3377/ WP#T-1219

Reconnaissance (1:20,000) Fish and Fish Habitat Inventory of the Shelagyote River

(Shelagyote River Planning Area) WSC 480-069500 to WSC 480-195700

Attachment VII Bull Trout Inventory

Prepared for:

NWBC Timber and Pulp.
4900 Keith Avenue
Terrace, BC
V8G 5L8

Prepared by:

TRITON
ENVIRONMENTAL CONSULTANTS LTD.

PO Box 88
Terrace, BC Canada V8G 4A2
Phone: (250) 635-1494
Fax: (250) 635-1495
www.triton-env.com

Bull Trout (*Salvelinus Confluentus*) Inventory in the Shelagyote Watershed

WSC 480-195700

Prepared for:

NWBC Timber and Pulp.
4900 Keith Avenue
Terrace, BC
V8G 5L8

January 2003

Prepared by:

TRITON
ENVIRONMENTAL CONSULTANTS LTD.

#300-4546 Park Avenue
Terrace, BC V8G 1V4
Tel: (250) 635 1494 Fax: (250) 635-1495

Report Reviewed by:

Tom Watson, Ph.D., R.P. Bio.

PROJECT REFERENCE INFORMATION

MELP Region:	06
MELP District:	Skeena
FW Management Unit:	6-7
Fisheries Planning Unit:	North Coast
DFO Sub-district:	4D
Forest Region:	Prince Rupert
Forest District:	Kispiox

WATERSHED INFORMATION

Watershed Group:	Babine River
Watershed Code:	480-000000-00000-00000-0000
UTM at Mouth:	NA
Watershed Area:	579 km^2
Total of All Stream Lengths:	1637 km
Stream Order:	6th (largest)
NTS Maps:	93M/11 93M/14 94D/03
TRIM Maps:	94D.004 93M.093 93M.094 93M.095 93M.083 93M.084 93M.085 93M.073 93M.074 93M.075 93M.063 93M.064 93M.065 93M.055
BGC Zones:	SBS, ESSF, AT
Air Photos:	BCB92074 #29-44 BCB92073 #17-25, 33, 125-137 176-193 BCB92052 #16-30, 65, 68, 151-171 212-223 BCB92072 #189-193 BCB92050 #99-123, 216-229 BCB92049 #18-27, 148-161, 199-209 BCB92092 #66-67 BCB92093 #177-179, 54-68 BCB92090 #23, 214-225 BCB92079 #25 BCB92119 #129-139, 163-167

CONTRACTOR INFORMATION

Project Manager:	Jason Harris, Fisheries Technician Triton Environmental Consultants Ltd. (Terrace) P.O. Box 88, Terrace, BC, V8G 4A2 Courier: #300-4546 Park Avenue, Terrace, BC, V8G 1V4 (250) 635-1494 fax (250) 635-1495 e-mail: jharris@triton-env.com
Field Crew:	J. Harris, J. Dorey, S. Giesbrecht, E. Lem, J. Anaka, S. Hartman, D. Taft.
Report Prepared by:	J. Harris
GIS Services:	Triton Environmental Consultants Ltd. (Prince George) Technician: K. Strong Courier: #201-1157 Fifth Avenue, Prince George, BC, V2L 2Y8 Phone: (250) 562-9155 Fax: (250) 562-9135
Fish Ageing:	Paul Graveline North/South Consultants Inc. 2-1475 Chevrier Blvd. Winnipeg, Manitoba, R3T 1Y7 Phone: (204) 284-3366 Fax: (204) 477-4173

ACKNOWLEDGMENTS

Triton would like to thank the following Ministry of Water, Land and Air Protection (MWLAP) staff: Darren Fillier and Ron Tetreau for their assistance in the field phases of this project. Paul Giroux MWLAP provided technical assistance during all phases of this project and his help is greatly appreciated. Todd Mahon (WildFor Consulting Ltd.) provided field assistance and discussion with this project and his contributions are appreciated.

Forest Renewal BC – a partnership of forest companies, workers, environmental groups, First Nations, communities and government, provided funding for this inventory. Forest Renewal BC funding – from stumpage fees and royalties that forest companies pay for the right to harvest timber on Crown lands – is reinvested in the forest, forest workers and forest companies.

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ATTACHMENTS AVAILABLE AT MELP REGIONAL OFFICE

1.0 INTRODUCTION

Triton Environmental Consultants Ltd. (Triton), was retained by NWBC Timber and Pulp – Carnaby Operations to obtain preliminary life history, distribution and habitat information for the bull trout (*Salvelinus confluentus*) population within the Shelagyote River watershed. Currently there are no forest development activities or road access in the Shelagyote River watershed. Within the next 5 years, NWBC Timber and Pulp plans on developing road networks to access cutting permits within the watershed. The Ministry of Sustainable Resources Management (MSRM) is concerned that these activities will allow angler access into the watershed and potential access to key bull trout spawning, rearing, staging and overwintering habitats within the Shelagyote River watershed. Increased access may adversely affect bull trout populations from increased angler pressures and habitat infringement.

In British Columbia, bull trout are species of concern and designated as 'blue listed' by the BC Conservation Data Center (2002). Blue listed species are considered to be vulnerable because of characteristics that make them sensitive to habitat degradation. The Shelagyote River has been considered a major spawning tributary for the Babine River bull trout population. The results of this work will provide baseline information for best management decisions and may be used to direct future, more intensive research within the watershed. This bull trout inventory was completed concurrently with the Fish and Fish Habitat Inventory being conducted by Triton (2003) within the watershed.

The specific objectives of the bull trout inventory were as follows:

1 To determine bull trout distribution within the watershed and develop habitat descriptions and habitat rankings for reaches/sub-reaches/sites as it pertains to adult bull trout staging, rearing, overwintering and/or spawning.
2 Ground surveys within suspected and confirmed juvenile bull trout rearing reaches to better document the distribution and habitat of bull trout within these reaches.
3 Conduct adult bull trout sampling to collect life history information.

The results of this project are presented on the 1:50,000 scale overview map (Appendix II) and in the body of this report. Additional information and more comprehensive results are presented in the 1:20,000 Fish and Fish Habitat Inventory Report, completed by Triton (2003) for the entire watershed (Attachment available at Ministry of Water Land and Air Protection (MWLAP), Smithers, BC).

1.2 Project Location

The Shelagyote watershed is located within the Babine watershed approximately 57 km northeast of Hazelton, British Columbia (Figure 1). The Shelagyote watershed encompasses an area of 57,864 ha within the Atna mountain range. The Shelagyote River is a tributary to the Babine River which flows into the Skeena River, ultimately draining into the Pacific Ocean.

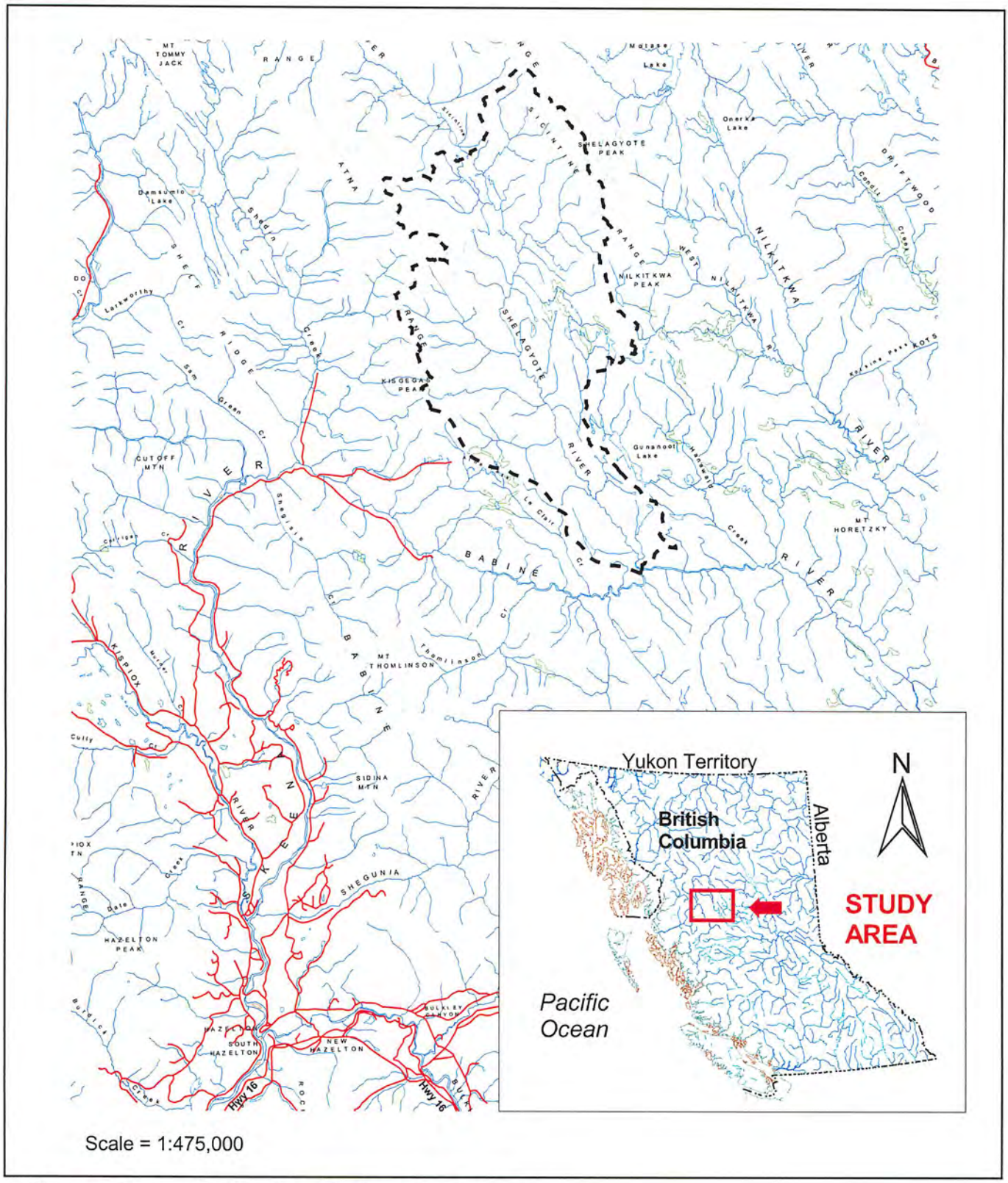


Figure 1. Shelagyote River Watershed area locational map.

