

SHUSWAP LAKE ANGLER SURVEY 2009 DATA REPORT

Prepared
by

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ABSTRACT

Fishery statistics derived from the Shuswap Lake Angling Survey (SLAS) are summarized and compared with previous years' surveys. These results are derived from a mail-out survey of licensed anglers who purchased a Shuswap Lake Conservation Surcharge Stamp (CSS). Data is summarized for angler residency, effort, catch, harvest, and success rates for rainbow trout and lake char. Overall, 2009 CSS sales of 5,138 for both rainbow trout and lake char on Shuswap Lake decreased by 5% after an increase of 13% in 2008, close to the sixteen year average of 5,187. .

BC residents represent the majority of all anglers (86%) with only 13% from the rest of Canada (mostly Alberta) and less than 1% from the US. The 2009 estimate of ~81,000 rod hours was well below the nine year average of ~100,000 rod hours and represents 19,782 angler days based on a mean angler day of ~ 4.1 hrs. Total 2009 catch for all size classes of rainbow trout was estimated to be 18,707 with an overall CPUE of 0.23 fish/h which was slightly higher than the previous three years rates. Total estimated effort directed at lake char was 11,586 angler hours, which represents 2,932 angler days based on a mean angler day of ~ 4.0 hrs. Lake char angling effort in 2009 was the lowest estimate in nine years. Total catch for all size classes of lake char was estimated to be 1,159, an increase from the 2008 estimate due to an increase in the average CPUE to 0.10 fish/h compared to 0.07 fish/h in 2008.

There does not appear to be any trend for rainbow trout effort or catch based on nine years of survey data. The exception to this is the recent catch of the largest fish (>6kg) appears to be in decline and this decline should be monitored closely by fisheries management. Angler hours for rainbow trout over the eight year period have ranged from ~81,000-131,000 hours while catch has ranged from ~15,000-28,000. The developing trend data for lake char is somewhat different as effort continues to decline. Lake char effort for the eight year period has ranged from ~11,500-22,000 angler hours with catch ranging from 950-3,700. Bull trout catch appears to be increasing.

It needs to be emphasized these survey estimates do not account for numerous catch and release fisheries that occur at several river mouth locations nor do the estimates include those who fished for other fish species. High release rates (>60%) have been recorded for each survey year for both rainbow trout and lake char with the 2009 survey exceeding an 80% release rate for both species. The Shuswap Lake conservation stamp limits harvest of trout and char > 50 cm to five per year and this limitation undoubtedly accounts for much of the high release rate(s).

In 2005, Ministry of Environment (Kamloops) fisheries staff instituted a tagging program for determining the exploitation rates for rainbow trout and lake char on Shuswap Lake. The 2009 survey facilitated recovery of five tagged rainbow trout.

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SHUSWAP LAKE ANGLER SURVEY 2009 RESULTS

by

Greg Andrusak¹

INTRODUCTION

Management of any fishery is dependent on obtaining key statistics such as angler effort, catch, harvest and population size. On Shuswap Lake such fishery statistics are difficult to acquire owing to the large size of the lake and multiple private and public access points that anglers can use. Implementing an annual creel census on this lake would be cost prohibitive due to the magnitude and variety of fisheries that would have to be surveyed. Often managers seek alternative methods of obtaining information from recreational fisheries that are less costly and time consuming although this often comes at the expense to the accuracy and precision of the information collected. Nearly two decades ago this was the case facing Shuswap lake fisheries managers who in 1994 developed a survey questionnaire of all anglers who fish and harvest rainbow trout and lake char on Shuswap Lake. The survey was possible since all Shuswap Lake anglers who sought to harvest these species over 50 cm commencing in 1994 were required to purchase a special stamp referred to as the Conservation Surcharge Stamp (CSS). Annual quotas of only five trout and char > 50 cm and >60 cm respectively were established with the establishment of the special surcharges. Creation of this stamp or surcharge provided the management agency, Ministry of Environment (MoE) with information (name and address) of Shuswap Lake anglers, thus enabling a mail-out of a questionnaire named the Shuswap Lake Angler Survey (SLAS). The SLAS provides MoE with a cost effective method of collecting valuable catch and effort information on the recreational fisheries on Shuswap Lake.

Shuswap Lake is synonymous with sockeye salmon since one of the world's largest sockeye population spawn in the Adams River and the progeny rear in the lake. The Thompson-Nicola region is also world renowned for its highly productive and very popular rainbow trout fishing found in the many small lakes within 100 km of Kamloops BC. In addition to these fisheries this region also supports some excellent river mouth rainbow trout fisheries especially on Shuswap Lake. This lake, with a surface area of ~330 km², is the largest lake in the region and provides one of the most diverse recreational fisheries in the province. Aside from the river mouth rainbow fisheries a considerable amount of angling effort on the lake is directed at trophy sized rainbow trout (*Oncorhynchus mykiss*) and lake char (*Salvelinus namaycush*) that can often attain sizes in excess of 9 kg (Renn and Bison 1996). However, due to its popularity in the early 1990s, there was concern of over-exploitation that prompted more restrictive regulations and special management strategies to ensure sustainability of these fisheries. This led to the aforementioned Conservation Surcharge Stamp created in 1994.

This report summarizes fishery data derived from questionnaires mailed out to anglers who purchased a Shuswap Lake CSS in the spring 2010 inquiring as to their total effort and catch during 2009-2010. . The survey provides information on number of anglers, residency, effort,

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harvest, catch, and success rates. As well, the mail-out survey facilitates the recovery of tag data from the fishery; trout and char have been tagged each year since 2005 to determine the annual exploitation rates for both rainbow trout and lake char. The SLAS over time provides invaluable trend data on the effort and catch by the recreational fisheries for Shuswap Lake rainbow trout and lake char stocks. Angler effort and catch of other species such as kokanee, burbot, and whitefish are not included in the survey.

It should be noted that the compiled survey catch statistics are conservative estimates of Shuswap Lake angling effort and catch since catch and release anglers do not require the CSS. Catch and release statistics have been collected for the spring fishery as part of a recently completed HCTF project: *Shuswap Lake Rainbow and Lake Trout Stock Status and Their Recreational Fishing Potential* and are reported separately.

