

**A SURVEY OF  
BULKLEY RIVER STEELHEAD ANGLERS  
DURING THE CLASSIFIED WATERS PERIOD  
OF 1997**

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Skeena Fisheries Report SK# 113

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## Executive Summary

### Interviews

- ◆ Four-hundred and sixty-nine steelhead (*Oncorhynchus mykiss*) anglers (469) were observed by the Interview Teams and 374 anglers were approached for an interview on the Bulkley River. Of those 374, 361 anglers at least partially completed the interview.
- ◆ The majority of time spent interviewing was in the first six weeks of the classified waters period and consequently, most interviews (83.7 percent) were conducted then.
- ◆ Most anglers (27 percent) were interviewed between Telkwa and just upstream of the Smithers bridge, 15 percent were interviewed between Trout Creek and Moricetown, 13 percent were interviewed between Quick and Telkwa and 12 percent were interviewed between Bymac and the Forks.

### Angler Characteristics

- ◆ Fifty percent (178 interviews) of all anglers interviewed were B.C. residents. Of all B.C. resident interviews, more than half (93 anglers) were from the Skeena Region and most Skeena Region anglers (89 percent, 83 interviews) resided in the Bulkley Valley. Residents from other areas of B.C. represented 40 percent of B.C. resident angler interviews.
- ◆ Eight percent (29 interviews) of all anglers interviewed lived in other Canadian provinces and 42 percent (149 interviews) were Non-Canadian residents.
- ◆ The Interview Team interviewed more B.C. residents than Non-Canadian residents in the shoulder weeks of the classified waters period. Conversely, more Non-Canadian residents were interviewed than B.C. residents in the middle of the classified waters period.
- ◆ Ninety-six percent of anglers interviewed were male, and only four percent were female. Overall, males were 44.9 years old and females were 45.4 years old.
- ◆ On average, Bulkley River anglers had been steelhead angling for 11.5 years. Over half of B.C. residents (51.4 percent) had more than ten years of steelhead angling experience whereas 35 percent of Non-Canadian residents and 15 percent of Canadian residents had more than ten years steelhead angling experience.
- ◆ Fifty-three percent of Bulkley River anglers interviewed were a member of at least one conservation club. More Canadian (82 percent) and Non-Canadian (64 percent) residents were a member of a conservation club than B.C. residents (40 percent). Of those anglers that were a member of at least one conservation club, 46 percent were a member of the B.C. Steelhead Society, 19 percent were a member of Trout Unlimited, 12 percent were a member of a local angling clubs, nine percent were a member of

Ducks Unlimited and six percent were a member of a foreign national angling club. Two anglers (1.3 percent) were members of the B.C. Wildlife Federation.

- ◆ Of all angler interviewed, 16 percent were guided and 84 percent were non-guided. Few B.C. residents interviewed were guided anglers (3 percent), while 33 percent of Non-Canadian residents interviewed were guided.
- ◆ Of all anglers interviewed, fly anglers were more common than gear anglers (81 and 19 percent, respectively). Among gear anglers, B.C. residents were approximately three times as frequent as Non-Canadian residents, but among fly anglers, B.C. residents and Non-Canadian residents were approximately equal.
- ◆ Of all anglers interviewed, about half were shore-access anglers (49.2 percent), whereas the other half gained access from a boat (50.7 percent). Slightly more anglers gained boat-access with a jet boat than a drift boat (26.4 and 24.3 percent, respectively).
- ◆ Overall, 92 percent of jet boat-access anglers were fly fishing and 95 percent of drift boat-access interviewed anglers were fly fishing. Fishing with gear was more common among shore-access anglers (31.5 percent) than jet or drift boat-access anglers (7.5 and 4.6 percent, respectively).
- ◆ Six percent of anglers interviewed were cited for an infraction. The majority of anglers with at least one citation were B.C. residents (65 percent), followed by Non-Canadian residents (17 percent) and Canadian residents (4 percent). Infractions were most prevalent during the first two weeks and declined steadily thereafter thus suggesting the River Guardian program had a positive effect on angler compliance with regulations.
- ◆ Failure to buy a classified waters license was the most frequent infraction cited (66.7 percent). None of the infractions cited were for illegal guiding.

#### **Angler Perceptions of Problems and Preferences for Management Strategies**

- ◆ A majority of anglers perceived no problems with the overall number of anglers, the number of boat-based anglers or the number of shore-based anglers.
- ◆ Among individual anglers responding to the question, 10 percent (27 anglers) perceived a major problem, 19 percent (53 anglers) perceived a minor problem and 69 percent (177 anglers) perceived no problems with the overall number of anglers on the river. Thirteen percent (35 anglers) perceived a major problem, 22 percent (58 anglers) perceived a minor problem and 64 percent (176 anglers) perceived no problems with the number of boat-based anglers on the river. Nine anglers (3.4 percent) perceived a major problem, 15 percent (40 anglers) perceived a minor problem and 80 percent (218 anglers) perceived no problems with the number of shore-based anglers on the river.

- ◆ B.C. residents perceived more problems than Canadian and Non-Canadian residents. In 1997, B.C. residents were most concerned with the number of anglers on the river, whereas Non-Residents appeared to be more concerned with regulation and fee orientated issues.
- ◆ The perceptions of problems did not vary among guided status, access method and angling method categories, indicating that residence categories may have shared some of the factors, such as angler experience and angling preferences, that affected the angler's perception of problems on the river.

### Angler Catch and Effort Estimations

- ◆ For all anglers interviewed, a total of 1,161.5 hours were spent angling, which averaged 3.43 hours per angler at the time of the interview. One hundred and sixty-six (166) steelhead were caught and released. The observed catch rate for all anglers interviewed during the classified waters period was 0.157 steelhead/hour or, assuming a rod day length of eight hours 1.26 steelhead per rod day.
- ◆ Steelhead anglers also reported catching seven other species of fish including; 23 Dolly Varden/bull trout (*Salvelinus malma/S. confluentus*), one coho salmon (*O. kisutch*), one sockeye salmon (*O. nerka*), one cutthroat trout (*O. clarki*), one pink salmon (*O. gorbuscha*), eight rainbow trout (*O. mykiss*) and eight whitefish (*Prosopium* sp.).
- ◆ Ten instantaneous aerial counts were conducted during the classified waters period and two were conducted in November. The aerial counts were conducted from Bymac downstream to the confluence of the Suskwa and Bulkley rivers. Of all twelve flights, 709 anglers, 161 jet boats and 84 drift boats were counted. In the classified waters period, angler counts ranged from a low of 27 (week 10-4) to a high of 124 (week 10-1). The number of anglers observed was positively correlated with the number of anglers interviewed in each week and river section and indicated good temporal and fair spatial representation of anglers interviewed.
- ◆ Using catch rates from the angler interviews and effort from the aerial counts, the estimated total angler effort for the classified waters period was 3,983 rod days and the estimated catch was 5,497 steelhead.
- ◆ In November, the observed catch rate for all anglers interviewed was 0.65 steelhead/hour, or assuming a rod day length of four hours 2.6 steelhead per rod day. From aerial counts, the total effort estimate for the month of November was 334 four hour rod days and the total catch estimate was 867 steelhead.
- ◆ For Morice River anglers, a total of 112 hours were spent angling, which averaged 2.6 hours fishing per angler, at the time of the interview. Twenty-five steelhead were caught and released. The observed catch rate for all anglers interviewed during the classified waters period was 0.22 steelhead/hour, or assuming a rod day length of eight hours 1.72 steelhead per rod day.

## Abstract

Recreational angler's demographics, angling characteristics, angling methods and steelhead (*Oncorhynchus mykiss*) catch rates were examined with an on-site roving survey of Bulkley River anglers during the classified waters period of September and October, 1997. In addition, anglers were asked about their perceptions of problems with the overall number of anglers, the number of boat-based anglers and the number of shore-based anglers on the Bulkley River. Aerial counts were used to estimate effort during the classified waters period. Catch rates from the on-site survey were applied to weekly effort estimates to estimate the steelhead catch within each week, river section, residence category and guided status.

The proportion of B.C. residents among Bulkley River anglers had declined and Non-Canadian residents had increased from earlier angler surveys. Fifty percent of angler interviews (and individual anglers) were B.C. residents, seven percent were Canadian residents and 43 percent were Non-Canadian residents. Of all angler interviews, 16 percent were guided and 84 percent were non-guided. Few B.C. residents interviewed were guided anglers (3 percent), while 33 percent of Non-Canadian residents interviewed were guided. Fly anglers (81 percent) were more common than gear anglers (19 percent). About half of anglers interviewed were shore-access anglers (49.2 percent), while the other half gained access from a boat (50.7 percent). Slightly more anglers gained access with a jet boat than a drift boat (26.4 and 24.3 percent, respectively).

Anglers perceptions of problems differed by residence category. B.C. residents perceived more problems on the Bulkley River than Canadian or Non-Canadian residents. Also, B.C. residents were most concerned with the number of anglers on the river, whereas non-residents appeared to be more concerned with regulation and fee orientated problems. Anglers within the guided status, access method or angling method categories were similar in their perception of problems with the overall number of anglers, the number of boat-based anglers or the number of shore-based anglers.

The observed catch rate for all anglers interviewed in 1997 (1.26 steelhead per rod day) was considerably higher than past estimates. The estimated total effort for the classified waters period was 3,983 rod days and the estimated catch was 5,497 steelhead. The November effort estimate was 344 four hour rod days and catch estimate was 867 steelhead.

## Table of Contents

Executive Summary .....	iii
<i>Interviews</i> .....	iii
<i>Angler Characteristics</i> .....	iii
<i>Angler Perceptions of Problems and Preferences for Management Strategies</i> .....	iv
<i>Angler Catch and Effort Estimations</i> .....	v
Abstract .....	vi
Table of Contents .....	vii
List of Tables .....	ix
List of Figures .....	xii
List of Appendices .....	xiv
1.0.0.0 Introduction .....	1
2.0.0.0 Study Area.....	2
3.0.0.0 Methods.....	5
3.1.0.0 On-Site Roving Survey .....	5
3.1.1.1 <i>Interviews</i> .....	5
3.1.1.1 On-Site Interview Methods .....	5
3.1.1.2 Relevant Definitions .....	6
3.1.1.3 Analysis Methods.....	6
3.1.2.0 <i>Angler Characteristics</i> .....	7
3.1.2.1 Angler Demographics .....	7
3.1.2.2 Angling Methods and Licenses .....	8
3.1.2.3 Angler Compliance with Regulations .....	8
3.1.3.0 <i>Angler Perceptions of Problems and Preferences for Management Strategies</i> .....	8
3.1.4.0 <i>Angler Catch and Effort Estimations</i> .....	10
3.1.4.1 Data Collection Methods .....	10
3.1.4.2 Analysis Methods.....	10
3.2.0.0 Instantaneous Aerial Counts .....	11
3.2.1.0 <i>Data Collection Methods</i> .....	11
3.2.2.0 <i>Analysis Methods</i> .....	11
3.2.2.1 Spatial and Temporal Distribution of Anglers .....	11
3.2.2.2 Catch and Effort Estimations .....	11
3.2.2.3 Catch and Effort Estimations for the Classified Waters Period and November 12	
3.2.2.3 Catch and Effort Estimations for River Sections .....	14
3.2.2.4 Catch and Effort Estimations for Residence and Guided Status Categories....	15
4.0.0.0 Results .....	17
4.1.0.0 On-Site Roving Survey .....	17
4.1.1.0 <i>Interviews</i> .....	17
4.1.2.0 <i>Angler Characteristics</i> .....	18
4.1.2.1 Angler Demographics .....	18
4.1.2.2 Angling Methods and Licenses .....	21
4.1.2.3 Angler Compliance with Regulations .....	26
4.1.3.0 <i>Angler Perceptions of Problems and Management Strategies</i> .....	27

4.1.3.1 Problems and Management Strategies for the Overall Number of Anglers.....	27
4.1.3.2 Problems and Management Strategies for the Number of Boat-Based Anglers .....	30
4.1.3.3 Problems and Management Strategies for the Number of Shore-Based Anglers.....	32
4.1.3.4 Other Concerns and Management Strategies .....	34
4.1.3.5 Angler Perceptions of All Major and Minor Problems .....	37
4.1.5.0 Angler Catch and Effort.....	39
4.2.0.0 Instantaneous Aerial Counts .....	41
4.2.1.0 Spatial and Temporal Distribution of Anglers.....	41
4.2.2.0 Catch and Effort Estimations.....	43
5.0.0.0 Discussion .....	48
5.1.0.0 Interviews Conducted.....	48
5.2.0.0 Angler Characteristics .....	48
5.3.0.0 Angler Perceptions of Problems and Preferences for Management Strategies .....	50
5.4.0.0 Angler Catch Rate and Effort.....	52
5.5.0.0 Limitations of the Survey .....	53
6.0.0.0 Recommendations .....	55
7.0.0.0 Acknowledgments.....	57
8.0.0.0 Literature Cited .....	58
9.0.0.0 Appendices.....	60



**List of Tables**

Table 1. The specific dates included in the weeks used for analysis. .... 6

Table 2. The Bulkley River sections used for analysis ..... 7

Table 3. The number of anglers observed, the percentage of observed anglers interviewed and the total anglers interviewed on the weekdays or weekends within each week..... 17

Table 4. The percentage and number (n) of interviews initiated within each river section. 18

Table 5. The percentage and number of all interviews initiated and individual anglers represented by those interviews within each residence category..... 18

Table 6. The percentage of male and female anglers within each age category and the mean age of male and female anglers interviewed..... 20

Table 7. The percentage of years steelhead angling experience within each residence category. .... 20

Table 8. Of the five most frequently mentioned conservation clubs, the percentage of all anglers that were a member of at least one conservation club and the percentage of anglers that were a member of all anglers that answered the question. .... 21

Table 9. The percentage of guided and non-guided anglers within each residence category.21

Table 10. The percentage of fly and gear anglers and jet-boat access, drift-boat access and shore-access anglers in each residence and guided status category..... 22

Table 11. The percentage of fly and gear anglers that gained access to the river by jet boat, drift boat and shore..... 22

Table 12. The percentage of anglers with a one day, eight day and annual license within each residence and guided status category. .... 23

Table 13. The number of classified waters days purchased at the time of the interview in each license class for Canadian and Non-Canadian residents. .... 23

Table 14. The percentage of all anglers interviewed with an infraction and the percentage of offending anglers with one or two infractions..... 26

Table 15. The percentage of all anglers cited with different types of infractions within each residence category. .... 27

Table 16. The percentage of anglers that perceived major, minor and no problems with the overall number of anglers within each residence category, guided status category, access method and angling method. .... 29

Table 17. The percentage of anglers that perceived major, minor and no problems with the number of boat-based anglers within each residence category, guided status category, access method and angling method..... 31

Table 18. The percentage of anglers that perceived major, minor and no problems with the number of shore-based anglers within each residence category, guided status category, access method and angling method..... 34

Table 19. Other regulation issues mentioned by anglers with suggested management strategies separated within each residence and guided status category. .... 35

Table 20. Other access issues mentioned by anglers with suggested management strategies within each residence and guided status category. .... 35

Table 21. Other fee issues mentioned by anglers with suggested management strategies within each residence and guided status category. .... 36

Table 22. Other angler number issues mentioned by anglers with suggested management strategies within each residence and guided status category. .... 36

Table 23. Other guiding issues mentioned by anglers with suggested management strategies within each residence and guided status category. .... 37

Table 24. The percentage of anglers with one, two or three major and minor problems (the sum of and anglers major or minor problems with the overall number of anglers, the number of boat-based anglers and the number of shore-based anglers on the river) within each residence and guided status category. .... 38

Table 25. The steelhead caught, hours fished, catch rate and steelhead per rod day within each week. .... 40

Table 26. The steelhead caught, hours fished, catch rate and steelhead per rod day within each river section..... 40

Table 27. The steelhead caught, hours fished, catch rate and steelhead per rod day within each residence, guided status, access method and angling method category ..... 41

Table 28. A summary of the total effort, catch rates, and catch by time period, river section, angler residence and guided status. .... 44

Table 29. The instantaneous aerial count estimation of total effort and catch with approximate 95 percent confidence intervals within each residence and guided status category. .... 45

Table 30. The instantaneous aerial count estimation of total effort and catch with approximate 95 percent confidence intervals for each week..... 46

Table 31. The instantaneous aerial count estimation of total effort and catch with approximate 95 percent confidence intervals for each river section. .... 47

Table 32. A summary of the composition of angler residence, angling method, conservation club member and steelhead catch rate for previous angler surveys on the Bulkley River. .... 49

Table 33. The Steelhead Harvest Analysis estimated effort and catch for past years..... 53

Table A1. The type of conservation club anglers were a member with the percentage and number of responses. .... 64

Table A2. A summary of weather and water conditions that were observed by the Interview Team by date. .... 65

Table A3. The date, week, time at start of interviewing stint, time at finish of interviewing stint, minutes interviewing, reach location at start, reach location at finish, the total anglers interviewed and observed and comments on the time estimation in minutes summarized from the angler count data forms. .... 67

## List of Figures

Figure 1. The Skeena River watershed. ....	3
Figure 2. The Bulkley River sections used for analysis. ....	4
Figure 3. The number of B.C. residents, Canadian residents and Non-Canadian residents interviewed within each week. ....	19
Figure 4. The number of B.C. residents, Canadian residents and Non-Canadian residents interviewed within each river section. ....	19
Figure 5. The number of classified waters days purchased at the time of the interview by those anglers with an eight day angling license within each residence category. ....	24
Figure 6. The number of classified waters days purchased at the time of the interview for anglers with an 8 day angling license by guided and non-guided anglers. ....	25
Figure 7. The number of classified waters days purchased at the time of the interview by anglers who purchased an annual angling license within each residence category. ....	25
Figure 8. The number of classified waters days purchased at the time of the interview by anglers with an annual angling license by guided and non-guided anglers. ....	26
Figure 9. The percentage of anglers that perceived a minor or major problem with the overall number of anglers within each residence category, guided status, access method and angling method. ....	28
Figure 10. The preferred management strategies of anglers who perceived a problem with the overall number of anglers. ....	30
Figure 11. The percentage of anglers that perceived a minor or major problem with the number of boat-based anglers within each residence category, guided status, access method and angling method. ....	31
Figure 12. The preferred management strategies of anglers who perceived a problem with the number of boat-based anglers. ....	32
Figure 13. The percentage of anglers that perceived a minor or major problem with the number of shore-based anglers within each residence category, guided status, access method and angling method. ....	33

Figure 14. Of all responses, the percentage of all major and minor problems with the overall number of anglers, the number of boat-based anglers and the number of shore-based anglers within each week..... 38

Figure 15. The percentage of major and minor problems with the overall number of anglers, the number of boat-based anglers and the number of shore-based anglers within each river section..... 39

Figure 16. The percentage of anglers interviewed by the on-site roving survey and anglers observed by aerial flights in each week. .... 42

Figure 17. The percentage of anglers interviewed by the on-site roving survey and anglers observed by aerial flights in each river section. .... 42

Figure 18. The percentage of jet boats and drift boats in each week observed during the aerial counts..... 43

Figure 19. The percentage of jets boats and drift boats in each river section observed during the aerial counts..... 43

**List of Appendices**

Appendix 1.0 The angler interview form, angler count data form an instantaneous aerial  
count form. .... 60

Appendix 2.0 The conservation clubs mentioned. .... 64

Appendix 3.0 Weather and water conditions during the classified waters period. .... 65

Appendix 4.0 The method of grouping ‘other issues’ mentioned by Bulkley River anglers.66

Appendix 5.0 A summary of the time spent interviewing by the Interview Teams..... 67

Appendix 6.0 Aerial Count Data..... 69

### **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 province of B.C. implemented a classified waters system to protect such high quality angling experiences on rivers throughout the province. The purpose of the classified waters system was to provide a diversity of angling opportunities, maintain a high quality angling experience and improve regulation of the angling guide industry (ARA Consulting Group 1991). Rivers or sections of rivers were defined as classified waters during critical time periods which usually happened during preferred steelhead angling seasons.

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 on the classified waters in the Skeena Region. In response to these concerns, the Skeena Region Fisheries Branch of the Ministry of Environment, Lands and Parks has been reviewing policy and guidelines for angling licenses and angling use plans on the Bulkley River.

To date, public information was solicited through open houses, public meetings and written submissions on draft angling use plans. The Steelhead Harvest Analysis (SHA) database was used to analyze angler effort and demographics relevant to the angling use plans. Limitations exist with respect to all these forms of data collection: open houses and public meetings often only solicit input from vocal individuals who may represent special interest groups. The SHA database was established by mailing questionnaires to a sample of anglers who purchased a steelhead conservation stamp. However, in recent years, some anglers on classified waters may not have been sampled because they could avoid purchasing a steelhead stamp due to a loophole in the fishing regulations. Also, there is some concern that the SHA results were only representative of those anglers that purchased a steelhead conservation stamp. Therefore, it was unknown if the SHA sample was representative of the angling population. The significance, if any, of these positive and negative biases in the SHA database is under review.

Meanwhile, persistent complaints of illegal guiding activities and license non-compliance prompted the province of B.C. to hire River Guardians to accompany Conservation Officers in enforcement duties on the Bulkley River during the classified waters period. The addition of the River Guardians provided an opportunity to conduct a roving survey with on-site interviews of anglers on the Bulkley River. The survey collected information about steelhead anglers demographics, perceptions of crowding and preferred angler management strategies. Also, instantaneous 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.

### **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 137 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 1996). This study included the Bulkley River from its lowermost reaches at Hazelton upstream to its confluence with the Morice River near Houston. The popular reach of the Morice River from the Bymac area near Houston downstream to Bulkley River confluence was also included.

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, by jet boat or drift boat along the river. The majority of the river is accessible to both jet and drift boats, but most fishing activity occurs in the most navigable water between Trout Creek and Morice River (Anonymous 1996). The boating opportunities are a major feature of the Bulkley River.

Prior to 1997/98 the Bulkley and Morice rivers were two of about 40 class two, classified rivers 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 seven licensed angling guides, any number of assistant guides and a total of 1504 rod days (Anonymous 1996). The Morice River is restricted to three licensed angling guides, and 433 rod days. Both rivers are classified between September 1 and October 31. In the spring of 1997 the Fisheries Branch eliminated the class 1 and class 2 classified waters designations and referred to them all as classified waters.

Relative to other angling rivers in the Skeena Region, the Bulkley River has good water clarity (Anonymous 1996). During high runoff from a large rainfall or warm weather, the Telkwa River provides the majority of turbidity that occurs downstream in the Bulkley River. During these events angling downstream of the confluence of 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 of 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 1997). In short, no fishing was permitted from January 1 to June 15. From June 16 to July 31 anglers were permitted to use natural bait, but after July 31 a bait ban was in effect. From June 16 to December 31, there was a single hook only restriction. The regulations stated steelhead must be released and angling from boats was not permitted from the Morice River to the CNR bridge (August 15 -December 31) or in Moricetown Canyon (all year). In the 1997 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. At the time of the survey, the Fisheries Branch had proposed to increase the classified waters license from \$10.00 per day to \$40.00 per day for non-resident anglers effective April 1, 1998. Since then, the proposed license fee increase has been canceled.

