BC Environment

A Survey of Zymoetz (Copper) River Steelhead Anglers in 1999

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Skeena Fisheries Report SK - 127

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Executive Summary

The Zymoetz (Copper) River in the Skeena Region of northwestern British Columbia (B.C.) is well known for providing a high quality steelhead (*Oncorhynchus mykiss*) recreational fishery. In 1990, the province of B.C. implemented a Classified Waters system to protect such high quality angling experiences on rivers throughout the province. Under the Classified Waters system, waters throughout the province have been designated as class one or class two waters. The upper portion of the Zymoetz River (upstream of Limonite Creek) is one of six class one waters throughout the province which are designated as remote, pristine, wilderness rivers with significant fisheries value and limited access. The Zymoetz River downstream of Limonite Creek is designated as class two and is a high quality steelhead fishery with better access and more angler effort.

In the fall of 1999, the River Guardians conducted a creel survey of Zymoetz (Copper) River steelhead anglers. Aerial counts, an access point (exit) survey and a roving survey were the main components of the creel survey. The study period was stratified into seven time periods (two week blocks) and into weekday and weekend day types within time periods (double (two-stage) stratified random sampling design). Three days were randomly selected within each day type and aerial counts of anglers and surveys at the exit survey station were conducted on those days. Twenty-five of the aerial counts covered both the class one and class two sections and the remaining 12 only covered the class two section. An additional four days (split between day types) were selected from each two week block for the roving survey component.

Interviews

- Nine-hundred and seventy-nine steelhead (*Oncorhynchus mykiss*) anglers were observed by the River Guardians and 758 anglers were approached for an interview. Of the 666 anglers observed at the exit station(s), 504 (76%) stopped for an interview. While roving, the River Guardians observed 313 anglers and approached 254 (81%) for an interview.

- Of the 758 anglers, 442 (59%) were interviewed for the first time and the remaining 309 (41%) had already completed the interview.

- Most anglers were interviewed between the first week in September and the first week in November (81%). In addition, the majority of angler interviews were conducted in the Classified Waters Period (68%; 517 interviews).

- Almost all anglers were interviewed in the class two portion of the Zymoetz River (99% Table 4). Only 1% of anglers interviewed had fished in the class one section.

Angler Characteristics

Residence, Gender and Age

- Sixty-five percent (469 interviews) of all anglers interviewed were B.C. residents. Of all B.C. resident interviews, 312 (75%) were Skeena Region residents and the remainder (25%) were from other areas of the province.

- Almost 4% of all angler interviews were Canadian residents which represented 18 individual anglers. Non-Canadian residents composed 31% of all interviews and 77 were repeat interviews (146 individual anglers).

- More B.C. residents than Canadian or Non-Canadian residents were interviewed in all time periods. Relative to other time periods, more Non-Canadians were interviewed in the Classified Waters Period than the shoulder season of the study period.

- Ninety-six percent of individual anglers interviewed were male (385 anglers) and 5% (18 anglers) were female.

- On average, males were 40 years old and females were 35 years old. There were no female anglers under the age of 16 and only one over the age of 55. In contrast, 2% of male anglers were under the age of 16% and 17% were over 55 years of age.

Guided Status

- There were 47 (6%) guided anglers and 691 (94%) non-guided anglers interviewed. Guides and assistant guides were not included in the number of guided angler interviews.

- The guided angler interviews were not evenly distributed throughout the study period. Almost 90% of guided anglers were interviewed in the Classified Waters Period (42 anglers) and few guided anglers were interviewed in the shoulder weeks of the study period (late August, November, early December).

- Few B.C. residents interviewed were guided anglers (<1%), while 4% of Canadian and 19% of Non-Canadian residents interviewed were guided.

Conservation Club Membership

- Thirty-two percent of anglers interviewed were members of at least one conservation club. Non-Canadian residents (42%) were more likely to be members of a conservation club than Canadian or B.C. residents (22%; 27%; respectively).

- Of the anglers that were members of at least one conservation club, most were members of the Steelhead Society (25%), Trout Unlimited (17%) or a foreign country fishing club (17%). Fewer anglers were members of the B.C. Wildlife Federation (11%), the Sierra Club (8%) or the B.C. Federation of Fly Fishers (8%).

Angler Trip Characteristics

Angling Method

- Of all angler interviews, there were more fly anglers than gear anglers (62%, and 31%; respectively) while 7% of anglers indicated they used both a fly and a gear rod.

- More B.C., Canadian and Non-Canadian residents were fly anglers than gear anglers. The proportion of B.C. residents that fished with a gear rod (42%) was higher than Canadian (15%) or Non-Canadian (11%) residents.

- Of all angler interviews, 92% were shore-access anglers, whereas the remaining anglers gained access with a drift boat (8%).

- Of all drift boat-access anglers interviewed, 61% were B.C. residents, 36% were Non-Canadian residents and 3% were Canadian residents. More than half of all shore-access anglers interviewed were B.C. residents while less were Non-Canadian residents (31%) or Canadian residents (3%).

- Overall, 82% of drift boat-access anglers interviewed were fly fishing, 12% were gear fishing and 5% were fishing with both a fly and a gear rod.

Trip Length

- Overall, anglers spent an average of 5.2 hours in and around the Zymoetz River.

- On average, B.C. and Canadian residents were angling for fewer hours per day (4.5 and 4.8 hours, respectively) than Non-Canadian residents (6.9 hours).

- Guided anglers fished longer (7.6 hr) than non-guided anglers (5.1 hr). Anglers that fished from a drift boat angled longer on average per day than shore-access anglers (6.3 and 5.1 hours, respectively).

- Overall, anglers planned to spend an average of 6.9 days angling for steelhead on the Zymoetz River. On average, B.C. residents planned to fish for 8.8 days, while Canadian and Non-Canadian residents planned to fish for fewer days (4.1 and 4.0 days, respectively).

- Guided anglers planned to fish for an average of 3.2 days while non-guided anglers planned to fish for 7.2 days.

License Class and Classified Days Purchased

- Most B.C. resident anglers interviewed purchased an annual angling license (97%). Only 1% of B.C. residents interviewed purchased an eight-day angling license and slightly more (2%)

anglers purchased one-day angling licenses. Similarly, Canadian and Non-Canadian residents bought more annual angling licenses than eight-day or one-day angling licenses.

- Canadian and Non-Canadian resident anglers planned to fish for more days than their Classified Waters license specified. Sixty-nine percent of non-guided anglers purchased a one-day Classified Waters license although they planned to fish for seven days on average. Similarly, 58% of guided anglers purchased a one-day Classified Waters license and planned on fishing for an average of three days. In addition, guided anglers purchased more four-, five- and six-day Classified Waters licenses than non-guided anglers which corresponded with their average trip length of three days. These results helped clarify the understanding that non-guided, Non-Resident anglers purchased their Classified Waters license in one- or two-day blocks.

Angler Compliance

- Almost 8% of all anglers interviewed had at least one license infraction, which included those anglers that refused to show River Guardians their license. Of those anglers with an infraction, 96% (53 angler interviews) had one infraction and two anglers had two infractions. The majority of anglers with at least one infraction were B.C. residents (67%), followed by Non-Canadian residents (31%) and Canadian residents (2%).

- Failure to produce a license was the most frequent infraction noted and included those anglers that refused to show the River Guardians their license (44% of all infractions).

Angler Catch and Effort

Catch Rate

- A total of 1,817 hours were recorded as spent fishing by Zymoetz River anglers which averaged 3.9 hours of fishing time per day. Five-hundred and forty-eight (548) steelhead were landed and released. The catch rate for all angler interviews was 0.30 steelhead/hour or 1.19 steelhead/rod day.

- Catch rates were estimated for each time period of the survey by grouping both river sections. Time period 11-2 produced the highest catch rate (2.4 steelhead/rod day) followed by 10-1 (1.3 steelhead/rod day) and 9-1 (1.3 steelhead/rod day). Time periods 10-2 (0.6 steelhead/rod day) and 9-2 (0.9 steelhead/rod day) had the lowest steelhead catch rates.

- Among residence categories, Canadian residents had the highest catch rate (1.7 steelhead/rod day), followed by B.C. residents (1.3 steelhead/rod day) and Non-Canadian residents (1.0 steelhead/rod day).

- Guided anglers had higher catch rates (1.3 steelhead/rod day) than non-guided anglers (1.2 steelhead/rod day) and drift boat-access anglers had higher catch rates (2.5 steelhead/rod day) than shore-access anglers (1.1 steelhead/rod day).

- On average, gear anglers caught 1.4 steelhead per rod day whereas fly anglers caught 1.1 steelhead per rod day.

Aerial Flights

- There were 380 anglers counted in the class two section during 37 aerial flights. The high count of 37 anglers occurred on September 26 (time period 9-2) while a zero angler count occurred on several occasions (August 25, September 20, November 14 and November 25).

- There were 23 drift boats counted in the class two section and the majority (87%) were below the Clore River.

- There were 57 anglers observed in 25 flights of the class one section and a high count of 15 anglers occurred on September 26.

- Four drift boats were counted on two separate occasions in the class one section.

Catch and Effort Estimates

- The total effort estimate for the whole study period (and study area) was 1,398 rod days while the effort estimate for the Classified Waters Period was 953 rod days (68% of total).

- The total catch estimate was 1,545 steelhead and 1,056 steelhead (68%) were caught in the Classified Waters Period.

- The majority (1,248 rod days, 89%) of angler effort and catch (1,389 steelhead, 90%) occurred in the class two section.

Quality Angling Experience

- Three-hundred and twenty individual anglers reported 372 quality angling experience characteristics. Just over half of anglers reported that both the beauty or scenic attributes of the area (53%) and high fish abundance or the likelihood of catching a fish (52%) were key characteristics of a high quality angling experience on the Zymoetz River.

- The proportion of Canadian and Non-Canadian residents that described beauty or scenic attributes as part of a high quality angling experience was substantially higher than B.C. residents. In contrast, more B.C. residents felt high fish abundance or catching a lot of fish and low numbers of anglers (few people) were important characteristics of a high quality angling experience.

- The average angler rating of their quality angling experience was 3.8 (between fair and good), where one was very poor and five was excellent. The majority of anglers rated their experience as good (29%) or excellent (35%) and few anglers rated their experience as poor (4%) or very poor (9%).

- B.C. and Non-Canadian residents rated their quality angling experience similarly, while Canadian residents rated their experience slightly higher which resulted in a statistical result that implied the groups differed.

Angler Comments

- One-hundred and thirteen anglers made 142 comments about fisheries management to the River Guardians. Of those, almost 18% (20 anglers) had positive comments about the River Guardian program. Seven percent supported the catch and release fishery or were in favor of a no kill fishery (winter steelhead included) and another 7% supported the simplification of the licensing system. Anglers also made comments about the good experience they had (6%), support of a fly fishing only regulation (6%) and voiced support for improvement or protection of fish habitat (6%).

Abstract

The River Guardians conducted a creel survey of Zymoetz (Copper) River steelhead (*Oncorhynchus mykiss*) anglers from late August to early December, 1999. Aerial angler counts, an access point (exit) survey and a roving survey were the three main components of the creel survey. River Guardians collected characteristics about recreational angler trips including; residence, age, conservation club membership, trip length, hours angling that day, angling methods, access method, license details, key characteristics of a quality angling experience, rating of the quality angling experience and steelhead catch.

The River Guardians approached 758 anglers for an interview. Of those, 442 (54%) were interviewed for the first time and 301 (41%) had been interviewed previously. The remainder did not speak enough English to complete the interview, refused to complete the interview or were not angling. The majority of anglers interviewed were B.C. residents (65%) followed by Non-Canadian (31%) and Canadian residents (4%). There were 47 (6%) guided anglers and 691 (94%) non-guided anglers interviewed. Few B.C. residents interviewed were guided anglers (<1%), while 19% of Non-Canadian residents interviewed were guided. Of all anglers interviewed, fly anglers were more common than gear anglers (62% and 31%, respectively). A higher percentage of B.C. anglers used gear rods than Canadian or Non-Canadian residents. Of all anglers interviewed, 92% were shore-access anglers, whereas the remaining anglers gained access with a drift boat (8%).

From angler interviews, total of 1,817 hours were reported spent angling and the observed catch rate for was 0.30 steelhead/hour or 1.19 steelhead per rod day.

There were 380 anglers counted in the class two section during 37 aerial flights. The high count of 37 anglers occurred on September 26 (time period 9-2) while a zero angler count occurred on several occasions (August 25, September 20, November 14 and November 25). In total, 23 drift boats were counted in the class two section and the majority (87%) were counted below the Clore River. There were 57 anglers observed in 25 flights of the class one section and the high count of 15 anglers was on September 26. Also, four drift boats were counted on two separate occasions in the class one section.

The total effort estimate for the whole study period (and study area) was 1,398 rod days while the effort estimate for the Classified Waters Period was 953 rod days (68% of total). The total catch estimate was 1,545 steelhead and 1,056 steelhead (68%) were caught in the Classified Waters Period. The total effort and catch estimates were the sum of all time period estimates. The majority of angler effort (1,248 rod days, 89%) and catch (1,389 steelhead, 90%) occurred in the class two section.

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1.0.0.0 Introduction

The Zymoetz (Copper) River in the Skeena Region of northwestern British Columbia (B.C.) is well known for providing a high quality steelhead (*Oncorhynchus mykiss*) recreational fishery. In 1990, the province of B.C. implemented a Classified Waters system to protect such high quality angling experiences on rivers throughout the province. The purpose of the Classified Waters system was to provide a diversity of angling opportunities, maintain a high quality angling experience and improve regulation of the angling guide industry (ARA Consulting Group 1991). Rivers or sections of rivers were defined as Classified Waters during critical time periods which were usually during preferred steelhead angling seasons.

Under the Classified Waters system, waters throughout the province have been designated as class one or class two. Class one waters are remote, pristine, wilderness rivers with significant fisheries value that are largely accessible only by boat or aircraft (J. Paul and Associates 1998). Class two waters are more accessible, but still represent a quality angling experience. Class two waters typically have more local use than class one waters. The upper portion of the Zymoetz River is one of six class one waters throughout the province and the remaining lower section of fishable water is designated as class two.

The freshwater recreational fishery in B.C. was estimated to grow in value by 2.0% per year between 1994 and 1999 (Price Waterhouse and ARA Consulting Group Inc. 1996). As a result of this growth, local anglers voiced concerns with respect to crowding on Classified Waters in the Skeena Region. In turn, the province of B.C. implemented a Skeena Region River Guardian program to help monitor recreational angling opportunities on Classified Waters.

The 1999 fall steelhead season marked the third consecutive year of the River Guardian program in the Skeena Region. The program was funded by the Habitat Conservation Trust Fund (HCTF) and was a cooperative effort between the B.C. Conservation Foundation, B.C. Ministry of Environment, Lands and Parks (MELP) and Cascadia Natural Resource Consulting.

The River Guardians conducted a survey of Zymoetz River anglers that collected information about steelhead angler's demographics, catch and effort, and characteristics of a quality angling experience. Also, aerial counts of anglers were conducted to further document the spatial and temporal patterns of angler effort and total angler effort. The River Guardians were not officers under the B.C. Wildlife Act and therefore did not have enforcement powers. Their presence was primarily for data collection and to promote river stewardship.

The objectives of the 1999 River Guardian Program on the Zymoetz River were:

1. To collect accurate catch and effort data in order to estimate total catch and effort by steelhead anglers;
2. To collect representative demographic data describing the steelhead anglers;
3. And to provide a Ministry of Environment/Fisheries presence and encourage river stewardship among anglers.

2.0.0.0 Study Area

The McDonnell Lake chain is the origin of the Zymoetz River drainage. From McDonnell Lake, the Zymoetz River flows for 109 km to meet the Skeena River 8 km northeast of Terrace, B.C. (Figures 1 and 2). The Clore and Kitnayakwa rivers are two major tributaries of the Zymoetz River and the whole watershed drains 3,080 km^2 (Beere 1995). This study included the Zymoetz River from the uppermost fishing boundary which is 3 km downstream of McDonnell lake to its confluence with the Skeena River.

The Zymoetz River is one of 42 Classified Waters in the province (Anonymous 1999). The Zymoetz River has both the class one and class two designations between September 1 and October 31. The section from the uppermost angling boundary near McDonnell Lake to Limonite Creek is class one, whereas the section downstream of Limonite Creek to the confluence with the Skeena River is class two (Figure 2). The primary access point to the class two section is from the Copper River Main Road although early in the season anglers gain access from the Copperside Road (Figure 2). Anglers access the class one section primarily via the Bornite Mtn. Road although some anglers use the McDonnell Lake Road from Smithers or helicopter. The majority of angler effort is concentrated near the confluence of the Clore River (class two section). Early in the season (August), most angler effort is concentrated in the lower river and subsequently progresses upstream later in the season (Lewis and Buchanan 1998).

During the Classified Waters Period the number of angling guides is limited, as is the number of days they can guide in each section. The class one section is restricted to a maximum of three licensed angling guides and a total of 88 guided rod days. The class two section is restricted to four licensed guides and 117 guided rod days. MELP does not restrict the number of assistant angling guides on any of the Classified Waters in the province.

Angler effort and success is highly variable due to weather and water conditions and can change on a daily basis. During high runoff from a large rainfall or unusually warm weather (late August) the water clarity is reduced, which, in turn produces unfavorable fishing conditions. The Clore River produces much of the water clarity problems on the Zymoetz River. During these unfavorable weather events angling downstream of the confluence of the Clore and Zymoetz rivers is poor, therefore most anglers move upstream. The frequency of these events can range from none to four of five per season and can last from one to 10 or 12 days.

The 1999 angling regulations for the Zymoetz River were published in the B.C. Freshwater Fishing Regulations Synopsis (Anonymous 1999). From July 1 to December 31, anglers were required to release steelhead in the Skeena River watershed. In addition, a barbless, single hook regulation and bait ban were in effect. In the Classified Waters Period, Non-Resident anglers were required to purchase a class one license at $20.00 per day and/or a class two license for $10.00 per day. B.C. residents were required to purchase an annual Classified Waters license at $10.00 per year. For all anglers, a steelhead stamp was required during the Classified Waters Period and when angling for steelhead outside of the Classified Waters Period. Powerboats are not permitted and therefore, only drift boats were present on the Zymoetz River.

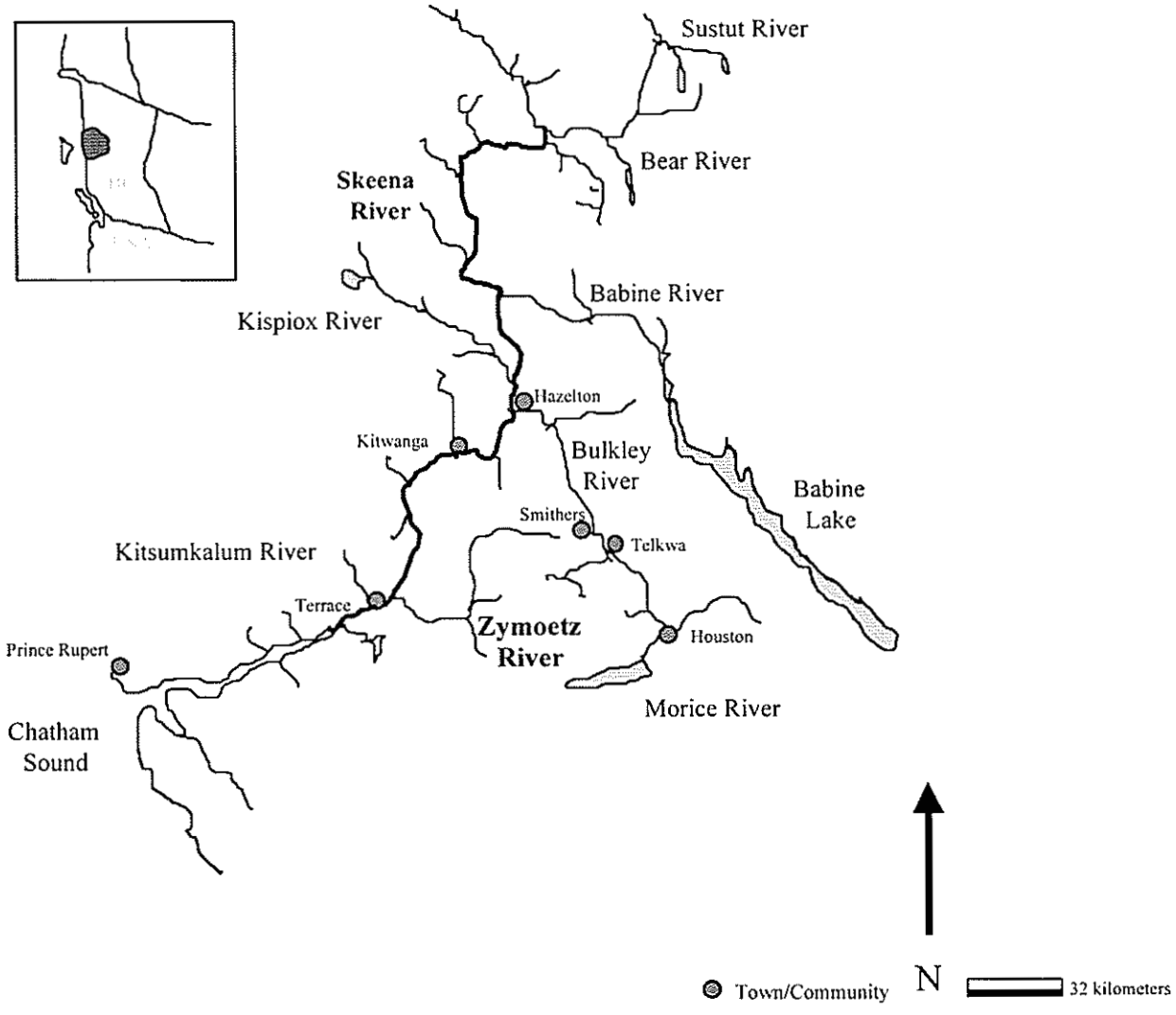

Figure 1. The Skeena River Watershed.