The Shelagyote River mainstem is 55 km long characterized by the prevalence of steep mountainous terrain. The headwater portions of mainstem and many of the larger tributaries (order >4) have a high percentage of glacial ice and steep land. The elevation gain is from 550 – 1885 m beginning at the confluence of the Babine River and extending to the upper most reach break on the Shelagyote mainstem.

The Shelagyote River flows in a north to south direction with most of the tributaries having an east or west aspect. Biogeoclimatic zones within the watershed include; Sub-Boreal Spruce (SBS), Engelmann Spruce Subalpine Fir (ESSF) and Alpine Tundra (AT). Most of the SBS, ESSF, and AT has low capability for agriculture due to adverse climate, topography, bedrock, stoniness or poor drainage (Meidinger & Pojar, 1991).

1.3 Historical Data

In addition to the data collected by Triton (2003), MWLAP (Skeena Region) collected comprehensive data. To date three MWLAP bull trout sampling events have taken place along the Shelagyote mainstem. The results of these efforts have been included in the tables and text of this report with permission from Paul Giroux, MWLAP Skeena Region, Fisheries Biologist. Fish sampling was conducted within the Shelagyote watershed by MWLAP beginning on April 26, 2000 and ending November 8, 2001. MWLAP sampling results are summarized by Beere (2000) and Giroux (2000, 2001) respectively.

Fisheries Information Summary System (FISS) records indicate that chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), steelhead (*O. mykiss*), rainbow trout (*O. mykiss*), Dolly Varden (*Salvelinus malma*), and bull trout are present in the Shelagyote River watershed (BC Ministry of Environment, Lands and Parks, and Department of Fisheries and Oceans, 1995).

2.0 METHODS

2.1 Habitat Descriptions and Rankings

The objective of this component was to identify and document the habitat characteristics of reaches within the Shelagyote River and mainstem sections of its largest tributaries, and to provide ratings/rankings of those reaches for the various life history requisites of bull trout.

Crews used a helicopter to point sample various sites along the Shelagyote mainstem. Sites were selected arbitrarily based on access and the potential to support bull trout habitat requisites. Sites were surveyed with respect to (but not limited to) adult rearing, adult staging, spawning and overwintering habitat. Habitat parameters at each site were compared to the physical parameters described by McPhail and Baxter, 1996 as well as observations and comparisons of habitat types within the watershed. Habitat utilization was compared to previously assessed bull trout sites and habitat rankings followed a 3

class rating system; High - (confirmed) Moderate (potential) and Low (low potential/negligible).

The overall habitat ranking was assigned based on the presence of habitat (described below) and comparisons to other sites within the watershed that contained various habitat parameters. The scoring followed a 3 point score for High, a 2 point score for Moderate and a 1 point score for Low. The scores were then averaged to give an overall ranking. The habitat ranking were as follows: 4-6 points = Low, 7-9 points = Moderate and 10-12 points = High. The overall ranking for a site which contained Low (1) staging, Moderate (2) rearing, Low (1) overwintering, and Low (1) spawning would be Low, score=5. If the site was a bull trout capture site then an additional point was given, weighting the staging areas.

Table 1 shows the habitat parameters that were used in evaluating rearing, spawning, staging and overwintering habitat for adult bull trout within the Shelagyote River.

Table 1. Habitat parameters and criteria used for habitat rankings.

Rearing Habitat	Habitat Parameters used for Evaluating Adult Bull Trout Rearing Habitat	frequent deep (>75 cm) pools
		occasional large (>1.5 m deep) pools
		deep runs along river banks
		functioning LWD
		moderate gradient (5 - 10%)
		perennial flows
		diverse habitats
	Low Habitat Potential for Adult Bull Trout	low habitat complexity
		lack of cover
		shallow average water depths
		lack of resting
		lack of significant pools
		high gradients (>10%)
	Moderate Habitat Potential for Adult Bull Trout	a combination between high and low habitat potentials with no fish captured or observed at site during the sampling events
	High Habitat Potential for Adult Bull Trout	fish were captured or observed at site during the sampling events
Spawning Habitat	Habitat Parameters used for Evaluating Adult Bull Trout Spawning habitat	abundant accumulations of gravels (>10% of total habitat area), <20 mm in size
		perennial flows
		moderate to low gradients (0 - 10%)
		moderate to low water velocity (0.03 - 0.8 m/sec)
		proximity to cover (cutbanks, log jams, pools, overhanging vegetation, etc.)
	Low Spawning Potential for Adult Bull Trout	lack of significant accumulations of gravels suitable for spawning (<10% of total habitat area), >20mm in size
		high proportion of fines mixed with gravels
		high average water velocity (>0.8 m/sec)
		high gradients (>10%)
		turbulent flows
		lack of cover
	Moderate Spawning Potential for Adult Bull Trout	a combination between high and low habitat potentials with no fish captured or observed at site during the sampling events
	High Spawning Potential for Adult Bull Trout	fish were captured or observed at site during the sampling events
Staging Habitat	Habitat Parameters used for Evaluating Adult Bull Trout Staging Habitat	frequent large (>10 m diameter, >1 m deep) deep pools
		occasional very large (>15 m dia, >1.5 m deep) deep pools
		pools associated with log jams
		canyon sections
		plunge pools below cascades and falls
	Low Staging Potential for Adult Bull Trout	shallow pools (<0.5 m deep)
		riffles
		high average water velocity (>0.8 m/sec)
		infrequent resting
		infrequent holding
		high gradients (>10%)
	Moderate Staging Potential for Adult Bull Trout	a combination between high and low habitat potentials with no fish captured or observed at site during the sampling events
	High Staging Potential for Adult Bull Trout	fish were captured or observed at site during the sampling events
Overwintering Habitat	Overwintering habitat was assessed by field crews on the ground and crews considered winter flows and freeze up conditions while completing stream walks and spawner surveys.	

Figure 2. Rearing habitat identified within the Shelagyote River.

Figure 3. Potential spawning location within the Shelagyote River watershed. Inset shows size of spawning gravels present.

Figure 4. Staging habitat identified within the Shelagyote River.

Figure 5. Overwintering habitat identified within the Shelagyote River.

2.2 Stream Walks and Spawner Surveys

Stream walks and spawner surveys were conducted in selected reaches to determine the occurrence and distribution of spawning, rearing and staging areas for bull trout. Reaches were selected based on the results of the 1:20,000 Fish and Fish Habitat Inventory that was conducted within the watershed. Streams were selected based on juvenile bull trout captures, accessibility of spawning habitats from the Shelagyote River and location of potential spawning sites in relation to adult bull trout capture locations.

Streams were accessed by helicopter and an aerial reconnaissance was conducted to determine the upper extent of fish distribution. The aerial reconnaissance helped to locate key habitat features such as barriers, debris jams, staging areas and potential spawning locations. Field surveys were conducted by two person crews and crews were supplied with location maps, aerial photographs, Geographic Positioning (GPS) units, and fish sampling gear. Resource Inventory Committee (RIC) site cards were completed for the reaches surveyed and the information was captured in the RIC Field Data Information System (FDIS).

Crews completing stream walks within suspected spawning streams looked for spawning adults and potential redd sites. Attention was placed on habitats that were considered to have the potential for supporting bull trout spawning and staging. Deep pools (>1 m deep) and cover were carefully probed and crew members often tried to chase fish from dense cover into view by placing one member at the lower end of the pool while the other member walked through the deepest portion of the pool or run.

2.3 Adult Sampling

Fish sampling was conducted within the Shelagyote watershed over the period of April 26, 2000 to September 21, 2002 inclusive. Mainstem and deep tributary pools were the primary habitats sampled for fish. Sampling methods included angling, electrofishing and visual observation.

Captured bull trout were anaesthetized in 1:10 parts clove oil/ethanol at a concentration of 1:4,000, clove oil/ethanol to water. Fork lengths were determined on anaesthetized fish and a 1 cm fin ray clip was collected from the front leading edge of the pectoral fin. Sampled fin rays were submitted to North/South Consultants of Winnipeg, Manitoba for ageing.

