EXECUTIVE SUMMARY

Triton Environmental Consultants Ltd. was retained by Pacific Inland Resources (PIR) in partnership with the Ministry of Environment, Lands and Parks (MELP) in Smithers to conduct reconnaissance level fish and fish habitat inventories in the Bulkley Forest District. This report summarzies the historical fisheries data collected by SKR Consultants Ltd and the field data collected by Trtion field crews in working unit 4. The historical fisheries data indicate that the follwoing species are present in the study area :

- coho (*O. kisutch*),
- sockeye (*O. nerka*),
- pink (*O. gorbusha*),
- steelhead and rainbow trout (*O. mykiss*),
- mountain whitefish (*P. williamsoni*),
- peamouth chub (*M. caurinus*),
- longnose sucker (*C. catastomus*),
- cutthroat trout (*O. clarkii*),
- priclky sculpin (*C. asper*)
- northern squawfish (*P. oregonensis*),
- Dolly Varden (*S. malma*).

A total of 304 sites were sampled between, 1996. Fifteen sites were classified as "Not A Creek" due to the lack of a defined channel. Fish were captured by electrofishing at 113 sites, the species sampled include Dolly Varden, rainbow trout, cutthroat trout and an unidentified sculpin species. A total of 48 sites were classified as S5 or S6, the basis for the non fish bearing status is summarized. The report also includes recommendations for resampling.

Triton Environmental Consultants Ltd.'s project team for this inventory project included:

Mr. Adam Lewis, M.Sc., R.P. Bio.	Project Manager/Crew Leader,
Ms. Julie Pavey, B.Sc., R.P. Bio.	Project Manager/Crew Leader,
Dr. Guy Martel, Ph.D.	Crew Leader,
Mr. Ryan Hill, MRM, R.P.Bio	Crew Leader,
Mr. Arne Lorenz, B.Sc.	Crew Leader,
Mr. Bruce Mattock, B.Sc.,R.P.Bio	Crew Leader,
Mr. Steve Jennings, B.Sc.	Crew Leader,
Mr. James Pegg, M.Sc.	Crew Leader,
Mr. Peter Frederiksen	Crew Leader,

Ms. Jennifer Haslett	Crew Leader,
Mr. Darrel Davis	Crew Leader,
Mr. Terry Davies	Crew Leader,
Ms. Karla Graf	Crew Leader,
Mr Ficus Chan	Field Technician,
Mr. Lucas Eades	Field Technician,
Ms. Heidi Schmit	Field Technician,
Ms. Kirsten Aichberger	Field Technician,
Mr. Eamon Miyagi	Field Technician
Mr. Jean-Francois Patenaude	Field Technician,
Mr. Hubert Karas	Field Technician,
Mr. Jim Lang	Field Technician,
Mr. Dave Warburton	GIS Coordinator,
Ms. Shannon Shields, B.A.	GIS Technician,
Mr. Derik Woo, B.A.	GIS Technician,
Ms Michelle King,B.A.	GIS Assistant,
Mr. Edward Lem	GIS Assistant,
Ms. Robyn Shortt, B.Sc.	Database Coordinator

Triton Environmental Consultants Ltd. would like to thank Mr. Alan Baxter of. Pacific Inland Resources for his assistance throughout the planning and field phases of this project. The principal contract monitor was Mr. Paul Giroux, B.C. Ministry of Environment, Lands and Parks, Smithers office. The quality assurance was conducted by Mr. Ward Prystay and Mr. Ryan Sherman. Triton Environmental Consultants Ltd. would also like to thank Mr. Dave Reynard and Mr. Steve Grey of Highland Helicopters.

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1.0 INTRODUCTION

1.1 Background

Pacific Inland Resources Ltd, retained Triton Environmental Ltd. (Triton) to conduct a reconnaissance level fish and fish habitat inventory in 14 watersheds located in the Bulkley Forest District. Triton Environmental Consultants Ltd. was retained by Pacific Inland Resources in partnership with the Ministry of Environment, Lands and Parks (MELP) in Smithers to conduct reconnaissance level fish and fish habitat inventories in the Bulkley Forest District.

Existing information on fish distribution within the watersheds under investigation, was collected by SKR Consultants LTD, in Smithers, B.C. Data from the provincial and federal government sources such as the Stream Information Summary System (SISS) and the evolving Fisheries Information Summary System (FISS) were researched for information.

The study area was broken up into 14 working units. This report summarizes historical and field data collected in working unit 11, which consists of the tributaries to the Zymoetz watershed. A total of 98 sites were sampled between September 22 and October 1 1996. Seven sites were classified as "Not A Creek" due to the lack of a defined channel. Fish were captured at 28 sites and the species sampled include :

- Dolly Varden (*Salvelinus malma*),
- rainbow trout (*Oncorhynchus mykiss*),
- cutthroat trout (*O. clarkii*).

Twelve sites were classified as non fish bearing (S5 or S6), the basis for the non fish bearing status is summarized.

Stream classification is now required under the Forest Practices Code (FPC) of British Columbia Act (Bill 40 - 1994) and the associated Operational Planning Regulation enacted in June 1995. One of the objectives of the FPC is to integrate fisheries and forestry resource management in areas proposed or approved for logging to ensure that fish habitat is protected. Stream classification is designed to identify the presence of sensitive fish habitat and species, and to assist in the determination of the appropriate riparian management areas in order to develop a responsible management strategy required for Operational Plans.

