diverse populations of both anadromous and resident fish habitats for diverse populations of both anadromous and resident fish. Numerous fish enhancement projects are associated with the lake and its tributaries, including the Fulton River Sockeye Salmon Spawning Channels near Granisle. In addition, downstream values include native fisheries and sport fisheries on the Babine River and Nilkitkwa Lake. The section of Babine River that flows from the north end of Babine Lake and into Nilkitkwa Lake is a very popular area for sport fishing and is locally known as Rainbow Alley. A small provincial park, called Rainbow Alley Park has been placed on this section of the river butted up against the north boundary of IR 16.

Historical records indicate that the fish species found within Babine Lake are as follows:

- sockeye salmon
- coho salmon
- pink salmon
- chinook salmon
- cutthroat trout
- rainbow trout
- steelhead
- Dolly Varden
- kokanee
- lake trout
- lake whitefish
- rocky mountain whitefish
- burbot
- prickly sculpin
- red sided shiner
- pigmy whitefish
- largescale sucker
- longnose sucker
- northern pike minnow
- longnose dace
- white sucker

Accordingly, Babine Lake is also an important site for recreational fishing. Although there are numerous fishing lodges and private cabins located along the lakeshore, the Fort Babine Lodge is the only recreational facility located within the Torkelson Watershed. This lodge is situated near the north end of Babine Lake within the West Babine sub-basin.

A logging camp is also located within the Torkelson Watershed, situated near Babine Lake and within the West Babine sub-basin. This camp has been in place for ten to fifteen years and has provided a centralized location to access timber harvesting areas.

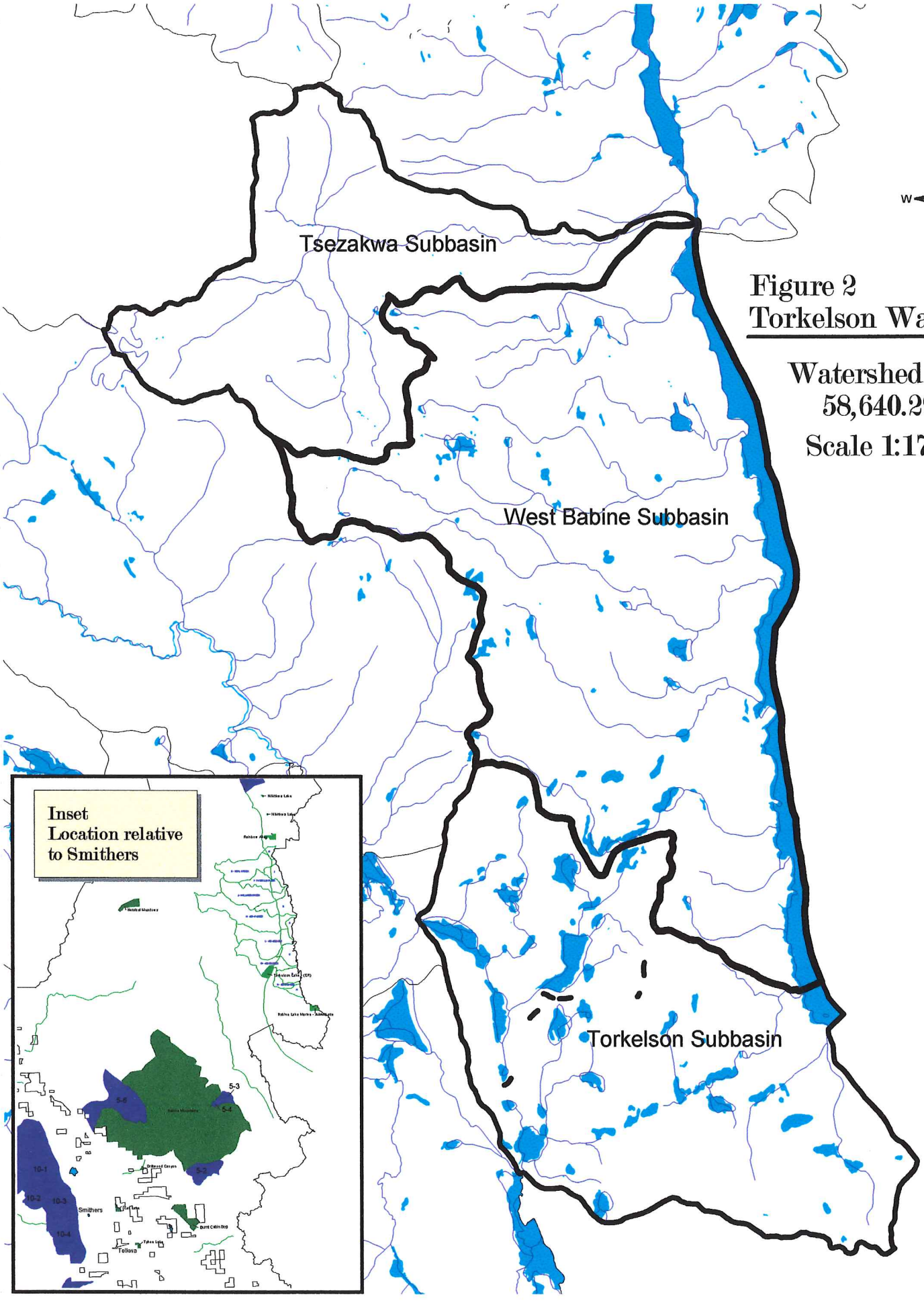


Figure 2
Torkelson Watershed

Watershed Area -
58,640.294ha

Scale 1:175 000

4. Watershed Level Objectives

The main focus within the Torkelson Watershed is the recovery and protection of fish and in-stream fish habitat. Previous overview planning exercises completed within this watershed provide limited information relating to specific fish habitat and riparian issues. While it is felt that instream habitat and riparian conditions within the watershed are generally acceptable, in order to deem the restoration of this watershed complete a level I Fish Habitat and Riparian Assessment should take place within the first few years of investment. This will ensure that all of the high priority instream and riparian restoration projects are identified and addressed within the watershed. The current contents of this plan utilize information available at the time of its completion and reference the information in section 11 of this report.

The lower reaches of several of the larger streams within this watershed are utilized by sockeye salmon, coho salmon, rainbow trout, kokanee and other resident Babine Lake species for spawning and/or rearing. Department of Fisheries and Oceans (DFO) documents indicate that high summer water temperatures and low water levels are frequently a limiting factor for spawning sockeye salmon in Babine Lake tributaries. DFO therefore considers that the streams within this watershed are "temperature-sensitive" and measures to protect and improve the temperature-moderating effects of riparian vegetation are important to this watershed. Other factors which may affect the fish utilization of the lower portions of the streams in this watershed include extensive sediment deposits at the stream mouths near Babine Lake which may limit access to the streams during periods of low water and potential debris jams which may also inhibit access during certain flow conditions.

Stream reaches not accessible to anadromous or lake species frequently contain resident Dolly Varden and/or rainbow trout. In these areas, fish access may be impaired by road crossings and direct impacts from loss of riparian vegetation or debris loading as a result of historical harvesting are possible.

In some cases works may be proposed on streams that are classified as non-fish bearing. In these cases water quality improvement, water temperature moderation, or reducing stream sediment (including bedload) is the main focus for the purpose of protecting downstream fish habitat values. In some cases protecting the lower reaches of the stream is of very high priority (such as the sockeye salmon spawning habitat in Reach 1 of stream 480-4746-000) and therefore activities on the remainder of the stream that would protect or improve water quality, moderate water temperature, or reduce bedload movement should also be high priority, even if the rest of the stream above the spawning habitat does not hold a fish bearing classification.

Table 15. Likelihood of Restoration Success

West Babine Sub-basin		Likelihood of Restoration Success			Component for Restoration	
Stream	Priority	Low	Moderate	High	Primary	Secondary
Heal Creek	High			*	In-stream habitat	Riparian
Five Mile Creek	High			*	In-stream habitat	Riparian
Williams Creek	High			*	In-stream habitat	Riparian
480-4746-000	Moderate		*	**	Landslides In-stream habitat	Riparian
480-4888-000	Moderate		*	**	In-stream habitat	Riparian
480-5042-000	High			*	In-stream habitat	Riparian
480-5184-000	Moderate		*		In-stream habitat	Riparian
Sub-unit A-G	Moderate-high		*	*	In-stream habitat	Riparian
Tsezakwa Sub-basin		Likelihood of Restoration Success			Component for Restoration	
Stream	Priority	Low	Moderate	High	Primary	Secondary
Tsezakwa Creek	High		**	*	In-stream habitat	Riparian

* Fish habitat values ** Water quality/sediment control

5. Restoration Activities Completed To Date

McElhanney Consulting Services Ltd. completed a Level I Integrated Watershed Restoration Plan for a large portion of PIRs Babine chart including the West Babine Sub-basin (the Level I calls this area the North West Babine Sub-unit) and the Tsezakwa sub-basin. The assessment was completed in 1997 and was developed using various assessments for the area including:

- Interior Watershed Assessment Procedure (IWAP)
- Sediment Source Survey (SSS)
- Surface Geology Review (Terrain Assessment)
- Access Management Plan (AMP)

Other projects conducted for this area include:

- Reconnaissance Level Fish and Fish Habitat Inventory
- Operational Inventory of Water Quality and Quantity of River Ecosystems in the Skeena Region (stream 480-4746-000, 29.5km Nilkitkwa FSR)

Related ongoing activities within this area include:

- Second Sample 1:20 000 Fish Inventories to confirm fish presence or absence in inferred stream reaches
- Terrain Stability Mapping (March 2001)
- Landscape Level Silviculture Opportunities Plan (2001). This plan provides an important link to any planned road deactivation within the area, as future access requirements for silviculture treatments will be identified.
- Fish Passage Culvert Inspections on all roads within the West Babine and Tsezakwa Sub-basins
- Road Deactivation Prescriptions on all eligible roads within the West Babine and Tsezakwa Sub-basins

Although planning and assessments have been conducted for the Babine chart area, which includes the Torkelson Watershed, prior to 2000/2001 no WRP/EEV projects specific to the Torkelson Watershed have been completed. This makes it difficult to determine dollar amounts and outputs previously directed at this watershed. Therefore, there are no dollar amounts or outputs estimated for this watershed.

6. Priority Sub-basins

Two of the three sub-basins within the Torkelson Watershed are targeted for investment through the EEV program. The West Babine and the Tsezakwa Sub-basins will be the focus of works for the watershed due to the extensive variation of fish species found within these watersheds and to the potential for improving fish habitat. The West Babine Sub-basin is considered to be of higher priority than Tsezakwa Sub-basin due to the abundance of major stream systems throughout its land base. Works will first be concentrated on the West Babine and then the Tsezakwa. Interim Watershed Restoration Plans have previously been submitted for both sub-basins, but due to recent assessments conducted in the area, the plans can be improved and a more detailed estimate of proposed works and budgets can be provided within this RP. Both of the targeted sub-basins are listed in the RMP as Category 1 watersheds and will potentially benefit from restoration activities.