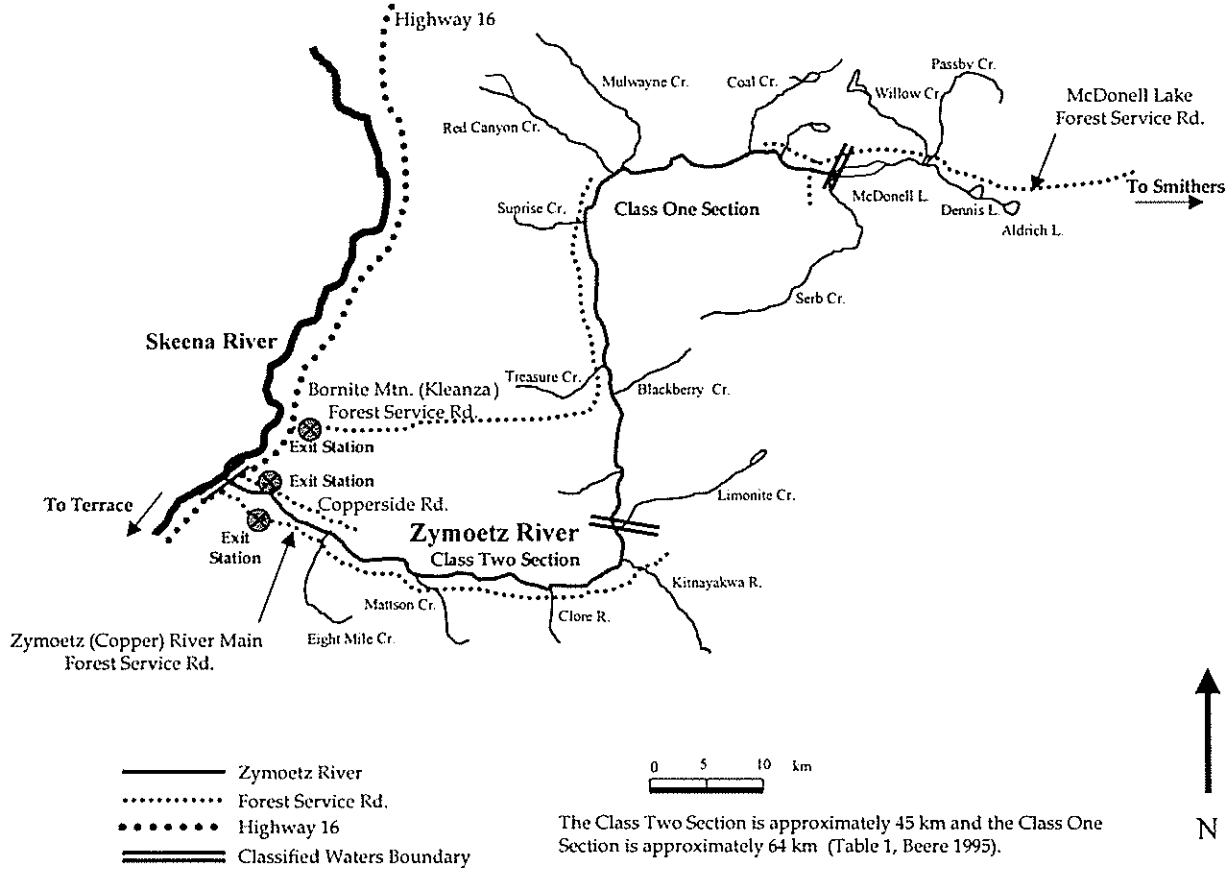

Figure 2. The Zymoetz River showing class one and class two sections, the main access roads and the exit survey stations (adapted from Beere 1995).

3.0.0.0 Methods

3.1.0.0 Study Design

The River Guardians conducted a creel survey of 1999 Zymoetz (Copper) River steelhead anglers. Aerial angler counts, an access point (exit) survey and a roving survey were the main components of the creel survey. In 1989, Lewynsky and Olmsted (1990) determined that angler effort was variable among weeks and between weekdays and weekends. Approximately 50% of angler effort occurred on weekdays and 50% occurred on weekend days in 1989. Therefore, in 1999 the study period was stratified into seven, time period strata (two week blocks) and into weekday and weekend day types within those time period strata (double (two-stage) stratified random sampling design; Schaeffer *et al.* 1990; Pollock *et al.* 1994). The sampling effort was allocated proportionally to each stratum according to the expected daily angling effort (Pollock *et al.* 1994). Three days were randomly selected within each day type and aerial counts of anglers and surveys at the exit survey station were conducted on those days (See Appendix 8.0 for schedule). An additional four days (split between day types) were randomly selected from each two week block for the roving survey component of the creel survey.

The Zymoetz River was divided into two river sections, class one and class two as determined by angling regulations (Figure 2). The class two portion of the river received the majority of angler effort (R.S. Hooton personal communication 1999). Therefore, the study was designed to collect representative data from class two anglers and to determine the amount of angler effort in the class one section. Thus, almost all survey effort was allocated to the class two section of the river and only half of the aerial counts covered the class one section. The remaining aerial counts covered only the class two section of the river. Unlike past studies (Lewynsky and Olmsted 1990), the 1999 survey was designed to cover the majority of the fall steelhead angling season (August 19 through December 5, 1999).

Four data forms were completed by the River Guardians including the angler interview form, the exit survey form, the roving survey form and the aerial count form (Appendix 1). Almost all anglers that stopped at the exit station or anglers encountered during the roving portion of the survey were interviewed. The recreational angler's demographics (residence, age), conservation club membership, trip length, hours angling that day, angling method, access method, the angler's characteristics of a quality angling experience, rating of the quality angling experience and steelhead catch were recorded on the angler interview form. The River Guardians also asked to see the angler's license, and if needed, recorded any infractions they noticed. If the angler did not agree to the interview or there was a language barrier, the River Guardians recorded as much data as possible on the angler interview form. Anglers encountered more than once were interviewed multiple times. Most B.C. residents purchased an annual Classified Waters license and therefore were not asked to produce their license on repeat interviews unlike Non-Resident anglers who were asked to show their license on each occasion they were interviewed.

The River Guardians were not officers under the B.C. Wildlife Act and therefore did not have enforcement powers. Their presence was primarily for data collection. However, the

Conservation Officer Service was contacted as soon as possible when the River Guardians observed an infraction.

3.1.1.0 Aerial Counts

A helicopter was used to conduct 37 of the 40 scheduled aerial counts of anglers. Three flights were cancelled due to poor weather conditions. Twenty-five of the flights covered both the class one and class two sections and the remaining 12 covered only the class two section (Appendix 8.0). An aerial flight that covered both sections occurred on August 21 for orientation purposes. Flights covered only the class 2 section for the first of the two-week strata (8-2) and then after August 30 alternated (between full and half coverage; systematically) within each day type starting with all of class one and class two being covered.

All aerial counts were conducted between 1:00 and 3:00 p.m. This time period represented when most anglers were on the Zymoetz River in a previous study (Lewynsky and Olmsted 1990). The flight time was 1.3 hr for the class one and class two sections and 0.8 hr for only the class 2 section. The count of anglers was recorded on aerial count forms while proceeding downstream (Appendix 1). The number of anglers, drift boats, fly or gear anglers and guided anglers (including the guide) were recorded for each river section. These data were used for effort calculations and assessing non-response bias at the exit stations. In addition, the date, weather, time and personnel were recorded for each aerial flight.

3.1.2.0 Access Point (Exit) Survey

Access point (exit) stations were staffed for the majority of daylight hours on all aerial flight days. The interviews at the exit survey stations collected data from anglers after their fishing trip (completed trip data). The three stations were located at the 2 km mark on the Copper River Main Road, near the Copperside Ranch on the Copperside Road and at the 1 km mark on the Bornite Mtn. (Kleanza) Road (Figure 2). On all aerial count days, the exit station was in place on the Copper River Main Road where the majority of anglers gained access. Exit stations were also in place on the Bornite Mtn. Road or the Copperside Road when anglers were spotted in those river sections. The Copperside exit station was manned several days early in the study period and the Bornite Mtn. Road exit station was operated a few days in the mid part of the study period because few anglers fished in the class one section. No exit stations were located on the McDonell Lake Road.

The River Guardians completed one exit station count form for each day the station(s) were in place (Appendix 1.0). The exit count form recorded the number of vehicles that stopped and did not stop and the number of people in those vehicles for each hour.

3.1.3.0 Roving Survey

The River Guardians travelled around the Zymoetz River to conduct a roving survey on days when aerial counts were not conducted. The purpose was to provide a 'presence' on the river and contact anglers camping in the study area. The River Guardians interviewed almost all anglers encountered. The roving survey provided incomplete catch and effort data and therefore were not used in the catch and effort analyses. The data were included in the description of anglers and for assessing non-response bias at the exit stations.

The roving survey count form was completed each day the River Guardians traveled throughout the study area (Appendix 1.0). The roving form included data on the weather and water conditions, a route description, the number of vehicles and anglers observed and the number of anglers interviewed.

3.2.0.0 Relevant Definitions

Angling Day: The time elapsed (hr) from the time and angler indicated they started fishing and the time of the exit interview (if the angler was finished fishing).

B.C. Resident: The anglers' permanent residence was within B.C. The angler must have been present in B.C. for at least six months during the 12 months immediately prior to purchasing an angling license (Anonymous 1999).

Canadian Resident: The anglers' permanent residence was outside of B.C. but within Canada. The angler resided outside of B.C. for more than six months during the 12 months prior to purchasing an angling license (Anonymous 1999).

Non-Canadian Resident: The anglers' permanent residence was outside of Canada. The angler resided outside of Canada for more than six months during the 12 months prior to purchasing an angling license (Anonymous 1999).

Rod Day: One day of angler effort, the length in hours varies depending on the time period in the study and other demographic variables.

Fishing Time: The time (hr) the time the angler spent fishing, excluding driving, hiking and preparation time.

3.3.0.0 Analysis Methods

All data analysis and entry was performed with SPSS 7.0 and SPSS DE, respectively. A review of former angler surveys on the Zymoetz River was conducted and results were compared to the current study.

3.3.1.0 Interviews

The number of anglers interviewed was summarized by time period and day type (weekend day or weekday) for both roving and exit surveys and river sections. In addition, the proportion of repeat interviews were summarized by time period (Tables 1 and 2; Figure 2).

Table 1. The dates included in each time period strata used in analyses (two-week blocks).

Time Period	Dates
8-2	Aug. 19 - Aug. 29
9-1	Aug. 30 – Sept. 12
9-2	Sept. 13 – Sept. 26
10-1	Sept. 27 – Oct. 10
10-2	Oct. 11 – Oct. 24
11-1	Oct. 25 – Nov. 7
11-2	Nov. 8 – Nov. 21
12-1	Nov. 22 – Dec. 5

Table 2. The Zymoetz River sections used in analyses (Figure 2).

	River Section
1	Class One, 3 km d/s McDonnell Lake - u/s Limonite Creek
2	Class Two, d/s Limonite Creek – confluence with Skeena River

3.3.2.0 Weather Conditions

Secchi depth and staff gauge height were both collected to measure water conditions on every working day. The Secchi depth was measured in a deep pool approximately 2 km upstream of Highway 16 on the Copperside Road. The staff gauge height was measured near the 3 km mark on of the Copper River Main Road. The proportion and number of fishable days were described by day type and time period.

3.3.3.0 Angler Characteristics

Some anglers were interviewed several times. The percentage and number of angler interviews attempted and the percentage and number of individual anglers were summarized by residence categories. For B.C. residents, the postal code was used to determine if the angler was from the Skeena Region or other provincial MELP regions. Canadian residents were asked for their province of origin and Non-Canadian residents were asked for their county of origin. The anglers' first interview was used to provide a summary for the region (of B.C.), province or country the angler resided in. In addition, in the anglers' first interview the date of birth was collected from the angler license. The numbers of male and female anglers were summarized by age categories. All angler interviews were used to summarize the proportion of anglers interviewed by each day type and time period.

Guided status (non-guided or guided) was recorded and summarized by day type, time period, number of repeat interviews and residence category.

The River Guardians asked anglers *"Are you a member of a conservation club or organization? If YES, what organization?"* Responses were summarized by the percentage of anglers belonging to at least one type of conservation club. A chi-square test of homogeneity was used to compare the frequency of membership in a conservation club with residence categories and guided status.

3.3.4.0 Angler Trip Characteristics

Angling method (fly or gear) and access method (drift boat or foot) were summarized by angler residence category and guided status. In addition, angling method was summarized by access method. A chi-square test of homogeneity was used to compare frequencies for all summaries and a Yates correction for continuity was used when necessary (Zar 1984). For angling methods, all angler interviews were used as the unit of analysis and not the individual angler.

Anglers were asked, *"When did you start your fishing trip today?"* The start time of the angling day and the time of the interview (if the angler was finished) was calculated for each interview and was the angling day. The angler day was summarized by time period, residence category, guided status, angling method and access method. Differences in the angler day for angler residence categories were compared with a non-parametric Kruskal-Wallis test. Mann-Whitney U tests were used to examine differences in angler day between guided status, access method and angling method categories. Non-parametric statistical tests were used because the data did not meet the assumption of a normal distribution. For the angler day, the angler interview was the unit of analysis, not the individual angler. The angler day information was used to construct an angler activity profile, which was the frequency of anglers that fished during each hour of the day (between 6:00 a.m. and 10:00 p.m.). The activity profile was constructed for the whole study period and for each time period throughout the study.

Due to the mobile nature of the fishery and the abundant road access anglers were asked, *"Excluding driving, hiking and prep time how long did you fish the Zymoetz River?"* The actual time spent fishing (fishing time) was summarized and compared to the angler day length (angler day) and used in catch rate calculations

Anglers were asked, *"How many days have you already fished on the Zymoetz River?"* and *"How many more days do you plan to fish on the Zymoetz River?"* The total number of planned angling days in the 1999 steelhead angling season was calculated by summing the results of these two questions. The angler's last interview (if interviewed more than once) was used to ensure the most accurate results were used. Differences in the number of planned angling days for angler residence categories were compared with a non-parametric Kruskal-Wallis test. A Mann-Whitney U test was used to examine differences in the number of planned angling days between guided status categories. The individual angler was the unit of analysis, not the angler interview.

3.3.5.0 Angling Licenses

The River Guardians recorded the angler's license class and the number of Classified Waters days purchased from the angler's license. The license class (one-day, eight-day and annual) and the number of Classified Waters days purchased were summarized by residence category and guided status. In addition, the number of Classified Waters days purchased was summarized for each license class. For B.C. residents, license details were collected the first time the angler was interviewed whereas Non-Resident license details were collected each time anglers were interviewed. The number of Classified Waters day purchased and the number of days planned angling were summarized for guided and non-guided anglers.

Anglers were not required to purchase all Classified Waters days at one time, nor were they required to carry all the used Classified Waters licenses they purchased with them. Therefore, the River Guardians recorded the number of Classified Waters days purchased by the angler just before the day the angler was interviewed.

The number and type of infractions observed by the River Guardians were recorded on the interview form. The frequency and type of infractions were summarized by residence category and time period. The angler interview was the unit of analysis not the individual angler.

3.3.6.0 Angler Effort and Catch

3.3.6.1 Catch Rate

The observed catch rate and effort were calculated with data from the on-site interviews. The River Guardians asked anglers, *"What species of fish have you landed today? How many did you keep or release?"* The time spent fishing, steelhead landed, Dolly Varden/bull trout (*Salvelinus malma/Salvelinus confluentus*) kept and released, and other species kept and released were recorded on the angler interview form. The angler interview was the unit of analysis and not the individual angler.

At the exit survey station, anglers were interviewed at the end of the angling day (trip) and therefore complete angler catch and effort data were collected. Thus, the ratio of the means was used to estimate catch rates instead of the mean of the ratios (Pollock *et al.* 1994; Jones *et al.* 1995; Pollock *et al.* 1997). Catch rate ($\hat{R}$) was estimated by:

Equation 1

$$\hat{R} = \frac{\sum_{i=1}^{n} c_i / n_i}{\sum_{i=1}^{n} L_i / n_i} = \bar{c} / \bar{L}$$

where $\hat{R}$ = catch rate of the sample, n = the number of sampling units (interviews), L_i = fishing time and c_i = the catch for the ith sampling unit (angler interview). The fishing time (hours) was obtained from the time the angler spent fishing (line in the water).

The observed catch rate (in hours and steelhead/rod day), steelhead caught and angler effort (hours) were summarized by time period, river section, angler residence, guided status, access method and angling method. Steelhead/rod day was the average catch per completed trip interview. The mean fishing time was calculated for each time period, residence category, guided status category, access method and angling method. In addition, the total number of pink salmon (*O. gorbuscha)*, coho salmon (*O. kisutch*), sockeye salmon (*O. nerka*), chum salmon (*O. keta*), whitefish (*Prosopium* sp.), cutthroat trout (*O. clarki)* and rainbow trout (*O. mykiss*) landed were summarized.

3.3.6.2 Aerial Flights

The observed number of anglers and drift boats counted on the aerial flights were summarized for each river section.

3.3.6.3 Effort and Catch Estimates

For each river section, angler effort and catch estimates were calculated for each day type (weekend day or weekday, *dt*) and summed within each time period (*tp*). All time period estimates were then summed to equal effort and catch estimates within each river section. The river sections were then summed to obtain the total Zymoetz River effort and catch estimates for the fall of 1999. The last two time periods (11-2 and 12-1) were combined to equal one time period due to few flights.

Class Two Effort and Catch

Any angler observed during aerial flights was counted as one rod day of effort. Aerial counts were corrected for anglers that were not on the river during the flight. The daily aerial counts (e_{daily}) were divided by the proportion of anglers that were on the river during the aerial flight (sampling probability; $P_{sampprob}$) and was the corrected daily effort estimate (Equation 2; $e_{dailycorr}$). The sampling probability was the mean probability that the angler was on the river during the flight for each day type within the time period stratum. The sampling probability was obtained by asking anglers when they started and stopped angling during the exit interview.

Equation 2

$$e_{dailycorr} = \frac{e_{daily}}{P_{sampprob}}$$

The corrected daily effort estimates were used to calculate the mean daily effort ($\bar{e}_{tp,dt}$) within each day type strata. The effort within each day type strata ($\hat{E}_{tp,dt}$) was estimated by multiplying the mean daily effort by the number of fishable days in the strata (Equation 3; Table 6 for the number of fishable days in each strata). Non-fishable days were determined by the comments and descriptions in Appendix 8.0)

Equation 3

$$\hat{E}_{tp,dt} = N_{tp,dt,fishable} \times \bar{e}_{tp,dt}$$

The variance in the estimate of effort within each day type ($Var(\hat{E}_{tp,dt})$) was calculated by:

Equation 4

$$Var(\hat{E}_{tp,dt}) = N^2_{tp,dt,fishable} \times (s^2_{tp,dt} / n) \times fpc_{tp,dt}$$

where $N_{tp,dt,fishable}$ was the total number of fishable days in the strata, $s^2_{tp,dt}$ was the sample variance of the daily effort within the strata, n was the number of observations of total daily effort within the stratum, and *fpc* was the finite population correction factor ((*N-n)/N*; Schubert 1988; Scheaffer *et al.* 1990).

The total effort ($\hat{E}_{tp}$) for each time period was the sum of day type effort within that time period (weekend day and weekday effort; Equation 5).

Equation 5

$$\hat{E}_{tp} = \sum_{dt} \hat{E}_{tp,dt} = \hat{E}_{tp,weekday} + \hat{E}_{tp,weekend}$$

The variance of the total effort ($Var(\hat{E}_{tp})$) for each time period was the sum of day type effort variance within that time period (weekend day and weekday effort variance; Equation 6).

Equation 6

$$Var(\hat{E}_{tp}) = \sum_{dt} Var(\hat{E}_{tp,dt}) = Var(\hat{E}_{tp,weekday}) + Var(\hat{E}_{tp,weekend})$$

Approximate 95% confidence intervals for the effort within each time period were calculated with Equation 7.

Equation 7 $$95\%\ \text{Confidence Intervals} = 2 \times \sqrt{Var(\hat{E}_{tp})}$$

The total class two effort ($\hat{E}_{C2}$) for the study period was the sum of the effort of all time period strata ($\hat{E}_{tp}$; Equation 8).

Equation 8 $$\hat{E}_{C2} = \sum_{tp} \hat{E}_{tp} = \hat{E}_{tp8\text{-}2} + \hat{E}_{tp9\text{-}1} + \hat{E}_{tp9\text{-}2} + \hat{E}_{tp10\text{-}1} + \hat{E}_{tp10\text{-}2} + \hat{E}_{tp11\text{-}1} + \hat{E}_{tp11\text{-}2\&12\text{-}1}$$

The variance in total effort ($Var(\hat{E})$) was estimated with Equation 9 where the variance in effort for each time period strata ($Var(\hat{E}_{tp})$) was summed (Schubert 1988).

Equation 9

$$Var(\hat{E}_{C2}) = \sum_{tp} Var(\hat{E}_{tp}) = Var(\hat{E}_{tp8\text{-}2}) + Var(\hat{E}_{tp9\text{-}1}) + Var(\hat{E}_{tp9\text{-}2}) + Var(\hat{E}_{tp10\text{-}1}) + Var(\hat{E}_{tp10\text{-}2}) + Var(\hat{E}_{tp11\text{-}1}) + Var(\hat{E}_{tp11\text{-}2\&12\text{-}1})$$

The approximate 95% confidence intervals for the total effort were calculated with Equation 10.

