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**A Survey of  
Bulkley River Steelhead Anglers  
in 1998**

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Skeena Fisheries Report SK - 119

March, 1999



# **A Survey of Bulkley River Steelhead Anglers in 1998**



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Skeena Fisheries Report SK - 119

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## **Executive Summary**

### ***Anglers Contacted***

- ◆ Two-thousand and sixty-five steelhead (*Oncorhynchus mykiss*) anglers were observed by the River Guardians and 1,199 anglers were approached for an interview on the Bulkley River. Of the 1,199 anglers, 693 (58 %) were interviewed for the first time and the remaining 506 (42 %) had already completed the interview.
- ◆ The majority of anglers were interviewed between the second week of September (9-2) and the third week of October (10-3; 70 %).
- ◆ Seventeen percent of anglers were interviewed between Chicken and Trout creeks, while 16 % of anglers were interviewed between Telkwa and Smithers Bridge and another 14 % were interviewed between Quick and Telkwa.

### ***Angler Characteristics***

#### **Residence, Gender and Age**

- ◆ Sixty-two percent (682 interviews) of anglers interviewed were B.C. residents. Of all B.C. resident interviews, 224 (33 %) were Bulkley Valley residents and the remainder (67 %) were from other areas of the province.
- ◆ Almost six percent of anglers interviewed lived in other Canadian provinces and 33 % percent were Non-Canadian residents.
- ◆ The majority of B.C. resident angler interviews were conducted early in the Classified Waters Period (September) whereas more Non-Canadian residents were interviewed later in the Classified Waters Period (October).
- ◆ Ninety-four percent of anglers interviewed were male and six percent were female. Overall, males averaged 44.5 years old and females averaged 41.4 years old.

#### **Guided Status**

- ◆ There were 165 (15 %) guided anglers and 968 (85 %) non-guided anglers interviewed by River Guardians in 1998.
- ◆ The guided angler interviews were not evenly distributed throughout the study period. Most guided anglers were interviewed in the Classified Waters Period (162 anglers, 97 % of guided anglers interviewed) and few guided anglers were interviewed in the shoulder weeks of the study period.

- ◆ Few B.C. residents interviewed were guided anglers (4 %), while 37 % of Non-Canadian residents interviewed were guided.

### **Conservation Club Membership**

- ◆ Forty-five percent of anglers interviewed were members of at least one conservation club. More Canadian (53 %) and Non-Canadian (63 %) residents interviewed were members of a conservation club than B.C. residents (35 %).
- ◆ Of those anglers that were members of at least one conservation club, 28 % were members of the B.C. Steelhead Society, 23 % were members of Trout Unlimited, 10 % were members of a local angling club, 5 % were members of the Nature Conservancy and 5 % were members of the Federation of Fly Fishers. Three percent of anglers were members of the B.C. Wildlife Federation.

### **Angling Method**

- ◆ Of all angler interviews, fly anglers were more common than gear anglers (80 % and 20 %, respectively). A larger proportion of Bulkley Valley anglers used gear rods than B.C., Canadian or Non-Canadian residents.
- ◆ Of all angler interviews, 42 % were shore-access anglers, whereas the remaining anglers gained access with a boat (58 %). Of boat-access anglers, more used a power boat (64 %) than a drift boat (36 %) to access the Bulkley River.
- ◆ Of all boat access anglers interviewed, 44 % (273 anglers) were B.C. residents, 38 % (237 anglers) were Non-Canadian residents, 14 % (86 anglers) were Bulkley Valley residents and 4 % (27 anglers) were Canadian residents.
- ◆ Overall, 84 % of power boat-access anglers were fly fishing and 94 % of drift boat-access anglers were fly fishing. Fishing with gear was more common among shore-access anglers (32 %) than power or drift boat-access anglers (16 and 6 %, respectively).

### **Angling Effort**

#### **Trip Length**

- ◆ Overall, anglers expected they would spend an average of 7.0 hours angling per day. In general, the expected angler day was longer in the middle of the steelhead angling season than in the shoulder weeks of the season.
- ◆ On average, Bulkley Valley residents planned to fish for 4.9 hours on the day they were interviewed, whereas other B.C. residents planned to fish for 7.3 hours, and Non-Canadian residents planned to fish for 8.2 hours.
- ◆ Guided anglers planned to fish longer (8.8 hr) than non-guided anglers (6.7 hr).

- ◆ Overall, the mean number of days the angler planned to fish during the steelhead angling season was 13.8 days. On average, Bulkley Valley residents planned to fish for 27.1 days, while other B.C. residents planned to fish for 10.6 days. Canadian and Non-Canadian residents planned to fish for fewer days (7.0 days).
- ◆ Guided anglers planned to fish for an average of 7.1 days during the steelhead angling season while non-guided anglers planned to fish for an average of 15.2 days.

### **License Class and Classified Days Purchased**

- ◆ Most B.C. resident anglers interviewed purchased an annual angling license. More Canadian residents bought annual licenses than eight-day or one-day angling licenses. In contrast, most Non-Canadian residents bought eight-day angling licenses compared to annual or one-day angling licenses.
- ◆ Canadian and Non-Canadian resident anglers planned to fish for more days than specified by the Classified Waters licenses they purchased. Forty percent of non-guided anglers purchased a one-day Classified Waters license although they planned to fish for 15 days on average. Non-guided, non-resident anglers frequently purchased several one- or two-day Classified Waters licenses. Guided anglers purchased more six-, seven- and eight-day Classified Waters licenses than non-guided anglers which corresponded with their average Bulkley River trip length of 7 days.

### **Temporal Distribution**

#### **Anglers**

- ◆ Thirty-six aerial counts were conducted between late August and mid-November. Of all 36 flights, 2,464 anglers were counted. The angler counts ranged from a low of 7 anglers (November 18) to a high of 161 anglers (October 4). On average, 68.4 anglers were counted per flight.
- ◆ The majority of observed angler effort occurred from mid-September through mid-October while less effort occurred in the shoulder weeks of the steelhead angling season. The number of anglers observed from aerial counts outside the Classified Waters Period (weeks 8-4, 11-1 - 11-3) was low in comparison to other weeks within the Classified Waters Period. The distribution of angler effort closely resembled a normal or a bell-shaped curve throughout the fall steelhead angling season.
- ◆ The total effort estimate for the whole study period (and study area) was 6,116 rod days while the effort estimate for the Classified Waters Period was 5,422 rod days. Morice River anglers (Bymac-the Forks) were estimated to fish for 262 rod days. The overall effort estimate in 1998 was larger than the 1997 effort estimate (4,317 rod days).

- ◆ For the whole study period, B.C. residents were estimated to angle for 3,766 rod days. Non-Canadian residents were estimated to produce 2,006 rod days of angler effort and 343 rod days of effort were estimated for Canadian residents.

### **Guided Anglers**

- ◆ A total of 331 guided anglers and guides were observed during the aerial counts. Of the 331 guided anglers counted, 329 (99 %) guided anglers were counted in the Classified Waters Period. This result was similar to the 97 % of guided angler interviews that were conducted during the Classified Waters Period. The observed guided effort was underestimated in the aerial count. From the air, not all guided boats could be identified and, therefore guided anglers were counted as non-guided anglers on several occasions.
- ◆ There were 910 guided angler days (15 %) and 5,205 non-guided angler days (85 %) of angler effort estimated for the whole study period. The estimate of the guided angler rod days did not include the guide him/herself. Guides themselves were counted as non-guided anglers. If they are included as a component of guided angler use the percent of the total angling effort accounted for by guided and non-guided anglers was 22 % and 78 %, respectively.

### **Boats**

- ◆ A total of 825 boats were observed during 36 aerial flights. Overall, there was an average of 23 boats counted per day. Similar to the number anglers observed, the majority of boats were observed in the Classified Waters Period (751 boats, 91 %) and not in the shoulder weeks of the study period. The boat counts ranged from a low of 2 boats (November 18) to a high of 54 boats (September 27).
- ◆ Considering all anglers counted from the aerial flights (2,464) the overall ratio of anglers to boats was 2.99:1. The ratio of anglers to boats differed in weeks throughout the study period. The shoulder weeks had a higher ratio of anglers to boats than weeks during the Classified Waters Period. The ratio of anglers to boats was 2.57:1 on the day with the highest boat count (September 27, 54 boats).
- ◆ Of all boats counted, 484 (59 %) were power boats and 341 (41 %) were drift boats. Throughout the study period both power and drift boats followed a normal or bell-shaped temporal distribution. A high count of 31 power boats occurred on September 27 (week 10-1) and a high count of 32 drift boats occurred on October 3 (week 10-1).
- ◆ For the whole study period, a total of 1,991 boat days were estimated to use the Bulkley River. Of those, more power boats (1,175 power boat days) were estimated to use the river than drift boats (816 drift boat days).
- ◆ Considering the total effort estimate in rod days (6,116 rod days) and the total estimate of boat days (1,991 boat days), the ratio of angler days to boat days was 3.07:1.

### **Angling Method**

- ◆ Of all observed anglers for whom gear type could be determined, more used a fly rod (1,537 rods) than a gear rod (355 rods).

- ◆ The distribution of fly rod anglers differed from gear rod anglers. The majority of fly rod anglers were observed in the Classified Waters Period and less fly rod anglers were observed during the shoulder seasons. In contrast, the number of gear rod anglers observed was relatively stable throughout most weeks.
- ◆ There was an estimated 3,716 fly rod days and 940 gear rod days of angler effort on the Bulkley River during the whole study period. In addition 1,397 rod days were estimated as unidentifiable fly or gear anglers because a proportion of anglers could not be identified as angling with a fly or gear rod from the helicopter.

## **Spatial Distribution**

### **Anglers**

- ◆ A high observed angler effort occurred in the river sections between Chicken Creek and Trout Creek, between Telkwa and Smithers, Quick and Telkwa and the Forks and Walcott. Fewer anglers were observed between Bymac and the Forks, Smithers Bridge and Chicken Creek and Trout Creek and Moricetown.

### **Guided Anglers**

- ◆ Relative to other river sections, a high number of guided anglers were observed between Chicken and Trout creeks and in the three river sections between Walcott and the Smithers Bridge.

### **Boats**

- ◆ The majority of power boat use occurred between the Forks and Walcott, Chicken Creek and Trout Creek and between Moricetown and the Suskwa River. Relative to other river sections, drift boat use was high in the three river sections upstream of the town of Smithers (between Walcott and Smithers Bridge).

### **Angling Method**

- ◆ The majority of fly rod anglers were observed between the Forks and Walcott, Quick and Telkwa, Telkwa and Smithers Bridge and Chicken Creek and Trout Creek. Of all gear rod anglers most were around the town of Smithers in the three river sections between Telkwa and Trout Creek.

## **Angler Catch**

### **Catch Rate**

- ◆ For all anglers interviewed, a total of 5,326 hours were spent angling which averaged 4.8 hours per angler at the time of the interview. Six-hundred and seventy-six (676) steelhead were caught and released by anglers at the time of the interview. The observed catch rate for all anglers interviewed was 0.19 steelhead/hour or assuming a rod day of 7 hours, 1.33 steelhead per rod day.

- ◆ For Morice River anglers, a total of 204 hours were spent angling and 38 steelhead were caught and released. The observed catch rate for all anglers interviewed was 0.23 steelhead/hour, or assuming a rod day of 7 hours, 1.61 steelhead per rod day.
- ◆ Among residence categories, B.C. residents had the highest catch rate (1.45 steelhead/rod day), followed by Non-Canadian residents (1.39 steelhead/rod day), Canadian residents (1.12 steelhead/rod day), and Bulkley Valley residents (0.87 steelhead/rod day). The expected angling day differed for each residence group which influenced the steelhead per rod day estimates.
- ◆ Guided anglers had higher catch rates (1.58 steelhead/rod day) than non-guided anglers (1.26 steelhead/rod day). The length of the expected angling day differed for guided and non-guided anglers which influenced the steelhead per rod day estimates.
- ◆ Gear rod anglers had higher catch rates (1.40 steelhead/rod day) than fly rod anglers (1.27 steelhead/rod day)
- ◆ Steelhead anglers also reported landing six other species of fish including, 39 Dolly Varden/bull trout (*Salvelinus malma/S. confluentus*), 25 coho salmon (*O. kisutch*), 18 rainbow trout (*O. mykiss*), 15 whitefish (*Prosopium* sp.), 7 pink salmon (*O. gorbuscha*), and 1 cutthroat trout (*O. clarki*).

### **Temporal Distribution**

- ◆ The total estimated catch was 8,956 steelhead and 92 % (8,222 steelhead) of those were caught in the Classified Waters Period. Morice River anglers (Bymac-the Forks) were estimated to catch 430 steelhead. The overall catch estimate in 1998 was larger than the 1997 catch estimate (6,364 steelhead).

### **Spatial Distribution**

- ◆ Relative to other river sections, the majority of steelhead were estimated to be caught between Chicken and Trout creeks (1,507 steelhead), Moricetown and the Suskwa River (1,482 steelhead) and between the Forks and Walcott (1,282 steelhead).

### **Angler Compliance**

- ◆ Almost five percent of anglers interviewed had a license infraction. The majority of anglers with at least one infraction noted were B.C. residents (58 %), followed by Non-Canadian residents (33 %) and Canadian residents (8 %). The actual proportion of anglers with license infractions could have been slightly higher because anglers were not checked for license compliance after their first interview.
- ◆ Failure to purchase a Classified Waters license was the most frequent infraction noted (50 %).

***Angler Comments***

- ◆ Three-hundred and ninety anglers made 510 comments about fisheries management to the River Guardians. Of those, almost 24 % (92 anglers) of anglers had positive comments about the River Guardian program. Twenty-two percent (87 anglers) of anglers commented there should not be a kill fishery for steelhead, whereas about 3 % (14 anglers) were in favor of a kill fishery in the fall of 1998.

## Abstract

The River Guardians conducted a creel survey of Bulkley River steelhead (*Oncorhynchus mykiss*) anglers from late August until mid November. Similar to the 1997 River Guardian program, aerial counts and an on-site roving survey were the two main components of the creel survey. Two River Guardian teams collected recreational angler's demographics (residence, age, conservation club membership, trip length, hours angling that day), angling methods, access method, license details, and steelhead catch were collected from the short interview.

The River Guardians conducted 1,199 interviews. Of those, 693 (58 %) were interviewed for the first time while 506 (42 %) had been interviewed previously. The majority of anglers interviewed were B.C. residents (63 %) followed by Non-Canadian residents (33 %) and Canadian residents (6 %). There were 165 (15 %) guided anglers and 968 (85 %) non-guided anglers interviewed. Few B.C. residents interviewed were guided anglers (4 %), while 37 % of Non-Canadian residents interviewed were guided. Of all anglers interviewed, fly anglers were more common than gear anglers (80 % and 20 %, respectively). A higher percentage of B.C. anglers used gear rods than Canadian or Non-Canadian residents. Of all anglers interviewed, 42 % were shore-access anglers, whereas the remaining anglers gained access with a boat (58 %). Of boat-access anglers, more used a power boat (64 %) than a drift boat (36 %) to access the Bulkley River.

For all anglers interviewed, a total of 5,326 hours were spent angling which averaged 4.8 hours per angler at the time of the interview. The observed catch rate for all anglers interviewed was 0.19 steelhead/hour or assuming a rod day length of seven hours, 1.33 steelhead per rod day.

The increased intensity of aerial flights and interviewing effort in 1998 (from 1997) provided precise angler catch and effort estimates. Thirty-six aerial counts were conducted between late August and late November. Of all 36 flights, 2,464 anglers were counted. The angler counts ranged from a low of 7 anglers (November 18) to a high of 161 anglers (October 4). On average, 68.4 anglers were counted per flight. A total of 825 boats were observed during 36 aerial flights. Overall, there was an average of 23 boats counted per day. The boat counts ranged from a low of 2 boats (November 18) to a high of 53 boats (September 27). Considering all anglers counted from the aerial flights (2,464) the overall ratio of anglers to boats was 2.99:1.

The total effort estimate for the whole study period (and study area) was 6,116 rod days while the effort estimate for the Classified Waters Period was 5,422 rod days. The total estimated catch was 8,956 steelhead and 92 % (8,222 steelhead) of those were caught in the Classified Waters Period. The estimated effort distribution closely resembled a normal distribution or a bell shaped curve throughout the fall steelhead angling season. Spatially, high estimated angler effort occurred in the river sections between Chicken Creek and Trout Creek, Telkwa and Smithers, Quick and Telkwa, and the Forks and Walcott.

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### 1.0.0.0 Introduction

The Bulkley River in the Skeena Region of northwestern British Columbia (B.C.) is known worldwide for providing a high quality steelhead (*Oncorhynchus mykiss*) recreational fishery. In 1990, the Bulkley River was designated Classified Waters from September 1 through October 31. There are two main objectives of the Classified Waters System (Anonymous 1998b);

- ◆ To maintain high quality angling opportunities (particularly for resident anglers) on premier steelhead and trout rivers and;
- ◆ To promote a stable angling guide industry.

The freshwater recreational fishery in B.C. was estimated to grow in value with a compound annual growth rate of 2.0 percent 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 during the Classified Waters Period in the Skeena Region and in particular, the Bulkley River. In response, the Ministry of Environment, Lands and Parks (MELP) initiated a review of the Bulkley River Angling Use Plan (AUP). The AUP was intended to address the objectives of the Classified Waters System. In 1997, the River Guardian program was initiated to provide a solid information base to aid in the development of a new AUP. Thus, 1998 was the second year of the River Guardian Program.

The River Guardian program provided an opportunity to conduct a roving survey with on-site interviews of anglers on the Bulkley River. The survey collected information about steelhead angler's demographics, catch and effort information. Also, aerial counts of anglers were conducted on the Bulkley River to further document the spatial and temporal patterns of angler effort and the total angler effort. Unlike 1997, the River Guardians were not officers under the Wildlife Act and therefore did not have enforcement powers. Their presence was primarily for data collection.

The objectives of the 1998 River Guardian Program were;

1. To collect accurate catch and effort data in order to estimate the total catch and effort by steelhead anglers on the Bulkley River in the 1998 steelhead angling season.
2. To collect representative demographic and angling method data from 1998 steelhead anglers on the Bulkley River.
3. To provide a 'presence' on the Bulkley River and to evaluate compliance with regulations and encourage river stewardship.

### **2.0.0.0 Study Area**

Morice Lake is the origin of the Bulkley River drainage. From Morice Lake, the Morice River flows for 74 km to meet the Bulkley River near Houston, B.C. (Anonymous 1996). The Bulkley River then flows for 142 km into the Skeena River near Hazelton, B.C. (Figures 1 and 2). The Bulkley watershed is the largest of the Skeena River tributaries and drains 12,173 km<sup>2</sup> (Anonymous 1998b). This study included the Bulkley River from its lowermost reaches at the Suskwa River upstream to its confluence with the Morice River near Houston (142 km). The popular reach of the Morice River from the Bymac campground near Houston downstream to the Bulkley River confluence was also included (4 km).

Highway 16 and the communities of Houston, Telkwa, Smithers, Moricetown and Hazelton are adjacent to the river. There are many access points for angling from shore, power boat or drift boat along the river. The majority of the river is accessible to both power and drift boats and the boating opportunities provide a major feature of the Bulkley River. Of the 146 km of the study area, most (98 km) is relatively heavily fished. Almost all fishing activity occurs in the most navigable water between Trout Creek and Morice River. The area from about 1 km downstream of the Suskwa River to the confluence of the Bulkley and Skeena rivers (about 18 km), the area from Porphyry Creek to Moricetown (about 22 km) and the area between Trout Creek and Moricetown (8 km) are all relatively lightly fished due to access limitations and/or paucity of good angling water.

The Bulkley and Morice rivers are two of about 40 class 2, Classified Waters in the province (Anonymous 1996). During the Classified Waters Period, angling guides are limited, as is the number of days they can guide. The Bulkley River is restricted to a maximum of eight licensed angling guides and a total of 1,504 guided rod days (Anonymous 1996). The Morice River is restricted to three licensed angling guides, and 433 guided rod days. Both rivers are Classified Waters between September 1 and October 31. The MELP does not restrict the number of assistant angling guides on any of the Classified Waters in the province.

Relative to other angling rivers in the Skeena Region, the Bulkley River has good water clarity throughout most of the steelhead angling season (Anonymous 1996). During high runoff from a large rainfall or unusually warm weather, the Telkwa River contributes the majority of turbidity that occurs downstream in the Bulkley River. During these events angling downstream of the confluence of the Telkwa and Bulkley rivers is poor. Most anglers move upstream, thus concentrating all angling activity upstream of the Telkwa River. During such events it is not uncommon for other rivers in the Skeena Region to be highly turbid, therefore adding to the angler concentration on the Bulkley River. The frequency of these events can range from none to four or five per year season, seldom lasting less than three or four days or more than 10 to 12 days.

Angling restrictions in the Bulkley River are published in the B.C. Freshwater Fishing Regulations Synopsis (Anonymous 1998a). In short, no fishing is permitted from January 1 to June 15. From June 16 to July 31 anglers are permitted to use natural bait, but after July 31 a bait ban is in effect. From June 16 to December 31, there is a single hook only

restriction. The regulations state steelhead must be released and angling from boats is not permitted from the Morice River to the CNR bridge (August 15 - December 31) or in Moricetown Canyon (all year). In the 1998 Classified Waters Period, non-resident anglers were required to purchase a Classified Waters license at \$10.00 per day and B.C. residents were required to purchase a 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. In addition, a new barbless hook regulation came into effect for the whole Skeena Region on August 8, 1998.

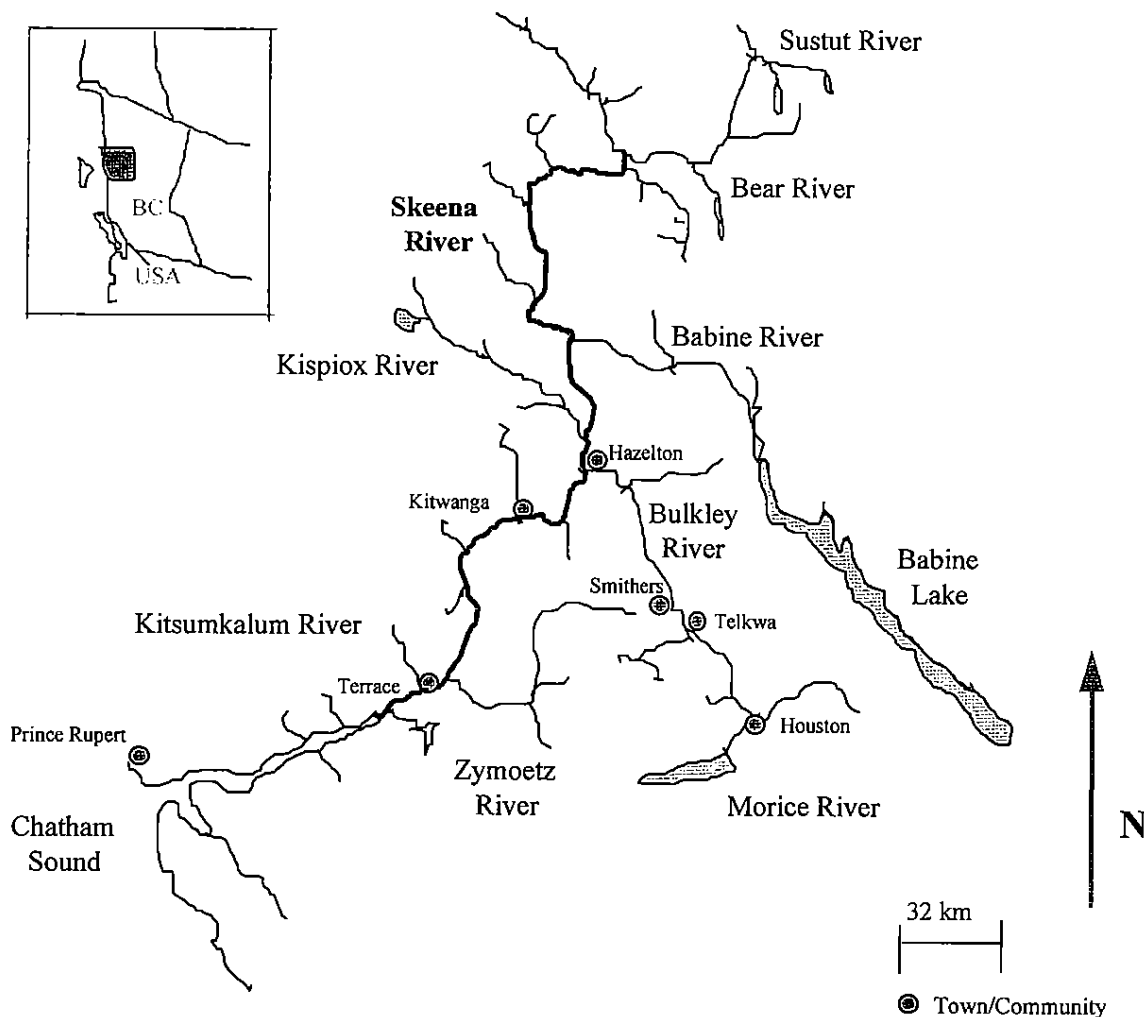


Figure 1. The Skeena River watershed.

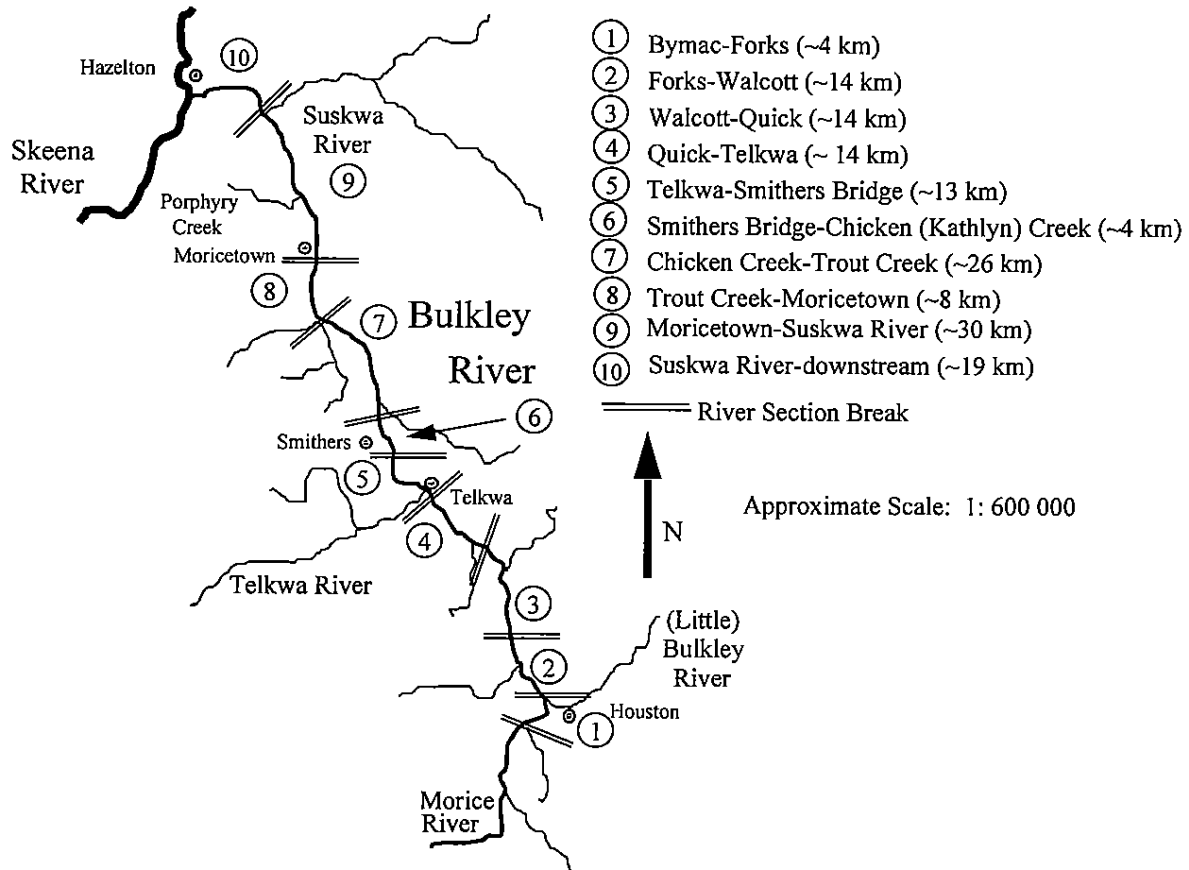


Figure 2. The Bulkley River sections used for analysis.