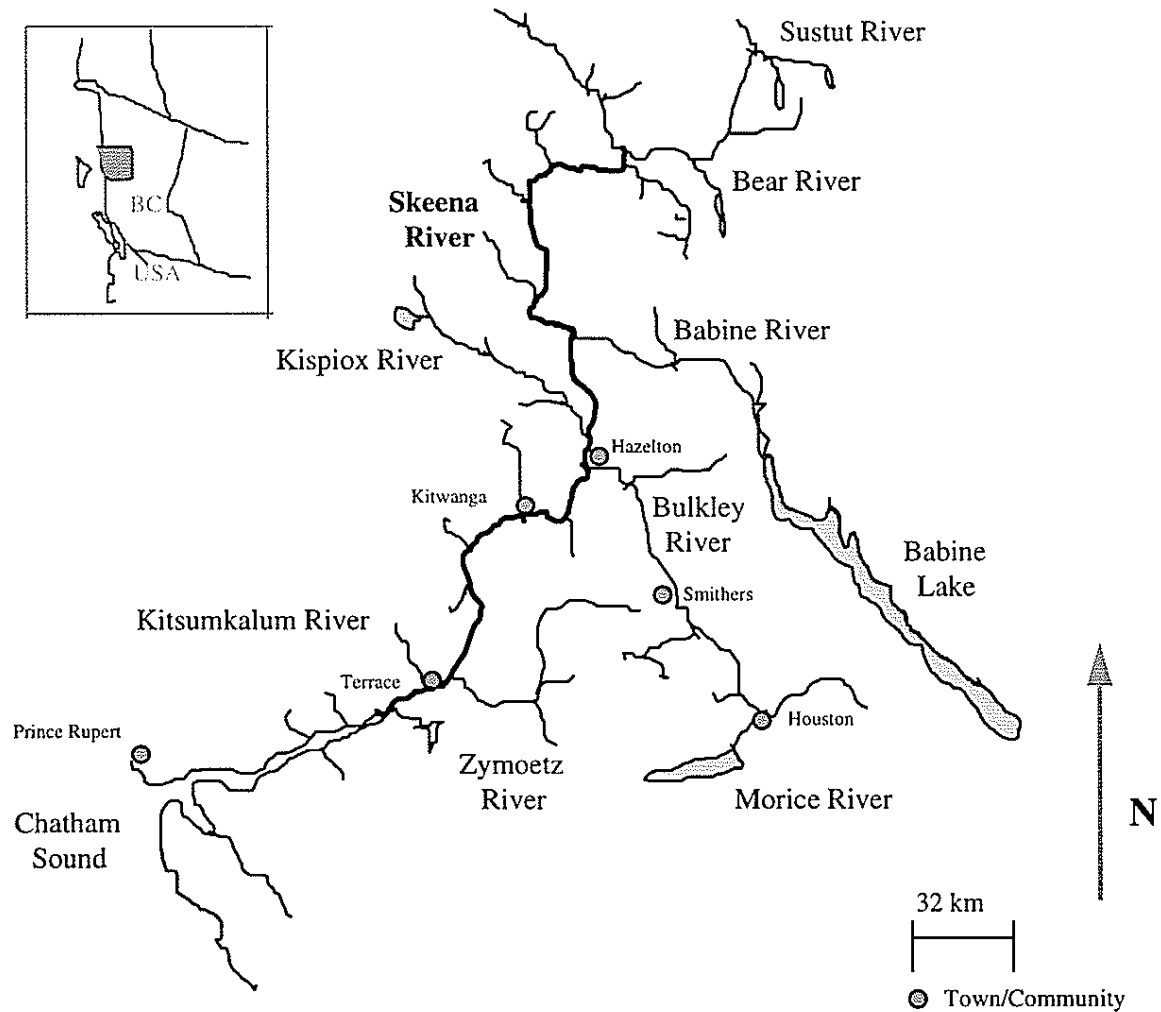


Figure 1. The Skeena River watershed.

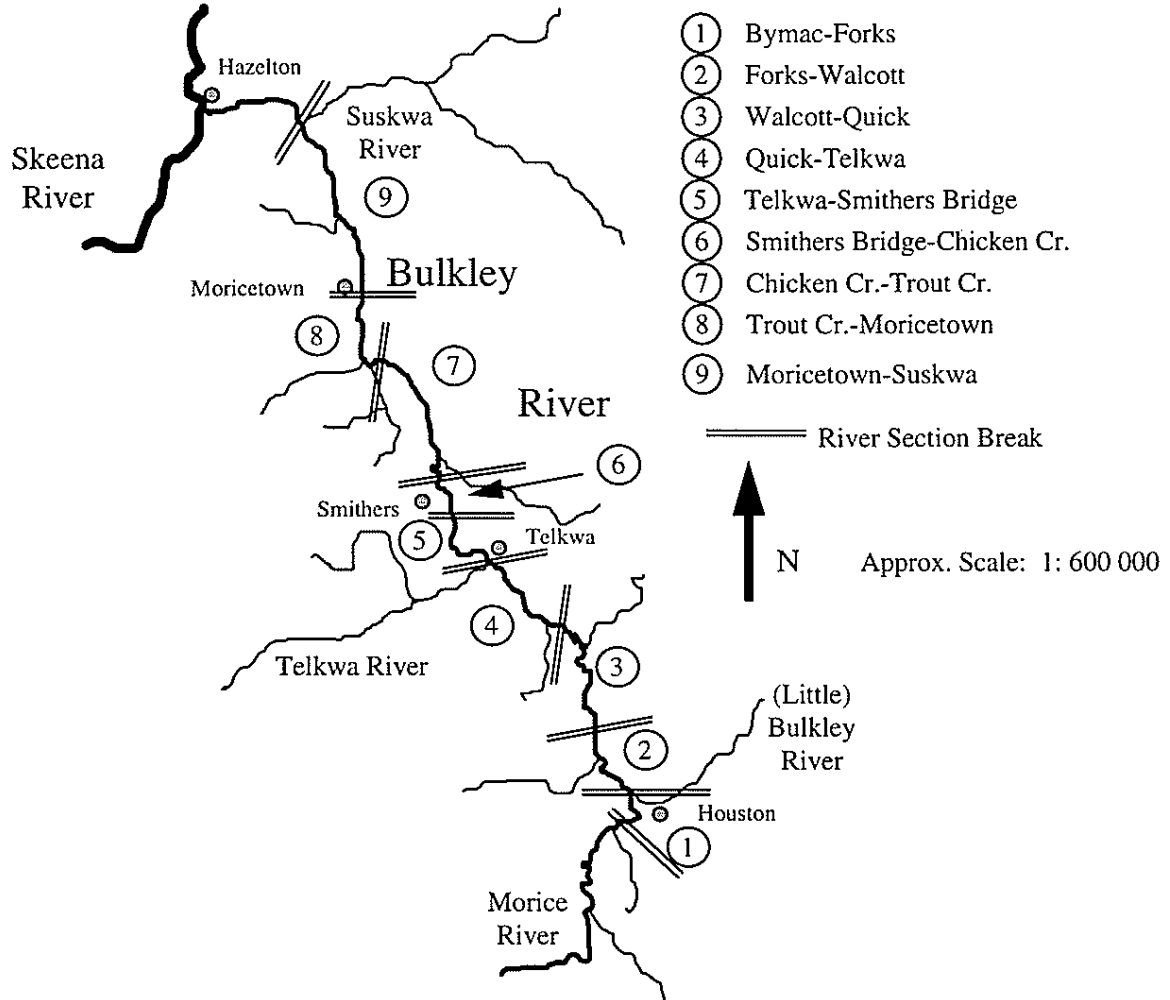


Figure 2. The Bulkley River sections used for analysis.

### **3.0.0.0 Methods**

#### **3.1.0.0 On-Site Roving Survey**

##### **3.1.1.1 Interviews**

###### *3.1.1.1 On-Site Interview Methods*

The province of B.C. hired River Guardians to accompany Conservation Officers in enforcement duties on the Bulkley River during the classified waters period in 1997. 'Deputy Conservation Officer' status was obtained for each River Guardian, which allowed them to address license violations under the *Wildlife Act*. An agreement between the Conservation Officer Services and the Fisheries Branch of the B.C. Ministry of Environment, Lands and Parks enabled the Fisheries Branch to collect information from steelhead anglers regarding their perceptions of problems on the river. The short interview was designed by the Fisheries Branch, Cascadia Natural Resource Consulting and the Conservation Officer Service.

A roving design was used to conduct on-site interviews. The interviewing was conducted in small teams of River Guardians and/or Conservation Officers (herein Interview Team). Jet boat-access anglers, drift boat-access anglers and shore-access anglers were asked to complete a short interview while angling. The Interview Team completed two forms while on the river: the angler interview form and the angler count form (Appendix 1).

The Interview Team collected information on the residence of the anglers, conservation club membership, years steelhead angling, hours angling that day, catch of all species, perceptions of problems with the overall number of anglers, the number of boat-based anglers and the number of shore-based anglers on the river and suggested management strategies around those issues. The Interview Team also recorded information about weather, the angler's access method (jet boat, drift boat or shore), angling method (fly or gear), gender and other data collected from the angler's license, such as name, birthdate, residence, license type, if guided or non-guided, the number of classified days purchased and used and the number and type of angling infractions that were cited (if any). All data was recorded on the angler interview form.

In addition, the Interview Team completed an angler count form every time they were on the river. The date, time at start of interviewing stint, time at finish of interviewing stint, location at start, location at finish, total anglers interviewed, total anglers observed, the initials of the Interview Team and any additional comments were recorded on the angler count form.

Interviews were conducted in the classified waters period from September 1 through October 31, 1997. In addition, several interviews were conducted in the first week of November. Because the primary duty of the River Guardians and Conservation Officers was to provide an enforcement presence, a strict sampling schedule could not be used and therefore, a convenience sample of anglers was collected. The Interview Team used a variety of methods

including jet boat patrol, drift boat and truck patrol to interview as many anglers as possible. The angler was approached and asked for their cooperation to complete the interview. The Interview Team proceeded with the interview and then asked to see the angler's license, and if needed, cited them for any infractions. If the anglers did not agree to the interview, had already completed the interview or there was a language barrier, the Interview Team only recorded data on the weather, access method, angling method, gender, hours fished, catch and license details.

### 3.1.1.2 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 1997).

**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 1997).

**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 1997).

**Non-Resident Angler:** The anglers' permanent residence was outside of B.C. Non-Resident anglers were mentioned in several responses from anglers about preferred management strategies, they were not specific to the Non-Canadian or Canadian residence status.

**Rod Day:** Eight hours of angler effort in September and October and in November four hours of angler effort constituted one rod day.

### 3.1.1.3 Analysis Methods

Several sources were used to analyze the number of anglers observed and where and when the Interview Team(s) were on the river. The angler count data forms were used to summarize the total anglers observed and the approximate time the Interview Team(s) spent interviewing on the river each week. If the time at the start and finish of the interviewing stint was missing estimates were made at the amount of time the Interview Team(s) were on the river (see Appendix 5). 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 specific dates included in the weeks used for analysis.

Week	Dates
9-1	Sept. 1 - Sept. 6
9-2	Sept. 7 - Sept. 13
9-3	Sept. 14 - Sept. 20
9-4	Sept. 21 - Sept. 27
9-5	Sept. 28 - Oct. 4
10-1	Oct. 5 - Oct. 11
10-2	Oct. 12 - Oct. 18
10-3	Oct. 19 - Oct. 25
10-4	Oct. 26 - Nov. 1

Table 2. The Bulkley River sections used for analysis

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

Angler non-response bias was checked by testing differences of those anglers that responded to all questions with those that refused to complete the interview, or could not complete the interview because of a language barrier. Several comparisons were made in order to ensure that the responses provided by anglers who completed the interview were not significantly different from those not completing the interview (residence, guided status, age, hours fished). It was possible to check for a non-response bias because Interview Teams collected catch and demographic data from the angling license even if the angler did not agree to the interview. Residence and guided status were compared with a chi-square test of homogeneity, and when necessary the Yates continuity correction was used (Zar 1984). Differences in age or hours fished were accessed with a Mann Whitney U test.

### 3.1.2.0 Angler Characteristics

#### 3.1.2.1 Angler Demographics

Anglers could have been approached several times for an interview. The data were sorted by angler license number and 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 anglers represented by those interviews was summarized by residence categories. Angler residency was determined from the angling license. For B.C. residents, the postal code was used to determine if the angler was from the Bulkley Valley (Houston-Hazelton), Skeena Region or remaining areas in the province. In addition, the date of birth was collected from the angler license. Age categories were summarized by male and female anglers.

Anglers were asked, "How many years have you been steelhead fishing?" The years of steelhead angling experience was summarized by residence categories. The mean years steelhead angling by B.C. residents, Canadian residents and Non-Canadian resident were compared with a one way ANOVA. A Levene test for homogeneity of variances between years was performed to test if the assumption of equal variances were met. Because the one-way ANOVA is so robust, it still operates well even when there is heterogeneity among variances (Zar 1984). Consequently, a one way ANOVA was used to compare the years steelhead fishing between resident categories. A five percent ( $P \leq 0.05$ ) level of significance

was used to analyze test results. Additional Bonferonni and Tukey HSD *post hoc* tests were used to determine which residence categories were significantly different from each other.

Anglers were 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).

### *3.1.2.2 Angling Methods and Licenses*

The Interview Team recorded guided status (non-guided or guided) from the angler’s license which was summarized by angler residence. The angling method (fly or gear) and access method (jet boat, drift boat or shore anglers) were recorded by the Interview Team 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, the angler interview was used as the unit of analysis and not the individual angler.

The Interview Team recorded the angler’s license class and the number of classified days purchased and used from the angler’s license. The license class (one day, eight day and annual) and the number of classified days purchased and used were summarized by residence category and guided status.

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 Interview Team recorded the number of classified days purchased by the angler just prior to the day the angler was interviewed. When an angler was carrying previous classified waters licenses, the Interview Team also recorded the number of classified waters days purchased from the additional licenses. It was not possible to determine the total number of days fished by individual non-resident anglers over the duration of their visit.

### *3.1.2.3 Angler Compliance with Regulations*

The number and type of infractions cited by the Interview Teams were recorded on the angler interview form. The frequency of infractions were summarized by angler residence, river section and week. The type of infraction was summarized by angler residence and guided status. The angler interview was used as the unit of analysis and not the individual angler.

### 3.1.3.0 Angler Perceptions of Problems and Preferences for Management Strategies

The Interview Team asked anglers;

*“On the Bulkley River to what degree do you perceive steelhead angler management problems about each of the following concerns?”*

*Do you perceive the;*

- |   |          |               |               |
|---|----------|---------------|---------------|
| 1. Number of boat-based anglers to be;  | NO PROB. | A MINOR PROB. | A MAJOR PROB. |
| 2. Number of shore-based anglers to be; | NO PROB. | A MINOR PROB. | A MAJOR PROB. |
| 3. Overall number of anglers to be;     | NO PROB. | A MINOR PROB. | A MAJOR PROB. |
| 4. Other Concerns _____;                | NO PROB. | A MINOR PROB. | A MAJOR PROB. |

If the angler perceived a problem about any of the above concerns they were asked to suggest a management strategy to deal with the problem. Anglers were also asked about any other concerns they perceived on the river and management strategies to deal with those concerns.

The major, minor and no problem categories (for the number of boat-based, the number of shore-based and the overall number of anglers) were summarized by residence categories, guided status, access method and angling method. For small samples, the major and minor problems were grouped and compared to no problems within each of the categories using a chi-square test of homogeneity and when necessary, a Yates correction for continuity (Zar 1984). The management strategies suggested by anglers were summarized for all three concerns.

In comparison to the summary of angler methods and infractions, the individual angler was the unit of analysis for perception of problem analysis and not the angler interview. One response per angler was used to evaluate perceptions of problems on the Bulkley River. This eliminated the possibility that one angler could have his/her opinion counted more than once. Those anglers indicating it was their first visit, or they had recently arrived to the river and did not have an opinion were excluded from the analysis (6 anglers, 2.2 percent of all anglers).

Other concerns were summarized in several ways because there was a wide variety of responses. Each response was categorized into one of 23 ‘response groups’ and then groups were placed into one of five broader categories: regulation issues, fee issues, angler number issues and guiding issues (see Appendix 4 for details). The concern within each broader category was summarized by the anglers’ residence categories and guided status. The suggested management strategy was listed for each of these concerns. Management strategies were not subdivided by residence or guided status because of small samples.

The overall perceptions of problems on the river was assessed by summing the percentage of major and minor problems for all three concerns (the overall number of anglers, the number of boat-based anglers and the number of shore-based anglers). The frequency of major and minor problems was summarized for each residence category and guided status. The differences between the mean number of minor and major problems within each residence category and guided status were compared with a non-parametric Kruskal-Wallis test. A Mann-Whitney U test was used to compare difference in the mean number of major and

minor problems between guided and non-guided anglers. The overall number of major and minor problems were also summarized by week and river section.

### 3.1.4.0 Angler Catch and Effort Estimations

#### 3.1.4.1 Data Collection Methods

The observed catch rate and effort was calculated with data from the on-site interviews. The Interview Team 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 hours 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.

#### 3.1.4.2 Analysis Methods

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 instead of the ratio of the means since anglers were sampled while they were still fishing, implying 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:

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

Equation 1

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).

Catch rate, steelhead caught and effort (in hours) were summarized by week, river section, angler residence, guided status, access method and angling method. Steelhead per rod day was the catch rate multiplied by eight hours of effort. The daily aerial counts were multiplied by eight hours to estimate the daily effort, since eight hours was representative of the typical rod day during the classified waters period (R.S. Hooton personnel communication). The river sections were similar to those used in the aerial counts. Due to small samples, the catch rate samples for some river sections were combined for analyses: the Forks to Walcott section was combined with the Walcott to Quick section and the Trout Creek to Moricetown section was combined with the Moricetown to Suskwa section (Table 2). The Morice River was separated from the Bulkley River for observed catch rate and effort. The sum of the hours fished and the steelhead caught for each river section did not equal the total (as determined by week) because some areas labeled on the data forms could not be assigned to a river section. Frequently, the angler interview forms were not specific in the river section



where the interview took place, and therefore it was unclear what river section the interview was in.

### **3.2.0.0 Instantaneous Aerial Counts**

#### **3.2.1.0 Data Collection Methods**

Ten aerial counts were conducted on the Bulkley River during the classified waters period. Two additional aerial counts were conducted on November 20 and November 22 (week 11-3) outside of the classified waters period. Aerial counts were planned on days that were most likely to have a high number of anglers on the river and were not randomly selected. There were at least two people in the helicopter at all times to count anglers. The helicopter traveled east from Smithers to the Bymac crossing on the Morice River. The helicopter proceeded to fly directly over the river downstream to the confluence of the Bulkley and Skeena rivers. All aerial counts were conducted in the midday between 1:00 and 2:30 p.m., except on November 22 when the counted commenced at 11:30 am. This time period represented when most anglers were on the Bulkley River (Lewynsky and Olmsted 1990). Each aerial count took approximately one and a half hours. The count of anglers was recorded on aerial count forms while proceeding downstream (Appendix 1). The number of anglers, jet boats and drift boats were recorded for each river section. In addition, the date, weather, time, personnel and helicopter carrier were recorded for each aerial flight.

#### **3.2.2.0 Analysis Methods**

##### *3.2.2.1 Spatial and Temporal Distribution of Anglers*

The percentage of anglers observed by the aerial counts and the percentage 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. In addition, the percentage of jet and drift boats observed were summarized by week and river section.

##### *3.2.2.2 Catch and Effort Estimations*

Catch and effort were estimated using the aerial counts and catch rates were estimated from the on-site survey. Catch and effort were estimated for the classified waters period and November, river sections, residence categories and guided status. To reduce variance, the aerial counts were post-stratified into weeks and river sections. The estimates of total catch and effort for each week and river section were then calculated using a stratified design (Pollock *et al.* 1994).

Aerial counts were not completed in the first, second and fourth weeks of the classified waters period. Therefore, the catch and effort estimates for the river sections, residence categories and guided status categories, were completed only for the six of nine weeks of the classified waters period with aerial counts. Several methods were used to estimate catch and

effort for the classified waters period and November. Methods differed according to the number of aerial counts conducted during relevant weeks.

Estimates of total catch and effort were made by summing estimates of catch and effort for all weeks (and methods) or river sections. The steelhead per rod day was the catch rate multiplied by eight hours (8 hr = 1 rod day) for the classified waters period, but for November the catch rate was multiplied by four hours (4 hr = 1 rod day).

### 3.2.2.3 Catch and Effort Estimations for the Classified Waters Period and November

For each week the mean of the catch rate ratios were used to estimate weekly catch rates ( $\hat{R}_{\text{week}}$ ; Equation 1). The variance in the weekly catch rate ( $Var(\hat{R}_{\text{week}})$ ) was the day-to-day variation in catch rates within the week ( $s_R^2$ ; Pollock *et al.* 1994). The variance of the total catch rate ( $Var(\hat{R})$ ) was the sum of the variance of catch rates for each week (Equation 3, Pollock *et al.* 1994).

$$\text{Equation 2} \quad Var(\hat{R}_{\text{week}}) = s_R^2$$

$$\text{Equation 3} \quad Var(\hat{R}) = \sum_{\text{week}} Var(\hat{R}_{\text{week}})$$

The daily aerial counts were multiplied by eight hours (8 hr. = 1 rod day) to estimate the daily effort. For each week, the daily effort estimates 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 4).

$$\text{Equation 4} \quad \hat{E}_{\text{week}} = N \times \bar{e}_{\text{week}}$$

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

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

$$\text{Equation 6} \quad Var(\hat{E}_{\text{week}}) = N^2 \times (s^2 / n) \times fpc$$

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 variance in total effort ( $Var(\hat{E})$ ) was estimated by:

$$\text{Equation 7} \quad \text{Var}(\hat{E}) = \sum_{\text{week}} \text{Var}(\hat{E}_{\text{week}})$$

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

The catch within a week ( $\hat{C}_{\text{week}}$ ) was the product of the catch rates for each week and the total effort within a week ( $\hat{E}_{\text{week}}$ ; Equation 8). The variance of catch within a week ( $\text{Var}(\hat{C}_{\text{week}})$ ) was calculated with the method described by Pollock *et al.* (1994; Equation 9). The approximate 95 percent confidence intervals were calculated with the method described by Scheaffer *et al.* (1990; Equation 10):

$$\text{Equation 8} \quad \hat{C}_{\text{week}} = \hat{R}_{\text{week}} \times \hat{E}_{\text{week}}$$

$$\text{Equation 9} \quad \text{Var}(\hat{C}_{\text{week}}) = \hat{E}_{\text{week}}^2 \times \text{Var}(\hat{R}_{\text{week}}) + \hat{R}_{\text{week}}^2 \times \text{Var}(\hat{E}_{\text{week}}) + \text{Var}(\hat{E}_{\text{week}}) \times \text{Var}(\hat{R}_{\text{week}})$$

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

The total catch ( $\hat{C}$ ) 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  $\text{Var}(\hat{C}_{\text{week}})$ . The approximate 95 percent confidence intervals were calculated using Equation 11.

$$\text{Equation 11} \quad 95\% \text{ Confidence Intervals} = 2 \times \sqrt{\text{Var}(\hat{C})}$$

Aerial counts were only available for six of the nine weeks during the classified waters period (weeks without counts were 9-1, 9-2 and 9-4). The distribution of angler effort within the classified waters period was believed to resemble a normal curve (R.S. Hooton personal communication), similar to the distribution of guided angler effort (Anonymous 1996). Therefore, the mean daily effort and variance was estimated for week 9-1 and 9-2 from effort estimations for the similar shoulder week in October. Thus, effort in 10-4 was used to estimate effort in 9-1 and the effort in 10-3 was used to estimate effort in 9-2. The mean daily effort and variance was estimated for week 9-4 by using the aerial counts from September 20 and October 9. These dates had similar weather and water condition observed by the Interview Team as week 9-4 (with an aerial count, see weather and water conditions Appendix 3.0). The aerial count on October 3 was not used because there were turbid water conditions downstream of Telkwa. The finite population correction factor was not used to estimate the variance in weekly effort for these three weeks.