6.1. West Babine Sub-basin

The West Babine Sub-basin is a fourth order watershed and is roughly 24 680ha in size (Figure 2). Approximately 1600ha of Babine Lake has been included in the total sub-basin area leaving 23 080ha of land base within the sub-basin. Approximately 17 730ha of the West Babine Sub-basin area is considered operable. Approximately 1 965ha or 8.5% of the sub-basin land base is equivalent to clearcut area (ECA).

The West Babine sub-basin was the site of a 1952 forest fire known as the John Fire. Fire fighting efforts resulted in numerous fireguards and access trails throughout the northern sub-basins. This fire had a significant effect on the sub-basin at the time and during the recovery period, however according to the Level I IWRP developed by McElhanney the sub-basin has recovered through sufficient forest regeneration. 1997 ECA calculations completed by McElhanney estimated the average regeneration height to be 20m with a hydraulic recovery of 90%. As a result there is a high component of immature timber within this sub-basin.

There are approximately fourteen significant stream crossings on the 4000 FSR within the West Babine sub-basin (see figure 3). Of these fourteen crossings six are located on fish bearing streams, three are located on potentially fish bearing or inferred fish bearing streams and five crossings are located on streams classified as S5 or S6. According to Triton's inventory, there are roughly seven major streams within the West Babine sub-basin. Of the seven major streams, all but three are unnamed tributaries to Babine Lake. Heal Creek, Five Mile Creek and Williams Creek are the named tributaries. The four unnamed tributaries have been labelled with a number that corresponds with Triton's inventory labelling. Triton has sampled numerous other smaller streams that flow directly into Babine Lake during the fish and fish habitat inventory. These other streams are not numbered within Triton's inventory.

In this report, the West Babine sub-basin is divided into individual sub-units for each of the seven major stream systems. The minor sub-units associated with the smaller streams which were not labelled in the inventory, were grouped together in this report and labelled from A through G (see figure 3).

6.1.1. Heal Creek Sub-unit

Located along the north boundary of the West Babine Sub-basin, Heal Creek is roughly 12.9km in length and is fed by seven tributaries. Heal Creek is the third longest fish bearing stream within the West Babine Sub-basin. Heal Creek is classified as S2 in its lower reaches and S3 for much of the remainder of its length. This stream is lake headed, although it is inferred that fish are not present within the lake or for the first 500m downstream of the lake. Tritons inventory samplings show rainbow trout and Dolly Varden throughout most of the stream and Bull Trout (a blue listed species) in the upper reaches. Historical records also list the presence of burbot, prickly sculpin, coho salmon, Dolly Varden, lampreys and rainbow trout within the lower reaches of the stream. Three of the seven tributaries feeding Heal Creek have been wholly or in part inferred as fish streams (see figure 3). The Heal Creek Sub-unit is a third order watershed.

In the section of stream where the Bull Trout were caught, the stream gradient is 14%. The habitat in the upper reaches of the stream is moderately steep with a channel gradient of 13 to 14%. These grades are well suited to both Dolly Varden and bull trout. The mid and lower reaches of the stream are moderately to well contained and run on a low gradient. Reach 1 has a channel width of 8.2m. Reach 4 has a channel width of 2.3m.

Numerous road crossings of Heal Creek tributaries and moderate to significant timber development throughout this drainage have occurred over time. Possible problems that may have risen from the road and timber development include loss of riparian vegetation and debris loading within the streams. Road system conditions will be assessed during EEV program activities such as road deactivation prescriptions and Fish Access Assessments.

Table 3. Heal Creek Sub-unit specifications

Sub-unit	Heal Creek Sub-unit
Drainage Area (ha)	2848.52ha
TSA	Bulkley
Area Logged (%)	18.0
Equivalent Clearcut Area (%)	11.5

6.1.2. Five Mile Creek Sub-unit

The next major stream to the south of Heal Creek is Five Mile Creek. This stream is roughly 10.3km in length and is a tributary of Williams Creek to the south. There are ten tributaries that feed Five Mile Creek. Historical records list the presence of rainbow trout and Dolly Varden within a large unnamed lake located below the 4000 FSR and within the lower reaches of the stream. Five Mile Creek has been classified as an S3 stream due to the presence of Dolly Varden at the sampling sites. The main stem of the stream as well as all of the tributaries are classified as fish bearing or are inferred as fish bearing due to the low gradient of the streams and the apparent absence of barriers.

Reach 1 is occasionally confined and has a low gradient. Reach 2 consists of a large lake roughly 70ha in size. Reaches 3, 4 and 5 become steadily steeper and more confined, but at least Reach 4 should be accessible to fish. Five Mile Creek has an average channel width of 1.9m. The Five Mile Creek Sub-unit is a third order watershed.

There are several road and trail crossings of Five Mile Creek and its tributaries as well as a moderate to significant amount of timber development within this drainage. Road system conditions will be assessed during EEV program activities such as road deactivation prescriptions and Fish Access Assessments.

Table 4 Five Mile Creek Sub-unit specifications

Sub-unit	Five Mile Creek Sub-unit
Drainage Area (ha)	1398.24ha
TSA	Bulkley
Area Logged (%)	38.3
Equivalent Clearcut Area (%)	9.8

6.1.3. Williams Creek Sub-unit

Williams Creek is the next major stream south of Five Mile Creek, which is a tributary to Williams Creek. At 15.1km in length, Williams Creek is the second longest fish-bearing stream within the West Babine Sub-basin and is classified as S2 for most of its length. A large unnamed tributary to Williams Creek is also classified as S2 due to the presence of Dolly Varden. Triton's inventory lists the fish species found within Williams Creek and its tributaries as Dolly Varden and rainbow trout. Historical records have noted sockeye salmon, coho salmon, kokanee salmon and rainbow trout at the mouth of Williams Creek. They also indicate that prickly sculpin, kokanee salmon and coho salmon have been caught in Reach 1, which extends roughly 2km above the 4000 FSR crossing.

Reach 1 is slightly confined and has a moderate to low gradient. Reach 2 is more confined with low to moderate gradient. The gradient and confinement increase through reach 3 but decrease again through Reach 4. Reach 4 flows through a low gradient and unconfined region and drains a small headwater lake. Williams Creek has an average channel width of 6.1m. Williams Creek Sub-unit is a fourth order watershed.

A significant amount of timber development has occurred in the upper reaches of the Williams Creek Sub-unit resulting in several road crossings of Williams Creek and its tributaries. Road system conditions will be assessed during EEV program activities such as road deactivation prescriptions and Fish Access Assessments.

Table 5. Williams Creek Sub-unit specifications

Sub-unit	Williams Creek Sub-unit
Drainage Area (ha)	3152.32ha
TSA	Bulkley
Area Logged (%)	22.9
Equivalent Clearcut Area (%)	10.0

6.1.4. 480-4746-000 Sub-unit

The next stream south of Williams Creek is an unnamed stream labelled 480-4746-000. This stream is 23km in length and is fed by 20 tributaries. Only Reach 1, which is the first 2.5km of this stream, is classified as fish bearing. Historical records indicate the presence of a falls that prevents fish passage into Reach 2. Spawning sockeye salmon have been historically noted within Reach 1 and should warrant special consideration in development plans for this sub-unit. No fish were caught at 17 sampling sites on this stream and its tributaries, above Reach 1, despite the presence of excellent fish habitat.

Reach 1 has low gradient and varied confinement. Reach 2 has low gradient and increasing confinement. A 4m cascade separates Reach 2 from Reach 3. Reaches 3 and 4 are confined and have a moderate gradient. Reach 5 consists of a set of four 10m falls. The width of this stream varies from 5.13m to 16.42m. Sub-unit 480-4746-000 is a fourth order watershed.

Numerous road crossings of 480-4746-000 tributaries and a moderate to significant amount of timber development throughout this drainage have occurred over time. Possible problems that may have risen from the road and timber development include loss of riparian vegetation and debris loading within the streams. Road system conditions will be assessed during EEV program activities such as road deactivation prescriptions and Fish Access Assessments.

Table 6. 480-4746-000 Sub-unit specifications

Sub-unit	480-4746-000 Sub-unit
Drainage Area (ha)	4759.36ha
TSA	Bulkley
Area Logged (%)	11.2
Equivalent Clearcut Area (%)	6.2

6.1.5. 480-4888-000 Sub-unit

To the south of 480-4746-000 is another unnamed stream labelled 480-4888-000. This stream is 14.3km in length. There are 14 tributaries that feed into this stream. Historical records indicate the presence of rainbow trout in this tributary. A 5m cascade has been identified on the main stem downstream of the 4000 FSR crossing. The majority of the stream, which lies above the cascades, has been classified as non-fish bearing despite excellent spawning and rearing habitat. This classification was due to no fish being caught at several sampling sites above the cascades. A large tributary to reach 1 of this stream has been identified as an S3 fish-bearing stream due to the presence of cutthroat trout at a sampling site. Due to the presence of a small lake that the upper reaches of this tributary stream flow into and because the stream appears to be accessible to fish, this stream has been inferred as a fish bearing stream to the headwaters.

Reaches 1 and 2 have low gradient and varied confinement. A 5m cascade separates Reach 2 from Reach 3. Reach 3 has low but steadily increasing gradient and runs through a treed wetland. Reach 4 has moderate gradient and is quite confined. Reach 5 is slightly confined with low to moderate gradient. Reach 6 drains a series of wetlands with a low gradient. The upper reaches of this stream have average stream widths of 3.78 and 4.22m. The 480-4888-000 Sub-unit is a third order watershed.

Several road crossings of 480-4888-000 Creek and its tributaries exist in this drainage as well as a moderate amount of timber development. Possible problems that may have risen from the road and timber development include loss of riparian vegetation and debris loading within the streams. Road system conditions will be assessed during EEV program activities such as road deactivation prescriptions and Fish Access Assessments.

Table 7. 480-4888-000 Sub-unit specifications

Sub-unit	480-4888-000
Drainage Area (ha)	3134.4ha
TSA	Bulkley
Area Logged (%)	10.4
Equivalent Clearcut Area (%)	11.5

6.1.6. 480-5042-000 Sub-unit

The longest fish bearing stream within the West Babine Sub-basin is an unnamed stream, which has been labelled in Triton's inventory as 480-5042-000. This stream is 15.7km long and is fed by 6 tributaries. This stream is classified as S2 in its lower reaches and S3 for the remainder of its length. The majority of the tributaries to this stream are S4 sized streams. Fish species sampled within this stream are coho salmon, rainbow trout, Dolly Varden and cutthroat trout. Fish presence has been inferred in the upper reaches of this stream because of suitable low gradient habitat and also because the upper reaches flow into a small lake. The wetlands bordering this lake have been identified as fisheries sensitive zones.

Reach 1 is described as slightly confined with a low gradient. Reach 2 has varied gradient and confinement. A small, unnamed lake roughly 29ha in size makes up Reach 3. Reach 4 is unconfined as it flows into the lake on a low gradient. Reach 5 is another small 15ha lake and Reach 6 has a low gradient and flows through a number of large wetlands. Reach 7 is slightly confined in some areas and has moderately steep gradient. Below Reach 6 the average channel width is 6.4m and 3.5m above. Sub-unit 480-5042-000 is a third order watershed.