### 3.0.0.0 Methods

#### 3.1.0.0 Field Methods

The River Guardians conducted a creel survey of 1998 Bulkley River steelhead anglers. Similar to the 1997 River Guardian program, aerial counts and an on-site roving survey were the two main components of the creel survey. In 1997, the results suggested variability in angler effort was larger between weeks than between weekdays and weekends. Therefore, in 1998 the steelhead angling season was stratified into one week strata and simple random sampling without replacement was conducted within those weeks to obtain three aerial counts in each week (stratified random sampling design; Schaeffer *et al.* 1990). In addition, the aerial counts and roving survey were designed to cover the majority of the steelhead angling season (August 25 through November 22, 1998) and not only the Classified Waters Period as in 1997. The Bulkley River was also divided into 10 river sections for the analysis (Figure 2).

Four River Guardians in two teams were on the Bulkley River on each of the days selected for aerial counts. The River Guardians used jet boats to contact as many power boat-access, drift boat-access and shore-access anglers as possible. Occasionally, a truck was used to access the anglers due to mechanical difficulties with the boat or a missing River Guardian team member. Usually, one River Guardian team interviewed anglers upstream of the Smithers Bridge (5 river sections) and the other interviewed anglers downstream (5 river sections). The direction of travel of each team was alternated between days that were surveyed (Pollock *et al.* 1994). As many interviews as possible were conducted in each river section although, all river sections were visited on most days when aerial flights were conducted. While in each river section the River Guardians randomly selected anglers to be interviewed.

In addition, each team of River Guardians worked a fourth day per week. The additional day on the river enabled at least one River Guardian team to be on the Bulkley River for five days of each week. The river section(s) for interviewing were selected according to angler effort and weather conditions.

Each team of River Guardians completed two forms while on the river: the angler interview form and the angler count form (Appendix 1). The angler was approached and asked for their cooperation to complete the interview. The recreational angler's demographics (residence, age, conservation club membership, trip length, hours angling that day), angling method, access method and steelhead catch were recorded on the angler interview form. Also, anglers were asked if they had landed any Floy-tagged steelhead. Tag information complimented the tag return program of the Skeena Region Fisheries Branch in 1998. The River Guardians also asked to see the angler's license, and if needed, recorded any infractions they noticed. If the anglers did not agree to the interview, had already completed the interview or there was a language barrier, the River Guardians only recorded data on the access method, angling method, gender, hours fished, catch and license details. Often, the River Guardians would interview an angler that was already interviewed. In this case, only

the name, angling method, access method, catch information, trip length and tag information were collected from the angler.

The River Guardians also completed an angler count form each day they were on the river. The date, river section surveyed, number of anglers interviewed in each river section, number of anglers observed in each river section, and weather and water conditions were completed on each angler count form. Also, the initials of the River Guardian crew and any other comments the River Guardians had were completed on the angler count form.

Unlike 1997, the River Guardians were not officers under the 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.

Thirty-six aerial counts were conducted on the Bulkley River during the study period. The helicopter traveled east from Smithers directly to the Bymac crossing on the Morice River. The helicopter then proceeded to fly directly over the river downstream to the confluence of the Bulkley and Suskwa rivers. All aerial counts were conducted between 1:00 and 2:30 p.m. This time period represented when most anglers were on the Bulkley River in a previous study (Lewynski and Olmsted 1990). Each aerial count took approximately 90 minutes. The count of anglers was recorded on aerial count forms while proceeding downstream (Appendix 1). The number of anglers, power boats and drift boats, fly anglers and gear anglers and guided anglers (including the guide) were recorded for each river section. In addition, the date, weather, time, personnel and helicopter carrier were recorded for each aerial flight. Inactive power or drift boats (tied up to a dock or permanent object for several days) observed during the aerial flights were excluded from the boat counts on the aerial count form.

### ***3.2.0.0 Relevant Definitions***

**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 1998).

**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 1998).

**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 1998).

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

**Drift Boat:** The angler used a non-motorized boat to access recreational angling on the Bulkley River including rafts, canoes, pontoon boats and float tubes.

**Power Boat:** The angler used a motorized boat to access recreational angling on the Bulkley River including boats with jet engines, propeller engines and jet skis.

### 3.3.0.0 Analysis Methods

#### 3.3.1.0 Interviews

Several sources were used to analyze the number of anglers observed, and where and when the River Guardians were on the river. The angler count data forms were used to summarize the total anglers observed and the approximate time the River Guardians spent interviewing on the river each week. The number of angler interview forms completed was used to summarize the number of anglers interviewed by week (Table 1) and river section (Table 2; Figure 2).

Table 1. The dates included in the weeks used in analyses.

Week	Dates
8-4	Aug. 23 - Aug. 29
9-1	Aug. 30 - Sept. 5
9-2	Sept. 6 - Sept. 12
9-3	Sept. 13 - Sept. 19
9-4	Sept. 20 - Sept. 26
10-1	Sept. 27 - Oct. 3
10-2	Oct. 4 - Oct. 10
10-3	Oct. 11 - Oct. 17
10-4	Oct. 18 - Oct. 24
10-5	Oct. 25 - Oct. 31
11-1	Nov. 1 - Nov. 7
11-2	Nov. 8 - Nov. 14

Table 2. The Bulkley River sections used in analyses.

	River Section
1	Bymac - The Forks
2	The Forks - Walcott Bridge
3	Walcott Bridge- Quick Bridge
4	Quick Bridge- Telkwa Bridge
5	Telkwa Bridge - Smithers Bridge
6	Smithers Bridge - Chicken Creek
7	Chicken Creek - Trout Creek
8	Trout Creek - Moricetown
9	Moricetown - Suskwa River

#### 3.3.2.0 Angler Characteristics

Anglers could have been approached several times for an interview. The data were sorted by angler name to get an accurate number of anglers that were interviewed more than once. The percentage and number of angler interviews attempted and the percentage and numbers of individual anglers were summarized by residence categories. Anglers were asked for their residency status. For B.C. residents, the postal code was used to determine if the angler was

from the Bulkley Valley (Houston-Hazelton), Skeena Region or other resource management regions in the province. 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 number of male and female anglers was summarized by age categories.

The River Guardians recorded guided status (non-guided or guided) which was summarized by angler residence categories. Also, the guided status of anglers was summarized by the number of repeat interviews conducted.

The first time a River Guardian approached an angler, he or she was asked, "*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. For 2x2 contingency tables (one degree of freedom), a Yates correction for continuity was used when necessary (Zar 1984).

#### **3.3.3.0 Angler Trip Characteristics**

The angling method (fly or gear) and access method (power boat, drift boat or walking) were recorded by the River Guardians and summarized by angler residence 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.

During their first interview, anglers were asked, "*When do you expect to finish your fishing trip today?*" With addition to the time the angler started fishing that day, the expected fishing effort was calculated for each angler interviewed. This was the expected angler day. The expected angler day was summarized by week, residence categories, guided status, angling method and access method. Differences in the expected angler day for week, angler residence and access method were compared with a non-parametric Kruskal-Wallis test. Mann-Whitney U tests were used to examine differences in expected angler day between guided status and angling method categories. An assumption of a normal distribution of anglers was not necessary for both non-parametric statistical tests. For expected angler day, the individual angler was the unit of analysis not the angler interview.

During their first interview, anglers were asked, "*How many days have you already fished on the Bulkley River?*" and "*How many more days do you plan to fish on the Bulkley River?*" The total number of planned angling days in the 1998 steelhead angling season was calculated from the results of these two questions. Differences in the number of planned angling days for angler residence categories was 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. An assumption of a normal distribution of anglers was not necessary for both non-parametric statistical tests. For angler trip length, the individual angler was the unit of analysis not the angler interview.

### 3.3.4.0 Angling Licenses

The River Guardians recorded the angler's license class and the number of Classified Waters days purchased and used from the angler's license. The license class (one day, eight day and annual) and the number of Classified Waters days purchased and used were summarized by residence category and guided status. In addition, the number of Classified Waters days purchased was summarized by license class. The license details were only collected the first time the angler was interviewed by the River Guardians.

Anglers were not required to purchase all the 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 prior to the day the angler was interviewed.

Anglers were asked if they had any additional comments. If an angler commented on the possibility of a 'steelhead kill fishery' they were asked to clarify their position and that was recorded as a comment. Otherwise, anglers were not asked to comment on specific topics. 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.

### 3.3.5.0 Angler Effort and Catch

#### 3.3.5.1 Catch Rate

The observed catch rate and effort was calculated with data from the on-site interviews. The River Guardians asked anglers, "How many hours have you fished today?" and "What type of fish have you landed today? How many did you keep or release?" The number of hours spent angling, 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.

Typically, anglers were not interviewed at the end of the angling day (trip) and therefore incomplete angler catch and effort data were collected. Thus, the mean of the ratios was used to estimate catch rates instead of the ratio of the means, since anglers were sampled while they were still fishing, implying catch probabilities were proportional to their trip length (Pollock *et al.* 1994; Jones *et al.* 1995; Pollock *et al.* 1997). Also, short incomplete trips (< 0.5 hr.) were excluded to prevent the variance from being influenced by extreme catch rates that may occur during short trips (Pollock *et al.* 1994; Hoenig *et al.* 1997). Catch rate ( $\hat{R}$ ) was estimated by:

Equation 1

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

where  $\hat{R}$  = catch rate of the sample,  $n$  = the number of sampling units (interviews),  $L_i$  = the length of the fishing trip at the time of the interview and  $c_i$  = the catch for the  $i$ th sampling unit (angler interview).

The catch rate (in hours and steelhead per rod day), steelhead caught and effort (hours) were summarized by week, river section, angler residence, guided status, access method and angling method. Steelhead per rod day was calculated by multiplying the catch rate by the rod day length in hours. The rod day length (hours) was obtained from the expected angling day length obtained from anglers in the interview (Table 14). The mean of the expected angling day length was calculated for each week, residence category, guided status category, access method and angling method. The mean expected angling day lengths were then multiplied by the catch rate for the analysis category to obtain steelhead per rod day.

For each river section the steelhead per rod day was calculated using the overall mean expected angling day (7.0 hr). The summary of steelhead caught includes all angler trips while the effort and catch rate summaries include only trips that were greater than or equal to 0.5 hr. at the time of the interview. Also, the other species of fish caught with catch rates in rod days were summarized. An overall rod day of 7.0 hr was used to calculate the fish per rod day for Dolly Varden/bull trout and coho salmon (*Oncorhynchus kisutch*).

### **3.3.5.2 Spatial and Temporal Distribution of Angler Effort**

The number of anglers observed by the aerial counts and the number of on-site interviews were summarized by week and river section. The relationship between the number of on-site interviews completed with the number of anglers observed from the aerial counts was examined by week and river section with a Pearson correlation coefficient. Also, a Pearson correlation coefficient was used to examine the number of fly and gear anglers, guided anglers and power and drift boats counted from the aerial flights with the number of on-site interviews completed in each week. The number of guided anglers observed from the aerial flight and the number of guided anglers interviewed were summarized. In addition, the number of power and drift boats, and fly and gear anglers observed were summarized by week and river section.

### 3.3.5.3 Effort and Catch Estimates

#### *Effort and Catch for Each Week*

Any angler observed during aerial flights was counted as one rod day of effort. For each week, the daily effort estimates ( $e_{\text{daily}}$ ) were used to calculate the mean daily effort within a week ( $\bar{e}_{\text{week}}$ ). The total effort within a week ( $\hat{E}_{\text{week}}$ ) was estimated by multiplying the mean daily effort by the number of days in the week ( $N = 7$ ; Equation 2).

**Equation 2** 
$$\hat{E}_{\text{week}} = N \times \bar{e}_{\text{week}}$$

The variance in the estimate of total effort within each week ( $\text{Var}(\hat{E}_{\text{week}})$ ) was estimated by:

**Equation 3** 
$$\text{Var}(\hat{E}_{\text{week}}) = N^2 \times (s^2 / n) \times fpc$$

where  $N$  was the total number of days in the week,  $s^2$  was the sample variance of the daily effort within the week,  $n$  was the number of observations of total daily effort within the week, and  $fpc$  was the finite population correction factor ( $(N-n)/N$ ; Schubert 1988).

The approximate 95 percent confidence intervals for effort within each week were calculated using Equation 4.

**Equation 4** 
$$95\% \text{ Confidence Intervals} = 2 \times \sqrt{\text{Var}(\hat{E}_{\text{week}})}$$

The total effort ( $\hat{E}$ ) for the study period was the sum of the effort of all weeks ( $\hat{E}_{\text{week}}$ ; Equation 5).

**Equation 5** 
$$\hat{E} = \sum_{\text{week}} \hat{E}_{\text{week}}$$

The variance in total effort ( $\text{Var}(\hat{E})$ ) was estimated with Equation 6 where the variance in effort for each week ( $\text{Var}(\hat{E}_{\text{week}})$ ) was summed (Schubert 1988).

**Equation 6** 
$$\text{Var}(\hat{E}) = \sum_{\text{week}} \text{Var}(\hat{E}_{\text{week}})$$

The approximate 95 percent confidence intervals for the total effort were calculated using Equation 7.

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

The total catch and weekly catch estimate was calculated with Equations 8 through 16. For each day a flight was conducted, the mean of the catch rates (obtained from the interviews) was used to estimate the mean daily catch rates (Equation 1). The daily effort estimate ( $e_{\text{daily}}$ ; in rod days) was multiplied by the mean weekly expected angling day ( $L_{\text{expected}}$ ; in hours, Table 14) to estimate the total daily effort in hours ( $\hat{E}_{\text{daily}}$ ; Equation 8).

**Equation 8** 
$$\hat{E}_{\text{daily}} = L_{\text{expected}} \times e_{\text{daily}}$$

The total daily effort ( $\hat{E}_{\text{daily}}$ ) was multiplied by the mean daily catch rate ( $\bar{R}_{\text{daily}}$ ) to obtain the daily catch (Equation 9).

**Equation 9** 
$$\hat{C}_{\text{daily}} = \bar{R}_{\text{daily}} \times \hat{E}_{\text{daily}}$$

The mean weekly catch was the average of daily catches within that week (Equation 10).

Equation 10

$$\bar{C}_{week} = \frac{\hat{C}_{daily}}{n}$$

The total weekly catch  $\hat{C}_{week}$  was estimated by multiplying the mean weekly catch  $\bar{C}_{week}$  by the number of days in the week ( $N=7$ ; Equation 11).

Equation 11

$$\hat{C}_{week} = N \times \bar{C}_{week}$$

The variance in the estimate of total catch within each week was estimated by:

Equation 12

$$Var(\hat{C}_{week}) = N^2 \times (s^2 / n) \times fpc$$

where  $N$  was the total number of days in the week,  $s^2$  was the sample variance of the daily catch within the week,  $n$  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). The approximate 95 percent confidence intervals for the catch within each week were calculated using Equation 13.

Equation 13

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

The total catch ( $C$ ) for the study period was the sum of the total weekly catches ( $\hat{C}_{week}$ ).

Equation 14

$$(C) = \sum_{week} (\hat{C}_{week})$$

The variance in the total catch ( $Var(C)$ ) was estimated by:

Equation 15

$$Var(C) = \sum_{week} Var(\hat{C}_{week})$$

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

The approximate 95 percent confidence intervals for the total catch were calculated with Equation 16.

Equation 16

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

Equations 2 through 7 were used to estimate the total effort for fly and gear anglers and power or drift boats. The daily effort estimates for each angling method ( $e_{flydaily}$ ,  $e_{geardaily}$ ) or boat type ( $e_{powerdaily}$ ,  $e_{driftdaily}$ ) were substituted for the total daily effort estimate ( $e_{daily}$ ). Thus, estimates for each gear and boat type were made for each week instead of just one angler effort estimate. All fly and gear anglers were not recognizable from the helicopter, so an estimate for unknown angling method was also calculated.

### *Effort and Catch for River Sections*

Estimates for each week within each river section were summed to equal the total catch and effort estimates for each river section. The methods to estimate total effort and catch within a river section varied from the methods used to estimate total effort and catch for each week because of small sample sizes. The weekly effort within each river section ( $\hat{E}_{secweek}$ ) was estimated with Equations 2 through 7. The total effort within the river section in rod days

( $\hat{E}_{\text{sec}(\text{rd})}$ ) was the sum of the weekly effort estimates within that river section ( $\hat{E}_{\text{secweek}}$ ; Equation 17).

**Equation 17**

$$\hat{E}_{\text{sec}(\text{rd})} = \sum_{\text{week}} \hat{E}_{\text{secweek}}$$

The variance in the estimate of total effort of the river section ( $\text{Var}(\hat{E}_{\text{sec}})$ ) was the sum of the weekly variance estimates within that river section ( $\text{Var}(\hat{E}_{\text{secweek}})$ ).

**Equation 18**

$$\text{Var}(\hat{E}_{\text{sec}(\text{rd})}) = \sum_{\text{week}} \text{Var}(\hat{E}_{\text{secweek}})$$

The approximate 95 percent confidence intervals for the total effort within a river section were calculated with Equation 19.

**Equation 19**

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

To calculate the catch for each week within a river section the daily effort estimate in rod days was converted to the daily effort in hours. The daily effort estimate ( $e_{\text{daily}(\text{rd})}$ ; in rod days) was multiplied by the mean weekly expected angling day ( $L_{\text{expected}}$ ; in hours, Table 14) to estimate total daily effort in hours ( $\hat{e}_{\text{daily}(\text{hr})}$ ; Equation 8). For each week the daily effort estimates were used to calculate the mean daily effort within a week ( $\bar{e}_{\text{week}(\text{hr})}$ ). The total effort within a week ( $\hat{E}_{\text{secweek}(\text{hr})}$ ) was estimated by multiplying the mean daily effort by the number of days in the week ( $N=7$ ; Equation 20).

**Equation 20**

$$\hat{E}_{\text{secweek}(\text{hr})} = N \times \bar{e}_{\text{week}(\text{hr})}$$

The variance in the estimate of total effort within each week ( $\text{Var}(\hat{E}_{\text{secweek}(\text{hr})})$ ) was estimated by:

**Equation 21**

$$\text{Var}(\hat{E}_{\text{secweek}(\text{hr})}) = N^2 \times (s^2 / n) \times fpc$$

where  $N$  was the total number of days in the week,  $s^2$  was the sample variance of the daily effort within the week,  $n$  was the number of observations of total daily effort within the week, and  $fpc$  was the finite population correction factor ( $(N-n)/N$ ; Schubert 1988).

For each river section, the catch within a week ( $\hat{C}_{\text{secweek}}$ ) was the product of the catch rates for each week and the total effort in hours within a week ( $\hat{E}_{\text{secweek}}$ , Equation 22).

**Equation 22**

$$\hat{C}_{\text{secweek}} = \hat{R}_{\text{secweek}} \times \hat{E}_{\text{secweek}(\text{hr})}$$

The variance of the catch within a week ( $\text{Var}(\hat{C}_{\text{week}})$ ) was calculated with the method described by Pollock *et al.* (1994; Equation 23). The approximate 95 percent confidence intervals were calculated with the method described by Scheaffer *et al.* (1990; Equation 24):

**Equation 23**

$$\text{Var}(\hat{C}_{\text{secweek}}) = \hat{E}_{\text{secweek}(\text{hr})}^2 \times \text{Var}(\hat{R}_{\text{secweek}}) + \hat{R}_{\text{secweek}}^2 \times \text{Var}(\hat{E}_{\text{secweek}(\text{hr})}) + \text{Var}(\hat{E}_{\text{secweek}}) \times \text{Var}(\hat{R}_{\text{secweek}})$$

**Equation 24**

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

The total catch within each river section ( $\hat{C}_{\text{sec}}$ ) was the sum of the weekly catch estimates and the variance for total catch was the sum of the weekly variance estimates in weekly catch ( $\text{Var}(\hat{C}_{\text{secweek}})$ ).

**Equation 25** 
$$C_{\text{sec}} = \sum_{\text{week}} (\hat{C}_{\text{secweek}})$$

The variance in total catch ( $\text{Var}(C_{\text{sec}})$ ) was the sum of the weekly variance estimates (Equation 26). The approximate 95 percent confidence intervals were calculated using Equation 27.

**Equation 26** 
$$\text{Var}(C_{\text{sec}}) = \sum_{\text{week}} \text{Var}(\hat{C}_{\text{secweek}})$$

**Equation 27** 
$$95\% \text{ Confidence Intervals} = 2 \times \sqrt{\text{Var}(\hat{C}_{\text{sec}})}$$

### *Effort and Catch for Residence and Guided Status*

The variance in total effort by week ( $\hat{E}_{\text{week}}$ ) was low in comparison to the variance of the total effort estimated by river section ( $\hat{E}_{\text{secweek}}$ ) which was a result of different methods of estimation to account for small sample sizes in the river section analysis. Therefore, the estimated catch and effort for each residence category and guided and non-guided anglers were calculated using the total effort estimated by week  $\hat{E}_{\text{week}}$  in the study period.

The estimated effort in each week in hours (Equation 28) was the effort estimate in each week in rod days multiplied by the mean expected angling day in each week ( $L_{\text{expected}}$ , in hours, Table 14)

**Equation 28** 
$$\hat{E}_{\text{week}(\text{hr.})} = \hat{E}_{\text{week}} \times L_{\text{expected}}$$

Within each week the effort for each residence category ( $\hat{E}_{\text{residence}}$ ) was the total effort ( $\hat{E}_{\text{week}(\text{hr.})}$ ) multiplied by the proportion of anglers in each residence category ( $\beta_{\text{residence}}$  Equation 29). The variance in effort for each residence category ( $\text{Var}(\hat{E}_{\text{residence}})$ ) was the total effort variance ( $\text{Var}(\hat{E})$ ) multiplied by the proportion of anglers in each residence category ( $\beta_{\text{residence}}$ ; Equation 30).

**Equation 29** 
$$\hat{E}_{\text{weekres}} = \hat{E}_{\text{week}(\text{hr.})} \times \beta_{\text{residence}}$$

**Equation 30** 
$$\text{Var}(\hat{E}_{\text{weekres}}) = \text{Var}(\hat{E}) \times \beta_{\text{residence}}$$

The mean of the catch rate ratios within each week and residence category were used to estimate catch rates ( $\hat{R}_{\text{residence}}$ ; Equation 1). The variance in the catch rate by angler residency ( $\text{Var}(\hat{R}_{\text{residence}})$ ) was the sample variance (Equation 31).

**Equation 31** 
$$\text{Var}(\hat{R}_{\text{residence}}) = s_{\text{residence}}^2$$

Within each week, the catch estimate ( $\hat{C}_{\text{weekres}}$ ) for each residence category was the product of the effort estimation in each residence category ( $\hat{E}_{\text{weekres}}$ ) and the catch rate for each residence category ( $\hat{R}_{\text{residence}}$ ; Equation 32).

**Equation 32** 
$$\hat{C}_{\text{weekres}} = \hat{E}_{\text{weekres}} \times \hat{R}_{\text{weekres}}$$

The variance in the catch for each residence category ( $Var(\hat{C}_{\text{residence}})$ ) was calculated with Equation 33 and the approximate 95 percent confidence intervals were calculated with the method described by Scheaffer *et al.* (1990; Equation 34).

**Equation 33** 
$$Var(\hat{C}_{\text{weekres}}) = \hat{E}_{\text{weekres}}^2 \times Var(\hat{R}_{\text{residence}}) + \hat{R}_{\text{residence}}^2 \times Var(\hat{E}_{\text{weekres}}) + Var(\hat{E}_{\text{weekres}}) \times Var(\hat{R}_{\text{residence}})$$

**Equation 34** 
$$95\% \text{ Confidence Intervals} = 2 \times \sqrt{Var(\hat{C})}$$

The total effort and catch estimate for each residence category was the sum of all of the weekly effort and catch estimates. The variance for the total effort and catch estimates was the sum of all the weekly variance estimates. The weekly effort estimates were converted back to rod days by dividing by the estimated effort in hours by the expected angling day ( $L_{\text{expected}}$ , in hours, Table 14) to obtain a final effort estimate for the residence group in rod days.

The total effort and catch estimate calculations for the guided status categories were similar to those for residence categories. Equations 28 through 34 were used to estimate total effort and catch for guided status categories except that the proportion of guided and non-guided anglers ( $\beta_{\text{guided}}$ ) were substituted for the proportion of anglers in each residence category ( $\beta_{\text{residence}}$ ).

## 4.0.0.0 Results and Discussion

### 4.1.0.0 Interviews

The River Guardians were on the Bulkley River for 62 (74 %) of the 84 day (12 weeks) study period. On those days, the River Guardian teams spent approximately 422 hours on the Bulkley River. The time spent on the river represents the time River Guardian teams interviewed or traveled on the river but did not include time spent in transportation to and from the river, launching boats or maintaining the trucks or boats. While on the river, the River Guardians did not approach every angler they observed. They endeavored to solicit interviews evenly throughout the target river sections each day. Of the 2,265 anglers that were observed, 1,199 of them were approached for an interview (Table 3). The number of anglers observed on the river was positively correlated with the number of anglers interviewed in each week (Pearson Correlation  $R = 0.968$ ,  $P < 0.0005$ ).

Of the 1,199 anglers approached for an interview, 1,197 anglers agreed to complete the interview while one angler did not know enough English to complete the whole interview and one angler refused to complete the interview. This yielded a non-response of less than one percent. Angler non-response bias was not an issue because of the low number of anglers that did not complete the whole interview. Of the 1,199 anglers that were approached for an interview, 693 (58 %) were being interviewed for the first time while 506 (42 %) had been interviewed previously.

The majority of interviews were completed on weekdays (60 %), while the remainder (40 %) were completed on weekends (Saturday, Sunday). Also, the majority of anglers were interviewed between week 9-2 and 10-3 (70 %). Almost 90 % (1070 interviews) of angler interviews were conducted in the Classified Waters Period.