BACKGROUND

Within the Thompson-Nicola region Shuswap Lake is the center for water based recreation that includes some very good fishing. The lake supports a highly diverse fish assemblage that includes 16 native species with two species (sturgeon and brassy minnow) possibly present (Andrusak et al. 2005). The only introduced species (confirmed) are brook trout, goldfish, and carp although yellow perch, bass and sunfish are also known to be present now in small lakes that drain into Shuswap Lake. This lake is the nursery area to the largest sockeye population in British Columbia that spawns in the lower reaches of the Adams River as well as a few other rivers including the Eagle. It is the most important nursery system for the world famous Adams River sockeye population, the largest in the Fraser River system. While the lake is best known for its production of sockeye, other commercial species of salmon, coho and chinook, also spawn and rear in the lakes' numerous tributaries. Kokanee, bull trout, rainbow trout, lake trout, burbot, and mountain whitefish are the primary sport fish species of interest to Shuswap Lake anglers. All fish populations in Shuswap Lake are self-sustaining through natural recruitment.

The recent invasion of spiny ray species (yellow perch, bass and sunfish) into small lakes that drain into Shuswap Lake has been alarming. These species could be competitive and detrimental to the lakes' trout and salmon populations especially in the smaller bays where these salmonids often rear. During the last five years the MOE has undertaken an ambitious eradication program of these species from some of the small lakes in the headwaters of Shuswap Lake but this is not possible for the lake itself.

In 2009 a fisheries operational plan was developed for all the large lakes in the Thompson-Nicola region and it was clear that Shuswap Lake has the potential to support considerably more fishing effort (Redfish Consulting Ltd. 2010). Rainbow trout fishing has been the species that attracts most of the attention of anglers and previous concerns of over-fishing resulted in a series of stock assessment studies during the 1990s and early 2000s were recently summarized by Andrusak et al. (2005). Aside from the need to ensure sustainability of the sport fish species the management plan also identified a number of key issues facing fisheries management that require their attention. These include:

1. General habitat protection related to agricultural developments, residential developments, water quality, linear development (Eagle River) and forest harvesting near the major spawning streams.
2. Foreshore development impacting fish rearing and spawning habitat.
3. Development along the Adams River.
4. Decrease in size of rainbow trout.
5. High variability in kokanee escapement levels and their small size for anglers.
6. Competition between kokanee and sockeye.
7. Invasion of spiny rays into headwater systems.

Despite the number of rainbow trout and lake char investigations an understanding of all rainbow trout (and possibly lake char) that inhabit Shuswap Lake is still quite limited with the majority of the data obtained from studies directed at the larger piscivorous forms. Regarding rainbow trout it is quite possible that up to five life history strategies are represented in Shuswap Lake:

- Fluvial rainbow trout probably exist in some of the larger rivers such as the Adams, Lower Shuswap River, and possibly the Eagle River. These systems are large enough that rainbow trout could reside in the mainstem river and utilize the smaller tributaries for spawning and rearing.
- Stream resident rainbow trout are known to exist above barriers on the Seymour, Scotch Creek, Eagle River tributaries, Salmon River, and most likely in some of the many smaller streams that flow into the lake.
- Adfluvial rainbow trout populations are known to exist in the lake and two or possibly three types are present:
 1. Small sized adfluvial rainbow trout stock (s) that are insectivores. i.e. non-piscivores. Similar populations are known to exist in Kootenay Lake and Arrow Reservoir. These trout tend to utilize smaller streams for spawning and rearing.
 2. Large pelagic piscivorous rainbow trout are known to migrate from the lake into the Eagle River and possibly Scotch Creek. These forms have been assessed to some degree as described by Andrusak et al. (2005).
 3. Intermediate forms of rainbows that are opportunistic feeders on salmon fry/smolt are very evident off the mouth of the Adams River and Scotch Creek. These fish seldom exceed 4 kg and spawn in the Adams River, Scotch Creek and possibly in McNomee and Danforth creeks. Genetic analysis is required to determine if they are a separate ecotype from Eagle River fish. Rainbow trout that inhabit Little Shuswap Lake most likely move

back and forth into Shuswap Lake in pursuit of seasonally available sockeye fry/smolts and it is possible they may be a separate stock.

OBJECTIVES

The objectives of this report include:

Summarization of the 2009 survey data.

Analyze trends in the rainbow trout and lake char fisheries.

Recommend changes for the 2010-2011 angler survey.

SITE DESCRIPTION

Shuswap Lake is located in the eastern corner of the MOE Thompson-Nicola Region. Shuswap Lake is approximately 330 km² and comprised of three arms: Seymour Arm to north, Anstey Arm to the northeast, and Salmon Arm in the south. These three arms form the Main Arm to the west that flows into Little Shuswap Lake then southwest via the South Thompson River that cuts through the southern interior plateau some 20 km east of Chase BC (Fig. 1). The lake lies between the Monashee Mountain Range on the east side and the Southern Interior Plateau to the west. The lake lies at an elevation 349 m and has a maximum depth of 162 m and mean of only 62 m (Stockner and Shortreed 1989).

Shuswap Lake is considered relatively productive and classified in the mid-upper range of oligotrophy by Shortreed et al. (2001). Due to the warm climate in the Shuswap Lake basin the lake seldom completely freezes over although some parts can freeze periodically. Summer surface water temperatures often exceed 20°C from July to September resulting in a strong, shallow (10 m) thermocline during most of the growing season (Shortreed et al. 2001). The lake is fed by numerous small streams and a number of large rivers, some of which are lake-fed. Annual runoff is quite high resulting in a theoretical flushing rate of 2.2 years (Goodlad et al. 1974). Additional limnological data on Shuswap Lake can be found in Goodlad et al. (1974), Nidle and Shortreed (1996) and Shortreed et al. (2001).