Several road crossings of 480-5042-000 tributaries exist in this drainage as well as a moderate amount of timber development. Possible problems that may have risen from the road and timber development include loss of riparian vegetation and debris loading within the streams. Road system conditions will be assessed during EEV program activities such as road deactivation prescriptions and Fish Access Assessments.

Table 8. 480-5042-000 Sub-unit specifications

Sub-unit	480-5042-000
Drainage Area (ha)	2326.48ha
TSA	Bulkley
Area Logged (%)	3.9
Equivalent Clearcut Area (%)	6.2

6.1.7. 480-5184-000 Sub-unit

480-5184-000 is the next labelled stream south of 480-5042-000. This 4.2km long stream is fed by three tributaries and is classified as S3. Historical records indicate the presence of Dolly Varden at the mouth of this stream and Tritons inventory shows the presence of rainbow trout.

Reaches 1 and 2 have steadily increasing gradient and confinement. The stream has an average channel width of 2.3m. Sub-unit 480-5184-000 is a second order watershed.

The 4000 FSR does not pass through this sub-unit, but there appears to be two road crossings on this stream from secondary roads used to access a small area of timber development. Possible problems that may have risen from the road and timber development include loss of riparian vegetation and debris loading within the streams. Road system conditions will be assessed during EEV program activities such as road deactivation prescriptions and Fish Access Assessments.

Table 9. 480-5184-000 Sub-unit specifications

Sub-unit	480-5184-000
Drainage Area (ha)	487.96ha
TSA	Bulkley
Area Logged (%)	11.2
Equivalent Clearcut Area (%)	3.6

6.1.8. Other Sub-units

This category includes the remainder of the sub-units with streams that flow directly into Babine Lake. These sub-units are labelled A through G. Even though many of the streams within these sub-units are short, the streams may still be quite significant to fish with many classified as S3 to S4 fish bearing streams. Many of these streams were inferred as fish bearing streams even if sampling did not prove fish presence. The classification was given due to the proximity to Babine Lake and the appearance that the streams are accessible to fish. Triton's inventory provides records of rainbow trout and coho salmon. Sub-units A to G are first to third order watersheds.

As these sub-units are generally small and located mainly close to the lake, limited timber development has had a significant impact within them. The 4000 FSR passes through all but sub-units A and B. Possible problems that may have risen from the road and timber development include loss of riparian vegetation and debris loading within the streams. Road system conditions will be assessed during EEV program activities such as road deactivation prescriptions and Fish Access Assessments.

Table 10. Specifications for Sub-units A through G

Sub-unit	Sub-units A through G
Combined Drainage Area (ha)	4973.52ha
TSA	Bulkley
Area Logged (%)	16.3
Equivalent Clearcut Area (%)	7.5

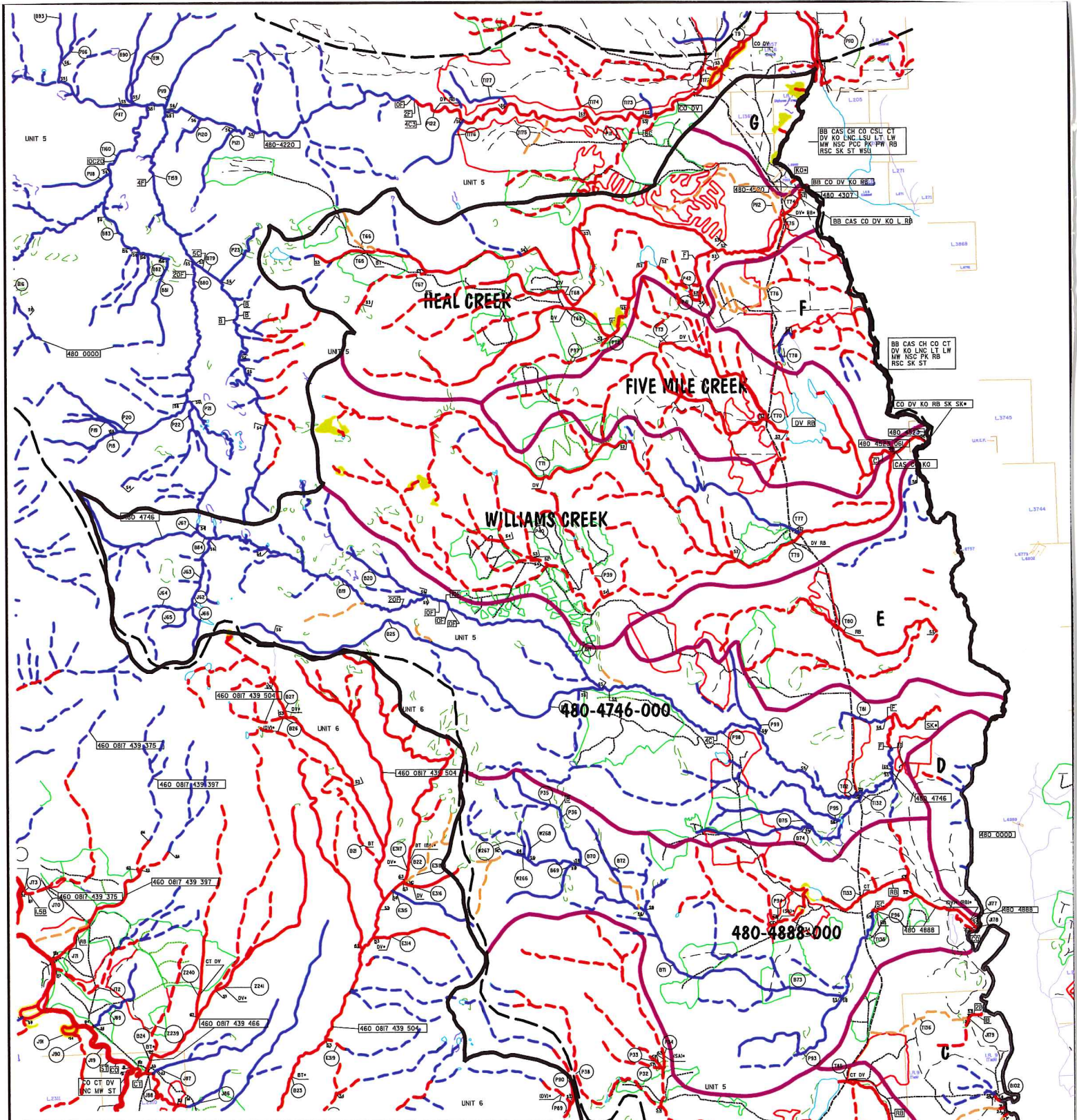


Figure 3 West Babine Subbasin

Fish Inventory Map

Date September 27, 2001
Scale 1:100 000
Watershed Area 24,680.68 ha

Roads
Streams
Watershed Boundary
Subunit Boundary

Fish Present (sampled)
Fish Present (inferred)
Fish Not Present (sampled)
Fish Not Present (inferred)
Stream Not Present

Silvatech SERVICES INC. Smithers, B.C.

6.2. Tsezakwa Sub-basin

6.2.1. Basin Conditions

The Tsezakwa sub-basin (Figure 2) is roughly 9729ha in size with 4490ha of operable ground. 260ha or 5.9% of operable ground within the Sub-basin is equivalent to clearcut. The Tsezakwa sub-basin is a fifth order watershed.

Tsezakwa Creek is the only major stream within this sub-basin. Tsezakwa Creek empties into the Babine River at the south end of Nilkitkwa Lake and is roughly 21km in length and fed by 27 tributaries.

The Tsezakwa Creek mainstem corridor is identified in the soil maps for sensitive, highly erodible soils. There are numerous sections of this steep walled channel that are eroding and in many cases sediment is being deposited into the stream.

Table 2. Tsezakwa Creek Sub-basin specifications

Sub-basin	Tsezakwa Creek Sub-basin
Drainage Area (ha)	9729Ha
TSA	Bulkley
Area Logged (%)	7.0
Equivalent Clearcut Area (%)	5.9

6.2.2. Impacted Fish Habitat

Reach 1 and 2 are classified as S2 with an average width of approximately 18m. Reach 1 is a low gradient channel with two large side channels that would provide great refuge habitat from the main stem during high flows. Reach 1 is extensively braided at the mouth. The area around the mouth of Tsezakwa creek is very flat and wet. This area is affected by frequent channel changes and influenced by extensive beaver activity. Sockeye salmon, coho salmon, pink salmon, Dolly Varden and rainbow trout were recorded at the mouth. Coho salmon, Dolly Varden and rainbow trout were found within reach 1 and 2 of the main stem. Tsezakwa Creek joins the Babine River at the south end of Nilkitkwa Lake. Harvesting has occurred in 1969 at the area around the mouth of Tsezakwa Creek possibly leading to an excess of LWD within the stream channel, but due to the braided structure of the stream it is felt that fish passage is not impeded and that the LWD likely adds to the habitat availability. This section of Tsezakwa Creek was identified within the Level I IWRP as a section which required a Fish Habitat Assessment Procedure, but due to it's location within IR 16 and Rainbow Alley Provincial Park it is not eligible for FRBC funding. Further assessment of this site may be warranted if other funding sources become available.

The 4000 FSR crosses Tsezakwa Creek at approximately 44km(see figure 4). Reach 2 is quite confined with a low but varied gradient and is classified as S2. A 10m falls, a 2m falls and a 4m cascade defines the break between reach 2 and 3.

Although there have been numerous sections of excellent spawning and rearing habitat identified within the extensive Tsezakwa Creek system above the falls, there were no fish found in any sample sites, therefore all reaches above the falls are classified as S5 and S6.

6.2.3. Restoration Objectives

There are two sub-basin level objectives for restoration in Tsezakwa Creek. The objectives are as follows:

- To reduce sediment delivery from roads and hillslopes into Tsezakwa Creek and its tributaries in order to improve water quality for fish habitat within the stream and to protect downstream habitat values.
- To replace or remove stream-crossing structures that may impede fish passage to high value habitat.

6.2.4. Proposed projects:

The projects listed below have been identified from various assessments for the Babine chart area, such as the Level I IWRP developed by McElhanney Consulting Ltd and a Watershed assessment developed by P. Beaudry and Associates Ltd for Pacific Inland Resources (PIR). Each of these projects have been identified to improve or repair fish habitat and to remove or protect against sediment sources to the streams. Each project may have a significant impact on improving the current habitat status and water quality for targeted fish species within the Tsezakwa sub-basin.

All the projects listed below are summarized in table 15 **Summary of Investment Status and Estimated Budget** (section 10.) of this restoration plan.