Gender, maturity and condition were determined through visual inspection. Gender was determined through head shape and the presence of a kype (for males). Maturity was determined by examining each fish for spawning signs including; abrasions on tail, deflated body cavity and sexual dimorphism displayed by typical salmonids at varying stages (Table 2). Figure 6 and Figure 7 are examples of male and female bull trout displaying ripe maturity characteristics.

Table 2. Descriptions of maturity stages for bull trout

Maturing	No signs of sexual dimorphism as a result of spawning (Giroux, 2001).
Ripe	Orange ventral surface, dark green head with a kipe (males only), bright red lateral spots and had milt or eggs present when ventrally compressed, and did not have evidence of fin abrasion or scratches on their posterior end (Giroux, 2001).
Kelt	Faded ventral and lateral spot colouring; a kipe and darkened head colour were present, but less developed; and when ventrally compressed, clear liquid was present for males, and only the ovipositor protruded for females (Giroux, 2001).

Figure 6. Male bull trout displaying ripe maturity characteristics

Figure 7. Female bull trout displaying ripe maturity characteristics.

3.0 RESULTS

3.1 Captured Species

A total of 93 fish and 5 species were captured within the Shelagyote mainstem during the April 26, 2000 to September 21, 2002 sampling period. Species captured included; 51 bull trout, 20 coho, 18 steelhead, 3 rainbow trout and 1 chinook salmon. Bull trout were captured at 36% of the sites sampled, accounting for 55% of the total catch. Steelhead trout occurred at 20% of the sites sampled accounting, for 19% of the total catch with resident rainbow trout occurring at 8% of the sites sampled, accounting for 3% of the total catch. Coho and chinook salmon were captured at 28% and 4% of the sites sampled

respectively with coho accounting for 22% of the catch and chinook accounting for 1% of the total catch. Figure 8 summarizes the fish abundance and species richness, by sample site within the Shelagyote River watershed.

Five different species were captured during the April 26, 2000 to September 21, 2002 sampling period. Site 3 was the richest site of all the sites sampled and this site had the highest number of fish captures compared to other sites.

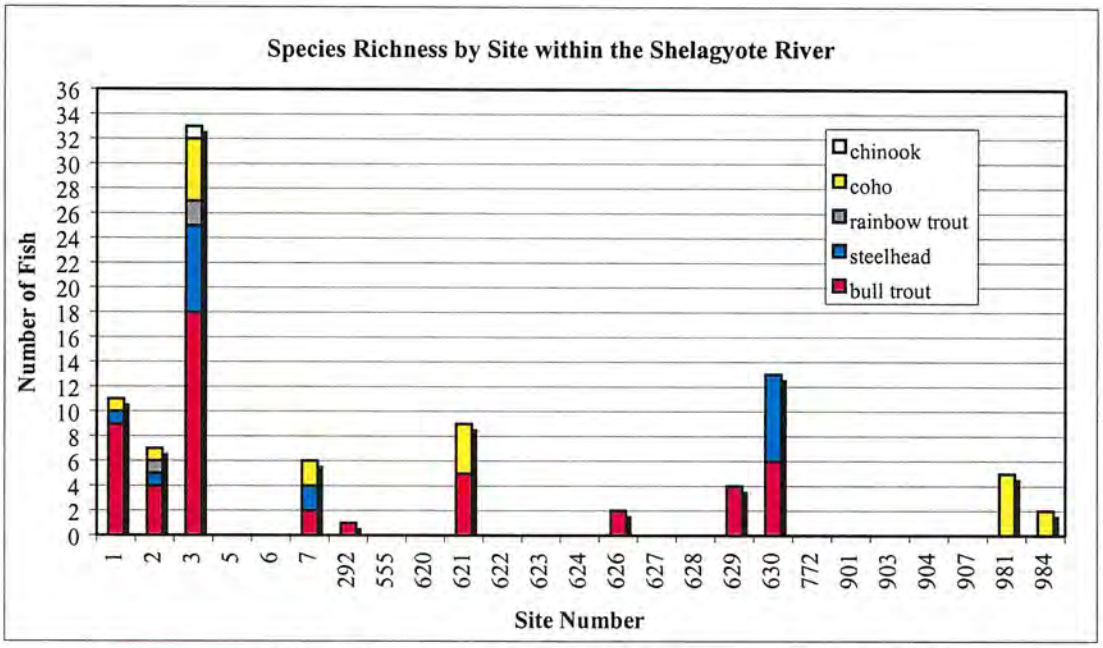


Figure 8. Summary of fish abundance and species richness, by site within the Shelagyote River (April 26, 2000 – September 26, 2002 sampling period, includes Beere 2000 and Giroux 2000 and 2001 data). See Figure 10 for site locations.

Figure 9 summarizes the fish abundance and species richness, per 4 km section within the Shelagyote mainstem starting at the Shelagyote / Babine confluence (0 km).

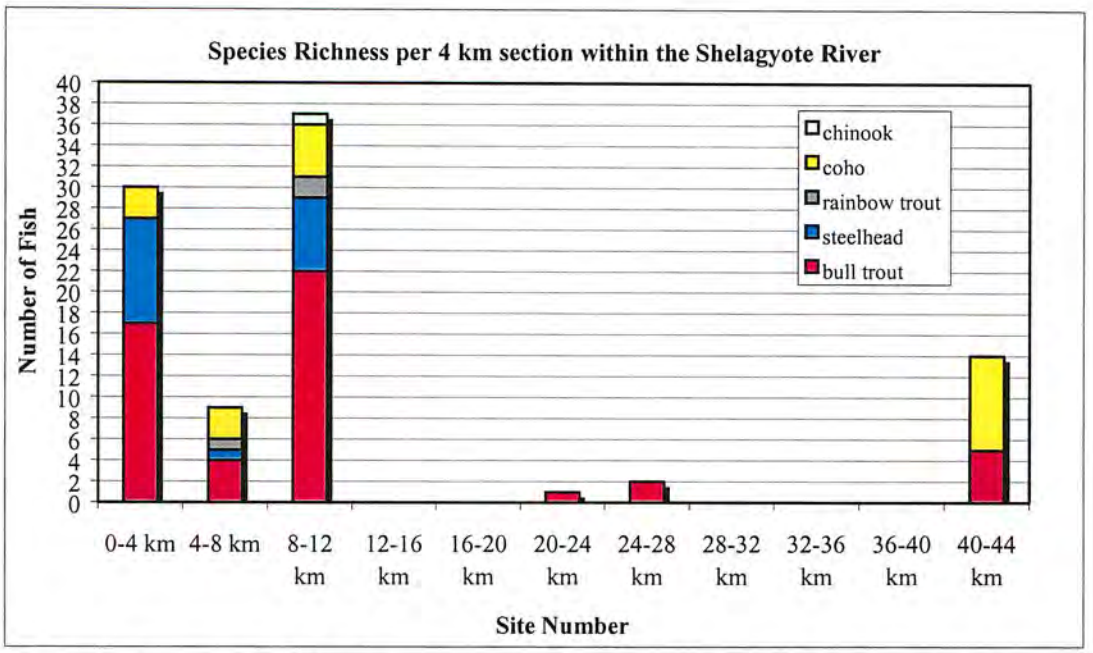


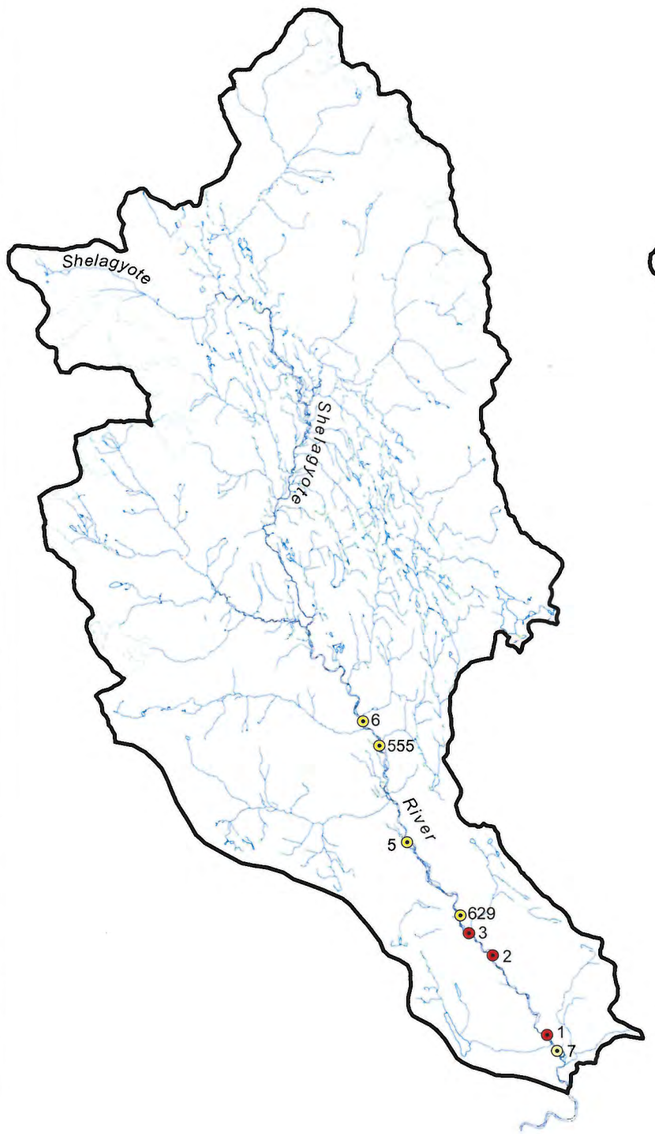
Figure 9. Summary of fish abundance and species richness, per 4 km section within the Shelagyote River (X-axis increments are for presentation only) (April 26, 2000 – September 26, 2002 sampling period, includes Beere 2000, and Giroux 2000 and 2001 data).