Equation 10 $$95\%\ \text{Confidence Intervals} = 2 \times \sqrt{Var(\hat{E}_{C2})}$$

The class two total catch and weekly catch estimates were calculated with Equations 11 through 20. For each day a flight was conducted, the daily catch rates (obtained from the interviews) were used to estimate the mean daily catch rate ($\overline{R}_{tp,dt,daily}$), Equation 1). The daily effort estimate ($e_{dailycorr}$; in rod days) was multiplied by the mean fishing time ($\overline{L}_{tp,dt}$); in hours, Table 23) to estimate the total daily effort in hours ($\hat{E}_{tp,dt,daily(hr)}$; Equation 11).

Equation 11 $$\hat{E}_{tp,dt,daily(hr)} = \overline{L}_{tp,dt} \times e_{dailycorr}$$

The total daily effort ($\hat{E}_{tp,dt,daily(hr)}$) was multiplied by the mean daily catch rate ($\overline{R}_{tp,dt,daily}$) to obtain the daily catch (Equation 12).

Equation 12 $$\hat{C}_{tp,dt,daily} = \overline{R}_{tp,dt,daily} \times \hat{E}_{tp,dt,daily(hr)}$$

The mean catch within each day type was the average of daily catches within that day type (Equation 13).

Equation 13 $$\overline{C}_{tp,dt} = \frac{\sum \hat{C}_{tp,dt,daily}}{n}$$

The total catch within each day type ($\hat{C}_{tp,dt}$) was estimated by multiplying the mean catch for that day type, ($\overline{C}_{tp,dt}$) by the number of fishable days in the day type and time period (Equation 14).

Equation 14 $$\hat{C}_{tp,dt} = N_{tp,dt,fishable} \times \overline{C}_{tp,dt}$$

The variance in the estimate of total catch within each day type was calculated with:

Equation 15 $$Var(\hat{C}_{tp,dt}) = N^2_{tp,dt,fishable} \times (s^2_{tp,dt} / n) \times fpc_{tp,dt}$$

where $N_{tp,dt,fishable}$ was the total number of fishable days in the strata, $s^2_{tp,dt}$ was the sample variance of the daily catch within the stratum, *n* was the number of observations of total daily catch within the week, and *fpc* was the finite population correction factor ((*N-n)/N*; Schubert 1988, Scheaffer *et al.* 1990).

The total catch ($\hat{C}_{tp}$) for each time period was the sum of the day type catch (weekend day and weekday catch; $\hat{C}_{tp,dt}$).

Equation 16
$$\hat{C}_{tp} = \sum_{dt}(\hat{C}_{tp,dt}) = \hat{C}_{tp,weekday} + \hat{C}_{tp,weekend}$$

The variance in the total catch for each time period ($Var(C_{tp})$) was calculated by:

Equation 17
$$Var(\hat{C}_{tp}) = \sum_{dt} Var(\hat{C}_{tp,dt}) = Var(\hat{C}_{tp,weekday}) + Var(\hat{C}_{tp,weekend})$$

where the variance in catch for each week ($Var(\hat{C}_{tp,dt})$) was summed (Schubert 1988).

The total class two catch ($\hat{C}_{C2}$) for the study period was the sum of the catch of all time period strata ($\hat{C}_{tp}$; Equation 18).

Equation 18
$$\hat{C} = \sum_{tp} C_{tp} = \hat{C}_{tp8-2} + \hat{C}_{tp9-1} + \hat{C}_{tp9-2} + \hat{C}_{tp10-1} + \hat{C}_{tp10-2} + \hat{C}_{tp11-1} + \hat{C}_{tp11-2\&12-1}$$

The variance in total effort ($Var(\hat{C}_{C2})$) was estimated with Equation 19 where the variance in catch for each time period stratum ($Var(\hat{C}_{tp})$) was summed (Schubert 1988).

Equation 19
$$Var(\hat{C}_{C2}) = \sum_{tp} Var(\hat{C}_{tp}) = Var(\hat{C}_{tp8-2}) + Var(\hat{C}_{tp9-1}) + Var(\hat{C}_{tp9-2}) + Var(\hat{C}_{tp10-1}) + Var(\hat{C}_{tp10-2}) + Var(\hat{C}_{tp11-1}) + Var(\hat{C}_{tp11-2\&12-1})$$

The approximate 95% confidence intervals for the total catch were calculated with Equation 20.

Equation 20
$$95\%\ \text{Confidence Intervals} = 2 \times \sqrt{Var(\hat{C}_{C2})}$$

Equations 2 through 10 were used to estimate the total effort for guided and non-guided anglers, fly, gear and unknown method anglers, and drift boats. The corrected daily effort estimates (Equation 2) for each angling method ($e_{flydailycorr}$, $e_{geardailycorr}$, $e_{unidentifiabledailycorr}$), guided status ($e_{guideddailycorr}$, $e_{non-guideddailycorr}$) or drift boats ($e_{driftdaily}$) were substituted for the total daily effort estimate ($e_{dailycorr}$). Thus, effort estimates were made for each angling method, guided status, and number of drift boats for each day type. Not all fly and gear anglers were recognizable from the helicopter, accordingly an estimate was calculated for an unknown angling method category.

Effort estimates for residence categories differed in calculation from guided status, angling method and drift boats because residency could not be determined from aerial flights. The proportion of anglers in each residence category was determined from the number of interviews completed on each flight day. Within each day type the effort for each residence category ($\hat{E}_{residence}$) was the total effort ($\hat{E}_{tp,dt}$) multiplied by the proportion of anglers in each residence category ($\beta_{residence}$; Equation 21).

Equation 21

$$\hat{E}_{tp,dt,res} = \hat{E}_{tp,dt} \times \beta_{\text{residence}}.$$

The variance in the proportion ($Var(\beta_{tp,dt,res})$) of residence category was calculated with Equation 22, where m was the number of interviews in each stratum (Palsson 1990).

Equation 22

$$Var(\beta_{tp,dt,res}) = \frac{(\beta_{tp,dt,res}(1-\beta_{tp,dt,res}))}{m_{tp,dt}} \times fpc_{tp,dt,res}$$

The variance in effort for each residence category ($Var(\hat{E}_{tp,dt,res})$) was calculated with Equation 23.

Equation 23

$$Var(\hat{E}_{tp,dt,res}) = (Var(\beta_{tp,dt,res}) \times (\hat{E}_{tp,dt})^2) + (Var(\hat{E}_{tp,dt}) \times (\beta_{tp,dt,res})^2) + ((Var(\hat{E}_{tp,dt}) \times (Var(\beta_{tp,dt,res})))$$

The approximate 95% confidence intervals for the residence effort were calculated with Equation 24.

Equation 24

$$95\% \text{ Confidence Intervals} = 2 \times \sqrt{Var(\hat{E}_{tp,dt,res})}$$

For catch in each residence and guided status category a similar approach was used. Equations 21 through 24 were used but day type effort was substituted with day type catch. Thus, proportions of catch were attributed to each residence and guided status category. In contrast, Equations 11 through 20 were used to calculate catch for each angling method category. Proportional allocation of catch could not be attributed to each angling method category because a proportion of the 'unknown' angling method from the aerial survey did not correspond with the exit survey interviews (all angling methods known).

Class One Effort and Catch

Due to few aerial counts in the class one section of the Zymoetz River, the seven time period strata were combined into three time period strata. Time periods 8-2, 9-1 and 9-2 were combined, time periods 10-1 and 10-2 were combined and time periods 11-1, 11-2 and 12-1 were combined. Day type stratification was kept in place. Similar equations (Equations 2 through 20) were used to calculate catch and effort for the class one section. Class one daily counts were not divided by the sampling probability because the nature of the fishery suggested most anglers were there for most of the day. Catch estimates were calculated using the catch rates from the class two section because of the small number of class one angler interviews completed. Catch and effort were only estimated up to November 15 due to poor access to the class one section. Thus, class one effort was assumed to be zero after November 15 when winter conditions prevailed.

Total Zymoetz River Effort and Catch

The total Zymoetz River angler effort in the study period was the class one section effort plus the class two section effort (Equation 25).

Equation 25

$$\hat{E} = \hat{E}_{C1} + \hat{E}_{C2}$$

The variance in the total Zymoetz River angler effort was the total effort variance of the class one section plus the total effort variance of the class two section (Equation 26).

Equation 26

$$Var(\hat{E}) = Var(\hat{E}_{C1}) + Var(\hat{E}_{C2})$$

The 95% confidence intervals for total angler effort was approximated by Equation 27.

Equation 27

$$95\% \text{ Confidence Intervals} = 2 \times \sqrt{Var(\hat{E})}$$

The total Zymoetz River angler catch in the study period was the class one section catch plus the class two section catch (Equation 28).

Equation 28 $$\hat{C} = \hat{C}_{C1} + \hat{C}_{C2}$$

The variance in the total Zymoetz River angler catch was the total catch variance of the class one section plus the total catch variance of the class two section (Equation 29).

Equation 29 $$Var(\hat{C}) = Var(\hat{C}_{C1}) + Var(\hat{C}_{C2})$$

The 95% confidence intervals for total angler catch was approximated by Equation 30.

Equation 30 $$95\% \text{ Confidence Intervals} = 2 \times \sqrt{Var(\hat{C})}$$

Steelhead Harvest Analysis (SHA) results from past years were compared with effort and catch estimates. The 1999 SHA results were not yet available.

3.3.7.0 Quality Angling Experience

Anglers were asked, *"What do you feel are the key characteristics of a high quality angling experience on the Zymoetz River?"* and *"How would you rate your quality angling experience today?"* The key characteristics of the quality experiences were summarized for each residence category and guided status. The individual angler was used for the unit of analysis, not the angler interviews, thus angler responses were only included. Also, only the first three key characteristics the angler provided were used. Mean ratings of the quality angling experience were summarized by time period, residence category and guided status. In this case, all angler interviews were used because the angler was asked to rate their experience on each day. In addition, angler ratings of their quality angling experience were summarized by time period.

3.3.8.0 Angler Comments

Anglers were asked if they had any additional comments. The comments were categorized into broad groups of responses. The individual angler was used for the unit of analysis not the angler interviews, thus anglers' comments were only included once in the analysis. Also, only the first three comments the angler provided (on the first interview) were used.

3.3.9.0 Survey Bias

To assess non-response bias at the exit survey station, the roving and aerial survey results were compared with the exit station results. The proportion of anglers interviewed in each residence category, guided status, access method and angling method category were compared between exit and roving surveys for the class two section. Chi-square tests were used to analyze the difference in proportions in each category. The proportion of anglers identified in the aerial survey in each guided status and angling method category were compared to the exit survey interviews for the class two section. A chi-square test of homogeneity was used to compare frequencies and a Yates correction for continuity was used when necessary.

4.0.0.0 Results and Discussion

4.1.0.0 Interviews

The River Guardians were on the Zymoetz River for 74 (66%) of the 112 day (16 week) study period. On those days, they spent 39 (55%) days at the exit survey station and 35 days (45%) roving around the river. Nine-hundred and seventy-nine steelhead anglers were observed and 758 were approached for an interview. Of the 666 anglers observed at the exit station(s), 504 (76%) stopped for an interview (Table 3). While roving, the River Guardians observed 313 anglers and approached 254 (81%) for an interview.

Of the 758 anglers approached for an interview, 735 anglers agreed to complete the interview while 3 anglers did not know enough English to complete the whole interview and 13 anglers refused to complete the interview. Seven other people approached were children or were not angling. Thus, almost 3% of anglers approached while roving or that stopped at the exit station did not complete the interview (20/758). The majority of anglers (59%, 442 anglers) were interviewed for the first time while 41% (309 anglers) had been interviewed previously (7 angler interviews did not have information recorded because they refused the interview or were not applicable).

There were 112 days in the study period and 35 (31%) were weekend or holiday days and 77 (69%) were weekdays. The proportion of interviews completed on weekends (61%; Saturday, Sunday, holidays) was higher than the interviews conducted on weekdays (39%) although the sampling effort was equally split between weekdays and weekend days. Most anglers were interviewed between the first week in September and the first week in November (81%). In addition, the majority of angler interviews were conducted in the Classified Waters Period (68%; 517 interviews).

Table 3. The number of anglers approached for an interview during exit and roving surveys and the total number of anglers interviewed on weekdays (Wday) and weekends (Wend) within each two-week period. Time periods that include the Classified Waters Period are bolded and italicized.

	Exit			Roving			Total		Grand
Period	**Wday**	**Wend**	**Total**	**Wday**	**Wend**	**Total**	**Wday**	**Wend**	**Total (%)**
8-2	0	0	0	0	13	13	0	13	13 (1.7%)
9-1	***37***	***51***	***88***	***45***	***19***	***64***	***82***	***70***	***152 (20.0%)***
9-2	***7***	***77***	***84***	***0***	***17***	***17***	***7***	***94***	***101 (13.3%)***
10-1	***56***	***79***	***135***	***27***	***16***	***43***	***83***	***95***	***178 (23.5%)***
10-2	***15***	***30***	***45***	***4***	***6***	***10***	***19***	***36***	***55 (7.3%)***
11-1	***39***	***56***	***95***	***16***	***16***	***32***	***55***	***72***	***127 (16.8%)***
11-2	20	15	35	19	24	43	39	49	78 (10.3%)
12-1	4	18	22	7	25	32	11	43	54 (7.1%)
Total (%)	**178 (35%)**	**326 (65%)**	**504 (100%)**	**118 (46%)**	**136 (53%)**	**254 (100%)**	**296 (39%)**	**462 (61%)**	**758 (100%)**

Almost all anglers were interviewed in the class two section (99%; Table 4). Only 1% of anglers interviewed fished in the class one section.

Table 4. The number of anglers approached for an interview and the percentage of anglers interviewed during exit and roving surveys with the total number of anglers interviewed on weekdays (Wday) or weekends (Wend) within each river section.

Section	Exit			Roving			Total		Grand
	Wday	Wend	Total	Wday	Wend	Total	Wday	Wend	Total (%)
Class One	2	9	11	0	0	0	2	9	11 (1.5%)
Class Two	176	317	493	118	136	254	294	453	747 (98.5%)
Total	**178 (35%)**	**326 (65%)**	**504 (100%)**	**118 (47%)**	**136 (53%)**	**254 (100%)**	**296 (39%)**	**462 (61%)**	**758 (100%)**

The River Guardians often encountered anglers more than once and thus, some anglers were interviewed multiple times. The number of repeat interviews constituted 41% of all interviews. The percentage of repeat interviews was relatively high in the later part of the study period reflecting the high proportion of local anglers (Table 5). Also, similar proportions of repeat interviews were conducted during the roving and exit surveys (43%, 40%, respectively).

Table 5. The percentages of repeat interviews in each week of the study period. Time periods that include the Classified Waters Period are bolded and italicized.

Period	Percentage (n) of Repeat Interviews in Each Period
8-2	7.1 (1)
9-1	***35.5 (54)***
9-2	***29.7 (30)***
10-1	***34.8 (62)***
10-2	***32.7 (18)***
11-1	***56.0 (70)***
11-2	53.8 (42)
12-1	65.3 (32)
Total	**40.8% (309)**

4.2.0.0 Weather Conditions

Detailed weather and water conditions were recorded for most days of the study period (Appendix 3.0 and 4.0). A total of 91 days (81%) were recorded as fishable and the remainder were non-fishable (Table 6; 21 days, 19%). A higher proportion of weekdays were recorded as non-fishable (23%) than weekend days (11%). On weekdays in periods 9-2 and 10-2, poor angling conditions existed. A landslide caused a natural dam that temporarily blocked the regular flow of Limonite Creek into the Zymoetz River on September 11. As a result, beginning on September 13 (period 9-2) there were several days of turbid conditions in Limonite Creek and the Zymoetz River. Also, in period 10-2 frequent rain events caused four days of poor angling conditions.

After November 15, the class one section was not accessible to anglers due to snow accumulation on the Bornite Mtn. Road. Forest harvesting was not active in the area and thus, the road was not cleared of snow. In other years, if forest harvesting was active, the road would have been cleared, increasing angler accessibility and effort.

Table 6. The number of days in each time period and the percentage of fishable days by weekday and weekend day. Time periods that include the Classified Waters Period are bolded and italicized.

Period	Total Days		Percentage (n) of Fishable Days	
	Weekday	Weekend	Weekday	Weekend
8-2	10	4	50.0 (5)	50.0 (2)
9-1	***9***	***5***	***100.0 (9)***	***80.0 (4)***
9-2	***10***	***4***	***40.0 (4)***	***100.0 (4)***
10-1	***10***	***4***	***90.0 (9)***	***100.0 (4)***
10-2	***9***	***5***	***55.6 (5)***	***100.0 (5)***
11-1	***10***	***4***	***100.0 (10)***	***75.0 (3)***
11-2	9	5	100.0 (9)	100.0 (5)
12-1	10	4	90.0 (9)	100.0 (4)
Total	77	**35**	**77.9 (60)**	**88.6 (31)**

4.3.0.0 Angler Characteristics

4.3.1.0 Angler Residence

Sixty-five percent (469 interviews) of all anglers interviewed were B.C. residents (Table 7). Two-hundred and four were repeat interviews, and thus 265 individual B.C. resident anglers were contacted. Of all B.C. resident interviews, 312 (75%) were Skeena Region residents and the remainder (25%) were from other areas of the province. One-hundred and seventy-four individual Skeena Region anglers and 79 individual anglers from other areas in the province were interviewed. Almost 4% of all angler interviews were Canadian residents, which represented 18 individual anglers. Non-Canadian residents composed 31% of all interviews and 77 were repeat interviews (146 individual anglers). Of all repeat angler interviews, most were B.C. residents (68%), followed by Non-Canadian residents (29%) and Canadian residents (3%). The proportion of repeat interviews did not differ by angler residence ($\chi^2 = 3.9$, df = 2, $P \leq 0.213$).

Table 7. The percentage of interviews initiated and repeat interviews for each residence category.

Residence	Percentage (n) of Angler Interviews Initiated[1]	Percentage (n) of Individual Anglers[2]
B.C. Total	65.3 (469)	61.8 (265)
Skeena Region	75.0 (312)	68.8 (174)
Rest of Province	25.0 (104)	31.2 (79)
Canadian	3.6 (26)	4.2 (18)
Non-Canadian	31.1 (223)	34.0 (146)

1. The residence was not collected from 40 interviews.
2. The residence was not collected from 13 interviews.

The postal code of B.C. residents described their regional residence status (Figure 3). Most B.C. residents interviewed were from the Skeena Region (69%, 174 anglers) followed by the Lower Mainland (17%, 43 anglers). Fewer anglers were from the Omineca-Peace (Prince George; 4%, 11 anglers), Vancouver Island (4%, 10 anglers), Kootenays 3%, (7 anglers) or the central portion of the province (Thompson-Nicola 2%, 5 anglers, Cariboo 3 %, 12 anglers, and Okanagan < 1%, 1 angler).

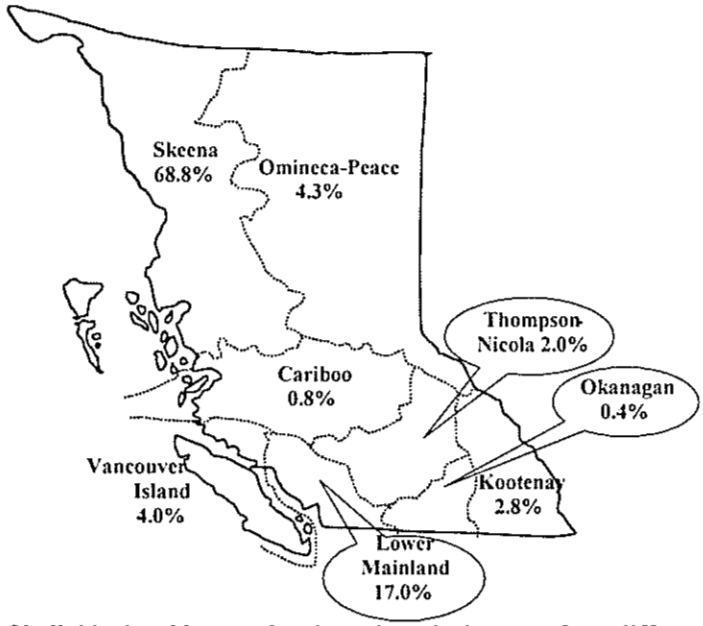

Figure 3. The percentage of individual resident anglers interviewed who were from different regions in the province of B.C.

Canadian and Non-Canadian residents were asked for their province or country of origin. Most Canadian residents were from Alberta (33%, 6 anglers), Ontario (28%, 5 anglers) or Newfoundland (22%, 4 anglers) while only a few were from Nova Scotia (11%, 2 anglers) or Saskatchewan (6%, 1 angler). The majority of Non-Canadian residents were from the United States (31%, 45 anglers), followed by Italy (19%, 28 anglers), Germany (13%, 19 anglers), the Czech Republic (6%, 8 anglers), Belguim, England, and France (all 5%, 7 anglers). Fewer than 5% (each) of Non-Canadian anglers were from Austria, Australia, Denmark, India, Japan, Luxembourg, Netherlands, New Zealand, Slovania, South Africa, Spain, or Switzerland.

The proportion of B.C. residents among Zymoetz River anglers has declined and the proportion of Non-Canadian residents has increased from earlier angler surveys (Table 8). In 1974, 79% of anglers interviewed were B.C. residents, 8% were Canadian residents and 13% were Non-Canadian residents (Whately 1975). Chudyk and Whately (1980) found that in 1978, 82% of angler trips were B.C. residents, 8% were Canadian residents and 10% were Non-Canadian residents. In the following year (1979), Chudyk and Whately (1980) found 93% of angler trips were B.C. residents, 5% were Canadian residents and 2% were Non-Canadian residents. More recently, in the fall of 1989, Lewynsky and Olmsted (1990) found that 63% of anglers were B.C. residents, 2% were Canadian residents and 35% were Non-Canadian residents.