6.2.4.1. Assessments/ Prescriptions

- Road Deactivation prescriptions
- Natural stream bank erosion Assessment
- Natural open slope shallow failure Assessment
- Open slope slumping Assessment
- Cut & fillslope ravelling Assessment
- Bedrock failure Assessment
- Logging debris, stream channel/bank damage Assessment
- Fish Access Assessment
- Fish Habitat and Riparian Assessment

6.2.4.2. Restoration Works

- Road Deactivation
- Natural stream bank erosion control
- Natural open slope shallow failure control
- Open slope slumping control
- Fish Access improvement
- Fish Habitat and Riparian Restoration

6.2.4.3. Monitoring & Evaluations

- Routine Monitoring of above works
- Intensive Monitoring of Fish Access Improvement

7. Restoration Priorities for Sub-basins

The projects listed below in sections 7.1, 7.2 and 7.3 have been identified from various assessments for the Babine chart area, such as the Level I IWRP developed by McElhanney Consulting Ltd for Pacific Inland Resources (PIR). Each of these projects have been identified to improve or repair fish habitat and to remove or protect against sediment sources to the streams. Each project may have a significant impact on improving the current habitat and status water quality for targeted fish species within the West Babine and Tsezakwa sub-basins (see figures 5and 6).

All the projects listed below are detailed in the **Summary of Investment Status and Estimated Budget** table 17 attached to this restoration plan (Section 10.). In some cases, projects throughout the sub-basins have been completed by the MOF because of safety issues, such as the replacement of an unsafe bridge. Projects that are complete or that are targeted for completion by other parties will be or have been removed from the list of proposed works (see section 7.2 Restoration Works) and the estimated budget will be adjusted accordingly. An assessment will be conducted during activities such as road deactivation prescriptions and Fish Access Assessments to determine which activities are still necessary, what priority they hold and whether any follow up treatments are necessary.

7.1. Assessments/ Prescriptions

The activities listed in the following Table 11 are expected to begin as assessments. The assessment for each activity will determine whether a prescription for the treatment of that activity is required. The assessment will also determine whether the priority level listed for the activities completion is adequate. The assessments may be a detailed summary of proposed work and recommendations or may be as simple as an ocular verification of the findings of the Level I IWRP where the prescription can be developed without delay.

Table 11. Assessments and Prescriptions

Sediment Source	Problem	Action Required	Sub-basin	Project Status	Area Description
1	Bridge Fill Sedimentation	Prescription for sediment control	West Babine 480-4746-000	Complete	29km 4000 FSR
2	Review of culvert removal site	Assessment during road deactivation of site where two culverts have been removed	West Babine 480-4888-000	Complete	Block 001-5 road crossing
3,4	Shallow harvest related slope failure	Professional prescription for stabilization, revegetation and rehabilitation	West Babine 480-4746-000	In progress	Block 001-2
5	Road surface erosion causing sedimentation	Assess during road deactivation may need separate prescription	West Babine Sub-basin F	Complete	On branch road 39km 4000 FSR
6	Cutslope erosion causing sedimentation	Prescription for sediment control	West Babine Heal Creek	In progress	40km 4000 FSR
7	Road surface erosion causing sedimentation	Assess during road deactivation, may need separate prescription	West Babine 480-5042-000	Complete	424 road junction with 4000 FSR
8	Harvesting related streambank and channel damage	Fish Habitat and Riparian Assessment will determine necessary works	West Babine Heal Creek	In progress	Block 522-3
9	Natural stream bank erosion Assessment	Professional prescription for stabilization, revegetation and rehabilitation	Tsezakwa	In progress	1km upstream of Tsezakwa bridge
10	Natural open slope shallow failure Assessment	Professional prescription for stabilization, revegetation and rehabilitation	Tsezakwa	In progress	1km upstream of Tsezakwa bridge
11	Open slope slumping	Professional prescription for stabilization, revegetation and rehabilitation	Tsezakwa	In progress	1km upstream of Tsezakwa bridge
12	Cut & fillslope ravelling	Project complete 2000	Tsezakwa	Complete	Bridge crossing of Tsezakwa Cr.
13	Failure of soil over bedrock	Site viewed, no action required	Tsezakwa	Complete	Above bridge on Tsezakwa Cr.
14	Logging debris, stream channel/bank damage Assessment	Beaver activity and natural flood plain cause channel changes, not eligible	Tsezakwa	Complete	Near mouth of Tsezakwa Cr.
	Fish Habitat and Riparian Assessment Procedure	Level I Assessment will determine necessary works	West Babine and Tsezakwa	Planned	All high priority streams
	Possible fish access barriers at road crossings	Fish Access Assessment will determine necessary works	West Babine and Tsezakwa	In progress	All road crossings
	Identified road related erosion and sediment sources	Road deactivation will repair or remove road related sediment sources	West Babine and Tsezakwa	Complete	All eligible roads

7.2. Restoration Works

The projects listed below are expected to be the resultant activities from the prescriptions listed previously in section 7.1. During the development of the prescriptions a more detailed cost estimate will be produced and the appropriate adjustments will be made to the budget. Other works may be proposed from various assessments, added to the project list and given a priority level.

Most of the following projects are expected to be completed by 2002/2003. Only the fish access improvements throughout the watershed are expected to take until 2005/2006. This is due to the high cost of structure replacements. The number of structures needing to be replaced has been estimated, and as such this project contains an inherent level of uncertainty. Only a field assessment of each stream crossing within the watershed will determine whether a drainage structure currently in place has been adequately installed and is passable to fish.

Throughout the 2001 field season many of the above assessments have been started. At this point in time only the road deactivation prescriptions for the West Babine Sub-basin are complete. None of the other above assessments are complete, but the amount of work conducted will provide a closer estimate of required works and estimated cost of the works. Works for the assessment area may have even been cancelled if the initial viewing of the site determined that no further works are necessary.

Table 12. Restoration Works

Sediment Source	Problem	Action Required	Sub-basin	Project Status	Area Description
3,4	Shallow harvest related slope failure	Stabilization, revegetation and rehabilitation as per professional prescription	West Babine 480-4746-000	Pending site assessment	Block 001-2
5	Road surface erosion causing sedimentation	Standard road deactivation	West Babine Sub-unit F	In progress	Branch road at 39km 4000FSR
6	Cutslope erosion causing sedimentation	Sediment control as per prescription	West Babine Heal Creek	Pending site assessment	40km 4000 FSR
8	Harvesting related streambank and channel damage	Repair of fish habitat and riparian area as per assessment prescription	West Babine Heal Creek	Pending site assessment	Block 522-3
9, 10, 11	Failure sites on Tsezakwa Cr	As per geotechnical assessment	Tsezakwa	Pending site assessment	1km upstream of Tsezakwa bridge
	Damaged fish habitat and riparian areas	Restoration of instream or riparian as per level I assessment	West Babine and Tsezakwa	Pending Level I assessments	All high priority streams
	Possible fish access barriers at road crossings	Replacement of drainage structure that are assessed as fish access barriers with structures that will allow for fish passage	West Babine and Tsezakwa	Pending site assessments	All road crossings
	Identified road related erosion and sediment sources	Road deactivation works on eligible roads as per prescriptions	West Babine and Tsezakwa	In progress	All eligible roads

During the fish access assessments currently in progress, it has been found that out of all the culverts assessed within the two sub-basins, a maximum of 11 culverts (only one within Tsezakwa Sub-basin) on the 4000 FSR and 9 culverts (all within the West Babine Sub-basin) on the secondary roads do not meet the Forest Practices Code requirements for fish passage. It must be stated that this project is not complete and that priority levels for these culverts have yet to be determined. If it is determined that a significant improvement to fish habitat cannot be gained through the replacement of the culvert then that culvert will receive a low priority rating and may not even be replaced. However, if a culvert is impeding access to a significant amount of habitat and replacing it with an appropriate structure will likely significantly improve overall habitat availability, then that culvert will receive a high priority rating.

7.3. Monitoring & Evaluations

Routine effectiveness evaluations will take place for most EEV Program activities. Routine effectiveness evaluations will determine whether the works have been successful in addressing the planned objectives, or whether follow up treatments are necessary. Intensive effectiveness evaluations will be performed on all other EEV Program activities to determine the effectiveness of the prescribed activities for the project and whether the works are meeting the objectives of the treatment. Also, intensive monitoring of the site will continue over two or more years to determine the long-term effectiveness of the treatment.

Table 13. Monitoring & Evaluations

Sediment Source	Problem	Action Required	Sub-basin	Project Status	Area Description
3,4	Shallow harvest related slope failure	Intensive monitoring of this site in the spring and summer following works to determine if works conducted are successful and determine if follow up work is necessary. Continue to monitor annually until site has stabilized	West Babine 480-4746-000	Pending works at site	Block 001-2
5	Road surface erosion causing sedimentation	Routine monitoring under road deactivation	West Babine Sub-unit F	Pending works at site	On branch road at 39km 4000 FSR
6	Cutslope erosion causing sedimentation	Routine monitoring under road deactivation	West Babine Heal Creek	Pending works at site	40km 4000 FSR
8	Harvesting related stream bank and channel damage	Routine monitoring of this site in the spring following works to determine if works conducted are successful and determine if follow up work is necessary	West Babine Heal Creek	Pending works at site	Block 522-3
9, 10, 11	Failure sites on Tsezakwa Cr	Intensive monitoring of this site as per geotechnical assessment	Tsezakwa	Pending works at site	1km upstream of Tsezakwa bridge
	Damaged fish habitat and riparian areas	Intensive or routine monitoring of restoration to ensure objectives are met, propose further works	West Babine and Tsezakwa	Pending Level I assessments	All high priority streams
	Possible fish access barriers at road crossings	Intensive monitoring of sites to ensure replaced drainage structures meet the objectives of fish access improvement	Overall West Babine Watershed	Pending works at sites	All road crossings
	Identified road related erosion and sediment sources	Routine monitoring of road deactivation and other similar works to ensure objectives are met, propose further works if necessary	Overall West Babine Watershed	Pending works at sites	All eligible roads

Table 14: Evaluation of the likelihood of restoration activities benefiting fish habitat for West Babine and Tsezakwa Sub-basins