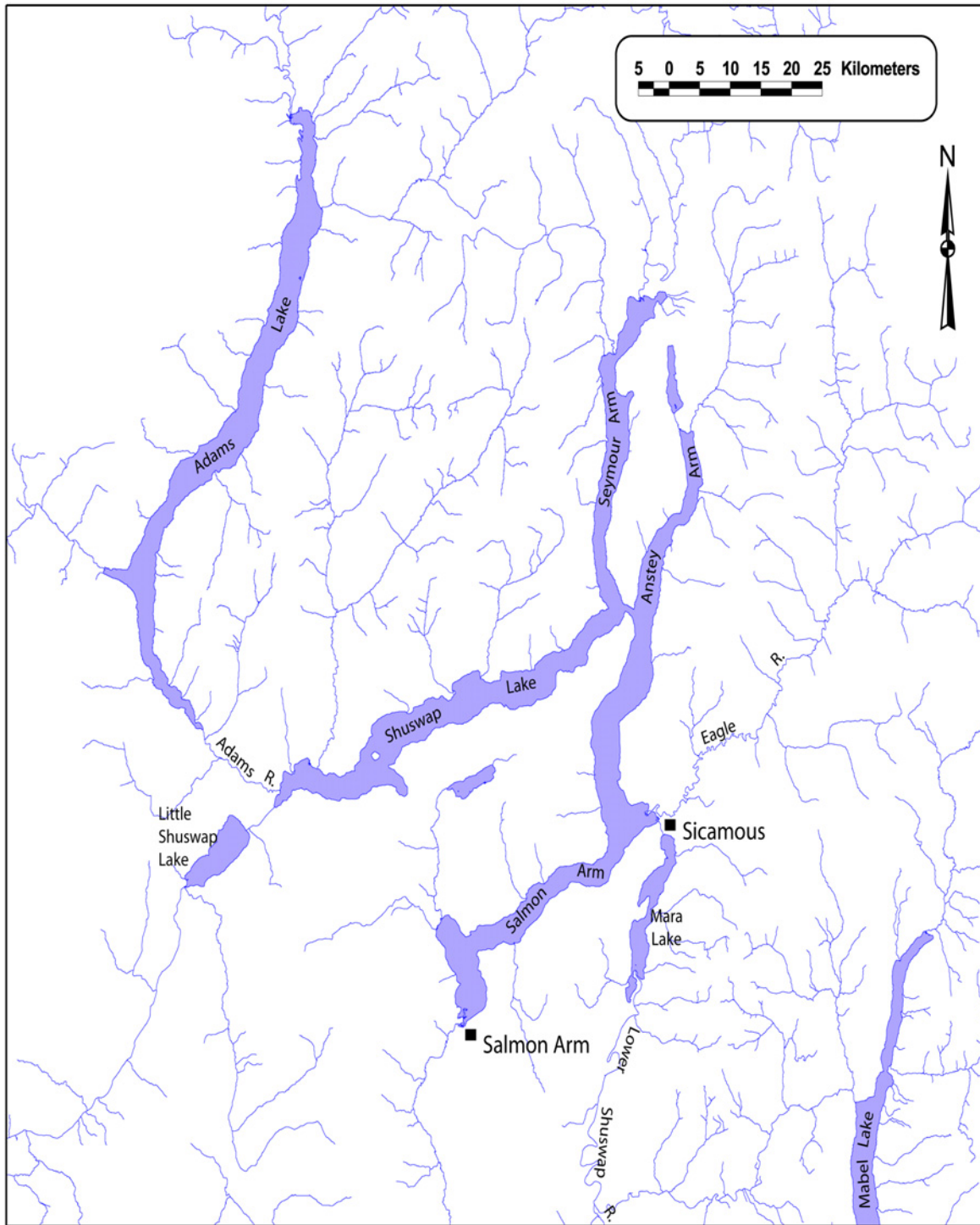


Figure 1. Shuswap Lake study area.

METHODS

Data Retrieval

Each year anglers who wish to harvest a large size Shuswap Lake rainbow trout (50 cm) and/or lake char (60 cm) must purchase a CSS for each species from a license vendor. The counterfoil of the CSS is removed from the stamp and returned to the Government Agent (GA) in Victoria by the license vendor. The counterfoils are then sent to the Ministry of Environment (MOE) regional office in Kamloops. By means of an annual contract angler name, address, and postal code information from the counterfoil are entered into a database. Using the addresses in the database, a survey questionnaire is mailed out in late February to a random sub sample to obtain angler effort, catch, and harvest data from the preceding years' sport fishery.

In 2010, the questionnaire was distributed at the end of February to 2,600 of the 5,138 anglers who purchased CSSs the preceding year (fiscal 2009-2010). Return dates for the questionnaires from surveyed anglers in 2010 was April 30th.

Note: discussion in this report refers to several key words or abbreviations that are defined in Appendix 1.

Data obtained from the returned questionnaire were entered into an Access database. The database was queried for data from the same standardized categories (catch, effort, etc.) provided in the returned questionnaire (Appendix 2) by the anglers including:

- Total CSS sales for Shuswap Lake in 2009.
- Angler residency and expenditures.
- Effort, catch, and CPUE estimates by residence type.
- Report the number of tagged fish recovered for rainbow trout and lake char in 2009.

The Access queries were then exported into Excel for summarization and analysis. The database can be used to make a number of other queries that are not included in this report, e.g., participation rates by residency, catch rates by residency.

Calculations

Angler effort expressed as angler hours by residence category for rainbow trout and lake char was calculated as follows:

$$E_{anglerhours} = \sum_{i=1}^n (D_i H_i) * \left(\frac{L_{total}}{L_{sampled}} \right)$$

Where H_i is the angler hours fished per day per angler, D_i is the number of days fished per angler, L_{total} is total number of CSSs sold, $L_{sampled}$ is the total number of CSSs in the survey sample and n is the number of questionnaire interviews.

The mean angler day for each residence category and for each species was calculated as follows:

$$\bar{D} = \sum \frac{H_i}{n}$$

Where H_i is the angler hours fished per day per angler i and n is the number of returned questionnaires in the survey sample.