1.2 Objectives

In partnership with MELP and Repap Smithers, Forest Renewal BC (FRBC) is implementing fish and fish habitat inventories to provide information required for resource planning. Triton's goals were to describe fish distributions and habitat characteristics, and to provide stream classifications according to the Forest Practices Code. Fish and fish habitat operational inventories consist of:

- reconnaissance-level species and habitat surveys to determine values and sensitivities in areas subject to or affected by forest harvesting;
- identification of fish and fish habitat values that require special designation under the Forest Practices Code (e.g. sensitive areas); and
- new, reinterpreted, or augmented data to meet Forest Practices Code requirements for classification of areas (e.g. fish stream classification).

2.0 STUDY AREA

2.1 Location

The Bulkley Forest District is located in north central BC and contains several major tributaries to the Babine and Bulkley Rivers. The 1: 20 000 TRIM sheets that cover this working unit are: 93 L 062, 93 L 071, 93 L 072, 93 L 073, 93 L 074, 93 L 082, 93 L 083, 93 L 084.

2.2 Biogeoclimatic Zones

This unit contains 5 different biogeoclimatic zones : the SBS (Sub Boreal Spruce Zone), the SSF(Engelmann Spruce Subalpine Fir), the MH (Mountain Hemlock), the CWH (Coastal Western Hemlock) and the AT (Alpine Tundra) zones. The river valley and lower elevation tributaries are characterized by the SBS zone which has seasonal temperature extremes and moderate annual precipitation (Meidinger, D. and Pojar, J., 1991). Hybrid white spruce (*Picea engelmannii x glauca*) and subalpine fir (*Abies lasiocarpa*) are the dominant climax species, and seral stand species are Douglas fir (*Pseudotsuga menziesii*), lodgepole pine (*Pinus contorta*) and trembling aspen (*Populus tremuloides*). Both coniferous forest and wetland habitat are abundant in this zone and support many species that are either adapted to cold winters or migrate south such as moose (*Alces alces*), grizzly bear (*Ursus arctos*)and breeding Barrow's goldeneye (*Bucephala islandica*) found specifically in the wetland habitat.

At higher elevations, the ESSF zone has long, cold winters and cool, short summers, and the amount of rainfall is highly variable. Engelmann spruce and subalpine fir dominate the mature stands, Lodgepole pine dominates the seral stand after fire, and deciduous trees are not common. The steep topography and common snow avalanche tracks attract mountain goat (*Oreamnos americanus*), caribou (*Rangifer tarandus*)and grizzly bear. The subalpine parkland is common near the adjacent, higher elevation AT zone.

The AT zone is largely treeless, with stunted species at lower elevations. The AT zone is dominated by rock, snow and ice, limiting the vegetation to shrubs, herbs, grass, bryophytes and lichens. Willows (*Salix spp.*) and scrub birch (*Betula glandulosa*) are commonly found in this zone. The wildlife species that are few and far between, but well-adapted to this harsh environment include: mountain goat, gyrfalcon, white-tailed (*Lagopus leucurus*), and willow ptarmigan (*Lagopus lagopus*), water pipit, and rosy finch.

The CWH zone is the rainiest zone and is characterized by a cool mesothermal climate, with mild winters and cool summers. The most common tree species in this zone are : western hemlock (*Tsuga heterophylla*), western red cedar (*Thuja plicata*), Douglas-fir (*Pseudotsuga menziesii*). Yellow cedar

(*Chamaecyparis nookatensis*) and amabilis fir (*Abies amabilis*) are also present in the the wetter areas of this zone. In addition, shore pine (*Pinus contorta var. contorta*) is found in both dry and wet (boggy) sites.
(Meidinger and Pojar et al 96) Deciduous species found in this zone include red alder (*Alnus rubra*) and black cottonwood *(Populus balsamifera ssp trichocarpa).*

The most common large mammals found in the CWH zone include : black tailed deer (*Odocoileus hemionus*), black bear (*Ursus americanus*) and gray wolf *(Canis lupus*). Less common, are grizzly bear and mountain goat.

The MH zone, is a subalpine zone located above the CWH, and is characterized by short cool summers and long wet winters. The most common tree species found in this zone are : mountain hemlock (*Tsuga mertensiana*), yellow cedar and amabilis fir. Less abundant species in the mountain hemlock zone include : western hemlock, western red cedar, Douglas -fir, sub alpine fir and whitebark pine (*Pinus albicaulis*). Shrubs from the Ericacea or heather family are predominant.

Wildlife diversity in this zone is limited in comparison with some other zones. Large mammals found in the mountain hemlock zone frequent such areas as avalanche tracks, south facing outcrops and subalpine parklands. Black tailed deer use subalpine meadows and forest openings and mountain goat are found in rock outcrops and talus. Both species also make use of avalanche tracks. Black bear is found in all three of these habitat units. Bird species found in the mountain hemlock zone include : pileated wood pecker (*Dryocopus pileatus*), red breasted nuthatch, (*Sitta canadensis*) great horned owl (*Bubo virginianus*), white tailed ptarmigan, willow ptarmigan and golden eagle (*Aquila chrysaetos*). The majority of the bird species in this zone occur in old growth and mature coniferous forests, but some species, likewhite tailed ptarmigan, are found in rock outcrops and talus slopes and subalpine meadows. .