Table 3. The number of anglers observed, the percentage of observed anglers interviewed and the total number of anglers interviewed on the weekdays or weekends within each week.

Week	Approximate Time Interviewing (hr)	Anglers Observed	Percentage Interviewed	Percentage (n) Interviews Initiated		
				Total	Weekday	Weekend
8-4	22.9	54	48.0	2.2 (26)	100.0 (26)	0.0 (0)
9-1	35.3	105	65.7	5.8 (69)	66.7 (46)	33.3 (23)
9-2	42.6	207	59.9	10.3 (124)	61.3 (76)	38.7 (48)
9-3	40.4	195	56.4	9.2 (110)	65.5 (72)	34.5 (38)
9-4	35.8	325	45.8	12.4 (149)	59.1 (88)	40.9 (61)
10-1	42.6	409	43.0	14.7 (176)	49.4 (87)	50.6 (89)
10-2	36.8	273	44.3	10.1 (121)	42.1 (51)	57.9 (70)
10-3	41.6	290	54.8	13.3 (159)	66.7 (106)	33.3 (53)
10-4	30.3	166	54.8	7.6 (91)	58.2 (53)	41.8 (38)
10-5	36.7	122	63.9	6.6 (79)	57.0 (45)	43.0 (34)
11-1	36.7	97	75.3	6.1 (73)	71.2 (52)	28.8 (21)
11-2	20.1	22	100.0	1.8 (22)	90.9 (20)	9.1 (2)
<b>Total</b>	<b>421.8</b>	<b>2265</b>	<b>52.9</b>	<b>100.0 (1199)</b>	<b>60.2 (722)</b>	<b>39.8 (477)</b>

Week 10-2 (October 5-8) had several days when the study area (Bulkley and lower Morice rivers) was 'out' and had poor angling conditions (see Appendix 3.0 for weather and water details). Otherwise, there were only a few days when the Telkwa River was slightly turbid. In 1998, fishing conditions were extremely good since the river only went 'out' once for a few days. In contrast, the 1997 steelhead angling season had a number of events when the river was 'out' and fishing conditions were poor. Overall, the 1998 steelhead angling season had fewer days of poor fishing conditions than 1997. In both 1997 and 1998, the month of November was unusually mild, making it possible for anglers to be out on the river well beyond the normal mid-November freeze-up, which usually makes angling impossible.

The spatial distribution of anglers interviewed was not equal throughout the Bulkley River (Table 4). Seventeen percent of anglers were interviewed between Chicken and Trout creeks, 16 % of anglers were between Telkwa and Smithers Bridge and 14 % of anglers were between Quick and Telkwa. Only 10 % of anglers were between Moricetown and Suskwa and 7 % were in the Morice River between Bymac and the Forks. The number of anglers observed on the river was positively correlated with the number of anglers interviewed in each river section (Pearson Correlation  $R = 0.932$ ,  $P < 0.0005$ ).

Table 4. The percentage and number (n) of interviews initiated within each river section.

River Section <sup>1</sup>	Percentage (n) of Interviews Initiated
Bymac – the Forks	7.1 (85)
Forks - Walcott	12.5 (150)
Walcott - Quick	10.1 (121)
Quick - Telkwa	13.6 (163)
Telkwa - Smithers Bridge	15.8 (189)
Smithers Bridge - Chicken Creek	10.3 (123)
Chicken Creek - Trout Creek	17.0 (204)
Trout Creek - Moricetown	3.7 (44)
Moricetown - Suskwa	9.9 (119)

1. The river section data was not completed for one interview.

The River Guardians often encountered anglers more than once and thus, some anglers were interviewed on more than one occasion. The number of repeat interviews constituted 42 % of all interviews. The percentage of repeat interviews was relatively high in September (weeks 9-2, 9-3 and 9-4) compared to other the weeks (Table 5). The high percentage of repeat interviews in these weeks could be a result of the relatively high number of B.C. residents (and low number of Non-Canadian residents) that were interviewed in September compared to October (Figure 4). B.C. residents reported spending more days angling for steelhead than Canadian and Non-Canadian residents which would increase the probability of being encountered for an interview (Table 16).

Table 5. The percentage of repeat interviews in each week of the study period.

Week	Percentage (n) of Repeat Interviews in Each Week
8-4	0.0 (0)
9-1	17.4 (12)
9-2	38.7 (48)
9-3	37.3 (41)
9-4	34.2 (51)
10-1	12.6 (64)
10-2	9.9 (50)
10-3	17.6 (89)
10-4	9.5 (48)
10-5	9.1 (46)
11-1	8.1 (41)
11-2	3.2 (16)
<b>Total</b>	<b>100.0 (506)</b>

#### 4.2.0.0 Angler Characteristics

##### 4.2.1.0 Angler Residence

Sixty-two percent (684 interviews) of all anglers interviewed were B.C. residents (Table 6). Two-hundred and eighty-one of those interviews were repeat interviews, and thus 403 individual B.C. resident anglers were contacted. Of all B.C. resident interviews, 226 (33 %) were Bulkley Valley residents and the remainder (67 %) were from other areas of the province. One hundred and ninety individual Bulkley Valley residents and 213 individual anglers from other areas in the province were interviewed. Almost six percent of all angler interviews were Canadian residents and of those, 23 were repeat interviews which represented 38 individual anglers. Non-Canadian residents composed 33 % of all interviews and 115 of those were repeat interviews (240 individual anglers). Of all repeat angler interviews, most were B.C. residents (67 %), followed by Non-Canadian residents (27 %) and Canadian residents (5 %). The rates of repeat interviews differed by angler residence ( $\chi^2 = 8.03$ ,  $df = 2$ ,  $P \leq 0.018$ ).

Table 6. The percentage of interviews initiated and repeat interviews for each residence category.

Residence	Percentage (n) of Angler Interviews Initiated <sup>1</sup>	Percentage (n) of Individual Anglers <sup>2</sup>
B.C. Total	62.0 (684)	59.2 (403)
Bulkley Valley	33.0 (226)	47.1 (190)
Rest of Province	67.0 (458)	52.9 (213)
Canadian	5.5 (61)	5.6 (38)
Non-Canadian	32.5 (357)	35.2 (240)

1. The residence was not collected from 99 interviews.

2. The residence was not collected from 11 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 (58 %, 217 anglers) followed by the Lower Mainland (17 %, 65 anglers) and Peace regions (Prince George; 12 %, 46 anglers). Fewer anglers were from Vancouver Island (6 %, 21 anglers), the Cariboo (3 %, 12 anglers)

or the southeastern portion of the province (Kootneys 2 %, 6 anglers; Thompson-Nicola 1 %, 5 anglers and Okanagan 1 %, 5 anglers).

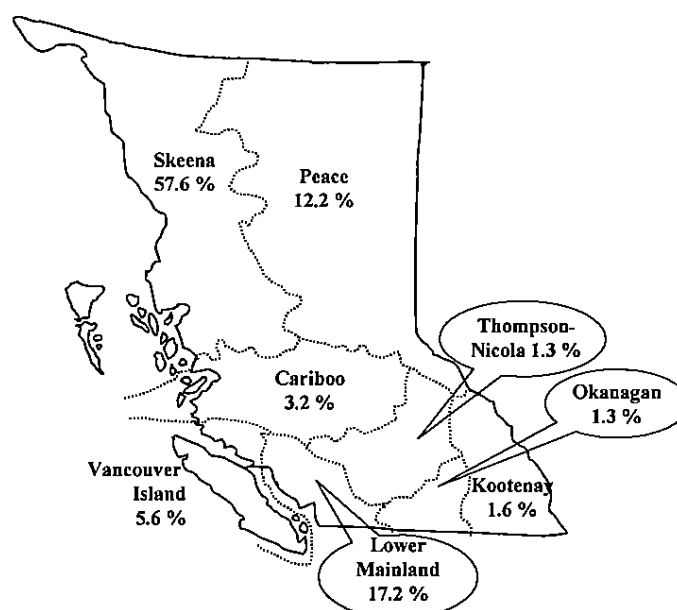


Figure 3. The percentage of individual resident anglers interviewed who were from different regions in the province of B.C.

Canadian and Non-Canadian residents were asked for their province or country of origin. Most Canadian residents were from Alberta (81 %, 30 anglers), while only a few were from Saskatchewan (8.4 %, 3 anglers), Ontario (8.4 %, 3 anglers) or the Northwest Territories (3 %, 1 angler). The majority of Non-Canadian residents were from the United States (83 %, 195 anglers), followed by Italy (5 %, 12 anglers), Germany (3 %, 6 anglers), Austria (3 %, 6 anglers) and Japan (2 %, 5 anglers). Fewer than two percent (< 5 % each) of Non-Canadian anglers were from England, Switzerland, Denmark, Holland, France or Australia.

The proportion of B.C. residents (59 %) interviewed in 1998 was higher than in 1997 (49 % B.C. residents; Morten and Parken 1998). As a result, the percentage of Non-Canadian residents interviewed (33 %) declined by ten percent from 1997 (43 %; Morten and Parken 1998). The percentage of Canadian residents interviewed has remained relatively stable in 1997 (7 %) and 1998 (6 %). Although the proportion of B.C. residents interviewed increased from 1997 to 1998, it was still lower than in the 1970's and 1980's (Table 11).

More B.C. residents than Canadian or Non-Canadian residents were interviewed in all weeks except 10-2, when slightly more Non-Canadian residents were interviewed (Figure 4). More Non-Canadians were interviewed in the Classified Waters Period than the shoulder weeks of the study period. The highest number of Non-Canadian resident interviews was in week 10-1 and more Non-Canadian residents were interviewed in October. The number of B.C. resident angler interviews was highest in weeks 9-1 through 9-4 (September) and 10-3. The majority of B.C. resident angler interviews were conducted early in the Classified Waters Period (September) whereas more Non-Canadian residents were interviewed later in the Classified

Waters Period (October). Most Canadian residents were interviewed in week 10-1, and no Canadian residents were interviewed in weeks 8-4, 10-4, or 11-2.

In 1997, most Non-Canadian residents were interviewed in the last week of September and the first week of October (Morten and Parken 1998). Also in 1997, more Non-Canadian residents were interviewed in September than October. Interestingly, in 1998 more Non-Canadian residents were interviewed in October than September. Non-Canadian residents fished later in the Classified Waters Period of 1998 than in 1997. In 1997, most Non-Canadians ceased angling after Thanksgiving weekend. (mid-October).due to persistent poor water conditions

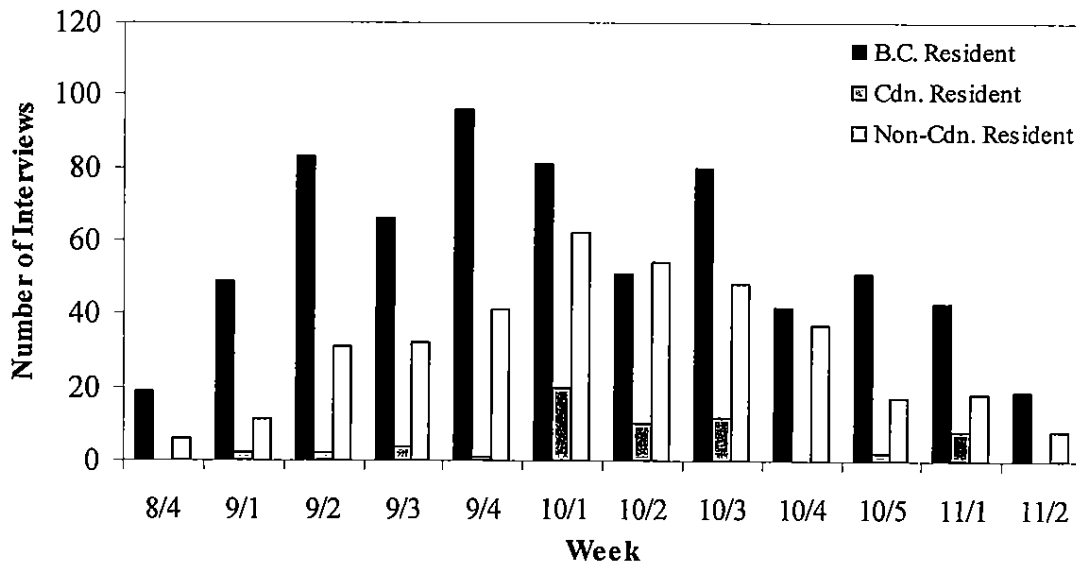


Figure 4. The number of angler interviews in each residence category completed in each week.

Postratification of the results into weekday and weekend strata indicated there were differences in residence composition of anglers by weekend and weekday days (chi-square  $\chi^2 = 9.143$ ,  $df = 3$ ,  $P < 0.027$ ; Table 7). The proportion of Bulkley Valley residents interviewed on weekends was higher than the proportion interviewed on weekdays. In contrast, the proportion of B.C., Canadian and Non-Canadian residents was higher on weekdays than weekends days. The proportion of Non-Canadian residents interviewed on weekends was probably influenced by the fact that Saturday is the changeover day for most guides and their clients therefore they seldom fish that day.

Table 7. The proportion 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
Bulkley Valley	17.6 (118)	24.7 (106)
B.C.	43.2 (290)	39.6 (170)
Canadian	6.3 (42)	4.4 (19)
Non - Canadian	32.9 (221)	31.2 (134)

The number of B.C. residents interviewed was higher than Canadian and Non-Canadian residents in all river sections (Figure 5). Canadian residents were not interviewed between Trout Creek and Moricetown. The number of Non-Canadian residents interviewed was the largest between Moricetown and Suskwa, Quick and Telkwa and Walcott and Quick. The number of Non-Canadian residents was relatively low between the Forks and Walcott whereas the number of B.C. and Canadian residents was highest between the Forks and Walcott.

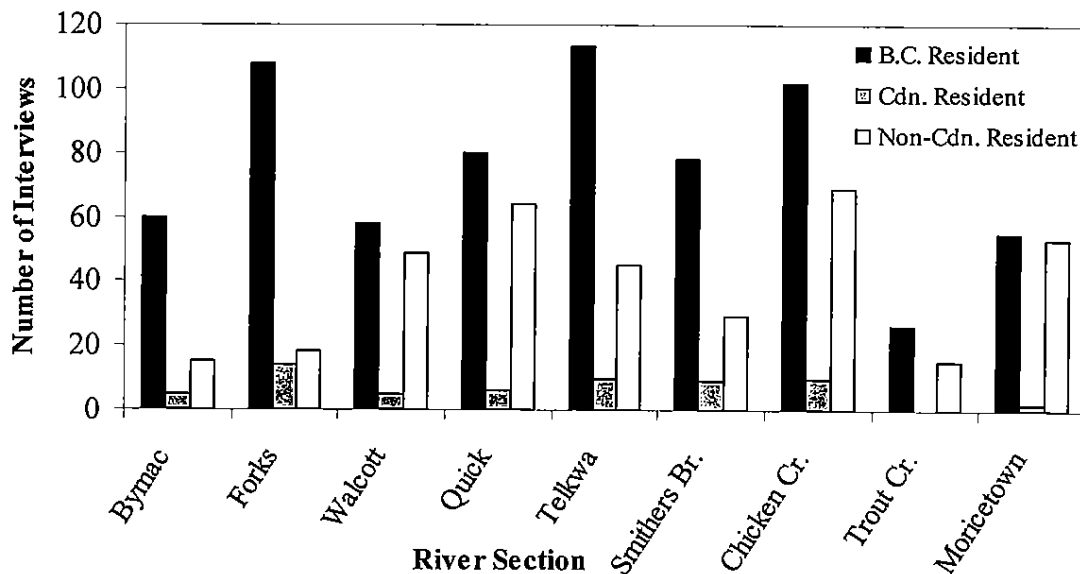


Figure 5. The percentage of angler interviews in each residence category in relation to all interviews completed in each river section.

The 1997 River Guardian project revealed a different spatial distribution of anglers. In 1997, most B.C. resident interviews were conducted between Telkwa and the Smithers Bridge and there was not a large number of B.C. resident interviews conducted in the upper river sections (Morten and Parken 1998). Also in 1997, the number of Non-Canadian residents interviewed was fairly even from Smithers Bridge to Trout Creek and only a few anglers were interviewed between Walcott and Quick (Morten and Parken 1998). The differences in the spatial distribution of anglers by residence category could be an effect of the sampling design. In 1998, River Guardians visited most river sections in each day, whereas in 1997 the River Guardians visited only a few river sections in day (Morten and Parken 1998).

#### 4.2.2.0 Angler Gender and Age

Ninety-four percent of anglers interviewed were male (651 anglers) and six percent (41 anglers) were female (Table 8). The percentage of female anglers in 1998 was slightly higher than the percentage of female anglers in 1997 (96 % male, 4 % female; Morten and Parken 1998). On average, males were 44.5 years old and females were 41.4 years old. No female anglers under the age of 25 were interviewed. The mean age of all 1998 anglers (44 years) was similar to 1997 anglers (45 years; Morten and Parken 1998) and 1974 anglers (44 years, Remington 1975).

Table 8. 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	0.3 (2)	0.0 (0)
17-24	3.9 (25)	0.0 (0)
25-34	20.6 (130)	38.5 (15)
35-44	28.9 (182)	28.2 (11)
45-54	22.9 (145)	20.7 (8)
55-64	14.8 (94)	4.8 (2)
65+	8.6 (54)	7.8 (3)
<b>Total</b>	<b>94.1 (632<sup>1</sup>)</b>	<b>5.9 (41<sup>2</sup>)</b>
<b>Mean Age</b>	<b>44.5</b>	<b>41.4</b>

1. The age was not collected from 19 male anglers.

2. The age was not collected from 2 female anglers.

#### 4.2.3.0 Angler Guided Status

There were 165 (15 %) guided anglers and 968 (85 %) non-guided anglers interviewed by River Guardians in 1998. 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 6). Most guided anglers were interviewed in the Classified Waters Period (162 anglers, 97 % of guided anglers interviewed) and few guided anglers were interviewed in the shoulder weeks of the study period.

Few B.C. or Bulkley Valley residents interviewed were guided anglers (4 %, and < 1 %, respectively), while 37 % of Non-Canadian residents interviewed were guided (Table 9). Non-Canadian residents were more likely to be guided anglers than Bulkley Valley, B.C. or Canadian residents (chi-square  $\chi^2 = 240.47$ ,  $df = 3$ ,  $P < 0.0005$ ).

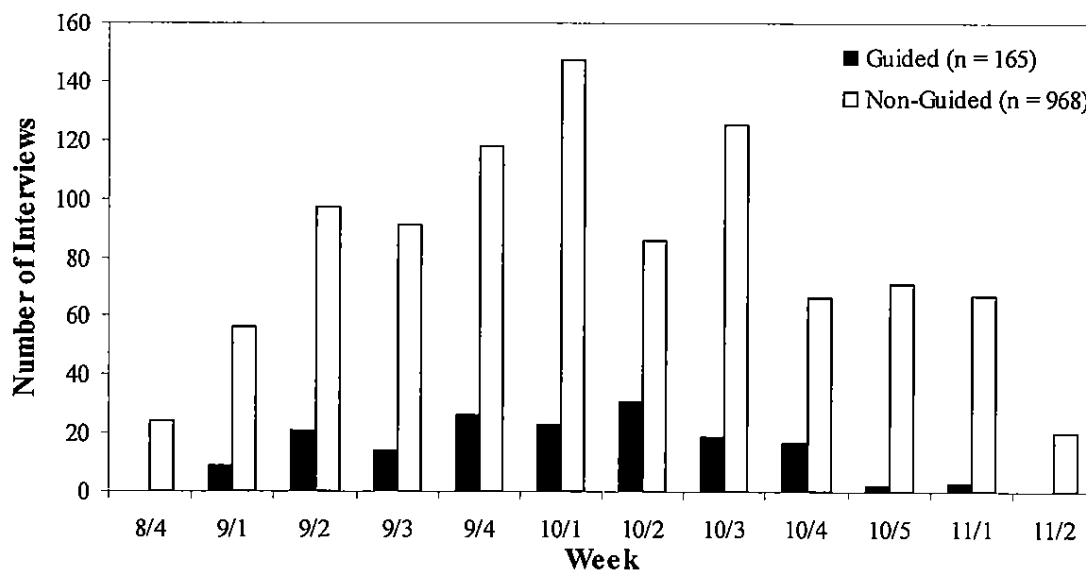


Figure 6. The number of guided and non-guided anglers interviewed in each week of the study period.

Forty percent (387 interviews) of non-guided angler interviews were repeat interviews while 34 % (56 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  $\chi^2 = 2.160$ ,  $df = 1$ ,  $P < 0.167$ ). In addition, there was no difference in the proportion of guided and non-guided anglers that were interviewed on the weekends in comparison to the weekdays (chi-square  $\chi^2 = 2.016$ ,  $df = 1$ ,  $P < 0.169$ ).

Of all anglers interviewed, the proportion of guided anglers in 1998 (15 %) was similar to the proportion of guided anglers in 1997 (16 %; Morten and Parken 1998) but lower than the proportion of guided anglers in past years. In 1989, Lewynsky and Olmsted (1990) found 30 % of Bulkley River anglers interviewed were guided.

Table 9. The percentage of guided and non-guided anglers within each residence category.

Residence	Percentage (n) of Anglers	
	Guided	Non-Guided
Bulkley Valley	0.4 (1)	99.6 (223)
B.C.	3.7 (17)	96.3 (441)
Canadian	4.9 (3)	95.1 (58)
Non- Canadian	37.3 (132)	62.7 (222)

#### 4.2.4.0 Angler Conservation Club Membership

Forty-five percent of anglers interviewed (302 anglers, 19 were missing this information) were members of a conservation club. Of those, 71 % were members of one club, 24 % were members of two clubs and 6 % were members of three or more clubs. Canadian (53 %) and Non-Canadian residents (62 %) were more likely to be members of a conservation club than B.C. residents (35 %; chi-square  $\chi^2 = 46.85$ ,  $df = 2$ ,  $P < 0.0005$ ). Sixty-three percent of guided anglers interviewed were members of a conservation club while 42 % of non-guided anglers were members of a conservation club. Guided anglers were more likely to be members of a conservation club than non-guided anglers (chi-square  $\chi^2 = 15.99$ ,  $df = 1$ ,  $P < 0.0005$ ).

Of the anglers that were members of at least one conservation club most were members of the Steelhead Society (28 %) or Trout Unlimited (23 %). Fewer anglers were members of the local angling clubs (10 %; ex. Whistler Fly Fishers), the Federation of Fly Fishers (5 %), the Nature Conservancy (5 %) or the B.C. Wildlife Federation (3 %). Fewer anglers were members of the top fifteen conservation clubs listed in Table 10. The remaining 17 conservation clubs reported were listed in Appendix 2.0.

Table 10. The top 15 conservation clubs that anglers reported they were members of.

Conservation Club	Percentage (n) of Anglers that Responded
Steelhead Society	27.6 (106)
Trout Unlimited	22.9 (88)
Local Angling Club	9.6 (37)
Federation of Fly Fishers	5.2 (20)
Nature Conservancy	5.2 (20)
B.C. Wildlife Federation	3.4 (13)
Local Rod and Gun Club	2.9 (11)
Other Environmental Group	2.3 (9)
B.C. Federation of Drift Fishers	2.3 (9)
Ducks Unlimited	2.3 (9)
Totem Fly Fishers	2.1 (8)
Foreign Country Angling Club	2.1 (8)
California, Oregon, Washington Trout	1.8 (7)
Atlantic Salmon Federation	1.6 (6)
Work Related Group	1.6 (6)

Of all anglers interviewed, the proportion that were members of a conservation club was lower in 1998 (45 %) than in 1997 (50 %; Morten and Parken 1998, Table 11). The decrease in the proportion of Non-Canadian residents probably accounted for some of the overall decrease in conservation club membership. Fewer B.C. and Canadian residents were members of a conservation clubs in 1998 than 1997 (Table 11). The proportion of Non-Canadian residents

Table 11. A summary of angler residence, angling method and conservation club membership for previous angler surveys on the Bulkley River

Year of study and Reference	Months	Residence Category (%)	Angling Method	Conservation Club Member (%)
1969 Pinsent 1970	Oct., Nov.	52% B.C. 48 % Non-B.C.	NA	NA
1974 Remington 1975	Sept., Oct., Nov.	77% B.C. 10% Cdn. 13% Non-Cdn.	38% Fly 82% Lure 46% Roe	21% of all interviewed
1982 O'Neill and Whately 1984	Sept., Oct., Nov.	81% B.C. 6% Cdn. 13% Non-Cdn.	46% Fly 54% Lure	NA
1983 O'Neill and Whately 1984	Sept., Oct., Nov.	83% B.C. 4% Cdn. 13% Non-Cdn.	57% Fly 43% Lure	NA
1989 Lewynsky and Olmsted 1990	Aug., Oct.	57% B.C. 13% Cdn. 30% Non-Cdn.	78% Fly 22% Lure approx.	20% B.C. 45% Non-B.C
1997 Morten and Parken 1998	Sept., Oct.	49% B.C. 7% Cdn. 43% Non-Cdn.	81% Fly 19% Gear	40% B.C. 82% Cdn. 64% Non-Cdn.
1998 Current Study 1999	Late Aug.- Nov.	59% B.C. 6% Cdn. 35% Non-Cdn.	80% Fly 20% Gear	35% B.C. 53% Cdn. 63% Non-Cdn.

that were members of a conservation club was about the same in 1997 and 1998. Lewynsky and Olmsted (1990) had a similar result for 1989 anglers; 20 % of B.C. residents were members of a conservation club while 45 % of Non-Residents were members of a conservation club.

#### 4.3.0.0 Angler Trip Characteristics

##### 4.3.1.0 Angling Methods

Of all angler interviews, more fly anglers were interviewed than gear anglers (80 %, 951 anglers and 20 %; 241 anglers, respectively; Table 12). Similarly, 542 individual anglers (no repeat interviews) were fly fishing while 148 individual anglers were gear fishing. More Bulkley Valley, B.C., Canadian and Non-Canadian residents were fly anglers than gear anglers (Table 12). The proportion of Bulkley Valley residents that fished with a gear rod was higher than B.C. (22 %), Canadian (18 %) or Non-Canadian (6 %) residents. The ratio of fly to gear anglers differed by residence category (chi-square  $\chi^2 = 100.84$ ,  $df = 3$ ,  $P < 0.0005$ ).

Table 12. The percentage of fly and gear anglers and power boat-access, drift boat-access and shore-access anglers in each residence and guided status category.