				Likelihood of benefits to Watershed Components					
Sub-basin	Target Species	Limiting Fish Habitat/Restoration Priority	Watershed Condition and Restoration Benefits	Landslides	Gullies	Roads	Riparian	Channel	Instream Fish Habitat
West Babine Heal Creek	Rainbow Trout Dolly Varden Bull Trout	Bull Trout Habitat Spawning and rearing habitat	• Road Deactivation and Sediment control will remove or repair sediment sources	N/A	Low	High	Moderate	Moderate	High
			• Fish access improvement will increase access to rearing and spawning grounds	N/A	N/A	N/A	N/A	N/A	High
West Babine Five Mile Creek	Rainbow Trout Dolly Varden	Spawning and rearing habitat	• Road Deactivation and Sediment control will remove or repair sediment sources	N/A	Low	High	Moderate	Moderate	High
			• Fish access improvement will increase access to rearing and spawning grounds	N/A	N/A	N/A	N/A	N/A	High
West Babine Williams Creek	Rainbow Trout Dolly Varden Sockeye Salmon Coho Salmon Kokanee Salmon Prickly Sculpin	Spawning and rearing habitat	• Road Deactivation and Sediment control will remove or repair sediment sources	N/A	Low	High	Moderate	Moderate	High
			• Fish access improvement will increase access to rearing and spawning grounds	N/A	N/A	N/A	N/A	N/A	High
West Babine 480-4746-000	Sockeye Salmon	Spawning and rearing habitat	• Road Deactivation and Sediment control will remove or repair sediment sources	N/A	Low	High	Moderate	Moderate	High
			• Hillslope restoration will control sediment source and reduce risk of slope failure	High	N/A	N/A	Moderate	High	High
			• Fish access improvement will increase access to rearing and spawning grounds	N/A	N/A	N/A	N/A	N/A	High
West Babine 480-4888-000	Rainbow Trout Cutthroat Trout	Spawning and rearing habitat	• Road Deactivation and Sediment control will remove or repair sediment sources	N/A	Low	High	Moderate	Moderate	High
			• Fish access improvement will increase access to rearing and spawning grounds	N/A	N/A	N/A	N/A	N/A	High
West Babine 480-5042-000	Coho Salmon Rainbow Trout Dolly Varden Cutthroat Trout	Spawning and rearing habitat	• Road Deactivation and Sediment control will remove or repair sediment sources	N/A	Low	High	Moderate	Moderate	High
			• Fish access improvement will increase access to rearing and spawning grounds	N/A	N/A	N/A	N/A	N/A	High
West Babine 480-5184-000	Dolly Varden Rainbow Trout	Spawning and rearing habitat	• Road Deactivation and Sediment control will remove or repair sediment sources	N/A	Low	High	Moderate	Moderate	High
			• Fish access improvement will increase access to rearing and spawning grounds	N/A	N/A	N/A	N/A	N/A	High
West Babine Sub-basin A-G	Rainbow Trout Coho Salmon	Spawning and rearing habitat	• Road Deactivation and Sediment control will remove or repair sediment sources	N/A	Low	High	Moderate	Moderate	High
			• Fish access improvement will increase access to rearing and spawning grounds	N/A	N/A	N/A	N/A	N/A	High
Tsezakwa	Rainbow Trout Dolly Varden Coho Salmon	Spawning and rearing habitat	• Road Deactivation and Sediment control will remove or repair sediment sources	N/A	Low	High	Moderate	Moderate	High
			• Hillslope restoration will control sediment source and reduce risk of slope failure	Moderate	N/A	N/A	N/A	Low	Moderate
			• Fish access improvement will increase access to rearing and spawning grounds	N/A	N/A	N/A	N/A	N/A	High

8. Access Management

Activities listed within this Watershed Restoration Plan will be conducted in accordance with the Coordinated Access Management Plan (CAMP) for the Bulkley portion of the Babine River area that was included in the McElhanney Level I IWRP. The access issues outlined in the (CAMP) will be adhered to during the development of this restoration plan. PIR has developed their Forest Development Plan (FDP) (see figure 6) in accordance with this approved access management plan. The Access Management Plan as part of the FDP will affect activities such as road deactivation where the level of deactivation prescribed will depend upon the long-term management strategies of the FDP. There were no issues raised during the development of the CAMP that would affect the restoration of the West Babine Sub-basin. However, the French Peak Trail, which runs partially within the Tsezakwa Sub-basin, was the point of some public concern. The concerns that were raised at a public meeting were the following:

- Access on the French Peak Trail to be maintained
- Cautions that too large of cross ditches may cause injury to snowmobilers

In addition to the FDP the Landscape Level Silviculture Opportunities Plan will be consulted to ensure that the access management plan reflects the future access requirements for silviculture treatments within the area.

9. Implementation Plan

Beginning in the 2001/2002 business year, the Torkelson Watershed will be the focus of EEV program activities by PIR. During the first year, various assessments and prescriptions will be completed and provide a more detailed knowledge of the watershed priorities. Also during this first year a full fish and fish habitat inventory will be completed for this watershed. This inventory will positively identify and classify all streams that are currently inferred as fish bearing or non-fish bearing. The following **Restoration Plan Budget** tables list the various projects proposed within this report. A budget amount has been estimated for the completion of each of these projects and broken down by the year the work is expected to be completed. As field assessments for each of these projects take place, further determination of the activities priority level can be made. The plan may be altered to finalize a higher priority project if at the time of the assessment the priority of a project is felt to be higher than the plan has indicated. This may alter the estimated budget for the subsequent years following the assessments.

10. Restoration Plan Budget

The following Tables 15 and 16 outline the expected projects as described in sections 6.1, 6.2 and 6.3. and estimate the costs and outputs for each project. Table 17 inserted into this report is the Restoration Plan budget designed for use with the FRBC work plan. Tables 15 and 16 are necessary to decipher the budget amounts attributable to each specific project.

Table 15: Summary of Investment Status and Estimated Budget											
Date: September, 2001											
Watershed Investment Phase	Proposed Projects	Activity Codes	Priority Level	Status (complete, ongoing, planned)	Estimated Outputs to complete	Estimated Budget to complete	Year 1 (2001-2002) $	Year 2 (2002-2003) $	Year 3 (2003-2004) $	Year 4 (2004-2005) $	Year 5 (2005-2006) $
Tsezakwa Sub-basin											
Watershed Planning & Coordination	IWRP	WP	High	Complete	.5	$3000.00	$3000.00				
Assessments/ Prescriptions	Road Deactivation Prescriptions	DWAR	High	Ongoing	9.5km	$6,500.00	$6500.00	$ -	$ -	$ -	$ -
	Assessment of failures on Tsezakwa Creek site 9, 10 and 11	DAWS	High	Planned	1.3ha	$6,100.00	$1,100.00	$5,000.00	$ -	$ -	$ -
	Fish Access Assessment	FARS	High	Ongoing	1	$1,050.00	$1,050.00	$ -	$ -	$ -	$ -
	Fish Habitat and Riparian Assessment	FHAS	High	Planned		$16,000.00	$ -	$ -	$16,000.00	$ -	$ -
Restoration Works	Road Deactivation	RDW	High	Planned	9.5km	$15,000.00	$ -	$15,000.00	$ -	$ -	$ -
	Slope failure rehabilitation and stabilization site 9, 10 and 11	HRW	High	Planned	1.3ha	$11,000.00	$ -	$ -	$11,000.00	$ -	$ -
	Fish Access Improvement	FARS	High	Planned	1	$80,000.00	$ -	$ -	$80,000.00	$ -	$ -
										$ -	$ -
Monitoring & Evaluations	Routine Monitoring of above works	EFEVR	High	Planned	9.5km/1.3ha	$1,000.00	$ -	$ -	$500.00	$500	$ -
	Intensive Monitoring of Fish Access Improvement	EFEVIN	High	Planned	1	$5,000.00	$ -	$ -	$ -	$5000.00	$ -
										$ -	$ -
				Grand Total		$144, 650.00	$11,650.00	$20,000.00	$107,500.00	$5,500.00	$ -

Table 16: Summary of Investment Status and Estimated Budget											
Date: September, 2001											
Watershed Investment Phase	Proposed Projects	Activity Codes	Priority Level	Status (complete, ongoing, planned)	Estimated Outputs to complete (Ha. or Km)	Estimated Budget to complete	Year 1 (2001-2002) $	Year 2 (2002-2003) $	Year 3 (2003-2004) $	Year 4 (2004-2005) $	Year 5 (2005-2006) $
West Babine Watershed											
Watershed Planning & Coordination	IWRP	WP	High	Complete	.5	$3000.00	$3000.00	$ -	$ -	$ -	$ -
Assessments/ Prescriptions	Road Deactivation Prescriptions	DWAR	High	Complete	14.11km	$8500.00	$8500.00	$ -	$ -	$ -	$ -
	Slope failure on stream 480-4746-000 site 3 and 4	DAWS	High	Planned	4ha	$8000.00	$ -	$8000.00	$ -	$ -	$ -
	Cutslope erosion causing sedimentation site 6	DAWS	High	Planned	.2ha	$3000.00	$3000.00	$ -	$ -	$ -	$ -
	Fish Habitat Assessment CP 522-3	FHAS	High	Planned	1km	$3650.00	$3650.00	$ -	$ -	$ -	$ -
	Fish Access Assessment	FARS	High	Ongoing		$37,095.00	$37,095.00	$ -	$ -	$ -	$ -
	Fish Habitat and Riparian Assessment	FHAS	High	Planned		$34,000.00	$ -	$ -	$34,000.00	$ -	$ -
Restoration Works	Road Deactivation	RDW	High	Planned	9.06km	$17,000.00	$17,000.00	$ -	$ -	$ -	$ -
	Slope rehabilitation and stabilization site 3 and 4	HRW	High	Planned	4ha	$32,500.00	$ -	$ -	$32,500.00	$ -	$ -
	Cutslope erosion control site 6	HRW	High	Planned	.2ha	$10,000.00	$ -	$10,000.00	$ -	$ -	$ -
	CP 522-3 Streambank and channel repair	ISRR	High	Planned	1km	$ -	$ -	$ -	$ -	$ -	$ -
	Fish Access Improvement	FARS	High	Planned	10	$600,000.00	$ -	$200,000.00	$200,000.00	$200,000.00	$ -
Monitoring & Evaluations	Routine Monitoring of above works	EFFVR	High	Planned	9.06km	$4,500.00	$ -	$ -	$4,000.00	$500.00	$ -
	Intensive Monitoring of Fish Access Improvement	EFEVIN	High	Planned	10	$20,000.00	$ -	$ -	$10,000.00	$5,000.00	$5,000.00
										$ -	$ -
				Grand Total		$781, 245.00	$72,245.00	$218,000.00	$280, 500.00	$205,500.00	$5,000.00

Table 17: Watershed Budget and Outputs by Activity by Year per Subbasin

District: Bulkley/Cassiar Forest District
Proponent: Pacific Inland Resources
Watershed: Torkelson