Table 8. A summary of angler residence from previous angler surveys on the Zymoetz River.

	Whately 1975	Chudyk and Whatley 1980	Chudyk and Whatley 1980	Lewynky and Olmsted 1990[2]	Current Study
Year	1974	1978	1979	1989	1999
Period	Sept. 14 - Oct. 7	Sept. 1 – Oct. 29	Aug. 18 – Dec. 13	Aug. 15 – Oct. 15	Aug. 21 – Dec. 5
Number of Interviews	51	912[1]	839[1]	239	748[1]
Residence Categories					
B.C. Resident (%)	79	82	93	63	65
Cdn. Resident (%)	8	8	5	2	4
Non-Cdn. Resident (%)	13	10	2	35	31

1. Number of angler trips not individual anglers.
2. Approximate numbers because data were interpreted from a bar graph.

More B.C. residents than Canadian or Non-Canadian residents were interviewed in all time periods (Figure 4). Relative to other time periods, more Non-Canadians were interviewed in the Classified Waters Period than the shoulder weeks. The highest number of Non-Canadian resident interviews were completed in period 10-1. The number of B.C. resident angler interviews was highest in periods 9-1 and 10-1. The vast majority of interviews completed in mid to late November and early December were B.C. residents. Most Canadian residents were interviewed in week 11-1, 9-1 and 10-1 and no Canadian residents were interviewed in weeks 8-2, 10-2, or 12-1. Few anglers were interviewed in period 9-2 and 10-2 due to several days of poor angling conditions.

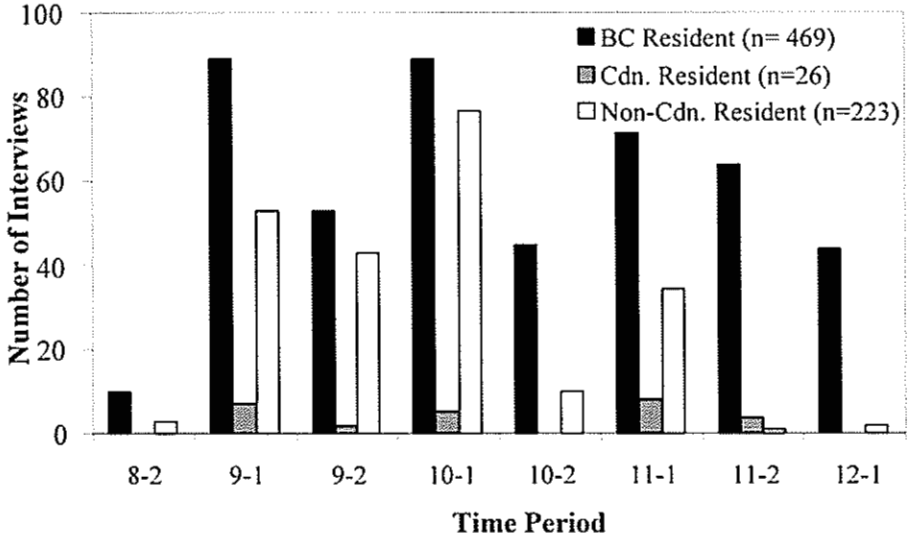

Figure 4. The number of angler interviews in each residence category completed in each time period.

Analysis of residence category results by day type indicated differences in residence composition of anglers by weekend and weekday days (chi-square $\chi^2 = 18.97$, df = 2, $P < 0.005$; Table 9). As expected, the proportion of B.C. residents interviewed on weekend days (70%) was higher than the proportion on weekdays (58%). In contrast, the proportion of Canadian and Non-Canadian residents was higher on weekdays than weekend days.

Table 9. The percentage of each residence category interviewed on weekdays and weekends for the entire study period.

Residence	Percentage (n) of Anglers Interviewed on: Weekday Days	Weekend Days
B.C.	58.0 (164)	70.1 (305)
Canadian	6.7 (19)	1.6 (7)
Non - Canadian	35.3 (100)	28.3 (123)

4.3.2.0 Angler Gender and Age

Ninety-six percent of individual anglers interviewed were male (385 anglers) and 4% (18 anglers) were female (Table 10). In 1989, Lewynsky and Olmsted (1990) reported a slightly higher proportion of female anglers (7%). In addition, the proportion of female anglers on the Bulkley River in 1998 was slightly higher than the percentage of female anglers on the Zymoetz River in 1999 (94% male, 6% female; Morten 1999).

On average, males were 40 years old and females were 35 years old. There were no female anglers under the age of 16 and only one over the age of 55. In contrast, 2% of male anglers were under the age of 16% and 17% were over 55 years of age.

Table 10. The percentage of male and female anglers within each age category and the mean age of male and female anglers.

Age Categories	Percentage (n) of Male Anglers	Percentage (n) of Female Anglers
under 16	1.8 (7)	0.0 (0)
17-24	8.3 (32)	16.7 (3)
25-34	28.1 (108)	33.3 (6)
35-44	25.5 (98)	33.3 (6)
45-54	19.5 (75)	11.1 (2)
55-64	14.0 (54)	0.0 (0)
65+	2.9 (11)	5.6 (1)
Total	**95.5 (385[1])**	**4.5 (18[2])**
Mean Age	**40.3**	**35.4**

1. Age was not collected from 37 male anglers.
2. Age was not collected from 2 female anglers.

4.3.3.0 Angler Guided Status

There were 47 (6%) guided anglers and 691 (94%) non-guided anglers interviewed. Guides and assistant guides were not included in the number of guided angler interviews. The guided angler interviews were not evenly distributed throughout the study period (Figure 5). Almost 90% of guided anglers were interviewed in the Classified Waters Period (42 anglers, 89% of guided anglers interviewed) and few guided anglers were interviewed in the shoulder weeks of the study period (late August, November, early December).

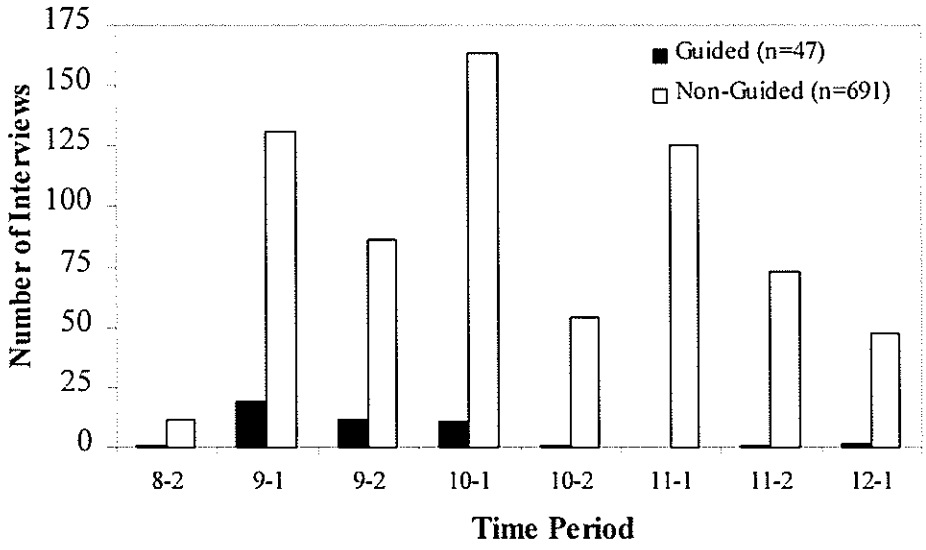

Figure 5. The number of guided and non-guided anglers interviewed in each week of the study period.

Few B.C. residents interviewed were guided (< 1%), while 4% of Canadian and 19% of Non-Canadian residents interviewed were guided (Table 11). Non-Canadian residents were more likely to be guided than B.C. or Canadian residents (chi-square $\chi^2 = 83.38$, df = 2, $P < 0.0005$).

Forty-two percent (289 interviews) of non-guided angler interviews were repeat interviews while 36% (17 interviews) of guided angler interviews were repeat interviews. There was no difference in the number of anglers that were interviewed more than once by their guided status (chi-square $\chi^2 = 0.579$, df = 1, $P \leq 0.447$).

Table 11. The proportion of guided and non-guided anglers that were B.C., Canadian and Non-Canadian residents.

Residence	Percentage (n) of Anglers[1]	
	Guided	Non-Guided
B.C.	0.6 (3)	99.4 (464)
Canadian	3.8 (1)	96.2 (25)
Non-Canadian	18.8 (42)	81.2 (181)

1. The guided status or residencey were not collected from 42 anglers.

Analysis of guided status results by weekday and weekend strata indicated no differences in guided status of anglers by weekend and weekday days (chi-square $\chi^2 = 0.395$, df = 1, $P < 0.530$; Table 12). The proportion of non-guided anglers interviewed on weekend days (93%) was similar to the proportion on weekdays (95%). Of all anglers interviewed, the proportion of guided anglers in 1999 (6%), was similar to the proportion of guided anglers in 1989 (7%; Lewynsky and Olmsted 1990).

Table 12. The proportion of each guided and non-guided anglers interviewed on weekdays and weekends for the whole study period.

Guided Status	Percentage (n) of Anglers[1] Interviewed on: Weekday Days	Weekend Days
Guided	5.5 (16)	6.7 (30)
Non - Guided	94.5 (273)	93.3 (419)

1. The guided status was not collected from 20 anglers.

4.3.4.0 Angler Conservation Club Membership

Thirty-two percent of anglers interviewed (135 anglers, 17 missing this information) were members of at least one conservation club. Non-Canadian residents (42%) were more likely to be members of a conservation club than Canadian or B.C. residents (22%; 27%; respectively, chi-square $\chi^2 = 9.43$, df $= 2$, $P \leq 0.009$). Thirty-eight percent of guided anglers interviewed were members of a conservation club while 32% of non-guided anglers were members of a conservation club. Similar proportions of guided anglers and non-guided anglers were members of a conservation club (chi-square $\chi^2 = 0.52$, df $= 1$, $P \leq 0.471$).

Of the anglers that were members of at least one conservation club, most were members of the Steelhead Society of British Columbia (25%) or Trout Unlimited (17%) or a foreign country fishing club (17%). Fewer anglers were members of the B.C. Wildlife Federation (11%), the Sierra Club (8%) or the B.C. Federation of Fly Fishers (8%). The remaining conservation clubs were listed in Table 13 and Appendix 2.0.

Table 13. The top 11 conservation clubs that anglers reported they were members of.

Conservation Club[1]	Percentage (n) of Anglers that Responded
Steelhead Society of British Columbia	24.7 (46)
Trout Unlimited	17.2 (32)
Foreign Country (other than Canada and US)	17.2 (32)
B.C. Wildlife Federation	10.8 (20)
Sierra Club	8.1 (15)
B.C. Federation of Fly Fishers	8.1 (15)
Local Rod and Gun Club	6.5 (12)
B.C. Federation of Driftfishers	5.4 (10)
Sportfish Advisory Board	4.3 (8)
Nature Conservancy	2.7 (5)
California, Oregon and Washington Trout	2.7 (5)

1. See Appendix 2.0 for the complete list of conservation clubs mentioned by Zymoetz River anglers.

Of all anglers interviewed, the proportion that were members of a conservation club was lower in 1999 (32%) than in 1974 (51%; Whately 1975, Table 18). Since the proportion of B.C. residents was higher in 1974, it appeared that B.C. residents were more likely to be members of a conservation club in 1974 than in 1999.

4.4.0.0 Angler Trip Characteristics

4.4.1.0 Angling Methods

Of all angler interviews, there were more fly anglers than gear anglers (62%, 453 anglers and 31%; 234 anglers, respectively; Table 15) while 7% of anglers (50 anglers) indicated they used both a fly and a gear rod. Similarly, 258 (64%) individual anglers (no repeat interviews) were fly fishing while 143 (36%) individual anglers were gear fishing. More B.C., Canadian and Non-Canadian residents were fly anglers than gear anglers (Table 14). The proportion of B.C. residents that fished with a gear rod (42%) was higher than Canadian (15%) or Non-Canadian (11%) residents. Statistically, the ratio of fly to gear anglers differed by residence category (chi-square $\chi^2 = 77.85$, df = 4, $P < 0.0005$).

Table 14. The percentage of fly and gear anglers and drift boat and shore-access anglers in each residence and guided status categories.

	Percentage (n) of Anglers		Percentage (n) of Anglers		
	Drift Boat	**Shore**	**Fly**	**Gear**	**Both**
Residence[1]					
B.C.	8.2 (38)	91.8 (428)	50.7 (237)	41.5 (194)	7.7 (36)
Canadian	7.7 (2)	92.3 (24)	84.6 (22)	15.4 (4)	0.0 (0)
Non-Canadian	9.9 (22)	90.1 (201)	83.4 (186)	11.2 (25)	5.4 (12)
Guided Status[2]					
Guided	34.0 (16)	66.0 (31)	63.8 (30)	21.3 (10)	14.9 (7)
Non-Guided	6.7 (46)	93.3 (642)	61.5 (424)	32.2 (222)	6.2 (43)

1. No data for 43 interviews.
2. No data for 23 interviews.

Five independent surveys of Zymoetz River anglers between 1974 and 1999 indicated a clear trend towards an increase in the proportion of fly anglers (Table 19). In 1989, Lewynsky and Olmsted 1990) found 51% of steelhead anglers interviewed were fly anglers and 45% were gear (lure) anglers. In addition, in 1979 Chudyk and Whately (1980) found 10% of steelhead anglers interviewed were fly anglers and 59% were gear (lure) anglers. A year earlier (1978), Chudyk and Whately only found 5% of steelhead anglers used a fly road and 64% used gear (Chudyk and Whately 1980). In 1974, none of the steelhead anglers interviewed used a fly rod while 31% used gear, 38% used roe, and the remaining anglers used both gear and roe (Whately 1975). The trend towards an increase in the proportion of fly anglers concurs with the increase in the proportion of Non-Residents (Table 8) and their propensity to use fly rods (Table 14).

Of all angler interviews, 92% were shore-access anglers, whereas the remaining anglers gained access with a drift boat (8%; Table 14). Of all drift boat-access anglers interviewed, 61% (38 anglers) were B.C. residents, 36% (22 anglers) were Non-Canadian and 3% (2 anglers) were Canadian residents. More than half of all shore-access anglers interviewed were B.C. residents (428 anglers) while less were Non-Canadian (31%, 201 anglers) or Canadian residents (4%, 24 anglers). A similar proportion of B.C., Canadian and Non-Canadian residents gained access to the Zymoetz River by drift boat (approx. 8%, chi-square $\chi^2 = 0.59$, df = 2, $P \leq 0.744$). All class one anglers interviewed were shore-access anglers and although no anglers were interviewed that gained access by helicopter and drift boat and anecdotal data suggested that some anglers used these alternate methods.

Guided anglers were more likely to fly fish or use both a fly and a gear rod than non-guided anglers (chi-square $\chi^2 = 6.56$, df = 2, $P \leq 0.038$; Table 14). A total of 79% of guided anglers compared to 68% of non-guided anglers indicated they fished with a fly rod or both a fly and a gear rod. A third of guided anglers accessed the river by drift boats (34%) and the remainder 66% (31 guided anglers) walked to their fishing location. In contrast, none of the guided anglers interviewed in 1989 gained access to the river by boat (Lewynsky and Olmsted 1990). In 1999, 7% of non-guided anglers accessed the river by drift boat and similarly, in 1989, 6% of non-guided anglers gained access by boat (Lewynsky and Olmsted 1990). Sample sizes did not permit the statistical testing of the proportion of guided anglers that used shore or a drift boat to access the river.

Overall, 82% of drift boat-access anglers interviewed were fly fishing, 12% were gear fishing and 5% were fishing with both a fly and a gear rod (Table 15). Fishing with gear was more common among shore-access anglers (34%) than drift boat-access anglers (13%). Statistically, the composition of fly and gear anglers differed by river access method (chi-square $\chi^2 = 12.08$, df = 1, $P \leq 0.001$; excluding anglers that fished with both to meet assumptions of the chi-square test).

Table 15. The percentages of drift boat and shore-access anglers that fished with fly, gear or both types of rods.

Angling Method	Percentage (n) of Anglers[1]		
	Drift Boat	Shore	Total
Fly	82.3 (51)	59.6 (402)	61.8 (453)
Gear	12.9 (8)	33.5 (226)	31.8 (234)
Both	4.8 (3)	7.0 (47)	6.8 (50)
Total	**8.4 (62)**	**91.6 (675)**	**100.0 (737)**

1. No data for 21 interviews.

4.4.2.0 Trip Length

Overall, anglers spent an average of 5.2 hours in and around the Zymoetz River (angling day; Table 16). In general, the angling day was longer in late August, September and early October than the later portion of the study period most likely due to the available light per day and weather conditions. The mean angling day was longest in time period 10-1 (5.9 hr) followed by 9-2 (5.8 hr), whereas the shortest mean angling day was in 12-1 (3.7 hr) followed by 11-2 (4.2 hr). The length of the angling day differed between time periods (Kruskal-Wallis $\chi^2 = 43.07$, df=6, $P < 0.0005$).

Table 16. The mean angling day and standard deviation (hours) of anglers interviewed at the exit station by time period. Time periods that included the Classified Waters Period are bolded and italicized.

Time Period	Mean (n) Angling Day (hr)	Standard Deviation
9-1	*5.7 (88)*	*3.1*
9-2	*5.8 (84)*	*2.3*
10-1	*5.9 (135)*	*2.4*
10-2	*4.3 (45)*	*2.7*
11-1	*4.6 (93)*	*2.2*
11-2	4.2 (35)	2.2
12-1	3.7 (22)	1.8
Total	**5.2 (504)**	**2.6**

On average, B.C. and Canadian residents fished for fewer hours per day (4.5 and 4.8 hours, respectively) than Non-Canadian residents (6.9 hours; Table 17). Guided anglers fished longer (7.6 hr) than non-guided anglers (5.1 hr). Anglers that fished from a drift boat fished longer on average than shore based anglers (6.3 and 5.1 hours, respectively). Also, fly rod anglers fished longer than gear rod anglers (5.7 and 4.3 hours, respectively).

Table 17. The mean angling day (hr) by angler residence category, guided status, access method and angling method with corresponding statistical test results.

	Mean (n) Angling Day (hr)	Standard Deviation	Statistical Test Result
Residence			Kruskal-Wallis $\chi^2 = 87.57$, df = 2,
B.C.	4.5 (300)	2.4	$P < 0.0005$
Canadian	4.8 (13)	2.1	
Non-Canadian	6.9 (149)	2.2	
Guided Status			Mann-Whitney U = 3291.0,
Guided	7.6 (33)	1.5	$P < 0.0005$
Non-Guided	5.1 (499)	2.5	
Access Method			Mann-Whitney U = 8598.0
Drift Boat	6.3 (48)	2.1	$P \leq 0.003$
Shore	5.1 (486)	2.6	
Angling Method			Mann Whitney U = 18975
Fly	5.7 (334)	2.6	$P \leq 0.000$
Gear	4.3 (164)	2.3	

Daily fishing activity followed a normal distribution and almost all anglers interviewed were on the river between 7:00 a.m. and 7:00 p.m. The majority of angler effort occurred between 11:00 a.m. and 3:00 p.m. (Figure 6). The activity profile indicated most angler effort occurred during the aerial count (between 1:00 and 3:00 p.m.) and 70% of angler activity was between 2:00 and 3:00 pm when the aerial counts occurred. Activity profiles for each time period are in Appendix 7.0.

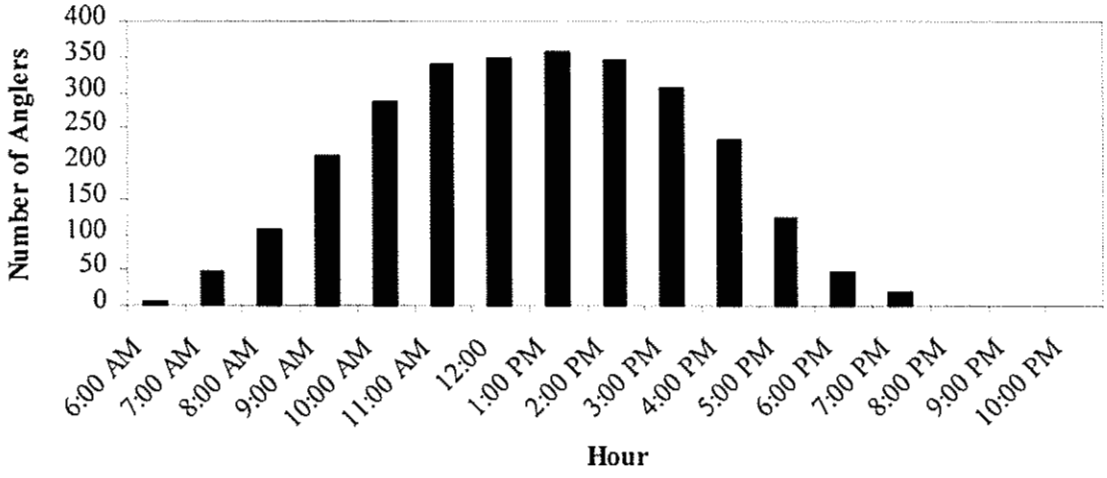

Figure 6. Of anglers interviewed at the exit station, the number of anglers that fished during each one hour time block (n=735).

Anglers were asked to subtract the time spent driving, hiking and preparation time from the angling day (which equaled fishing time). The difference between the mean angling day (5.2 hr) and the mean fishing time (3.9 hr) was 1.3 hr (Table 24). The difference indicated that on average, anglers spent 1.3 hr of their angling day driving, hiking or preparing to fish and illustrates the highly mobile nature of the fishery.