The total catch by residence category for each species was calculated as follows:

$$C_{total} = c_{sampled} \times \left(\frac{L_{total}}{L_{sampled}} \right)$$

Where $c_{sampled}$ is the catch in the survey sample, L_{total} is total number of CSSs sold and $L_{sampled}$ is the total number of CSSs in the survey sample.

Catch per unit of effort (CPUE) by residence category for each species is therefore:

$$CPUE = \frac{C_{total}}{E_{anglerhours}}$$

RESULTS

Survey Data 2009

All results from the 2009 survey were generated from a sample of 776 responding anglers. Overall, 31% (2,520 mailed out) of anglers responded to the survey questionnaire.

Conservation Surcharge Stamp Sales and Angler Composition

A total of 3,883 rainbow trout stamps were sold for Shuswap Lake during 2009-2010 (

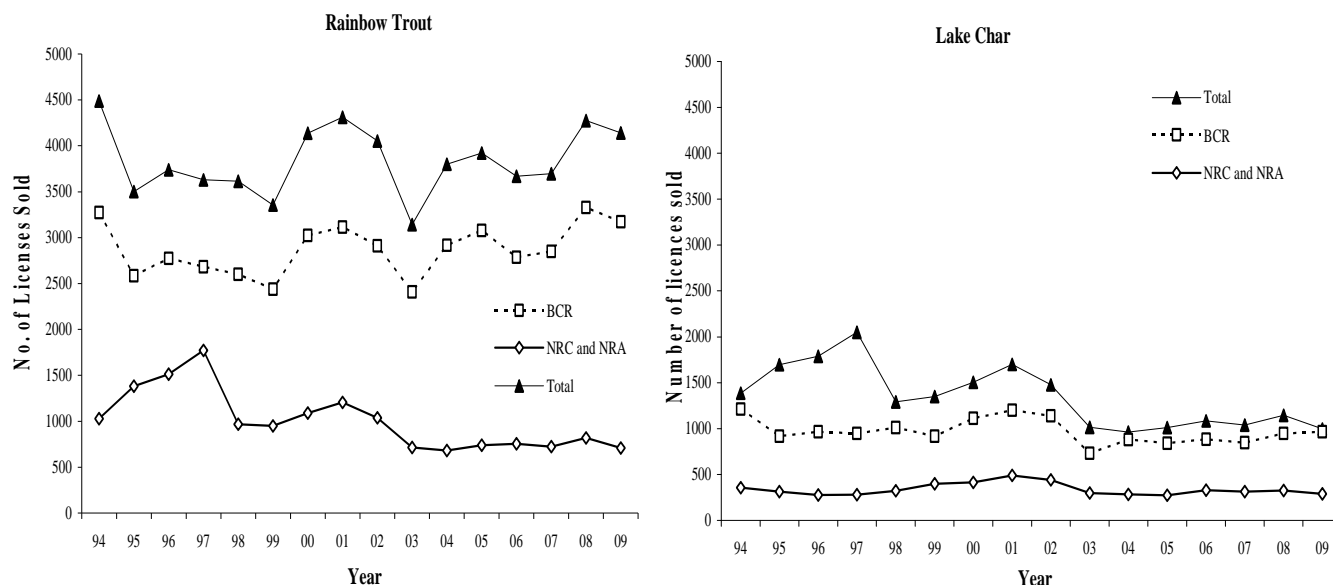


Figure 2). Sales included 3,174 to BC Residents (BCR), and 709 to Non-Resident Canadians (NRC) and Non-Resident Alien (NRA). Additionally, 1,255 lake char CSSs were sold: 967 to BCR and 288 to NRC and NRA (Table 1). The 2009-10 rainbow trout sales to resident anglers were slightly lower than the 2008-09 sales which were the highest in fifteen years; the 2009 sales were still well above the sixteen year average sale of 2,872. Resident lake char sales were slightly higher than the previous year but still below the peak sales recorded in the early 2000s. Nonresident sales for rainbow trout and lake char were the second lowest in sixteen years and well below the peak recorded during the late 1990s. Electronic sales in 2009-10 by individuals online represented 31% of the total.

Based on the sample, 86% were British Columbia Residents (BCR), 13% were Non-Resident Canadians (NRC) and the remaining <1% were Non-Resident Aliens (NRA) who reside outside of Canada (Figure 3). Annual licenses comprised 92% of all license sales while 8-day license sales comprised 7 and the remaining <1% were 1 day licensees in 2009.

Note: the small percentage of 2009 short term licensed anglers were treated as annual licence holders, i.e., their reported effort and catch were treated the same.

Table 1. Summary of the 2009 Shuswap Angler Questionnaire mail-out and respondents.

	Rainbow Trout	Lake Char
Total Conservation Surcharge Stamp sold	3,883	1,255
No. of Shuswap Lake Angler Questionnaires mailed out		2,600
No. of respondents		883
No. of respondents who did not fish	284	572
No. of respondents who fished for rainbow trout/lake char	549	261
Estimated no. of anglers with Conservation Surcharge Stamps who fished for rainbow trout/lake char in 2009	2,563	389

Estimated Effort and Catch

Rainbow Trout

The majority of fishing on Shuswap Lake in 2009-10 was directed at rainbow trout and angler effort was estimated at 80,798 angler hours. This approximates 19,782 angler days based on a mean angler day of ~ 4.1 hrs ($n=549$, Table 2). It should be noted that effort and catch data were extrapolated from 549 surveyed anglers from the total of 883 responses, less those anglers who purchased a CSS but did not fish for rainbow trout.

Table 2. Summary of 2009 rainbow trout effort by residence category.