The fish capture data table, Appendix I summarizes the fish capture data for all sampling periods within the Shelagyote River.

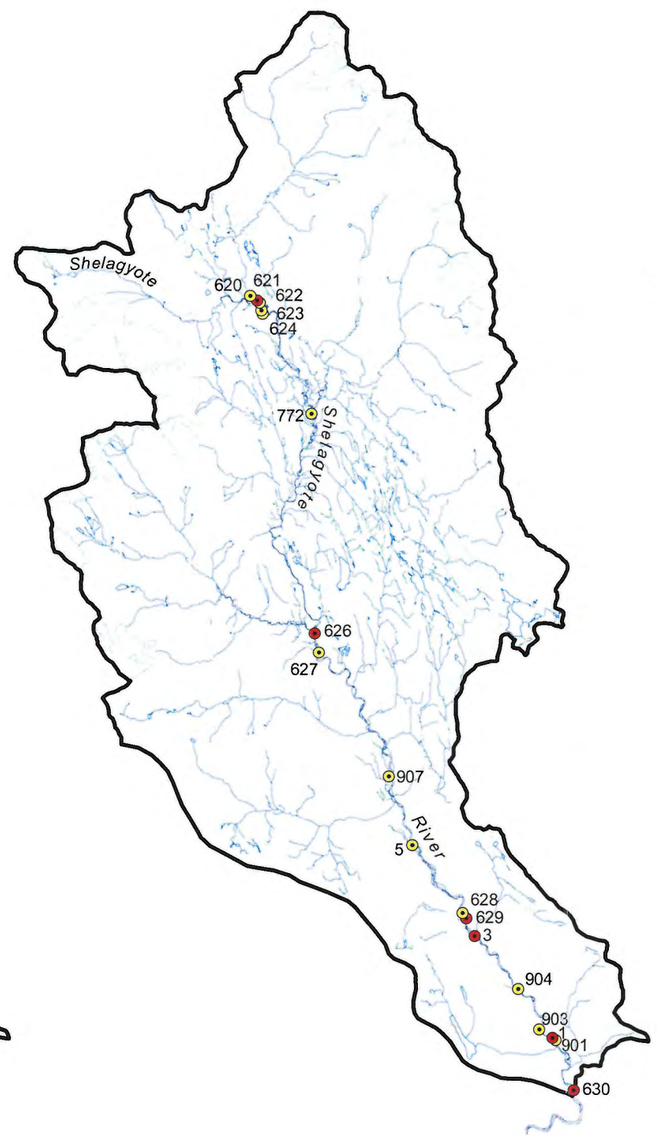
3.2 Bull Trout

Figure 10 shows sampling locations as well as the number of bull trout captured at each site during the 2000, 2001 and 2002 sampling seasons (Figures include Beere 2000 and Giroux 2000 and 2001 data).

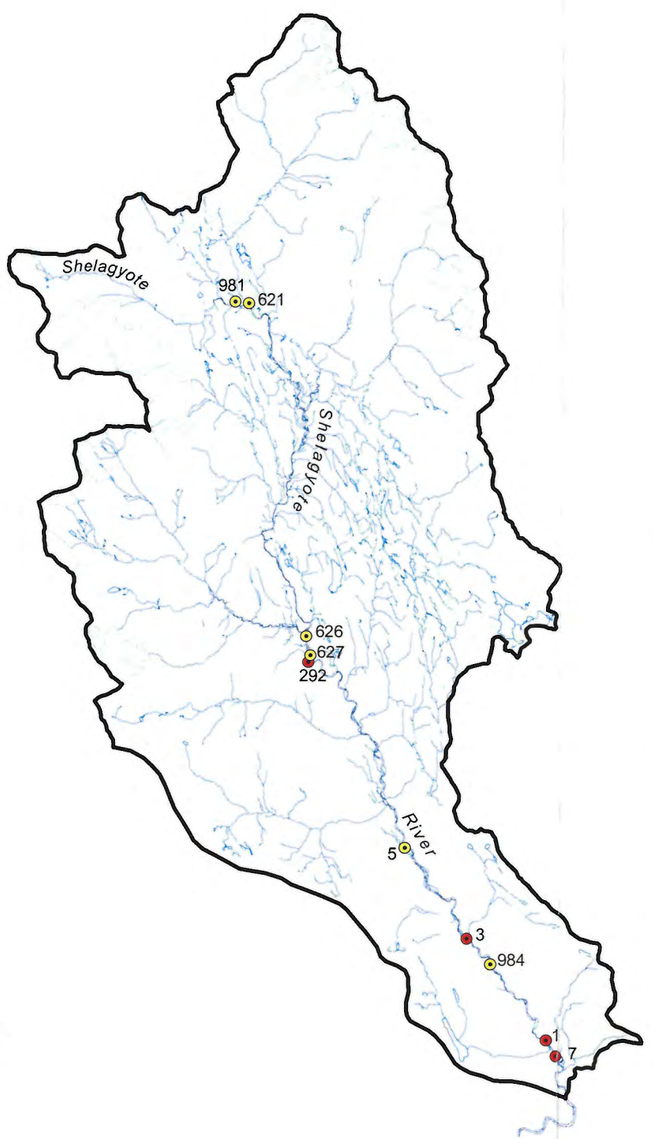
2000

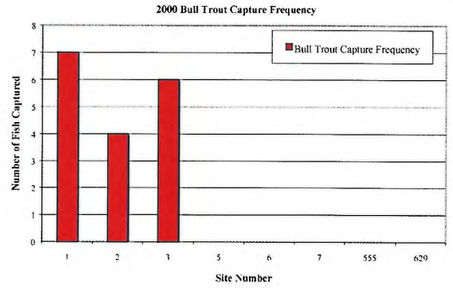


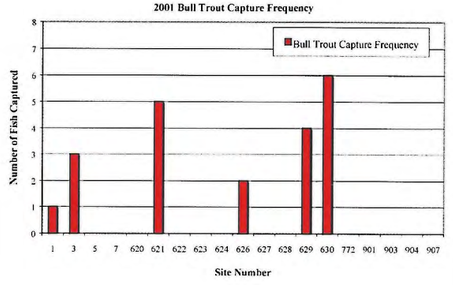
2001



2002







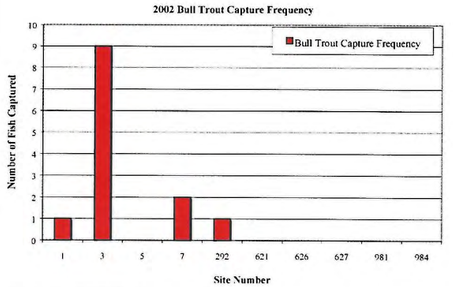
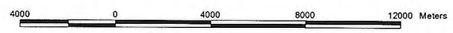


Figure 10. 2000-2002 Bull Trout Capture Locations & Frequency Within The Shelagyote River Watershed

Scale 1:250,000



Date: 2003/01/20 (yyyy/mm/dd)

Created By: KJS of TRITON

map#: 3236/apr/bulltrout.apr/ bt_site_locations

Sample Site

- Bull Trout Capture
- Angled Non Bull Trout Capture

Several sites were sampled at different times over multiple years. The number of bull trout capture events compared to the total number of sampling events are summarized in Table 3. The general trend within the sampling data is that bull trout were typically the only species captured at certain locations.

Table 3. Summary of bull trout capture events.

Site	Number of Bull Trout Capture Events	Total Number of Sampling Events	Bull Trout Captured Events / Number of Sampling Events	Total Number of Bull Trout Captured
1	4	5	80%	9
2	1	1	100%	4
3	6	7	86%	18
5	0	3	0%	0
6	0	1	0%	0
7	1	4	25%	2
292	1	1	100%	1
555	0	1	0%	0
620	0	1	0%	0
621	2	4	50%	5
622	0	1	0%	0
623	0	1	0%	0
624	0	1	0%	0
626	1	3	33%	2
627	0	3	0%	0
628	0	1	0%	0
629	2	3	67%	4
630	3	3	100%	6
772	0	1	0%	0
901	0	1	0%	0
903	0	1	0%	0
904	0	1	0%	0
907	0	1	0%	0
981	0	1	0%	0
984	0	1	0%	0

3.2.1 Length at Age

Bull trout length was normally distributed (Figure 11) with a mean of 50.75 cm, the minimum and maximum lengths observed were 30.0 cm and 65 cm respectively. The mean age for the bull trout captured was 8 yrs with minimum and maximum ages of 5 yrs and 13 yrs respectively. Figure 11 provides a length class frequency and mean age distribution for bull trout captured in the Shelagyote River watershed.