Two aerial counts in November were used to estimate catch and effort for the whole month. The mean daily effort and variance were estimated from aerial counts on November 20 and

22. Due to colder temperatures and shorter days, a four hour rod day was used to estimate effort instead of an eight hour rod day. Catch rates and variance were estimated from five on-site interviews conducted in the first week of November. Equations 2 through 11 were used to estimate total catch and effort.

### 3.2.2.3 Catch and Effort Estimations for River Sections

For each river section the mean of the catch rates for the six weeks with aerial counts was estimated with Equation 1 ( $\hat{R}_{\text{section}}$ ). The variance in catch rates within each river section ( $\text{Var}(\hat{R}_{\text{section}})$ ) was the sample variance ( $s_R^2$ ; Equation 12). The total catch rate ( $\hat{R}$ ) was calculated by dividing the sum of the catch rates for each river section ( $\hat{R}_{\text{section}}$ ) by the number of river sections ( $n_{rs}$ ; Equation 13).

Equation 12 
$$\text{Var}(\hat{R}_{\text{section}}) = s_R^2$$

Equation 13 
$$\hat{R} = \frac{\sum_{\text{section}} \hat{R}_{\text{section}}}{n_{rs}}$$

Equation 14 
$$\text{Var}(\hat{R}) = \sum_{\text{section}} \text{Var}(\hat{R}_{\text{section}})$$

The variance of the total catch rate ( $\text{Var}(\hat{R})$ ) was the sum of the variance of catch rates within each river section (Equation 14). Due to small sample sizes, catch rate estimates were pooled between Walcott and Telkwa (sections Walcott to Quick and Quick to Telkwa) and between Trout Creek to the Suskwa River (sections Trout Creek to Moricetown, Moricetown to the Suskwa and downstream of the Suskwa River). Although effort and catch were estimated separately for each section.

The ten daily aerial counts were multiplied by eight hours to estimate the daily effort within a river section. All daily effort estimations were used to estimate mean daily effort within a river section ( $\bar{e}_{\text{section}}$ ). The total effort within a river section ( $\hat{E}_{\text{section}}$ ) was estimated by multiplying the mean daily effort by the number of days in the sampling period ( $N = 42$ ; Equation 15).

Equation 15 
$$\hat{E}_{\text{section}} = N \times \bar{e}_{\text{section}}$$

Equation 16 
$$\hat{E} = \sum_{\text{section}} \hat{E}_{\text{section}}$$

The total effort ( $\hat{E}$ ) was the sum of the effort of all river sections ( $\hat{E}_{\text{section}}$ ; Equation 16). The variance in the estimate of total effort within each river section ( $\text{Var}(\hat{E}_{\text{section}})$ ) was estimated by:

$$\text{Equation 17} \quad \text{Var}(\hat{E}_{\text{section}}) = N^2 \times (s^2 / n) \times fpc$$

where  $N$  was the total number of days in the study period,  $s^2$  was the sample variance of the daily effort,  $n$  was the number of observations of total daily effort, and  $fpc$  was the finite population correction factor ( $(N-n)/N$ ; Schubert 1988). The variance in total effort ( $\text{Var}(\hat{E})$ ) was estimated by:

$$\text{Equation 18} \quad \text{Var}(\hat{E}) = \sum_{\text{section}} \text{Var}(\hat{E}_{\text{section}})$$

where the variance in effort for each section ( $\text{Var}(\hat{E}_{\text{section}})$ ) was summed.

The catch within a section ( $\hat{C}_{\text{section}}$ ) was the product of the catch rates for each river section and the total effort within a section ( $\hat{E}_{\text{section}}$ ; Equation 19). The variance of catch within a river section ( $\text{Var}(\hat{C}_{\text{section}})$ ) was calculated with the method described by Schubert (1988; Equation 20). The approximate 95 percent confidence intervals were calculated with the method described by Scheaffer *et al.* (1990; Equation 21):

$$\text{Equation 19} \quad \hat{C}_{\text{section}} = \hat{R}_{\text{section}} \times \hat{E}_{\text{section}}$$

$$\text{Equation 20} \quad \text{Var}(\hat{C}_{\text{section}}) = \hat{E}_{\text{section}}^2 \times \text{Var}(\hat{R}_{\text{section}}) + \hat{R}_{\text{section}}^2 \times \text{Var}(\hat{E}_{\text{section}}) + \text{Var}(\hat{E}_{\text{section}}) \times \text{Var}(\hat{R}_{\text{section}})$$

$$\text{Equation 21} \quad 95\% \text{ Confidence Intervals} = 2 \times \sqrt{\text{Var}(\hat{C}_{\text{section}})}$$

The total catch ( $\hat{C}$ ) was the sum of the estimated catch for each river section ( $\hat{C}_{\text{section}}$ ) and the variance for total catch was the sum of the variance in catch for each river section ( $\text{Var}(\hat{C}_{\text{section}})$ ). The approximate 95 percent confidence intervals were estimated using Equation 22.

$$\text{Equation 22} \quad 95\% \text{ Confidence Intervals} = 2 \times \sqrt{\text{Var}(\hat{C})}$$

#### 3.2.2.4 Catch and Effort Estimations for Residence and Guided Status Categories

The estimated catch and effort for each residence category and guided and non-guided anglers were calculated using the total effort estimated by week for the six weeks in the

classified waters period with aerial counts. The variance in total effort (by week) was low in comparison to the variance of the total effort estimated by river section.

The mean of the catch rate ratios within each residence category for six of nine weeks of the classified waters period were used to estimate catch rates ( $\hat{R}_{residence}$ ; Equation 1). The variance in resident catch rate ( $Var(\hat{R}_{residence})$ ) was the sample variance. The effort for each residence category ( $\hat{E}_{residence}$ ) was the total effort ( $\hat{E}$ ; as estimated by week) multiplied by the proportion of anglers in each residence category ( $\beta_{residence}$  Equation 24).

Equation 23 
$$Var(\hat{R}_{residence}) = s_{residence}^2$$

Equation 24 
$$\hat{E}_{residence} = \hat{E} \times \beta_{residence}$$

The variance in effort for each residence category ( $Var(\hat{E}_{residence})$ ) was the total effort variance ( $Var(\hat{E})$ ) multiplied by the proportion of anglers in each residence category ( $\beta_{residence}$ ; Equation 25). The catch estimate ( $\hat{C}_{residence}$ ) for each residence category was the product of the effort estimation in each residence category ( $\hat{E}_{residence}$ ) and the catch rate for each residence category ( $\hat{R}_{residence}$ ; Equation 26).

Equation 25 
$$Var(\hat{E}_{residence}) = Var(\hat{E}) \times \beta_{residence}$$

Equation 26 
$$\hat{C}_{residence} = \hat{E}_{residence} \times \hat{R}_{residence}$$

The variance in the catch for each residence category ( $Var(\hat{C}_{residence})$ ) was calculated using Equation 27 and the approximate 95 percent confidence intervals were calculated with the method described by Scheaffer *et al.* (1990; Equation 28).

Equation 27 
$$Var(\hat{C}_{residence}) = \hat{E}_{residence}^2 \times Var(\hat{E}_{residence}) + \hat{R}_{residence}^2 \times Var(\hat{E}_{residence}) + Var(E_{residence}) \times Var(R_{residence})$$

Equation 28 
$$95\% \text{ Confidence Intervals} = 2 \times \sqrt{Var(\hat{C})}$$

The total effort and catch estimate calculations for the guided status categories were similar to those used for residence categories. Equation 23 through 28 were used except the proportion of guided and non-guided anglers ( $\beta_{guided}$ ) were substituted for the proportion of anglers in each residence category ( $\beta_{residence}$ ).

## 4.0.0.0 Results

### 4.1.0.0 On-Site Roving Survey

#### 4.1.1.0 Interviews

Four-hundred and sixty-nine anglers (469) were observed by the Interview Teams on the Bulkley River (Table 3). Three-hundred and seventy-four (374) anglers were approached for an interview and of those eight (2.1 percent) refused to complete the interview and five (1.3 percent) were not angling. The remaining 361 surveys were at least partially completed and of those 15 anglers (4.0 percent) did not know enough English to understand all of the questions and 40 anglers (12.8 percent) replied they had already completed the interview. Of the repeat angler interviews, 28 anglers were approached twice and eight anglers were approached three times. Four (4) anglers claimed they were previously interviewed but their names or angling license number were not found among the angler interview forms.

Overall, the Interview Team approached about 80 percent of the anglers they observed (Table 3). Over half of the interviews were completed on weekdays, while the remainder (46.4 percent) were completed on weekend days (Saturday or Sunday, Table 3). The majority of interviews (83.7 percent) were conducted in the first six weeks of the classified waters period. The 469 anglers observed was a slight underestimate of the anglers observed as one day in week 9-2 did not have the number of anglers observed information completed on the angler count form. Weeks 9-5, 10-2, 10-3 and 10-4 had at least one day when the river was 'out' or turbid downstream of Telkwa.

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

Week	Approximate Time Interviewing <sup>3</sup>	Anglers Observed <sup>1</sup>	Percentage Interviewed	Percentage Interviews Initiated		
				Total (n)	Weekday (n)	Weekend (n)
9-1	11.9 hr	36	75.0	7.2 (27)	70.4 (19)	29.6 (8)
9-2	19.8 hr	> 33	NA	8.8 (33)	18.2 (6)	81.8 (27)
9-3	24.9 hr	79	69.6	14.7 (55)	87.3 (48)	12.7 (7)
9-4	9.0 hr	37	70.3	6.8 (26)	42.3 (11)	57.7 (15)
9-5 <sup>2</sup>	30.4 hr	99	85.9	22.7 (85)	54.1 (46)	45.9 (39)
10-1	20.3 hr	106	82.1	23.3 (87)	63.2 (55)	36.8 (32)
10-2 <sup>2</sup>	8.5 hr	27	74.1	5.3 (20)	10.0 (2)	90.0 (18)
10-3 <sup>2</sup>	8.2 hr	29	79.3	6.0 (23)	26.1 (6)	73.9 (17)
10-4 <sup>2</sup>	9.5 hr	23	78.3	4.8 (18)	44.4 (8)	55.6 (10)
<b>Total</b>	<b>142.5 hr</b>	<b>469</b>	<b>79.7</b>	<b>100 (374)</b>	<b>53.6 (201)</b>	<b>46.4 (173)</b>

1. Complete count data was not available, therefore the total of 469 anglers observed was the minimum.

2. Each week had at least one day when the water was recorded as turbid or the river was 'out' on the aerial count forms or interview forms.

3. See appendix 5.0 for details of the calculation of time spent interviewing.

The distribution of interviewed anglers was not equal throughout the Bulkley River (Table 4). Most anglers (27 percent) were interviewed between Telkwa and just upstream of the Smithers bridge, 15 percent were interviewed between Trout Creek and Moricetown, and 13 percent were interviewed between Quick and Telkwa. Another 13 percent of anglers were interviewed on the

Morice River between Bymac and the Forks. Only one percent of anglers were interviewed between Moricetown and the confluence of the Bulkley and Suskwa rivers.

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

	River Section	Percentage (n) of Interviews Initiated
1	Bymac - upstream of Forks	12.6 (43)
2	Forks - upstream of Walcott	6.7 (23)
3	Walcott - upstream of Quick	1.5 (5)
4	Quick - upstream of Telkwa	13.2 (45)
5	Telkwa - upstream Smithers Bridge	26.7 (91)
6	Smithers Bridge - upstream Chicken Creek	12.0 (41)
7	Chicken Creek - upstream Trout Creek	11.1 (38)
8	Trout Creek - upstream Moricetown	15.0 (51)
9	Moricetown - Suskwa	1.2 (4)

A non-response bias check was completed for those anglers that refused or only partially completed the on-site interview. Respondents and non-respondents were similar in the number of hours fished (Mann Whitney U = 1085.5, df=1,  $P \leq 0.055$ ), angler age (Mann Whitney U = 2926.0,  $P \leq 0.727$ ) and guided status (chi-square  $\chi^2 = 0.025$ , df=1,  $P \leq 0.875$ ). However, respondents differed from non-respondents by their residence categories (chi-square  $\chi^2 = 13.45$ , df=2,  $P \leq 0.001$ ). There were more Non-Canadian residents that did not respond to the survey (because they could not speak English) than B.C. residents or Canadian residents.

#### 4.1.2.0 Angler Characteristics

##### 4.1.2.1 Angler Demographics

Fifty percent (178 interviews) of all anglers interviewed were B.C. residents (Table 5). Twenty-three of those interviews (13 percent) were repeat interviews and thus, 155 individual anglers were B.C. residents (49 percent of all anglers). Of all B.C. resident interviews, more than half (93 anglers) were from the Skeena Region and most Skeena Region anglers (89 percent, 83 interviews) resided in the Bulkley Valley. Residents from other areas of B.C. represented 40 percent of all B.C. resident angler interviews. Eight percent (29 interviews) of all anglers interviewed lived in other Canadian provinces and six (21 percent) of them were interviewed several times. Of all interviews completed, 42 percent were Non-Canadian residents, but 12 anglers were interviewed several times (8 percent; Table 5).

Table 5. The percentage and number of all interviews initiated and individual anglers represented by those interviews within each residence category.

Anglers Residence	Percentage of Angler Interviews Initiated (n) <sup>1</sup>	Percentage of Individual Anglers (n)
B.C. Resident Total	50.0 (178)	49.2 (155)
Skeena Region	52.2 (93)	49.0 (76)
Other areas of the Province	40.4 (72)	43.8 (68)
Unknown (postal code not collected)	7.3 (13)	7.1 (11)
Canadian Resident	8.1 (29)	7.1 (23)
Non-Cdn. Resident	41.9 (149)	43.5 (137)

<sup>1</sup>Percentage included all angler interviews attempted but 18 interviews did not have the residence category data recorded and were excluded.



More B.C. residents were interviewed in all weeks except 9-5, 10-1 and 10-3, when more Non-Canadian residents were interviewed (Figure 3). Canadian residents were interviewed only in weeks 9-1, 9-5, 10-1, 10-3 and 10-4. The Interview Team interviewed more B.C. residents than Non-Canadian residents in the shoulder weeks of the classified waters period (9-1, 9-2 and 10-4) except for week 10-3. The number Non-Canadian residents interviewed was higher than the number of B.C. residents interviewed in the middle of the classified waters period (9-5 and 10-1).

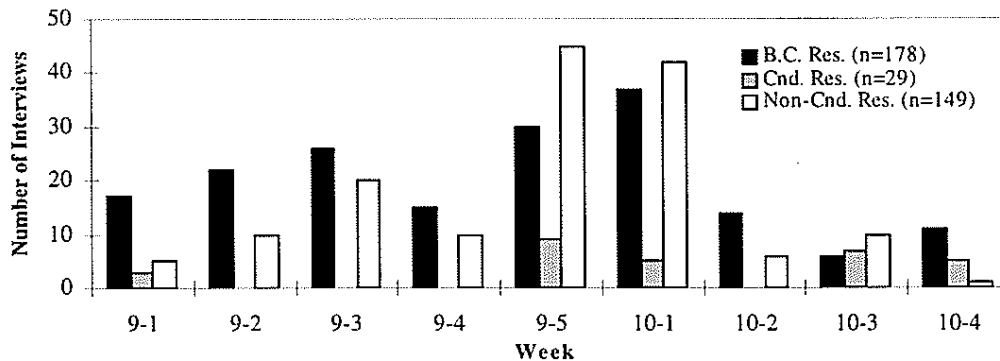


Figure 3. The number of B.C. residents, Canadian residents and Non-Canadian residents interviewed within each week.

There were more B.C. residents interviewed than Non-Canadian residents in the river sections between Bymac and Smithers bridge (Figure 4). In contrast, between Chicken Creek and downstream of Moricetown, there were more Non-Canadian residents interviewed than B.C. residents. Canadian residents were interviewed in the Bymac, Quick, Telkwa, Chicken Creek and Trout Creek river sections.

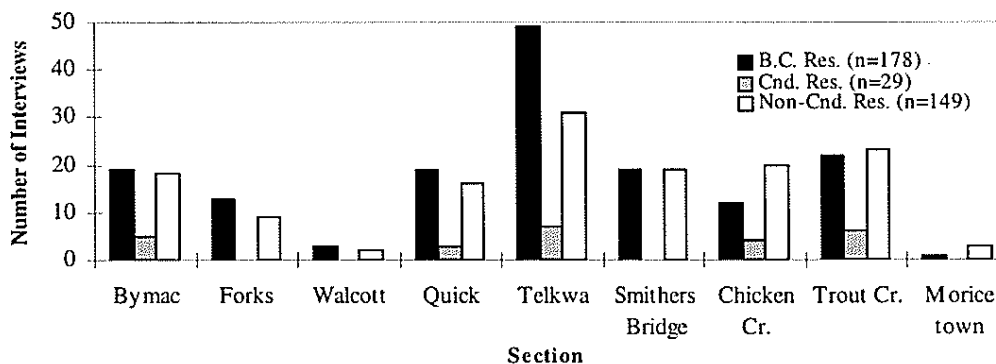


Figure 4. The number of B.C. residents, Canadian residents and Non-Canadian residents interviewed within each river section.

Ninety-six percent of anglers were male (301 anglers), and only four percent (12 anglers) were female (Table 6). On average, males were 44.9 years old and females were 45.4 years old. Over half of male and female anglers were between 35 and 54 years old (51.1 and 58.3 percent, respectively). No female anglers under the age of 25 or over the age of 64 were surveyed.

Table 6. The percentage of male and female anglers within each age category and the mean age of male and female anglers interviewed.

Age Categories	Percentage of Male Anglers (n)	Percentage of Female Anglers (n)
under 16	0.3 (1)	0.0 (0)
17-24	4.2 (14)	0.0 (0)
25-34	19.4 (58)	16.7 (2)
35-44	28.2 (85)	33.3 (4)
45-54	22.9 (69)	25.0 (3)
55-64	12.6 (38)	25.0 (3)
65+	12.0 (36)	0.0 (0)
<b>Total</b>	<b>96.3 (301)</b>	<b>3.7 (12)</b>
<b>Mean Age</b>	<b>44.93</b>	<b>45.42</b>

On average, Bulkley River steelhead anglers had been angling for 11.5 years (Table 7). Over half of B.C. residents (51.4 percent) had more than ten years of steelhead angling experience whereas 35 percent of Non-Canadian residents and 15 percent of Canadian residents had more than ten years steelhead angling experience. Consequently, the years of steelhead angling experience differed significantly between B.C. residents, Canadian residents and Non-Canadian residents (ANOVA  $F = 5.328$ ,  $df = 2$ ,  $P \leq 0.005$ ). This result indicated that at least one of the residence categories (and not necessarily all of the residence categories) was different in mean years angling from another residence category. Further *post hoc* tests (Bonferonni and Tukey HSD) suggested B.C. residents had more years of steelhead angling experience than Canadian residents or Non-Canadian residents (Tukey HSD = 5.97  $P \leq 0.041$ , Tukey HSD = 3.51  $P \leq 0.021$ ; respectively).

Table 7. The percentage of years steelhead angling experience within each residence category.

Residence	Percentage of Anglers in Years Angling Experience Categories (n)						Mean* (total n)
	1	2-5	6-10	11-15	16-20	21+	
B.C. Resident	9.3 (14)	22.0 (33)	17.3 (26)	14.0 (21)	16.7 (25)	20.7 (31)	13.57 (150)
Canadian Resident	25.0 (5)	20.0 (4)	35.0 (7)	10.0 (2)	0.0 (0)	5.0 (1)	7.60 (20)
Non-Cdn. Resident	21.7 (23)	30.2 (32)	13.2 (14)	14.2 (15)	6.6 (7)	14.2 (15)	10.06 (106)
<b>Total</b>	<b>15.6 (44)</b>	<b>25.2(71)</b>	<b>17.0 (48)</b>	<b>13.5 (38)</b>	<b>12.1 (34)</b>	<b>16.7 (47)</b>	<b>11.67 (282)</b>

\*SE of the mean for B.C. resident, Canadian resident and Non-Canadian. resident and total were 0.85, 1.59, 1.05 and 0.62 respectively.

Fifty-three percent of Bulkley River anglers (157 anglers) interviewed were a member of a conservation club (Table 8). Of those, 82 percent were a member of one club, almost 17 percent were a member of two clubs and one percent were a member of three or more clubs. Forty percent of B.C. residents, 82 percent of Canadian residents and 64 percent of Non-Canadian residents were a member of at least one conservation club. More Canadian and Non-Canadian residents were a member of a conservation club than B.C. residents (chi-square  $\chi^2 = 21.92$ ,  $df=2$ ,  $P < 0.0005$ ). Seventy-two percent of guided anglers interviewed were a member of a conservation club while 51 percent of non-guided anglers were a member of a conservation club. More guided anglers interviewed were a member of a conservation club than non-guided anglers (chi-square  $\chi^2 = 5.18$ ,  $df=1$ ,  $P \leq 0.023$ ).

Of those anglers that were a member of at least one conservation club, 46 percent (23 percent of all anglers that answered the question) were a member of the B.C. Steelhead Society, 19 percent (9 percent of all anglers that answered the question) were a member of Trout Unlimited, 12 percent were a member of a local angling clubs (within their communities), nine percent were a member of Ducks Unlimited and six percent were a member of a foreign national angling club (Table 8). Two anglers (1.3 percent) were members of the B.C. Wildlife Federation. The remaining conservation clubs were listed in Appendix 2.

Table 8. Of the five most frequently mentioned conservation clubs, the percentage of all anglers that were a member of at least one conservation club and the percentage of anglers that were a member of all anglers that answered the question.

Conservation Club	Percentage of Anglers that were a member of at least one conservation club (n)	Percentage of Anglers that answered the question (n)
B.C. Steelhead Society	45.7 (69)	23.1 (69)
Trout Unlimited	18.5 (28)	9.4 (28)
Other Angling Club (local)	11.9 (18)	6.0 (18)
Ducks Unlimited	9.3 (14)	4.7 (14)
Foreign Country Angling Club	6.0 (9)	3.0 (9)

#### 4.1.2.2 Angling Methods and Licenses

Of all anglers interviewed, 16 percent were guided and 84 percent were non-guided. Few B.C. residents interviewed were guided anglers (3 percent), while 33 percent of Non-Canadian residents interviewed were guided (Table 9). None of the Canadian residents interviewed were guided. Non-Canadian residents were more likely to be guided anglers than B.C. or Canadian residents (chi-square  $\chi^2 = 55.78$ ,  $df=2$   $P \leq 0.005$ ; Table 9).