Residence	Sampled Effort (angler hours)	Extrapolated Effort (angler hours)	Mean Hours Per Angler day	Estimated Total Angler days
BCR (n=462)	13,956	65,593	4.1	16,036
NRC (n=79)	3,116	14,645	4.1	3,549
NRF (n=8)	119	559	2.8	197
Total (n=549)	17,191	80,798	4.1	19,782

Similar to previous years, queries were made for the reported 2009 rainbow trout catch by the following weight categories; <1.5 kg, 1.5-3 kg, 3-6 kg, and >6 kg (Table 3, Appendix 3). Total catch for all weight classes of rainbow trout was estimated to be 18,707. Rainbow trout weighing <1.5kg represented 66% (12,422) of all rainbow trout caught in 2009, while the remaining 34% (6,285) were comprised of trout weighing > 1.5 kg. The 1.5-3 kg rainbow trout weight category had the highest harvest, with an estimated 1,241 trout harvested. In contrast, the < 1.5 kg category had an estimated 11,618 released and only 804 harvested. Not surprisingly, BCR caught 90% of the total catch, followed by NRC and NRA at 10% and <1%, respectively, in 2009.

Table 3. Summary of 2009 rainbow trout catch by residence.

Residence	<1.5kg		1.5-3kg		3-6kg		>6kg		Catch Totals
	Harvested	Released	Harvested	Released	Harvested	Released	Harvested	Released	
BCR (n=462)	743	10,608	1,086	3548	296	512	0	33	16826
NRC (n=79)	42	1001	150	503	52	85	5	5	1843
NRF (n=8)	19	9	5	0	5	0	0	0	38
Total (n=549)	804	11,618	1,241	4,051	353	597	5	38	18,707

Overall, catch of rainbow trout (18,707) in 2009 resulted in an average CPUE of 0.19 fish/h (Appendix 4). According to the responses a surprisingly high 87% of all trout caught were released. By residency, the highest success rate was recorded by BCR's in the <1.5 kg size category with 0.15 fish/h (Table 4). Success rates for the larger size categories were quite similar amongst the residents and non residents. These estimates should be viewed with caution due to the limited sample size and high variability.

Table 4. Summary of 2009 rainbow trout mean CPUE (\pm SE) by residence category.

2009 Residence	<1.5kg		1.5-3kg		3-6kg		>6kg	
	mean	SE	mean	SE	mean	SE	mean	SE
BCR (n=462)	0.15	0.01	0.07	0.01	0.009	0.002	0.0003	0.0002
NRC (n=79)	0.08	0.02	0.05	0.01	0.009	0.003	0.0005	0.0005
NRF (n=8)	0.09	0.07	0.01	0.01	0.01	0.01	n/a	n/a

Lake Char

Compared to rainbow trout fishing a much smaller group of Shuswap Lake anglers specifically fished for lake char in 2009. Total estimated effort for lake char was 11,586 angler hours, which represents 2,932 angler days based on a mean angler day of ~ 4.0 hrs ($n=267$, Table 5). Similar to rainbow trout, estimated effort and catch for lake char was extrapolated from 267 surveyed anglers from the total of 883 responses, less those anglers who purchased a CSS but proceeded not to fish for lake char.

Table 5. Summary of 2009 lake char effort by residence category.

Residence	Sampled Effort (angler hours)	Extrapolated Effort (angler hours)	Mean Hours Per Angler day	Estimated Total Angler days
BCR (n=198)	5,646	8,469	4.0	2,118
NRC (n=57)	2,005	3,007	3.9	770
NRF (n=5)	73	110	2.5	44
Total (n=260)	7,724	11,586	4.0	2,932

The 2009 lake char catch was separated into the following weight categories; <1.5 kg, 1.5-3 kg, 3-6 kg and >6 kg (Table 6). Total catch for all weight classes of lake char was estimated to be 1159 (Appendix 5). The >1.5 kg size category comprised 53% (728) of all the lake char caught in 2009. The 1.5-3 kg category had the highest estimated harvest of 78 lake char. Similar to rainbow trout, BCR ($n=202$) comprised 71% of the total lake char catch while NRA comprised < 2% of the total catch.

Table 6. Summary of 2009 lake char catch by residence category.

Residence	<1.5kg		1.5-3kg		3-6kg		>6kg	
	Harvested	Released	Harvested	Released	Harvested	Released	Harvested	Released
BCR (n=198)	32	288	60	312	39	69	2	18

NRC (n=57)	2	104	18	144	9	39	8	0
NRF (n=5)	0	5	0	8	2	0	0	0
Total (n=260)	34	397	78	464	50	108	10	18

Overall catch of lake char (1159) yielded an estimated average CPUE of 0.10 fish/h (Appendix 6). The highest char success rate (CPUE) actually was by non residents for fish in the 1.5-3kg size category with 0.06 fish/h (Table 7). BCR's experienced the highest success rate for large lake char (>6 kg) with a CPUE of 0.007 fish/h. The release rate for lake char was 85% which was almost identical to the rainbow trout release rate.

Table 7. Summary of 2008 lake char mean CPUE (\pm SE) by residence category.

Residence	<1.5 kg		1.5-3kg		3-6kg		>6kg	
	mean	SE	mean	SE	mean	SE	mean	SE
BCR (n=198)	0.029	0.005	0.04	0.01	0.007	0.002	0.007	0.007
NRC (n=57)	0.035	0.01	0.06	0.02	0.02	0.008	0.004	0.003
NRF (n=5)	0.050	0.050	0.07	0.05	0.005	0.005	n/a	n/a

Bull Trout

Since 1995 a single question in the survey has been asked regarding how many bull trout were caught, released, and/or harvested. The survey does not attempt to ascertain effort for the bull trout fishery, and therefore, provides no information on CPUE. A total of 485 bull trout were estimated caught in 2009 of which only 35 were harvested and 450 were released. This represents a very high rate of release at > 93%. There was a slight decline in the 2009 bull trout catch estimate (Appendix 7).

Tag Recoveries in 2009

The 2009 mail-out survey was used to facilitate recovery of tagged rainbow trout and lake char for determining exploitation rates on Shuswap Lake. From a total of 883 returns, a total of 5 tagged rainbow trout were recovered. More detail regarding the methods, total number of tagged fish released and total number returned will be provided under a separate report produced by the Ministry of Environment (Kamloops) staff.