Tsezakwa Subbasin		Year 1	Outputs	Year 2	Outputs	Year 3	Outputs	Year 4	Outputs	Year 5	Outputs	Total	Total Ouputs	
Activities	**Code**	**2001/02**	**#**	**2002/03**	**#**	**2003/04**	**#**	**2004/05**	**#**	**2005 & on**	**#**	**$$$**	**#**	**Units**
Watershed Restoration Plans	WP	$ 3,000	0.5	$ -		$ -		$ -		$ -		$ 3,000	0.5	Reports
Access Management Plan	AM	$ -		$ -		$ -		$ -		$ -		$ -	0	Map Sheets
Detailed Assessments & Plans - Hillside and Upslope	DAWS	$ 1,100	0	$ 5,000	1.3	$ -		$ -		$ -		$ 6,100	1.3	HA
Detailed Assessments & Plans - Roads	DWAR	$ 6,500	9.5	$ -		$ -		$ -		$ -		$ 6,500	9.5	KM of Road
Gully Assessments	GA	$ -		$ -		$ -		$ -		$ -		$ -	0	HA
Sediment Source Survey	SSU	$ -		$ -		$ -		$ -		$ -		$ -	0	Surveys
Riparian Assessment	RPA	$ -		$ -		$ -		$ -		$ -		$ -	0	HA
Detailed Assessment & Plans - Riparian	DAR	$ -		$ -		$ -		$ -		$ -		$ -	0	HA
Fish Habitat Assessment - Lake	FHAL	$ -		$ -		$ -		$ -		$ -		$ -	0	HA of Lake
Fish Habitat Assessment - Stream	FHAS	$ -		$ -		$ 16,000	1	$ -		$ -		$ 16,000	1	KM of Stream
Detailed Assessment & Plans - Instream	DAS	$ -		$ -		$ -		$ -		$ -		$ -	0	KM of Stream
Hillside Rehabilitation & Restoration	HRW	$ -		$ -		$ 11,000	1.3	$ -		$ -		$ 11,000	1.3	HA
Road Deactivation - WR	RDW	$ -		$ 15,000	9.5	$ -		$ -		$ -		$ 15,000	9.5	KM of Road
Road Rehabilitation - WR	RRW	$ -		$ -		$ -		$ -		$ -		$ -	0	KM of Road
Riparian Rehabilitation	RT	$ -		$ -		$ -		$ -		$ -		$ -	0	HA
Fish Access Restoration	FARS	$ 1,050	1	$ -		$ 80,000	1	$ -		$ -		$ 81,050	2	Sites
Instream Rehabilitation & Restoration	ISRR	$ -		$ -		$ -		$ -		$ -		$ -	0	KM of Stream
Sidechannel Rehabilitation & Restoration	SCRR	$ -		$ -		$ -		$ -		$ -		$ -	0	KM of Stream
Effectiveness Evaluation - Intensive	EFEVIN	$ -		$ -		$ -		$ 5,000	1	$ -		$ 5,000	1	Surveys
Effectiveness Evaluation - Operational	EFEVOP	$ -		$ -		$ -		$ -		$ -		$ -	0	Surveys
Effectiveness Evaluation - Routine	EFEVR	$ -		$ -		$ 500	9.5	$ 500	1.3	$ -		$ 1,000	10.8	Surveys
Totals		**$ 11,650**		**$ 20,000**		**$ 107,500**		**$ 5,500**		**$ -**		**$ 144,650**		

West Babine Subbasin		Year 1	Outputs	Year 2	Outputs	Year 3	Outputs	Year 4	Outputs	Year 5	Outputs	Total	Total Ouputs	
Activities	**Code**	**2001/02**	**#**	**2002/03**	**#**	**2003/04**	**#**	**2004/05**	**#**	**2005 & on**	**#**	**$$$**	**#**	**Units**
Watershed Restoration Plans	WP	$ 3,000	0.25	$ -		$ -		$ -		$ -		$ 3,000	0.25	Reports
Access Management Plan	AM	$ -		$ -		$ -		$ -		$ -		$ -	0	Map Sheets
Detailed Assessments & Plans - Hillside and Upslope	DAWS	$ 3,000	1	$ 8,000	4	$ -		$ -		$ -		$ 11,000	5	HA
Detailed Assessments & Plans - Roads	DWAR	$ 8,500	14.11	$ -		$ -		$ -		$ -		$ 8,500	14.11	KM of Road
Gully Assessments	GA	$ -		$ -		$ -		$ -		$ -		$ -	0	HA
Sediment Source Survey	SSU	$ -		$ -		$ -		$ -		$ -		$ -	0	Surveys
Riparian Assessment	RPA	$ -		$ -		$ -		$ -		$ -		$ -	0	HA
Detailed Assessment & Plans - Riparian	DAR	$ -		$ -		$ -		$ -		$ -		$ -	0	HA
Fish Habitat Assessment - Lake	FHAL	$ -		$ -		$ -		$ -		$ -		$ -	0	HA of Lake
Fish Habitat Assessment - Stream	FHAS	$ -		$ -		$ 34,000	1	$ -		$ -		$ 34,000	1	KM of Stream
Detailed Assessment & Plans - Instream	DAS	$ 3,650	1.5	$ -		$ -		$ -		$ -		$ 3,650	1.5	KM of Stream
Hillside Rehabilitation & Restoration	HRW	$ -		$ 10,000	0.2	$ 32,500	4	$ -		$ -		$ 42,500	4.2	HA
Road Deactivation - WR	RDW	$ 17,000	9.06	$ -		$ -		$ -		$ -		$ 17,000	9.06	KM of Road
Road Rehabilitation - WR	RRW	$ -		$ -		$ -		$ -		$ -		$ -	0	KM of Road
Riparian Rehabilitation	RT	$ -		$ -		$ -		$ -		$ -		$ -	0	HA
Fish Access Restoration	FARS	$ 37,095	10	$ 200,000	3	$ 200,000	3	$ 200,000	3	$ -		$ 637,095	19	Sites
Instream Rehabilitation & Restoration	ISRR	$ -		$ -		$ -		$ -		$ -		$ -	0	KM of Stream
Sidechannel Rehabilitation & Restoration	SCRR	$ -		$ -		$ -		$ -		$ -		$ -	0	KM of Stream
Effectiveness Evaluation - Intensive	EFEVIN	$ -		$ -		$ 10,000	3	$ 5,000	3	$ 5,000	3	$ 20,000	9	Surveys
Effectiveness Evaluation - Operational	EFEVOP	$ -		$ -		$ -		$ -		$ -		$ -	0	Surveys
Effectiveness Evaluation - Routine	EFEVR	$ -		$ -		$ 4,000	4.2	$ 500	1	$ -		$ 4,500	5.2	Surveys
Totals		**$ 72,245**		**$ 218,000**		**$ 280,500**		**$ 205,500**		**$ 5,000**		**$ 781,245**		
Watershed Activity Totals		$ 83,895		$ 238,000		$ 388,000		$ 211,000		$ 5,000		**$ 925,895**		

Table 18: Total Expenditures and Outputs over 5 years

District: Bulkley/Cassiar Forest District
Proponent: Pacific Inland Resources
Watershed: Torkelson

Activities	Code	Year 1 2001/02	Outputs #	Year 2 2002/03	Outputs #	Year 3 2003/04	Outputs #	Year 4 2004/06	Outputs #	Year 5 2005 & on	Outputs #	Total $$$	Total Ouputs #	Total Ouputs Units
Assessments/Prescriptions - General														
Watershed Restoration Plans	WP	$ 6,000	0.8	$ -	0.0	$ -	0.0	$ -	0.0	$ -	0.0	$ 6,000		Reports
Assessments/Prescriptions - Upslope														
Access Management Plan	AM	$ -	0.0	$ -	0.0	$ -	0.0	$ -	0.0	$ -	0.0	$ -		Map Sheets
Detailed Assessments & Plans - Hillside and Upslope	DAWS	$ 4,100	1.0	$ 13,000	5.3	$ -	0.0	$ -	0.0	$ -	0.0	$ 17,100		HA
Detailed Assessments & Plans - Roads	DWAR	$ 15,000	23.6	$ -	0.0	$ -	0.0	$ -	0.0	$ -	0.0	$ 15,000		KM of Road
Gully Assessments	GA	$ -	0.0	$ -	0.0	$ -	0.0	$ -	0.0	$ -	0.0	$ -		HA
Sediment Source Survey	SSU	$ -	0.0	$ -	0.0	$ -	0.0	$ -	0.0	$ -	0.0	$ -		Surveys
Assessments/Prescriptions - Riparian														
Riparian Assessment	RPA	$ -	0.0	$ -	0.0	$ -	0.0	$ -	0.0	$ -	0.0	$ -		HA
Detailed Assessment & Plans - Riparian	DAR	$ -	0.0	$ -	0.0	$ -	0.0	$ -	0.0	$ -	0.0	$ -		HA
Assessments/Prescriptions - Instream														
Fish Habitat Assessment - Lake	FHAL	$ -	0.0	$ -	0.0	$ -	0.0	$ -	0.0	$ -	0.0	$ -		HA of Lake
Fish Habitat Assessment - Stream	FHAS	$ -	0.0	$ -	0.0	$ 50,000	2.0	$ -	0.0	$ -	0.0	$ 50,000		KM of Stream
Detailed Assessment & Plans - Instream	DAS	$ 3,650	1.5	$ -	0.0	$ -	0.0	$ -	0.0	$ -	0.0	$ 3,650		KM of Stream
Restoration Works - Upslope														
Hillside Rehabilitation & Restoration	HRW	$ -	0.0	$ 10,000	0.2	$ 43,500	5.3	$ -	0.0	$ -	0.0	$ 53,500		HA
Road Deactivation - WR	RDW	$ 17,000	9.1	$ 15,000	9.5	$ -	0.0	$ -	0.0	$ -	0.0	$ 32,000		KM of Road
Road Rehabilitation - WR	RRW	$ -	0.0	$ -	0.0	$ -	0.0	$ -	0.0	$ -	0.0	$ -		KM of Road
Restoration Works - Riparian														
Riparian Rehabilitation	RT	$ -	0.0	$ -	0.0	$ -	0.0	$ -	0.0	$ -	0.0	$ -		HA
Fish Access Restoration	FARS	$ 38,145	11.0	$ 200,000	3.0	$ 280,000	4.0	$ 200,000	3.0	$ -	0.0	$ 718,145		Sites
Restoration Works - Instream														
Instream Rehabilitation & Restoration	ISRR	$ -	0.0	$ -	0.0	$ -	0.0	$ -	0.0	$ -	0.0	$ -		KM of Stream
Sidechannel Rehabilitation & Restoration	SCRR	$ -	0.0	$ -	0.0	$ -	0.0	$ -	0.0	$ -	0.0	$ -		KM of Stream
Evaluation & Monitoring														
Effectiveness Evaluation - Intensive	EFEVIN	$ -	0.0	$ -	0.0	$ 10,000	3.0	$ 10,000	4.0	$ 5,000	3.0	$ 25,000		Surveys
Effectiveness Evaluation - Operational	EFEVOP	$ -	0.0	$ -	0.0	$ -	0.0	$ -	0.0	$ -	0.0	$ -		Surveys
Effectiveness Evaluation - Routine	EFEVR	$ -	0.0	$ -	0.0	$ 4,500	13.7	$ 1,000	2.3	$ -	0.0	$ 5,500		Surveys
Training														
Grand Total		***$ 83,895***		***$ 238,000***		***$ 388,000***		***$ 211,000***		***$ 5,000***		***$ 925,895***		