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

	Percentage of Anglers	
	Guided (n)	Non-Guided (n)
B.C. Resident	2.6 (4)	97.4 (152)
Canadian Resident	0.0 (0)	100.0 (25)
Non-Cdn. Resident	32.8 (43)	67.2 (88)

Of all anglers interviewed, fly anglers were more common than gear anglers (81 and 19 percent, respectively; Table 11). Seventy-two percent of B.C. residents interviewed were fly anglers, while 28 percent were gear anglers (Table 10). Similarly, the majority of Canadian residents interviewed were fly anglers (85.7 percent), while 14 percent were gear anglers. Of all Non-Canadian resident anglers interviewed, 90 percent were fly anglers and only 10 percent were gear anglers. The ratio of fly to gear anglers differed by residence category (chi-square  $\chi^2 = 15.75$ ,  $df=4$ ,  $P \leq 0.005$ , Table 10). Among gear anglers, B.C. residents were approximately three times more frequent than Non-Canadian residents, but among fly anglers, B.C. residents and Non-Canadian residents were approximately equal.

Table 10. The percentage of fly and gear anglers and jet-boat access, drift-boat access and shore-access anglers in each residence and guided status category.

	Percentage of Anglers			Percentage of Anglers	
	Jet Boat Access	Drift Boat Access	Shore Access	Fly Anglers	Gear Anglers
B.C. Resident	28.6 (46)	21.1 (34)	50.3 (81)	72.0 (116)	28.0 (45)
Canadian Resident	7.4 (2)	37.0 (10)	55.6 (15)	85.7 (24)	14.3 (4)
Non-Cdn. Resident	23.7 (33)	30.9 (43)	45.3 (63)	89.7 (130)	10.3 (15)
Guided	47.7 (21)	45.5 (20)	6.8 (3)	93.9 (46)	6.1 (3)
Non-Guided	22.4 (57)	25.2 (64)	52.4 (133)	79.8 (201)	20.2 (51)

Of all anglers interviewed about half were shore-access anglers (49.2 percent), whereas the other half gained access from a boat (50.7 percent; Table 11). Slightly more anglers gained boat access with a jet boat than a drift boat (26.4 and 24.3 percent respectively; Table 11). Approximately half of the anglers in each residence category were shore-access anglers (Table 10). For B.C. residents the Bulkley River was more commonly accessed by jet boats (28.6 percent) than drift boats (21.1 percent). In contrast, Canadian and Non-Canadian residents more commonly accessed the river with drift boats than jet boats (Table 10). However, the differences in access method were statistically similar between residence categories (chi-square  $\chi^2 = 8.863$ ,  $df=2$ ,  $P \leq 0.065$ ).

Guided anglers were more likely to fly fish than non-guided anglers (chi-square  $\chi^2 = 5.552$ ,  $df=1$ ,  $P \leq 0.031$ , Table 10). Only six percent of guided anglers fished with gear while 20 percent of non-guided anglers fished with gear. Most guided anglers interviewed accessed the river by either jet or drift boats (47.7 and 45.5, respectively) and only 6.8 percent (3 guided anglers) used the shore as an access method. In contrast, only about half the non-guided anglers accessed the river by jet or drift boat (22.4 and 25.2 percent, respectively). Guided anglers accessed the river differently than non-guided anglers (chi-square  $\chi^2 = 31.667$ ,  $df=2$ ,  $P \leq 0.005$ ).

Overall, 92 percent of jet boat-access anglers were fly fishing, and 95 percent of drift boat-access anglers interviewed were fly fishing (Table 11). Fishing with gear was more common among shore-access anglers (31.5 percent) than jet or drift boat-access anglers (7.5 and 4.6 percent respectively). Sixty-nine percent of shore-access anglers interviewed were fly anglers. The composition of fly and gear anglers differed by access method (chi-square  $\chi^2 = 35.34$ ,  $df=2$ ,  $P \leq 0.005$ ; Table 11).

Table 11. The percentage of fly and gear anglers that gained access to the river by jet boat, drift boat and shore.

Gear Type	Jet Boat Access (%)	Drift Boat Access (%)	Shore Access (%)	Total (%)
Fly	92.4 (73)	95.4 (83)	68.5 (111)	81.4
Gear	7.5 (6)	4.6 (4)	31.5 (51)	18.6
Total	24.3	26.4	49.2	100.0

Almost all of B.C. resident anglers interviewed (99.4 percent) purchased an annual angling license. Only one B.C. resident angler bought an eight day license (Table 12). Canadian residents interviewed also bought more annual licenses than eight day or one day licenses. Forty-six percent of Non-Canadian residents bought annual licenses, while 37 percent bought

eight day licenses and 17 percent bought one day licenses. The distribution of license class days differed by residence category (chi-square  $\chi^2 = 113.432$  df=4,  $P < 0.0005$ ) and their guided status (chi-square  $\chi^2 = 28.531$ , df=2,  $P < 0.0005$ , Table 12). Non-Canadian residents were less likely to buy an annual license than B.C. or Canadian resident anglers. Similarly, guided anglers were less likely to buy an annual license than non-guided anglers.

Table 12. The percentage of anglers with a one day, eight day and annual license within each residence and guided status category.

	Percentage of Anglers in License Class		
	1 Day (n)	8 Day (n)	Annual (n)
B.C. Resident	0.0 (0)	0.6 (1)	99.4 (172)
Canadian Resident	13.6 (3)	22.7 (5)	63.6 (14)
Non-Cdn. Resident	16.5 (19)	37.4 (43)	46.1 (53)
Guided	7.9 (3)	44.7 (17)	47.4 (18)
Non-Guided	7.4 (18)	11.2 (27)	81.4 (197)

Anglers were not required to purchase all the classified waters days 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 days purchased by the angler just 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.

All of the Canadian residents (3 anglers interviewed) who purchased a one day angling license had purchased a one day classified waters license (Table 13). In comparison, 17 (89.5 percent) of the Non-Canadian residents purchased one day classified waters licenses, and one angler had purchased three classified waters days but had only used one of them. Another angler (5.3 percent of Non-Canadian residents) had purchased six classified waters days and had already used four of them. It was unclear why these two guided anglers purchased multiple classified waters days and only purchased a one day angling license. Those anglers that purchased more than one classified waters day would have purchased the same number of one day angling licenses. The classified days purchased were indicative only of the data available when the angler's license was examined (Table 13).

Table 13. The number of classified waters days purchased at the time of the interview in each license class for Canadian and Non-Canadian residents.

License Class	Classified Waters Days Purchased (n)							
	1 Day	2 Day	3 Day	4 Day	5 Day	6 Day	7 Day	8 Day
<b>Canadian Resident</b>								
1 Day	3	0	0	0	0	0	0	0
8 Day	1	3	0	0	0	0	0	0
Annual	6 <sup>1</sup>	2	0	1	1	1	0	0
<b>Non-Cdn. Resident</b>								
1 Day	17	0	1	0	0	1	0	0
8 Day	6 <sup>2</sup>	2	4	0	1	10	2	5
Annual	18	4	3	3	1	1	13	4

1. Represents four anglers, two anglers bought two one day classified licenses.
2. Represents five anglers, one angler bought two one day classified licenses.

The number of classified waters days purchased with an eight day angling license varied among residence categories (Table 13, Figure 5). One B.C. resident and one Canadian resident purchased one day classified waters licenses. Six Non-Canadian residents purchased a one day classified waters licenses at the time of the interview. Three Canadian residents bought two days of classified waters angling and two Non-Canadian residents purchased two days of classified waters angling. More Non-Canadian residents purchased six, seven or eight days of classified waters angling than those that purchased one two or three days of classified waters angling (Table 13, Figure 5).

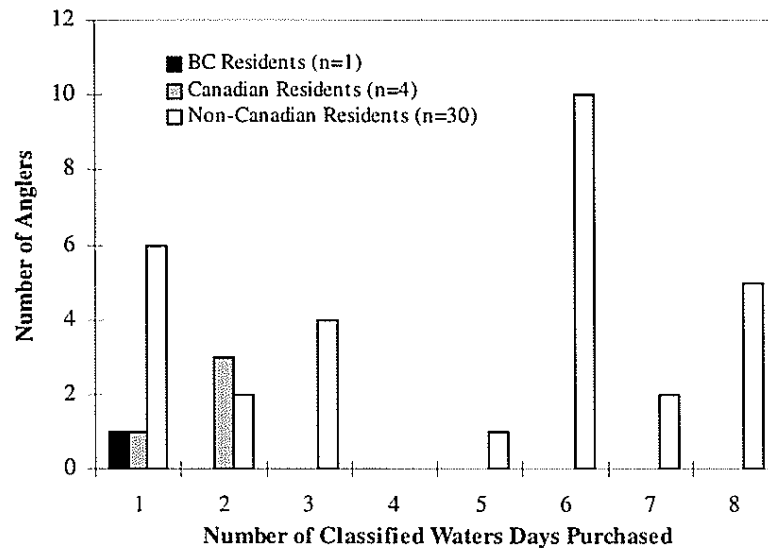


Figure 5. The number of classified waters days purchased at the time of the interview by those anglers with an eight day angling license within each residence category.

The majority of guided anglers that bought eight day angling licenses purchased six, seven or eight days of classified waters angling (Figure 6). Non-Guided anglers that bought eight day angling licenses purchased more one, two and three day licenses than six, seven and eight days classified waters licenses (Figure 6).

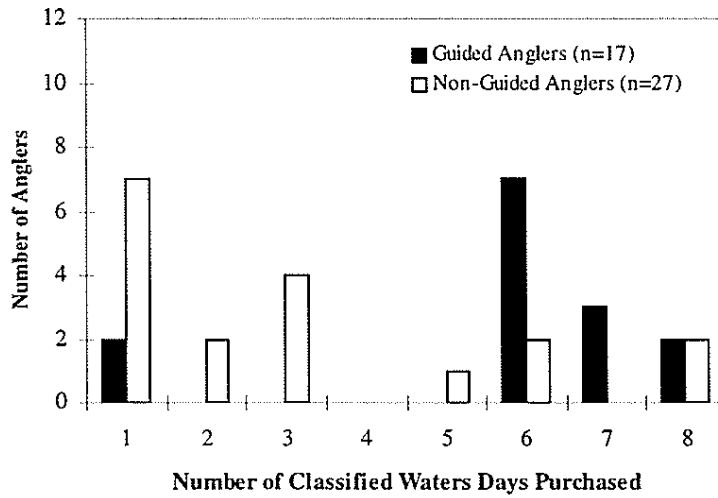


Figure 6. The number of classified waters days purchased at the time of the interview for anglers with an 8 day angling license by guided and non-guided anglers.

Most Canadian residents who bought annual angling licenses purchased one or two days of classified waters angling, and only a few Canadian residents bought four, five or six days of classified waters angling (Table 13, Figure 7). The majority of Non-Canadian residents who bought annual angling licenses purchased one or seven days of classified waters angling at the time of the interview. Thus, the data indicated that those anglers that purchased an annual angling license must have purchased classified waters licenses on several occasions because most anglers that would purchase an annual angling license would not angle for just one day.

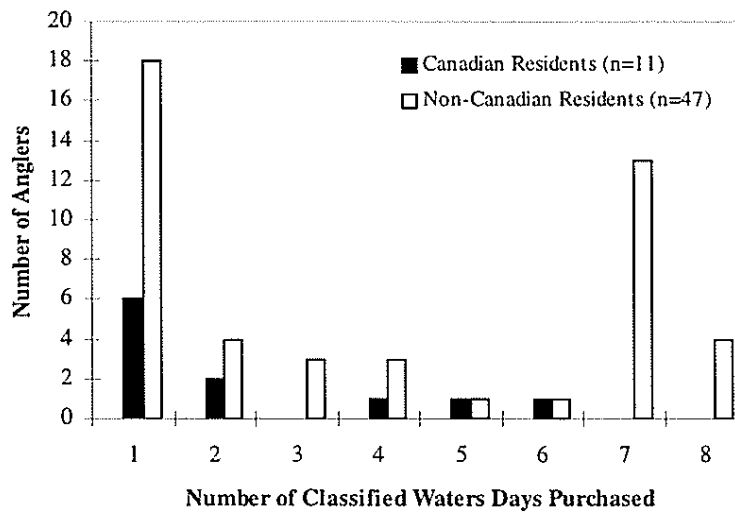


Figure 7. The number of classified waters days purchased at the time of the interview by anglers who purchased an annual angling license within each residence category.

Twenty-one (21) non-guided anglers who bought annual angling licenses purchased one day of classified waters angling (Figure 8). The number of classified waters days purchased by non-guided anglers was similar between two and eight days of angling. In contrast, the majority of guided anglers purchased seven days of classified waters angling and few guided anglers bought one, two or eight days of classified waters angling.

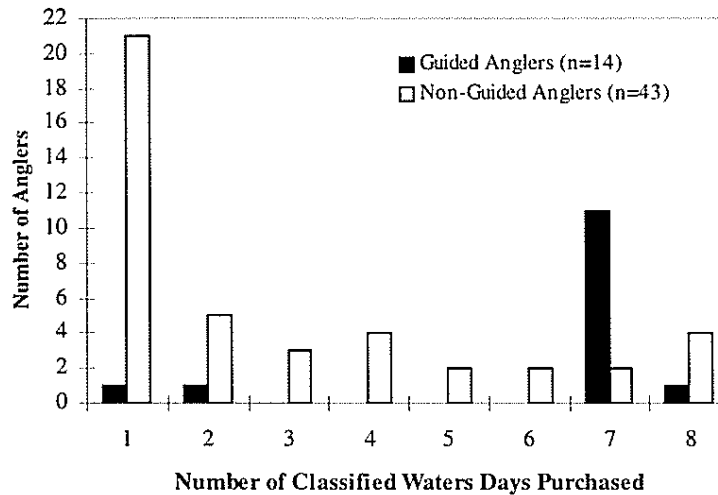


Figure 8. The number of classified waters days purchased at the time of the interview by anglers with an annual angling license by guided and non-guided anglers.

#### 4.1.2.3 Angler Compliance with Regulations

Six percent of anglers interviewed were cited for an infraction (Table 14). Of those anglers with an infraction, 72 percent (17 angler interviews) had one infraction, while the remainder had two infractions (29.2 percent; Table 14). The majority of anglers with at least one citation were B.C. residents (65 percent), followed by Non-Canadian residents (17 percent) and Canadian residents (4 percent). The residence of the remaining anglers with at least one infraction (14 percent) was unknown. Of the anglers that were interviewed more than once, only one Non-Canadian resident angler was cited with an infraction (failure to produce an angling license) during the second interview.

Table 14. The percentage of all anglers interviewed with an infraction and the percentage of offending anglers with one or two infractions.

	Percentage of Anglers
Anglers with at least one infraction	6.1 (23)
1 Infraction	69.6 (16)
2 Infractions	30.4 (7)

Failure to buy a classified waters license was the most frequent infraction cited (66.7 percent; Table 15). Seventy percent (14 citations) of those were B.C. residents which represented eight percent of all B.C. resident interviews completed. Failure to buy a steelhead stamp made up



almost 27 percent of citations. Two percent of all B.C. residents interviewed, three percent of all Canadian residents interviewed and two percent of all Non-Canadian residents interviewed failed to purchase a steelhead stamp. The remaining infractions were failure to produce a license (to a Non-Canadian resident) and two lines in the water (to a B.C. resident). Two guided anglers (4 percent) were cited with one infraction each. One citation was for not having a classified waters license and the other was for not having a steelhead conservation stamp.

Table 15. The percentage of all anglers cited with different types of infractions within each residence category.

Type of Infraction	Percentage of Anglers with Infractions (n)			
	Total <sup>1</sup>	B.C. Residents	Canadian Residents	Non-Cdn. Resident
No classified waters license	66.7 (20)	7.9 (14)	3.4 (1)	1.3 (2)
No steelhead conservation stamp	26.7 (8)	1.7 (3)	3.4 (1)	2.0 (3)
Failure to carry/produce license	3.3 (1)	0 (0)	0 (0)	< 1 (1)
Two (2) lines in the water	3.3(1)	< 1 (1)	0 (0)	0 (0)

<sup>1</sup>The sum of all the residents infractions for the classified waters and steelhead stamp because several infractions given did not have the residence of the angler recorded.

Over half of the infractions were in the first two weeks of the classified waters period and the remaining infractions were given in weeks four through six with no infractions in the last two weeks. Spatially, 74 percent of infractions were cited between Telkwa and Chicken Creek whereas only 39 percent of interviews were conducted there. Conversely, 17 percent of infractions were cited downstream of the Forks to Telkwa whereas 16 percent of interviews were completed there. One infraction was cited in the Morice River. The results presented here are only representative of infractions cited when the Interview Team was interviewing anglers. Other infractions were cited at different times during the classified waters period.

#### 4.1.3.0 Angler Perceptions of Problems and Management Strategies

##### 4.1.3.1 Problems and Management Strategies for the Overall Number of Anglers

Of all individual anglers completing the question, ten percent (27 anglers) perceived a major problem, 19 percent (53 anglers) perceived a minor problem and 69 percent perceived no problems with the overall number of anglers on the river. Two percent of anglers (6 anglers) responded they were on the river for the first time and did not answer the question. Twenty-nine percent perceived at least a minor problem with the overall number of anglers on the river.

Twenty-seven anglers perceived a major problem with the overall number of anglers on the Bulkley River. Of B.C. residents, fifteen percent perceived a major problem with the overall number of anglers on the Bulkley River while 21 percent perceived it as a minor problem (Table 16, Figure 9). Five percent of Canadian Residents perceived a major problem and five percent perceived a minor problem with the overall number of anglers on the Bulkley River. For Non-Canadian residents, five percent perceived a major problem but 21 percent perceived a minor problem with the overall number of anglers on the Bulkley River. Angler perceptions of problems with the number of anglers on the Bulkley River differed by residence category (chi-square  $\chi^2 = 6.807$ ,  $df=2$ ,  $P \leq 0.033$ ; Table 16).

Among guided anglers, five percent perceived a major problem and 27 percent perceived a minor problem with the overall number of anglers on the river (Table 16, Figure 9). Eleven (11) percent of non-guided anglers perceived a major problem and 20 percent perceived a minor problem with the overall number of anglers on the river. However, anglers perceptions toward the overall number of anglers on the river were similar between guided and unguided anglers (chi-square  $\chi^2 = 1.081$ ,  $df=2$ ,  $P \leq 0.583$ ).

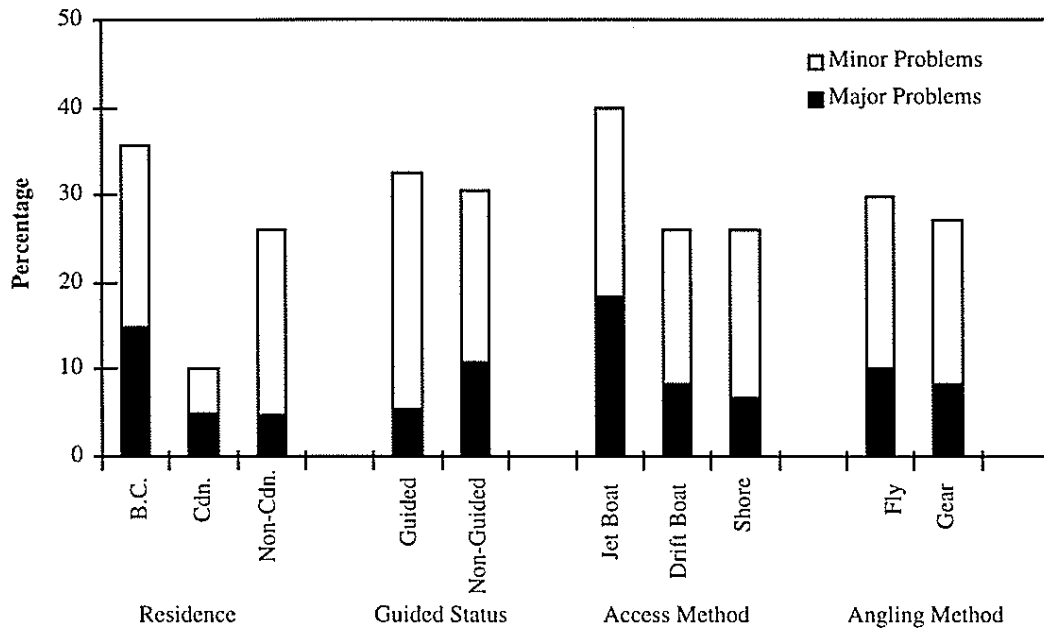


Figure 9. The percentage of anglers that perceived a minor or major problem with the overall number of anglers within each residence category, guided status, access method and angling method.

Eighteen percent (11 anglers) of jet boat-access anglers perceived a major problem and 22 percent perceived a minor problem with the overall number of anglers on the river (Table 16, Figure 9). Eight percent of drift boat-access anglers perceived a major problem and 18 percent perceived a minor problem with the overall number of anglers on the river. Angler perceptions of problems toward the overall number of anglers on the river was similar for the different access methods (chi-square  $\chi^2 = 7.235$ ,  $df=4$ ,  $P \leq 0.124$ ).

Ten percent of fly anglers and eight percent of gear anglers perceived a major problem with the overall number of anglers on the river (Table 16, Figure 9). In comparison, 20 percent and 19 percent of fly and gear anglers (respectively) perceived a minor problem with the overall number of anglers on the river. Angler perceptions of problems with the overall number of anglers on the river were similar among fly and gear anglers (chi-square  $\chi^2 = 0.198$ ,  $df=2$ ,  $P \leq 0.906$ ).

Table 16. The percentage of anglers that perceived major, minor and no problems with the overall number of anglers within each residence category, guided status category, access method and angling method.

	Percentage of Anglers with			Chi Square Value, df (significance level) <sup>1</sup>
	Major Problems (n)	Minor Problems (n)	No Problems (n)	
<b>Residence</b>				$\chi^2 = 6.807, df=2, P \leq 0.033$
B.C. Resident	14.7 (21)	21.0 (30)	64.3 (92)	
Cdn. Resident	5.0 (1)	5.0 (1)	90.0 (18)	
Non-Cdn. Resident	4.8 (5)	21.2 (22)	74.0 (77)	
<b>Guided</b>				$\chi^2 = 1.081, df=2, P \leq 0.583$
Guided	5.4 (2)	27.0 (10)	67.6 (25)	
Non-Guided	10.8 (22)	19.6 (40)	69.6 (142)	
<b>Access Method</b>				$\chi^2 = 7.235, df=4, P \leq 0.124$
Jet-Boat	18.3 (11)	21.7 (13)	60.0 (36)	
Drift Boat	8.2 (6)	17.8 (13)	74.0 (54)	
Shore	6.7 (8)	19.3 (23)	73.9 (88)	
<b>Angling Method</b>				$\chi^2 = 0.198, df=2, P \leq 0.906$
Fly fishing	10.1 (21)	19.8 (41)	70.0 (145)	
Gear fishing	8.3 (4)	18.8 (9)	72.9 (35)	

<sup>1</sup>The major and minor problems were grouped together for residence categories to meet sample size assumptions for the chi-square test.

Anglers suggested 20 management strategies to deal with the overall number of anglers on the Bulkley River. Twenty-five anglers responded to the question, although five responses were not management strategies but comments on the overall number of people on the river (Figure 10). For example, several people responded with comments of when it was busy on the river. Four anglers suggested limiting the number of Non-Canadian resident anglers, and an additional four anglers suggested limiting the overall number of anglers on the river. Three anglers suggested a no conflicts area, or to manage the river by zoning and separate fly and gear anglers. Two anglers each answered to increase fees, limit guiding or eliminate illegal guiding, and to start a lottery or limited entry system. Management strategies such as all foreigners having a guide, not raising fees and a barbless hook regulation were proposed by one angler each.