Overall, anglers planned to spend an average of 6.9 days angling for steelhead on the Zymoetz River. On average, B.C. residents planned to fish for 8.8 days, while Canadian and Non-Canadian residents planned to fish for fewer days (4.1 and 4.0 days, respectively). Statistically, there were differences in the number of days that each residence category planned to fish (Kruskal-Wallis $\chi^2 = 20.65$, df = 2, $P < 0.0005$). Guided anglers planned to fish for an average of 3.2 days while non-guided anglers planned to fish for 7.2 days (Table 18). Although guided anglers planned to spend fewer days angling than non-guided anglers, the difference was not statistically significant (Mann-Whitney U = 21548.0, $P < 0.0005$) and was probably a result of residence status.

Table 18. The percentage of days anglers planned to fish in 1999 for steelhead on the Zymoetz River within each residence and guided status category.

	Percentage (n) of Anglers in Each Category of Days They Planned to Fish							
	1-5 days	6-10 days	11-15 days	16-20 days	21-25 days	26-30 days	31+ days	Mean (n)
Residence								
B.C.	50.8 (121)	25.6 (61)	8.0 (19)	5.0 (12)	3.4 (8)	2.1 (5)	5.0 (12)	8.8 (238)
Canadian	71.4 (10)	14.3 (2)	7.1 (1)	0.0 (0)	7.1 (1)	0.0 (0)	0.0 (0)	4.1 (14)
Non-Canadian	75.4 (98)	21.5 (28)	1.5 (2)	0.8 (1)	0.0 (0)	0.0 (0)	0.8 (1)	4.0 (130)
Guided Status								
Guided	66.7 (16)	33.3 (8)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	3.2 (24)
Non-Guided	59.6 (214)	23.1 (83)	6.1 (22)	3.6 (13)	2.5 (9)	1.4 (4)	3.6 (13)	7.2 (359)

Anglers were asked how many days they had already fished and how many more they planned to fish on the Zymoetz River. Individual anglers planned to fish for a total of 2,961 rod days on the Zymoetz River, in 1999. However, not all anglers were interviewed, therefore 2,961 rod days was an underestimate of the total number of days that all anglers planned to fish. Despite the underestimate, anglers planned to fish for 1,554 more rod days than the effort estimate from aerial counts (1,398 rod days, Table 27). The discrepancy indicated that anglers did not fish as many days as they planned and was similar to results obtained on the Bulkley River in 1998 (Morten 1999). Also, anglers estimated the number of days they planned to fish while assuming water conditions would be favorable for angling on those days.

Table 19. A summary of angler guided status and conservation club membership from previous angler surveys on the Zymoetz River.

	Whately 1975	Chudyk and Whatley 1980	Chudyk and Whatley 1980	Lewynky and Olmsted 1990[2]	Current Study
Year	1974	1978	1979	1989	1999
Period	Sept. 14 - Oct. 7	Sept. 1 – Oct. 29	Aug. 18 – Dec. 13	Aug. 15 – Oct. 15	Aug. 21 – Dec. 5
Number of Interviews	51	912[1]	839[1]	239	748[1]
Guided Anglers (%)	NA	NA	NA	6	6
Access Method					
Drift Boat (%)	NA	NA	NA	5	8
Foot (%)	NA	NA	NA	95	92
Angling Method					
Fly (%)	0	5	10	51	62
Gear (%)	31	64	59	45	31
Roe (%)	38	26	31	NA	NA
Combination (%)	31[3]	NA	NA	4[4]	7[4]
Conservation Club Member (%)	51	NA	NA	NA	32
Gender					
Male (%)	94	NA	NA	93	96
Female (%)	6	NA	NA	7	4

1. Number of angler trips not individual anglers.
2. Approximate numbers because data were interpreted from a bar graph.
3. Combination of roe and gear.
4. Combination of fly and gear.

4.5.0.0 Angling Licenses

4.5.1.0 Angling License Class

Most B.C. resident anglers interviewed purchased an annual angling license (97%; Table 20). Only 1% of B.C. residents interviewed purchased an eight-day angling license and slightly more (2%) anglers purchased a one-day angling license. Similarly, Canadian and Non-Canadian residents bought more annual angling licenses than eight- or one-day angling licenses. The proportion of angler residence categories and guided status categories that purchased different license types could not be tested statistically because of low sample sizes in the one- and eight-day license categories.

Table 20. The percentage of anglers with a one-day, eight-day and annual license within each residence and guided status category.

	Percentage (n) of Anglers in License Class		
	One-Day	Eight-Day	Annual
Residence			
B.C.	2.1 (5)	0.9 (2)	97.0 (234)
Canadian	5.6 (1)	38.9 (7)	55.6 (10)
Non-Canadian	5.0 (7)	17.9 (25)	77.1 (108)
Guided Status			
Guided	0.0 (0)	50.0 (14)	50.0 (14)
Non-Guided	3.6 (13)	5.7 (21)	90.7 (332)

4.5.2.0 Classified Waters Days Purchased

Anglers were not required to purchase all Classified Waters licenses at one time, nor were they required to carry all of their used Classified Waters licenses they purchased with them. Therefore, the data represented the number of Classified Waters days purchased by the angler on or immediately prior to the day the angler was interviewed.

Daily Classified Waters licenses purchased were analyzed by grouping all Canadian and Non-Canadian residents together. B.C. residents were excluded because all buy an annual Classified Waters license that is not available to anglers residing outside of the province. All anglers that purchased one-day angling licenses also purchased a one-day Classified Waters license. The majority of anglers that purchased eight-day angling licenses purchased a one-day Classified Waters license (82%, Table 21). Similarly, the majority (80%) of anglers that purchased an annual angling license purchased a one- or two-day Classified Waters license. The propensity of anglers to purchase a one-day Classified Waters license was due to the volatility of the water conditions.

Table 21. The number of Classified Waters days purchased at the time of the interview in each license class for Canadian and Non-Canadian residents (grouped together).

License Class	Percentage (n) of Classified Waters Days Purchased							
	1-Day	2-Day	3-Day	4-Day	5-Day	6-Day	7-Day	8-Day
1 Day	100.0 (9)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)
8 Day	81.5 (22)	3.7 (1)	0.0 (0)	11.1 (3)	0.0 (0)	3.7 (1)	0.0 (0)	12.3 (17)
Annual	63.8 (88)	15.9 (22)	0.0 (0)	6.9 (12)	1.1 (2)	0.6 (1)	9.8 (17)	9.8 (17)

Canadian and Non-Canadian resident anglers planned to fish for more days than their Classified Waters license specified. For example, only 54 anglers planned to fish for only one day while 119 anglers purchased one-day Classified Waters licenses. Sixty-nine percent of non-guided anglers purchased a one-day Classified Waters license although they planned to fish for seven days on average (Figure 7). Similarly, 58% of guided anglers purchased a one-day Classified Waters license and planned on fishing an average of three days. Also, guided anglers purchased more four-, five- and six-day Classified Waters licenses than non-guided anglers which corresponded with their mean trip length of three days.

These results helped clarify the understanding that non-guided, Non-Resident anglers purchase their Classified Waters license in one- or two-day blocks. Anglers may want to fish on different Classified Waters or do not want to take the chance of being 'rained out' and wasting their license investment. A similar result was obtained on the Bulkley River in 1998 (Morten 1999).

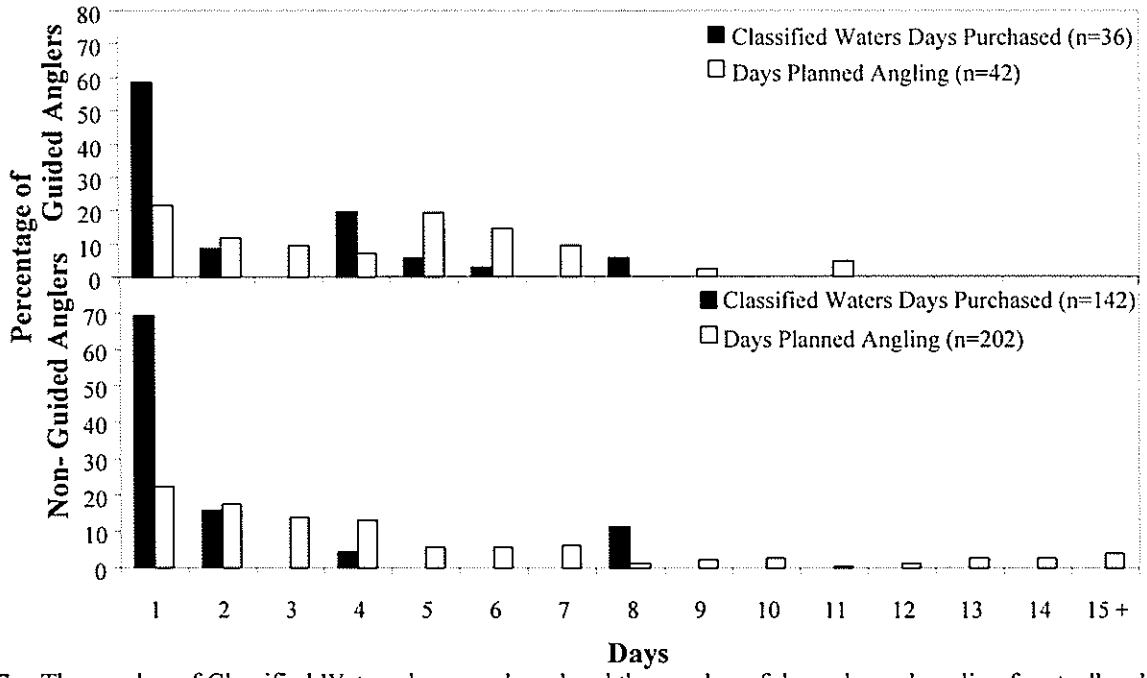

Figure 7. The number of Classified Waters days purchased and the number of days planned angling for steelhead for guided and non-guided anglers (Canadian and Non-Canadian residents only) at the time of the interview.

4.5.3.0 Angler Compliance

Angling licenses were inspected for compliance with regulations and non-compliance was recorded on the interview form. The River Guardians did not have the authority to issue citations for license non-compliance but simply recorded the license infraction if one existed. Almost 8% of anglers interviewed had at least one license infraction, which included those anglers that refused to show the River Guardian their license (Table 22). Of those anglers with an infraction, 96% (53 angler interviews) had one infraction and two anglers had two infractions. The majority of anglers with at least one infraction were B.C. residents (67%), followed by Non-Canadian residents (31%) and Canadian residents (2%).

Table 22. The percentage of anglers interviewed with an infraction and the percentage of offending anglers with one or two infractions.

Number of Infractions	Percentage of Interviews (n)[1]
Anglers with at least one infraction	7.5 (57)
One Infraction	96.0 (55)
Two Infractions	4.0 (2)

1. 28 interviews were missing infraction data

Failure to produce a license was the most frequent infraction and included those anglers that refused to show the River Guardians their license (44%, Table 23). Eighty percent (20 infractions) were B.C. residents which represented 4% of all B.C. residents interviewed. Failure to purchase a steelhead conservation stamp comprised 37% of license infractions noted. Two percent of all B.C. residents interviewed and 5% of all Non-Canadian residents interviewed failed to purchase a steelhead conservation stamp. Ten anglers did not have a Classified Waters license, seven were B.C. residents

(2% of all B.C. residents) and the remaining three were Non-Canadian residents. One B.C. resident was suspected of having fished with roe. Nineteen-ninety-nine (1999) was the third year that B.C. residents were required to purchase a Classified Waters license for the Zymoetz River during September and October. All anglers were required to purchase a steelhead stamp during that period and outside of the Classified Waters Period if they were angling for steelhead.

Table 23. The percentage of all anglers noted with each type of infraction and the percentage of infractions within each residence category.

Type of Infraction	All Infractions	Percentage (n) of Anglers with Infractions[2]		
		B.C.	Canadian	Non-Canadian
Failure to carry/produce license[1]	43.9 (25)	4.3 (20)	0.0 (0)	1.4 (3)
No steelhead conservation stamp[3]	36.8 (21)	1.7 (8)	3.8 (1)	5.0 (11)
No Classified Waters license	17.5 (10)	1.5 (7)	0.0 (0)	1.4 (3)
Fishing with roe	1.8 (1)	0.2 (1)	0.0 (0)	0.0 (0)

1. Failure to carry/produce included those anglers that refused to show the River Guardians their angling license, 2 anglers could not be assigned to a residence category.
2. Refers to the percentage within each residence category.
3. One angler could not be assigned to a residence category.

Three guided anglers were observed with a license infraction (7% of all guided anglers). Two guided anglers did not have a valid Classified Waters license and one angler did not produce an angling license. All three guided anglers that had license infractions had the same guide.

The infractions were noted in the first half of the study period (47% before September 26). No infractions were noted in November or early December. Spatially, all infractions were noted on the class two section of the Zymoetz River. The infractions noted temporally and spatially could be a result of the small amount of sampling effort in the class one section and the later part of the study period.

These results cannot be generalized to past years or other rivers because of the publicity regarding the presence of River Guardians in 1999. The knowledge of an increased presence on the river may have caused an angler who may not have purchased a steelhead stamp or Classified Waters license in the past to purchase one in 1999. All evidence suggested the River Guardian program had a positive effect on angler compliance with regulations.

4.6.0.0 Angler Catch and Effort

4.6.1.0 Catch Rate

A total of 1,817 hours of angling effort were reported by anglers at the time of the interview. Overall, anglers averaged 3.9 hours of fishing time per day (Table 24). Five-hundred and forty-eight (548) steelhead were landed and released. The catch rate was calculated by averaging the steelhead catch and fishing time for interviews where anglers fished for 0.5 hr (30 minutes) or more. The catch rate for all angler interviews was 0.30 steelhead/hour or 1.19 steelhead/rod day (3.91 hr rod day). The observed catch rate for anglers in 1999 was higher than past estimates. In 1989, steelhead anglers caught between 0.04 and 0.11 steelhead/hour (Table 5 *in* Lewynsky and Olmsted 1990). Although in 1989, driving, hiking and preparation time were not accounted for and thus a lower catch rate was expected.

Catch rates were estimated for each time period of the survey by grouping both river sections (Table 24). Time period 11-2 produced the highest catch rate (2.4 steelhead/rod day) followed by 10-1 (1.3 steelhead/rod day) and 9-1 (1.3 steelhead/rod day). Time periods 10-2 (0.6 steelhead/rod day) and 9-2 (0.9 steelhead/rod day) had the lowest steelhead catch rates. Turbid and high water conditions dominated most of 10-2 and slightly turbid conditions resulted from the land slide in the Limonite Creek watershed in 9-2.

Table 24. The numbers of steelhead landed, hours fished, catch rate and steelhead/rod day by time period. Time periods that include the Classified Waters Period are bolded and italicized.

Time Period[4]	Steelhead Landed	Total Hours Fished	Catch Rate [1]	Mean Fishing Time (hr)[2]	Steelhead per Rod Day[3]
9-1	*104*	*352*	*0.29*	*4.25*	*1.25*
9-2	*74*	*359*	*0.20*	*4.49*	*0.93*
10-1	*163*	*541*	*0.30*	*4.29*	*1.29*
10-2	*26*	*137*	*0.19*	*3.35*	*0.65*
11-1	*83*	*256*	*0.32*	*3.16*	*1.05*
11-2	76	118	0.64	3.57	2.38
12-1	22	54	0.41	2.56	1.05
Total	**548**	**1,817**	**0.30**	**3.91**	**1.19**

1. The mean steelhead caught each day divided by the mean fishing time with only completed trip data 0.5 hr or longer (n=461).
2. The time (hr) the time the angler spent fishing, excluding driving, hiking and preparation time.
3. Steelhead/rod day was the mean number of steelhead caught per angler.
4. Time period 8-2 did not have any exit surveys completed and therefore was not included.

Catch rates were estimated for completed trip interviews in the class one and class two river sections. The catch rate for the class two section was 0.30 steelhead/hour and the catch rate for 10 interviews in the class one section was 0.24 (Table 25). Statistically, there was no difference in the catch rates between sections (students t = 0.185, $P \leq 0.559$).

Table 25. The number of steelhead landed, hours fished, catch rate and steelhead per rod day within each river section.

River Section	Steelhead Caught	Total Hours Fished	Catch Rate	Mean Fishing Time (hr)	Steelhead per Rod Day
Class One	10	41	0.24	4.10	1.00
Class Two	538	1,776	0.30	3.90	1.19

Among residence categories, Canadian residents had the highest catch rate (1.7 steelhead/rod day), followed by B.C. residents (1.3 steelhead/rod day) and Non-Canadian residents (1.0 steelhead/rod day, Table 26). Guided anglers had higher catch rates (1.3 steelhead/rod day) than non-guided anglers (1.2 steelhead/rod day) and drift boat-access anglers had higher catch rates (2.5 steelhead/rod day) than shore-access anglers (1.1 steelhead/rod day). On average, gear anglers caught 1.4 steelhead/rod day whereas fly anglers caught 1.1 steelhead/rod day.

Table 26. The number of steelhead landed, hours fished, catch rate and steelhead per rod day within each residence, guided status, access method and angling method category.

	Steelhead Caught	Total Hours Fished	Catch Rate	Mean Fishing Time (hr)	Steelhead per Rod Day
Residence					
B.C.	363	918	0.40	3.27	1.30
Canadian	22	52	0.43	3.96	1.69
Non-Canadian	153	788	0.19	5.25	1.02
Guided					
Guided	41	178	0.23	5.74	1.32
Non-Guided	507	1,637	0.31	3.82	1.18
Access Method					
Drift Boat	101	207	0.48	5.05	2.46
Shore	447	1,610	0.27	3.83	1.06
Angling Method					
Fly fishing	293	1,176	0.25	4.24	1.07
Gear fishing	215	499	0.43	3.26	1.41
Both	37	37	0.26	4.60	1.19

On the Zymoetz River, 131 Dolly Varden/bull trout were caught and 128 were released and three were kept. The catch rate was 0.3 Dolly Varden/bull trout/rod day. In addition, 55 coho salmon, 10 pink salmon, 3 chum salmon, 2 sockeye salmon, 8 rainbow trout, 9 whitefish and 2 cutthroat trout were landed and released.

Anglers also had the opportunity to fish on the Clore River. Of the 504 anglers that stopped at the exit station, 47 (9%) had fished the Clore River for a total of 62 hours and an average of 1.6 hours. Clore River anglers caught 29 steelhead for an overall catch rate of 0.47 steelhead/hour. Clore River anglers also caught 4 Dolly Varden/bull trout. In addition, 3 coho salmon and 6 whitefish were landed and released.

4.6.2.0 Aerial Flights

There were 380 anglers counted in the class two section of the Zymoetz River during 37 aerial flights. The high count of 37 anglers occurred on September 26 (time period 9-2) while a zero angler count occurred on several occasions (August 25, September 20, November 14 and November 25). On average, 10 anglers were counted in the class two section per flight. The proportion of anglers counted above and below the Clore River was equal at 50% each. There were 23 drift boats counted in the class two section and the majority (87%) were below the Clore River.

There were 57 anglers observed in 25 flights of the class one section and the high count of 15 anglers was on September 26. Also, four drift boats were counted on two separate occasions in the class one section.

4.6.3.0 Catch and Effort Estimates

4.6.3.1 Catch and Effort Estimates for All Anglers

The total effort estimate for the whole study period (and study area) was 1,398 rod days while the effort estimate for the Classified Waters Period was 953 rod days (68% of total; Table 27). The total catch estimate was 1,545 steelhead and 1,056 (68%) were caught in the Classified Waters Period. The total effort and catch estimates were the sum of all time period estimates. The majority (1,248 rod days, 89%) of angler effort and catch (1,389 steelhead, 90%) occurred in the class two section.

Table 27. Angler catch and effort estimates with 95% confidence intervals for the last week of August, September, October, November and early December of 1999.

	Effort Estimate (rod day)	95 % CI	Catch Estimate (steelhead)	95 % CI
Whole Season				
Class Two	1,248	± 110	1,389	± 319
Class One[1,2]	150	± 62	156	± 87
Total	**1,398**	**± 126**	**1,545**	**± 330**
Classified Waters Period				
Class Two	835	± 66	929	± 118
Class One[1]	118	± 47	127	± 78
Total	**953**	**± 84**	**1,056**	**± 141**

1. Catch rates from the class two section were used.
2. Access to the class one section after November 15 was poor and therefore, no angler effort was assumed.

The temporal distribution of estimated angler effort for the class two section was influenced by weather conditions. The largest effort estimates occurred in the time period of 11-1 (215 rod days) followed by 10-1 (186 rod days), whereas 10-2 and 8-2 had the lowest effort estimates (99, 10 rod days respectively, Table 28). The largest catch estimates occurred in 10-1 (469 steelhead) followed by 9-1 and 11-1 (94 and 74 steelhead, respectively). The lowest catch estimates occurred in late August (8-2) and when poor angling conditions occurred (9-2, 10-2). Time periods 11-2 and 12-1 were combined for effort and catch estimates. The landslide in 9-2 and poor weather in 10-2 reduced angler effort estimates.

For the whole study period, 725 (52%) rod days of angler effort were estimated on weekdays and the remaining 673 (48%) rod days were estimated for weekend days.

Table 28. A summary of the effort and total catch with 95% confidence intervals by time period in the class two section. Time periods that include the Classified Waters Period are bolded and italicized.

Time Period[2]	Total Effort (rod days)	95% CI Effort	Total Catch (steelhead)	95% CI for Total Catch
8-2[3]	10	± 14	5	± 8
9-1	***170***	***± 29***	***206***	***± 94***
9-2	***149***	***± 45***	***130***	***± 66***
10-1	***186***	***± 50***	***469***	***± 110***
10-2	***99***	***± 30***	***61***	***± 41***
11-1	***215***	***± 67***	***201***	***± 74***
11-2/12-1[1]	254	± 83	324	± 385

1. Strata 11-2 and 12-1 were combined.
2. Includes both weekend and weekdays.
3. Includes catch rates from 9-1, weekend days.