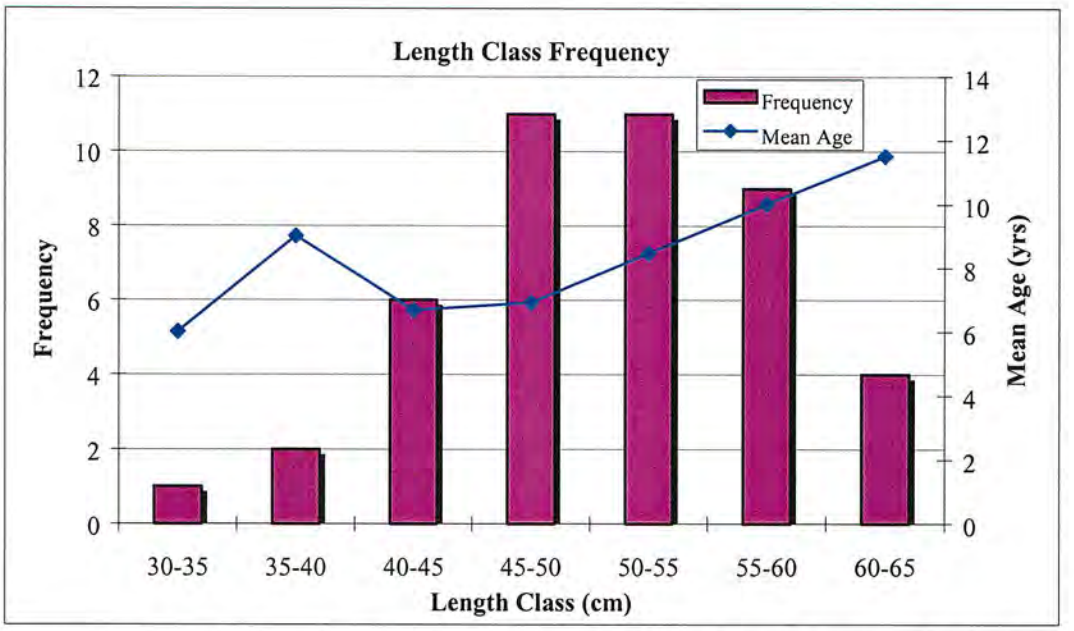


Figure 11. Length class frequency and mean age for bull trout captured in the Shelagyote River (April 26, 2000 – September 26, 2002 sampling period, includes Beere 2000, and Giroux 2000 and 2001 data).

3.2.1 Maturity

Shelagyote River bull trout appear to reach maturity by age five, as this was the youngest age to be described as mature. No fish in the 30-40 cm range were described as mature even though one of these fish was aged at 11 years old. Thirty-three percent of the fish in the 40-45 cm range were described as mature, whereas 54.5% of the 45-50 cm range were described as mature. Fish in the 50-65 cm range displayed a 93% maturity rate. Figure 12 describes the percentage of bull trout captured in the Shelagyote watershed identified as being mature vs. average age for the same length class.

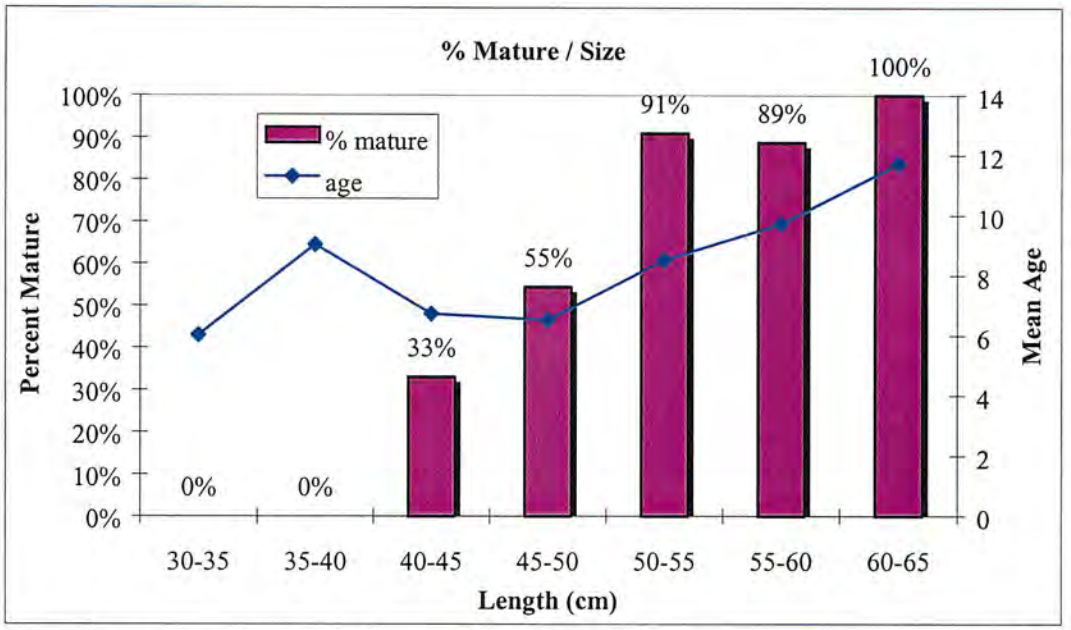


Figure 12. Percentage of bull trout identified as being mature vs. age and length captured within the Shelagyote River (April 26, 2000 – September 26, 2002 sampling period, includes Beere 2000, and Giroux 2000 and 2001 data).

3.3 Tributary Habitat Surveys

Stream walks were conducted for 13 sites within the watershed during suspected bull trout spawning times (August 25th to September 25th). Sites were selected based on juvenile bull trout captures, potential access from the Shelagyote River and relation to bull trout capture locations (ie. tributaries flowing into a staging area). These tributary sites were inspected for redds or spawning bull trout. Site physical characteristics of the suspected spawning sites are summarized in Table 4.

Table 4. Summary of physical parameters measured at representative sites within suspected bull trout spawning sites.

Site	WSC	Reach	Ave. Channel Width (m)	Ave Wetted Width (m)	Ave. Pool Depth (m)	Ave. Gradient (%)	Morphology	Dominant Substrate	Sub-Dominant Substrate	D95	D	Temp	Overall Habitat Ranking
26	480-195700	8	22.7	13.2	0.5	4.5	CP	C	B	68	12	5	Low
11	480-195700-29500	2	21.5	8.0	0.4	6.3	CP	C	B	112	28	5	Low
249	480-195700-29500	2	7.5	3.3	0.4	4.3	CP	C	G	45	13	5	Low
773	480-195700-36100	1	8.3	4.8	1.1	6.8	CP	B	C	80	40	5	Low
12	480-195700-36100	2	23.3	8.0	0.4	4.5	CP	C	B	68	10	7	Low
15	480-195700-48200	1	25.2	20.5	0.7	5.3	CP	C	B	114	19	5	Low
625	480-195700-48200	1	16.4	7.1	0.5	4.5	RP	C	B	100	50	9	Low
18	480-195700-48200-36200	1	6.5	3.3	0.3	6.0	CP	B	C	95	17	5	Low
20	480-195700-60300	1	7.2	6.0	0.6	6.5	CP	C	B	146	9	5	Low
771	480-195700-69300	1	19.7	6.2	1.2	2.8	RP	C	G	50	25	5	Mod
231	480-195700-69300-18900	1	8.3	8.3	0.5	3.5	RP	B	C	95	30	6	Low
620	480-195700-80300	1	9.0	7.5	0.7	3.5	RP	C	B	70	40	7	Low
255	480-195700-82900	1	5.8	5.7	0.6	4.0	RP	G	C	80	30	7	Mod

CP = Cascade Pool, RP = Riffle Pool, C = Cobble, B = Boulder, G = Gravel

3.4 Habitat Rankings

Sixty-five sites throughout the Shelagyote River watershed were inspected and given a habitat ranking based on the physical characteristics and the presence of staging, rearing, spawning and overwintering requisites for adult bull trout. A habitat ranking sheet and the corresponding site label is presented on the attached 1:50,000 overview map (Appendix II). Nine sites were considered to have a high overall habitat ranking accounting for 14% of the sites, where as 41 sites had a low overall ranking accounting for 63% of the sites and 15 sites were considered to have a moderate ranking accounting for 23% respectively.

4.0 DISCUSSION

4.1 Maturity Differences in Relation to Date and Water Temperature

It has been suggested that the threshold temperature below which spawning activity begins is 9°C (McPhail and Murray, 1979; Weaver and White, 1984). Water temperatures measured by MWLAP in the Shelagyote mainstem ranged between -0.16 and 12°C from May 5, 2001 to November 8, 2001. The average temperature for this

period was 4.6°C. Figure 13 describes the maturity of the bull trout captured during the sampling events as well as the temperature for that sampling period.