2.3 Watersheds Sampled

The streams sampled in unit 11 include :

- Passby Creek,
- Silvern Creek,
- Serb Creek,
- Sandstone Creek,
- Coal Creek,
- Henderson Creek,

- White Swan Creek,
- Red Canyon Creek,
- MulwainCreek,

.

A number of unnamed tributaries to the Zymoetz River were also sampled. This large working unit covers roughly 1000sq. km and comprises 12.7% of the study area. The upper Zymoetz River (Fisheries Class I waters) defines the boundaries of this working area. Historical fisheires information for this unit covers the mainstem of the Zymoetz from the Bulkley forest district boundary up to and including the headwaters, Denis and Aldrich Lakes. Fish presence has also been documented in some of the tributaries to the Zymoetz River, including the unnamed creeks draining into the south side of the upper Zymoetz near Denis and Aldrich Lakes, (440-9447 and 440-9648), Silvern Creek (up to and including Silvern Lake), Passby Creek (lower 5km), Hankin Creek (up to and including Hankin Lake), Sandstone Creek (up to and including Sandstone Lake), Coal Creek up to and including Louise Lake, unnamed creek (440-6382) and Red Canyon Creek.

2.4 Fish Species Sampled

Fish species identified in the Zymoetz working unit include:

- coho (*O. kisutch*),
- sockeye (*O. nerka*),
- pink (*O. gorbusha*),
- steelhead and rainbow trout (*O. mykiss*),
- mountain whitefish (*P. williamsoni*),
- peamouth chub (*M. caurinus*),
- longnose sucker (*C. catastomus*),
- cutthroat trout (*O. clarkii*),
- priclky sculpin (*C. asper*)
- northern squawfish (*P. oregonensis*),
- Dolly Varden (*S. malma*).

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fig.1

2.5 Access

Road access exists for the lower reaches of the streams draining into the northern shores of Aldrich, Denis and Mc Donnell Lakes and the Zymoetz River downstream to Sandstone Creek. Lower Serb Creek and the tributaries draining into the southern shores of Denis and Mc Donnell lakes are also accessible by road. The uppermost reaches of Serb Creek, Red Canyon Creek, Mulwain Creek and some of the large unnamed tributaries to the Zymoetz require helicopter access. Road access was available for some of the Mulwain Creek system, however the upper reaches of most of the Mulwain were accessed by helicopter.

2.6 Resource Use

Logging is the dominant resource actiivty in this working unit and a number of forest recreation sites are found off of the McDonnell F.S.R. Mineral deposits have been noted in the Mulwain system.

3.0 METHODS

3.1 Physical

Prior to the start of the field program 1:20,000 TRIM maps were used to estimate the location of reach breaks, determine the length of the reaches and identify potential sampling sites. The locations of these reach breaks were subsequently confirmed or modified during the field studies.

The survey was conducted by a ten person field crew working in five teams. Sites at the top of the watershed(s) were done first to determine fish presence whenever possible. DFO/MELP Stream Inventory Survey forms were filled out for each site (Department of Fisheries and Oceans and Ministry of Environment, 1989). Channel widths were measured with hipchains, meter sticks and measuring tapes and water depth was measured with a meter stick. Stream classification, whether fish bearing or non fish bearing, requires the measurement of a minimum of six channel widths. Stream gradients were measured with a Suunto clinometer. In order to allow for future verification of sampling sites, all sampling sites were permanently marked with unique flagging tape (blue and white striped) and the GPS locations of all sites were noted.

Photos were taken at each site to document field data and conditions. Canon Sure Shot A1 Prima AS-1 cameras were used for this purpose. The camera is an automatic with 32 mm lens. Photos were usually taken of both the upstream and downstream view of the stream and any characteristic features such as beaver dams. Photos were often taken of fish captured at the site. The film used was 200 ISO. **Appendix 1** documents these photos.

The report maps were generated using 1:20,000 scale TRIM base maps provided by MELP. Using ARC Info, these files were projected into UTM and coverages were created from the field sampling and stream classification data.

3.2 Biological

Fish presence/absence was determined by electrofishing and/or minnow trapping and occasionally angling. Electrofishing was conducted at all sites where it was deemed necessary. That is, where fish presence had not been determined upstream or habitat characteristics were sufficiently different from other sites. A minimum area of approximately 100 m was sampled to asceretain fish presence. The effort, or shocking time and distance shocked, was recorded for each sample site. A variety of electroshocker models were used in this study including :

- Smithroot 12 B POW ,

- Smithroot Type VII,
- Smithroot 15 A,
- Coffelt Mark 10.

The electroshockers were commonly set at 60HZ at 6MS, however adjustments were made where appropriate. Salt was not used at any of the sample sites. The fork length of each fish collected was then measured and, whenever necessary, voucher specimens were collected and stored in a 10% formaldehyde solution in plastic bags. These specimens were delivered to the Smithers office of BC Environment.