The 1999 SHA results were not yet available and thus, only past SHA results (1983-1998) were compared to River Guardian estimates. The effort estimate for the 1999 fall steelhead season (1,396 rod days) was less than 1997 and 1998 steelhead harvest analysis SHA estimates but larger than 1990 through 1996 estimates (Table 29). A similar pattern existed for angler catch where the SHA estimates were greater in the most recent two years but less from 1990 through 1996. The average for both effort and catch from 1983 through 1989 was considerably larger than the recent SHA estimates and effort and catch estimates in this study. A comprehensive study of precision and bias of the SHA reported an upward discrepancy estimate for the SHA of 58% for angler days and 109% for released steelhead catch (De Gisi 1999). Although the author notes that most field studies in the data set used for analysis were subject to a substantial downward bias that was not quantified.

Table 29. The Steelhead Harvest Analysis estimated effort and catch for past years.

Year(s)[1,2]	Estimated Effort (rod days)	Estimated Catch (sthd)
1998	1,877	2,526
1997	1,553	1,901
1996	1,037	1,241
1995	1,288	1,151
1994	1,260	1,478
1993	1,251	1,007
1992	779	695
1991	661	370
1990	1,331	906
1983-1989	mean = 2,995	mean = 2,337

1. The pooled years were separated into groups with similar regulations. After 1991, usually all steelhead were caught and released after August 1, in years 1983-1990 there were variable regulations about catch and release, before 1983 there were no catch and release regulations.
2. Refers to the year of the fall steelhead season.

4.6.3.2 Catch and Effort Estimate for Angler Residence, Guided Status and Angling Method

In the class two section, B.C. residents were estimated to angle for 809 rod days between August 21 and December 5 (Table 30). Non-Canadian residents were estimated to produce 386 rod days of angler effort and 53 rod days of effort were estimated for Canadian residents. There were 117 guided angler days and 1,131 non-guided angler days of angler effort estimated. The estimate of guided angler rod days included the guide. There was an estimated 879 fly rod days and 286 gear rod days of angler effort. In addition, 83 rod days were estimated as unidentifiable, fly or gear anglers because a small proportion of anglers could not be identified as angling with a fly or gear rod from the helicopter.

In the class two section, B.C. residents were estimated to catch a total of 870 steelhead in the whole study period. Non-Canadian residents were estimated to catch 453 steelhead while Canadian residents caught an estimated 66 steelhead (class two section only; Table 30). Non-guided anglers were estimated to catch 998 steelhead while guided anglers caught an estimated 391 steelhead. Fly rod anglers were estimated to catch 966 steelhead while gear rod anglers caught an estimated 213 steelhead. Also, unidentifiable gear or fly rod anglers caught an estimated 86 steelhead.

In the class two section, a total of 62 drift-boat days were estimated (Confidence Interval ± 41) between August 21 and December 5. Considering the total effort estimate in rod days (1,248 rod days) and the total estimate of boat days (62 boat days), the ratio of angler days to boat days was 20:1.

Table 30. A summary of the effort and catch with 95% confidence intervals for the class two section by angler residence, guided status, angling method for the whole study period.

	Total Effort (rod days)	95% CI Effort	Total Catch (steelhead)	95% CI for Total Catch
Angler Residence				
B.C.	809	± 80	870	± 266
Canadian	53	± 23	66	± 37
Non-Canadian	386	± 44	453	± 103
Guided Status				
Guided	117	± 47	391	± 155
Non-guided	1,131	± 115	998	± 278
Angling Method				
Fly	879	± 144	966[1]	± 238
Gear	286	± 99	213	± 107
Unidentifiable	83	± 39	86	± 91

1. Fly, gear and unidentifiable catch does not add up to total steelhead caught in the class two section due to different methods used to calculate catch (see section 3.3.6.0).

4.7.0.0 Quality Angling Experience

4.7.1.0 Key Characteristics of a Quality Angling Experience

Anglers were asked, "*What do you feel are the key characteristics of a high quality angling experience on the Zymoetz River?*" Three hundred and twenty individual anglers reported 372 characteristics. The 372 responses were sorted into 17 categories (Figure 8). Just over half of anglers reported that both the beauty or scenic attributes of the area (53%) and high fish abundance or the likelihood of catching a fish (52%) were key characteristics of a high quality angling experience on the Zymoetz River.

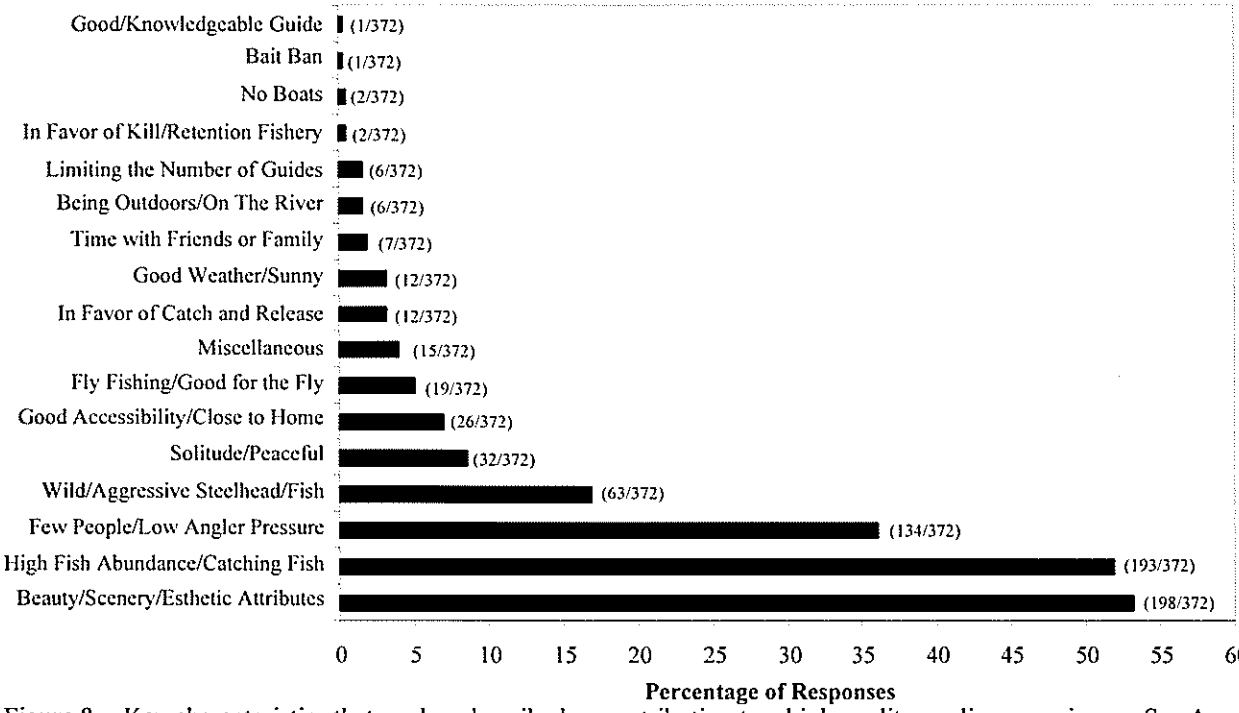

Figure 8. Key characteristics that anglers described as contributing to a high quality angling experience. See Appendix 5.0 for detailed miscellaneous comments.

More than one third of anglers indicated that low angler pressure was a key characteristic of a quality angling experience. Fewer anglers mentioned that wild or aggressive steelhead, solitude/peacefulness, good access and the opportunity for good fly fishing were key characteristics. Several anglers mentioned that catch and release angling, good weather, time with friends or family, being outdoors, limiting the number of guides, a retention fishery, no boats, a bait ban and a good/knowledgeable guide were key characteristics of good quality angling experience.

B.C. residents indicated that high fish abundance, few anglers, beauty of the area, wild or aggressive fish, good accessibility and solitude were all key characteristics of a high quality angling experience (Figure 9). Canadian and Non-Canadian anglers answered similarly and believed that the beauty or scenic attributes, high fish abundance, few people, wild or aggressive fish and solitude were all important characteristics of a high quality angling experience. The proportion of Canadian and Non-Canadian residents that described beauty or scenic attributes as part of a high quality angling

experience was substantially higher than B.C. residents. In contrast, more B.C. residents felt high fish abundance or catching a lot of fish and low numbers of anglers (few people) were important characteristics of a high quality angling experience.

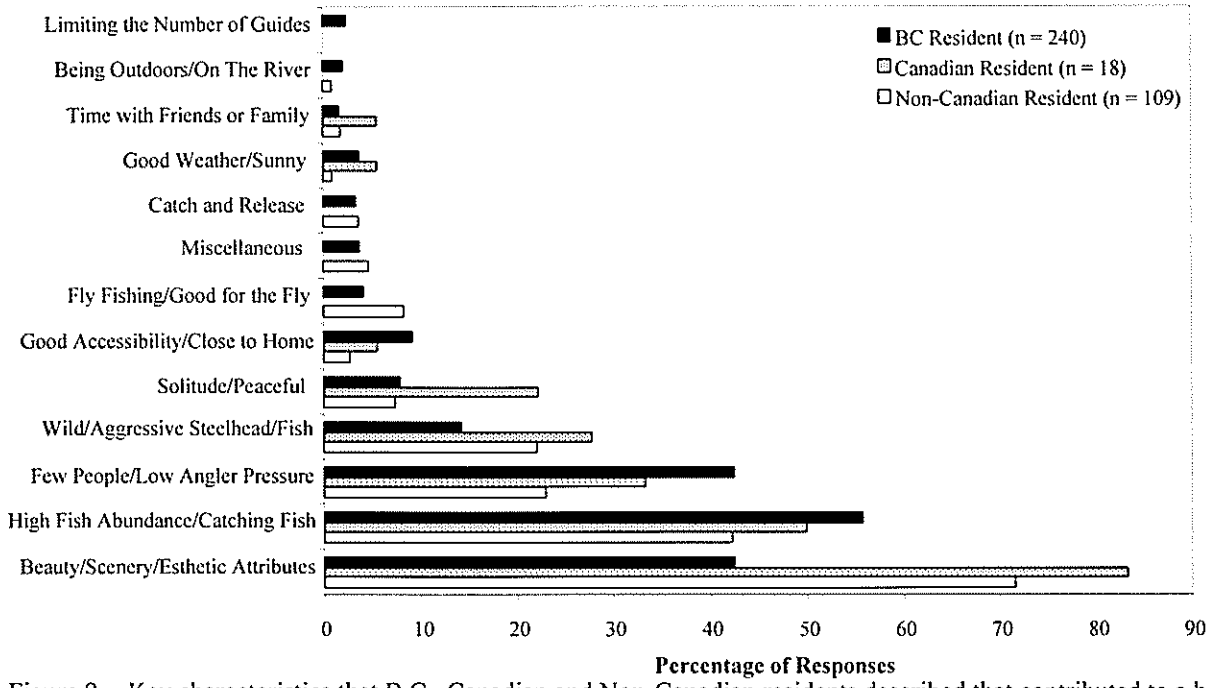

Figure 9. Key characteristics that B.C., Canadian and Non-Canadian residents described that contributed to a high quality angling experience.

Although sample sizes were small, guided anglers responded that beauty or scenic attributes, high fish abundance, wild or aggressive fish, catch and release regulations and being outdoors on the river were all key characteristics of a high quality angling experience (Figure 10). Non-guided anglers responded that beauty or scenic attributes, high fish abundance, few anglers, and wild fish were important characteristics in a high quality angling experience. Few differences existed between the guided and non-guided angler responses although the most notable was the higher proportion of non-guided anglers that commented that fewer anglers was a key characteristic of a high quality angling experience. This difference may result from the fact that guided anglers more frequently used a boat to access the river than non-guided anglers and thus, competed for good angling locations less frequently than shore-access anglers.

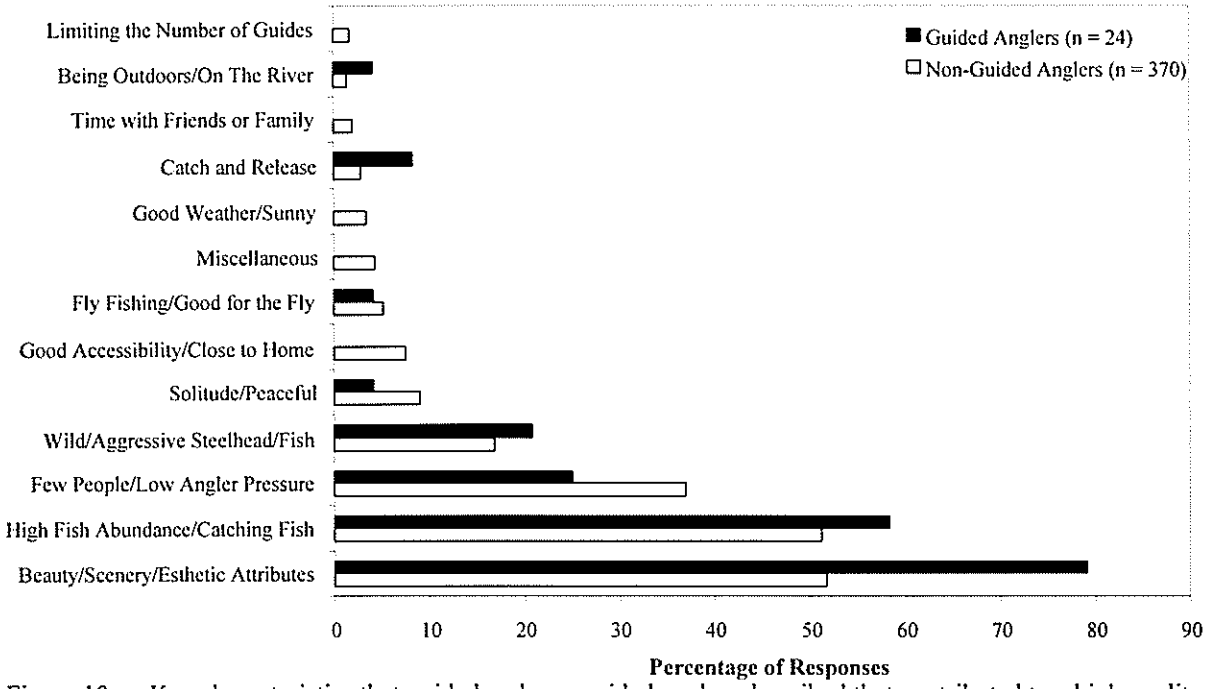

Figure 10. Key characteristics that guided and non-guided anglers described that contributed to a high quality angling experience.

The results clearly indicate that a 'quality angling experience' on the Zymoetz River has several dimensions and that anglers indicated that the beauty of the area was as important to a quality experience as fish abundance. In other words, a high quality angling experience means different things to different people. Holland and Ditton (1992) found similar results and concluded that there were a diversity of factors that caused satisfaction with an angling experience.

In terms of a quality angling experience, the responses of Zymoetz River anglers were similar to past studies where highly specialized anglers were more interested in non-catch aspects of fishing than catch aspects (Holland and Ditton 1992). Canadian and Non-Resident anglers were more interested in non-catch aspects of fishing than B.C. resident anglers who were more interested in catch aspects. Although the degree of angler specialization was not studied here, the results indicated that angler residence categories could reflect angler specialization. A similar pattern was observed with guided and non-guided anglers where more non-guided anglers indicated that catch aspects were important to the quality experience than guided anglers.

4.7.2.0 Ratings of Quality Angling Experiences

Anglers were asked, "*On a scale of 1-5, 1 being very poor and 5 being excellent how would you rate your quality angling experience today*?" The average angler rating of their quality angling experience was 3.8 (between fair and good), where one was very poor and five was excellent (Table 31). The majority of anglers rated their experience as good (29%) or excellent (35%) and few anglers rated their experience as poor (4%) or very poor (9%). B.C. and Non-Canadian residents rated their quality angling experience similarly, while Canadian residents rated their experience slightly higher which resulted in a statistical result that implied the groups differed. The ANOVA could reflect sample size differences between the Canadians and B.C. and Non-Canadian residents. Guided anglers had a higher average rating of their experience than non-guided anglers and those anglers that

used a drift boat to access the river had a higher mean rating than those that access the river by foot. There was no difference in the mean ratings of the quality angling experience between fly and gear anglers.

Table 31. Mean ratings of the anglers quality angling experience by residence category, guided status, access method and angling method.

	Mean (n)[1,2] Rating	Standard Deviation	Statistical Test Result
All Anglers	3.8 (718)	1.1	NA
Residence			ANOVA F = 2.9, df = 2, $P \leq 0.050$
B.C.	3.8 (461)	1.1	
Canadian	4.4 (25)	0.9	
Non-Canadian	3.9 (210)	1.2	
Guided Status			t = 2.4, $P \leq 0.015$
Guided	4.2 (43)	1.2	
Non-Guided	3.8 (673)	1.1	
Access Method			t = 3.2, $P \leq 0.001$
Drift Boat	4.3 (59)	1.1	
Shore	3.8 (658)	1.1	
Angling Method[3]			t = 1.6, $P \leq 0.111$
Fly	3.9 (440)	1.1	
Gear	3.7 (231)	1.2	

1. The mean rating is derived from the scale of 1=Very Poor, 2=Poor, 3=Fair, 4=Good, 5=Excellent.
2. See Appendix 5.0 for the proportion of anglers in each rating group.
3. Anglers that used both fly and gear were eliminated from this analysis (n=47).

The proportion of anglers that rated their experience as excellent was higher in the shoulder weeks than the Classified Waters Period (8-2, 9-1, and 12-1; Figure 11). In contrast, the proportion of anglers that rated their experience as good (and not excellent) was higher in the Classified Waters Period than in the shoulder weeks. Thus, it appeared that anglers were more likely to rate their trip as good rather than excellent during the Classified Waters Period. Few anglers rated their trip as excellent during 9-1 and 10-2 likely due to poor angling conditions.

Investigation of the relationships between angler effort, catch rate, quality rating and Secchi depth (water conditions) with a correlation matrix did not provide clear results (Appendix 6.0). A weak positive relationship was found between Secchi depth and the rating of quality angling experience (Pearson R = 0.66). All other combinations of variables had no statistically significant relationships.

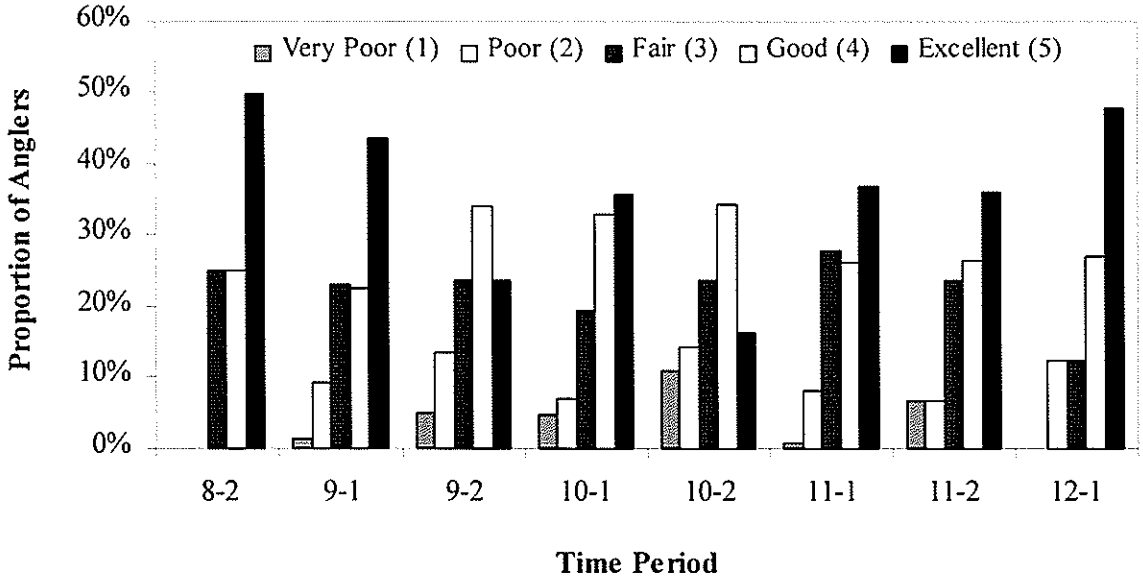

Figure 11. The proportion of anglers that rated their quality angling experience as very poor, poor, fair, good or excellent by time period.

4.8.0.0 Angler Comments

One-hundred and thirteen anglers made 142 comments about fisheries management to the River Guardians (Table 32; Appendix 4.0). Eighty-three anglers had one comment, 24 reported two comments and 6 had three comments (anglers were limited to three comments). Of those, almost 18% (20 anglers) had positive comments about the River Guardian program. Seven percent supported the catch and release fishery or were in favour of a no kill fishery (winter steelhead included) and another 7% supported the simplification of the licensing system. Anglers also commented about the good experience they had (6%), and voiced support for a fly fishing only regulation (6%) and for improvement or protection of fish habitat (6%). The complete list of angler comment groups is in Appendix 4.0.

Table 32. The top 12 groups of comments reported to River Guardians.

Comment Group	Percentage[1] (n) of Anglers who made that comment
Supports river guardian program	17.7 (20)
Miscellaneous comments	10.6 (12)
Miscellaneous regulation comments	8.9 (10)
Supports catch and release/no kill fishery	7.1 (8)
Supports the simplification of the licensing system	7.1 (8)
Good experience	6.2 (7)
Supports fly only	6.2 (7)
Improve/protect fish habitat	6.2 (7)
Supports more enforcement	5.3 (6)
Bad scenery attributes	4.4 (5)
Reduce/stop commercial fishery and/or native net fishery	4.4 (5)
Poor angling experience	4.4 (5)

1. Refers to the percentage of anglers making that comment of all anglers that made at least one comment (not all anglers that were interviewed). The total could equal more than 100% because up to three comments per angler were permitted.