	Percentage (n) of Anglers			Percentage (n) of Anglers	
	Power Boat	Drift Boat	Shore	Fly	Gear
<b>Residence<sup>1</sup></b>					
Bulkley Valley	30.9 (68)	8.2 (18)	60.9 (134)	59.8 (134)	40.2 (90)
B.C.	42.1 (192) <sup>3</sup>	17.8 (81)	40.1 (183)	77.9 (357)	22.1 (101)
Canadian	26.2 (16)	18.0 (11)	55.7 (34)	82.0 (50)	18.0 (11)
Non-Canadian	36.0 (128)	30.6 (109)	33.4 (119)	93.8 (334)	6.2 (22)
<b>Guided Status</b>					
Guided	55.5 (91)	40.2 (66)	4.3 (7)	95.7 (156) <sup>2</sup>	4.3 (7)
Non-Guided	34.1 (327)	17.2 (165)	48.8 (468)	77.6(750)	22.4 (217)

1. No data for 102 interviews. 2. No data for 69 interviews 3. No data for 69 interviews.

From six independent surveys of Bulkley River anglers between 1974 and 1998 a clear trend toward an increase in the proportion of fly anglers is evident (Table 11). The proportion of fly anglers and gear anglers interviewed in 1998 was similar to the proportion of fly anglers and gear anglers interviewed in 1997 (Table 12). Also, the proportion of fly and gear anglers recently (1997 and 1998) was similar to anglers that fished in the fall of 1989 (Table 11). In 1983, O'Neill and Whately (1984) found 57 % of steelhead anglers interviewed were fly anglers and 43 % were gear (lure) anglers. Interestingly, in 1982, O'Neill and Whately (1984) found 46 % of steelhead anglers interviewed were fly anglers and 54 % were gear (lure) anglers. Remington (1975) found that 38 % of steelhead anglers interviewed in 1974 fly fished, 82 % gear (lure) fished and 46 % used roe. In 1974, the percentages exceeded 100 because many anglers used several methods depending on the conditions of the water (Remington 1975).

Of all angler interviews, 42 % were shore-access anglers, whereas the remaining anglers gained access with a boat (58 %). Of boat-access anglers, more used a power boat (64 %) than a drift boat (36 %) to access the Bulkley River. Considering access method within each

residence category, relatively more Bulkley Valley and Canadian residents accessed the Bulkley River from shore, whereas other B.C. and Non-Canadian residents were more frequent boat users (Table 12). More of the Non-Canadian residents accessed the Bulkley River with a drift boat than any other residence category whereas more B.C. residents used a power boat than other residents categories. Statistically, the access method differed between residence categories (chi-square  $\chi^2 = 72.28$ ,  $df = 6$ ,  $P < 0.0005$ ).

The proportions of anglers' residence categories were considered within each access method. Of all boat access anglers interviewed, 44 % (273 anglers) were B.C. residents, 38 % (237 anglers) were Non-Canadian residents, 14 % (86 anglers) were Bulkley Valley residents and 4 % (27 anglers) were Canadian residents. Of all power boat access anglers interviewed, 48 % (192 anglers) were B.C. residents, 32 % (128 anglers) were Non-Canadian anglers, 17 % (68 anglers) were Bulkley Valley Residents and only 4.0 % were Canadian residents. Almost half of all drift boat-access anglers interviewed were Non-Canadian residents (109 anglers) while less were B.C. residents (37 %, 81 anglers), Bulkley Valley residents (8 %, 18 anglers) or Canadian residents (5 %, 11 anglers).

Guided anglers were more likely to fly fish than non-guided anglers (chi-square  $\chi^2 = 28.90$ ,  $df = 1$ ,  $P < 0.0005$ ; Table 12). Only four percent of guided anglers fished with gear while 22 % of non-guided anglers fished with gear. Most guided anglers accessed the river by either power or drift boats (56 % and 40 %, respectively) and only 4 % (7 guided anglers) walked to their fishing location. In contrast, only about half the non-guided anglers accessed the river by power or drift boat (34 % and 17 %, respectively). The difference between guided and non-guided angler access methods was significant (chi-square  $\chi^2 = 119.10$ ,  $df=2$ ,  $P \leq 0.0005$ ).

Overall, 84 % of power boat-access anglers interviewed were fly fishing, and 94 % of drift boat-access anglers interviewed were fly fishing (Table 13). Fishing with gear was more common among shore-access anglers (32 %) than power or drift boat-access anglers (16 % and 6 % respectively). Statistically, the composition of fly and gear anglers differed by river access method (chi-square  $\chi^2 = 77.90$ ,  $df=2$ ,  $P \leq 0.0005$ ; Table 13).

Table 13. The percentages of fly and gear anglers that gained access to the river by power boat, drift boat and shore.

Angling Method	Percentage (n) of Anglers <sup>1</sup>			
	Power Boat	Drift Boat	Shore	Total
Fly	84.4 (378)	94.3 (233)	68.4 (338)	79.8 (949)
Gear	15.6 (70)	5.7 (14)	31.6 (156)	20.2 (240)
Total	37.7 (448)	20.8 (247)	41.5 (494)	100.0 (1189)

1. No data for 10 interviews.

#### 4.3.2.0 Trip Length

Overall, Bulkley River anglers expected to spend an average of 7.0 hours fishing per day. In general, the expected angling day was longer in the middle of the steelhead angling season than the shoulder weeks (Table 14). The mean expected angling day was longest in week 9-4 (7.7 hr) followed by week 10-1 (7.5 hr), whereas the shortest mean expected angling day was

in week 11-2 (4.3 hr) followed by week 11-1 (5.8 hr). The expected angling day differed between weeks in the study period (Kruskal-Wallis  $\chi^2 = 34.46$ ,  $df=11$ ,  $P \leq 0.0005$ ).

Table 14. The mean expected angling day (hours) for each week in the study period.

Week	Mean (n) Expected Angling Day (hr)	Standard Deviation
8-4	6.8 (25)	2.8
9-1	6.0 (55)	3.2
9-2	6.5 (75)	3.0
9-3	7.5 (66)	2.9
9-4	7.7 (97)	2.9
10-1	7.5 (111)	3.1
10-2	7.5 (71)	2.8
10-3	6.9 (70)	3.1
10-4	6.5 (43)	2.8
10-5	6.4 (32)	2.6
11-1	5.8 (32)	2.4
11-2	4.3 (6)	2.0
<b>Total</b>	<b>7.0 (683)</b>	<b>3.0</b>

On average, Bulkley Valley residents planned to fish for 4.9 hours on the day they were interviewed whereas B.C. residents planned to fish for 7.3 hours and Non-Canadian residents planned to fish for 8.2 hours. The expected angling day differed between residence categories (Table 15). Guided anglers planned to fish longer than non-guided anglers (6.7 hr). Drift boat anglers planned to fish for more hours on the day they were interviewed than power boat and shore-access anglers. Also, fly rod anglers planned to fish for longer than gear rod anglers (5.2 hr).

Table 15. The mean expected angling day (hours) in each residence category, guided status category, access method and angling method.

	Mean (n) Expected Angling Day (hr)	Standard Deviation	Statistical Test Result
<b>Residence</b>			Kruskal-Wallis $\chi^2 = 141.8$ , $df = 3$ , $P < 0.0005$
Bulkley Valley	4.9 (186)	2.7	
B.C.	7.3 (212)	2.9	
Canadian	8.0 (38)	2.2	
Non-Canadian	8.2 (238)	2.5	
<b>Guided Status</b>			Mann-Whitney U = 17499.5, $P < 0.0005$
Guided	8.8 (107)	1.6	
Non-Guided	6.7 (574)	3.1	
<b>Access Method</b>			Kruskal-Wallis $\chi^2 = 11.8$ , $df = 2$ , $P < 0.0005$
Power boat	7.9 (384)	2.4	
Drift Boat	8.5 (211)	1.8	
Shore	5.9 (444)	3.3	
<b>Angling Method</b>			Mann-Whitney U = 22178.5, $P < 0.0005$
Fly	7.5 (535)	2.8	
Gear	5.2 (146)	2.9	

Overall, anglers planned to spend an average of 13.8 days angling for steelhead on the Bulkley River. On average, Bulkley Valley residents planned to fish for 27.1 days, while B.C. residents planned to fish for 10.6 days (Table 16). Canadian and Non-Canadian

residents planned to fish for fewer days (7.0 days). Statistically, there were differences in the number of days that each residence category planned to fish (Kruskal-Wallis  $\chi^2 = 163.45$ ,  $df = 3$ ,  $P < 0.0005$ ). Guided anglers planned to fish for an average of 7.1 days while non-guided anglers planned to fish for 15.2 days (Table 16). Non-guided anglers planned to spend more days angling than guided anglers (Mann-Whitney  $U = 21548.0$ ,  $P < 0.0005$ ).

Table 16. The percentage of days anglers planned to fish for steelhead within each residence and guided status category.

	Percentage (n) of Anglers in Each Category of Days They Planned to Fish							Mean (SD) (n)
	1-5 days	6-10 days	11-15 days	16-20 days	21-25 days	26-30 days	31+ days	
<b>Residence</b>								
Bulkley Valley	10.1 (18)	11.7 (21)	13.4 (24)	12.3 (22)	13.4 (24)	8.9 (16)	30.2 (54)	27.1 (21.7) (179)
B.C.	45.1 (92)	22.6 (46)	12.3 (25)	7.4 (15)	4.4 (9)	3.4 (7)	5.0 (10)	10.6 (12.9) (204)
Canadian	37.1 (13)	45.7 (16)	11.4 (4)	5.7 (2)	0.0 (0)	0.0 (0)	0.0 (0)	7.0 (4.0) (35)
Non-Canadian	53.3 (78)	49.2 (115)	11.1 (26)	2.6 (6)	1.7 (4)	1.7 (4)	0.4 (1)	7.0 (4.0) (234)
<b>Guided Status</b>								
Guided	30.6 (33)	54.6 (59)	12.0 (13)	0.0 (0)	0.1 (1)	1.9 (2)	0.0 (0)	7.1 (4.5) (108)
Non-Guided	7.6 (170)	26.2 (145)	12.3 (68)	8.1 (45)	6.5 (36)	4.5 (25)	11.7 (65)	15.2 (17.0) (554)

Anglers that were interviewed planned to fish for 9,191 rod days. However, not all anglers that fished on the Bulkley River were interviewed, therefore this was an underestimate of the total number of days that all anglers planned to fish. Despite the underestimate, anglers planned to fish for 3,075 more rod days than the effort estimate from aerial counts (6,116 rod days, Table 26). The discrepancy indicated that anglers did not fish as many days as they planned.

#### 4.4.0.0 Angling Licenses

##### 4.4.1.0 Angling License Class

Most B.C. resident anglers interviewed purchased an annual angling license. Only 3 % of B.C. residents interviewed purchased an eight-day angling license and slightly less (2 %) anglers purchased a one-day angling license (Table 17). Canadian residents bought more annual angling licenses than eight-day or one-day angling licenses. In contrast, more Non-Canadian residents bought eight-day angling licenses than annual or one-day angling licenses. Forty-seven percent of Non-Canadian residents bought annual angling licenses, while 48.9 % bought eight-day angling licenses and 4.4 % bought one-day angling licenses. Non-Canadian residents were less likely to buy an annual angling license than B.C. or Canadian resident anglers (chi-square  $\chi^2 = 219.13$ ,  $df = 6$ ,  $P < 0.0005$ ). Similarly, non-guided anglers were more likely to buy an annual angling license than guided anglers (chi-square  $\chi^2 = 173.45$ ,  $df = 2$ ,  $P < 0.0005$ ). The majority of guided anglers (Non-Canadian residents) purchased eight-day angling licenses because they visit the Bulkley River for one week trips.

Table 17. The percentages 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 <sup>1</sup>		
	One-Day	Eight-Day	Annual
<b>Residence</b>			
Bulkley Valley	2.7 (5)	0.0 (0)	97.3 (0)
B.C.	1.5 (3)	2.9 (6)	95.6 (196)
Canadian	2.7 (1)	35.1 (13)	62.2 (23)
Non-Canadian.	4.4 (10)	48.9 (112)	46.7 (107)
<b>Guided Status<sup>2</sup></b>			
Guided	1.9 (2)	67.6 (71)	30.5 (32)
Non-Guided	3.4 (19)	11.4 (64)	85.2 (479)

1. No data for 33 interviews.

#### 4.4.2.0 Classified Waters Days Purchased

Anglers were not required to purchase all the 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. The total number of Classified Waters licenses purchased up to the time of the interview was only available when the angler carried previous Classified Waters licenses.

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 that do not reside in B.C. All anglers that purchased a one-day angling licenses also purchased a one-day Classified Waters license. The majority of anglers that purchased eight-day angling licenses purchased six or more days of Classified Waters licenses (60 %, Table 18). In contrast, the majority of anglers that purchased an annual angling license purchased a one- or two-day Classified Waters license.

Table 18. 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 (10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8 Day	12.0 (12)	12.0 (12)	5.0 (5)	5.0 (5)	6.0 (6)	14.0 (14)	21.0 (21)	25.0 (25)
Annual	42.2 (35)	12.0 (10)	9.6 (8)	7.2 (7)	6.0 (5)	7.2 (7)	8.4 (6)	6.0 (5) <sup>1</sup>

1. Includes two anglers that bought 12, 14 Classified Waters days.

Canadian and Non-Canadian resident anglers planned to fish for more days than their Classified Waters license specified (Figure 7). For example, only 10 anglers planned to fish for only one day and 58 anglers purchased one-day Classified Waters licenses. These results helped clarify the understanding that non-guided, non-resident anglers purchase their Classified Waters license in one or two day blocks. The 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. Forty percent of non-guided anglers purchased a one-day Classified Waters license although they planned to fish for 15 days on average. In contrast, only 13 % of guided anglers purchased a one day Classified Waters license and planned on

fishing an average of seven days. Also, the guided anglers purchased more six-, seven- and eight-day Classified Waters licenses than non-guided anglers which corresponded with their average Bulkley River trip length of seven days.

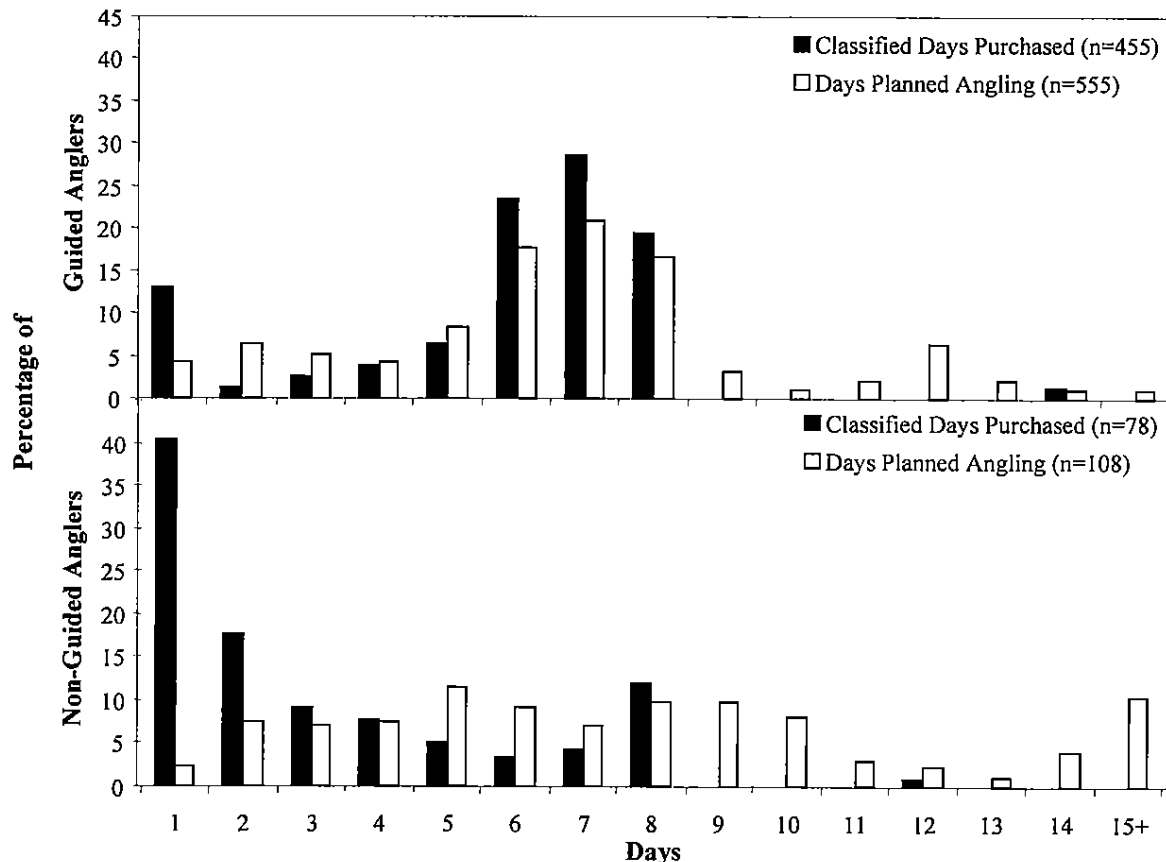


Figure 7. The number of Classified Waters days purchased and the number of days planned angling for steelhead on the Bulkley River for guided and non-guided anglers (Canadian and Non-Canadian residents only) at the time of the interview.

#### 4.4.3.0 Angler Compliance

The River Guardians inspected licenses for compliance with regulations on the first interview only (506 interviews) and recorded non-compliance with license requirements. 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 five percent of anglers interviewed had a license infraction (Table 19). This result was similar to the six percent of anglers that had an infraction in 1997 (Morten and Parken 1998). In 1998, non-compliance with angling regulations could have been slightly higher because anglers were not checked for compliance after their first interview.

Of those anglers with an infraction, 96 % (23 angler interviews) had one infraction and one angler had two infractions. The majority of anglers with at least one citation were B.C. residents (58 %), followed by Non-Canadian residents (33 %) and Canadian residents (8 %).

The 1997 River Guardian results were similar because the majority of infractions cited were also committed by B.C. residents (60 % in 1997 Morten and Parken 1998).

Table 19. The percentage of anglers interviewed with an infraction and the percentage of offending anglers with one or two infractions.

Number of Infractions	Percentage of Anglers (n)
Anglers with at least one infraction	4.7 (24)
One Infraction	96.0 (23)
Two Infractions	4.0 (1)

Failure to purchase a Classified Waters license was the most frequent infraction noted by River Guardians (50 %, Table 20). Seventy percent (14 citations) of those were B.C. residents which represented two percent of all B.C. residents interviewed for the first time. Failure to produce a license made up 33 % of license infractions noted. One percent of all B.C. residents interviewed and almost two percent of all Non-Canadian residents interviewed failed to produce an angling license. Three anglers did not have a steelhead conservation stamp. Two were Canadian residents (5 % of all Canadian residents) and the other was a B.C. resident. Only one B.C. resident did not have a barbless hook. Nineteen-ninety-eight (1998) was the second year that B.C. residents were required to purchase a Classified Waters license for the Bulkley River during September and October. All anglers were required to purchase a steelhead stamp during that period.

Table 20. The percentage of all anglers cited with different types of infractions within each residence category.

Type of Infraction	Percentage (n) of Anglers with Infractions			
	Total	B.C.	Canadian	Non-Canadian
No Classified Waters license	50.0 (12)	2.0 (8)	0.0 (0)	1.3 (4)
Failure to carry/produce license	33.3 (8)	1.0 (4)	0.0 (0)	1.7 (4)
No steelhead conservation stamp	12.5 (3)	< 1 (1)	5.3 (2)	0.0 (0)
Barbed hook	4.2 (1)	< 1 (1)	0.0 (0)	0.0 (0)

Unlike 1997, 33 % of infractions noted in 1998 were for failure to carry/produce an angling license (3 % in 1997, Morten and Parken 1998). A change in policy with the River Guardian program could explain this result. In 1997, the River Guardians were deputy Conservation Officers under the Wildlife Act. In 1998, the River Guardians did not have the authority to ticket or cite an angler with an infraction, they simply recorded and reported infractions. In 1997, the River Guardians and Conservation Officers probably used some discretion in the citation of an angler for failure to produce the license if, for example, the angler indicated they had one in the truck or boat. In 1998, the River Guardians simply recorded the infraction even if the angler said they had their license at another location.

In 1998, fewer anglers were noted for not having a steelhead conservation stamp (13 %, 3 anglers) than 1997 anglers (27 %, 8 anglers; Morten and Parken 1998). Nineteen-ninety seven was the first year when steelhead conservation stamps were mandatory for anglers during the Classified Waters Period. Thus, not all anglers were aware of the new regulation, and they did not have steelhead conservation stamps.

The infractions noted were equally distributed throughout the study period (50 % before September 30). Only two infractions were noted in November. Spatially, 54 % of infractions were noted between Telkwa and Trout Creek whereas only 43 % of interviews were conducted there. Conversely, 17 % of infractions were noted downstream of the Forks to Telkwa whereas 37 % of interviews were completed there. Two infractions (8 %) were noted in the Morice River (7 % of interviews conducted there). Also, 21 % of infractions were noted between Trout Creek and the Suskwa River and 14 % of interviews were completed there.

These results cannot be generalized to past years and other rivers because of the increased publicity regarding enforcement on the river in 1997 and the presence of River Guardians in 1998. The knowledge of an increased presence on the river for the past two years may have caused an angler who may not have purchased a steelhead stamp in the past to purchase a steelhead stamp in 1997 or 1998. All evidence suggested the River Guardian program had a positive effect on angler compliance with regulations.

#### 4.5.0.0 Angler Comments

Three-hundred-ninety anglers made 510 comments about fisheries management to the River Guardians. Two-hundred and ninety-five anglers had one comment, 70 anglers reported two comments and 25 anglers had three comments to the River Guardians (anglers were limited to three comments). Of those, almost 24 % (92 anglers) of anglers had positive comments about the River Guardian program. Twenty-two percent (87 anglers) of anglers felt there should not be a kill fishery for steelhead, whereas almost 3 % (14 anglers) were in favor of a kill fishery in the fall of 1998 (Table 21).

Table 21. The top ten groups of comments that anglers reported to River Guardians.

Comment Group	Percentage <sup>1</sup> (n) of Anglers who made that comment
Positive towards River Guardian program or River Guardian etiquette	23.6 (92)
There should be not be a kill fishery for steelhead	22.3 (87)
Angler had good fishing, good experience or liked the surroundings	9.7 (38)
Negative comment about licensing system	9.0 (35)
General comment about fisheries management (not River Guardian related, ex. Coho, tagging issues)	8.5 (33)
Suggestion about methods of angler management (e.g. zoning, fly fishing only areas)	7.7 (30)
Negative comment about power boats/jet skis	7.7 (30)
Negative comment about guides/guiding	4.8 (19)
Miscellaneous comments not related to fisheries management	3.8 (15)
Negative comment about facilities (lack of boat launches, garbage)	3.8 (15)
Negative comment about number of people (too many)	3.8 (15)

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 from anglers were permitted.

Anglers also made comments/suggestions about angler management (8 %) and negative comments were made about power boats/jet skis, guides, lack of facilities and too many people. Two of the negative comments about guides concerned illegal guiding on the Bulkley River. If an angler commented on the possibility of a 'steelhead kill fishery' they were asked

to clarify their position and that was recorded as a comment in this section. Otherwise, anglers were not asked to comment on specific topics. The complete list of angler comment groups is in Appendix 4.0.

#### **4.6.0.0 Angler Catch and Effort**

##### **4.6.1.0 Catch Rate**

A total of 5,326 hours (1,181 interviews, 18 missing with no data) were spent fishing by Bulkley River anglers which averaged 4.82 hours fishing per anglers at the time of the interview (Table 23). Six-hundred and seventy-six (676) steelhead were landed and released. At the time of the interview, 781 anglers landed nothing, 255 anglers landed one steelhead, 99 anglers landed two steelhead, 40 anglers landed three steelhead, 11 anglers landed 4 steelhead, 6 anglers landed 5 steelhead, 1 angler landed 6 steelhead, 1 angler landed 7 steelhead and 2 anglers landed 8 steelhead.

The catch rate was calculated by averaging the steelhead catch rate for interviews where anglers were fishing for 0.5 hr (30 minutes) or more. Almost two percent of interviews (80 interviews) were eliminated because the angler was on the river for less than 30 minutes. The catch rate for all angler interviews was 0.19 steelhead/hour or 1.33 steelhead/rod day (7.0 hr rod day) or 1.52 steelhead/rod day (8 hr, 1997 rod day used).

The observed catch rate for anglers in 1998 was higher than 1997 and considerably higher than past estimates (Table 22). In 1969, steelhead anglers caught 1.07 steelhead per rod day (Pinsent 1970). O'Neill and Whately (1984) reported steelhead anglers caught 0.52 steelhead/rod day in 1982 and 0.42 steelhead/rod day in 1983. In 1989, anglers caught 0.99 steelhead per rod day (Lewynsky and Olmsted 1990).

Catch rates were estimated for each week during the study period by grouping all river sections together (Table 22). Week 10-5 produced the highest catch rate (1.93 steelhead/rod day) followed by 9-3 (1.57 steelhead/rod day) and week 10-4 (1.55 steelhead/rod day). Week 8-4 (0.68 steelhead/rod day) and week 9-2 (1.05 steelhead/rod day) had the lowest steelhead catch rates. Turbid and high water conditions were reported for 3 days of week 10-2 for the whole study area (Morice and Bulkley rivers) and slightly turbid conditions occurred in week 8-4, 10-1 and 10-4 just downstream of the Telkwa River.

Table 22. The number of steelhead landed, hours fished, catch rate and steelhead per rod day within each week.

Week	Steelhead Landed	Total Hours Fished	Catch Rate (SD) <sup>1</sup>	Steelhead per Rod Day <sup>2</sup>
8-4	4	2.15	0.10 (0.25)	0.68
9-1	42	193.93	0.22 (0.41)	1.33
9-2	71	398.48	0.16 (0.28)	1.05
9-3	67	377.47	0.21 (0.37)	1.57
9-4	75	550.21	0.14 (0.26)	1.08
10-1	91	580.52	0.14 (0.23)	1.05
10-2	49	390.72	0.15 (0.33)	1.12
10-3	114	591.76	0.22 (0.39)	1.52
10-4	54	1186.51	0.24 (0.40)	1.55
10-5	54	209.08	0.30 (0.52)	1.93
11-1	40	129.61	0.23 (0.43)	1.32
11-2	15	42.31	0.36 (0.71)	1.53
Total	676	5326.23	0.19 (0.36)	1.33

1. The average of the individual catch rates for each angler for each week were ignored for all short trips (less than 0.5 hour).
2. Steelhead per rod day was calculated using the mean expected angling day for that week (see Table 14).

Complete angling trip information on catch was collected from 50 anglers while the remaining 1,149 anglers had incomplete trip catch information. There was no difference in average catch rates between the complete and incomplete trip information for all angler interviews completed on days when at least one complete trip interview was completed (Mann-Whitney  $U=11085.5$ ,  $P \geq 0.566$ ). More specifically, on October 17, 13 complete trip interviews were conducted and on that day there was no difference in catch rates between complete trips catch rates and incomplete trip catch rates (Mann-Whitney  $U=162$ ,  $P \geq 0.812$ ).

Catch rates were estimated for river sections during the study period by grouping all weeks together (Table 23). The highest catch rate was between the Forks and Walcott (1.68 steelhead/rod day) and the catch rate for the Morice River was the second highest (1.61 steelhead/rod day). The lowest catch rate was between Quick and Telkwa (0.91 steelhead/rod day) and it was the only section with a catch rate of less than one steelhead per rod day.

Table 23. The number of steelhead landed, hours fished, catch rate and steelhead per rod day within each river section.