IMS WRP Activity Organization

Activities	Code	Component	Sub Component	Output
Assessments/Prescriptions				
* Watershed Restoration Plans	WP	General		Reports
Access Management Plan	AM	Upslope	Roads	Map Sheets
Detailed Assessments & Plans - Hillside and Upslope	DAWS	Upslope	Hillslope	HA
Detailed Assessments & Plans - Roads	DWAR	Upslope	Roads	KM of Road
Gully Assessments	GA	Upslope	Gullies-coast	HA
** Sediment Source Survey	SSU	Upslope		Surveys
*** Riparian Assessment	RPA	Riparian		HA
Detailed Assessment & Plans - Riparian	DAR	Riparian		HA
Fish Habitat Assessment - Lake	FHAL	Instream		HA of Lake
****Fish Habitat Assessment - Stream	FHAS	Instream		KM of Stream
^Detailed Assessment & Plans - Instream	DAS	Instream		KM of Stream
Restoration Works				
^^Hillside Rehabilitation & Restoration	HRW	Upslope	Hillslope	HA
Road Deactivation - WR	RDW	Upslope	Roads	KM of Road
Road Rehabilitation - WR	RRW	Upslope	Roads	KM of Road
Riparian Rehabilitation	RT	Riparian		HA
Fish Access Restoration	FARS	Riparian		Sites
^^^Instream Rehabilitation & Restoration	ISRR	Instream		KM of Stream
Sidechannel Rehabilitation & Restoration	SCRR	Instream		KM of Stream
Evaluation & Monitoring ^^^^				
Effectiveness Evaluation - Intensive	EFEVIN	General		Surveys
Effectiveness Evaluation - Operational	EFEVOP	General		Surveys
Effectiveness Evaluation - Routine	EFEVR	General		Surveys

NOTE:
*WP Previously IWRP includes Overview Assessment
**includes Erosion and Mass-Wasting Risk Assessment
***Includes FHAP Level I Field Assessment & Level I Riparian Assessment
****Previously Overview Fish Habitata Assessement Procedure (FHAP), Channel Condisition and Prescription Assessment (CCPA)
^ includes Re-CcAP Reconnaissance-level CAP & Channel Assessment Procedure (CAP)
^^previously Upslope Rehabilitation & Restoration
^^^previously was Instream & Off-Channel Rehabilitation
^^^^ replaces previous Monitoring and Evaluation

11. Literature Cited

Babine Watershed Restoration Plan. McElhanney Consulting Services Ltd.1997. Level One Integrated Watershed Restoration Plan

Reconnaissance Level Fish and Fish Habitat Inventory in the Bulkley TSA. Triton Environmental Consultants Ltd. 1998. A fish and fish habitat inventory for the Bulkley TSA.

Planning and Priority Setting for the Next Five Years. Phase 3 Watershed Level Planning. 2000. A working draft technical circular prepared by the WRP Provincial Coordination Team.

Operational Inventory of Water Quality and Quantity of River Ecosystems in the Skeena Region (stream 480-4746-000, 29.5km Nilkitkwa FSR). British Columbia Conservation Foundation. 1998.

Bulkley Land and Resource Management Plan. 1998. Bulkley Valley Community Resources Board Interagency Planning Team.

D.L. Hogan, S.A. Bird and D.J. Wilford. 1996. Channel Conditions and Prescriptions Assessment (Interim Methods). British Columbia Ministry of Environment, Lands and Parks and Ministry of Forests. Watershed Restoration Program, Technical Circular No. 7.

Interior Watershed Assessment Procedure Guidebook (IWAP). 1995

IWRP West Babine Watershed. 2000. An integrated watershed restoration plan for the West Babine Sub-basin.

12. Watershed Restoration Committee (WRC)

The Watershed Restoration Committee (WRC) for this area is comprised of three individuals from three different government agencies. These three members have reviewed this restoration plan prior to its submittal to FRBC and are in general agreement with the direction of the restoration plan. The WRC members are as follows:

2002/01/16

Grant Marleau – Ministry of Forests (MOF)

2002/01/24

Jeff Lough – Ministry of Water, Land and Air Protection (WLAP)

2002/01/16

Tom Pendray – Department of Fisheries and Oceans (DFO)

In addition, the Ministry of Forests will attempt to solicit meaningful consultation on this plan with the office of the Wit'At Nation (Lake Babine Nation). It is expected that this will be an ongoing consultation process that will exceed the timeline for submission of this plan to Forest Renewal BC (October 01, 2001).

Appendix A

Distribution List

This document has been distributed to the following individuals/agencies/companies:

- Paul Perkins – FRBC
- Grant Marleau and Glen Buhr – Ministry of Forests (MOF)
- Additional copy submitted to the MOF for distribution to the Wit'At Nation
- Jeff Lough – Ministry of Water, Land and Air Protection (WLAP)
- Tom Pendray – Department of Fisheries and Oceans (DFO)
- Alan Baxter – Pacific Inland Resources (PIR)

Figure 4 Tsezakwa Subbasin Fish Inventory Map

Date September 27, 2001
Scale 1:50 000
Watershed Area 9,729.05 ha

- Roads
- Streams
- Watershed Boundary
- Subunit Boundary
- Fish Present (sampled)
- Fish Present (inferred)
- Fish Not Present (sampled)
- Fish Not Present (inferred)
- Stream Not Present

UNIT 4
UNIT 5
578-4
P17
529-3
535-2
535
518-2
518-1
574-2
574-1
380-3
380-2
380-1
575-2
575-3
576-2
575-1
576-1
522-2
522-3
575-4
522-4
541-3
573-1
JOHN FIRE 1952
448 RD
444 RD
CO RB
CO DV PK RB SK
CH CO* PK
CO DV
DV RB
DV* RB*
KO*
FRENCH PK.
NETALZUL MTN.

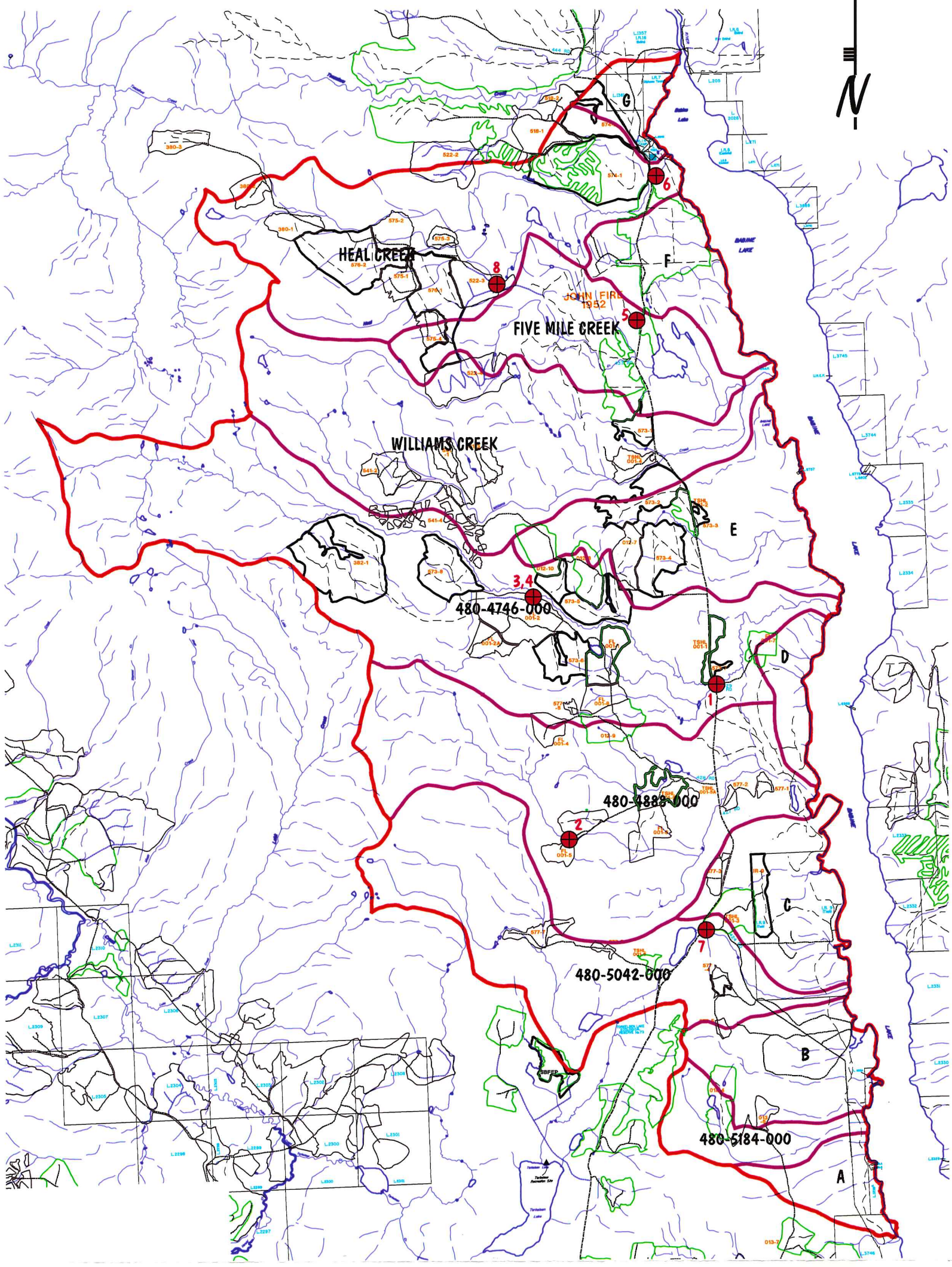


Figure 5. West Babine Watershed showing location of Proposed EEV Activities

Roads
Streams
Watershed Boundary
Subunit Boundary

Date September 27, 2001
Scale 1:100 000
Watershed Area 24,680.68 ha

- 1 Bridge Fill Sedimentation
- 2 Review of Culvert Removal Site
- 3,4 Shallow Harvest Related Slope Failure
- 5 Road Surface Erosion
- 6 Cutslope Erosion
- 7 Road Surface Sedimentation
- 8 Streambank and Channel Damage

Whole Watershed - Fish Access Improvement
Whole Watershed - Road Deactivation

SILVICON SERVICES INC.