3.3 Stream Classification

The data collected from existing sources and during the field program were used to determine the riparian class as defined under the *Forest Practices Code*. **Table 1** provides the FPC definition of each riparian class.

Draft procedures are also outlined in the guidebook to determine the riparian management areas (RMA) for lakes (L1 - L4), wetlands (W1 - W5) and fisheries sensitive zones.

The summary table for all sites within the study area includes:

- the results of fish sampling;
- the average channel width (m);
- the average gradient (%); and
- the riparian class according to the FPC

A stream survey card and photograph(s) are presented for each sampling site following the order in which they are listed in the summary table. The stream survey data, for each site, is an electronic duplication of the stream survey forms completed in the field and provides additional information used by the field crew to designate a stream as fish or non-fish bearing.

An S5 or S6 classification was based on electrofishing results, substrate composition, stream gradient, general fish habitat characteristics and location of barriers that may preclude fish use in the area. The absence of fish during sampling did not rule out an S1 to S4 designation. At sites where no fish were collected but there was no reason to conclude that fish would not use the segment of creek, the reach was classified as fish bearing and given the appropriate S1 to S4 classification. Additional sampling, at different times of the year, would be required to confirm that fish do not utilize a stream reach before an

S5 or S6 final designation would be accepted. The rationale for S5 and S6 designations was summarized in conjunction with recommended sites for further sampling.

The use of 1:20,000 scale TRIM maps meant that some of the first order (headwater) streams marked on the map were not necessarily stream channels. Under the FPC's Operational Planning Regulation (June 1995) a stream is defined as:

> "... a watercourse, having an alluvial sediment bed, formed when water flows on a perennial or intermittent basis between continuous definable banks;"

During the field classification, crews would define a watercourse as "not a creek" if there were no alluvial sediments and no continuous, definable banks. Watercourses that had a substrate that consisted entirely of organic material were not considered to have an alluvial sediment bed.

4.0 Stream Flow and Water Quality

4.1 Stream Flow

The hydrological records were reviewed from Water Survey of Canada (WSC)records. An estimate of daily flows (m^3/s) was based on Water Survey of Canada Daily maxima, minima, and maximum instantaneous flows were also summarized from existing records if available. Mean annual discharge (m^3/s) was calculated from existing hydrological records.

4.2 Water Quality

As agreed with the Ministry Representative, water samples were not collected for chemical analyses. The parameters that were measured for each site, however, were turbidity, pH and conductivity. Conductivity was measured with a handheld LaMotte TDSTestr 3™ conductivity meter with a range of 0 to 1990 μS. The acceptable values of conductivity for electroshocking purposes must exceed 30 μS. The pH at each site was measured with a handheld LaMotte pHTestr 2™ pH meter. Turbidity was determined subjectively and it was stipulated by the ministry representative during the quality assurance phase of the project that the depth of the deepest pool would be the default value in the database when the water was clear to the bottom.

Water temperatures during this period ranged between 1 and 12°C. Table 2 summarizes the temperature, pH, conductivity and turbidity measurements collected during the course of this inventory project. The average water temperature was 5.1°C. The pH values ranged from 7.0 to 8.0, with an average pH of 7.5. The conductivity ranged from 20 to 120 (umhos/cm) with an average value of 56.47.

tab.2

5.0 RESULTS AND DISCUSSION

The survey took place between September 22 and October 1 1996. The mean air temperatures ranged from 3 to 12.7°C. A total of 98 sites were sampled and only 8 sites were classified as "Not a creek" due to a lack of defined channel. The flow stages ranged from dry to medium. Most streams could be sampled by electrofishing. .The summary information for all sites is listed in Table 4. Histograms of the fish species sampled during the study .

5.1 Coal Creek (440-7411-000) (93 L 082)

5.1.1 Sensitive Habitats and Barriers

The mainstem of Coal Creek is 14.1km in length and flows southwest from Louise Lake. At roughly 4.5 km from the mouth the stream begins to flow south toward the Zymoetz River. Coal Creek is characterized by low gradient and is periodically confined. A total of 33 tributaries flow into Coal Creek. Many of the tributaries to this system contain a number of small lakes, ponds and wetlands which provide additional rearing habitat. A 2 m falls was noted in the historical information 4.5 km from the mouth. The Coal Creek mainstem was sampled in reaches 1, 3 and 5 and its tributaries were sampled in 25 locations. The upper reaches of a number of the tributaries as well as reach 5 of the mainstem , have large wetlands.

5.1.2 Fish Summary Tables and Stream Classification

The historical records indicate the presence of steelhead, coho, cutthroat and rainbow trout at the mouth. Steelhead are also indicated 1.8km from the mouth while steelhead, coho, Dolly Varden and cutthroat are indicated 2.4 km from the mouth. Dolly Varden, steelhead and rainbow trout have also been documented in Louise Lake, which is reach 4 of Coal Creek. Rainbow trout were caught by electrofishing in reach 1 and cutthroat trout were caught by electrofishing in reach 5. Cutthroat trout were caught by electrofishing in two tributaries to reach one, one tributary to reach 2, two tributaries to reach 3 and in one tributary to reach 5. Dolly Varden were captured by electrofihsing in reach 3 and in a tributary to reach 4. Fish were typically caught in the lower reaches of these tributaries, as many have steeper gradient in the upper reaches. This appears to be a highly producetive system, with abundant rearing and spawning opportunites. The presence of steelhead in reaches 1 and 4 of Coal Creek makes this system particularly important and perhaps sensitive.