COMPARISON OF SURVEY RESULTS FOR ALL YEARS

CSS Sales and Angler Composition

Each year the SLAS survey data becomes more informative as a good time series of fishery statistics is accumulating on the primary Shuswap Lake sport fisheries. The license sales have been recorded since 1994 and have demonstrated relatively consistent numbers from year to year (Table 8;

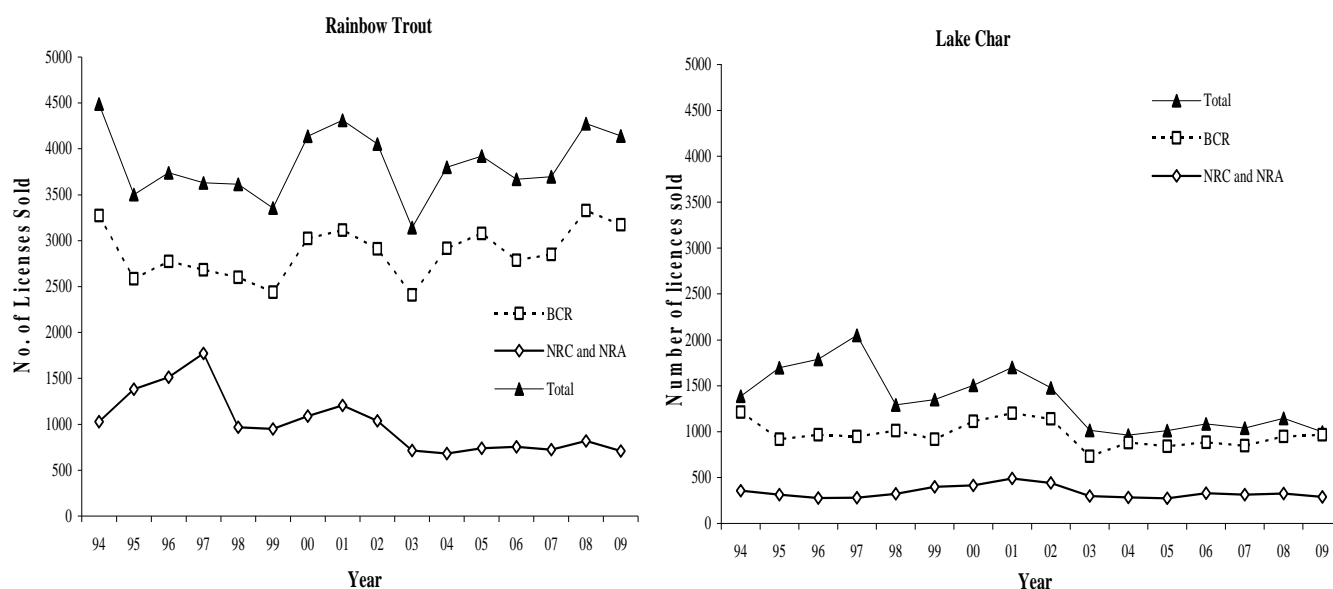


Figure 2). After a substantive increase in total sales in 2008 the 2009 sales declined somewhat while remaining higher than the mid 2000s sales. Overall 2009 license sales (n=5,138) decreased by ~ 5% but remained very close to the sixteen year average of 5,187. (n=15). Amongst the years surveyed, 2001 had the highest sales (6,012), while 2003 (4,155) represented the lowest. The resident license sales declined only slightly from 4,274 (2008) to 4,141 in 2009. However the non-resident license holders declined considerably to the second lowest level in sixteen years. Not surprisingly, BCR comprise the highest percent of all anglers since 1994, ranging from 77-87% (Figure 3). NRC angler composition has ranged from 12-22% since 1994. NRA makes up the lowest percent of anglers (1-3%) for all years (Figure 4).

Table 8. License sales by residency from 1994-2009

Year	Resident			Non resident/alien			Grand Total
	rainbow	lake char	Total	rainbow	lake char	Total	
1994	3,274	1,214	4,488	1,029	357	1,386	5,874
1995	2,586	917	3,503	1,383	314	1,697	5,200
1996	2,775	965	3,740	1,513	276	1,789	5,529
1997	2,682	947	3,629	1,772	279	2,051	5,680
1998	2,602	1,012	3,614	969	324	1,293	4,907
1999	2,439	918	3,357	951	399	1,350	4,707
2000	3,025	1,113	4,138	1,089	415	1,504	5,642
2001	3,114	1,199	4,313	1,207	492	1,699	6,012
2002	2,912	1,141	4,053	1,037	442	1,479	5,532
2003	2,409	732	3,141	715	299	1,014	4,155
2004	2,918	882	3,800	681	283	964	4,764
2005	3,080	842	3,922	740	273	1,013	4,935
2006	2,786	884	3,670	755	330	1,085	4,755
2007	2,850	847	3,697	724	315	1,039	4,736
2008	3,327	947	4,274	820	327	1,147	5,421
2009	3,174	967	4,141	709	288	997	5,138

Analysis of the questionnaire data suggests that there is a predictable relationship between effort and total license sales on Shuswap Lake. Most of the variation ($r^2=0.62$) in effort is explained by the trends in NRC and NRA CSS sales since 1994 (Figure 5). Since the NRC/NRA license sales are such a low percentage of the total sales, total angler effort is driven by the resident component. The decline in effort in 2009 can mainly be attributed to the decrease in resident effort for rainbow trout and lake char (Figure 6, Figure 7).

Survey Sample Sizes

The Shuswap Lake survey has been conducted eight times thus providing comparable rainbow trout survey data from the mid 1990s and all of the 2000s. Survey questions about lake char fishing did not commence until 2003 thus comparable data is available only for five years with effort data from 2003 extrapolated from the 1994, 1995, and 2004 results due to an error in the 2003 lake char questionnaire. Excluding 1995, mail-out sample sizes have averaged ~2,450 while response rates have averaged ~30% since 1994 (Table 9). One surprising result of this survey is the high number of anglers who purchase the Shuswap Lake CSS's but chose not to fish. This trend is most pronounced for lake char fishing, where on average ~6% (1994, 2004-2009) of the anglers who purchase a CSS for lake char evidently didn't fish. Consequently from the survey mail out a much smaller sample size of anglers actually report catch statistics. In comparison, on average, only ~25% of anglers who purchased a stamp did not fish for rainbow trout for the same time period (Table 9).