Bulkley/Morice River Section	Steelhead Caught	Total Hours Fished	Catch Rate (SD)	Steelhead per Rod Day <sup>2</sup>
Bymac-Forks (MORICE RIVER)	38	204.21	0.23 (0.49)	1.61
Forks - upstream Walcott	99	421.85	0.24 (0.40)	1.68
Walcott - upstream of Quick	86	467.05	0.19 (0.35)	1.33
Quick - upstream Telkwa	78	576.68	0.13 (0.26)	0.91
Telkwa - upstream Smithers Bridge	94	609.11	0.16 (0.31)	1.12
Smithers Bridge - upstream Chicken Creek	57	282.07	0.20 (0.41)	1.40
Chicken Creek - upstream Trout Creek	132	733.97	0.19 (0.36)	1.33
Trout Creek - Moricetown	21	119.20	0.21 (0.31)	1.47
Moricetown-Suskwa	71	366.60	0.23 (0.39)	1.61

1. The average of the individual catch rates for each angler for each river section were ignored for all short trips (less than 0.5 hour).
2. Steelhead per rod day was calculated using the mean expected angling day for all interviews (see Table 14).

Among residence categories, B.C. residents had the highest catch rate (1.45 steelhead/rod day), followed by Non-Canadian residents (1.39 steelhead/rod day), Canadian residents (1.12 steelhead/rod day), and Bulkley Valley residents (0.87 steelhead/rod day, Table 24). Guided anglers had higher catch rates (1.58 steelhead/rod day) than non-guided anglers (1.26 steelhead/rod day). Power boat-access anglers had higher catch rates (1.74 steelhead/rod day), than drift (1.28 steelhead/rod day), or shore-accessed anglers (1.05 steelhead/rod day). On average, gear anglers caught 1.40 steelhead per rod day whereas fly anglers caught 1.27 steelhead per rod day. The expected angling day differed for each residence group which influenced the steelhead per rod day estimates.

Forty-one (41) Dolly Varden/bull trout were caught and of those 39 were released and two were kept. The catch rate was 0.087 Dolly Varden/bull trout/rod day. Steelhead anglers caught and released five other species of fish. Twenty-five coho salmon were landed and released and the catch rate was 0.088 coho/rod day. In addition, 1 cutthroat trout (*O. clarki*) was landed and released, 7 pink salmon (*O. gorbuscha*) were landed and released, 18 rainbow trout (*O. mykiss*) were landed and 16 were released (2 kept) and a total of 15 whitefish (*Prosopium* sp.) were landed and released.

Table 24. 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 <sup>2</sup>	Total Hours Fished	Catch Rate (Steelhead/hr) (SD) <sup>1</sup>	Steelhead per Rod Day <sup>3</sup>
<b>Residence</b>				
Bulkley Valley	98	570.82	0.18 (0.39)	0.87
B.C.	260	1441.33	0.20 (0.39)	1.45
Canadian	22	175.52	0.14 (0.32)	1.12
Non-Canadian	199	1246.36	0.17 (0.28)	1.39
<b>Guided</b>				
Guided	117	710.84	0.18 (0.28)	1.58
Non-Guided	492	2863.07	0.19 (0.37)	1.26
<b>Access Method</b>				
Power Boat	333	1606.41	0.22 (0.36)	1.74
Drift Boat	128	969.30	0.15 (0.32)	1.28
Shore	200	1181.75	0.18 (0.39)	1.05
<b>Angling Method</b>				
Fly fishing	496	3154.74	0.17 (0.33)	1.27
Gear fishing	166	610.73	0.27 (0.46)	1.40

1. The average of the individual catch rates for each angler and all short trips were ignored (less than 0.5 hour).

2. Thirteen anglers could not be assigned to a residence category (4 steelhead), 45 anglers could not be assigned to a guided status (21 steelhead), 24 anglers could not be assigned an access method (10 steelhead) and 19 anglers could not be assigned to an angling method (10 steelhead).

3. Steelhead per rod day was calculated using the expected angling day length for each demographic group (see Table 15).

#### 4.6.2.0 Observed Effort

##### 4.6.2.1 Temporal and Spatial Distribution

There were 2,464 anglers counted on the Bulkley River during 36 aerial flights. The high count of 161 anglers occurred on October 4 (week 10-2) while the low count of 7 anglers occurred on November 18 (week 11-3). On average, 68.4 anglers were counted per flight. The majority of observed angler effort occurred from mid-September through mid-October

while less effort occurred in the shoulder weeks of the steelhead angling season (Figure 9). The number of anglers observed from aerial counts outside the Classified Waters Period (weeks 8-4, 11-1, 11-3) was low in comparison to other weeks within the Classified Waters Period. The distribution of angler effort closely resembled a normal or a bell-shaped curve throughout the fall steelhead angling season (Figure 8).

The number of anglers observed in the aerial flights was positively correlated with the number of anglers interviewed in each week and indicated good temporal representation (Pearson Correlation  $R = 0.875$ ,  $P < 0.0005$ ). A similar temporal distribution of angler effort occurred in 1997 (Morten and Parken 1998). In both 1997 and 1998, the month of November was unusually mild, making it possible for anglers to be on the river well beyond the normal mid-November freeze-up, which usually makes angling impossible. Although, the Bulkley was 'out' (poor fishing conditions) for more days in 1997 than 1998.

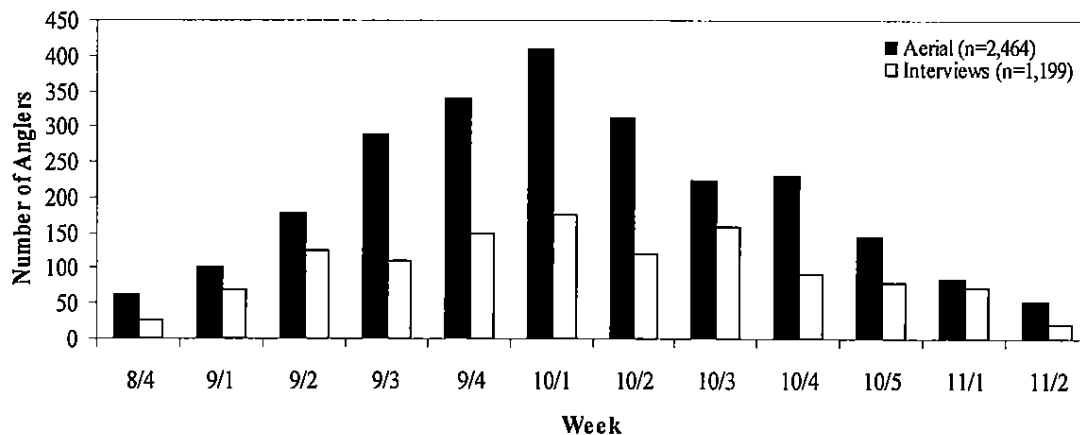


Figure 8. The number of anglers interviewed and anglers observed by aerial flights in each week.

The spatial distribution of angler interviewed followed a similar pattern to the number of anglers observed in each river section by the aerial counts (Figure 9). The number of anglers observed in the aerial flights was positively correlated with the number of anglers interviewed in each river section and indicated good spatial representation (Pearson Correlation  $R = 0.961$ ,  $P < 0.0005$ ). A high observed angler effort occurred in the river sections between Chicken Creek and Trout Creek, between Telkwa and Smithers, Quick and Telkwa and the Forks and Walcott. Fewer anglers were observed between Bymac and the Forks, Smithers Bridge and Chicken Creek and Trout Creek and Moricetown. There were no interviews conducted downstream of the Suskwa River. In the 1997, the proportion of anglers observed between Chicken Creek and Trout Creek and between Moricetown and the Suskwa River was smaller than the proportions observed in 1998 (Morten and Parken 1998). All other river sections had similar proportions of anglers in 1997 and 1998.

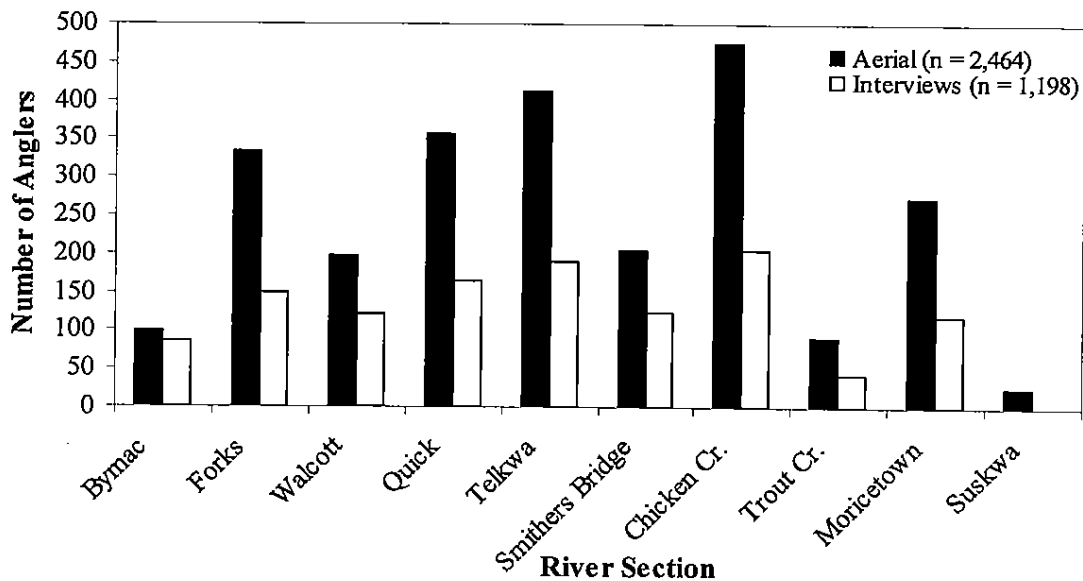


Figure 9. The number of anglers interviewed and anglers observed by aerial flights in each river section.

The aerial and observed river count data were examined between the river sections from Bymac to Chicken Creek and from September 21 to November 9 to understand if the river counts were closely related to the aerial counts. These river sections were selected because the River Guardians covered the entire length of each of these sections in the jet boat, whereas the entire length of the other river sections downstream of Chicken Creek could not be covered due to navigation obstructions. The dates were chosen because the River Guardians covered all of these river sections on all the flight days between September 21 and November 9. There was a weak but positive correlation between anglers counted on the two counting methods (Figure 10). Overall, the aerial count consistently produced a slightly higher count of anglers than the river counts.

Closer examination of the outlying points indicated they occurred between Bymac and the Forks and Smithers Bridge and Chicken Creek. The counts could be variable between Bymac and the Forks because anglers move through the section to fish below the Forks. The Forks marks the end of the Morice River and the beginning of the Bulkley River, and Canadian and Non-Canadian anglers were required to purchase two separate Classified Waters Licenses if they wanted to fish each river during one day. Thus, some anglers moved through the Bymac section (Morice River) without angling until they reached the Forks section (Bulkley River) to avoid purchasing two separate Classified Waters licenses. Also, there were many shore access points between Smithers Bridge and Chicken Creek and anglers moved between positions within this area which could cause high variability in the counts.

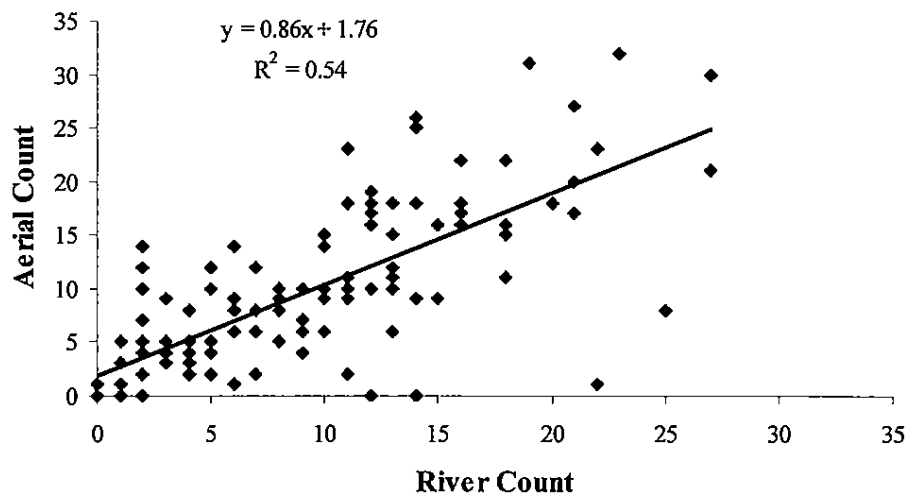


Figure 10. The correlation between anglers counted by the aerial flights and the River Guardians for each river section between Bymac and Chicken Creek and each day between September 21 to November 9.

There was less variability between counting methods when all river sections were grouped together for a total count on each particular day or all days were grouped together for a total count in each river section (see Appendix 7.0), although the aerial counts still produced a slightly higher count than the river count.

#### 4.5.2.2 Angling Method

Of all observed anglers, more anglers used a fly rod (1,537 rods) than a gear rod (355 rods), although 572 anglers' rods could not be identified. The temporal distribution of fly rod anglers differed from gear rod anglers (Figure 11). The majority of fly rod anglers were observed in the Classified Waters Period while fewer fly rod anglers were observed during the shoulder seasons. In contrast, the number of gear rod anglers observed was relatively stable throughout most weeks. The number of gear anglers observed in the aerial flights was positively correlated with the number of gear anglers interviewed in each week (Pearson Correlation  $R = 0.892$ ,  $P < 0.044$ ). In addition, the number of fly anglers observed from the aerial flights was positively correlated with the number of fly anglers interviewed in each week (Pearson Correlation  $R = 0.917$ ,  $P < 0.0005$ ). These results indicated good temporal representation of fly and gear rod interviews completed by the River Guardians in relation to fly and gear anglers observed from the aerial counts.

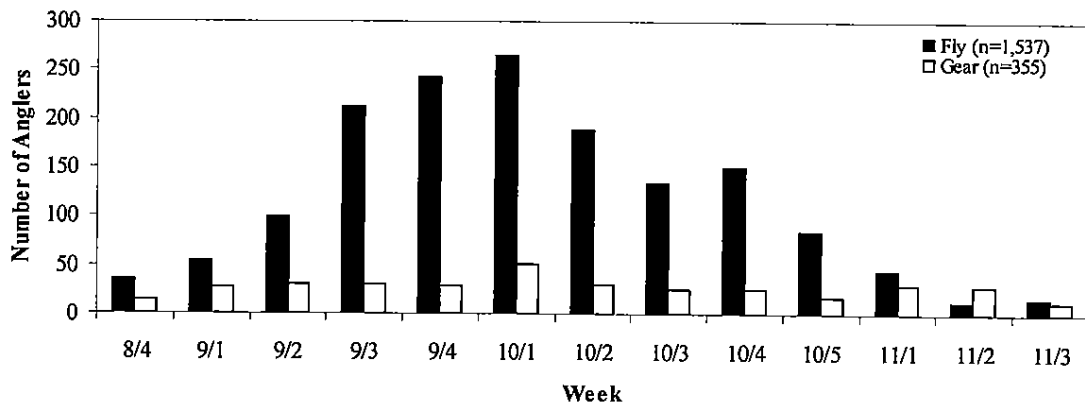


Figure 11. The number of fly and gear anglers observed in each week relative to other weeks in the study period.

The spatial distribution of fly and gear anglers indicated that most fly anglers were observed between the Forks and Walcott, Quick and Telkwa, Telkwa and Smithers Bridge and Chicken Creek and Trout Creek (Figure 12). Of all gear rod anglers most were around the town of Smithers in the three river sections between Telkwa and Trout Creek.

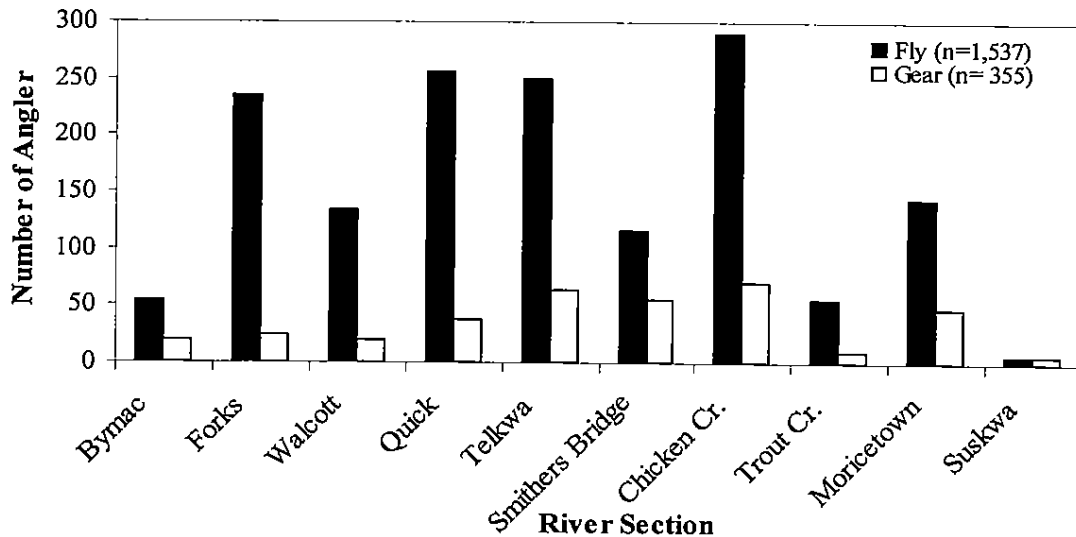


Figure 12. The number of fly and gear anglers observed in each river section relative to other river sections in the study area.

#### 4.6.2.3 Guided Anglers

A total of 331 guided anglers and guides were observed during the aerial counts while 165 guided anglers were interviewed on the river. The temporal distribution of aerial counts and interviews of guided anglers provided slightly different interpretations of when the most guided angler effort occurred. In week 8-4 there were no guided anglers interviewed and only two guided anglers were counted in the aerial flight (Figure 13). The number of guided anglers interviewed in weeks 9-4, 10-1 and 10-2 was high relative to the other weeks. Similarly, the number of guided anglers counted from the helicopter was high in weeks 9-3,

10-1 and 10-2. The number of guided anglers observed in the aerial flights had a fair but positive correlation with the number of guided anglers interviewed in week (Pearson Correlation  $R = 0.764$ ,  $P < 0.004$ ). Of the 331 guided anglers and guides counted, 329 (99 %) were counted in the Classified Waters Period. This result was similar to the 97 % of guided angler interviews that were conducted during the Classified Waters Period.

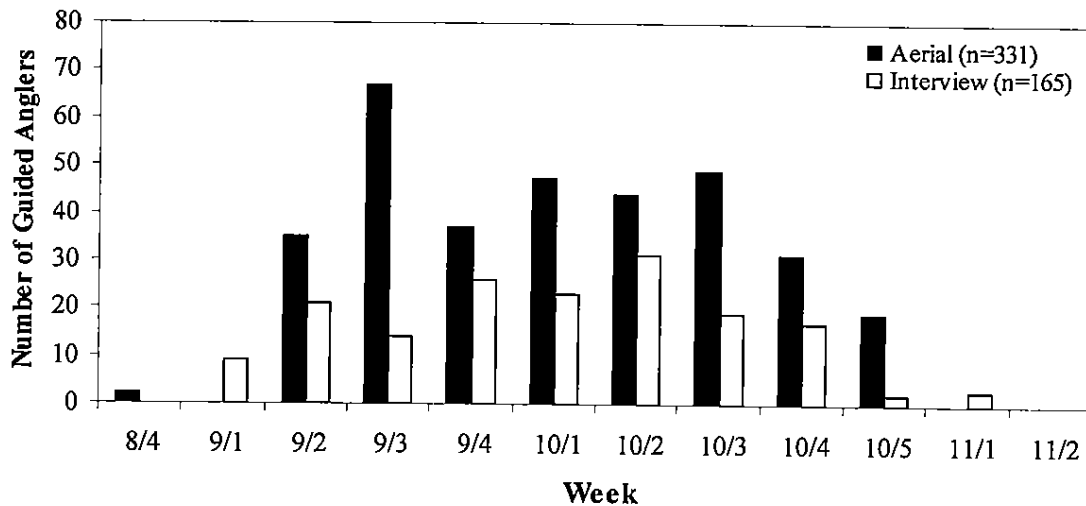


Figure 13. The number of guided anglers interviewed on the river and observed from the air in each week.

The spatial distribution of aerial counts and interviews of guided anglers provided different interpretations of where most of the guided angler effort occurred (Figure 14). Relative to other river sections, a high number of guided anglers were observed between Chicken Creek and Trout Creek and in the three river sections between Walcott and the Smithers Bridge. The River Guardians interviewed most guided anglers between Walcott and Quick, Chicken Creek and Trout Creek and Quick and Telkwa. The number of guided anglers observed in the aerial flights had a fair but positive correlation with the number of guided anglers interviewed in river sections (Pearson Correlation  $R = 0.782$ ,  $P < 0.007$ ).

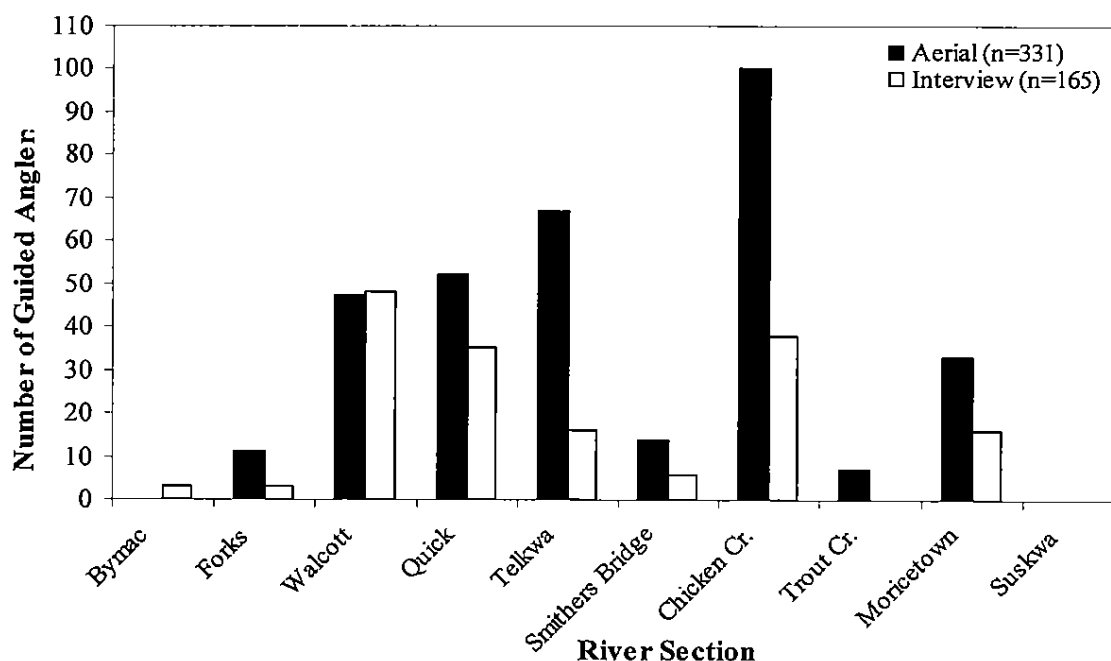


Figure 14. The number of guided anglers interviewed on the river and observed from the air in each river section.

The observed guided effort was probably underestimated both in the aerial count and from angler interviews. From the air, not all guided boats could be identified. Thus, guided anglers were counted as non-guided anglers on several occasions. On the water, guides that were interviewed were not categorized as guided anglers even though they occupied the same boat and often fished with clients. If guides were included as a component of guided angler activity the effect would be to increase that activity by about 50 % because the ratio of guided anglers to guides is generally 2:1.

#### 4.6.2.4 Boats

A total of 825 boats were observed during 36 aerial flights. Overall, there was an average of 23 boats counted per day. Similar to the number anglers observed, the majority of boats were observed in the Classified Waters Period (751 boats, 91 %) and not in the shoulder weeks of the study period (Figure 15). Considering all anglers counted from the aerial flights (2,464) the overall ratio of anglers to boats was 2.99:1. A high count of 54 boats occurred on September 27 and the ratio of anglers to boats on that day was 2.57:1. The ratio of anglers to boats differed throughout the study period (Figure 15). The shoulder weeks had a higher ratio of anglers to boats than the Classified Waters Period. Also, September had a slightly lower ratio of anglers to boats than October. In 1997, the overall angler to boat ratio was similar to 1998 results (approximately 3:1, Anonymous 1998b).

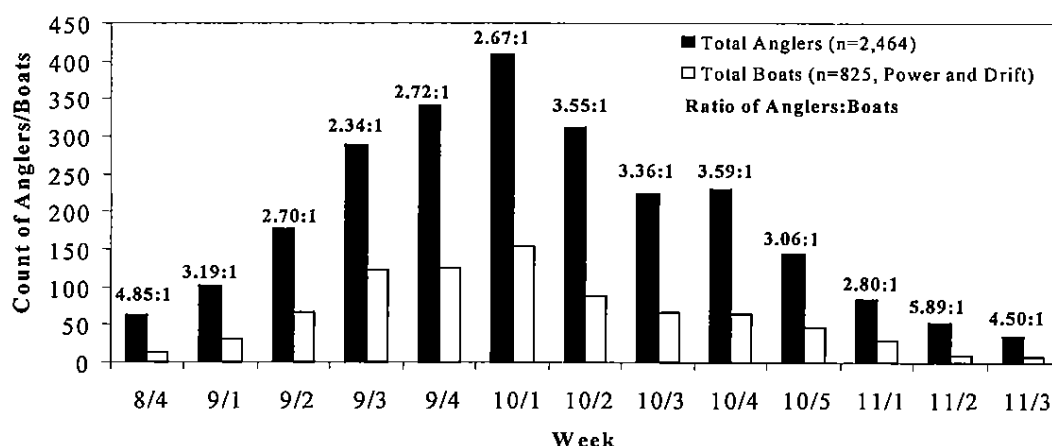


Figure 15. The number of anglers and boats (power and drift) and the ratio of anglers to boats observed in each week.

Of all boats counted, 484 (59 %) were power boats and 341 (41 %) were drift boats. Throughout the study period both power and drift boats followed a normal or bell-shaped temporal distribution (Figure 16). A high count of 31 power boats occurred on September 27 (week 10-1) and a high count of 32 drift boats occurred on October 3 (week 10-1). The number of power and drift boats observed in the aerial flights were positively correlated with the number of power and drift boat-access anglers interviewed in each week (power boat Pearson Correlation  $R = 0.835$   $P < 0.001$ , drift boat Pearson Correlation  $R = 0.747$ ,  $P < 0.005$ ). In 1998, the ratio of power to drift boats was 1.41:1; whereas the 1997 ratio was higher (2:1 Anonymous 1998b).