4.9.0.0 Survey Bias

As with any survey, the results presented here were susceptible to survey bias and must be interpreted with caution. In general three types of errors, sampling, response and non-response, affected the survey (Pollock *et al.* 1994). Although, these results were generally representative of the Zymoetz River anglers in the class two section during the study period.

Sampling error could lead to incomplete information about Zymoetz River anglers. For example, some anglers had a higher probability of being contacted. Avidity bias may occur for anglers who fish more often and were therefore more likely to be interviewed (Schubert 1988; Pollock *et al.* 1994). Thus, anglers who fished more frequently than average anglers had a higher than average probability of being interviewed. In addition, length of stay bias may occur for anglers when the probability of being interviewed increases with their trip length (Schubert 1988; Pollock *et al.* 1994). Thus, anglers who fished longer than average had a higher than average probability of being interviewed. Similarly, anglers that fished longer days and exited the study area after dark would be under-represented.

The study design was intended to be representative of anglers in the class two section. Accordingly, sampling error occurred for the class one anglers because few of them were interviewed and the information may not have been representative. The number of anglers interviewed in the class one section (11) was a small proportion of the rod day estimate (7.3%; see Table 27). In contrast, the number of interviews conducted in the class two section was approximately 60% of the effort estimate. Thus, class one anglers were under-represented mainly due to the difficulty in reaching them as some gained access from helicopters or the McDonell Lake Road.

Sampling error may have also occurred in the aerial survey because of observer efficiency. The aerial survey may not have counted anglers that were not fishing or visible in an open area (gravel bar) during the flight. The difference between the angler day and fishing time was considerable (1.3

hr) and indicated anglers spent a fair amount of time hiking and driving between locations. The sampling error would slightly underestimate angler effort.

It was not mandatory for all anglers to stop at the exit station, and therefore, some anglers chose not to stop. Non-response bias would result if the anglers who chose to stop differed from those who did not stop. To investigate non-response bias and sampling error the roving and aerial surveys were compared with the exit survey. The comparison was made on the premise that anglers were approached randomly during the roving survey and few refused an interview once approached (3%). Similarly, the aerial survey identified guided status and angling method without any opportunity for non-response bias.

A comparison of roving and exit surveys investigated non-response bias and sampling error at the exit station. Comparisons of residence, guided status, access and angling method categories were made for the Classified Waters Period and shoulder time periods (Table 34). During the Classified Waters Period, the proportion of B.C. residents interviewed at the exit station was higher than in the roving survey. In fact, fewer Non-Residents were interviewed during the exit survey than during the roving survey. Non-response bias would result from Non-Resident anglers passing the exit station because they did not speak enough English and/or refusing to stop. Sampling error would result from Non-Resident anglers camping in the area, fishing for very long angler days (exit after dark) and therefore not passing through the exit station. The descriptive statistics in Sections 4.1.0.0 through 4.5.0.0 were not affected from these errors because both exit and roving survey results were used in the analyses. In catch and effort calculations for residence categories, only exit survey results were used and therefore Non-Residents could be slightly under-represented. The non-response bias and sampling error would result in a slightly higher proportion of Non-Resident angler effort and slightly fewer steelhead caught due to the lower catch rate of the Non-Residents. Total angler effort estimates were not affected because residency status was not used in the calculation.

Table 34 Statistical test results of a non-response bias check. The roving survey results were compared with the access (exit) point survey results for residence category, guided status, access method and angling method.

	Classified Waters Period	Sig.[2]	Shoulder Time Periods	Sig.[2]
Residence[1]	$\chi^2 = 5.05$, df = 1, $P \leq 0.025$	Y	$\chi^2 = 2.20$, df = 1, $P \leq 0.138$	N
Guided Status	$\chi^2 = 0.01$, df = 1, $P \leq 0.937$	N	Did Not Meet Assumptions	-
Access Method	$\chi^2 = 1.09$, df = 1, $P \leq 0.296$	N	$\chi^2 = 0.09$, df = 1, $P \leq 0.763$	N
Angling Method	$\chi^2 = 13.92$, df = 2, $P \leq 0.001$	Y	$\chi^2 = 0.12$, df = 2, $P \leq 0.943$	N

1. Canadian and Non-Canadian anglers were grouped into one Non-Resident category due to sample size deficiencies.
2. Indicates if the statistical test was significant (Y=Yes) or not significant (N=No).

In the Classified Waters Period, the proportion of fly anglers interviewed during roving surveys was smaller than those interviewed in the exit survey, and more gear anglers were interviewed in the exit survey than the roving survey. The differences were related to the discrepancy observed for residence categories. More B.C. anglers were interviewed at the exit station than Non-Residents, and B.C. anglers more frequently fished with gear road which may account for more gear anglers in the exit survey (Table 13).

To further investigate if non-response bias and sampling error existed at the exit station, the proportion of guided status and angling method categories were compared between the aerial and exit surveys in the Classified Waters Period and shoulder time periods. The results indicated a higher

proportion of both guided and fly anglers in the aerial survey than in the exit survey. The difference in angling method was not significant in the shoulder season, similar to the results of the roving and exit survey comparison. It confirmed the understanding that fly anglers (mostly Non-Residents) were underrepresented at the exit station resulting in some non-response bias and sampling error.

The higher proportion of guided anglers observed in the aerial survey indicated some non-response bias and sampling error of guided anglers in the exit survey (Table 35). The difference may be attributed to the fact that Guides and Assistant Guides were not counted as guided anglers in the exit interviews or that guided anglers were underrepresented in the exit survey results. Sampling error, would result from guided anglers exiting after dark and not encountering the exit station. Non-response bias would result from guided anglers not stopping at the exit station. The under representation of guided anglers may not have been detected in the comparison of exit and roving surveys because guided anglers commonly used drift boats, making it difficult for them to be sampled in the roving survey (shore-access).

Table 35. Statistical test results of a non-response bias check. The aerial angler counts were compared with the access (exit) point survey results for guided status and angling method.

	Classified Waters Period	**Sig.[1]**	**Shoulder Time Periods**	**Sig.[1]**
Guided Status	$\chi^2 = 4.61$, df = 1, $P \leq 0.032$	Y	Did Not Meet Assumptions	-
Angling Method	$\chi^2 = 22.14$, df = 1, $P \leq 0.000$	Y	$\chi^2 = 0.17$, df = 1, $P \leq 0.68$	N

1. Indicates if the statistical test was significant (Y=Yes) or not significant (N=No).

In addition to non-response and sampling errors, response errors may also have biased the survey results. The actual interviewing could have caused some reactivity by anglers, causing them to give responses that were not indicative of their actual perceptions. In addition, it was possible that anglers may have exaggerated the number of steelhead landed for prestige purposes. Other sources of response errors include rounding bias, intentional deception (strategic bias), question misinterpretation and species misidentification (Pollock *et al.* 1994; Connelly and Brown 2000). Recall bias was expected to be minimal because anglers were asked questions pertaining to the day of the interview.

5.0.0.0 Recommendations

1. MELP should continue to periodically administer surveys of Zymoetz River anglers to monitor changes in angler effort, demographics, angling characteristics and angler catch. The improved road access to the class one section has undoubtedly increased angler effort in recent years and therefore particular attention should be paid to monitoring class one angler effort. Additional information will aid MELP with planning necessary to protect the quality of angling experiences offered by the Classified Waters designation.

2. To reduce the effect of observer efficiency (anglers not being counted on the flight because they were not seen), MELP should ask anglers if they were on the river during the flight. The proportion of anglers not visible (but in the area) could be used to estimate daily observer efficiency.

3. The guided angler effort and catch estimates should be compared with the guided effort and catch reported by the guides in their year-end reports. License stub data for guided anglers should also be incorporated into the comparisons. The comparisons would help to quantify guided effort on the Zymoetz River during 1999.

4. The difference in proportions of angler residence categories between weekdays and weekend days indicated weighted stratification by day type should be continued if future creel surveys are performed on the Zymoetz River.

5. In highly mobile fisheries such as on the Zymoetz River, MELP should continue to collect actual time spent fishing rather than just the angler day length. The actual time spent fishing will achieve more accurate catch rate and total catch estimates.

6. In future surveys, an incentive should be offered to anglers for completion of each angler interview. The incentive would encourage more angler participation in the program and reduce non-response bias.

7. Angler ratings of their 'quality angling experience' were lower in the Classified Waters Period than outside of the Classified Waters Period (shoulder season). Similar patterns on other classified waters should be investigated if this pattern exits elsewhere in other spatial and temporal scales.

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8.0.0.0 Appendices

Appendix 1.0 The angler interview form, access point (exit) survey form, roving survey form and aerial count form.

Interviewer _____ **Time**_____ **Date**_____ **Day Type** WEND WDAY

Gender MALE FEMALE Site: COPPER KLEANZA/BORNITE MTN. ROVING

People per vehicle: _____ If Roving Where: C2 BELOW CLORE C2 ABOVE CLORE CI CLORE R.

Hello, my name is _ _ _ _ _ I am a River Guardian and we are collecting information from anglers on the Zymoetz/Copper River. **Are you willing to let me examine your fishing license and answer a few questions for me?** The interview is voluntary and will last only about 5 minutes. All your answers will be confidential.

YES NOT APPLICABLE (*not angling/child*) DOES NOT SPEAK ENOUGH ENGLISH REFUSED

Have you already been interviewed? NO YES

Angler License #_____ **Classified Waters License #**_____ **Steelhead Stamp:** YES NO

Angler Name _____ **Year of Birth** _____

Guided YES NO If yes by WHO? _____

Residence B.C. postal code _____, CDN province _____, NON-CDN country _____

License Class 1 DAY 8 DAY ANNUAL **Classified Days Purchased** _____

Observed License Violations NONE NO STEELHEAD STAMP NO CLASSIFIED WATERS NO LICENSE
OTHER _____

Did you use a fly or gear rod today? FLY GEAR BOTH **Did you fish on the Clore River today?** YES NO

How did you access the river today? DRIFT BOAT FOOT

When did you start your fishing today? _____ AM/PM **When did you quit fishing today?**_____ AM/PM

(If roving) **When do you expect to finish fishing today?** _____

Excluding driving, hiking and prep time how long did you fish the Zymoetz/Copper River? _____*hrs.*
(If Yes about fishing the Clore) **Clore River?** _____*hrs.*

What species of fish have you landed today? How many did you keep or release?

Species	C1 or C2 (above or below Clore) or Clore	Rel./Kept	Fly or Gear	Time for each method

---

How many days have you already fished for steelhead on the Zymoetz/Copper River this year? _____

How many *more* days do you plan to fish for steelhead on the Zymoetz/Copper River this year? _____

Are you a member of a conservation club or organization? YES NO

If YES, what organization(s) *(list first 3)* ? _____, _____, _____

What do you feel are the key characteristics of a high quality angling experience on the Zymoetz/Copper River*(list top 3)***?**

_____, _____, _____

On a scale of 1-5, 1 being very poor and 5 being excellent, how would you rate your quality angling experience today?

1	2	3	4	5	6 *(Don't Read)*
VERY POOR	POOR	FAIR	GOOD	EXCELLENT	NOT SURE

Please describe any additional comments the angler had on the back of this form.

Access Point (Exit) Survey Form

Interviewer: _____ **Site:** Copper Bornite Mtn. Other _____

Date: _____ **Day Type:** Weekday Weekend

Weather: Sun Partial Cloud 100% Overcast Rain Snow

Secchi Depth: _____u/s Clore **Secchi Depth:** _____d/s Clore

Water Level: Low Rising High Flood **S. Gauge Height:** _____

Time	Angler Vehicles				Anglers		
	Stopped	Missed	Total		Interviewed	Not Interviewed	Total
10:00-10:59							
11:00-11:59							
12:00-12:59 PM							
1:00-1:59							
2:00-2:59							
3:00-3:59							
4:00-4:59							
5:00-5:59							
6:00-6:59							
7:00-7:59							
8:00-8:59							
9:00-9:59							
TOTALS							

Comments:

_____

_____

_____

_____

Roving Survey Form

Interviewer: _____ **Site:** Copper Bornite Mtn. Other _____

Date: _____ **Day Type:** Weekday Weekend

Time Start: _____ **Time Stop:** _____

Weather: Sun Partial Cloud 100% Overcast Rain Snow

Secchi Depth: _____u/s Clore **Secchi Depth:** _____d/s Clore

Water Level: Low Rising High Flood **S. Gauge Height**: _____

Route Description:

Area	Anglers Observed.	Vehicles Observed	Anglers Interviewed	Time entered area	Time exited area
Zymoetz C2 below Clore					
Zymoetz C2 above Clore					
Zymoetz C1					
Clore					
Total					

Comments:

Aerial Count Form

Personnel: _____ **Date:** _____ **Day Type:** Weekday Weekend

Weather: Sun Partial Cloud 100% Overcast Rain Snow

Water Clarity: Clear Turbid **Water Level:** Low Rising High Flood

Time	Location	Anglers			Drift Boats	Guided?	Vehicles
		Total	Fly	Gear			
	Leave Base						
	Class 1 **Boundary- u/s Limonite Cr.**						
	Class 2 **d/s Limonite Cr.- u/s Clore R.**						
	Class 2 **d/s Clore R.-mouth**						
	Return Base						
	Total						

Appendix 2.0 The conservation clubs mentioned.

Table A1. The conservation club membership of anglers interviewed.

Conservation Club	N	% of Responses (n=268)	% of Anglers (n=186)
Steelhead Society	46	17.2%	24.7%
Trout Unlimited	32	11.9%	17.2%
Foreign Country (other than Canada and US)	32	11.9%	17.2%
B.C. Wildlife Federation	20	7.5%	10.8%
Sierra Club	15	5.6%	8.1%
B.C. Federation of Fly Fishers	15	5.6%	8.1%
Local Rod and Gun Club	12	4.5%	6.5%
Driftfishers	10	3.7%	5.4%
Sportfish Advisory Board	8	3.0%	4.3%
Nature Conservancy	5	1.9%	2.7%
California, Oregon and Washington Trout	5	1.9%	2.7%
Ducks Unlimited	4	1.5%	2.2%
Atlantic Salmon Federation	4	1.5%	2.2%
Guide	3	1.1%	1.6%
BCCF	3	1.1%	1.6%
Anglers Co-op Association	3	1.1%	1.6%
Kitsap Fly Anglers	3	1.1%	1.6%
Terrace Salmonid Enhancement Society	3	1.1%	1.6%
Western Canada Wilderness Committee	2	0.7%	1.1%
Greenpeace	2	0.7%	1.1%
World Wildlife Federation	2	0.7%	1.1%
Kamloops Fly Fishers	2	0.7%	1.1%
American Fisheries Society	2	0.7%	1.1%
NRA	2	0.7%	1.1%
Little Campbell Hatchery	2	0.7%	1.1%
Montana Wildlife	2	0.7%	1.1%
Puget Sound Anglers	2	0.7%	1.1%
Northwest Fly Anglers	2	0.7%	1.1%
Northwest Steelheaders	1	0.4%	0.5%
Nature Trust	1	0.4%	0.5%
Osprey Fly Fishers of BC	1	0.4%	0.5%
Fly Fishers USA	1	0.4%	0.5%
Henry's Fork Foundation	1	0.4%	0.5%
Idaho Rivers United	1	0.4%	0.5%
Idaho Conservation League	1	0.4%	0.5%
Alberni Valley Guides	1	0.4%	0.5%
Wildlife Federation of Saskatchewan	1	0.4%	0.5%
Steelhead Assoc. of Quebec	1	0.4%	0.5%
Totem Fly Fishers	1	0.4%	0.5%
Western Pennsylvanian Conservancy	1	0.4%	0.5%
Montana Wildlife Federation	1	0.4%	0.5%
West Women Fly Fishers	1	0.4%	0.5%
California Conservation Corps.	1	0.4%	0.5%
Canadian Wildlife Association	1	0.4%	0.5%
Mt. Remo Backcountry Association	1	0.4%	0.5%
North Coast Anglers	1	0.4%	0.5%
David Suzuki Foundation	1	0.4%	0.5%
Trapping Club	1	0.4%	0.5%
Arizona Big Sheep Society	1	0.4%	0.5%
Spruce City Wildlife	1	0.4%	0.5%

Appendix 3.0 The weather and water conditions during the study period.

Table A2. A summary of weather conditions observed from the aerial flights and by the River Guardians.

Weather Condition Codes: 1= Sun 2= Partial Cloud 3= 100% Overcast 4=Rain 5=Snow

Time Period	Date	Secchi Depth (cm)	Staff Gauge Height (cm)	Weather
8-2	21-Aug	44		2
	22-Aug	67	35	2
	23-Aug	55	48	2/3
	25-Aug	30	59	2
	27-Aug	35	61	3/4
9-1	31-Aug	82	32	2
	01-Sep	100	28	1,2
	02-Sep	100	18	2
	03-Sep	100	17	2
	04-Sep	100	17	2,3
	06-Sep	54	38	3
	08-Sep	95	20	4
	09-Sep	77	30	2
	10-Sep	100	25	2
	11-Sep	100	15	1,2
	12-Sep	100	11	2
9-2	13-Sep	41	5	1
	14-Sep	40	15	2
	15-Sep	70	5	3
	18-Sep	100	0	3
	19-Sep	33	22	2
	20-Sep	27	26	1,2
	21-Sep	42	16	2
	24-Sep	50	17.5	4
	25-Sep	100	7	4
	26-Sep	100	1	2
10-1	27-Sep	100	0	2
	28-Sep	100	0	3,4,5
	01-Oct	100	10	2
	02-Oct	100	5	1
	03-Oct	100	1	3,4
	04-Oct	100	0	2
	07-Oct	24	38	3
	08-Oct	85	20	2
	09-Oct	100	15	3,4
	10-Oct	100	7	2,3,4
10-2	13-Oct	45	15	3
	14-Oct	62	18	2
	15-Oct	100	7.5	3
	16-Oct	95	5	3,4
	17-Oct	42	30	3
	18-Oct	90	22	3
	21-Oct	20	80	4
	22-Oct	25	68	2
	23-Oct	55	45	3,4

Time Period	Date	Secchi Depth (cm)	Staff Gauge Height (cm)	Weather
	24-Oct	80	35	4
11-1	25-Oct	90	15	2
	26-Oct	75	22	2,3
	29-Oct	100	6	5
	30-Oct	23	15	2
	31-Oct	94	8	2
	03-Nov	100	0	3
	04-Nov	100	0	4,5
	05-Nov	100	0	3
	05-Nov	100	0	2
	06-Nov	100	0	4,5
	07-Nov	100	0	4
11-2	10-Nov	100	0	4
	11-Nov	100	0	2
	12-Nov	100	0	2
	13-Nov	100	0	3
	14-Nov	100	0	4,5
	16-Nov	100	0	3,4
	18-Nov	100	0	3
	19-Nov	100	0	4
	20-Nov	100	0	2
	20-Nov	100	0	2
	21-Nov	80	0	3
12-1	24-Nov	44	0	2
	25-Nov	100	0	2
	26-Nov	100	0	2
	27-Nov	100	0	3
	28-Nov	100	0	5
	01-Dec	100	0	5
	02-Dec	100	0	3
	03-Dec	100	0	5
	04-Dec	100	0	4
	05-Dec	50	0	4

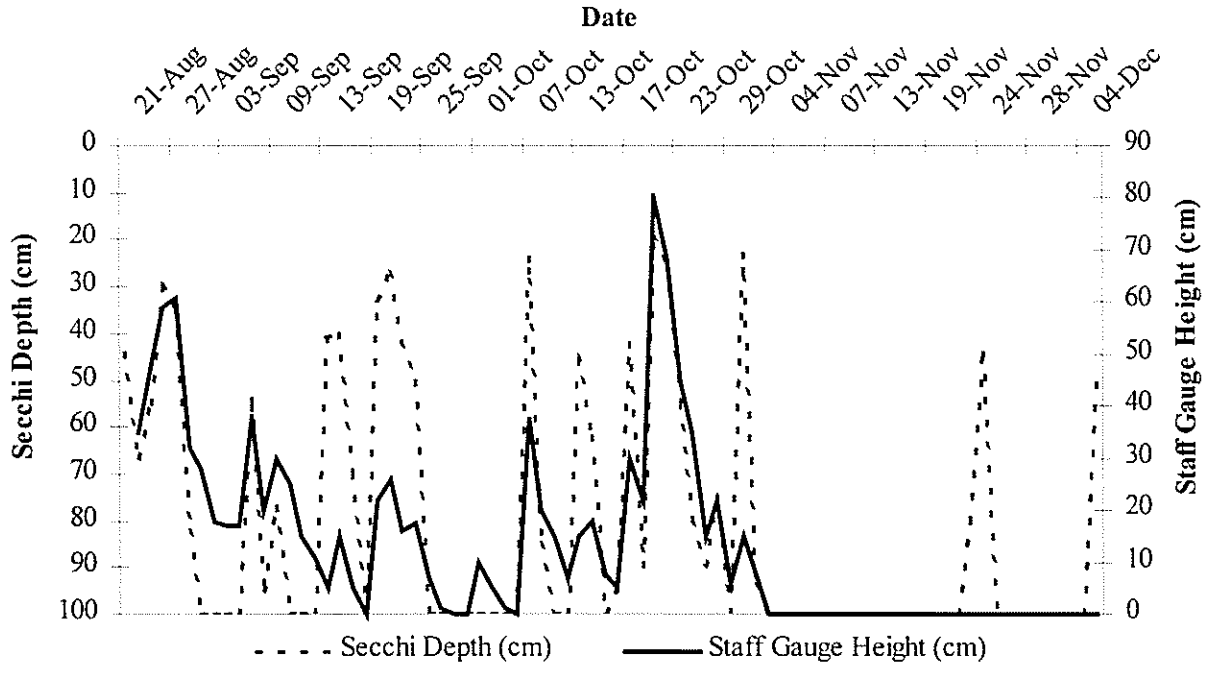

Figure A1. Graphical representation of Secchi depth and staff gauge data from Table A2.