The mainstem of Coal Creek was classified as an S2 in reach 1, based on an average channel width of 7.4 m and the presence of rainbow trout in the sampling area. It was classified as S4 in reaches 3 and 5, based on the presence of fish in the sampling areas and avergae channel widths of 1.35 and 1.03 meters respectively. The tributaries are S3 and S4 sized streams, with only 13 small reaches classified as non fish bearing based on steep gradient.

5.2 Henderson Creek (440-9871-000) (93 L 074)

5.2.1 Sensitive Habitats and Barriers

The mainstem of Henderson Creek is 5.9 km in length and flows southwest from the steep headwater region through reach 2. Reach 1 continues to flow southwest but at a much lower gradient. The stream eventually flows south into Aldrich Lake. A mine is located near the channel in reach 1. The TRIM sheet indicates steep gradient in reach 2, however, the gradient was only 10% in the sample site located in reach 2 and the some good rearing habitat was identified. Further sampling of this reach is reccommended as the gradient increased above and below the road crossing. Sloan Creek, one of the larger tributaries to Henderson Creek, was sampled in rach 2 and was classified as non fish bearing due to steep gradient and unfavourable habitat associated in part with low flow. At the time of sampling, the flow was very limited. The historical information indicates the presence of a falls at reach 4, howver fish distribution in the mainstem is most likely limited to reach 3.

5.2.2 Fish Summary Tables and Stream Classification

No historical information exists for Henderson Creek, however, it flows into Aldrich Lake, which is known to support steelhead, rainbow trout, mountain whitefish, Dolly Varden, sockeye, coho, longnose sucker and peamouth chub. No fish were caught in this system, which was sampled in both 1996 and 1997. Henderson Creek has been classified as an S2 in reach 1, based on an average channel width of 12.5m. It may be significant to note that reach 1 was totally dry at the time of sampling in 1996. Sloan Creek was classified as an S5 based on steep gradient and a lacl of suitable habitat. White Swan, a tributary to Henderson Creek that will be discussed in a lter section, was classified as an S3 in reaches 1 and 2. The two unsampled tributaries have been classified as non fish beariang due to extreme gradient.

5.3 Passby Creek (440-8930-000) (93 L 073, 93 L 083,)

5.3.1 Sensitive Habitats and Barriers

The mainstem of Passby Creek is 16.6 km in length and flows northwest from the headwaters, to south in reach 2 and most of reach 1. It then flows southwest into the Zymoetz River. This creek is quite confined from the headwaters through to reach 1. The valley walls are moderately steep to quite steep in the headwater region. The creek itself has generally low gradient, particularly near the mouth. A total of 38 tributaries flow into Passby Creek, a number of which are characterized by steep gradient. A large side channel roughly 720 m in length occurs in reach 1. A 2 m high beaverdam was noted in the historical information at reach 2. The mianstem and the tributaries to Passby Creek were sampled in 21 locations.

5.3.2 Fish Summary Tables and Stream Classification

The historical information indicates the presence of coho, steelhead, cutthroat, Dolly Varden and rainbow trout at the mouth of Passby Creek , Dolly Varden at 1.8km from the mouth and coho and rainbow trout at 4.7km from the mouth. Fish sampling was conducted by electrofishing at the majority of the sites which resulted in the capture and or observation of fish at 11 sites. Dolly Varden were caught in reaches 1 and 2 and rainbow trout were observed in reach 1 near the mouth. The mainstem of Passby Creek was classified as an S2 , based on the 5.1m and 18.4m average channel widths obtained in the sampling areas A27 and K62 respectively, as well as the presence of fish and fish habitat at both sites (see Table 4). An S1 classification may be likely downstream of K62 as the channel moves over a low gradient area and has a very wide flood zone (see K62 stream card). The majority of tributaries sampled were classified as S3, with some S4 and S2 classifications. Rainbow trout, cutthroat trout and Dolly Varden were caught in the several of the tributaries sampled.

One particularly large tributary to Passby Creek (440-8913-000) was sampled in 14 different areas. The historical records indicate that steelhead, coho, cutthroat, Dolly Varden, and rainbow trout are present in reach 3. Steelhead spawning was also indicated at the reach 1/reach 2 break. Fish were caught by electrofishing at 4 of these sites and were visually observed at 1. This stream was classified as an S2 in reaches 1 and 3 based on average channle widths of 8.62 m and 5.95 meters respecctively and the presence of fish in the sampling areas. Rainbow trout were captured in reach 1 and Dolly Varden and cutthroat trout were captured in reach 3.