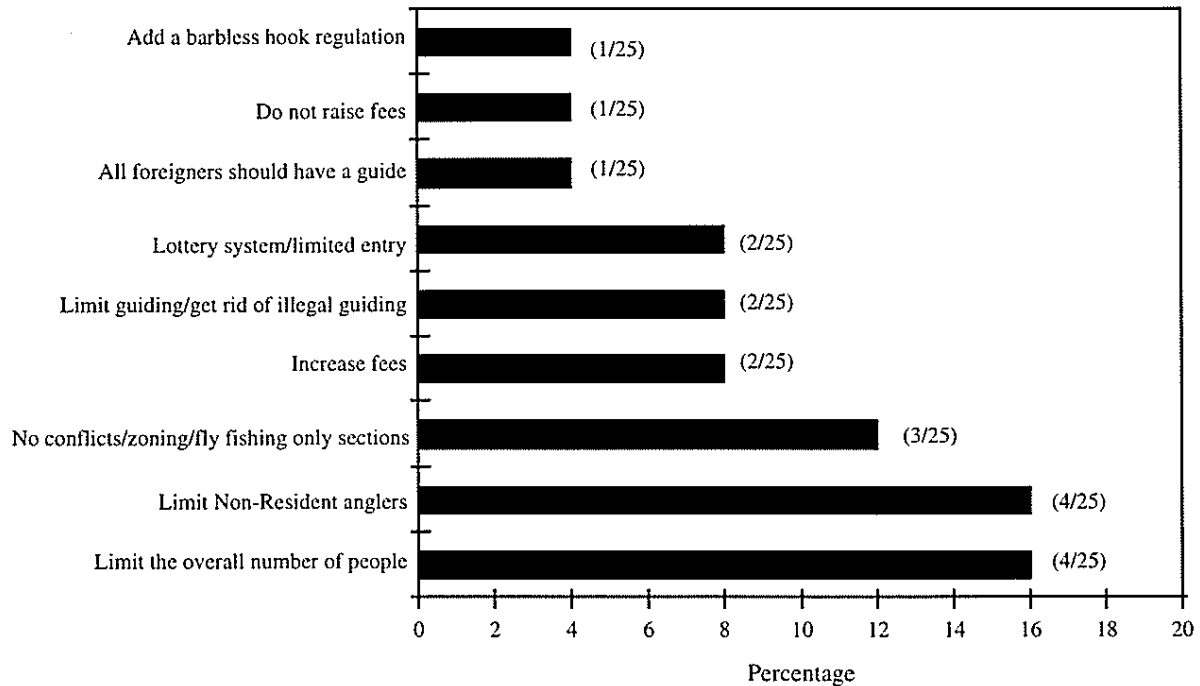


Figure 10. The preferred management strategies of anglers who perceived a problem with the overall number of anglers.

#### 4.1.3.2 Problems and Management Strategies for the Number of Boat-Based Anglers

Of all individual anglers that completed the question, 13 percent (35 anglers) perceived a major problem, 22 percent (58 anglers) perceived a minor problem and 64 percent (176 anglers) perceived no problems with the number of boat-based anglers on the river. Two percent of anglers (6 anglers) responded they were on the river for the first time and did not answer the question. Thirty-five (35) percent perceived at least a minor problem with the number of boat-based anglers.

Thirty-five anglers perceived a major problem with the number of boat-based anglers on the Bulkley River (Table 17, Figure 11). Nineteen percent of B.C. resident anglers perceived a major problem and 18 percent perceived a minor problem with the number of boat-based anglers on the river. Ten and 15 percent of Canadian residents perceived a major and a minor problem with the number of boat-based anglers, respectively. Six percent of Non-Canadian anglers perceived a major problem and 25 percent perceived a minor problem with the number of boat-based anglers on the river. Angler perceptions of problems with the number of boat-based anglers were similar between residence categories (chi-square  $\chi^2 = 1.816$ ,  $df=2$ ,  $P \leq 0.403$ ).

Eleven percent of guided anglers perceived a major problem and 27 percent perceived a minor problem with the number of boat-based anglers on the river (Table 17; Figure 11). Similarly, 14 percent of non-guided anglers perceived a major problem and 20 percent perceived a minor problem with the number of boat-based anglers on the river. Angler perceptions of problems with the number of boat-based anglers on the Bulkley River were similar between guided and non-guided anglers (chi square  $\chi^2 = 1.081$ ,  $df=2$ ,  $P \leq 0.583$ ).

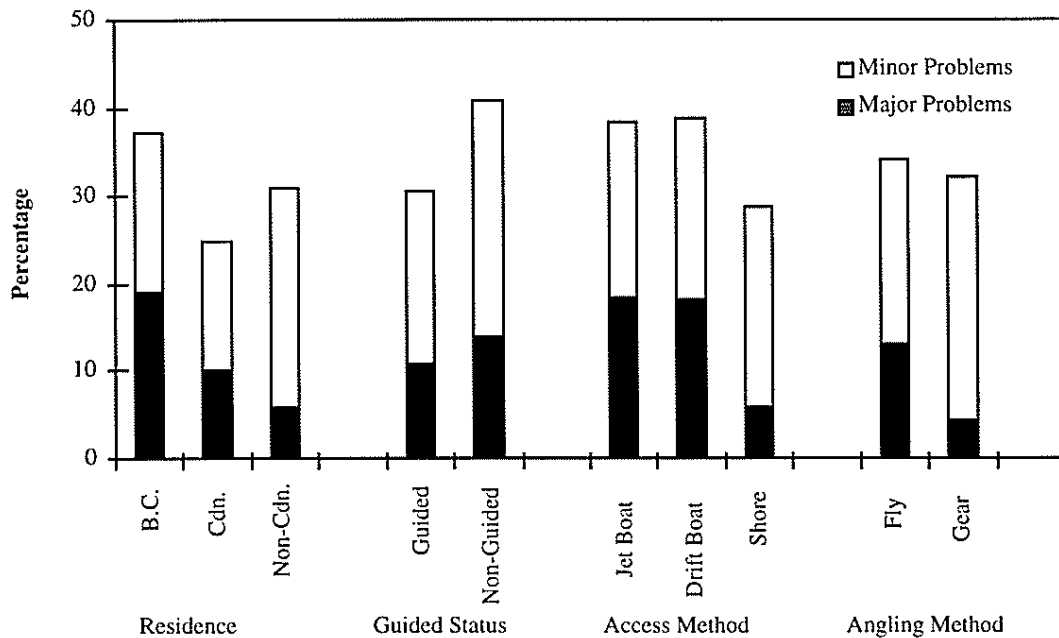


Figure 11. The percentage of anglers that perceived a minor or major problem with the number of boat-based anglers within each residence category, guided status, access method and angling method.

Jet and drift boat-access anglers perceived major and minor problems with boat-based anglers similarly. In contrast, shore-access anglers perceived less major problems (5.9 percent) and slightly more minor problems (22.9 percent) than boat-access anglers (Table 17; Figure 11). Fly anglers perceived more major problems (13.1 percent) than gear anglers (4.3 percent), but gear anglers perceived more minor problems (27.7 percent) than fly anglers (20.9 percent). However, angler perceptions with the number of boat-based anglers were similar for all access methods (chi-square  $\chi^2 = 8.634$ ,  $df=4$ ,  $P \leq 0.071$ ).

Table 17. The percentage of anglers that perceived major, minor and no problems with the number of boat-based anglers within each residence category, guided status category, access method and angling method.

	Percentage of Anglers with			Chi Square Value, df, significance level <sup>1</sup>
	Major Problems (n)	Minor Problems (n)	No Problems (n)	
<b>Residence</b>				$\chi^2 = 1.816$ , $df=2$ , $P \leq 0.403$
B.C. Resident	19.0 (27)	18.3 (26)	62.7 (59)	
Cdn. Resident	10.0 (2)	15.0 (3)	75.0 (15)	
Non-Cdn. Resident	5.8 (6)	25.2 (26)	68.9 (71)	
<b>Guided</b>				$\chi^2 = 1.081$ , $df=2$ , $P \leq 0.583$
Guided	10.8 (4)	27.0 (10)	62.2 (23)	
Non-Guided	13.9 (28)	19.8 (40)	66.6 (134)	
<b>Access Method</b>				$\chi^2 = 8.634$ , $df=4$ , $P \leq 0.071$
Jet-Boat	18.3 (11)	20.0 (12)	61.7 (37)	
Drift Boat	18.1 (13)	20.8 (15)	61.1 (44)	
Shore	5.9 (7)	22.9 (27)	71.2 (84)	
<b>Angling Method</b>				$\chi^2 = 3.436$ , $df=2$ , $P \leq 0.179$
Fly fishing	13.1 (27)	20.9 (43)	66.0 (136)	
Gear fishing	4.3 (2)	27.7 (13)	68.1 (32)	

<sup>1</sup>The major and minor problems were grouped together for residence categories to meet sample size assumptions for the chi-square test.

Forty anglers suggested management strategies to deal with the number of boat-based anglers on the Bulkley River (Figure 12). Two responses were statements that did not suggest a management strategy but commented on the situation. Most anglers suggested restricting the number of jet boats (21 of 40 responses). Five anglers suggested restricting the overall number of boats although the anglers did not suggest that jet boats specifically should be restricted. A limit to the motor size or noise of jet boats was suggested by four anglers. Two anglers each suggested to limit the overall number of people or Non-Canadian residents and implementing a lottery or limited entry system. Increased fees, all foreigners having a guide, a fly only or no conflict zone and limiting fishing from boats were all suggested by one angler each (Figure 12).

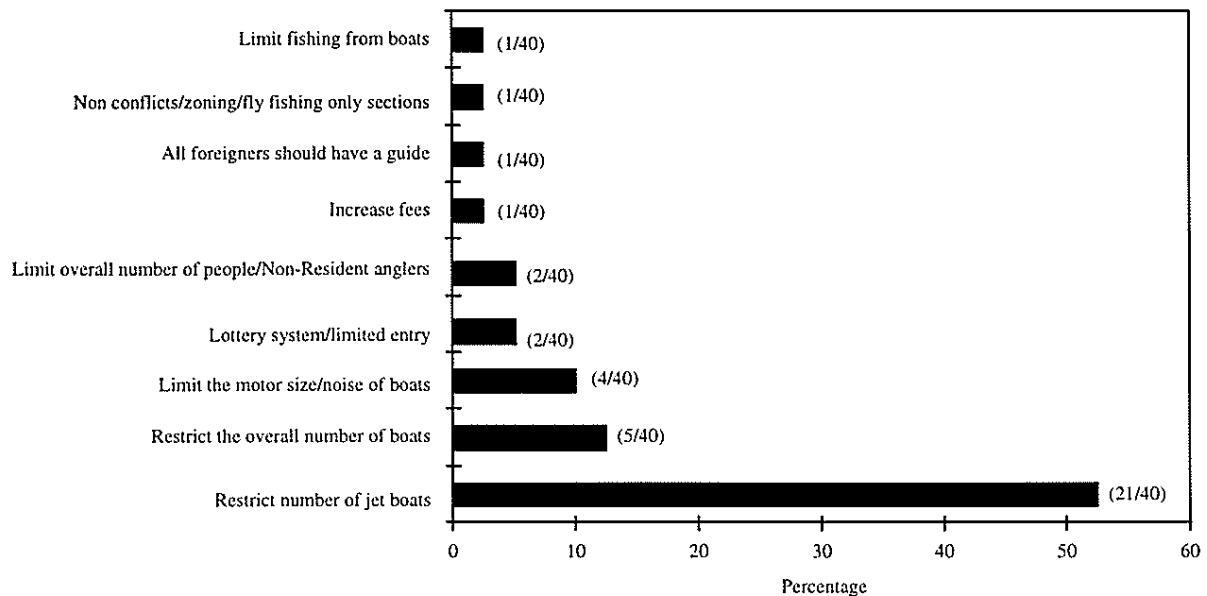


Figure 12. The preferred management strategies of anglers who perceived a problem with the number of boat-based anglers.

#### 4.1.3.3 Problems and Management Strategies for the Number of Shore-Based Anglers

Anglers did not perceive as many problems with the number shore-based anglers as they did with boat-based anglers. Of all individual anglers that completed the question, 3.4 percent (9 anglers) perceived a major problem, 14.7 percent (40 anglers) perceived a minor problem and 80 percent (218 anglers) perceived no problems with the number of shore-based anglers on the river. Two percent of anglers (6 anglers) responded they were on the river for the first time and did not answer the question.

No Canadian residents perceived a major problem and only five percent perceived a minor problem with the number of shore-access anglers (Table 18; Figure 13). Four percent of B.C. residents perceived a major problem and 15 percent perceived a minor problem with number of shore-based anglers. Similarly, Non-Canadian residents perceived a major problem four percent of the time and 16 percent of anglers perceived a minor problem with the number of shore-based anglers.

Three percent of guided anglers perceived a major problem and 14 percent perceived a minor problem with the number of shore-based anglers on the river (Table 18, Figure 13). Three percent of non-guided anglers perceived a major problem and 22 percent perceived a minor problem with the number of shore-based anglers on the river. Angler perceptions of problems with the number of shore-based anglers were similar between guided and non-guided anglers (chi-square  $\chi^2 = 1.636$ ,  $df=2$ ,  $P \leq 0.441$ ).

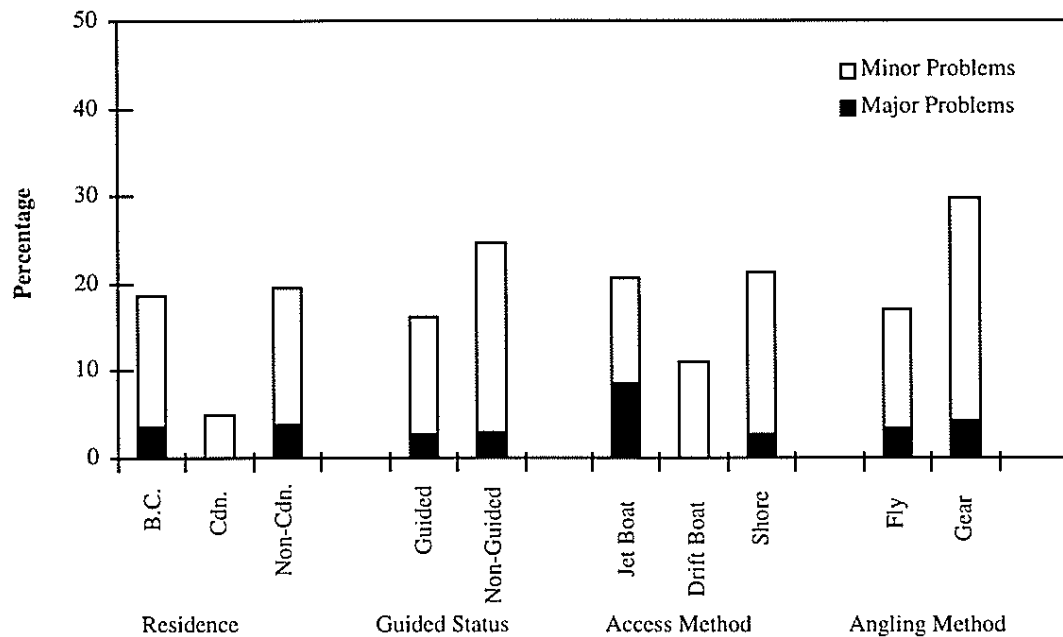


Figure 13. The percentage of anglers that perceived a minor or major problem with the number of shore-based anglers within each residence category, guided status, access method and angling method.

Almost nine percent of jet boat-access anglers perceived a major problem with shore-based anglers whereas 12 percent perceived a minor problem (Table 18, Figure 13). No drift boat-access anglers perceived a major problem, but 11 percent perceived a minor problem with the number of shore-based anglers. Slightly more gear anglers perceived a major and a minor problem (4.3 and 25.5 percent, respectively) than fly anglers (2.4 and 13.7 percent, respectively). Angler perceptions of problems with the number of shore-based anglers were similar between fly and gear anglers (chi-square  $\chi^2 = 4.171$ ,  $df=2$ ,  $P \leq 0.124$ ).

Table 18. The percentage of anglers that perceived major, minor and no problems with the number of shore-based anglers within each residence category, guided status category, access method and angling method.

	Percentage of Anglers with			Chi Square Value, df, significance level <sup>1</sup>
	Major Problems (n)	Minor Problems (n)	No Problems (n)	
<b>Residence</b>				$\chi^2 = 2.472, df=2, P \leq 0.291$
B.C. Resident	3.6 (5)	15.0 (21)	81.4 (114)	
Canadian Resident	0.0 (0)	5.0 (1)	95.0 (19)	
Non-Cdn. Resident	3.9 (4)	15.5 (16)	80.6 (83)	
<b>Guided</b>				$\chi^2 = 1.636, df=2, P \leq 0.441$
Guided	2.7 (1)	13.5 (27)	83.5 (167)	
Non-Guided	3.0 (6)	21.6 (8)	75.7 (28)	
<b>Access Method</b>				$\chi^2 = 3.609, df=2, P \leq 0.165$
Jet-Boat	8.6 (5)	12.1 (7)	79.3 (46)	
Drift Boat	0.0 (0)	11.0 (8)	89.0 (65)	
Shore	2.6 (3)	18.8 (22)	78.6 (92)	
<b>Angling Method</b>				$\chi^2 = 4.171, df=2, P \leq 0.124$
Fly fishing	3.4 (7)	13.7 (28)	82.8 (169)	
Gear fishing	4.3 (2)	25.5 (12)	70.2 (33)	

<sup>1</sup>The major and minor problems were grouped together for residence categories and access method to meet sample size assumptions for the chi-square test.

Only four anglers suggested management strategies for shore-based anglers. Two of those responses were comments on the situation of too many shore-based anglers. One angler suggested all foreigners should have a guide and the other suggested limiting the number of shore-based anglers.

#### 4.1.3.4 Other Concerns and Management Strategies

Steelhead abundance was commonly cited as 'other concerns' among B.C. residents, Canadian and Non-Canadian residents. For B.C. residents, anglers were concerned with low numbers of fish (19.3 percent), commercial fishing (16.9 percent) and native fishing (7.1 percent). Seven percent of Canadian residents responses were concerned with the low numbers of fish. Of Non-Canadian resident responses, almost 15 percent were concerned about commercial fishing and two percent were concerned about native fishing.

A total of 99 steelhead angler management concerns were mentioned by B.C. residents (53 percent), Canadian residents (4 percent) and Non-Canadian residents (43 percent). Nineteen percent of B.C. resident responses, ten percent of Canadian resident responses and 39 percent of Non-Canadian responses were about regulations (Table 19). The majority of these concerns were about the licensing system. Most Non-Canadian resident anglers who responded felt the classified waters license was too specific and suggested the classified waters license should not be river specific (Table 19). B.C. residents suggested they were concerned with the regulations in general, the lack of a fly only section, the licensing system, enforcement and gear restrictions. The suggested angler management strategies were to zone or add a section of river for fly only angling, adding more enforcement and having a barbless hook regulation (Table 19). Guided anglers had no concerns about regulations on the Bulkley River.



Table 19. Other regulation issues mentioned by anglers with suggested management strategies separated within each residence and guided status category.

Regulation Issues	Percentage of all Responses (n) <sup>1</sup>					Suggested Management Strategies (All)
	B.C.	Cdn.	Non-Cdn.	Guided	Non-Guided	
Total	26.0 (12)	10.0 (1)	46.5 (20)	0 (0)	35.3 (30)	
Licensing System	6.7 (3)	0 (0)	41.8 (18)	0 (0)	23.5 (20)	<ul style="list-style-type: none"> <li>◆ Class. license should not be river specific (13)</li> <li>◆ River should not be classified for locals (1)</li> <li>◆ Don't segregate non-residents and resident anglers (1)</li> </ul>
Lack of Fly Only Section	2.2 (1)	10.0 (1)	0 (0)	0 (0)	2.4 (2)	<ul style="list-style-type: none"> <li>◆ Zone, manage for no conflicts, add fly fishing only zone. (2)</li> </ul>
Enforcement	2.2 (1)	0 (0)	0 (0)	0 (0)	1.1 (1)	<ul style="list-style-type: none"> <li>◆ More enforcement (1)</li> </ul>
General Regs.	11.1 (5)	0 (0)	2.3 (1)	0 (0)	7.1 (6)	<ul style="list-style-type: none"> <li>◆ Publish article on etiquette/conservation issues (1)</li> <li>◆ Lower the number of restrictions (1)</li> <li>◆ Should be able to keep steelhead (1)</li> <li>◆ Don't implement limited entry (1)</li> </ul>
Gear Restrictions	4.4 (2)	0 (0)	0 (0)	0 (0)	1.1 (1)	<ul style="list-style-type: none"> <li>◆ Have a barbless hook regulation (2)</li> </ul>

<sup>1</sup> The percentages are those of all responses of other concerns within each residence and guided status category. The sum of concerns within all residence categories may not equal the sum within all guided categories because the data may not have been available to assign them to each group.

Only a few concerns regarded access (n=9, Table 20). B.C. resident responses were concerned about boat access and the suggested management strategy was to restrict the number of jet boats. Non-Canadian residents were concerned about the lack of access to the Bulkley River and they suggested improving the access. Guided anglers did not have any concerns regarding access to the Bulkley River (Table 20).

Table 20. Other access issues mentioned by anglers with suggested management strategies within each residence and guided status category.

Access Issues	Percentage of Responses (n) <sup>1</sup>					Suggested Management Strategies (All)
	B.C.	Cdn.	Non-Cdn.	Guided	Non-Guided	
Total	4.4 (2)	0 (0)	16.3 (7)	0 (0)	10.5 (9)	
Access Issues	0 (0)	0 (0)	7.0 (3)	0 (0)	3.5 (3)	<ul style="list-style-type: none"> <li>◆ Improve access (3)</li> </ul>
Boat Issues	4.4 (2)	0 (0)	9.3 (4)	0 (0)	7.1 (6)	<ul style="list-style-type: none"> <li>◆ Restrict number of jet boats (3)</li> </ul>

<sup>1</sup> The percentages are those of all responses of other concerns within each residence and guided status category. The sum of concerns within all residence categories may not equal the sum within all guided categories because the data may not have been available to assign them to each group.

Angling license fees were of concern to 27 anglers (Table 21). Sixteen percent of B.C. resident responses were concerned about fee issues. Of all B.C. resident responses, seven percent were concerned about the proposed classified waters license fee increase, while nine percent felt license fees were too expensive. Ninety percent (10 responses) of all Canadian resident responses regarded fees. Most Canadian anglers suggested concerns about the proposed license fee increase (70 percent), while several were concerned with the price of licenses in general (30 percent). Twenty-three percent of all Non-Canadian resident responses regarded the proposed classified waters license fee increase. Thirty percent of all guided anglers concerns regarded fees. Thirteen anglers suggested that fisheries managers should not raise the classified waters license angling fee. Several anglers suggested that Canadian resident fees should be less than

Non-Canadian fees and that Non-Resident anglers should not be segregated from residents (Table 21).

Table 21. Other fee issues mentioned by anglers with suggested management strategies within each residence and guided status category.