Weather Notes:

1. Secchi depth data over 100 cm and staff gauge height below 0 cm were not collected.
2. A landslide caused a natural dam that temporarily blocked the regular flow of Limonite Creek into the Zymoetz River on September 11. As a result, beginning on September 13 (period 9-2) there were several days of turbid conditions in Limonite Creek and the Zymoetz River.
3. Frequent minor weather events caused high turbidity and poor angling conditions on the Zymoetz River.
4. One major weather event caused a rise in water level and an increase in the turbidity between October 19 and 22 (time period 10-2).

Appendix 4.0 The comments mentioned by Zymoetz River Anglers.

Table A3. A summary of the groups that individual comments were categorized into.

Comment Group	Percentage of Anglers	n
Supports river guardian program	17.70	20
Miscellaneous comments	10.62	12
Miscellaneous regulation comments	8.85	10
Supports catch and release/no kill fishery	7.08	8
Supports the simplification of the licensing system	7.08	8
Good experience	6.19	7
Supports fly only	6.19	7
Improve/protect fish habitat	6.19	7
Supports more enforcement	5.31	6
Bad scenery attributes	4.42	5
Reduce/stop commercial fishery and/or native net fishery	4.42	5
Poor angling experience	4.42	5
Good scenery attributes	3.54	4
Bad etiquette/angler training needed	3.54	4
Too many people/crowding issues	3.54	4
Supports limited entry	3.54	4
Reduce/stop guiding	3.54	4
Good fishing/catching	2.65	3
Does not support improved access	2.65	3
Does not support the Classified Waters system	2.65	3
Supports the Classified Waters system	2.65	3
Supports Non-Resident guided only	1.77	2
Supports improved access	1.77	2
Support raising license fees	1.77	2
Does not support fly only	0.88	1
Does not support Non-Resident guided only	0.88	1
Complaints about illegal guiding	0.88	1
Supports lowering license fees	0.88	1
Total	100	113

Table A4. Detailed miscellaneous comments and miscellaneous comments regarding regulations.

Miscellaneous Comments	Miscellaneous Regulation Comments
• also fished salmon run creek but did not catch anything	• should be closed from the canyon down
• glad that some rivers are open for coho	• no barbed hooks
• has been fishing the Copper River for the last 30 years. Last year	• close lower part of river from Jan. 1 to May 31
• maintain angling use for residents	• should be closed from the canyon down
• put money back into it. Pay river guardians more.	• close after Jan. 1
• river is higher than normal	• boat ban would be good
• should be sign at road entrance about safety issues on road	• Canadian residents should not be grouped with Non-Residents
• there should be designated camping areas, there is too much	• must take care to keep the river from being over fished
• fee's should be for enhancement	• no foreigners should be allowed to fish
• no campers should be allowed in class 2 waters	• residents only
• river has come back last couple of years	• should not need a steelhead tag to catch and release steelhead
• give more rod days to more people	

Appendix 5.0 Detailed quality experience ratings.

Table A5. The proportion of anglers that rated their quality angling experience as very poor, poor, fair, good and excellent by residence, guided status, access method and angling method categories and time period.

	On a scale of 1-5, 1 being very poor and 5 being excellent how would you rate your quality angling experience today?											
	Very Poor		Poor		Fair		Good		Excellent		Total	Mean
	n	%	n	%	n	%	n	%	n	%	n	Score
All Anglers	**27**	**3.8%**	**67**	**9.3%**	**162**	**22.6%**	**207**	**28.8%**	**255**	**35.5%**	**718**	**3.8**
Residence												
B.C.	15	3.3%	46	10.0%	113	24.5%	129	28.0%	158	34.3%	461	3.8
Cdn.	0	0.0%	1	4.0%	4	16.0%	5	20.0%	15	60.0%	25	4.4
Non-Cdn.	10	4.8%	18	8.6%	43	20.5%	60	28.6%	79	37.6%	210	3.9
Guided Status												
Yes	2	4.7%	3	7.0%	4	9.3%	8	18.6%	26	60.5%	43	4.2
No	25	3.7%	64	9.5%	158	23.5%	198	29.4%	228	33.9%	673	3.8
Access Method												
Drift Boat	3	5.1%	0	0.0%	11	18.6%	8	13.6%	37	62.7%	59	4.3
Foot	24	3.6%	67	10.2%	150	22.8%	199	30.2%	218	33.1%	658	3.8
Angling Method												
Fly	16	3.6%	37	8.4%	99	22.5%	120	27.3%	168	38.2%	440	3.9
Gear	11	4.8%	27	11.7%	51	22.1%	66	28.6%	76	32.9%	231	3.7
Both	0	0.0%	3	6.4%	12	25.5%	21	44.7%	11	23.4%	47	3.9
Time Period												
8-2	0	0.0%	0	0.0%	3	25.0%	3	25.0%	6	50.0%	12	4.3
9-1	2	1.4%	13	9.2%	33	23.2%	32	22.5%	62	43.7%	142	4.0
9-2	5	5.2%	13	13.4%	23	23.7%	33	34.0%	23	23.7%	97	3.6
10-1	8	4.7%	12	7.1%	33	19.4%	56	32.9%	61	35.9%	170	3.9
10-2	6	10.9%	8	14.5%	13	23.6%	19	34.5%	9	16.4%	55	3.3
11-1	1	0.8%	10	8.2%	34	27.9%	32	26.2%	45	36.9%	122	3.9
11-2	5	6.9%	5	6.9%	17	23.6%	19	26.4%	26	36.1%	72	3.8
12-1	0	0.0%	6	12.5%	6	12.5%	13	27.1%	23	47.9%	48	4.1

Table A6. Miscellaneous key characteristics.

Miscellaneous Key Characteristics
• no commercial gillnets
• playing in the snow
• courteous anglers
• need to be good angler
• reputation
• getting drunk
• easy to read
• similar to Bulkley
• can stay in 1 spot
• no commercial nets
• conservation
• no native fishing
• serious fishermen
• regulation enforcement
• know it well

Appendix 6.0 Correlation matrix for key angling variables.

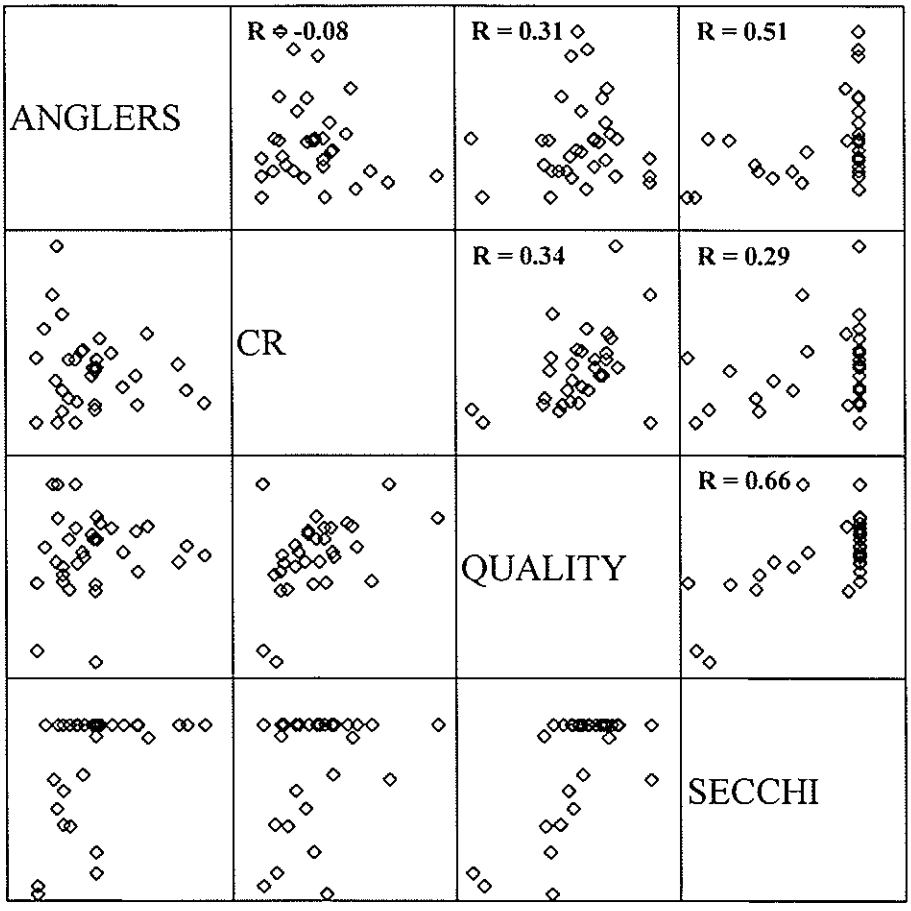

Figure A2. Correlation matrix for angler effort (ANGLERS), catch rate (CR), quality rating (QUALITY) and Secchi depth (SECCHI).

Appendix 7.0 The activity profiles per time period.

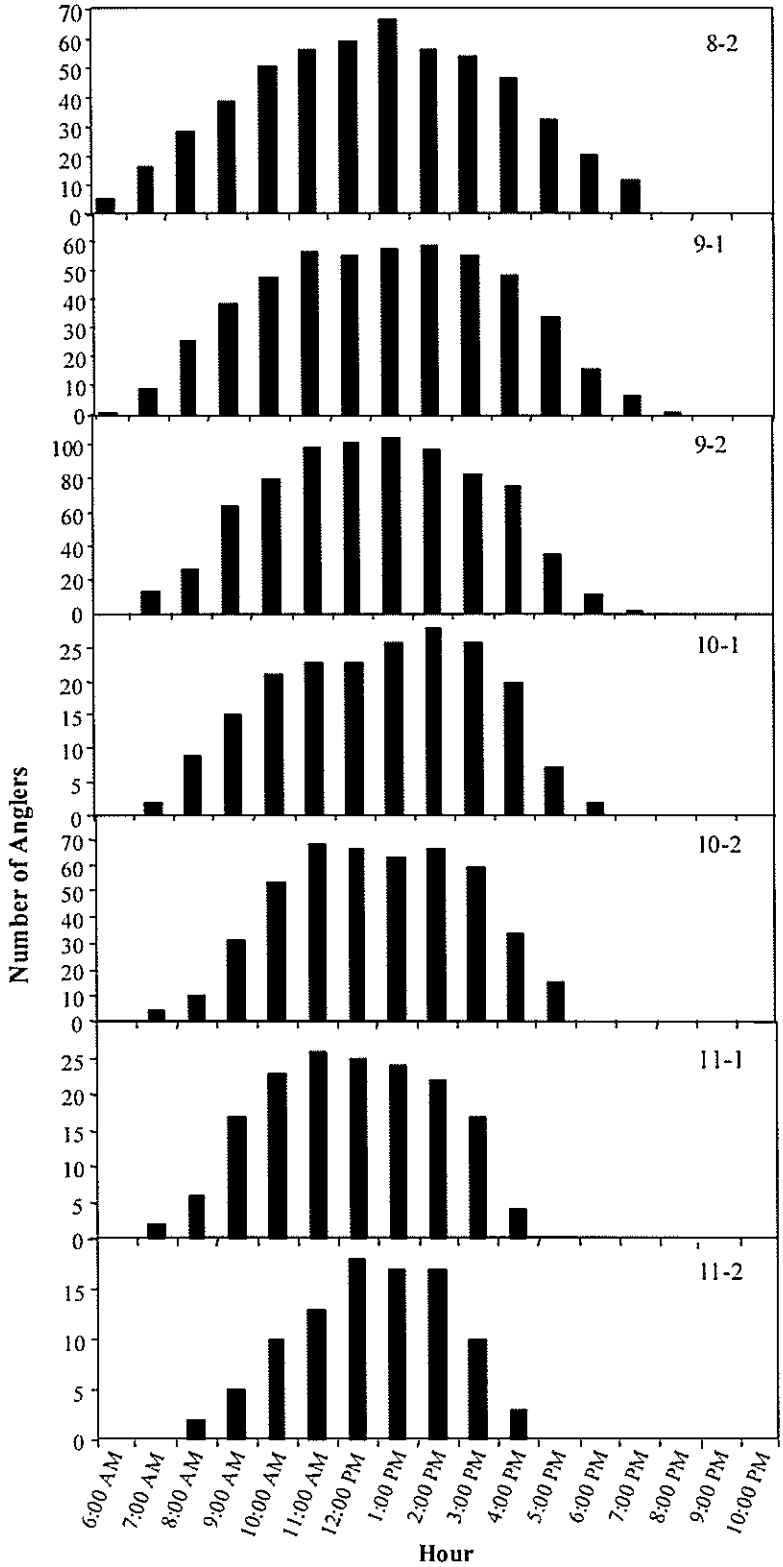

Figure A3. Activity profiles by time period. The bars represent the number of anglers on the river during each hour of the day and were obtained from angler interviews.

Appendix 8.0 Summary of flight and weather information.

Table A7. Detailed Secchi depth, fishable comment and flight data for each day in the study period.

	Date	Secchi Depth (cm)	Fish-able	Flight	Section 1 (C1) Anglers	Fly	Gear	Drift boats	Guided	Veh.	Section 2 (C2) Anglers	Fly	Gear	Drift boats	Guided	Veh.
Strata 1 (8-1)																
Weekdays (n=10)	16-Aug		Y													
Fishable	17-Aug		Y													
Weekdays (n=5)	18-Aug		Y													
	19-Aug		Y													
	20-Aug		Y													
	23-Aug	55	N													
	24-Aug		N													
	25-Aug	30	N	Full	0	0	0	0	0	0	0	0	0	0	0	1
	26-Aug		N													
	27-Aug		N													
Weekends (n=4)	21-Aug	44	Y	Full	0	0	0	0	0	0	2	1	0	0	0	2
Fishable	22-Aug	67	Y													
Weekends (n=2)	28-Aug		N													
	29-Aug		N													
Strata 2 (9-1)																
Weekdays (n=9)	30-Aug		Y													
Fishable	31-Aug	82	Y													
Weekdays (n=9)	01-Sep	100	Y	Half							9	7	2	0	3	8
	02-Sep	100	Y													
	03-Sep	100	Y													
	07-Sep		Y													
	08-Sep	95	Y													
	09-Sep	77	Y	Full	0	0	0	0	0	0	10	9	1	2	4	12
	10-Sep	100	Y	Half							7	3	2	0	0	5
Weekends (n=5)	04-Sep	100	Y	Full	0	0	0	0	0	0	13	9	4	0	3	6
Fishable	05-Sep		Y													
Weekends (n=4)	06-Sep	54	Y	Full	2	0	2	0	0	0	7	6	1	0	0	14
	11-Sep	100	Y	Full	1	1	0	0	0	0	12	5	3	1	0	7
Sept.6 is Labour Day	12-Sep	100	Y													
Strata 3 (9-2)																
Weekdays (n=10)	13-Sep	41	Y	Full	0	0	0	0	0	0	2	2	0	0	0	1
Fishable	14-Sep	40	N													
Weekdays (n=4)	15-Sep	70	Y	Full	4	4	0	0	0	0	6	3	0	0	0	1
	16-Sep		Y													
	17-Sep		Y													
	20-Sep	27	N	Full	0	0	0	0	0	0	0	0	0	0	0	0
	21-Sep	42	N													
	22-Sep		N													
	23-Sep		N													
	24-Sep	50	Y													

	Date	Secchi Depth (cm)	Fish-able	Flight	Section 1 (C1)						Section 2 (C2)					
					Anglers	Fly	Gear	Drift boats	Guided	Veh.	Anglers	Fly	Gear	Drift boats	Guided	Veh.
Weekends (n=4)	18-Sep	100	Y	Half							33	27	2	2	10	12
Fishable	19-Sep	33	Y	Full	3	0	0	1	0	0	13	4	3	0	0	10
Weekends (n=4)	25-Sep	100	Y													
	26-Sep	100	Y	Full	15	15	0	3	4	1	22	21	1	0	0	18
Strata 4 (10-1)																
Weekdays (n=10)	27-Sep	100	Y	Half							16	16	0	2	6	4
Fishable	28-Sep	100	Y	Full	3	3	0	0	0	0	20	18	2	0	0	4
Weekdays (n=9)	29-Sep		Y													
	30-Sep		Y													
	01-Oct	100	Y													
	04-Oct	100	Y	Half							17	16	1	5	3	3
	05-Oct		Y													
	06-Oct		Y													
	07-Oct	24	N													
	08-Oct	85	Y													
Weekends (n=4)	02-Oct	100	Y													
Fishable	03-Oct	100	Y	Full	14	10	4	0	0	1	23	19	4	4	0	8
Weekends (n=4)	09-Oct	100	Y	Half							14	10	4	1	3	5
	10-Oct	100	Y	Full	5	5	0	0	0	0	27	27	0	1	6	2
Strata 5 (10-2)																
Weekdays (n=9)	12-Oct		Y													
Fishable	13-Oct	45	Y													
Weekdays (n=5)	14-Oct	62	Y	Full	1	1	0	0	0	0	5	4	1	0	0	3
	15-Oct	100	Y													
	18-Oct		Y	Full	0	0	0	0	0	0	3	2	1	0	0	3
	19-Oct		N													
	20-Oct		N													
	21-Oct	20	N													
	22-Oct	25	N													
Weekends (n=5)	11-Oct		Y													
Fishable	16-Oct	95	Y	Full	2	2	0	0	0	1	11	8	3	0	0	8
Weekends (n=5)	17-Oct	42	Y	Half							11	6	5	1	3	10
	23-Oct	55	Y	Full	2	1	1	0	0	2	5	5	0	0	0	4
	24-Oct	80	Y													
Strata 6 (11-1)																
Weekdays (n=10)	25-Oct	90	Y													
Fishable	26-Oct	75	Y	Half							4	4	0	0	0	2
Weekdays (n=10)	27-Oct		Y													
	28-Oct		Y													
	29-Oct	100	Y													
	01-Nov		Y													
	02-Nov		Y													
	03-Nov	100	Y													
	04-Nov	100	Y	Full	2	2	0	0	0	1	10	7	3	0	0	6

	Date	Secchi Depth (cm)	Fish-able	Flight	Section 1 (C1) Anglers	Fly	Gear	Drift boats	Guided	Veh.	Section 2 (C2) Anglers	Fly	Gear	Drift boats	Guided	Veh.
	05-Nov	100	Y	Full	1	1	0	0	0	1	15	10	5	1	0	6
Weekends (n=4)	30-Oct	23	N	Full	0	0	0	0	0	1	0	0	0	0	0	0
Fishable	31-Oct	94	Y	Half							13	11	2	0	0	10
Weekends (n=3)	06-Nov	100	Y	Full	2	2	0	0	0	1	12	7	5	0	0	10
	07-Nov	100	Y													
Strata 7 (11-2/12-1)																
Weekdays (n=19)	08-Nov		Y													
Fishable	09-Nov		Y													
Weekdays (n=18)	10-Nov	100	Y													
	12-Nov	100	Y	Full	0	0	0	0	0	0	11	9	2	3	0	5
	15-Nov		Y													
	16-Nov	100	Y	Half							6	2	2	0	0	3
	17-Nov		Y													
	18-Nov	100	Y													
	19-Nov	100	Y													
	22-Nov		Y													
	23-Nov		Y													
	24-Nov	44	N													
	25-Nov	100	Y	Half							9	0	8	0	0	4
	26-Nov	100	Y													
	29-Nov		Y													
	30-Nov		Y													
	01-Dec	100	Y													
	02-Dec	100	Y													
	03-Dec	100	Y													
Weekends (n=9)	11-Nov	100	Y													
Fishable	13-Nov	100	Y													
Weekends (n=9)	14-Nov	100	Y	Half							2	0	2	0	0	3
	20-Nov	100	Y	Full	0	0	0	0	0	0	5	1	4	0	0	4
	21-Nov	100	Y													
	27-Nov	100	Y													
	28-Nov	100	Y													
	04-Dec	100	Y	Full	0	0	0	0	0	0	5	2	0	0	0	2
	05-Dec	100	Y													

Non-fishable day notes:

1. Aug. 23-29: Low Secchi depth, no anglers seen on Aug. 25 or Aug. 27.
2. Sept. 14: Low Secchi depth, no anglers observed while roving, landslide-see Figure A1.
3. Sept. 20-23: Low Secchi depth, no anglers observed from flight or roving.
4. Oct. 7: Low Secchi depth, no anglers observed.
5. Oct. 19-22. Storm event, low Secchi depth no anglers observed, see Figure A1.
6. Oct. 31, Nov. 24: One-day events, low Secchi depth and no anglers observed see Figure A1.

Appendix 9.0 Steelhead Harvest Analysis Data.

Table A8. Steelhead Harvest Analysis (SHA) rod day and catch data from 1983-1998 by residence category.

	B.C.		Cdn		Non-Cdn		Total	
	Rod Days	Catch	Rod Days	Catch	Rod Days	Catch	Rod Days	Catch
1998	1482	2051	30	56	365	420	1877	2526
1997	1384	1661	30	42	138	198	1553	1901
1996	925	1194	20	20	92	28	1037	1241
1995	1086	1001	77	88	125	62	1288	1151
1994	1155	1423	40	13	65	42	1260	1478
1993	1169	922	3	0	79	85	1251	1007
1992	733	678	9	11	37	6	779	695
1991	545	337	.	.	116	33	661	370
1990	952	632	41	51	338	223	1331	906
1989	1436	1278	81	63	191	111	1708	1452
1988	2676	2414	34	11	402	503	3112	2928
1987	2296	1905	51	55	587	295	2934	2255
1986	4658	3432	135	70	715	742	5508	4244
1985	3236	2507	111	102	448	377	3795	2986
1984	2249	1370	37	6	87	69	2373	1445
1983	1427	945	78	73	33	30	1538	1048