INSERT CARDS/PHOTOS

5.4 Sandstone Creek (440-7670-000) (93 L 082)

5.4.1 Sensitive Habitats and Barriers

The mainstem of Sandstone Creek is 9.8 km in length and flows southwest from fish bearing Sandstone Lake. At the mouth it flows directly south into the Zymoetz River. On the whole Sandstone Creek is a low gradient stream with stretches of moderate confinement. A steep right bank occurs in the headwater region. Thirteen tributaries flow into Sandstone Creek A beaver dam was noted 420 m upstream from the mouth in the historical information and a large network of wetlands was noted in reach 3. This system was sampled at 8 locations. The mainstem was sampled in reaches 1 and 3 and 6 of its tributaries were sampled.

5.4.2 Fish Summary Tables and Stream Classification

The historical records indicate the presence of cutthroat trout, rainbow trout and Dolly Varden at the mouth, as well as Dolly Varden and cutthroat trout upstream in Sandstone Lake. Two sites were electrofished in 1996, with cutthroat trout caught in the mainstem in reach 1. Rainbow trout were caught in by electrofishing in reach 3 and cutthroat trout were caught by electrofishing in a tributary to Sandstone Lake in 1997. The mainstem of Sandstone Creek was classified as an S3 in reach 1, based on an average channel width of 4.1m and the presence of cutthroat trout in the sampling area. It was classified as an S3 in reach 3, based on the presence of fish and an average channel width of 1.5m. Four S4 sized streams, one S3 and one "NC" were identified by sampling crews working in this watershed. The remaining unsampled tributaries appear to be S4 sized streams.

INSERT SITE CARDS/PHOTOS

5.5 Serb Creek (460-8150-000) (93 L 072, 062)

5.5.1 Sensitive Habitats and Barriers

The mainstem of Serb Creek is roughly 29.9 km in length and flows northeast from the headwaters into reach one, where it then flows north into the Zymoetz River. The headwaters of reach 4 are quite confined and many of the tributaries are closely associated with icefields. Downstream, the valley broadens considerably and the channel fans out. Several large, fisheries sensitive zones are noted in reach 3. Small lakes in close proximity to the main channel are also abundant for roughly 3 km of this reach. Extensive side channels are also found in reach 3 and part of reach 2. Significant barriers were identifed at six locations in tributaries to this system, which typically identify the upper limits of fish distribution in a given creek (see Table 3). It is interesting to note that fish were captured in a very large tributary to reach 3 of Serb Creek, above a 7 m falls and a 4m cascade. This creek is not fed by a large lake supporting resident fish populations so the presence of fish at this site is quite unique. A total of 52 tributaries flow into the mainstem. On the whole Serb Creek runs at a low gradient and the historical records indicate Dolly Varden high up in the watershed in reach 3. The Serb Creek watershed was sampled in over 25 locations, including the mainstem.

5.5.2 Fish Summary Tables and Stream Classification

The historical records indicate Dolly Varden and steelhead at the mouth of Serb Creek. Dolly Varden are also indicated 21 km from the mouth while steelhead are indicated at 9 km from the mouth. Bulltrout, identified using the formula created by Gordon Haas, were captured by electrofishing in a tributary to reach 3, in a side channel area and Dolly Varden were captured by electrofishing in 4 tributaries to reach 3.

Serb Creek was classified as an S1 in the headwaters, based on an avergae channel width of 36.83m and the presence of fish habitat. A number of S1 sized tributaries were identified in this reach. The entire upper watershed appears to be subject to real blowout, with a huge flood zone identified at Z69 and ragged new banks identified at Z76, both classified as S1. The lower reaches of the tributaries sampled in this inventory are either fish bearing or have been classifeid as fish inferred based on the presence of fish and or fish habtiat. Cacade and falls barriers were identified in many of the tributaries to this system and typically they represent the upper limit of fish distribution in the streams. For example, multiple cascade barriers as well as a 5m falls were identified on the tributary sampled at Z71. No fish were caught above these barriers despite the presence of excellent fish habitat.

5.X Silvern Creek (440-90553-000) (93 L 073, 074, 93 L 083, 084)

5.5X.1 Sensitive Habitats and Barriers

The mainstem of Silvern Creek is 11.8 km in length and flows in a southerly direction, from two headwater lakes (including Silvern Lake) through most of reach 1. It then flows southwest into the Zymoetz River. Silvern Lake is fish bearing and surrounded by marshes. Silvern Creek is quite confined in the upper reaches below the two lakes. The valley walls are quite steep through reach 2. The confinement lessens considerably beyond this point. Reach 1 of Silvern Creek is characterized by relatively low gradient. A total of 27 tributaries flow into Silver Creek. The mainstem of Silvern Creek was sampled in reaches 1,2 and 3 and the tributaries were sampled at 5 locations.

5.X.2 Fish Summary Tables and Stream Classification

The historical records indicate the presence of coho, Dolly Varden, sockeye and steel head at the mouth of Silvern Creek. Dolly Varden are also indicated in Silvern Lake. Dolly Varden were caught by electrofishing in reaches 1 and 3 of the mainstem and in 2 of the tributaries. The mainstem of Silvern Creek is classified as an S2 in reach 1 based on the 8.7 m average channel width and the presence of fish and fish habitat. It was classifeid as an S2 in reach 2, based on an average channel width of 10.80m and the presence of fish habitat and as an S3 in reach 3 based on the presence of Dolly Varden and an average channel width of 4.43m. Two Silvern Creek tributaries , an S3 and an S4, were sampled in 1996 but only one was confirmed as fish bearing. One S4 and two S3 sized tributarires were identified in 1997 but no fish wer caught. Many of the tributaries to Silvern Creek are characterized by steep gradient and can be classified as non fish bearing.