Figure 6 Tsezakwa Subbasin

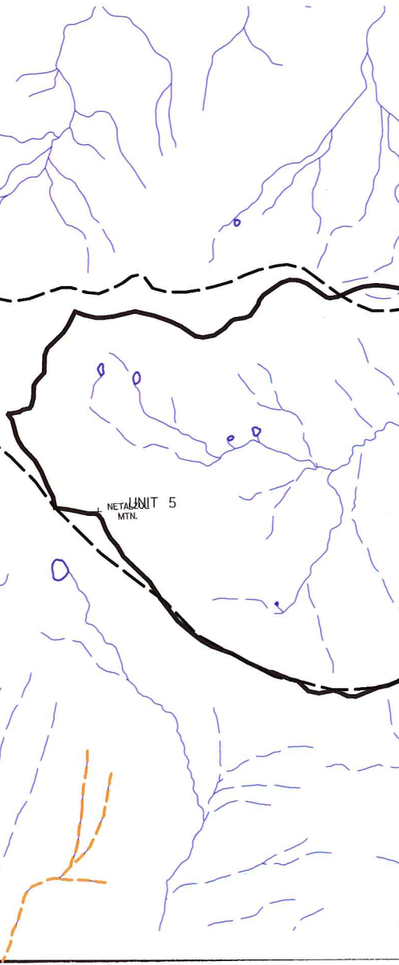
Showing location of Proposed EEV Activities

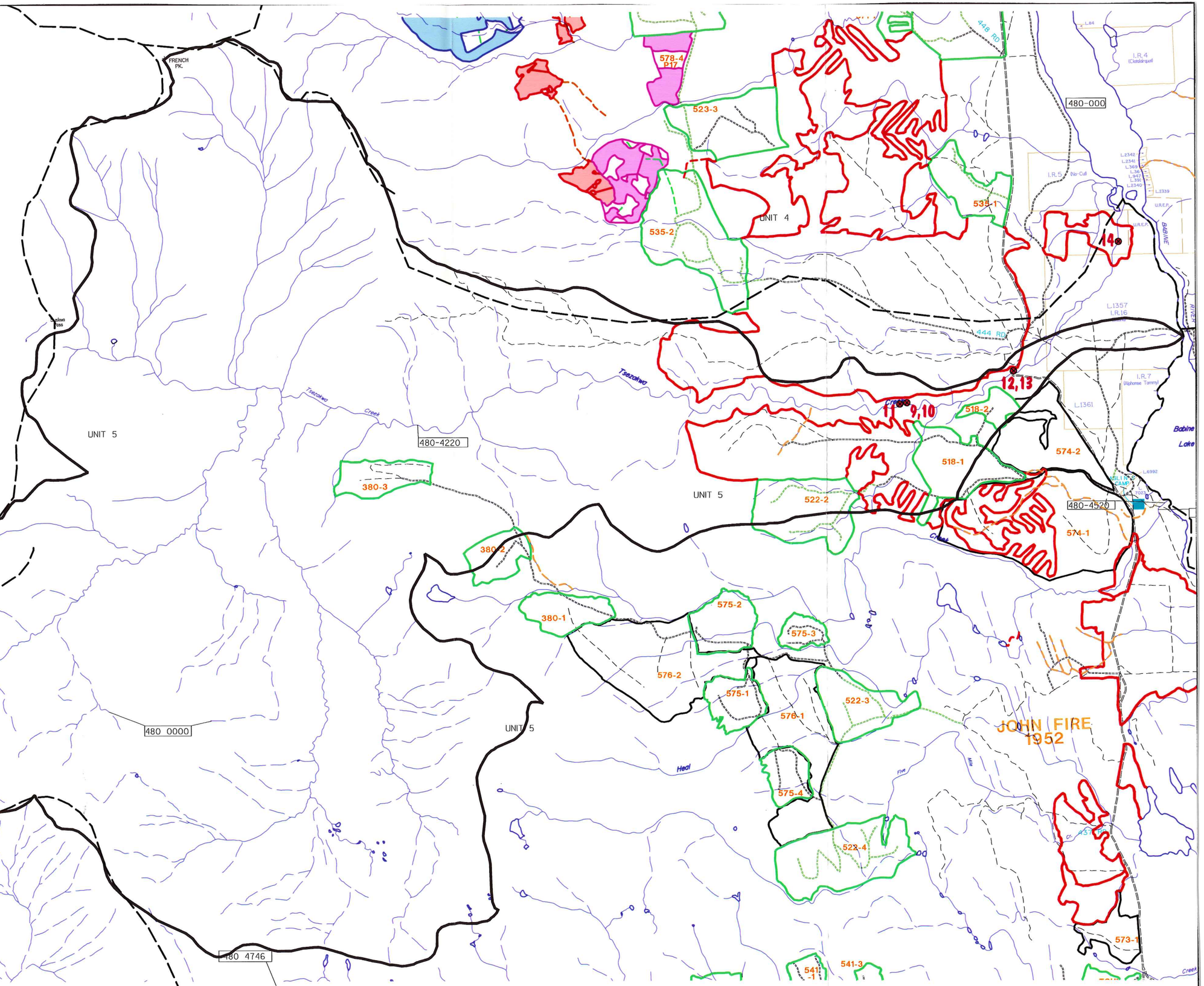
Date September 27, 2001
Scale 1:50 000
Watershed Area 9,729.05 ha

Roads
Streams
Watershed Boundary
Subunit Boundary

- 9 Stream Bank Erosion
- 10 Open Slope Shallow Failure
- 11 Open Slope Slumping
- 12 Cut and Fill Slope Ravelling
- 13 Failure of Soil Over Bedrock
- 14 Logging Debris, Streambank Channel Damage

Whole Watershed - Fish Access Improvement
Whole Watershed - Road Deactivation





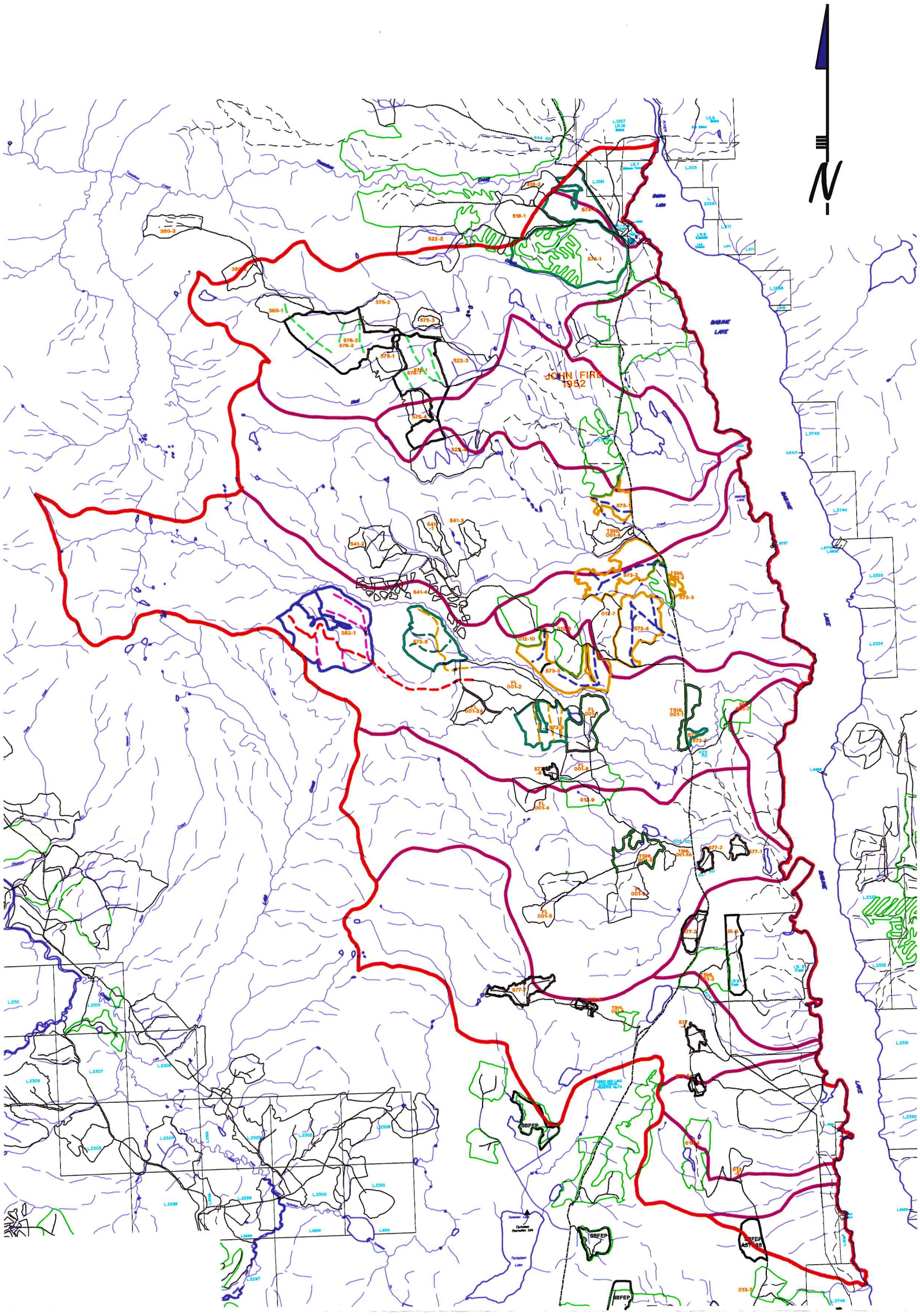


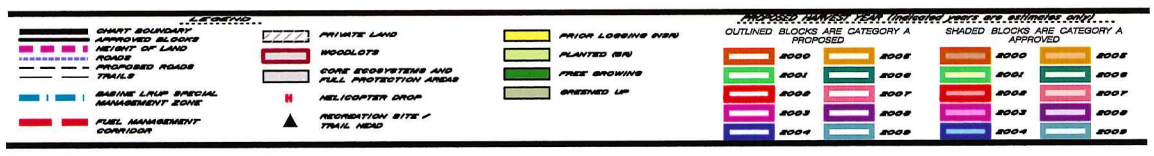
Figure 7. West Babine Watershed showing Forest Development Plan (West Fraser Mills Ltd.)

Roads

Streams

Watershed Boundary

Subunit Boundary



Date September 27, 2001

Scale 1:100 000

Watershed Area 24,680.68 ha

SILVICON SERVICES INC.

Figure 8 Tsezakwa Subbasin showing Forest Development Plan (West Fraser Mills Ltd.)

Date September 27, 2001
Scale 1:50 000
Watershed Area 9,729.05 ha

Roads
Streams
Watershed Boundary
Subunit Boundary

578-3
584-3
578-4
584-7
571-2
448 RD
FRENCH PK.
480-000
523-3
578-5
535-1
535-2
L.84
I.R.4 (Cataldaroux)
L.2342
L.2341
L.569
L.340
L.947
L.338
L.2340
L.2339
I.R.5 (No-Cut)
W.R.E.P.
BABINE
L.1357
I.R.16
444 RD
Tsezakwa Creek
480-4220
I.R.7 (Alphonse Tommy)
L.1361
518-2
574-2
518-1
Babine Lake
L.6992
SLIM'S CAMP
480-4520
574-1
380-3
522-2
380-2
380-1
575-2
575-3
576-2
576-2
575-1
576-1
522-3
JOHN FIRE 1952
Heal
Fire
575-4
522-4
573-1
TSHL 001-4
Creek
Sustwa Pass
NETALZUL MTN
480 0000
480 4746

LEGEND

- CHART BOUNDARY
- APPROVED BLOCKS
- HEIGHT OF LAND
- ROADS
- PROPOSED ROADS
- TRAILS
- BABINE LRUP SPECIAL MANAGEMENT ZONE
- FUEL MANAGEMENT CORRIDOR
- PRIVATE LAND
- WOODLOTS
- CORE ECOSYSTEMS AND FULL PROTECTION AREAS
- H HELICOPTER DROP
- ▲ RECREATION SITE / TRAIL HEAD
- PRIOR LOGGING 91/92
- PLANTED 92/93
- FREE GROWING
- GREENED UP

Proposed Harvest Year (indicated years are estimates only)
OUTLINED BLOCKS ARE CATEGORY A PROPOSED
SHADED BLOCKS ARE CATEGORY A APPROVED

2000	2006	2000	2006
2001	2006	2001	2006
2002	2007	2002	2007
2003	2008	2003	2008
2004	2009	2004	2009