Survey response rate of only ~ 30% can be largely attributed to mailing vs. home address. The postal system will only deliver to a mailing address hence those with a home address (from the license) are rejected. As more anglers use the internet to purchase their licenses it is expected that rejected survey forms will decrease over time. Another problem that accounts for large number of rejected survey forms is due to anglers often moving within the year, especially

apartment dwellers, and the survey is sent to the new home/apartment owner who often discards the survey rather than forwarding on.

Table 9. Sample sizes from mail surveys conducted in 1994, 1995 and 2003-2009.

Year	# Surveys Mailed	# Returned Responses	% response	Rainbow trout				Lake char			
				Didn't Fish	%	Did Fish	%	Didn't Fish	%	Did Fish	%
1994	2,350	692	29%	179	26	513	74%	273	39	419	61%
1995 ^a	5,200	721	14%	151	21	570	79%	370	51	351	49%
2003 ^b	2,504	892	36%	173	19	719	81%	843	95	49	5%
2004	2,499	863	35%	202	23	661	77%	475	55	388	45%
2005	1,993	665	33%	171	26	455	68%	394	59	232	35%
2006	2,543	945	37%	248	26	697	74%	604	64	341	36%
2007	2,537	603	24%	157	26	446	74%	396	66	207	34%
2008	2,520	776	31%	213	27	563	73%	509	66	267	34%
2009	2,600	883	34%	284	32	549	62%	572	64.78	261	30%

^a Note: number of mailed-out responses was taken directly from total license sales

^b Note: the lake char estimate is almost certainly low due to the problem with the lake char question

Rainbow Trout Effort, Catch and CPUE

The various rainbow trout stocks that inhabit Shuswap Lake are the preferred target of most anglers. The survey does not capture all rainbow trout anglers since catch and release anglers and those not retaining trout > 50 cm do not require the CSS. Since 1994, survey results indicate rainbow trout effort has ranged between ~ 81,000-131,000 rod hours (Figure 6; Table 10). A substantial increase in CSS sales for rainbow trout in 2008 was reflected in a large increase in effort and conversely in 2009 a 5% decline led to the lowest effort estimate since the surveys began. The 2009 estimate of ~81,000 rod hours was well below the nine year average of ~100,000 rod hours (Table 10). As in previous years lake char are not sought by anglers to the same degree as rainbow trout. Only 11,586 hours were directed at lake char in 2009, considerably lower than approximate 15,600, hours estimated from 2004-2009. (Figure 7; Table 10).

Estimated angler days illustrate considerable year-to-year variation, ranging from 219,000-31,000 for rainbow trout with the 2009 estimate the lowest of all years (Table 10). Reported angler days (hours per day) obtained from the survey demonstrate little variation for rainbow trout from 1994-2009, ranging from 4.1-4.3 hours per day. There is far greater variation in reported hours per day for lake char (see below).

Table 10. Summary of angler effort, harvest and CPUE for 1994, 1995, 2003-2009.

Year	Estimated rod hours		Estimated angler days		Estimated hr/angler day		Estimated total harvest	
	<i>RB</i>	<i>LC</i>	<i>RB</i>	<i>LC</i>	<i>RB</i>	<i>LC</i>	<i>RB</i>	<i>LC</i>
1994	101,196	15,548	23,483	5,717	4.3	2.7	3,028	383
1995	131,111	22,455	31,210	5,293	4.2	4.2	1,514	90

2003*	90,638	19,937	20,754	5,310	4.4	3.8	5,082	487
2004	103,828	20,189	24,679	4,921	4.2	4.1	5,935	488
2005	92,892	13,762	21,992	3,413	4.2	4.0	4,362	539
2006	100,506	18,404	23,629	4,268	4.3	4.3	3,431	337
2007	96,481	15,419	22,327	3,311	4.3	4.7	2,562	176
2008	100,602	14,369	23,776	3,382	4.2	4.2	4,899	220
2009	80,798	11,586	19,782	2,932	4.1	4.0	2,403	172

* denotes reconciled 2003 lake char data using average effort (19,397) from 1994, 1995 and 2004

Year	Estimated total catch and release				CPUE (catch per angler hour)		CPUE (catch per angler day)	
	RB	LC	RB	LC	RB	LC	RB	LC
1994	22,514	3,731	19,486	3,348	0.22	0.24	0.96	0.65
1995	17,842	952	16,327	862	0.14	0.04	0.57	0.18
2003*	25,718	2,291	20,635	1,804	0.28	0.12	1.24	0.43
2004	27,502	2,348	21,567	1,860	0.26	0.12	1.11	0.48
2005	15,634	1,678	11,272	1,139	0.17	0.12	0.71	0.49
2006	21,170	2,270	17,738	1,933	0.21	0.12	0.90	0.53
2007	20,252	1,396	17,690	1,220	0.21	0.09	0.91	0.42
2008	22,179	977	17,280	756	0.22	0.07	0.93	0.29
2009	18,707	1,159	16,304	987	0.23	0.10	0.95	0.40

The initial years of the survey (1995 and 1996) the anglers' rainbow trout catch was based on length (cm) not weight (kg). For sake of comparison, the assumption has been made that the length categories are comparable to the weight categories of the other survey years.