5.X White Swan Creek (440-9871-263) (93 L 074)

5.X.1 Sensitive Habitats and Barriers

The mainstem of White Swan Creek is 3.2 km in length and flows southwest from the headwaters in reach 2. This reach is characterized by steep gradient. Reach 1 of this stream flows west into Henderson Creek. This reach is characterized by low gradient and appears to be accessible to fish. No tributaries to White Swan Creek were noted on the map. This stream was sampled in reach 1 and in reach 2.

5.7.2 Fish Summary Tables and Stream Classification

No historical records were found for White Swan Creek and no fish were caught on the sampling area. However, this stream flows into Henderson Creek, which flows into the fish bearing Aldrich Lake. No obvious barriers appear on the TRIM sheet between Henderson Creek and Aldrich Lake, and between Henderson Creek and White Swan Creek. As a result fish presence has been inferred. Aldrich Lake is

known to support coho, steelhead, rainbow trout, peamouth chub, cutthroat trout, mountain whitefish, longnose sucker and sockeye. Reaches 1 and 2 of White Swan Creek were classified as an S3 based on avergae channle widths of 2.07 and 2.37m and the presence of suitable fish habitat. No fish were caught at either of the two sample sites.

5.X Zymoetz River (440-0000-000) (93 L 071, 072. 073, 074)

5.X.1 Sensitive Habitats and Barriers

No barriers were observed on the Zymoetz mainstem. Roughly 83.1km of the Zymoetz River flows through Unit 11. The upper reaches of this river are characterized by low gradient. Side channels, wetlands, oxbow lakes and three large fish bearing lakes : Mc Donnell, Denis and Aldrich Lakes, occur along the mainstem. This system is fed by a very large system of tributaries, including Serb Creek, Red Canyon Creek and Mulwain Vreek. Overall the habitat in this river is variable and well suited to fish..

5.X.2 Fish Summary Tables and Stream Classification

The historical records indicate that the Zymoetz River supports spawning sockeye, cutthroat, Dolly Varden, rainbow trout, coho and steelhead. Prickly sculpin, mountain whitefish and longnose sucker have also been recorded in the Zymoetz River. The historical records indicate the presence of the following species in Aldrich Lake :

- steelhead,
- rainbow trout,
- cutthroat trout,
- Dolly Varden,
- longnose sucker,
- peamouth chub,
- mountain whitefish,
- coho,
- sockeye.

The records indicate the following species in Denis Lake :

- cutthroat,
- Dolly Varden,

- northern squawfish,
- sockeye,
- pink,
- coho, steelhead,
- rainbowtrout,
- sculpins.

The records also indicate the presence of the following species in Mc Donnell Lake :

- cutthroat,
- Dolly Varden,
- peamouth chub,
- steelhead,
- coho,
- sockeye,
- rainbow trout,
- longnose sucker,
- prickly sculpin.

A total of 67 sites were electrofished in the Zymoetz watershed,and fish were caught and/or observed at 29 Dolly Varden, cutthroat trout and rainbow trout were the species caught in the sampling areas (see Appendix).

The Zymoetz River is an S1 for much of its length. It was not sampled in this project as fish presence is well documented for the mainstem. Many unnamed tributaries to the Zymoetz watershed were sampled in this study. They have typically been classified as S3's and to a lesser degree S4 with occasional S6 classifications. Two notable tributaries were sampled at K76 and J219. The mainstem of K76 is 7.7km in length and flows northeast at a fairly steep gradient, from the headwaters in reach 3. The gradient lessens in reach 2 where the flow travels primarily north and northwest. Reach 1 is characterized by low gradient and flows northwest into the Zymoetz River. This large tributary, which is fed by 5 smaller tributaries, was sampled in reach 1 and classifed as an S2 based on a 5.8 m average channel width (see Table 4). Rainbow trout and Dolly Varden were captured by electrofishing at this site. the historical information indicates the presence of Dolly Varden high up in this drainage. The smaller tributaries feeding into the main channel appear to be primarily S3 with some S4 sized streams. The upper reaches of three of these tributaries have steep gradient and can be classified as non fish bearing. The mainstem of the tributary

sampled at J219 is 4.5 km in length and flows northeast from the headwaters in reach 2, then north in reach 1 inot the Zymoetz River. Cutthroat trout were captured by electrofishing at this site. No historical information is avaialbe for this tributary, however, it is closely associated with the Zymoetz mainstem and Denis Lake. This tributary has been classified as an S3, based on an average channel width of 1.9m. One small S4 sized tributary feeds into this stream.