Fee Issues	Percentage of Responses (n) <sup>1</sup>					Suggested Management Strategies (All)
	B.C.	Cdn.	Non-Cdn.	Guided	Non-Guided	
Total	16.0 (7)	90.0 (10)	23.3 (10)	30.0 (3)	27.1 (23)	
Proposed License Fee Increase	6.7 (3)	70.0 (7)	20.9 (9)	40.0 (2)	18.8 (16)	<ul style="list-style-type: none"> <li>◆ Don't raise fees (13)</li> <li>◆ Use money for research/conservation (1)</li> </ul>
Licenses are too expensive	8.9 (4)	30.0 (3)	2.3 (1)	20.0 (1)	8.2 (7)	<ul style="list-style-type: none"> <li>◆ Do not raise fees (2)</li> <li>◆ Canadian resident fees should be less than Non-Canadian residents.. (2)</li> <li>◆ Don't segregate non residents from residents (1)</li> </ul>

<sup>1</sup> The percentages are those of all responses of other concerns within each residence and guided status category. The sum of concerns within all residence categories may not equal the sum within all guided categories because the data may not have been available to assign them to each group.

Thirty-six percent of B.C. resident responses regarded concerns with the number of anglers on the Bulkley River (Table 22). Eighteen percent of B.C. resident responses were concerned about the number of non-resident anglers. The management strategies suggested were to increase fees, implement a lottery or limited entry system, all foreigners should have a guide and limiting non-resident angler numbers. Non-Canadian residents were not concerned about the number of non-resident angler numbers, although one Non-Canadian resident was concerned about crowding in general. Garbage and angler etiquette were of concern to both B.C. residents and Non-Canadian residents.

Table 22. Other angler number issues mentioned by anglers with suggested management strategies within each residence and guided status category.

Angler Number Issues	Percentage of Responses (n) <sup>1</sup>					Suggested Management Strategies (All)
	B.C.	Cdn.	Non-Cdn.	Guided	Non-Guided	
Total	36.0 (16)	0 (0)	9.3 (4)	0 (0)	20.0 (17)	
Fly/gear conflicts	4.4 (2)	0 (0)	2.4 (1)	0 (0)	2.3 (2)	
Non-resident anglers	17.8 (8)	0 (0)	0 (0)	0 (0)	8.2 (7)	<ul style="list-style-type: none"> <li>◆ Increase fees (2)</li> <li>◆ Lottery system/limited entry/limit # of days (2)</li> <li>◆ All foreigners should have a guide (1)</li> <li>◆ Limit non resident angler numbers</li> </ul>
Garbage/littering/campsite garbage	6.7 (3)	0 (0)	2.4 (1)	0 (0)	4.7 (4)	<ul style="list-style-type: none"> <li>◆ Clean up garbage (1)</li> <li>◆ Limit guiding (causing garbage) (1)</li> </ul>
Angler Education/Etiquette	6.7 (3)	0 (0)	2.4 (1)	0 (0)	3.5 (3)	
Crowding	0 (0)	0 (0)	2.4 (1)	0 (0)	1.1 (1)	<ul style="list-style-type: none"> <li>◆ Lottery system/limited entry/limit # of days (1)</li> </ul>

<sup>1</sup> The percentages are those of all responses of other concerns within each residence and guided status category. The sum of concerns within all residence categories may not equal the sum within all guided categories because the data may not have been available to assign them to each group.

Eighteen percent of B.C. resident responses were concerned about guides on the river (Table 23). Eleven percent of B.C. resident responses (5 anglers) suggested there were too many guides on the river and three percent were concerned about the illegal guides. One Non-Canadian resident each was concerned that fisheries managers were eliminating guides and concerned with the presence of illegal guides. Guided anglers were also concerned about fisheries managers eliminating guides and the illegal guiding issue. Some non-guided anglers were concerned that there were too many guides. Management strategies included not decreasing the number of guide days and eliminating illegal guiding (Table 23).

Table 23. Other guiding issues mentioned by anglers with suggested management strategies within each residence and guided status category.

Guiding Issues	Percentage of Responses (n) <sup>1</sup>					Suggested Management Strategies (All)
	B.C.	Cdn.	Non-Cdn.	Guided	Non-Guided	
Total	17.8 (8)	0 (0)	4.7 (2)	20.0 (2)	7.1 (6)	
Too many guides	11.1 (5)	0 (0)	0 (0)	0 (0)	3.5 (3)	
Fisheries Managers are eliminating guides	2.2 (1)	0 (0)	2.3 (1)	10.0 (1)	1.1 (1)	♦ Don't decrease guide days (1)
Illegal guides	4.4 (2)	0 (0)	2.3 (1)	10.0 (1)	2.4 (2)	♦ Get rid of illegal guiding (1)

<sup>1</sup> The percentages are those of all responses of other concerns within each residence and guided status category. The sum of concerns within all residence categories may not equal the sum within all guided categories because the data may not have been available to assign them to each group.

#### 4.1.3.5 Angler Perceptions of All Major and Minor Problems

The sum of the number of major and minor problems of all three concerns (the overall number of anglers on the river, the number of boat-based anglers and the number of shore-based anglers) was examined within each residence category, guided status category, week and river section.

Eighteen percent of individual anglers (49 anglers) had at least one major problem (Table 24). Twelve percent (32 anglers) reported one major problem, four percent (12 anglers) reported two major problems and 2 percent (5 anglers) reported three major problems (Table 24). More B.C. residents had one, two or three major problems (18, six and three percent, respectively) than Canadian (five, five and zero percent, respectively) or Non-Canadian residents (six, three and one percent, respectively). Overall, B.C. residents had more major problems (with the overall number of anglers on the river, the number of boat-based anglers and the number of shore-based anglers) than Canadian residents and Non-Canadian residents (Kruskal-Wallis = 11.468,  $df = 2$ ,  $P \leq 0.003$ ; Table 24). There was no difference in the overall number of major problems reported by guided and non-guided anglers (Mann Whitney U = 3535.0,  $P \leq 0.366$ ).

Thirty-three percent of anglers (89 anglers) had at least one minor problem (Table 24). Seventeen percent (44 anglers) reported one minor problem, 11 percent (29 anglers) reported two minor problems and six percent (16 anglers) reported three minor problems. There was no difference in the number of minor problems within each residence category or between guided and non-guided anglers (Kruskal-Wallis = 0.903,  $df = 2$ ,  $P \leq 0.213$ , Mann Whitney U = 3378.5,  $P \leq 0.342$ , respectively).

Table 24. The percentage of anglers with one, two or three major and minor problems (the sum of and anglers major or minor problems with the overall number of anglers, the number of boat-based anglers and the number of shore-based anglers on the river) within each residence and guided status category.

	Percentage of Major Problems (n)			Percentage of Minor Problems (n)		
	1	2	3	1	2	3
<b>Residence</b>						
B.C. Resident	18% (25)	6% (8)	3% (4)	20% (20)	11% (16)	4% (5)
Canadian Resident	5% (1)	5% (1)	0% (0)	10% (2)	5% (1)	0% (0)
Non-Cdn. Resident	6% (6)	3% (3)	1% (1)	13% (13)	12% (12)	9% (9)
<b>Statistical Result</b>	Kruskal-Wallis = 11.468, df = 2, $P \leq 0.003$			Kruskal-Wallis = 0.903, df = 2, $P \leq 0.213$		
<b>Guided<sup>1</sup></b>						
Guided	11% (4)	0% (0)	3% (4)	14% (5)	11% (4)	14% (5)
Non-Guided	13% (26)	12% (12)	1% (2)	17% (34)	12% (22)	5% (9)
<b>Statistical Result</b>	Mann Whitney U = 3535.0, $P \leq 0.366$			Mann Whitney U = 3378.5, $P \leq 0.342$		

1. Thirty anglers were not assigned to a guided status category, seven percent had one major problem (2 anglers), seven percent (2 anglers) had 3 major problems, 17 percent (34 anglers) had one minor problem, 10 percent (3 anglers) had two minor problems and seven percent (2 anglers) had three minor problems.

Of all responses, the percentage of minor problems reported within each week was more than the percentage of major problems within each week, except for the shoulder weeks of 9-1 and 10-4 (Figure 14). The percentage of major problems in the first several weeks (9-1 through 9-3) and the last week of the classified waters period was higher than for weeks 9-5 through 10-3. The percentage of minor problems was relatively high in weeks 9-2, 9-5, 10-2 and 10-3, and lower in weeks 9-1, 9-3, 9-4 and 10-1. The frequency of minor problems was lowest in week 10-4. There appeared to be more major and minor problems in weeks 9-1 through 9-3, 9-5, 10-2 and 10-3 than the other weeks.

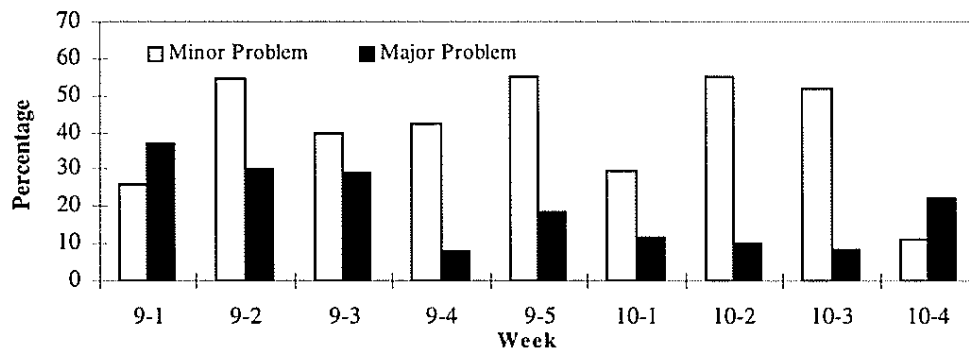


Figure 14. Of all responses, the percentage of all major and minor problems with the overall number of anglers, the number of boat-based anglers and the number of shore-based anglers within each week.

For all river sections, the percentage of minor problems was more than the percentage of major problems (Figure 15). There were no major problems reported in the river section from Walcott to Quick and the Moricetown to Suskwa section had few major problems reported. The remainder of the river sections had a relatively similar frequency of major problems. Minor problems were frequent in the river sections from Walcott to Smithers bridge and Moricetown downstream. The frequency of major and minor problems was highest from Quick to Trout Creek.

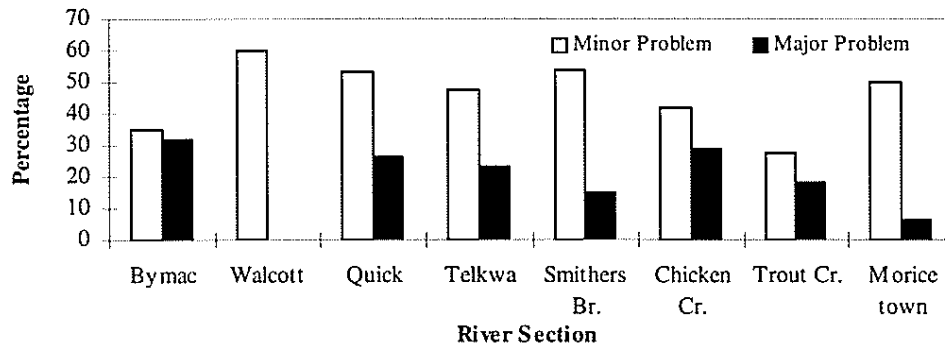


Figure 15. The percentage of major and minor problems with the overall number of anglers, the number of boat-based anglers and the number of shore-based anglers within each river section.

#### 4.1.5.0 Angler Catch and Effort

For those anglers interviewed, a total of 1161.5 hours were spent fishing by Bulkley River anglers which averaged 3.43 hours fishing per angler at the time of the interview. One hundred and sixty-six (166) steelhead were caught and released. At the time of the interview 248 anglers caught nothing, 67 anglers caught one steelhead, 10 anglers caught two steelhead, one angler caught four steelhead, one angler caught five and three anglers caught six steelhead.

The catch rate was calculated by summing the steelhead caught for interviews of 0.5 hr (30 minutes) or more. Eight percent of interviews (28 interviews) were eliminated because they had been on the river for less than thirty minutes. The catch rate for all angler interviews was 0.1574 steelhead/hour or 1.26 steelhead/rod day.

Catch rates were estimated for all weeks during the classified waters period by grouping all river sections together (Table 25). Week 9-4 produced the highest catch rate on the Bulkley River (2.4 steelhead/rod day) followed by week 9-2 (2.1 steelhead/rod day) and week 10-4 (1.9 steelhead/rod day; Table 25). Weeks 9-5 and 10-3 had the lowest catch rate (0.76 and 0.61 steelhead/rod day, respectively). The Interview Team and personnel that conducted aerial counts recorded turbid water conditions in weeks 9-5, 10-2, 10-3 and 10-4.

Table 25. The steelhead caught, hours fished, catch rate and steelhead per rod day within each week.

Week	Steelhead Caught	Total Hours Fished (%)	Catch Rate (SD) <sup>1</sup>	Steelhead per Rod Day
9-1	6	54.0 (4.6)	0.11 (0.306)	0.86
9-2	15	70.0 (6.0)	0.26 (0.570)	2.10
9-3	42	201.5 (17.3)	0.20 (0.335)	1.61
9-4	10	41.0 (3.5)	0.30 (0.627)	2.43
9-5	33	315.8 (27.1)	0.10 (0.184)	0.76
10-1	35	244.5 (20.9)	0.13 (0.287)	1.10
10-2	4	42.0 (3.6)	0.18 (0.486)	1.45
10-3	8	128.0 (11.0)	0.08 (0.132)	0.61
10-4	13	62.0 (5.3)	0.23 (0.264)	1.86

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).

Catch rates were estimated for river sections during the classified waters period by grouping all weeks together. The highest catch rate was between the Forks and upstream of Quick (2.1 steelhead/rod day; Table 26). The catch rate for the Morice River was the second highest of all those calculated (1.7 steelhead/rod day). The lowest catch rate was between Chicken Creek and upstream of Trout Creek (0.62 steelhead/rod day). There were 32 interviews that could not be assigned to any river section.

Table 26. The steelhead caught, 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
Bymac-Forks (MORICE RIVER)	25	112.0 (10.7)	0.22 (0.481)	1.72
Forks - upstream Quick	16	67.50 (6.4)	0.26 (0.496)	2.10
Quick - upstream Telkwa	15	152.50 (14.6)	0.12 (0.273)	0.98
Telkwa - upstream Smithers Bridge	35	283.00 (27.0)	0.13 (0.382)	1.26
Smithers Bridge - upstream Chicken Creek	17	139.00 (13.3)	0.12 (0.270)	0.92
Chicken Creek - upstream Trout Creek	16	162.00 (15.5)	0.08 (0.140)	0.62
Trout Creek - downstream	18	131.25 (12.5)	0.11 (0.224)	0.91

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).

Among residence categories, B.C. residents interviewed had the highest catch rate (1.5 steelhead/rod day), followed by Non-Canadian residents (0.67 steelhead/rod day) and Canadian residents (1.10 steelhead/rod day; Table 27). Guided anglers had higher catch rates (1.6 steelhead/rod day) than non-guided anglers (1.2 steelhead/rod day) interviewed. Jet boat-access and drift boat-access anglers had similar steelhead catch rates (1.1 steelhead/rod day and 1.2 steelhead/rod day, respectively), while shore-access anglers had a higher catch rate than either boat-access methods (1.5 steelhead/rod day). Fly anglers caught 1.2 steelhead/rod day while gear anglers caught 1.8 steelhead/rod day.

Table 27. The steelhead caught, 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 (SD) <sup>1</sup>	Steelhead per Rod Day
<b>Residence</b>				
B.C. Resident	78	481.8 (42.8)	0.181 (0.388)	1.45
Cdn. Resident	13	142.0 (12.6)	0.084 (0.144)	0.67
Non-Cdn. Resident	67	503.5 (44.6)	0.138 (0.295)	1.10
<b>Guided</b>				
Guided	38	238.5 (23.2)	0.199 (0.363)	1.60
Non-Guided	107	788.3 (76.8)	0.151 (0.345)	1.21
<b>Access Method</b>				
Jet-Boat	50	339.0 (31.2)	0.143 (0.227)	1.14
Drift Boat	39	344.5 (31.7)	0.144 (0.337)	1.15
Shore	64	402.5 (37.1)	0.188 (0.427)	1.50
<b>Angling Method</b>				
Fly fishing	124	972.5 (88.2)	0.145 (0.316)	1.16
Gear fishing	30	129.8 (11.8)	0.224 (0.485)	1.79

1. The average of the individual catch rates for each angler and we ignore all short trips (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 a to an angling method (10 steelhead).

Twenty-three Dolly Varden/bull trout were caught and of those 19 were released and four were kept. The catch rate for all anglers interviewed was 0.15 Dolly Varden/bull trout/rod day. Steelhead anglers caught and released six other species of fish. Three anglers interviewed each caught one coho salmon (*Oncorhynchus kisutch*), one angler caught one sockeye salmon (*O. nerka*), one angler caught one cutthroat trout (*O. clarki*), one angler caught one pink salmon (*O. gorbuscha*), four anglers caught a total of eight rainbow trout (*O. mykiss*) and four anglers caught a total of eight whitefish (*Prosopium* sp.).

#### 4.2.0.0 Instantaneous Aerial Counts

##### 4.2.1.0 Spatial and Temporal Distribution of Anglers

There were 709 anglers counted on the Bulkley River during the 12 aerial flights. The number of angler interviews conducted and aerial observations of anglers were highest in weeks 9-5 and 10-1 (Figure 16). In week 9-5 turbid water conditions were reported downstream of the confluence of the Bulkley and Telkwa rivers thus, half of anglers were counted above the Telkwa River. Prior to week 9-5, the number of angler interviews completed steadily increased until week 9-4. Both the percentage of angler interviews conducted and aerial counts of anglers declined at a steady rate in weeks 10-2 through 10-4. Turbid water conditions downstream of the Telkwa River were also poor between weeks 10-2 and 10-4. The number of anglers observed was positively correlated with the number of anglers interviewed in each week and indicated good temporal representation (Pearson Correlation  $R = 0.905$   $P \leq 0.013$ ). In 1997, weeks 9-5 and 10-1 (the last week in September and the first week in October) had the most anglers in relation to other weeks in the classified waters period. Poor water conditions were reported in weeks 9-5, 10-2 10-3 and 10-4.

The percentage of anglers observed from aerial counts outside of the classified waters period (week 11-3) was low in comparison to other weeks in the classified waters period. There were no interviews completed in week 11-3, but five interviews were conducted in week 11-1. In 1997, the month of November was unusually mild, making it possible for anglers to be out on the river well beyond the mid-November freeze-up which usually makes angling impossible.

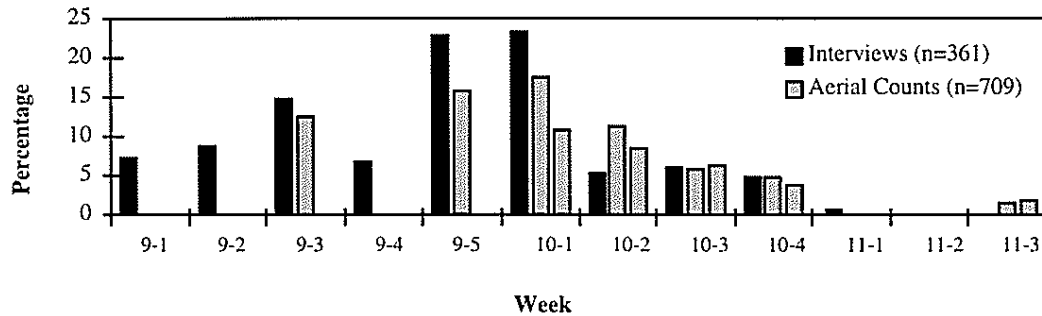


Figure 16. The percentage of anglers interviewed by the on-site roving survey and anglers observed by aerial flights in each week.

The distribution of angler interviews conducted by the on-site survey followed a similar pattern to the number of anglers observed in each river section by the aerial counts (Figure 17). The number of anglers observed was positively correlated with the number of anglers interviewed in each river section and indicated fair temporal representation (Pearson Correlation  $R = 0.74$   $P \leq 0.018$ ). The river section from Walcott to Quick and from Moricetown downstream were under-represented in the percentage of interviews conducted. The number of anglers observed by the aerial counts was highest between Telkwa and the Smithers Bridge followed by the river section from Bymac to Walcott and the section from Quick to Telkwa. The number of anglers in each of the three river sections between the Smithers Bridge and upstream of Moricetown were similar.

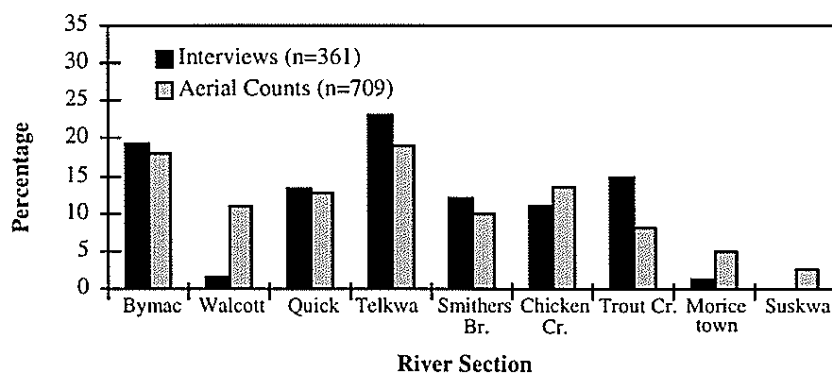


Figure 17. The percentage of anglers interviewed by the on-site roving survey and anglers observed by aerial flights in each river section.

Of all aerial counts, 161 jet boats and 84 drift boats were observed (Figure 18). The relative percentage of both jet and drift boats was highest in week 9-5 and steadily declined until week 10-4. Weeks 9-3 and 10-1 had similar amounts of jet and drift boat use. The amount of jet and



drift boat use was small in week 11-3 relative to weeks in the classified waters period (9-1 through 10-4).

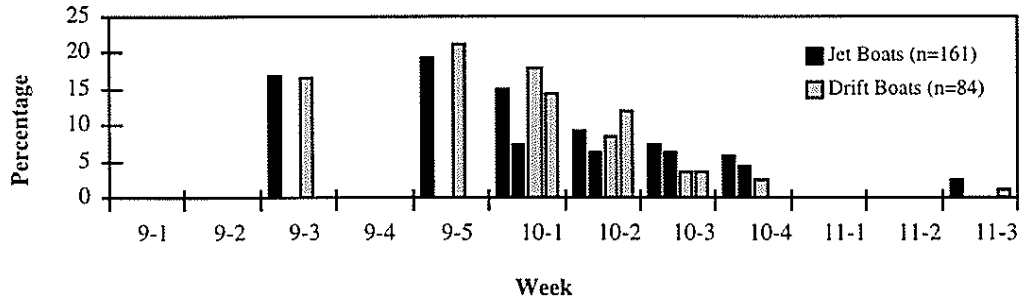


Figure 18. The percentage of jet boats and drift boats in each week observed during the aerial counts.

The spatial distribution of jet and drift boat use indicated the majority of jet boat use was between Bymac and Walcott, whereas most of the drift boat use was observed between Telkwa and the Smithers bridge (Figure 19). Drift boats were common in the two river sections between Walcott and Quick and Quick and Telkwa. There were no drift boats observed downstream around the confluence of the Bulkley and Suskwa rivers, however the percentage of jet and drift boats observed between Chicken Creek and Trout Creek was slightly higher than between Smithers bridge and Chicken Creek.