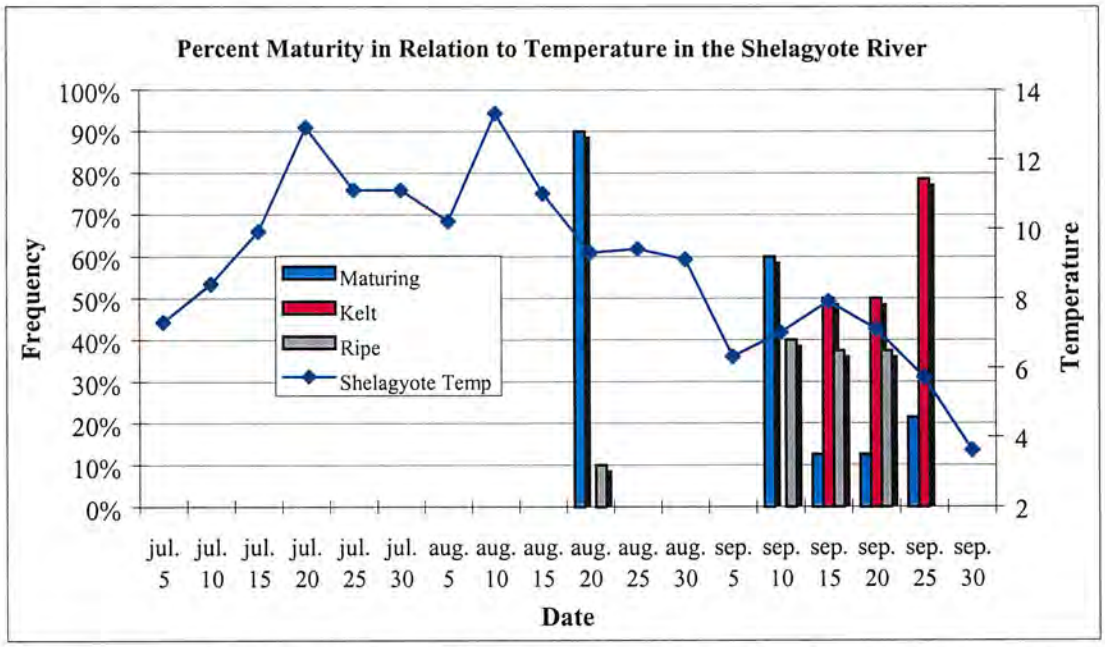


Figure 13. Maturity of the bull trout captured within the Shelagyote River vs. temperature for that period.

Maturity differences were noted throughout the study with 90% of the bull trout sampled to August 20th being identified as maturing and only 10% being described as ripe. Forty percent of the bull trout sampled on September 8th were identified as ripe, with 60% being identified as maturing. Of the bull trout sampled on September 14th, 37.5% were identified as ripe, 12.5% were identified as maturing and 50% were identified as kelts. The same percentages were observed on September 21st, 37.5% ripe, 12.5% maturing and 50% kelts. On September 26th, 21% of the bull trout captured were identified as maturing, where as 79% were identified as kelts.

Based on the observations it is believed that spawning occurs between August 25th and September 25th. Temperatures within the Shelagyote River appear to drop to below 9 °C after the third week in August and spawning appears to be completed by September 25th. Bahr (2002) noted that the spawning window for bull trout in the Morice watershed (2000 and 2001) occurred between August 23rd and September 30th. It is likely that the two watersheds have similar spawning windows.

4.2 Bull Trout Run Timing and Movement

Low catch results in the Shelagyote through the fall and spring sampling periods would suggest that Shelagyote River bull trout likely overwinter and rear in the Babine River and migrate into the Shelagyote River for spawning.

Swanberg (1997) found that fluvial bull trout began upstream migrations as water temperatures increased and stream discharge decreased. Maximum freshet discharge occurs within the upper Skeena River / Babine River confluence area in mid June (Remington, 1995) and increasing water temperatures were observed through July in the Shelagyote watershed (MWLAP data). This would likely put immigration into the Shelagyote River during the months of July and August. Figure 14 shows that both male and female bull trout were captured in the Shelagyote during the August 20th sampling event. This figure also indicates that outmigration likely occurs shortly after spawning. A bull trout captured and tagged within the Shelagyote River on September 26, 2000 was recaptured by an angler in the Babine on October 16, 2000 (Giroux, 2001), suggesting that bull trout likely move out of the Shelagyote sometime in late September, early October.

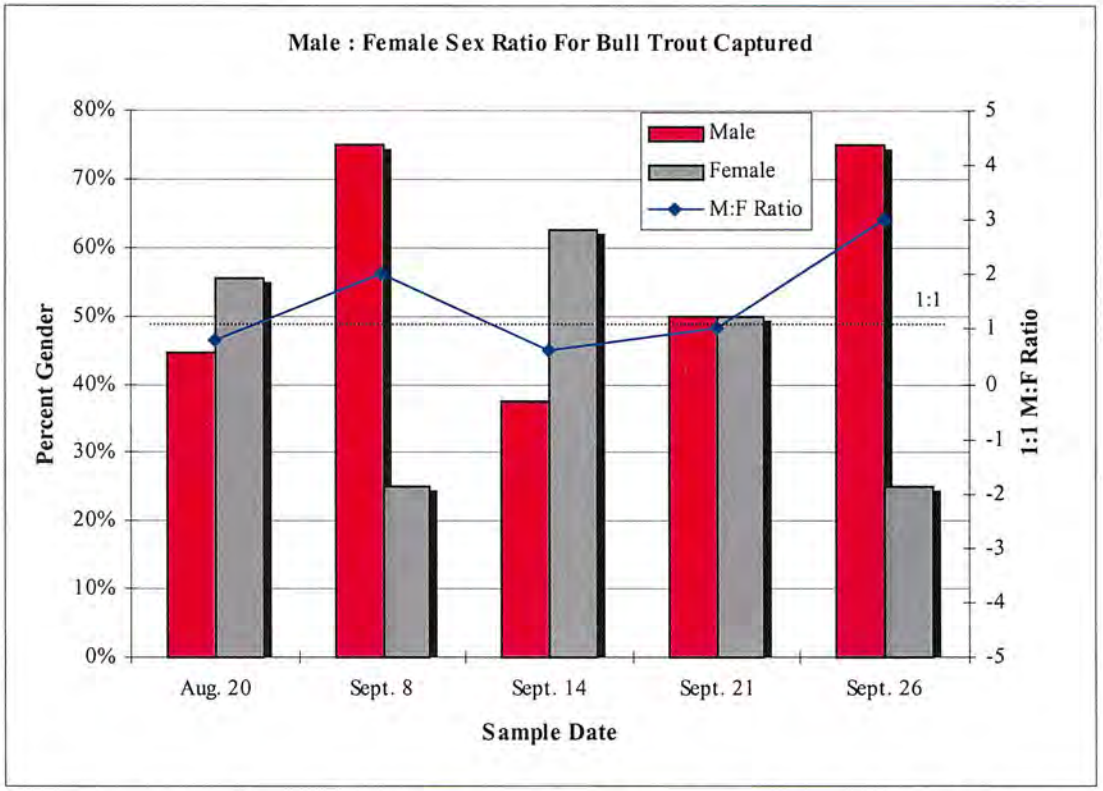


Figure 14. Male : Female sex ratio for bull trout captured in the Shelagyote River (April 26, 2000 – September 26, 2002 sampling period, includes Beere 2000, and Giroux 2000 and 2001 data).

4.3 Mainstem Spawning Locations

Fish and fish habitat surveys within the Shelagyote watershed indicate that the mainstem provides important spawning, rearing and overwintering areas for bull trout. No redds were observed in the mainstem or in any of the tributary sampling sites. Adults in spawning condition are a reliable indicator of spawning activity, which may indicate that the mainstem supports spawning.

handling and an additional 10-15 eggs were expelled when a hand was lightly drawn down the belly of the fish. Several bull trout males expressed milt when laterally compressed. Figure 15 shows the eggs expelled during the September 14th, 2001 sampling period. An examination of Shelagyote bull trout kelt vouchers indicated that no more than 2 eggs remained within the vouchers after spawning. It is possible, therefore, that some fish were angled off redds.

Figure 15. Bull trout eggs expelled during September 14th sampling period.

Sebastion (1988), completed species density sampling within the Shelagyote mainstem and during this study young of the year Dolly Varden were captured. It is possible that the Dolly Varden captured were young of the year bull trout since differentiating between the two species was not considered at that time. It is unknown what the dispersal rate of juvenile Shelagyote bull trout or Dolly Varden is, but the young of the year captures were close to bull trout capture sites and adjacent to habitats identified by Triton during this study as potential spawning locations.

4.4 Alternate Year and Annual Spawning Cohorts

Examinations of voucher specimens indicate that not all Shelagyote bull trout spawn each year. Non spawning or 'carry over' fish were found to be mixed in with the spawning fish and this may be the reason for maturing fish being found throughout all sampling dates. Figure 16 shows a 'carry over' female bull trout captured within the Shelagyote River. This fish was classified as maturing in the field and was confirmed by examination of the gonads.

Figure 16. 'Carry over' female bull trout captured within the Shelagyote River.