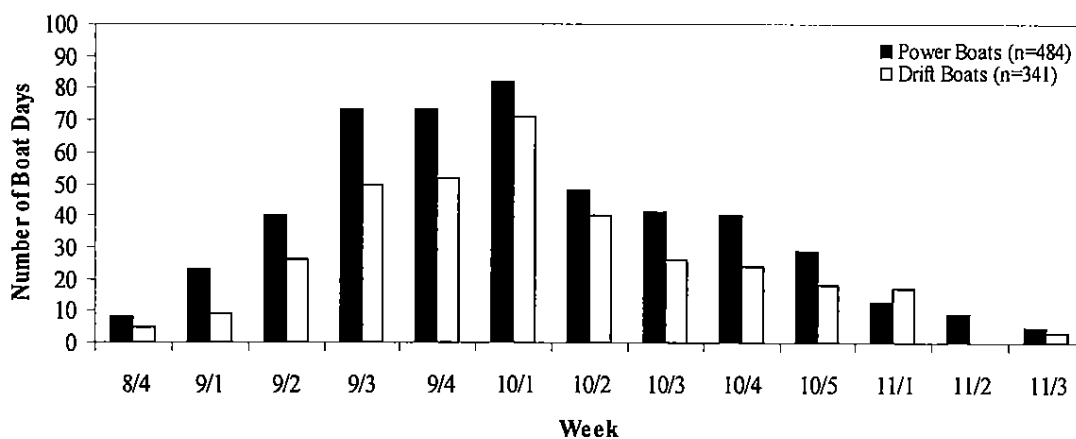


Figure 16. The number of power and drift boats observed in each week relative to other weeks in the study period.

The spatial distribution of power and drift boats indicated the majority of power boat use occurred between the Forks and Walcott, Chicken Creek and Trout Creek and Moricetown and Suskwa. Relative to other river sections, drift boat use was high in the three river sections upstream of the town of Smithers (between Walcott and Smithers Bridge, Figure 17). Relatively few power boats or drift boats were noted between Bymac and the Forks,

Smithers Bridge and Chicken Creek, Trout Creek and Moricetown and downstream of the Suskwa River. A similar spatial distribution of power and drift boats existed in 1997 (Morten and Parken 1998).

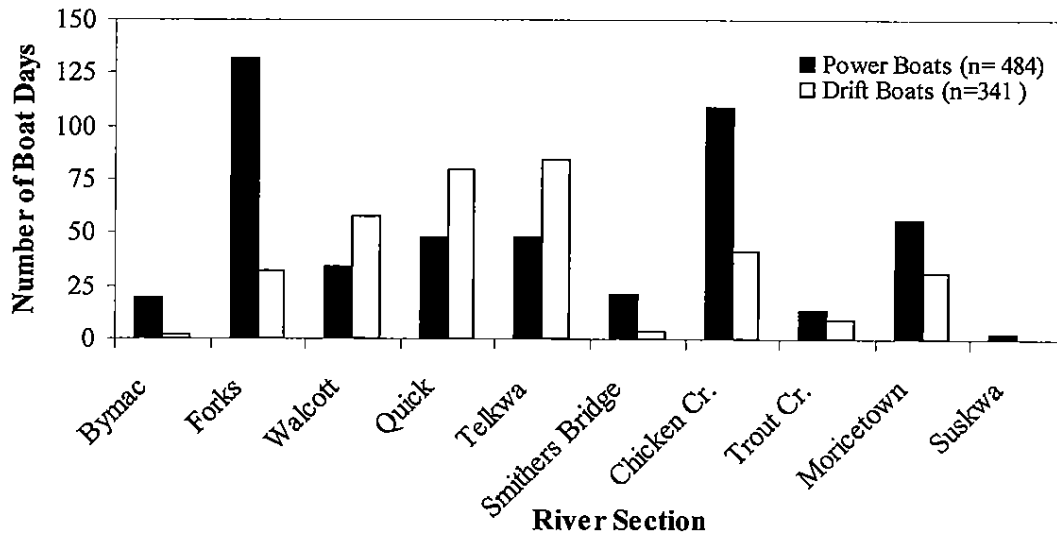


Figure 17. The number of power and drift boats observed in each river section relative to other river sections in the study area.

#### 4.6.3.0 Catch and Effort Estimates

##### 4.6.3.1 Temporal and Spatial Catch and Effort Estimates for All Anglers

The total effort estimate for the whole study period (and study area) was 6,116 rod days while the effort estimate for the Classified Waters Period was 5,422 rod days (Table 25). The total catch estimate was 8,956 steelhead and 8,222 steelhead (92 %) of those were caught in the Classified Waters Period. The total effort and catch estimates were the sum of all weekly estimates. The total effort and catch estimates for the whole study period and the Classified Waters Period were higher in 1998 than 1997 (Table 26).

Table 25. Angler catch and effort estimates with 95 % confidence intervals for the last week of August, September, October and November of 1998 and September through November of 1997 (1997 data from Morten and Parken 1998).

	Effort Estimate (rod day <sup>3</sup> )	95 % CI	Catch Estimate (steelhead)	95 % CI
<b>Whole Season</b>				
1998	6,116	± 442	8,956	± 1,466
1997 <sup>1</sup>	4,317	± 324 <sup>2</sup>	6,364	± 6,650
<b>Classified Waters Period</b>				
1998	5,422	± 389	8,222	± 1,380
1997 <sup>1</sup>	3,983	± 282	5,497	± 8,597

1. The total estimates for 1997 should be interpreted cautiously since methods differed slightly between sub-groups of the study period (Morten and Parken 1998).

2. This confidence interval was small because several weeks had only one aerial count and thus no variability. Thus, although the variability was small the accuracy of the estimate could be skewed due to the small number of aerial flights.

3. Different methods were used to estimate rod days between the 1998 and 1997 rod day estimates.

Several methods were used to estimate catch and effort for weeks, river sections, residence categories, guided status, access method and angling method. Methods differed according to the amount of information that was collected on the aerial flight. The temporal distribution of estimated angler effort followed a bell-shaped curve. The largest effort estimates occurred in week 10-1 (954 rod days) followed by week 9-4 (793 rod days), whereas the weeks in November and August had the lowest effort estimates (221, 126 rod days respectively, Figure 18, Table 26). The largest catch estimates occurred in week 9-3 (1,304 steelhead) followed by week 9-4 and 10-1 (1,064 and 1,057 steelhead, respectively). The lowest catch estimates occurred in the shoulder weeks in November and August. Both the effort and catch estimates were highest during the Classified Waters Period.

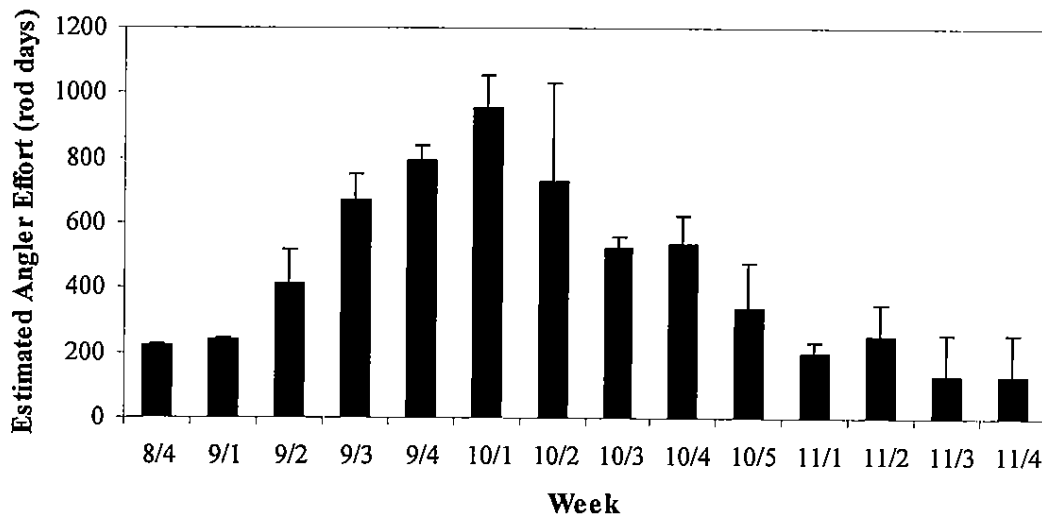


Figure 18. The estimated angler effort (rod days) in each week of the study period. The errors bars indicate the 95 % confidence intervals.

The spatial distribution of angler effort indicated, the highest effort estimates were in the river sections from Chicken Creek to Trout Creek (1,183 rod days) followed by Telkwa to Smithers Bridge (1,048 rod days, Figure 19, Table 26). The lowest effort estimates were between Trout Creek and Moricetown and downstream of Suskwa (225 and 74 rod days, respectively). The small section of the Morice River that was included (Bymac to the Forks) had an effort estimate of 262 rod days. The largest catch estimate was between Chicken Creek and Trout Creek (1,507 steelhead) followed by the river section between Moricetown and the Suskwa River (1,482 steelhead). The smallest catch estimate occurred downstream of the Suskwa River and between Trout Creek and Moricetown (123 and 526 steelhead, respectively).

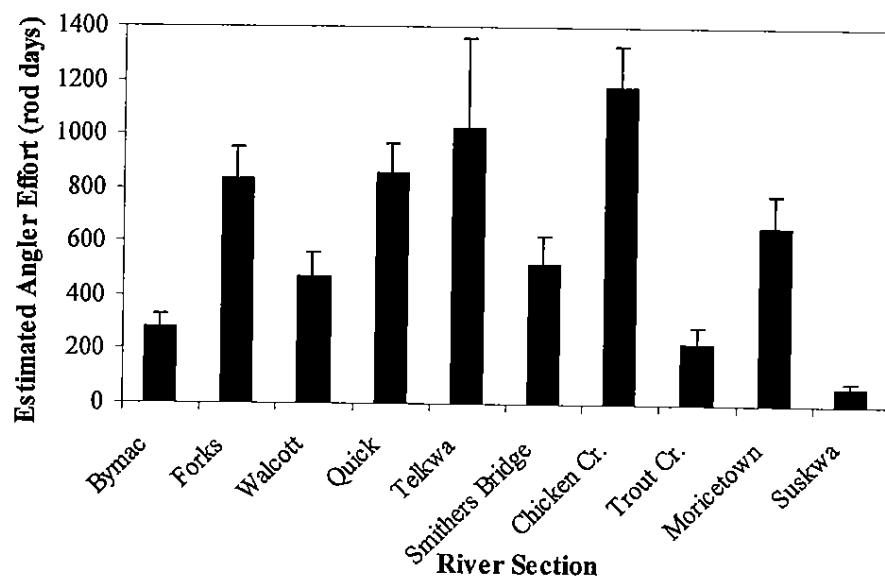


Figure 19. The estimated angler effort (rod days) in each river section of the study area. The errors bars indicate the 95 % confidence intervals.

Table 26. A summary of the total effort and total catch with 95% confidence intervals by time period and river section.

	Total Effort (rod days)	95% CI Effort	Total Catch (steelhead)	95% CI for Total Catch
<b>Time Period</b>				
8-4	221	$\pm 6$	176	$\pm 162$
9-1	238	$\pm 6$	725	$\pm 1,048$
9-2	415	$\pm 104$	540	$\pm 354$
9-3	672	$\pm 78$	1,304	$\pm 525$
9-4	793	$\pm 47$	1,064	$\pm 460$
10-1	954	$\pm 99$	1,057	$\pm 165$
10-2	728	$\pm 304$	989	$\pm 457$
10-3	525	$\pm 32$	972	$\pm 34$
10-4	537	$\pm 89$	874	$\pm 126$
10-5	336	$\pm 140$	659	$\pm 269$
11-1	196	$\pm 38$	239	$\pm 217$
11-2	249	$\pm 101$	152	$\pm 97$
11-3	126	$\pm 130$	103	$\pm 126$
11-4	126	$\pm 130$	103	$\pm 126$
<b>River Section</b>				
Bymac	262	$\pm 44$	430	$\pm 284$
Forks	842	$\pm 123$	1,282	$\pm 682$
Walcott	457	$\pm 95$	893	$\pm 378$
Quick	894	$\pm 111$	777	$\pm 521$
Telkwa	1,048	$\pm 339$	951	$\pm 698$
Smithers Br.	502	$\pm 104$	703	$\pm 519$
Chicken Cr.	1,183	$\pm 160$	1,507	$\pm 884$
Trout Cr.	225	$\pm 65$	526	$\pm 260$
Moricetown	712	$\pm 122$	1,482	$\pm 662$
Suskwa	74	$\pm 24$	123	$\pm 78$

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

For the whole study period, B.C. residents were estimated to angle for 3,766 rod days (Table 27). Non-Canadian residents were estimated to produce 2,006 rod days of angler effort and 343 rod days of effort were estimated for Canadian residents. There were 910 guided angler days and 5,205 non-guided angler days of angler effort estimated. The estimate of the guided angler rod days did not include the guide him/herself. There was an estimated 3,716 fly rod days and 940 gear rod days of angler effort on the Bulkley River. In addition 1,397 rod days were estimated as unidentifiable fly or gear anglers because a proportion of anglers could not be identified as angling with a fly or gear rod from the helicopter.

B.C. residents were estimated to catch a total of 5,294 steelhead in the whole study period. Non-Canadian residents were estimated to catch 2,435 steelhead while Canadian residents caught an estimated 312 steelhead (Table 28). Non-guided anglers were estimated to catch 6,576 steelhead while guided anglers caught an estimated 1,201 steelhead. Fly rod anglers were estimated to catch 5,166 steelhead while gear rod anglers caught an estimated 1,101 steelhead. Also, unidentifiable gear or fly rod anglers caught an estimated 2,861 steelhead.

Table 27. A summary of the total effort and total catch with 95 % confidence intervals by angler residence, guided status and angling method for the whole study period.

	Total Effort (rod days)	95% CI Effort	Total Catch (steelhead)	95% CI for Total Catch
<b>Angler Residence</b>				
B.C.	3,766	± 64	5,294	± 5,840
Canadian	343	± 18	312	± 631
Non-Canadian	2,006	± 60	2,435	± 2,510
<b>Guided Status</b>				
Guided	910	± 39	1,201	± 1,638
Non-guided	5,205	± 70	6,576	± 7,484
<b>Angling Method</b>				
Fly	3,716	± 47	5,166	± 1,094
Gear	940	± 77	1,101	± 345
Unidentifiable	1,397	± 6	2,861	± 864

#### 4.6.3.3 Effort Estimate for Boats

For the whole study period, a total of 1,991 boat days were estimated for the Bulkley River (Table 28). Of those, more power boats (1,175 power boat days) were estimated to use the river than drift boats (816 drift boat days). Considering the total effort estimate in rod days (6,116 rod days) and the total estimate of boat days (1,991 boat days), the ratio of angler days to boat days was 3.07:1.

Table 28. The total number of boat days for power and drift boats with 95% confidence intervals

Boat Type	Total Effort (boat days)	95% CI Effort
Power	1,175	± 112
Drift	816	± 82

#### **4.7.0.0 Limitations of the Survey**

As with any on-site survey the results presented here must be used with caution. These results were only representative of the anglers interviewed during the study period of 1998. The actual interviewing could have caused some reactivity by the Bulkley River anglers, causing them to give responses that were not indicative of their actual perceptions.

Some anglers had a higher probability of being contacted due to the nature of a roving survey. 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. 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.

Response errors may also have biased the survey results. It was possible that anglers may have exaggerated the number of steelhead landed for prestige purposes (Pollock *et al.* 1994).

### **5.0.0.0 Recommendations**

1. The MELP should continue to administer a survey of Bulkley River anglers to monitor any changes in angler effort, demographics, angling characteristics and angler catch. The results of 1997 and 1998 indicated there can be considerable variation in angler effort and angler residence between years. Additional information will aid the MELP in the planning necessary to protect the quality of angling experiences offered by the Classified Waters designation.
2. Further investigations of angler perceptions of problems and crowding on the river should be undertaken. Since differences in perceptions of steelhead angler management problems differed by angler residence in 1997, the sampling should be stratified by residence category. If future research on Bulkley River anglers focuses on angler opinion, attitude, perception or demographics data then the sampling plans should incorporate weekend and weekday stratification. Postratification of 1998 results indicated the proportion Bulkley Valley residents was higher on weekends than weekdays. The survey could define the expectations of the Classified Waters angling experience on the Bulkley River. Also, the survey could inquire if anglers changed their expectation of their angling experience or changed their behavior in response to the perceived problems with the numbers of anglers and boats on the river. If future research continues to focus on catch and effort estimates the weekly stratification of the study period should be continued.
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.
4. Although aerial and river counts were moderately correlated, aerial counts should continue to be the primary method to estimate effort. When compared, they provided a slightly higher count than river observations. Also, complete coverage is possible with aerial counts which is difficult in river sections downstream from Chicken Creek in a boat.
5. If aerial counts cannot be conducted, progressive counts by the River Guardians could be used to estimate daily effort, provided a pre-determined schedule with timed check points is adhered to. The sampling should occur on a random sample of days and random directions of travel, when possible. The use of jet boats due to their speed and accuracy in providing an 'instantaneous' count is preferred over other ground level access options.
6. Anglers should continue to be contacted at the end of their trip to compare catch rate estimates between complete and incomplete trips. This would assess the amount of incomplete trip interview bias in catch rate estimation.
7. If more boat launches are contemplated for the Bulkley River careful consideration should be given to the number and distribution of boat days and their influence on perceptions of crowding.

8. In 1998, discrepancies existed between the temporal and spatial distribution of guided anglers observed from the helicopter and interviewed on the river. If aerial counts are conducted in future surveys, guides should be encouraged to display a flag or large colored sticker on their boat that would allow easy identification of guided boats from the helicopter. In addition, the observed number of guided anglers (including the guide) should be recorded in each river section on each day. Easy identification of guided boats (and angler) could produce an accurate effort estimate of guided angler rod days.
9. Complete addresses of Bulkley River anglers could be collected by River Guardians to develop a sampling frame for a detailed mailback questionnaire.

### **6.0.0.0 Acknowledgments**

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## **8.0.0.0 Appendices**

**Appendix 1.0 The angler interview form, angler count data and aerial count form.**

Interviewer \_\_\_\_\_ Time \_\_\_\_\_ Date \_\_\_\_\_

**River Section of interview:**

BYMAC-FORKS FORKS-U/S WALCOTT WALCOTT-U/S QUICK QUICK-U/S TELKWA TELKWA-U/S SM. BRIDGE  
SM. BRIDGE-U/S CHICKEN CR. CHICKEN CR.-U/S TROUT CR. TROUT CR.-U/S MORICETOWN MORICETOWN -SUSKWA D/S SUSKWA

Gender MALE FEMALE

Angler access JET BOAT DRIFT BOAT SHORE Fishing method FLY GEAR

Hello, my name is \_\_\_\_\_. I am a River Guardian and we are collecting information from steelhead anglers on Bulkley 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 (move on to catch data)

Angler License # \_\_\_\_\_ Angler Name \_\_\_\_\_ Year of Birth \_\_\_\_\_

Guided NO YES If yes by WHO \_\_\_\_\_

Residence BC postal code \_\_\_\_\_, CANADIAN province \_\_\_\_\_, NON-CANADIAN RESIDENT country \_\_\_\_\_

License Class 1 DAY 8 DAY ANNUAL Classified Days \_\_\_\_\_ DAYS PURCHASED \_\_\_\_\_ DAYS USED \_\_\_\_\_

How many days have you already fished on the Bulkley River? \_\_\_\_\_ How many days do you plan to fish on the Bulkley River? \_\_\_\_\_

When did you start your fishing trip today? \_\_\_\_\_ Time (24 hr. clock)

When do you expect to finish your fishing trip today? \_\_\_\_\_ Time (24 hr. clock)

Are you a member of a conservation club or organization? NO YES If YES, what organization(s)? \_\_\_\_\_

What type of fish have you landed today? How many did you keep or release? Were any tagged?

Species	#	#	#	River Section/Time fished in that River section (If not the section presently in)	If steelhead tagged, tag color and number
STHD		REL.			
DV/BT		REL.	KEPT		
OTHER (Specify)		REL.	KEPT		
OTHER (Specify)		REL.	KEPT		

Please describe any additional comments concerning the angler interview here or on the back of this sheet

# River Section Count Form

[illegible]

River Sections include: Bymac- u/s Forks, Forks- u/s Walcott, Walcott- u/s Quick, Quick- u/s Telkwa, Telkwa- u/s Smithers Bridge, Smithers Bridge- u/s Chicken Cr., Chicken Cr. - u/s Trout Cr., Trout Cr.- u/s Moricetown, Moricetown - Suskwa

Water Conditions: COMMENT ON WATER LEVEL AND CLARITY

Weather Conditions: RAIN, OVERCAST (no sun), CLOUDS WITH SOME SUN, MAINLY SUN, SUNNY AND CLEAR

Personnel \_\_\_\_\_ Date \_\_\_\_\_ Water Conditions \_\_\_\_\_ Weather Conditions \_\_\_\_\_

Bulkley River Aerial Count Form						
Time	Location	Anglers	Fly	Gear	Guided?	Drift Boats
	Depart Base					
	Bymac- u/s Forks					
	Forks-u/s Walcott					
	Walcott-u/s Quick					
	Quick- u/s Telkwa Br.					
	Telkwa Br.-u/s Smithers Br.					
	Smithers Br. - u/s Chicken Cr.					
	Chicken Cr.- u/s Trout Cr.					
	Trout Cr. - u/s Moricetown					
	Moricetown- u/s Suskwa					
	Suskwa d/s					
	Return Base					

## Appendix 2.0 The conservation clubs mentioned.

Table A1. The conservation club membership of anglers interviewed.

Conservation Club	Percent of Responses	N
Steelhead Society	27.7	106
Trout Unlimited	22.9	88
Local Angling Club	9.6	37
Federation of Fly Fishers	5.2	20
Nature Conservancy	5.2	20
B.C. Wildlife Federation	3.4	13
Local Rod and Gun Club	2.9	11
Other Environmental Group	2.3	9
Ducks Unlimited	2.3	9
B.C. Federation of Drift Fishers	2.3	9
Foreign Country Fishing Club	2.1	8
Totem Fly Fishing Club	2.1	8
California, Oregon, Washington Trout	1.8	7
North Atlantic Salmon Federation	1.6	6
Work Related Group	1.6	6
Sierra Club	1	3
Pacific Salmon Federation	0.8	3
Polar Coachmen	0.5	2
American Fisheries Society	0.5	2
Stream Borne	0.5	2
Wild Trout	0.5	2
Nature Trust	0.5	2
Kispiox Protection Society	0.3	1
Audubon Society	0.3	1
World Wildlife Fund	0.3	1
Wilderness Watch	0.3	1
3H	0.3	1
Conservation International	0.3	1
Tyee Club	0.3	1
Streamkeepers	0.3	1
Sport Fish Advisory Board	0.3	1
North American Fly Fishers	0.3	1

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

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

Week	Date	Weather				Water					Comments
		Sun	Mixed	Overcast	Rain	High	Mod.	Low	Turbid	Clear	
8-4	0825			X	X			X		X	
	0826			X				X		X	
	0827	X		X				X		X	
	0828	X		X				X		X	
9-1	0831	X						X		X	Telkwa R. slightly turbid
	0902	X		X			X		X		Telkwa R. slightly turbid
	0903			X				X		X	
	0904	X		X				X		X	
	0905	X								X	
	0906			X	X			X		X	
9-2	0908	X						X		X	
	0909	X		X				X		X	
	0910			X	X			X		X	
	0911	X		X				X		X	
	0912	X		X				X		X	
	0913	X						X		X	
9-3	0915	X						X		X	
	0916	X		X				X		X	
	0917	X						X		X	
	0919	X						X		X	
	0920	X						X		X	
	0921	X						X		X	
9-4	0923			X	X			X		X	Drizzle
	0925	X						X		X	
	0926	X		X				X		X	
	0927	X		X				X		X	Telkwa R. slightly turbid, Bulkley R. still clear
	0929	X		X				X		X	
10-1	0930	X		X				X		X	
	1002			X				X		X	
	1003			X				X		X	
	1004	X		X				X		X	
	1007			X		X			X		BLOWN OUT (Morice and Bulkley rivers)
10-2	1008			X	X	X			X		
	1009			X			X		X		
	1010			X			X		X		
	1011			X			X		X		
	1013			X			X	X		X	
10-3	1014			X			X	X		X	
	1015	X		X			X			X	
	1016		X	X	X			X	X		
	1017	X		X				X		X	
	1018			X	X		X			X	
10-4	1020	X						X		X	Telkwa R. slightly turbid, Bulkley R. still clear
	1021	X						X		X	
	1022	X						X		X	
	1025	X		X	X			X		X	

Week	Date	Weather				Water					Comments
		Sun	Mixed	Overcast	Rain	High	Mod.	Low	Turbid	Clear	
	1027			X	X			X		X	
	1029	X						X		X	Snow at Bymac
	1030		X	X	X			X		X	
	1031		X	X	X			X		X	
11-1	1101			X			X		X		Snow in mtns. prevents complete blow out of Bulkley R.
	1103			X				X		X	Trout Cr. tea color
	1104			X				X		X	Snow at Bymac
	1105			X	X			X		X	
	1107	X		X				X		X	
11-2	1109	X						X		X	
	1110	X						X		X	
	1112	X		X				X		X	
	1113	X		X				X		X	
	1114			X				X		X	
11-3	1118		X					X		X	
	1121		X					X		X	

#### Appendix 4.0 The comments mentioned by Bulkley River Anglers.

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

Comment Group	Percent of Responses	N
Positive towards River Guardian program or River Guardian etiquette	23.6	92
There should be not be a kill fishery for steelhead	22.3	87
Angler had good fishing, good experience or liked the surroundings	9.7	38
Negative comment about licensing system	9.0	35
General comment about fisheries management (not River Guardian related, ex. Coho, tagging issues)	8.5	33
Suggestion about methods of angler management (e.g. zoning, fly fishing only areas)	7.7	30
Negative comment about power boats/jet skis	7.7	30
Negative comment about guides/guiding	4.9	19
Miscellaneous comments	3.8	15
Negative comment about facilities (lack of boat launches, garbage)	3.8	15
Negative comment about number of people (too many)	3.8	15
In favor of kill fishery	2.7	14
General comment about fishing	2.7	14
Positive about barbless hooks	2.4	13
River guardian program suggestion	2.2	11
Good comment about fish stock (#s)	2.0	10
Expensive fishing	2.0	10
Issues about AUP	1.8	9
Comment about bad fishing	1.2	6
Negative helicopter comment	1.0	5
Guardians should have enforcement power	< 1.0	4
Negative comment about program	< 1.0	3
Negative comment about barbless hook	< 1.0	3