5.X. Mulwain Creek (440-6382-000) (93 L 071, 93 L 081, 103I090, 103I100

5.X.1 Sensitive Habitats and Barriers

Mulwain Creek is 25.9 km in length and if fed by 56 tributaries. The mainstem has low gradient and moderate flow in reach 1, providing great spawning habitat. Barriers were noted on several tributaries to Mulwain Creek, which typically delinate the upper limits of fish distribution on those tributaries (see Table 3). For example a 12m cascade was identified ay Z178, located on 103I090. Fish were not caught above this barrier. A set of falls below site Z176 on 103I 100, delinate the upper limits of fish distribution in the large tributary to the upper Mulwain. Reach one of Mulwain Creek has Canyon Like confinement but low gradient. Reach two is less confined and still has low graidient. Reaches 3 and 4 comprise the headtwaters, located in a plateau. Reach 4 is the large lake feeding this system.

5.X.2 Fish Summary tables and Stream Classification

Rainbow trout are historically present at 14.4 km from the confluence with the Zymoetz River and were caught by electrofishing in reaches 2 and 3 of the mainstem and in three tributaries in this inventory. Dolly Varden were caught by electrofishing in 17 tributaries and were visually observed in 2 tributaries to Mulwain Creek.

Mulwain Creek was classified as an S2 in reach 2 based on an average channel width of 13.98 meters and the presence pof fish in the sampling area and as an S3 in reach 3 based on an average channel widht of 1.95 m and the presence of fish in the sampling area. The tributaries to this stream range in size from S2 to S4, with the upper reaches of some tributaries classified as non fish bearing due to the presence of barriers or steep graident.

5.X Red Canyon Creek (440-6208-000) (103I 080, 103I 090, 93 L 081, 93 L 071)

5.X.1 Sensitive Habitats and Barriers

Red Canyon Creek is 16.24 km in length and is fed by 36 tributaries. Spawning and rearing habitat were identified in reach 1, however reaches 2 and above have been classified as non fish bearing due the lack of evidence of resident populations above a 6m cascade on the mainstem. A number of the tributaries above this casacde have barriers of their own, for example an 8m falls was identified above site Z148, on a large tributary to reach 2 of Red Canyon. Reach 1 of the mainstem is a wide low gradient channel , while reach 2 is considerably more confined with a series of cascades and moderate gradient.

5.X.2 Fish Summary Tables and Stream Classification

Rainbow trout, cutthroat trout and Dolly Varden are historically present at the confluence with the Zymoetz River. Bulltrout, identified with the formula and Dolly Varden were captured by electrofishing in reach 1 of Red Canyon Creek., which was classified as an S1 based on an average channel width of 25.20m and the presence of fish inteh sampling area. No fish were caught in the 12 sample sites located above the 6m cascade identified in reach 2, despite the presence of some excellent fish habitat, particularly at Z148 and Z149 on 103I 090. Two fair sized lakes occur above reach 1 in the Red Canyon system, but do not appear to support fish as no fish were caught above the barrier. Reach 2 of the mainstem has been classified as an S5 based on an average channel width of 11.02 m and absence of fish in the sampling area. This reach is fed by three S5 sized streams and 5 S6 sized streams.

6.0 CONCLUSION AND RECOMMENDATIONS

tab.4

The Riparian Management Areas (RMA) around streams, lakes and wetlands consist of a riparian management zone, the width which is determined by the presence of fish species and channel width. The retention of streamside vegetation is required to protect water quality, stabilize stream banks, regulate water temperature, and supply woody debris to the stream channel. The RMA can consist of both a management zone and of a reserve zone. Timber harvesting is not permitted within the reserve zone of the RMA and there are recommended management practices for the management zone.

Table 5 summarizes the specified Riparian Management Area (RMA) which is adjacent to the stream. The RMA extends from the top of the stream bank to the slope distance specified in the table.

The recommended management practices for these classifications are as follows:

S1, S2 and S3 Streams (fish-bearing)

The RMA adjacent to these creeks contain a reserve zone and management zone whose objective is to reduce the risk of windthrow to the reserve zone and provide opportunities for meeting wildlife tree objectives.

tab.5

S4 Streams (fish-bearing)

S4 streams have a management zone of 30 m and do not have a reserve zone, with the exception of a 10 m reserve zone required in the interior where the risk of windthrow is considered low. The management objectives are to reduce the risk of windthrow to the reserve zone and retain all high valued wildlife trees contained in the reserve zone.

S5 and S6 Streams (non fish-bearing)

S5 and S6 streams do not have a reserve zone. The management zone should maintain wildlife habitat, provide a source of large woody debris and root networks for bank stability, and shading for stream temperature control.

Gullies or "Not a creek"

It is also noted that several waterways shown on the maps were classified as "not a creek" as they did not meet the definition of a stream. A stream is a watercourse formed when water flows between continuous definable banks. These drainages are usually gullies and will need to be included in the gully assessment procedure.

Gullies are defined in the Forest Practices Code by channel dimensions. A gully channel has:

- greater than 25% overall stream gradient from the fan apex to the top of the headwall; and,
- from the fan apex to the top of the headwall, at least one stream reach greater than 100 m long, with

  ≥ 40 % sidewall slope

  ≥ 20 % channel gradient

  ≥ 3 m gully height.

A stream channel must have both of these attributes to be defined as a gully. The majority of field observations were of transport zones which is often a confined, V-notch ravine. The sediment transported from gullies can have detrimental effects on fish habitat in downstream channels. Gully management goals should maintain channel stability and the natural rates of erosion and transport of sediment and debris.

7.0 REFERENCES

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