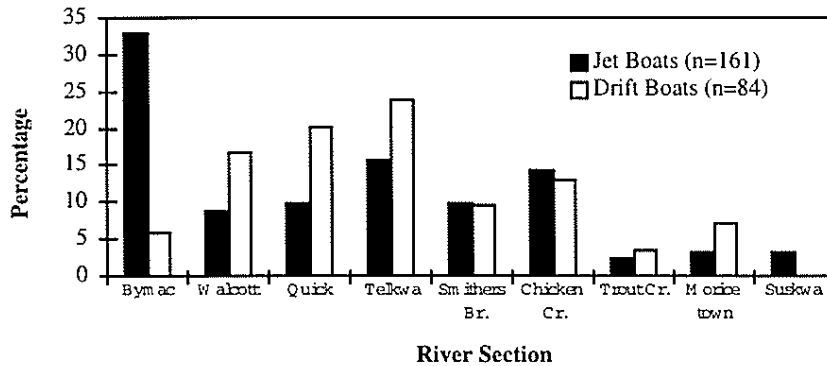


Figure 19. The percentage of jets boats and drift boats in each river section observed during the aerial counts.

#### 4.2.2.0 Catch and Effort Estimations

Several methods were used to estimate catch and effort for the classified waters period and November. Methods differed according to the number of aerial counts conducted during relevant weeks (Tables 28 and 30). For the six weeks in the classified waters period with aerial counts, the total effort was 2,891 rod days. The largest effort estimates occurred in week 9-5 (777 rod days) followed by week 10-1 (704 rod days), whereas weeks 10-3 and 10-4 had the lowest total effort estimates (298, 214 rod days respectively). For weeks 9-1, 9-2 and 9-4 without aerial counts the weekly effort was estimated at 214, 298 and 581 rod days, respectively. The total effort estimate for the classified waters period was 3,983 rod days. For the month of November, the total effort was estimated at 334 rod days.

For the six weeks in the classified waters period with aerial counts, the total catch was estimated at 3,278 steelhead (Tables 28 and 30). The largest catch estimates occurred in week 10-1 (744 steelhead) followed by week 10-2 (703 steelhead), whereas weeks 10-3 and 10-4 had the lowest total catch estimates (181, 395 steelhead, respectively). For the three weeks in September without aerial counts, the total of the weekly catch estimates was 2,219 steelhead. For this period, the highest weekly catch was estimated for week 9-4 (1,413 steelhead) and the lowest catch was for week 9-1 (184 steelhead). For the month of November, the total catch was estimated at 867 steelhead. The total catch estimate for the classified waters period was 5,497 steelhead and 6,364 steelhead for September, October and November.

Table 28. A summary of the total effort, catch rates, and catch by time period, river section, angler residence and guided status.

	Total Effort (rod days)	95% Confidence Interval for Effort	Catch Rate <sup>3</sup> (sth/rod day)	95% Confidence Interval for Catch Rate	Total Catch (sth)	95% Confidence Interval for Total Catch
<b>Time Period<sup>1</sup></b>						
9-1	214	± 49	0.9	± 10.4	184	± 2236
9-2	298	± 35	2.1	± 14.8	622	± 4403
9-3	413	NA	1.6	± 3.1	665	± 1287
9-4	586	± 84	2.4	± 3.6	1413	± 2120
9-5	777	NA	0.8	± 2.2	590	± 1717
10-1	704	± 278	1.1	± 2.5	744	± 1815
10-2	487	± 112	1.4	± 2.0	703	± 996
10-3	298	± 30	0.6	± 3.7	181	± 1090
10-4	214	± 41	1.9	± 2.4	395	± 523
November <sup>2</sup>	334 (4 hr)	± 841	2.6	± 6.6	867	± 2220
<b>River Section<sup>1</sup></b>						
Bymac	517	± 158	1.3	± 6.1	697	± 1261
Walcott	323	± 201	0.7	± 3.1	239	± 1605
Quick	378	± 151	0.7	± 3.1	279	± 1209
Telkwa	559	± 160	1.0	± 3.6	531	± 1279
Bridge	281	± 134	1.0	± 4.5	285	± 1075
Chicken	357	± 165	0.7	± 2.3	234	± 1321
Trout	244	± 101	1.0	± 3.8	253	± 810
Moricetown	134	± 76	1.0	± 3.8	140	± 605
Suskwa	59	± 48	1.0	± 3.8	61	± 383
<b>Angler Residence<sup>1</sup></b>						
B.C. Res.	1446	± 215	1.4	± 5.4	1962	± 7904
Cdn. Res.	234	± 87	0.7	± 2.4	171	± 566
Non-Cdn. Res.	1211	± 197	1.0	± 3.8	1202	± 4617
<b>Guided Status<sup>1</sup></b>						
Guided	463	± 122	1.3	± 4.1	604	± 1924
Non-guided	2428	± 279	1.1	± 4.8	2685	± 11671

1. Time period totals were calculated for September, October and November whereas River Section totals were calculated for six weeks of the classified waters period. Totals for angler residence and guided status were calculated with the total weekly effort for the six weeks of the classified waters period with aerial counts.

2. November estimates were based on a four hour rod day.

3. Catch rates include fly and gear anglers.

The total effort and catch were estimated by river section for six of the nine weeks during the classified waters period (Tables 28 and 30). The highest effort estimates were for the Bymac to Walcott (517 rod days) and Telkwa to Smithers bridge (559 rod days) river sections. The lowest effort estimates were for the river sections downstream of Moricetown (134 Moricetown-Suskwa, 59 Suskwa-downstream rod days, respectively). The total catch was highest for the Bymac to Walcott (697 steelhead) and the Telkwa to Smithers bridge (531 steelhead) river sections. The total catch was lowest for the river sections downstream of Moricetown (140 Moricetown-Suskwa, 61 Suskwa-Downstream steelhead, respectively).

For the six weeks of the classified waters period with aerial counts, B.C. residents were estimated to angle 1,446 rod days and catch 59 percent of the steelhead (1,962 steelhead), while they constituted 50 percent of the angler interviews (Tables 28 and 29). The total effort estimated for Canadian residents was 234 rod days. They were estimated to catch five percent of the total steelhead catch while they represented five percent of the angler interviews. Non-Canadian residents were estimated to angle for 1,211 rod days and the proportion of the steelhead caught (36 percent, 1,202 steelhead) was less than the proportion of interviews (42 percent).

For the six weeks of the classified waters period with aerial counts, 463 guided rod days were estimated in the Bulkley River (Tables 28 and 29). In comparison, non-guided anglers were estimated to fish for 2,428 rod days. The proportion of total steelhead caught for guided anglers (18 percent, 604 steelhead) was slightly more than the proportion of interviews (16 percent).

Caution is warranted when interpreting the catch estimates because the Interview Teams were on the river during good weather and water conditions. Thus, catch data was not collected on days when the river was 'out'. Catch and effort data were collected on days when angling was fair or good and catch rates from those days were applied to days when the river was 'out'. Therefore, catch estimates on days when the river was 'out' may be overestimates.

Table 29. The instantaneous aerial count estimation of total effort and catch with approximate 95 percent confidence intervals within each residence and guided status category.

	Effort (hr) $\hat{E}_{residence}$	Variance in effort (hr) $Var(\hat{E}_{residence})$	Catch Rate <sup>1</sup> (sthd/hr) $\hat{R}_{residence}$	Variance in Catch Rate (sthd/hr) $Var(\hat{R}_{residence})$	Total Catch Estimate $\hat{C}_{residence}$	Variance in Total Catch (sthd) $Var(\hat{C}_{residence})$	Approx. 95% CI for Total Catch (sthd)
B.C. Res.	11564	740320	0.170	0.116	1962	15619422	±7904
Cdn. Res.	1873	119932	0.091	0.022	171	80011	±566
Non-Cdn. Res.	9691	620388	0.124	0.056	1202	5329626	±4617
Guided	3701	236902	0.163	0.066	604	925862	±1924
Non-Guided	19428	1243738	0.138	0.090	2685	34055042	±11671

1. Catch rates include fly and gear anglers.

Table 30. The instantaneous aerial count estimation of total effort and catch with approximate 95 percent confidence intervals for each week.

	Aerial Counts	Mean Daily Effort (hr) $\bar{E}_{week}$	Total Effort (hr) $\hat{E}_{week}$	Variance of the Total Effort (hr) $Var(\hat{E}_{week})$	Approximate 95% CI for Total Effort (hr)	Mean Daily Catch Rate <sup>5</sup> (sthd/hr) $\bar{R}_{week}$	Variance of the mean daily catch rate (sthd/hr) $Var(\bar{R}_{week})$	Total Catch (sthd) $\hat{C}_{week}$	Variance of the Total Catch (sthd) $Var(\hat{C}_{week})$	Approximate 95% CI for Total Catch (sthd)
9-3	89	472	3304	NA	NA	0.201	0.038	665	413764.9	± 1287
9-5	111	888	6216	NA	NA	0.095	0.019	590	736684.6	± 1717
10-1	124, 77	804	5628	1237040	± 2244	0.132	0.024	744	823726.8	± 1815
10-2	79, 60	556	3892	202160	± 899	0.181	0.016	703	248058.9	± 996
10-3	40, 45	340	2380	14000	± 236	0.076	0.052	181	296850.8	± 1090
10-4	34, 27	244	1708	27440	± 331	0.232	0.023	395	68435.3	± 523
<b>Sub-total</b>			<b>23128</b>	<b>1480640</b>	<b>± 2434</b>	<b>0.153</b>	<b>0.172</b>	<b>3278</b>	<b>2587521</b>	<b>± 3217</b>
9-1	34, 27 <sup>1</sup>	244	1708	38416	± 392	0.108	0.423	184	1250184	± 2236
9-2	40, 45 <sup>2</sup>	340	2380	19600	± 280	0.261	0.853	622	4847035	± 4403
9-4	89, 77 <sup>3</sup>	664	4648	112896	± 672	0.304	0.052	1413	1139727	± 2120
<b>Sub-total</b>			<b>8736</b>	<b>170912</b>	<b>± 826.8</b>	<b>0.224</b>	<b>1.327</b>	<b>2219</b>	<b>7236946</b>	<b>± 5380</b>
<b>November</b>	10, 13	92	1334	28188	± 336	0.65	0.675	867	1232136	± 2220
<b>Total<sup>4</sup></b>			<b>32998</b>	<b>1679740</b>	<b>± 2592</b>			<b>6364</b>	<b>11056603</b>	<b>± 6650</b>

1. Since no aerial counts were conducted during 9-1, the reciprocal shoulder week of 10-4 was used to estimate effort.

2. Since no aerial counts were conducted during 9-2, the reciprocal shoulder week of 10-3 was used to estimate effort.

3. Since no aerial counts were conducted during 9-4, the daily counts from September 20 and October 9 were used to estimate the mean daily effort and variance.

4. The total estimates should be interpreted cautiously, since the methods differed slightly between the three sub-groups.

5. Catch rates include fly and gear anglers.

Table 31. The instantaneous aerial count estimation of total effort and catch with approximate 95 percent confidence intervals for each river section.

	Aerial Counts	Mean Daily Effort (hr) $\bar{E}_{section}$	Total Effort (hr) $\hat{E}_{sections}$	Variance of the Total Effort (hr) $Var(\hat{E}_{sections})$	Approx. Total Effort of 95% CI (hr)	Mean Section Catch Rate (sthd/hr) $\hat{R}_{section}$	Variance of the Mean Section Catch Rate (sthd/hr) $Var(\hat{R}_{section})$	Total Section Catch (sthd) $\hat{C}_{section}$	Variance of the Total Section Catch (sthd) $Var(\hat{C}_{section})$	Approx. Total Catch of 95% CI (sthd)
Bymac	18, 22, 22, 5, 17, 7, 7, 10, 10, 5	98.4	4133	397681	± 1261	0.169	0.146	697	2563046	± 1261
Walcott	13, 18, 10, 6, 3, 25, 0, 0, 2, 0	61.6	2587	644260	± 1605	0.092	0.037	239	276635	± 1605
Quick	1, 15, 14, 4, 7, 22, 5, 4, 12, 6	72.0	3024	365090	± 1209	0.092	0.037	279	354500	± 1209
Telkwa	20, 18, 25, 15, 13, 1, 12, 14, 8, 7	106.4	4469	409149	± 1279	0.119	0.052	531	1064275	± 1279
Bridge	10, 12, 16, 10, 7, 1, 10, 0, 0, 1	53.6	2251	288727	± 1075	0.126	0.079	285	428167	± 1075
Chicken	17, 12, 15, 21, 15, 1, 3, 3, 0, 5	68.0	2856	436292	± 1321	0.081	0.021	234	179774	± 1321
Trout	5, 15, 4, 7, 3, 3, 7, 2, 1	46.4	1949	164004	± 810	0.130	0.057	253	230012	± 810
M-twn.	2, 3, 7, 10, 4, 0, 0, 4, 0, 2	25.6	1075	91368	± 605	0.130	0.057	140	73091	± 605
Suskwa	3, 0, 0, 2, 6, 0, 0, 3, 0, 0	11.2	470	36700	± 383	0.130	0.057	61	15416	± 383
<b>Total</b>	<b>686</b>		<b>22814</b>	<b>2833271</b>	<b>± 3367</b>	<b>0.115</b>	<b>0.309</b>	<b>2718</b>	<b>5184914</b>	<b>± 3366</b>

1. Catch rates include fly and gear anglers.

## **5.0.0.0 Discussion**

### ***5.1.0.0 Interviews Conducted***

On-site interviews using a roving design were used to examine Bulkley River angler characteristics, angling methods, perceptions of problems on the river and steelhead catch rates. Angler effort was estimated with the aerial counts. Angler catch was estimated with catch rates from on-site interviews and with effort was from the aerial counts.

As many anglers as possible were interviewed and accordingly, the Interview Teams were on the river as much as possible. The number of interviews conducted was highly correlated with the number of anglers observed from the aerial counts for weekly periods which indicated the sampling conducted by the Interview Teams was temporally proportional to effort. However, on the spatial scale, the interview sampling was less representative. The non-response bias check indicated that Non-Canadian resident anglers were more likely not to complete the interview than Canadian or B.C. residents. This was indicative of the language barrier as more Non-Canadians could not understand English enough to complete the interview. Because the Interview Team still collected license details and catch (when possible), those data were relatively free of non-response bias. The perceptions of problems on the river could therefore under-represent Non-Canadian resident perceptions. Generally, the data were representative of the anglers that were interviewed in the classified waters period of 1997.

### ***5.2.0.0 Angler Characteristics***

The proportion of B.C. residents among Bulkley River anglers had declined and the proportion of Non-Canadian residents had increased from earlier angler surveys (Table 32). In 1997, 50 percent of angler interviews (and individual anglers) were B.C. residents, seven percent were Canadian residents and 43 percent were Non-Canadian residents. In 1969, Pinsent (1970) found 52 percent of the Bulkley River anglers interviewed were B.C. residents, while 48 percent were Non-Residents (no distinction was made between Canadian and Non-Canadian residents). Remington (1975) found that 77 percent of anglers interviewed in the fall of 1974 were B.C. residents, ten percent were Canadian residents and 13 percent were Non-Canadian residents. Of steelhead anglers in 1982, O'Neill and Whately (1984) found 81 percent were B.C. residents, six percent were Canadian residents and 13 percent were Non-Canadian residents. Similarly, in 1983, 83 percent of anglers were B.C. residents, four percent were Canadian residents and 13 percent were Non-Canadian residents (O'Neill and Whately 1984). More recently, in the fall of 1989, Lewynsky and Olmsted (1990) found that 57 percent were B.C. residents, 13 percent were Canadian residents and 30 percent were Non-Canadian residents.

The steelhead harvest analysis (SHA) reported similar results of angler residence composition. From 1983 to 1987, B.C. residents comprised between 74 and 83 percent of anglers and between 1988 and 1992, B.C. residents were between 64 and 72 percent of the anglers interviewed. In contrast, from 1993 to 1995 the percentage of B.C. residents had declined to between 53 and 58 percent (Anonymous 1996). An apparent steady decline in B.C. residents has coincided with a

steady increase of Non-Canadian residents. The highest percentage of Non-Canadian residents between 1992 and 1995 (38 percent) was less than the percentage of Non-Canadian resident anglers interviewed during the classified waters period in 1997 (42 percent). The percentage of Canadian residents has remained relatively stable and was comparable to the results obtained in 1997 (Anonymous 1996).

Table 32. A summary of the composition of angler residence, angling method, conservation club member and steelhead catch rate for previous angler surveys on the Bulkley River.

Year of study and Reference	Months	Residence Category (%)	Angling Method	Conservation Club Member (%)	Steelhead catch rate
1969 Pinsent 1970	Oct., Nov.	52% B.C. Res. 48 % Non-Res.	NA	NA	1.073 sthd/rod day
1974 Remington 1975	Sept., Oct., Nov.	77% B.C. Res. 10% Cdn. Res. 13% Non-Cdn. Res.	38% Fly 82% Lure 46% Roe	21.0 % of all interviewed	NA
1982 O'Neill and Whately 1984	Sept., Oct., Nov.	81% B.C. Res. 6% Cdn. Res. 13% Non-Cdn. Res.	46% Fly 54% Lure	NA	0.524 sthd/rod day (approximate) <sup>1</sup>
1983 O'Neill and Whately 1984	Sept., Oct., Nov.	83% B.C. Res. 4% Cdn. Res. 13% Non-Cdn. Res.	57% Fly 43% Lure	NA	0.422 sthd/rod day (approximate) <sup>1</sup>
1989 Lewynsky and Olmsted 1990	Aug., Oct.	57% B.C. Res. 13% Cdn. Res. 30% Non-Cdn. Res.	78% Fly 22% Lure approx.	20% B.C. Res. 45% Non-Res.	0.988 sthd/ rod day
1997 Current Study	Sept., Oct.	50% B.C. Res. 7% Cdn. Res. 43% Non-Cdn. Res.	81% Fly 19% Gear	40% B.C. Res. 82% Cdn. Res. 64% Non-Cdn. Res.	1.26 sthd/rod day

1. Calculations were approximated because some assumptions were made about the data and back calculations were necessary.

The percentage of male and female anglers (96 percent male, 4 percent female) was similar to the results of Remington (1975) for steelhead anglers in the fall of 1974 (97 percent male and 3 percent female). The mean age of 1997 classified waters period steelhead anglers (45 years old) was also similar to the mean of 44 years old in 1974 steelhead anglers (Remington 1975).

The proportion of guided anglers interviewed in 1997 was lower than those estimates of guided anglers in other years. Sixteen percent of anglers were guided in 1997, while in 1989, Lewynsky and Olmsted (1990) found 33 percent of Bulkley River anglers were guided.

The proportion of fly anglers had increased from earlier angler surveys on the Bulkley River (Table 32). The proportion of fly to gear anglers in 1997 was similar to the proportion of fly to gear anglers among anglers in the fall of 1989. In 1997, 81 percent of anglers interviewed during the classified waters period were fly fishing while 19 percent were gear fishing. In 1989, approximately 78 percent of anglers were fly fishing, whereas 22 percent were gear (lure) fishing (Lewynsky and Olmsted 1990). Prior to 1989, the proportion of gear anglers was higher. In 1983, O'Neill and Whately (1984) found 57 percent of steelhead anglers were fly anglers and 43 percent were gear (lure) anglers. Interestingly, in 1982, O'Neill and Whately (1984) found 46 percent of steelhead anglers were fly anglers and 54 percent were gear (lure) anglers. Remington (1975) found that 38 percent of steelhead anglers in 1974 fly fished, 82 percent gear

(lure) fished and 46 percent used roe. In 1974, the percentages totaled more than 100 because many anglers used several methods depending on the conditions of the water (Remington 1975).

The membership of Bulkley River anglers in a conservation club has increased in recent angler surveys (Table 32). In 1997, over half of anglers interviewed were members of a conservation club, whereas in 1974, only 21 percent of steelhead anglers were members of a conservation or sportsman club (Remington 1975). The increase in the proportion of Non-Canadian residents probably accounted for part of the increase in the percentage of anglers that were members of a conservation club. In 1997, more Canadian residents (81.8 percent) and Non-Canadian residents (63.7 percent) were members of a at least one conservation club than B.C. residents (40.1 percent). Lewynsky and Olmsted (1990) had a similar result of 1989 anglers; 20 percent of B.C. residents were members of a conservation club while 45 percent of Non-Residents were members of a conservation club.

Most angling infractions were committed by B.C. residents (60 percent, 18 infractions) followed by Non-Canadian residents (23 percent, 6 infractions) and by Canadian residents (7 percent, 2 infractions). The residence of the remainder of the anglers with at least one infraction was unknown (10 percent, 3 infractions). The majority of citations (78 percent) given to B.C. residents were for not having a classified waters license. Nineteen-ninety seven (1997) was the first year that non-guided B.C. residents were required to purchase a classified waters license for class two classified rivers. Thus, the infractions indicated that it took some time for the B.C. residents to adjust to the new regulation.

In the past several years, there were concerns that steelhead anglers did not buy a steelhead conservation stamp and had been angling for steelhead (Anonymous 1996). Only 1.7 percent (3 citations) of all B.C. residents, 3.4 percent (1 citation) of Canadian residents and 2.0 percent (3 citations) of Non-Canadian residents were cited for not having a steelhead stamp. The effort estimates for the 1997 SHA (not yet compiled) should be accurate for the Bulkley River because of the low numbers of anglers cited for not having a steelhead stamp. This result cannot be generalized to past years because of the increased publicity regarding enforcement effort on the Bulkley River. The knowledge of increased enforcement may have caused anglers who may not have purchased a steelhead stamp in the past to purchase a steelhead stamp in 1997 and comply with the regulations.

Over half of infractions were in the first two weeks of the classified waters period and the remaining infractions were given in weeks four through six and no infractions were cited in the last two weeks. All evidence suggested that the River Guardian program had a positive effect on angler compliance with regulations.

#### ***5.3.0.0 Angler Perceptions of Problems and Preferences for Management Strategies***

There are many factors that affect perceptions of problems with the number of other anglers on the river. Density is a physical concept relating the number of people in a certain amount of space. Crowding has psychological meaning; it is a negative and a subjective evaluation of density level (Manning 1996). Thus, density may increase to a point where it is perceived to interfere with one's activities and at that point crowding occurs (Manning 1986). In the case of



anglers on the Bulkley River, the perception of a major problem or a specific concern was indicative of that problem interfering with an anglers activities. After an angler has perceived a major problem they may employ a coping mechanism. The angler could change their perception of the area (product shift) or change the way they use the area (displacement; Shelby *et al.* 1988).

Many factors could affect an angler's perception of problems on the Bulkley River: motivations for angling, preferences for angling, expectations of the trip, experience, attitudes, angler demographics, characteristics of other anglers encountered, and other situational variables (Manning 1986). Residence groups, guided status, access method and angling method are ways to group anglers into categories that may share some of the above factors that could affect an angler's perception of problems on the river.

The majority of anglers had no problems with all the concerns investigated. Sixty-four percent of B.C. residents interviewed, 90 percent of Canadian residents and 74 percent of Non-Canadian residents had no problems with the overall number of anglers on the river. Sixty-two percent, 75 percent and 69 percent of B.C. residents, Canadian residents and Non-Canadian residents, respectively had no problems with the number of boat-based anglers. Even more anglers had no problems with the number of shore-based anglers (81 percent of B.C. residents, 95 percent of Canadian residents and 81 percent of Non-Canadian residents). The overwhelming majority of anglers did not perceive problems with the overall number of anglers, the number of boat-access anglers or the number of shore-access anglers.