**Appendix 5.0 The aerial count data.**

		27-Aug	28-Aug	31-Aug	02-Sep	04-Sep	06-Sep	09-Sep	11-Sep	15-Sep	17-Sep	19-Sep	21-Sep	23-Sep	26-Sep	27-Sep	30-Sep	03-Oct	04-Oct	09-Oct
Bymac	Anglers	3	3	3	4	0	4	0	3	2		4	5	9	4	5	5	9	6	8
	Fly	1	2	1	2	0	0	0	2	0		3	4	7	0	3	3	9	4	7
	Gear	0	1	2	2	0	4	0	0	0		1	0	0	0	0	1	0	0	1
	Jet Boat	2	1	2	0	0	1	0	1	1		1	1	0	4	1	0	0	0	0
	Drift Boats	1	0	0	0	0	0	0	0	0		0	0	1	0	0	0	0	0	0
	Guided	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0
Forks	Anglers	5	2	6	1	3	7	6	9	10	11	18	9	22	17	27	15	12	25	12
	Fly	5	2	3	1	3	3	4	2	5	8	18	7	16	12	14	9	10	20	4
	Gear	0	0	3	0	0	0	0	1	0	1	0	0	0	1	4	1	0	0	3
	Jet Boat	1	1	4	0	2	3	2	7	5	11	10	4	6	6	11	5	3	10	2
	Drift Boats	1	0	1	0	1	1	1	1	1	0	1	0	1	0	1	0	1	1	0
	Guided	0	0	0	0	0	0	0	0	0	0	4	0	4	0	0	0	0	0	0
Walcott	Anglers	1	2	4	5	2	6	3	4	2	6	4	14	3	11	20	4	16	10	17
	Fly	1	2	2	4	2	0	3	4	2	6	4	8	1	7	15	1	14	5	7
	Gear	0	0	1	1	0	2	0	0	0	0	0	0	2	0	0	2	0	0	4
	Jet Boat	1	1	1	2	1	2	0	0	0	0	1	2	0	2	4	3	3	2	2
	Drift Boats	0	0	1	0	0	0	1	2	1	2	2	3	2	6	11	0	6	0	3
	Guided	0	0	0	0	0	0	3	0	0	10	1	7	0	0	0	0	6	0	12
Quick	Anglers	0	5	8	6	7	1	7	19	4	12	7	26	16	25	23	17	32	10	18
	Fly	0	5	5	0	7	1	7	11	4	9	5	22	14	20	20	12	14	9	15
	Gear	0	0	3	3	0	0	0	0	0	0	2	2	0	3	2	4	7	0	0
	Jet Boat	0	0	4	1	1	0	2	4	0	2	2	5	2	2	3	4	1	0	0
	Drift Boats	0	2	1	1	0	0	0	7	0	4	2	7	6	8	5	4	9	2	4
	Guided	0	0	0	0	0	0	4	0	3	3	0	5	0	6	6	4	3	0	7
Telkwa	Anglers	9	5	2	5	10	15	12	13	25	22	15	19	9	11	16	23	31	30	6
	Fly	3	2	2	4	4	6	7	13	13	18	12	15	3	9	11	17	17	14	1
	Gear	4	2	0	1	2	8	0	0	0	4	3	5	2	0	3	0	5	6	1
	Jet Boat	0	0	0	0	1	1	0	4	3	4	1	3	3	0	4	4	1	2	1
	Drift Boats	0	0	0	1	1	1	4	3	11	5	3	5	0	1	1	5	8	6	1
	Guided	2	0	0	0	0	3	9	12	2	1	0	0	0	0	0	7	6	6	7
Smithers Bridge	Anglers	2	0	1	4	6	4	1	12	8	3	5	6	8	10	14	2	15	18	2
	Fly	0	0	1	1	5	1	1	11	8	2	2	5	7	9	9	2	6	11	2
	Gear	2	0	0	1	1	3	0	1	0	1	3	0	0	0	5	0	5	3	0
	Jet Boat	0	0	0	1	0	0	1	1	2	0	1	0	2	0	3	1	2	0	0
	Drift Boats	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	1	0	0
	Guided	0	0	0	0	0	0	0	0	2	0	3	0	0	0	0	0	0	0	0
Chicken Creek	Anglers	7	14	3	1	5	5	2	6	32	22	18	24	29	14	14	32	17	39	18
	Fly	6	4	1	1	3	3	1	2	20	19	8	18	21	7	9	31	6	17	15
	Gear	1	4	2	0	0	2	0	3	0	0	8	0	2	1	0	0	4	6	1
	Jet Boat	1	0	0	0	2	0	3	1	9	4	5	8	9	0	4	8	3	8	3
	Drift Boats	0	0	0	0	0	0	0	0	4	4	2	1	3	0	1	5	3	5	3
	Guided	0	0	0	0	0	0	0	0	11	14	5	0	4	4	6	0	0	9	0
Trout Creek	Anglers	1	0	3	1	0	8	1	4	1	11	5	2	5	2	3	1	4	9	1
	Fly	1	0	1	1	0	5	1	0	1	10	5	0	3	1	1	1	1	8	0
	Gear	0	0	2	0	0	2	0	1	0	1	0	2	0	0	0	0	1	0	0
	Jet Boat	0	0	0	0	0	0	0	0	1	2	2	1	1	0	0	0	0	2	0
	Drift Boats	0	0	0	0	0	2	0	0	0	0	1	1	0	0	1	1	0	0	0
	Guided	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
Morisetown	Anglers	3	1	5	6	1		13	4	15	16	3	2	19	17	17	19	15	14	0
	Fly	1	0	0	0	0		7	2	14	14	2	0	17	8	12	10	7	6	0
	Gear	0	1	2	0	1		1	0	0	2	1	2	2	4	0	3	4	1	0
	Jet Boat	0	0	0	1	0		3	2	1	3	2	1	5	6	2	5	6	4	0
	Drift Boats	1	0	0	2	0		2	0	4	3	0	1	3	0	4	0	4	2	0
	Guided	0	0	0	0	0					6	2		7	0	6	0	3	3	0
Suskwa	Anglers	0	0	0	0	0		4	5	0	4	3		2	0	0	1	0	0	0
	Fly	0	0	0	0	0		1	1	0	0	0		2	0	0	1	0	0	0
	Gear	0	0	0	0	0		1	1	0	1	3		0	0	0	0	0	0	0
	Jet Boat	0	0	0	0	0		1	1	0	0	0		0	0	0	0	0	0	0
	Drift Boats	0	0	0	0	0		0	0	0	0	0		0	0	0	0	0	0	0
	Guided	0	0	0	0	0		0	0	0	0	0		0	0	0	0	0	0	0
Total	Anglers	31	32	35	33	34	50	49	79	99	107	82	107	122	111	139	119	151	161	82
	Fly	18	17	16	14	24	19	32	48	67	86	59	79	91	73	94	87	84	94	51
	Gear	7	8	15	8	4	21	2	7	0	10	21	11	8	9	14	11	26	16	10
	Jet Boat	5	3	11	5	7	7	12	21	22	26	25	25	28	20	31	29	22	29	8
	Drift Boats	3	2	3	4	2	4	8	14	21	19	10	19	16	17	23	16	32	16	11
	Guided	2	0	0	0	0	7	16	12	18	34	15	12	15	10	18	11	18	18	26

		10-Oct	13-Oct	15-Oct	16-Oct	18-Oct	20-Oct	21-Oct	25-Oct	27-Oct	29-Oct	01-Nov	03-Nov	04-Nov	09-Nov	14-Nov	15-Nov	18-Nov	Totals
Bymac	Anglers	2	2	0	3	1	0	3	2	0	0	1	3	1	0	0	3	0	98
	Fly	1	1	0	1	0	0	0	1	0	0	0	0	1	0	0	1	0	54
	Gear	0	1	0	1	0	0	2	1	0	0	0	3	0	0	0	0	0	20
	Jet Boat	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	19
	Drift Boats	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Forks	Anglers	8	4	10	2	18	12	12	14	6	7	1	2	3	1	10	3	3	333
	Fly	7	4	5	2	12	12	8	11	5	6	1	5	3	1	3	2	2	235
	Gear	0	0	0	0	0	0	1	2	1	0	0	0	0	0	7	0	0	25
	Jet Boat	3	1	2	1	4	6	5	4	2	2	1	2	1	0	4	1	0	132
	Drift Boats	2	0	6	1	5	0	0	1	1	0	1	1	1	0	0	0	0	32
Walcott	Anglers	2	9	16	8	10	9	0	1	0	2	0	2	4	0	0	0	0	197
	Fly	2	4	12	5	10	6	0	1	0	0	0	2	4	0	0	0	0	134
	Gear	0	4	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	19
	Jet Boat	0	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	34
	Drift Boats	1	2	3	2	2	2	0	0	0	1	0	2	3	0	0	0	0	58
Quick	Anglers	8	11	17	18	5	8	5	11	3	4	5	4	3	5	4	2	1	357
	Fly	6	5	7	17	3	8	3	9	1	4	2	4	3	2	1	0	1	256
	Gear	0	0	0	0	2	0	1	0	0	0	2	0	0	3	3	1	0	38
	Jet Boat	0	2	2	3	0	0	1	2	0	1	0	0	0	1	0	1	0	48
	Drift Boats	4	1	0	4	0	3	2	2	0	0	0	1	1	0	0	0	0	80
Telkwa	Anglers	22	5	10	18	18	12	9	10	6	1	9	4	1	0	0	7	2	412
	Fly	12	5	6	10	8	10	7	7	3	1	4	0	0	0	0	5	0	249
	Gear	0	0	0	2	1	1	1	1	3	0	4	2	1	0	0	2	0	64
	Jet Boat	2	0	1	4	1	1	1	0	2	1	1	1	0	0	0	1	0	48
	Drift Boats	5	1	3	1	5	0	0	6	0	0	3	1	0	0	0	1	2	84
Smithers	Anglers	6	12	4	4	6	2	9	10	1	0	6	2	8	4	4	6	0	205
	Fly	3	4	2	2	4	2	8	1	0	0	2	0	1	0	1	2	0	115
	Gear	3	2	2	2	0	0	1	3	1	0	3	0	7	0	2	4	0	55
	Jet Boat	0	1	0	0	0	0	2	2	0	0	0	0	1	0	0	1	0	21
	Drift Boats	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Chicken	Anglers	12	21	10	13	19	13	11	13	13	6	8	4	7	6	13	4	0	475
	Fly	10	8	7	10	12	10	7	10	10	2	2	3	5	1	1	0	0	290
	Gear	1	6	1	0	1	1	3	0	1	1	6	1	0	3	7	4	0	70
	Jet Boat	3	3	4	5	5	2	2	4	3	1	2	0	3	2	2	0	0	109
	Drift Boats	1	2	0	0	0	0	0	0	2	2	0	0	3	0	0	0	0	41
Trout	Anglers	0	3	3	12	6	7	3	6	6	1	0	0	0	0	0	0	0	100
	Fly	0	4	4	2	3	2	2	3	7	0	0	0	0	0	0	2	0	91
	Gear	0	2	2	2	0	1	2	1	3	0	0	0	0	0	0	2	0	55
	Jet Boat	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
	Drift Boats	0	1	1	0	0	1	1	0	1	0	0	0	0	0	0	0	0	14
Moricetown	Anglers	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	7
	Fly	7	1	8	9	13	14	14	9	7	8	3	0	0	2	4	2	1	272
	Gear	2	1	4	6	4	7	6	3	2	4	1	0	0	0	2	0	1	143
	Jet Boat	0	0	1	3	0	0	8	0	2	2	2	0	0	2	2	2	0	48
	Drift Boats	2	0	2	1	5	1	0	1	1	2	0	0	0	0	0	0	0	56
Suskwa	Anglers	0	0	0	0	0	2	1	2	0	0	0	0	0	0	0	0	0	31
	Fly	0	0	3	0	0	0	0	0	0	3	0	0	0	0	0	0	0	33
	Gear	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
	Jet Boat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
	Drift Boats	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
Total	Anglers	69	69	79	77	93	72	65	73	43	28	33	21	30	18	35	29	7	2464
	Fly	43	34	45	55	53	56	41	44	24	17	12	14	18	4	8	12	4	1537
	Gear	4	14	4	8	4	5	17	7	8	3	17	6	8	8	21	13	0	355
	Jet Boat	11	10	14	17	16	12	12	13	9	7	4	3	6	3	6	5	0	484
	Drift Boats	13	6	12	8	13	7	4	12	3	3	4	5	8	0	0	1	2	341
	Guided	0	9	10	30	6	13	12	6	9	4	0	0	0	0	0	0	0	331

## Appendix 6.0 The detailed effort and catch estimates.

Table A4. The effort estimate calculations for each week of the study period.

Week	$e_{\text{daily}}$ (rod day)	$\bar{e}_{\text{week}}$ (rod day)	$\hat{E}_{\text{week}}$ (rod day)	$Var(\hat{E}_{\text{week}})$ (rod day)	95 % CI (rod day)
8/4	31,32	31.5	220.5	8.8	5.9
9/1	35,33,34	34.0	238.0	9.3	6.1
9/2	50,49,79	59.3	415.3	2709.8	104.1
9/3	99,107,82	96.0	672.0	1521.3	78.0
9/4	107, 122, 111	113.3	793.3	563.1	47.5
10/1	139, 119, 151	136.3	954.3	2439.1	98.8
10/2	161,82,69	104.0	728.0	23137.3	304.2
10/3	69,79,77	75.0	525.0	261.3	32.3
10/4	93,72,65	76.7	536.7	1981.8	89.0
10/5	73,43,28	48.0	336.0	4900.0	140.0
11/1	33,21,30	28.0	196.0	364.0	38.2
11/2	18,35	35.5	248.5	2528.8	100.6
11/3	29,7	18.0	126.0	4235.0	130.2
11/4	29,7	18.0	126.0	4235.0	130.2
<b>Totals</b>			$\hat{E} = 6115.6$	$Var(\hat{E}) = 48894.5$	442.24

Notes:

This table applies to equations 2 through 7 in section 3.3.5.3

Table A5. The first half of the catch estimate calculations in each week of the study period.

Date	$e_{\text{daily}}$ (rod day)	$L_{\text{expected}}$ (hr)	$\hat{E}_{\text{daily}}$ (hr)	$\bar{R}_{\text{daily}}$ (sthd/hr)	$\hat{C}_{\text{daily}}$ (sthd)
8/27	31	6.97	216.07	0.06	13.50
8/28	32	6.97	223.04	0.16	36.69
8/31	35	6.51	227.85	0.03	6.00
9/02	33	6.51	214.83	1.17	250.64
9/04	34	6.51	221.34	0.24	53.87
9/08	50	7.21	360.50	0.09	32.71
9/09	49	7.21	353.29	0.34	120.22
9/11	79	7.21	569.59	0.14	78.55
9/15	99	7.68	760.32	0.23	175.71
9/17	107	7.68	821.76	0.31	255.73
9/19	82	7.68	629.76	0.20	127.21
9/21	107	8.08	864.56	0.11	93.46
9/23	122	8.08	985.76	0.16	155.45
9/26	111	8.08	896.88	0.23	207.18
9/27	139	8.05	1118.95	0.12	137.07
9/30	119	8.05	957.95	0.15	141.49
10/03	151	8.05	1215.55	0.14	174.43
10/04	161	7.79	1254.19	0.15	183.74
10/09	82	7.79	638.78	0.26	163.02
10/10	69	7.79	537.51	0.14	77.08
10/13	69	7.32	505.08	0.27	135.11
10/15	79	7.32	578.28	0.25	143.41
10/16	77	7.32	563.64	0.25	138.15
10/18	93	6.71	624.03	0.22	134.48
10/20	72	6.71	483.12	0.22	106.96
10/21	65	6.71	436.15	0.31	133.33
10/25	73	6.41	467.93	0.28	131.77
10/27	43	6.41	275.63	0.30	82.06
10/29	28	6.41	179.48	0.38	68.74
11/01	33	5.11	168.63	0.38	63.42
11/03	21	5.11	107.31	0.10	10.70
11/04	30	5.11	153.30	0.18	28.13
11/09	18	3.68	66.24	0.22	14.72
11/14*	35	3.68	128.80	0.22	28.62
11/15*	29	3.68	106.72	0.22	23.71
11/18*	7	3.68	25.76	0.22	5.72

## Notes:

Catch rates were pooled for the last four days of sampling because of low sample size.

This table applies to equations 8 through 9 in section 3.3.5.3

Table A6. The second half of the catch estimate calculations in each week of the study period.

Week	$\bar{C}_{week}$ (sthd)	$\hat{C}_{week}$ (sthd)	$(Var)\hat{C}_{week}$ (sthd)	95% CI (sthd)
8/4	25.10	175.68	6585.32	162.30
9/1	103.50	724.53	274566.38	1047.98
9/2	77.16	540.13	31295.70	353.81
9/3	186.22	1303.52	68798.78	524.59
9/4	152.03	1064.22	52950.53	460.22
10/1	151.00	1056.98	6806.86	165.01
10/2	141.28	988.95	52242.26	457.13
10/3	138.89	972.23	288.35	33.96
10/4	124.92	874.47	3957.34	125.81
10/5	94.19	659.32	18024.69	268.51
11/1	34.08	238.58	11785.02	217.12
11/2	21.67	151.68	2367.11	97.31
11/3	14.72	103.03	3964.29	125.93
11/4	14.72	103.03	3964.29	125.93
Totals		$C = 8956.35$	$Var(C) 537596.91$	1466.42

Notes:

Week 11/3 and 11/4 are identical because similar effort and catch rates were used.

This table applies to equations 10 through 16 in section 3.3.5.3

Table A7. The effort estimate calculations in each river section of the study area.

Week	$e_{\text{daily}}$ (rod day)	$\bar{e}_{\text{week}}$ (rod day)	$\hat{E}_{\text{sec week}}$ (rod day)	$Var(\hat{E}_{\text{sec week}})$ (rod day)	95 % CI (rod day)
<b>Bymac</b>					
8/4	3,3	3.00	21.00	0.00	0.00
9/1	3,4,0	4.33	30.31	40.44	12.72
9/2	4,0,3	4.33	30.31	40.44	12.72
9/3	2,4	3.00	21.00	28.00	10.58
9/4	5,9,4	6.00	42.00	65.33	16.17
10/1	5,5,9	6.33	44.31	49.78	14.11
10/2	6,8,2	5.33	37.31	87.11	18.67
10/3	2,0,3	1.67	11.67	21.78	9.33
10/4	1,0,3	1.33	9.33	21.78	9.33
10/5	2,0,0	0.67	4.67	12.44	7.06
11/1	1,3,1	1.33	9.33	12.44	7.06
11/2	0,0	0.00	0.00	0.00	0.00
11/3	3,0	1.50	10.50	78.75	17.75
11/4	3,0	1.50	10.50	78.75	17.75
Totals			$\hat{E}_{\text{sec( rd )}} =$ 282.24	$Var(\hat{E}_{\text{sec( rd )}}) = 537.06$	46.35
<b>Forks</b>					
8/4	5,2	3.50	24.50	78.75	17.75
9/1	6,1,3	3.33	23.31	59.11	15.38
9/2	7,6,9	7.33	51.33	21.77	9.33
9/3	10,18	14.00	98.00	448.00	42.33
9/4	9,22,17	16.00	112.00	544.44	46.67
10/1	27,15,12	18.00	126.00	588.00	48.50
10/2	25,12,8	15.00	105.00	737.33	54.31
10/3	4,10,2	5.33	37.33	161.78	25.44
10/4	18,12,12	14.00	98.00	112.00	21.17
10/5	14,6,7	9.00	63.00	177.33	26.63
11/1	1,2,3	2.00	14.00	9.33	6.11
11/2	1,10	5.50	38.50	183.75	27.11
11/3	3,3	3.00	21.00	0.00	0.00
11/4	3,3	3.00	21.00	0.00	0.00
Totals			$\hat{E}_{\text{sec( rd )}} =$ 832.98	$Var(\hat{E}_{\text{sec( rd )}}) = 3121.60$	111.74
<b>Walcott</b>					
8/4	1,2	1.50	10.50	8.75	5.92
9/1	4,5,2	3.67	25.67	21.78	9.33
9/2	6,3,4	4.33	30.33	21.78	9.33
9/3	2,6,4	4.00	28.00	56.00	14.97
9/4	14,3,11	9.33	65.33	301.78	34.74
10/1	20,4,16	13.33	93.33	647.11	50.88
10/2	10,17,2	9.67	67.67	525.78	45.86
10/3	9,18,8	11.67	81.67	283.11	33.65
10/4	10,9,0	6.33	44.33	283.11	33.65
10/5	1,0,2	1.00	7.00	9.33	6.11
11/1	0,2,4	2.00	14.00	37.33	12.22
11/2	0,0	0.00	0.00	0.00	0.00
11/3	0,0	0.00	0.00	0.00	0.00
11/4	0,0	0.00	0.00	0.00	0.00

Week	$e_{\text{daily}}$ (rod day)	$\bar{e}_{\text{week}}$ (rod day)	$\hat{E}_{\text{sec week}}$ (rod day)	$Var(\hat{E}_{\text{sec week}})$ (rod day)	95 % CI (rod day)
Totals			$\hat{E}_{\text{sec( rd )}} = 467.83$	$Var(\hat{E}_{\text{sec( rd )}}) = 2195.86$	93.72
Quick					
8/4	0,5	2.50	17.50	218.75	29.58
9/1	8,6,7	7.00	49.00	9.33	6.11
9/2	1,7,19	9.00	63.00	784.00	56.00
9/3	4,12,7	7.67	53.67	228.67	30.24
9/4	26,16,25	22.33	156.33	283.11	33.65
10/1	23,17,32	24.00	168.00	532.00	46.13
10/2	10,18,8	12.00	84.00	261.33	32.33
10/3	11,17,18	15.33	107.33	133.78	23.13
10/4	5,8,5	6.00	42.00	28.00	10.58
10/5	11,3,4	6.00	42.00	177.33	26.63
11/1	5,4,3	4.00	28.00	9.33	6.11
11/2	5,4	3.50	24.50	8.75	5.92
11/3	2,1	1.50	10.50	8.75	5.92
11/4	2,1	1.50	10.50	8.75	5.92
Totals			$\hat{E}_{\text{sec( rd )}} = 856.33$	$Var(\hat{E}_{\text{sec( rd )}}) = 2691.89$	103.77
Telkwa					
8/4	9,5	7.00	49.00	140.00	23.66
9/1	2,5,10	5.67	39.67	152.44	24.69
9/2	15,12,13	13.33	93.33	21.78	9.33
9/3	25,22,15	20.67	144.67	368.67	38.40
9/4	19,9,11	13.00	91.00	261.33	32.33
10/1	16,23,31	23.33	163.33	525.78	45.86
10/2	30,6,22	19.33	135.33	1393.78	74.67
10/3	5,10,18	11.00	77.00	401.33	40.07
10/4	18,12,9	13.00	91.00	196.00	28.00
10/5	10,6,1	5.67	39.67	189.78	27.55
11/1	9,4,1	4.67	32.67	152.44	24.69
11/2	0,0	0.00	0.00	0.00	0.00
11/3	7,2	4.50	31.50	218.75	29.58
11/4	7,2	4.50	31.50	218.75	29.58
Totals			$\hat{E}_{\text{sec( rd )}} = 1019.67$	$Var(\hat{E}_{\text{sec( rd )}}) = 4240.83$	130.24
Smithers Bridge					
8/4	2,0	1.00	7.00	8.75	5.92
9/1	1,4,6	3.67	25.67	59.11	15.38
9/2	4,1,12	5.67	39.67	301.78	34.74
9/3	8,3,5	5.33	37.33	88.67	18.83
9/4	6,8,10	8.00	56.00	37.33	12.22
10/1	14,2,15	10.33	72.33	488.44	44.20
10/2	18,2,6	8.67	60.67	647.11	50.88
10/3	12,4,4,	6.67	46.67	199.11	28.22
10/4	6,2,9	5.67	39.67	115.11	21.46
10/5	10,1,0	3.67	25.67	283.11	33.65
11/1	6,2,8	5.33	37.33	87.11	18.67
11/2	4,4	4.00	28.00	0.00	0.00

Week	$e_{\text{daily}}$ (rod day)	$\bar{e}_{\text{week}}$ (rod day)	$\hat{E}_{\text{sec week}}$ (rod day)	$Var(\hat{E}_{\text{secweek}})$ (rod day)	95 % CI (rod day)
11/3	6,0	3.00	21.00	315.00	35.50
11/4	6,0	3.00	21.00	315.00	35.50
Totals			$\hat{E}_{\text{sec( rd )}} =$ 518.00	$Var(\hat{E}_{\text{sec( rd )}})=2945.64$	108.55
Chicken Creek					
8/4	7,14	10.50	73.50	428.75	41.41
9/1	3,1,5	3.00	21.00	37.33	12.22
9/2	5,2,6	4.33	30.33	40.44	12.72
9/3	32,22,18	24.00	168.00	728.00	53.96
9/4	24,29,14	22.33	156.33	544.44	46.67
10/1	14,32,17	21.00	147.00	868.00	58.92
10/2	39,18,12	23.00	161.00	1876.00	86.63
10/3	21,10,13	14.67	102.67	301.78	34.74
10/4	19,13,11	14.33	100.33	161.78	25.44
10/5	13,13,6	10.67	74.67	152.44	24.69
11/1	8,4,7	6.33	44.33	40.44	12.72
11/2	6,13	9.50	66.50	428.75	41.41
11/3	4,0	2.00	14.00	140.00	23.66
11/4	4,0	2.00	14.00	140.00	23.66
Totals			$\hat{E}_{\text{sec( rd )}} =$ 1173.67	$Var(\hat{E}_{\text{sec( rd )}})=5888.17$	153.47
Trout Creek					
8/4	1,0	0.50	3.50	8.75	5.92
9/1	3,1,0	1.33	9.33	21.78	9.33
9/2	8,1,4	4.33	30.33	115.11	21.46
9/3	1,11,5	5.67	39.67	354.67	37.67
9/4	2,5,2	3.00	21.00	28.00	10.58
10/1	3,1,4	2.67	18.67	21.78	9.33
10/2	9,1,0	3.33	23.33	227.11	30.14
10/3	4,4,2	3.33	23.33	12.44	7.06
10/4	3,2,2	2.33	16.33	3.11	3.53
10/5	3,7,0	3.33	23.33	115.11	21.46
11/1	0,0,0	0.00	0.00	0.00	0.00
11/2	0,0	0.00	0.00	0.00	0.00
11/3	2,0	1.00	7.00	35.00	11.83
11/4	2,0	1.00	7.00	35.00	11.83
Totals			$\hat{E}_{\text{sec( rd )}} =$ 222.83	$Var(\hat{E}_{\text{sec( rd )}})=977.86$	62.54
Moricetown					
8/4	3,1	2.00	14.00	35.00	11.83
9/1	5,6,1	4.00	28.00	65.33	16.17
9/2	13,4	8.50	59.50	708.75	53.24
9/3	15,16,3	8.00	56.00	732.67	54.14
9/4	2,19,17	12.67	88.67	805.78	56.77
10/1	17,19,15	17.00	119.00	37.33	12.22
10/2	14,0,7	7.00	49.00	457.33	42.77
10/3	1,8,9	6.00	42.00	177.33	26.63
10/4	13,14,14	13.67	95.67	3.11	3.53
10/5	9,7,8	8.00	56.00	9.33	6.11

Week	$e_{\text{daily}}$ (rod day)	$\bar{e}_{\text{week}}$ (rod day)	$\hat{E}_{\text{sec week}}$ (rod day)	$Var(\hat{E}_{\text{secweek}})$ (rod day)	95 % CI (rod day)
11/1	3,0,0	1.00	7.00	28.00	10.58
11/2	2,4	3.00	21.00	35.00	11.83
11/3	2,1	1.50	10.50	8.75	5.92
11/4	2,1	1.50	10.50	8.75	5.92
Totals			$\hat{E}_{\text{sec( rd )}} =$ 656.83	$Var(\hat{E}_{\text{sec( rd )}})=3112.47$	111.58
Suskwa					
8/4	0,0	0.00	0.00	0.00	0.00
9/1	0,0,0	0.00	0.00	0.00	0.00
9/2	4,5	4.50	31.50	8.75	5.92
9/3	0,4,3	2.33	16.33	60.67	15.58
9/4	2,0	1.00	7.00	28.00	10.58
10/1	0,1,0	0.33	2.33	3.11	3.53
10/2	0,0,2	0.67	4.67	12.44	7.06
10/3	0,0,0	0.00	0.00	0.00	0.00
10/4	0,0,0	0.00	0.00	0.00	0.00
10/5	0,0,0	0.00	0.00	0.00	0.00
11/1	0,0,3		0.00	0.00	0.00
11/2	0,0,	0.00	0.00	0.00	0.00
11/3	0,0	0.00	0.00	0.00	0.00
11/4	0,0	0.00	0.00	0.00	0.00
Totals			$\hat{E}_{\text{sec( rd )}} =$ 61.83	$Var(\hat{E}_{\text{sec( rd )}})=112.97$	21.26

## Notes:

Week 11/3 and 11/4 are identical because similar effort and catch rates were used for each river section.