Swanberg (1997), found that a percentage of the bull trout that migrated upstream in the Blackfoot River study did not spawn. These fish were observed to hold for a shorter period of time in the spawning tributaries than the spawning fish. In colder and less productive systems it may take longer to produce gametes for spawning, which may lead to alternate year spawning (Post and Johnston 2002). It is unknown why non-spawning fish move into the Shelagyote River.

One of the fish described as ripe on September 8, 2002 was a tagged male fish that was captured at the same location (site 3) on September 14, 2001 (tag #10225). This fish was described as a kelt in 2001. The capture of this male bull trout the following year in a ripe condition and the capture of the female 'carry over' fish provides evidence that Shelagyote bull trout have varying life strategies and they may spawn annually or in alternate years.

4.5 Bull Trout Distribution Mapping

The attached 1:50,000 overview map (Appendix II) was developed to illustrate the findings of this bull trout study. A 1:50,000 hill shade map, also in Appendix II, is provided to show general watershed features such as; mountainous areas, steep slopes and low lying areas as well as the study findings. Mapping was an iterative process starting with the results of the data search and evolving to include the results of the bull trout study as well as relevant Fish and Fish Habitat Inventory results.

The overview map and the hill shade map includes the confirmed and predicted distributions of bull trout within the watershed. We have assumed that the large adults captured in the watershed are a fluvial life history form of bull trout (Giroux 2001) and we have also assumed that there is likely a stream resident population within the watershed. Juvenile captures in tributaries could potential be the progeny of either the

fluvial bull trout migrating upstream to spawn in tributaries or resident bull trout confined to the habitat present within these tributaries. Polygons depicting rankings (low – high) have been overlaid over the confirmed and predicted fish distributions to quantify the habitat present and prioritize each area. Photos have also been included on the overview map and hill shade map to help depict the various habitat parameters identified within the watershed.

Based on the sampling results and mapping exercise we have identified certain areas and sites within the watershed that provide important habitat requirements for bull trout. These sites have been identified with a leader line and caption indicating the type of habitat present or they are associated with a high habitat ranking polygon. Sites or sections that do not have a polygon associated with them are habitat limiting with features such as, sections with high velocity, shallow areas (rapids or riffles) with small pools not conducive to adult bull trout staging or rearing. Pools or holding water in these sections are likely used for a short period of time as resting spots for fish migrating upstream to larger holding or staging locations.

Based on our preliminary assessment we have identified 6 high habitat ranking sites in the lower portion of the Shelagyote River that provide important staging, rearing and overwintering areas for bull trout. For a description of the habitat rankings refer to section 2.1 and Table 1 in the methods section. The following table outlines the sites that would be considered the main staging, rearing or overwintering locations (critical habitat locations) for bull trout within the lower section of the Shelagyote River.

Table 5. High ranking sites within the lower section of the Shelagyote River watershed.

	UTM			Habitat Ranking					
Site / Location	Zone	Easting	Northing	Staging	Rearing	Over-wintering	Spawning	Overall Habitat Ranking	Comments
1	9	617662	6167499	high	high	mod	low	High	mainstem, bt/st/co capture site
2	9	615349	6170802	high	high	mod	low	High	mainstem, bt/st/co/rb capture site
3	9	614352	6171726	high	high	high	mod	High	mainstem, bt/st/co/rb/ch capture site
7	9	618078	6166823	high	high	mod	low	High	mainstem, bt/st/co capture site
629	9	613991	6172469	high	high	mod	mod	High	mainstem, bt capture site
630	9	618585	6165291	high	high	mod	low	High	mainstem, bt/st capture site

bt = bull trout, st = steelhead, co = coho, ch = chinook, rb = rainbow trout

5.0 CONCLUSIONS

The results of the 1:20,000 Fish and Fish Habitat Inventory as well as sampling results from the bull trout studies (Beere, 2000, Giroux, 2000 and 2001, Triton, 2003) provide sufficient information to provide an overview of the distribution and habitat utilization of bull trout within the Shelagyote watershed. Based on the sampling data collected, it can be concluded that:

- All fish species within the Shelagyote watershed appear to be concentrated in sites downstream of site 3 (9 km upstream from Shelagyote / Babine confluence).

- Bull trout were the most widely distributed fish species captured in the Shelagyote mainstem during the April 26, 2000 – September 26, 2002 sampling period.
- Mainstem habitats downstream of site 3 (9 km upstream from the Shelagyote / Babine confluence) provide the best combination of staging, rearing and overwintering habitats for bull trout within the watershed.
- Mainstem habitats downstream of site 3 (9 km upstream from the Shelagyote / Babine confluence) provided the highest species richness of habitats within the watershed.
- Important spawning, rearing and overwintering habitats are found in areas throughout the watershed.
- Bull trout distribution within the watershed was found to be generally associated with perennial fish habitat contiguous (hydraulically connected) to the Shelagyote mainstem.
- Perennial habitat, moderate to low water velocity, abundant cover, low gradients and cobble / gravel type substrates were all physical parameters observed at bull trout capture locations.
- 'Carry over' and annual spawning bull trout are present within the watershed.

Factors affecting the distribution and abundance of bull trout within the watershed include:

- Major barriers to upstream migration (falls, cascades, chutes, gradient and velocity), result in a significant portion of the watershed being inaccessible and unutilized by fish,
- High average stream gradients, limited resting rearing and staging within lower sections of tributary streams; and,
- Shallow water depths and coarse substrates limit spawning and rearing habitat values.

6.0 RECOMMENDATIONS

Based on the above observations and conclusions the following recommendations have been made:

- The Shelagyote watershed is utilized by bull trout, steelhead, coho, chinook, rainbow trout and Dolly Varden. This watershed is considered a natal tributary to the Babine River. The vulnerability of the species present within the watershed to increased angling pressure should be considered by resource managers. Increased angling pressure on staging areas could potentially fish out a spawning population of bull trout in a single season (Chris Schell, 2003). MacPhail and Baxter (1996) suggest that catch restrictions, gear regulation and closures are the surest way to improve adult bull trout survival.

- Development within the watershed should be conducted in a manner that minimizes impacts to identified staging locations and areas that have a high habitat value ranking (high habitat value ranking areas for bull trout have been identified on the attached 1:50,000 overview map). If a road crossing of the

Shelagyote River is planned a crossing location upstream or downstream of these identified high ranking sites as opposed to right adjacent or over top of should be considered.

- Tributaries identified as confirmed or potential bull trout spawning rearing or overwintering tributaries should be considered when developing an access or angling management plan for the watershed. Fish Stream Identification Guidebook (FSIG) recommendations and fish habitat protection should be applied where bull trout presence is confirmed or predicted. Emphasis should also be placed on ensuring fish access is not disturbed and that Riparian Management Areas (RMAs) remain intact, stable and undisturbed. Riparian areas (streamside vegetation) protect water quality and provides vegetation that stabilizes stream banks and regulates stream temperatures. Vegetation from riparian areas provides a continual source of woody debris to the stream channel adding complexity and related features that enhance productive capacity (BC Forest Practices Code, 1995).

- Fish stream identification as described in the FSIG provides fish and fish habitat protection. However, not all tributaries within the watershed were sampled and where forestry activities are proposed and planned these streams should receive additional studies to document species presence and develop appropriate protection.

6.0 REFERENCES

BC Conservation Data Center. 2002. Ministry of Sustainable Resource Management. http://srmwww.gov.bc.ca/cdc/

BC Forest Practices Code. 1995. Forest Practices Code Riparian Management Areas Guidebook. Forest Practices Code of British Columbia Act. Co-published by Forest Service British Columbia and British Columbia Environment.

BC Ministry of Environment, Lands and Parks, and Department of Fisheries and Oceans, 1995. Fisheries Information Summary System (FISS) Data Compilation and Mapping Procedures. British Columbia Ministry of Environment, Lands and Parks, and Department of Fisheries and Oceans.

Bahr, M. 2002. Examination of bull trout (*Salvelinus confluentus*) in the Morice River Watershed. Final Report prepared for Canadian Forest Products, Houston Forest Products and BC Ministry of Environment, Lands and Parks, Forest Renewal BC.

Beere, M.C., 2000. Memo to File: 34250-20-Fish-Special Stocks/Char/Bull Trout; Shelagyote (Babine Ri. Watershed) River file.

Schell, C. 2003. A Concise Review of Fish, Fisheries and Aquatic Habitat Resources in the Morice TSA. Morice Land and Resource Management Plan.

Giroux, P.A., 2000. Memo to File: 34561-27 BAB/SHELAG. Trip Report, Shelagyote River, September 26, 2000.

Giroux, P.A., 2001. Aspects of the Life History of the Shelagyote River Adult River Bull Trout (*Salvelinus confluentus*). Prepared for Fish and Wildlife Science and Allocation Branch, British Columbia Ministry of Water, Land and Air Protection, Smithers BC.

McPhail, J.D. and J.S. Baxter. 1996. A review of bull trout (*Salvelinus confluentus*) life-history and habitat use in relation to compensation and improvement opportunities. Fisheries Management Report No. 104. Department of Zoology, UBC, Vancouver, BC.

McPhail, J.D. and C.B. Murray. 1979. The early life history and ecology of Dolly Varden (*Salvelinus malma*) in the Upper Arrow lakes. Prepared for B.C. Hydro and the Kootenay Region Fish and Wildlife Branch by the University of British Columbia.