Considering all concerns investigated, more anglers perceived a major problem with the number of boat-based anglers (13 percent) than the overall number of anglers (10 percent) and the number of shore-based anglers (3 percent). Twenty-two percent of anglers perceived a minor problem with the number of boat-based anglers, 19 percent perceived a minor problem with the overall number of anglers on the river while 15 percent of anglers interviewed perceived a minor problem with the number of shore-based anglers. Together, more anglers perceived at least a minor problem with the number of boat-based anglers (35 percent) on the river than the overall number of anglers (29 percent) or the number of shore-based anglers (18 percent).

B.C. residents perceived more problems on the Bulkley River than Canadian or Non-Canadian residents. Twenty-seven percent of B.C. residents had at least one major problem with the concerns (overall number of anglers, the number of boat-based anglers, the number of shore-based anglers). In contrast, ten percent of Canadian residents and ten percent of Non-Canadian residents had at least one major problem with the three concerns. More B.C. residents considered the overall number of anglers to be a problem (15 percent) than Canadian residents (5 percent) or Non-Canadian residents (5 percent). Nineteen (19) percent of B.C. residents had a major problem with the number of boat-based anglers, while ten percent of Canadian residents and six percent of Non-Canadian residents perceived problems with the number of shore-based anglers. The number of B.C. residents that perceived a problem with shore-based anglers was similar to Non-Canadian residents (3.6 and 3.9 percent, respectively).

The contribution of additional concerns varied by residence category. Forty-six (46) percent of the additional concerns were suggested by B.C. residents (29 percent of all B.C. residents). Similarly, 43 percent were suggested by Non-Canadian residents (29 percent of Non-Canadian residents) and eight percent of additional concerns were suggested by Canadian residents (27 percent of Canadian residents).

Thirty-six percent of B.C. resident concerns regarded the number of anglers on the river whereas only nine percent of Non-Canadian angler concerns and none of the Canadian angler concerns considered the number of anglers as a problem. Twenty-six percent of B.C. resident concerns were about regulations. Most B.C. residents had concerns about the regulations in general, the licensing system, gear restrictions, the lack of a fly only section and enforcement issues. Ten percent of Canadians (1 angler) were concerned with regulations and specifically, the lack of a fly only section. Forty-seven percent of Non-Canadian resident concerns were about regulations. The majority of those were about the licensing system, and particularly the classified waters license being river specific. Only 16 percent of B.C. resident concerns were about fees, in contrast to 90 percent of Canadian concerns and 23 percent of Non-Canadian resident concerns. More specifically, the majority of Canadian and Non-Canadian residents concerns with fees regarded the proposed license fees increase.

The additional concerns results added some insight to the perceptions of problems within each residence category. In 1997, B.C. residents were most concerned with the number of anglers on the river while non-residents appeared to be more concerned with regulation and fee orientated problems. This could explain why more B.C. residents perceived the most major problems regarding the overall number of anglers on the river and the number of boat-based anglers on the river. These problems are specific to 1997 because during the classified waters period there was an impending increase in fees from \$10 per day to \$40 per day for Canadian and Non-Canadian residents to purchase classified waters licenses. Since then, the fee increase has been canceled and will not be implemented in the near future.

The overall number of problems with the concerns investigated was small in comparison to those anglers that had no problems. Of those anglers that did have problems, the perceptions of problems differed by residence category. Anglers within the guided status, access method or angling method categories were similar in their perception of problems with the overall number of anglers, the number of boat-based anglers or the number of shore-based anglers. Therefore, residence categories may have shared some of the factors, such as angler experience and angling preferences, that affected the angler's perception of problems on the river.

#### ***5.4.0.0 Angler Catch Rate and Effort***

The observed catch rate for all anglers interviewed in 1997 (1.26 steelhead per rod day) was considerably higher than past estimates (Table 32). 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).

In 1997, the estimated total effort for the classified waters period was 3,983 rod days and the estimated catch was 5,497 steelhead. The total catch and effort estimate increase considerably when November estimates of effort and catch are added. When compared to the SHA, the total catch estimate of steelhead for September, October and November (6,364) was similar to 1995/96 but higher than years between 1990 and 1994 (Table 33). The effort estimated (4,327 rod days) for the majority of the steelhead season were considerably less than what was estimated from the SHA in the 1995/96 and 1994/95 but similar to the 1993/94, 1992/93 and 1991/92 and less than the mean between 1984 and 1990 and before 1968 and 1984 (Table 33).

Previous SHA angler effort estimates were suspected to under-represent the actual steelhead angler effort because steelhead anglers could avoid purchasing a steelhead stamp. However, when angler effort was estimated with aerial counts in 1997, the estimated angler effort was much less than SHA in 1995/96 and 1994/95 but was similar to the estimated from 1993/94 and 1991/92 and was higher than 1992/93 (Table 33). Since the 1997 effort estimates were not substantially higher than SHA estimates of recent years, the SHA effort estimates did not appear to be substantially biased from anglers failing to purchase steelhead stamps. Although interannual variability in steelhead abundance and weather/water conditions were not accounted for when the results were compared between years of the SHA and with 1997.

Table 33. The Steelhead Harvest Analysis estimated effort and catch for past years.

Year(s) <sup>1</sup>	Estimated Effort (rod days)	Estimated Catch (sthd)
1995/96	8093	6641
1994/95	6761	5403
1993/94	4079	4040
1992/93	3465	3224
1991/92	4317	2506
1985-1990	mean = 9695	mean = 6166
1968-1984	mean = 7060	mean = 2524

1. The lumped years were separated into groups with similar regulations. After 1991, usually all steelhead were caught and released after August 1, in years 1984-1990 there were variable regulations about catch and release, before 1984 there were no catch and release regulations.

Caution is warranted when interpreting these results because catch and effort estimates for the period between September and November were estimated with several different methods. Also, November 1997 was highly unusual because the winter was slow in arriving as a result of the El Nino event. This made it possible for anglers to be out on the river later in the season, well beyond the mid-November freeze-up which usually makes angling impossible. In 1997, the Bulkley River did not freeze over before the season ended on December 31, thus providing additional steelhead angling opportunities that would increase catch and effort.

#### 5.5.0.0 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 classified waters period of 1997. 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. For example, survey

research conducted during law enforcement activities could jeopardize the quality of data collected (Pollock *et al.* 1994). However, this bias was unavoidable due the objectives of the River Guardian program. Improper sample selection bias (Pollock *et al.* 1994) may have occurred because interviews were conducted opportunistically and when large numbers of anglers were known to be on the river.

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. Also, successful anglers may have left the Bulkley River before being contacted. Alternatively, contacting anglers when their trip was incomplete may bias the catch rate estimation if steelhead catchability changes throughout the day.

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). In addition, question misinterpretation could have occurred with the long and complex nature of the questions regarding perceived problems. For example, a number of the responses to the other concerns with steelhead angler management question were about fisheries management in general or were unrelated to the question asked.

### **6.0.0.0 Recommendations**

1. The Fisheries Branch should continue to administer a survey of Bulkley River anglers to monitor any changes in angler effort, demographics, angling characteristics, angler's perceptions of problems and angler catch. Additional information will aid the Fisheries Branch in the planning necessary to protect the quality of angling experiences offered by the classified waters designation.
2. A more detailed mail-back questionnaire should be developed to investigate differences in angler perceptions of problems and crowding on the river. Since differences in perceptions of steelhead angler management problems differed by angler residence, the survey sampling design should be stratified by residence category. 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.
3. The total number of angler days (effort) should be monitored during the classified waters period. Due to the high variability in angler counts within and between weeks, at least two random aerial counts are recommended to be conducted per week. Pre-determined boundaries of river sections should continue to be used to describe the distribution of angler effort throughout the Bulkley River. These boundaries should distinguish the Morice River (upstream of the Forks) from the remainder of the Bulkley River. If resources are sufficient, the number of aerial counts should be increased during weeks with high variation in angler effort (possibly weeks with variable water conditions). Also, if resources permit, a sampling design could be developed that differentiates by weeks (or 2 week periods) on the primary level and weekdays/weekend days on the secondary level.
4. 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.
5. The Interview Teams should record the location of anglers according to the pre-determined river section boundaries that are used for the aerial counts. The river sections should be expanded to reduce the number of river sections with low angler effort.
6. If aerial counts cannot be conducted, progressive counts by the Interview Team could be used to estimate daily effort within the river section, 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.
7. For catch rate and total catch estimation, angler surveys are recommended on all days with aerial counts and they should be as spatially representative as possible. Only a few completed surveys need to be collected from each section for catch rate and total catch estimation, provided the anglers surveyed have been fishing for more than 0.5 hours.

8. Future sampling efforts should include a higher proportion of surveys in the Bulkley River in areas downstream of Moricetown and the river section from Walcott to Quick.
9. Anglers should also 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.
10. In subsequent years for non-resident anglers, the number of classified waters licenses (days) purchased prior to the time of contact and the anticipated number of days the angler may fish on the Bulkley River before leaving the area should be collected.

### **7.0.0.0 Acknowledgments**

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### **9.0.0.0 Appendices**

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





<b>Bulkley River Angler Effort Data Flight</b>				
<b>Date</b>	<b>Personnel</b>	<b>Carrier</b>		
<b>Weather Conditions</b>		<b>Water Conditions</b>		
<u><b>Time</b></u>	<u><b>Location</b></u>	<u><b>Anglers</b></u>	<u><b>J-Boats</b></u>	<u><b>D-Boats</b></u>
	Depart Base			
	Bymac			
	Walcott			
	Quick			
	Telkwa			
	Smithers Bridge			
	Chicken Ck			
	Trout Creek			
	Moricetown			
	Suskwa			
	Skeena			
	Arrive Base			

**Appendix 2.0 The conservation clubs mentioned.**

A total of 299 Bulkley River anglers answered the question and 157 anglers were a member of at least one conservation club.

Table A1. The type of conservation club anglers were a member with the percentage and number of responses.

<b>Conservation Club</b>	<b>Percentage of Anglers that were a member of at least one conservation club (n)</b>	<b>Percentage of Anglers that answered the question(n)</b>
Steelhead Society	45.7 (69)	23.1 (69)
Trout Unlimited	18.5 (28)	9.4 (28)
Other angling club	11.9 (18)	6.0 (18)
Ducks Unlimited	9.3 (14)	4.7 (14)
Foreign Country Fishing Club	6.0 (9)	3.0 (9)
Work Related Group	4.6 (7)	2.3 (7)
Nature Conservancy	3.3 (5)	1.7 (5)
North Atlantic Salmon Federation	2.3 (4)	1.3 (4)
Federation of Fly Fishers	2.0 (3)	1.0 (3)
Rod and gun club	2.0 (3)	1.0 (3)
Kispiox Protection Society	1.3 (2)	0.67 (2)
Polar Coachmen	1.3 (2)	0.67 (2)
Habitat Restoration Clubs	1.3 (2)	0.67 (2)
BC Wildlife Federation	1.3 (2)	0.67 (2)
Greenpeace	1.3 (2)	0.67 (2)
Other Environmental Group	1.3 (2)	0.67 (2)
Audobon	0.7 (1)	0.33 (1)
National Wildlife Fund	0.7 (1)	0.33 (1)
American Rivers	0.7 (1)	0.33 (1)
Skeena Wild Steelhead Society	0.7 (1)	0.33 (1)
World Wildlife Fund	0.7 (1)	0.33 (1)
Western Canada Wilderness Committee	0.7 (1)	0.33 (1)

**Appendix 3.0 Weather and water conditions during the classified waters period.**

Each 'X' represents what at least one Interview Team member recorded that the weather or water conditions were for that day. For example, on September 3 Interview Team recorded that it was sunny, overcast and rained. The river was flowing at medium height and was clear.

Table A2. A summary of weather and water conditions that were observed by the Interview Team by date.

Week	Date	Weather				Water					Comments
		Sun	Mixed	Overcast	Rain	High	Mod.	Low	Turbid	Clear	
9-1	903	X					X			X	
	904	X		X	X		X			X	
	905		X				X			X	
	906		X	X	X		X			X	
9-2	907	X	X				X			X	
	909	X	X				X			X	
	910		X				X			X	
	913		X	X			X			X	
9-3	914				X		X			X	
	915			X	X		X			X	
	916		X	X			X			X	
	918	X	X	X			X			X	
	919		X	X			X			X	
	920		X	X			X			X	
9-4	921	X	X	X			X			X	
	923			X			X			X	
	924	X					X			X	
	926	X					X			X	
9-5	928	X	X	X	X		X			X	
	930			X			X			X	
	1002		X				X		X	X	
	1003	X	X	X			X		X	X	Turbid d/s of Telkwa noted on aerial count form
	1004	X	X				X		X	X	
10-1	1005		X	X			X		X	X	
	1006	X	X	X			X			X	
	1007		X	X			X			X	
	1008		X	X			X		X		
	1010			X			X			X	1009 water conditions excellent (clear) on aerial count form
	1011	X	X	X		X	X			X	
10-2	1012			X			X		X	X	
	1014		X	X		X			X		1015- Turbid d/s of Telkwa noted on aerial count form
	1018		X	X		X			X		
10-3	1019		X	X		X	X		X		
	1021		X	X			X		X		
	1022			X		X	X		X		1023- Turbid d/s of Telkwa noted on aerial count form
10-4	1026		X	X		X	X		X		Turbid d/s of Telkwa noted on aerial count form
	1029		X	X			X		X		
	1030		X			X	X	X	X		1031- Turbid d/s of Telkwa noted on aerial count form

**Appendix 4.0 The method of grouping 'other issues' mentioned by Bulkley River anglers.**

The five broad categories of management issues were numbered below, with the bulleted items representing each of the twenty-three response groups that were included within each of those five issues.

1. Regulations issues included:
  - Gear use-should be barbless hooks only.
  - Regulations
  - Lack of fly only section
  - Licensing system
  - Enforcement
  - Fly/gear conflicts
  
2. Access issues included:
  - Access issues (in general)
  - Boats
  
3. Fee issues included:
  - Proposed license fee increase
  - Licenses are too expensive
  
4. Guiding issues included:
  - Too many guides
  - Fisheries managers are eliminating guides
  - Illegal guides
  
5. People/Density issues included:
  - Fly/gear conflicts
  - Non-Resident anglers
  - Angler education/etiquette
  - Crowding
  - Garbage/littering
  
6. Other issues included:
  - Native fishing
  - Commercial fishing
  - Habitat
  - Enhancement
  - Low numbers of fish



**Appendix 5.0 A summary of the time spent interviewing by the Interview Teams.**

Table A3. The date, week, time at start of interviewing stint, time at finish of interviewing stint, minutes interviewing, reach location at start, reach location at finish, the total anglers interviewed and observed and comments on the time estimation in minutes summarized from the angler count data forms.

Date	Week	Time @ Start	Time @ Finish	Min.	Reach @ Start	Reach @ Finish	Anglers Interviewed (n)/Observed (n)	Comments
903	1	920			Lunan	Quick	4/8	
903					Quick	Walcott	2/2	
903			1430	310	Walcott	Bymac	4/4	time from 920 to 1430
903		1600	?	10*	Chicken Cr.		1/2	assume 10 min. for 1 angler interviewed
904		1210	1245	35	Trout Cr.	Rainbow Ranch	65/	
904		1500	1530	30	Rainbow Ranch	Trout Cr.	2/3	
904		1900	1915	15	Trout Cr.		1/1	
906		930			Lunan	Telkwa	2/3	
906		1225			Telkwa	Quick	1/1	
906		1310			Quick	Lunan	3/5	
906		1415	?	315	Lunan	Chicken Cr.	1/1	time from 930 to 1415, plus 30 min. estimate from lunan to chicken creek
<b>Total Week 9-1</b>				<b>715</b>				
907	2	1100			Ebenezer			
907		1205			Par 3		3/?	
907		1248					1/?	
907		1315			Lunan	Telkwa	3/?	
907		1410	?	240*	Telkwa	Morice	3/?	time from 1100 to 1410 plus 50 min until 1500 when next reach starts
907		1500	1545	45	Quick	Telkwa	3/6	added 6 to ensure 33 were observed because 33 were interviewed
909		1200	1340	100	Quick	Walcott	1/1	
909		1415	1815	240	Walcott	Bymac	3/4	
909		1900		10	Chicken Cr.		1/1	
910		1300	1630	210	Bymac	Walcott	1/1	
913		945	1045	60	Bymac	Forks	3/5	
913		1045	1430	225	Forks	Walcott	12/12	
913		1400	1500	60	Bymac		1/3	
<b>Total Week 9-2</b>				<b>1190</b>				
914	3	1500	1800	180	Bymac	Bymac	3/7	
915		1030	1600	330	Lunan-Canyon Cr.	Tatlow Falls	12/22	
916		1415	1445	30	Trout Cr.		4/5	
916		1505		10	Chicken Cr.		1/1	
916		1515		10	Bulkley Bridge		1/1	
918		1300	1630	210	Quick	Telkwa	20/22	
919		1020	1600	340	Bymac	Walcott	4/4	

Date	Week	Time @ Start	Time @ Finish	Min.	Reach @ Start	Reach @ Finish	Anglers Interviewed (n)/Observed (n)	Comments
919			?	330*	Lunan-Canyon Cr.	Lunan	10/12	estimate time as 330 min. for similar reach done on 915
920			?	55*	Quick	Telkwa	4/5	estimate time as 45 min for similar reach on 907 plus 10 min for 1 angler interview
<b>Total Week 9-3</b>				<b>1495</b>				
921	4	1015	1445	270	Lunan	Telkwa	15/20	
923		1400		20	Trout Cr.		2/6	
924		1020	1430	250	Telkwa	Lunan	9/11	
<b>Total Week 9-4</b>				<b>540</b>				
928	5	1000	1500	300	Trout Cr.		12/15	
928		1430	1945	315	Telkwa	Lunan	14/15	
930		1400	1530	90	Trout Cr.		10/15	
1002		1620	1630	10	Rainbow ranch		2/2	
1003		930	1000	90	Walcott		2/2	
1003		1200	1730	330	Bymac	Walcott	16/17	
1003		1200	1800	360	Chicken Cr.	Trout Cr.	16/16	
1004		1100	1630	330	Quick		16/17	
<b>Total Week 9-5</b>				<b>1825</b>				
1005	6	1000	1200	120	Lunan	Telkwa	10/10	
1005		1540	1630	50	Trout Cr.	Telkwa	13/13	
1006		1400	1830	270	Lunan	Driftwood	14/22	
1007		900	1500	360	Telkwa	Chicken Cr.	17/25	
1010		1130	1200	30	Bymac		8/9	
1010		1430	1630	120	Telkwa	Smithers	9/13	
1011		1130	1530	240	Telkwa	Lunan	8/10	
1011		1015	1045	30	Lunan		4/4	
<b>Total Week 10-1</b>				<b>1220</b>				
1012	7	1030	1330	180	Lunan	Chicken/Trot Cr.	7/7	
1013		1430	1530	60	Walcott	Bymac	2/9	
1018		1100	1530	270	Walcott	Bymac	11/11	
<b>Total Week 10-2</b>				<b>510</b>				
1019	8	1600	1800	120	Chicken Cr.	Tatlow	17/17	
1021		1030	1300	150	Tatlow	Chicken Cr.	4/7	
1022		1730		10*	Smithers		1/2	estimate 10 min. for 1 angler interview conducted
1024		1100	1430	210	Telkwa	Smithers	1/3	
<b>Total Week 10-3</b>				<b>490</b>				
1026	9	1400	1600	120	Bymac	Forks	10/12	
1029		1100	1400	240	Quick	Telkwa	3/4	
1030		1130	1500	210	Walcott	Bymac	5/7	
<b>Total Week 10-4</b>				<b>570</b>				
<b>Total All Weeks</b>				<b>8555</b>			<b>374/469</b>	

The total 8,555 minutes was divided by 60 to equal 142.6 hours.

The box times with stars are those that were estimated, see the comments section for explanations

Appendix 6.0 Aerial Count Data.

	920	1003	1005	1009	1012	1015	1019	1023	1026	1031	1120	1122	Totals
Bymac	18	22	22	5	17	7	7	10	10	5	2	3	128
Anglers	18	22	22	5	17	7	7	10	10	5	2	3	128
Jet Boat	9	10	11	2	4	2	5	4	3	2	1	0	53
Drift Boats	1	1	1	0	0	1	0	1	0	0	0	0	5
Walcott	13	18	10	6	3	25	0	0	2	0	0	0	77
Anglers	13	18	10	6	3	25	0	0	2	0	0	0	77
Jet Boat	3	4	2	1	0	3	0	0	1	0	0	0	14
Drift Boats	0	7	0	1	1	5	0	0	0	0	0	0	14
Quick	1	15	14	4	7	22	5	4	12	6	0	0	90
Anglers	1	15	14	4	7	22	5	4	12	6	0	0	90
Jet Boat	0	5	1	1	0	5	1	0	2	1	0	0	16
Drift Boats	1	2	3	0	3	4	0	2	2	0	0	0	17
Telkwa	20	18	25	15	13	1	12	14	8	7	0	2	135
Anglers	20	18	25	15	13	1	12	14	8	7	0	2	135
Jet Boat	7	3	3	2	2	0	2	3	2	1	0	0	25
Drift Boats	6	4	5	1	1	0	2	0	0	0	0	1	20
Smithers Br.	10	12	16	10	7	1	10	0	0	1	4	0	71
Anglers	10	12	16	10	7	1	10	0	0	1	4	0	71
Jet Boat	2	3	4	1	1	0	4	0	0	0	1	0	16
Drift Boats	2	1	2	2	1	0	0	0	0	0	0	0	8
Chicken Cr.	17	12	15	21	15	1	3	3	0	5	2	2	96
Anglers	17	12	15	21	15	1	3	3	0	5	2	2	96
Jet Boat	5	3	3	3	5	0	0	1	0	2	1	0	23
Drift Boats	3	1	2	4	1	0	0	0	0	0	0	0	11
Trout Cr.	5	11	15	4	7	3	3	7	2	1	0	0	58
Anglers	5	11	15	4	7	3	3	7	2	1	0	0	58
Jet Boat	1	1	0	1	0	0	0	0	1	0	0	0	4
Drift Boats	1	1	0	0	0	0	1	0	0	0	0	0	3
Monicetown	2	3	7	10	4	0	0	4	0	2	0	4	36
Anglers	2	3	7	10	4	0	0	4	0	2	0	4	36
Jet Boat	0	2	0	1	0	0	0	1	0	1	0	0	5
Drift Boats	0	0	2	4	0	0	0	0	0	0	0	0	6
Suskwa	3	0	0	2	6	0	0	3	0	0	2	2	18
Anglers	3	0	0	2	6	0	0	3	0	0	2	2	18
Jet Boat	0	0	0	0	3	0	0	1	0	0	1	0	5
Drift Boats	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>89</b>	<b>111</b>	<b>124</b>	<b>77</b>	<b>79</b>	<b>60</b>	<b>40</b>	<b>45</b>	<b>34</b>	<b>27</b>	<b>10</b>	<b>13</b>	<b>709</b>
Anglers	89	111	124	77	79	60	40	45	34	27	10	13	709
Jet Boat	27	31	24	12	15	10	12	10	9	7	4	0	161
Drift Boats	14	17	15	12	7	10	3	3	2	0	0	1	84