This table applies to equations 17 through 19 in section 3.3.5.3

Table A8. The catch estimate calculations in each river section of the study area.

Week	$e_{daily}(rd)$	$L_{expected}$ (hr)	$\hat{e}_{daily}(hr)$	$\bar{e}_{week}(hr)$	$\hat{E}_{secweek}(hr)$	$Var(\hat{E}_{secweek}(hr))$	$\bar{R}_{(week)}$ (sthd/hr)	$\hat{C}_{secweek}$ (sthd)	$Var(\hat{C}_{week})$ (sthd)	95 % CI (sthd)
<b>Bynac</b>										
8/4	3,3	6.97	20.91,20.91	20.91	146.37	0.00	0.09	13.77	826.97	28.76
9/1	3,4,0	6.51	19.53, 26.04, 0	15.19	106.33	1714.07	0.09	10.00	517.75	22.75
9/2	4,0,3	7.21	28.84, 0, 21.63	16.82	117.76	2102.43	0.00	0.00	0.00	0.00
9/3	2,4	7.68	15.36, 30.72	23.04	161.28	1651.44	0.56	90.64	15155.15	123.11
9/4	5,9,4	8.08	40.4, 72.72, 32.32	48.48	339.36	4193.09	0.31	104.52	38353.71	195.84
10/1	5,5,9	8.05	40.25, 40.25, 72.45	50.98	356.88	3225.69	0.12	43.29	12475.85	111.70
10/2	6,8,2	7.79	46.74, 62.32, 15.58	41.55	290.83	5483.24	0.00	0.00	0.00	0.00
10/3	2,0,3	7.32	14.64, 0, 21.96	12.20	85.40	1166.91	0.55	46.89	5808.58	76.21
10/4	1,0,3	6.71	6.71, 0, 20.13	8.95	62.63	980.52	1.15	72.00	4325.89	65.77
10/5	2,0,0	6.41	12.82, 0, 0	4.27	29.91	511.32	0.10	2.93	22.31	4.72
11/1	1,3,1	5.11	5.11, 15.33, 5.11	8.52	59.62	324.95	0.33	19.87	1758.79	41.94
11/2	0,0	3.68	0, 0	0.00	0.00	0.00	0.33	0.00	0.00	0.00
11/3	3,0	3.68	11.04, 0	5.52	38.64	1066.46	0.33	12.88	1254.90	35.42
11/4	3,0	3.68	11.04, 0	5.52	38.64	1066.46	0.33	12.88	1254.90	35.42
Totals					1833.66	23486.59		$C_{sec} = 429.68$	$Var(C_{sec}) = 80927.82$	284.48
<b>Forks</b>										
8/4	5,2	6.97	34.85, 13.94	24.40	170.77	3825.75	0.11	19.26	1286.66	35.87
9/1	6,1,3	6.51	39.06, 6.51, 19.53	21.70	151.90	2505.13	0.11	17.13	991.85	31.49
9/2	7,6,9	7.21	50.47, 43.26, 64.89	52.87	370.11	11398.77	0.19	71.28	40931.30	202.31
9/3	10,18	7.68	76.8, 138.24	107.52	752.64	26424.12	0.23	170.02	72495.37	269.25
9/4	9,22,17	8.08	72.72, 177.76, 137.36	129.28	904.96	26201.61	0.15	135.74	102853.20	320.71
10/1	27,15,12	8.05	217.35, 120.75, 96.6	144.90	1014.30	38103.87	0.15	148.29	51930.03	227.88
10/2	25,12,8	7.79	194.75, 93.48, 62.32	116.85	817.95	44744.41	0.23	185.76	52472.59	229.07
10/3	4,10,2	7.32	29.28, 73.2, 14.64	39.04	273.28	8668.44	0.04	10.41	859.42	29.32
10/4	18,12,12	6.71	120.78, 80.52, 80.52	93.93	657.53	5042.70	0.30	197.92	96245.89	310.24
10/5	14,6,7	6.41	89.74, 38.46, 44.87	57.69	403.83	7286.29	0.27	107.06	20104.04	141.79
11/1	1,2,3	5.11	5.11, 10.22, 15.33	10.22	71.54	243.71	0.60	42.64	2751.36	52.45

Week	$e_{daily(rad)}$	$L_{expected}$ (hr)	$\hat{e}_{daily}(hr)$	$\bar{e}_{week}(hr)$	$\hat{E}_{secweek}(hr)$	$Var(\hat{E}_{secweek}(hr))$	$\bar{R}_{(week)}$ (sthdl/hr)	$\hat{C}_{secweek}$ (sthdl)	$Var(\hat{C}_{week})$ (sthdl)	95 % CI (sthdl)
11/2	1,10	3.68	3.68, 36.8	20.24	141.68	9598.18	0.60	84.46	18157.26	134.75
11/3	3,3	3.68	11.04, 11.04	11.04	77.28	0.00	0.60	46.07	2968.18	54.48
11/4	3,3	3.68	11.04, 11.04	11.04	77.28	0.00	0.60	46.07	2968.18	54.48
Totals					5885.05	184042.98		$C_{sec} = 1282.11$	$Var(C_{sec}) = 465728.66$	682.44
Walcott										
8/4	1,2	6.97	6.97, 13.94	10.46	73.19	425.08	0.86	63.06	3385.34	58.18
9/1	4,5,2	6.51	26.04, 32.55, 13.02	20.87	146.09	922.94	0.86	125.87	12507.99	111.84
9/2	6,3,4	7.21	43.26, 21.63, 28.84	31.24	218.70	1132.10	0.15	32.46	2232.19	47.25
9/3	2,6,4	7.68	15.36, 46.08, 30.72	30.72	215.04	3303.01	0.56	119.63	34118.39	184.71
9/4	14,3,11	8.08	113.12, 24.24, 88.88	75.41	527.89	19701.99	0.19	97.66	39462.83	198.65
10/1	20,4,16	8.05	161, 32.2, 128.8	107.33	751.33	41934.42	0.17	130.13	29445.10	171.60
10/2	10,17,2	7.79	77.9, 13.43, 15.58	35.64	249.46	12514.11	0.51	127.78	4193.69	64.76
10/3	9,18,8	7.32	65.88, 131.76, 58.56	85.40	597.80	15169.77	0.15	87.52	10700.22	103.44
10/4	10,9,0	6.71	67.1, 60.39, 0	42.50	297.48	12746.82	0.22	64.08	9025.65	95.00
10/5	1,0,2	6.41	6.41, 0, 12.82	6.41	44.87	383.49	0.77	34.34	536.19	23.16
11/1	0,2,4	5.11	0, 10.22, 20.44	10.22	71.54	974.85	0.15	10.55	819.37	28.62
11/2	0,0	3.68	0,0	0.00	0.00	0.00	0.15	0.00	0.00	0.00
11/3	0,0	3.68	0,0	0.00	0.00	0.00	0.15	0.00	0.00	0.00
11/4	0,0	3.68	0,0	0.00	0.00	0.00	0.15	0.00	0.00	0.00
Totals					3193.39	109208.60		$C_{sec} = 893.06$	$Var(C_{sec}) = 143041.62$	378.21
Quick										
8/4	0,5	6.97	0, 34.85	17.43	121.98	10627.08	0.11	13.42	888.13	29.80
9/1	8,6,7	6.51	52.08, 39.06, 45.57	45.57	318.99	395.55	0.11	35.09	3046.82	55.20
9/2	1,7,19	7.21	7.21, 50.47, 136.99	64.89	454.23	40755.54	0.12	54.05	11453.62	107.02
9/3	4,12,7	7.68	30.72, 92.16, 53.76	58.88	412.16	13487.31	0.09	35.52	5186.69	72.02
9/4	26,16,25	8.08	210.08, 129.28, 202	180.45	1263.17	18483.31	0.12	152.47	78843.18	280.79
10/1	23,17,32	8.05	185.15, 136.85, 257.6	193.20	1352.40	34474.93	0.08	101.46	32301.45	179.73
10/2	10,18,8	7.79	77.9, 140.22, 62.32	93.48	654.36	15571.06	0.10	66.48	10850.87	104.17

Week	$e_{daily}(rd)$	$L_{expected}$ (hr)	$\hat{e}_{daily}(hr)$	$\bar{e}_{week}(hr)$	$\hat{E}_{secweek}(hr)$	$Var(\hat{E}_{secweek}(hr))$	$\bar{R}_{(week)}$ (sthd/hr)	$\hat{C}_{secweek}$ (sthd)	$Var(\hat{C}_{week})$ (sthd)	95 % CI (sthd)
10/3	11,17,18	7.32	80.52, 124.44, 131.76	112.24	785.68	7168.13	0.28	219.83	114837.58	338.88
10/4	5,8,5	6.71	33.55, 53.68, 33.55	40.26	281.82	1260.67	0.18	50.45	8512.13	92.26
10/5	11,3,4	6.41	70.51, 19.23, 25.64	38.46	269.22	7286.29	0.12	31.74	5121.74	71.57
11/1	5,4,3	5.11	25.55, 20.44, 15.33	20.44	143.08	243.71	0.05	7.82	435.13	20.86
11/2	5,4	3.68	18.4, 14.70	16.55	115.85	119.79	0.05	6.33	284.31	16.86
11/3	2,1	3.68	7.36, 3.68	5.52	38.64	118.50	0.05	2.11	34.15	5.84
11/4	2,1	3.68	7.36, 3.68	5.52	38.64	118.50	0.05	2.11	34.15	5.84
Totals					6250.22	150110.36		$C_{sec} = 776.77$	$Var(C_{sec}) = 270941.81$	520.52
Telkwa										
8/4	9,5	6.97	62.73, 34.85	50.29	352.03	6801.35	0.14	48.37	9301.48	96.44
9/1	2,5,10	6.51	13.02, 32.55, 65.10	36.89	258.23	6460.61	0.14	35.48	5254.44	72.49
9/2	15,12,13	7.21	108.15, 86.52, 93.73	96.13	672.93	1132.10	0.09	60.76	15131.01	123.01
9/3	25,22,15	7.68	192, 168.96, 115.2	158.72	1111.04	21744.85	0.18	204.21	110082.86	331.79
9/4	19,9,11	8.08	153.52, 72.72, 88.88	105.04	735.28	17061.51	0.05	34.11	8998.93	94.86
10/1	16,23,31	8.05	128.8, 185.15, 249.55	187.83	1314.83	34071.72	0.09	114.94	64551.83	254.07
10/2	30,6,22	7.79	233.7, 46.74, 171.38	150.61	1054.25	84580.15	0.09	93.88	39325.96	198.31
10/3	5,10,18	7.32	36.6, 73.2, 131.76	80.52	563.64	21504.40	0.30	167.74	79580.08	282.10
10/4	18,12,9	6.71	120.78, 80.52, 60.39	87.23	610.61	8824.72	0.13	81.39	30312.50	174.10
10/5	10,6,1	6.41	64.1, 38.46, 6.41	36.32	254.26	1193163.39	0.17	43.05	122761.66	350.37
11/1	9,4,1	5.11	45.99, 20.44, 5.11	23.85	166.93	3980.64	0.17	27.96	5429.82	73.69
11/2	0,0	3.68	0,0	0.00	0.00	0.00	0.17	0.00	0.00	0.00
11/3	7,2	3.68	25.76, 7.36	16.56	115.92	2962.40	0.17	19.42	2821.89	53.12
11/4	7,2	3.68	25.76, 7.36	16.56	115.92	2962.40	0.17	19.42	2821.89	53.12
Totals					7325.87	1405250.25		$C_{sec} = 950.72$	$Var(C_{sec}) = 487072.87$	697.91
Smithers Bridge										
8/4	2,0	6.97	13.94, 0	6.97	48.79	1700.33	0.04	2.03	31.29	5.59

Week	$e_{daily(n)}:$	$L_{expected}$ (hr)	$\hat{e}_{daily}(hr)$	$\bar{e}_{week}(hr)$	$\hat{E}_{seewek}(hr)$	$Var(\hat{E}_{seewek}(hr))$	$\bar{R}_{(week)}$ (sthd/hr)	$\hat{C}_{seewek}$ (sthd)	$Var(\hat{C}_{seewek})$ (sthd)	95 % CI (sthd)
9/1	1,4,6	6.51	6.51, 26.04, 39.06	23.87	167.09	2505.13	0.04	6.96	215.62	14.68
9/2	4,1,12	7.21	28.84, 7.21, 86.52	40.86	286.00	15687.65	0.07	20.43	2069.64	45.49
9/3	8,3,5	7.68	61.44, 23.04, 38.4	40.96	286.72	5229.78	0.19	53.87	1584.53	39.81
9/4	6,8,10	8.08	48.48, 64.64, 80.80	64.64	452.48	2437.36	0.05	24.05	4966.67	70.47
10/1	14,2,15	8.05	112.7, 16.1, 120.75	83.18	582.28	31652.42	0.16	92.35	19991.36	141.39
10/2	18,2,6	7.79	140.22, 15.58, 46.74	67.51	472.59	39269.36	0.37	176.89	185917.35	431.18
10/3	12,4,4	7.32	84.84, 29.28, 29.28	47.80	334.60	9603.73	0.10	32.70	4539.64	67.38
10/4	6,2,9	6.71	40.26, 13.42, 60.39	38.02	266.16	5182.77	0.38	102.23	16577.97	128.76
10/5	10,1,0	6.41	64.1, 6.41, 0	23.50	164.52	11632.50	0.38	63.29	9345.52	96.67
11/1	6,2,8	5.11	30.66, 10.22, 40.88	27.25	190.77	2274.65	0.29	54.62	12831.25	113.28
11/2	4,4	3.68	14.72, 14.72	14.72	103.04	0.00	0.29	29.50	3471.84	58.92
11/3	6,0	3.68	22.08, 0	11.04	77.28	4265.86	0.29	22.13	3697.51	60.81
11/4	6,0	3.68	22.08, 0	11.04	77.28	4265.86	0.29	22.13	3697.51	60.81
Totals					3509.61	135707.40		$C_{sec} = 703.19$	$2 Var(C_{sec}) = 68937.69$	518.59
Chicken Creek										
8/4	7,14	6.97	48.79, 97.58	73.19	512.30	20829.07	0.15	77.66	30505.88	174.66
9/1	3,1,5	6.51	19.53, 6.51, 32.55	19.53	136.71	1582.19	0.15	20.73	2185.18	46.75
9/2	5,2,6	7.21	36.05, 14.42, 43.26	31.24	218.70	2102.47	0.21	46.34	5886.70	76.72
9/3	32,22,18	7.68	245.76, 168.96, 138.24	184.32	1290.24	42939.19	0.13	172.12	128906.82	359.04
9/4	24,29,14	8.08	193.92, 234.32, 113.12	180.45	1263.17	35538.54	0.20	250.87	103544.03	321.78
10/1	14,32,17	8.05	112.7, 257.6, 136.85	169.05	1183.35	56248.57	0.17	199.16	100610.58	317.19
10/2	39,18,12	7.79	303.81, 140.22, 93.48	179.17	1254.19	113843.38	0.13	160.41	96156.43	310.09
10/3	21,10,13	7.32	153.72, 73.2, 95.16	107.36	751.52	16169.98	0.19	145.27	66832.75	258.52
10/4	19,13,11	6.71	127.49, 87.23, 73.81	96.18	673.24	7283.90	0.30	203.32	74809.89	273.51
10/5	13,13,6	6.41	83.33, 83.33, 38.46	68.37	478.61	6263.65	0.38	181.83	199526.21	446.68
11/1	8,4,7	5.11	40.88, 20.44, 35.77	22.36	156.54	1056.09	0.10	15.29	595.95	24.41
11/2	6,13	3.68	22.08, 47.84	34.96	244.72	5806.31	0.10	23.90	1561.10	39.51

Week	$e_{daily(rd)}$	$L_{expected}$ (hr)	$\hat{e}_{daily}(hr)$	$\bar{e}_{week}(hr)$	$\hat{E}_{secweek}(hr)$	$Var(\hat{E}_{secweek}(hr))$	$\bar{R}_{(week)}$ (sthd/hr)	$\hat{C}_{secweek}$ (sthd)	$Var(\hat{C}_{week})$ (sthd)	95 % CI (sthd)
11/3	4,0	3.68	14.72, 0	7.36	51.52	1895.94	0.10	5.03	122.38	11.06
11/4	4,0	3.68	14.72, 0	7.36	51.52	1895.94	0.10	5.03	122.38	11.06
Totals					8266.33	313455.20		$C_{sec} = 1506.95$	$Var(C_{sec}) = 780860.39$	883.66
Trout Creek										
8/4	1,0	6.97	6.97, 0	3.49	24.40	425.08	1.17	28.46	1995.56	44.67
9/1	3,1,0	6.51	19.53, 6.51, 0	8.68	60.76	922.94	1.17	70.89	7665.77	87.55
9/2	8,1,4	7.21	57.68, 7.21, 28.84	31.24	218.70	5983.95	0.27	59.57	6901.83	83.08
9/3	1,11,5	7.68	7.68, 84.48, 38.4	43.52	304.64	20919.09	0.25	75.82	8701.71	93.28
9/4	2,5,2	8.08	16.16, 40.4, 16.16	24.24	169.68	1828.02	0.09	14.57	436.32	20.89
10/1	3,1,4	8.05	24.15, 8.05, 32.2	21.47	150.27	1411.25	0.18	27.29	2281.09	47.76
10/2	9,1,0	7.79	70.11, 7.79, 0	25.97	181.77	13782.03	0.22	39.84	5391.14	73.42
10/3	4,4,2	7.32	29.28, 29.28, 14.64	24.40	170.80	666.80	0.24	41.42	6961.96	83.44
10/4	3,2,2	6.71	20.13, 13.42, 13.42	15.66	109.60	140.07	0.08	8.93	3789.77	61.56
10/5	3,7,0	6.41	19.23, 44.87, 0	21.37	149.57	4729.70	0.97	145.78	24384.72	156.16
11/1	0,0,0	5.11	0,0,0	0.00	0.00	0.00	0.40	0.00	0.00	0.00
11/2	0,0	3.68	0,0	0.00	0.00	0.00	0.40	0.00	0.00	0.00
11/3	2,0	3.68	7.36,0	2.45	17.17	473.98	0.40	6.86	417.85	20.44
11/4	2,0	3.68	7.36,0	2.45	17.17	473.98	0.40	6.86	417.85	20.44
Totals					1574.52	51756.92		$C_{sec} = 526.30$	$Var(C_{sec}) = 67350.02$	259.52
Morictown										
8/4	3,1	6.97	20.91, 6.97	13.94	97.58	1700.33	1.17	113.84	17901.22	133.80
9/1	5,6,1	6.51	32.55, 39.06, 6.51	26.04	182.28	2768.83	1.17	212.66	53763.24	231.87
9/2	13,4	7.21	93.73, 28.84	61.29	429.00	36843.75	0.27	113.68	15787.17	125.65
9/3	15,16,3	7.68	115.2, 122.88, 23.04	87.04	609.28	43214.44	0.16	94.62	23023.96	151.74
9/4	2,19,17	8.08	16.16, 153.52, 145.44	105.04	735.28	55449.92	0.22	162.28	39217.15	198.03
10/1	17,19,15	8.05	136.85, 152.95, 120.75	136.85	957.95	2419.29	0.12	111.12	32658.86	180.72
10/2	14,0,7	7.79	109.06, 0, 54.53	54.53	381.71	27752.86	0.28	108.67	27573.97	166.05
10/3	1,8,9	7.32	7.32, 58.56, 65.88	43.92	307.44	9501.95	0.16	49.68	8929.76	94.50
10/4	13,14,14	6.71	87.23, 93.94, 93.94	91.70	641.92	140.07	0.08	52.33	128526.65	358.51

Week	$e_{daily(rd)}$	$L_{expected}$ (hr)	$\hat{e}_{daily(hr)}$	$\bar{e}_{week}(hr)$	$\hat{E}_{secweek(hr)}$	$Var(\hat{E}_{secweek(hr)})$	$\bar{R}_{(week)}$ (sthd/hr)	$\hat{C}_{secweek}$ (sthd)	$Var(\hat{C}_{week})$ (sthd)	95 % CI (sthd)
10/5	9,7,8	6.41	60.39, 44.87, 51.28	52.18	365.26	567.70	0.97	356.02	98882.54	314.46
11/1	3,0,0	5.11	15.33, 0, 0	5.11	35.77	731.14	0.40	14.29	1011.48	31.80
11/2	2,4	3.68	7.36, 14.72	11.04	77.28	473.98	0.40	30.88	2944.24	54.26
11/3	2,1	3.68	7.36, 14.72	11.04	77.28	473.98	0.40	30.88	2944.24	54.26
11/4	2,1	3.68	7.36, 14.72	11.04	77.28	473.98	0.40	30.88	2944.24	54.26
Totals					4975.31	182512.24		$C_{sec} = 1481.84$	$Var(C_{sec}) = 438207.49$	661.97
Suskwa										
8/4	0,0	6.97	0,0	0.00	0.00	0.00	2.00	0.00	0.00	0.00
9/1	0,0,0	6.51	0,0,0	0.00	0.00	0.00	2.00	0.00	0.00	0.00
9/2	4,5	7.21	28.84, 36.05	32.45	227.12	454.86	0.27	60.19	3141.62	56.05
9/3	0,4,3	7.68	0, 30.72, 23.04	17.92	125.44	3578.27	0.16	19.48	1110.69	33.33
9/4	2,0	8.08	16.16, 0	10.67	74.67	1194.67	0.22	16.48	472.91	21.75
10/1	0,1,0	8.05	0, 8.05, 0	2.68	18.78	201.61	0.12	2.18	22.37	4.73
10/2	0,0,2	7.79	0,0, 15.58	5.19	36.35	755.18	0.28	10.35	364.41	19.09
10/3	0,0,0	7.32	0, 0, 0	0.00	0.00	0.00	0.16	0.00	0.00	0.00
10/4	0,0,0	6.71	0, 0, 0	0.00	0.00	0.00	0.08	0.00	0.00	0.00
10/5	0,0,0	6.41	0, 0, 0	0.00	0.00	0.00	0.97	0.00	0.00	0.00
11/1	0,0,3	5.11	0, 0, 15.33	5.11	35.77	731.14	0.40	14.29	1011.48	31.80
11/2	0,0,	3.68	0, 0	0.00	0.00	0.00	0.40	0.00	0.00	0.00
11/3	0,0	3.68	0, 0	0.00	0.00	0.00	0.40	0.00	0.00	0.00
11/4	0,0	3.68	0, 0	0.00	0.00	0.00	0.40	0.00	0.00	0.00
Totals					518.13	6915.72		$C_{sec} = 122.97$	$Var(C_{sec}) = 6123.48$	78.25

Notes:

Week 11/3 and 11/4 are identical because similar effort and catch rates were used for each river section.  
Catch rates from the Moricetown to Suskwa river section were also used downstream of the Suskwa River.  
This table applies to equations 20 through 27 in section 3.3.5.3

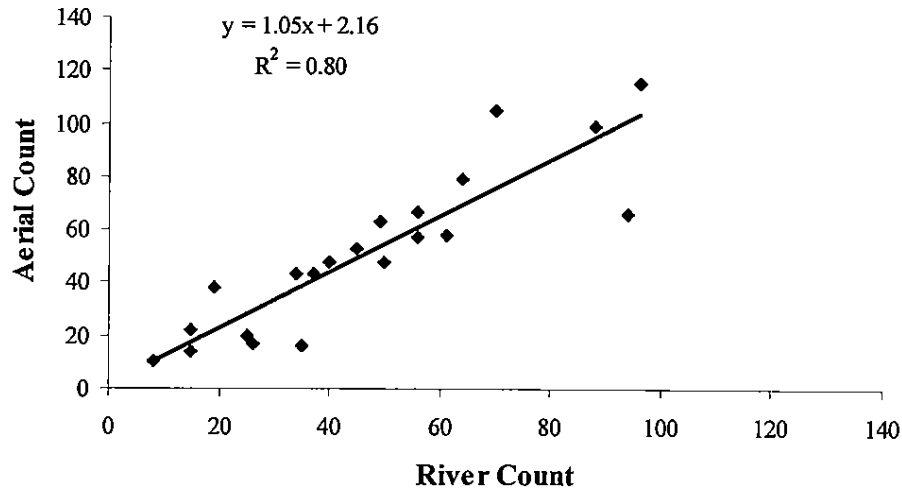
**Appendix 7.0 The correlation plots for aerial and river counts.**

Figure 20. The correlation between total anglers counted each day by the aerial flights and the River Guardians between Bymac and Chicken Creek and from September 21 to November 9.

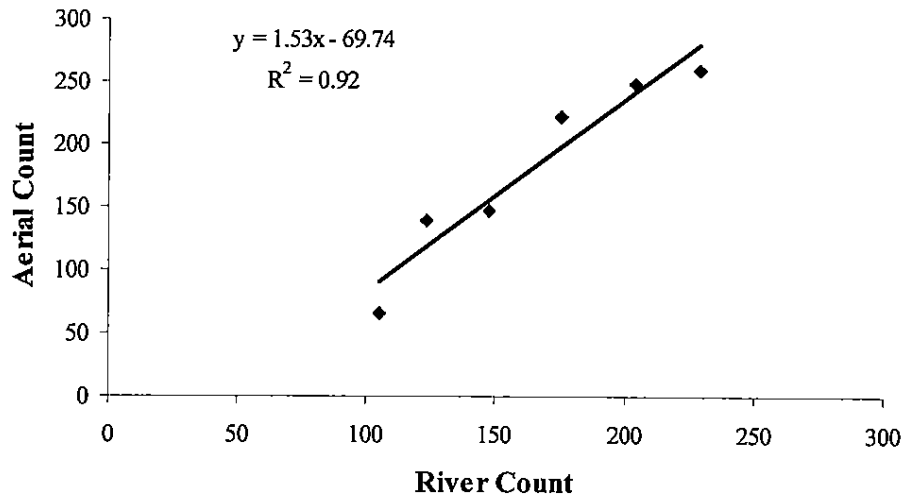


Figure 21. The correlation between anglers the total anglers counted in each river section by the aerial flights and the River Guardians between Bymac and Chicken Creek and from September 21 to November 9.