Meidinger, D. & J. Pojar. 1991. Ecosystems of British Columbia. British Columbia Ministry of Forests. Victoria, B.C. pp. 330

Post, J. R. and F. D. Johnston. 2002. Status of the Bull Trout (Salvelinus confluentus) in Alberta. Alberta Sustainable Resource Development, Fish and Wildlife Division, and Alberta Conservation Association, Wildlife Status Report No. 39, Edmonton, AB. 40 pp.

Remington, Dawn. 1995. Review and Assessment of Water Quality in the Skeena River Watershed, British Columbia. Habitat Management Sector, Habitat Enhancement Branch, Department of Fisheries and Oceans.

Sebastian, D. 1988. Steelhead Production Characteristics of the Babine River and Tributaries, 1987. Prepared for Fisheries Assessment and Improvement Unit, Recreational Fisheries Branch, Victoria, BC.

Swanberg, T.R. 1997. Movements of and Habitat Use by Fluvial Bull Trout in the Blackfoot River, Montana. Transactions of the American Fisheries Society 126:735-746.

Triton Environmental Consultants Ltd. 2003. Reconnaissance (1:20,000 scale) Fish and Fish Habitat Inventory of the Shelagyote River. Prepared for NWBC Timber and Pulp.

Weaver, T.M. and R.G. White. 1984. Coal Creek fisheries monitoring study number II. Quarterly progress report to United States Department of Agriculture, Forest Service, Flathead National Forest, contract number 53-0385-3-2685, from Montana State Cooperative Fisheries Research Unit, Bozeman, Montana, USA.

APPENDIX I

Summary of fish captured within the Shelagyote River
(April 26, 2000 – September 26, 2002 sampling period)

Summary of Fish Captured within the Shelagyote River (April 26, 2000 - September 26, 2002 sampling period).

			UTM							Fork Length			Sex			Age			Maturity		
Site	Location	Reach	Zone	Easting	Northing	Date	Sample	Species	#	Range	Mean	Median	M	F	?	Range	Mean	Median	Maturing	Ripe	Kelt
630	0+300 m	1	9	618585	6165291	20-Aug-01	1	BT	3	47-53	49.5	48.5	2	1	0	5-8	6.3	6	3	0	0
630	0+300 m	1	9	618585	6165291	14-Sep-01	2	BT	1	53	53	53	0	1	0	11	11	11	0	0	1
630	0+300 m	1	9	618585	6165291	8-Nov-01	3	BT	2	46-49	47.5	47.5	1	1	0	5-6	5.5	5.5	0	0	1
630	0+300 m	1	9	618585	6165291	8-Nov-01	3	ST	7												
7	2+100 m	1	9	618078	6166823	26-Apr-00	1	ST	2												
7	2+100 m	1	9	618078	6166823	14-Sep-01	2	CO	2												
7	2+100 m	1	9	618078	6166823	8-Sep-02	3	BT	2	49-50	49.5	49.5	1	1	0	9	9	9	1	1	0
7	2+100 m	1	9	618078	6166823	21-Sep-02	4	NFC													
901	2+800 m	1	9	617800	6167400	20-Aug-01	1	NFC													
1	3+000 m	1	9	617662	6167499	26-Apr-00	1	BT	1	35	35	35	1	0	0	no age data			1	0	0
1	3+000 m	1	9	617662	6167499	26-Apr-00	1	ST	1												
1	3+000 m	1	9	617662	6167499	26-Sep-00	2	BT	6	41-63.5	51.1	51.5	2	3	1	8-12	9.5	9.5	1	0	5
1	3+000 m	1	9	617662	6167499	8-Nov-01	3	BT	1	59	59	59	1	0	0	10	10	10	0	0	1
1	3+000 m	1	9	617662	6167499	8-Sep-02	4	BT	1	63	63	63	1	0	0	11	11	11	0	1	0
1	3+000 m	1	9	617662	6167499	21-Sep-02	5	CO	1												
903	3+600 m	1	9	617089	6167848	20-Aug-01	1	NFC													
904	5+800 m	2	9	616191	6169530	20-Aug-01	1	NFC													
984	7+300 m	2	9	615350	6170658	8-Sep-02	1	CO	2												
2	7+600 m	2	9	615349	6170802	26-Sep-00	1	BT	4	33-60	47	47.5	2	0	2	6-11	8.75	9	2	0	2
2	7+600 m	2	9	615349	6170802	26-Sep-00	1	ST	1												
2	7+600 m	2	9	615349	6170802	26-Sep-00	1	CO	1												
2	7+600 m	2	9	615349	6170802	26-Sep-00	1	RB	1												
3	9+000 m	2	9	614352	6171726	26-Apr-00	1	BT	1	51	51	51	1	0	0	no age data			1	0	0
3	9+000 m	2	9	614352	6171726	26-Apr-00	1	ST	1												
3	9+000 m	2	9	614352	6171726	26-Sep-00	2	BT	5	42-62	52	52	5	0	0	6-12	8.75	8.5	0	0	4
3	9+000 m	2	9	614352	6171726	26-Sep-00	2	ST	1												
3	9+000 m	2	9	614352	6171726	26-Sep-00	2	RB	1												
3	9+000 m	2	9	614352	6171726	20-Aug-01	3	BT	2	42-44.5	43.25	43.25	1	0	1	5-6	5.5	5.5	2	0	0
3	9+000 m	2	9	614352	6171726	14-Sep-01	4	BT	1	59.5	59.5	59.5	1	0	0	8	8	8	0	0	1
3	9+000 m	2	9	614352	6171726	14-Sep-01	4	RB	1												
3	9+000 m	2	9	614352	6171726	14-Sep-01	4	CH	1												
3	9+000 m	2	9	614352	6171726	8-Nov-01	5	ST	3												
3	9+000 m	2	9	614352	6171726	8-Nov-01	5	CO	1												
3	9+000 m	2	9	614352	6171726	8-Sep-02	6	BT	1	61	61	61	1	0	0	no age data			0	1	0
3	9+000 m	2	9	614352	6171726	8-Sep-02	6	CO	4												
3	9+000 m	2	9	614352	6171726	8-Sep-02	6	RB	1												
3	9+000 m	2	9	614352	6171726	21-Sep-02	7	BT	8	48-60	53	52	4	4	0	7-11	8.8	8	1	3	4
3	9+000 m	2	9	614352	6171726	21-Sep-02	7	ST	2												
629	9+700 m	2	9	613991	6172469	26-Sep-00	1	NFC													
629	9+700 m	2	9	613991	6172469	20-Aug-01	2	BT	1	41	41	41	0	1	0	5	5	5	1	0	0
629	9+700 m	2	9	613991	6172469	14-Sep-01	3	BT	3	48-65	56.5	57	1	2	0	8-11	9	8	0	1	2
628	10+100 m	2	9	613840	6172687	14-Sep-01	1	NFC													
5	13+600 m	2	9	611716	6175535	26-Sep-00	1	NFC													
5	13+600 m	2	9	611716	6175535	20-Aug-01	2	NFC													
5	13+600 m	2	9	611716	6175535	21-Sep-02	3	NFC													
907	16+600 m	3	9	610713	6178442	20-Aug-01	1	NFC													
555	18+200 m	3	9	610528	6179616	26-Apr-00	1	NFC													
6	19+500 m	4	9	609832	6180653	26-Sep-00	1	NFC													
292	23+900 m	4	9	607642	6183390	8-Sep-02	1	BT	1	30	30	30	0	0	1	no age data			1	0	0
627	24+400 m	4	9	607730	6183688	14-Sep-01	1	NFC													
627	24+400 m	4	9	607730	6183688	8-Sep-02	2	NFC													
627	24+400 m	4	9	607730	6183688	21-Sep-02	3	NFC													
626	25+400 m	4	9	607549	6184502	14-Sep-01	1	BT	2	52-56	54	54	0	2	0	7	7	7	0	1	0
626	25+400 m	4	9	607549	6184502	8-Sep-02	2	NFC													
626	25+400 m	4	9	607549	6184502	21-Sep-02	3	NFC													
772	36+300 m	5	9	607355	6193736	14-Sep-01	1	NFC													
624	42+300 m	6	9	605300	6197929	14-Sep-01	1	NFC													
623	42+400 m	6	9	605241	6198075	14-Sep-01	1	NFC													
622	42+700 m	6	9	605165	6198391	14-Sep-01	1	NFC													
621	42+800 m	6	9	605060	6198480	20-Aug-01	1	BT	4	40-59	49.25	49	2	2	0	5-13	9	9	3	1	0
621	42+800 m	6	9	605060	6198480	14-Sep-01	2	BT	1	53	53	53	1	0	0	8	8	9	0	1	0
621	42+800 m	6	9	605060	6198480	8-Sep-02	3	CO	4												
621	42+800 m	6	9	605060	6198480	21-Sep-02	4	NFC													
620	43+300 m	Trib	9	604773	6198675	14-Sep-01	1	NFC													
981	43+500 m	7	9	604423	6198535	8-Sep-02	1	CO	5												

APPENDIX II

1:50,000 Overview Map and 1:50,000 Hill Shade Map