Catch estimates for all sizes of rainbow trout have ranged from 15,000-27,000 (Table 10; Appendix 3). However, with the exception of 2005, the catch had been relatively consistent (> 20,000) but in 2009 total catch declined to just under 19,000. Over the SLAS survey period the vast majority of the rainbow catch has consistently been comprised of small trout that annually ranged between 12-14,000 fish with the notable exception of 2005 (Figure 8). <1.5 kg. (8). On the other hand, catch of larger rainbow trout (>1.5 kg) has been much more variable, ranging from 4,000-15,000 (Figure 9). The substantial increase in catch of larger rainbow trout (>1.5 kg) in 2008 was not followed up in 2009 as the numbers declined to the second lowest estimate over nine years of surveys. Of particular significance is the catch of "trophy" rainbow trout (>6 kg). Some impressive numbers were initially estimated during the earlier surveys up to and including 2004. Since then there has been a worrisome downward trend in catch with numbers < 100 and a record low of only 43 in 2009. This decline has occurred over several years despite more than half of these larger trout being released as well as high release rates for those in the 3-6 kg category (Figure 10)

Angler catch per hour, also called success rate, can often reflect population abundance. The survey data does indicate a fairly steady state with the CPUE for smaller trout (< 1.5kg) quite constant at about 0.12 per hour over the last five years (Figure 12). The trend for the larger trout was also quite constant from 2005-2008 but there was a noticeable decrease in 2009. The highest success rates were recorded in 2004 and 2005 while the lowest rates were experienced in 1995. Interestingly, the 1995 CPUE of 0.14 fish/h was the lowest of the nine years of surveys at a time when there was the highest overall effort for rainbow trout.

Lake Char Effort, Catch and CPUE

Angling for lake char on Shuswap Lake is far less intensive than effort for rainbow trout. Over the SLAS survey period (1994-2009), effort has ranged between ~11,500-22,000 rod hours for lake char which is only about one quarter that estimated for rainbow trout (Table 10). Lake char effort declined in 2009 (11,586) for the third consecutive year, well below the nine year average of 16,852 rod hours (Table 10). The 2009 decline in effort appears to be due to a combination of fewer licences sold, fewer actual anglers who fished for char and less effort per day. As a consequence estimated angler days for lake char fell to the lowest level yet recorded (Table 10).

Overall catches (all sizes) for lake char have ranged from 952-3,700 (Appendix 5). There has been a sharp decline in total catch of lake char since 2003 but in 2009 there was actually a slight increase compared to 2008. The general decline in catch from the peak recorded in 2004 is quite obvious and the 2009 catch was well below (62%) the nine year average of 1,867. The decline in lake char catch is evident for all sizes but most pronounced for the catch of larger fish that has been in decline since 2003 albeit a slight increase in 2009 (Figure 13). Closer examination of the catch of the larger size category (> 1.5 kg) illustrated in Figure 14 also shows the continued decrease in harvest. The catch and harvest of the largest fish (> 6kg) appears to be in decline but the extrapolated values generated for 2003 skews the data. It can be argued that catch of the largest char actually remains fairly constant. Total estimated annual harvest of lake char has been < 600 for any of the survey years, with released numbers far greater than harvest numbers (Appendix 5). While there has been a declining trend in harvest for all size categories of lake char since 2004, the 2008 and 2009 data suggests some stability especially for larger lake trout (>3 kg; Figure 15). Interestingly, although small char (<3 kg) dominate the catch on Shuswap Lake, the majority of the harvest is comprised of larger fish most likely reflecting the regulation that prohibits retention of char < 60 cm.

Decline in catch of lake char may well be simply a function of decreased effort in recent years. However if the assumption is made that CPUE is proportional to abundance then there may potentially be a problem. CPUE trends demonstrate a close relationship with trends in catch, with a recent decline in the CPUE of 0.07 fish/h in 2008 from 0.09 fish/h in 2007 (Figure 18, Appendix 6). The 2009 data for all sizes increased slightly. There appears to be some weak evidence that a downward trend is at play over the last six years (Figure 18). Over the nine survey years, highest CPUE was recorded at 0.24 fish/h in 1994 and the lowest was recorded in 1995 at 0.04 fish/h with the average at 0.11 fish/h. Although success rates are considered to be low, CPUE of the largest char (> 3 kg) at 0.02 fish/h is quite comparable to Kootenay Lake rainbow trout and bull trout success rates (Table 9, Redfish Consulting Ltd. 2008).

Bull trout

A single question included in the survey is how many bull trout were harvested and or released. The data suggests that catch is increasing with the number released also increasing and harvest, if anything, is decreasing.

Table 11. Total catch, release and harvest of Shuswap Lake bull trout reported by anglers in the questionnaire except for 2004 (Renn and Bison 1996).

Year	Shuswap Lake Bull Trout		
	Total Catch	Released	Harvest
1994 ^a	170	140	30
1995 ^b	238	190	48
2003 ^b	326	232	94
2004	242	198	44
2005	295	249	46
2006	684	578	106
2007	495	447	47
2008	527	450	77
2009	485	450	35

^bcorrected extrapolated values from previous years' report

DISCUSSION

The Shuswap Lake angler survey has now been conducted for enough years that some useful trend information is emerging for the rainbow trout and lake char fisheries. This survey provides a simple and cost effective method of obtaining valuable effort and catch trend information on some of the recreational fisheries on the lake. The questionnaire results represent the “best available information” on the rainbow trout and lake char fisheries. This survey was instituted in 1994 following whole lake assessments which indicated possible over-exploitation (Pankratz 1991). Although, mail surveys are relatively simple and comparatively inexpensive for their breadth of scope (Brown 1991; Pollock et al. 1994) they do have the potential for serious errors affecting the precision and accuracy of results (Brown 1991; Pollock et al. 1994, Renn and Bison 1996; DeGisi 1999). They also have the potential for serious non-response bias which would require substantial reconsideration of the survey design to estimate its accuracy, thus leading to an increase in overall costs. It is believed that the SLAS survey biases are similar to the Steelhead Harvest Analysis (SHA) which were biased upward, inflating the effort and catch (De Gisi 1999). Data analysis indicates that the variation observed in effort may be explained by changes in NRC and NRA CSS license sales (Fig. 5). Despite these limitations, the importance of the survey information used as a long term data set for fisheries management should not be underestimated, especially since no other cost effective alternative appears feasible. The Kootenay Lake fishery is also monitored by a survey but in 2011 a full creel census is underway at a cost of ~ \$300,000; this amount is difficult to obtain during poor economic times.

The SLAS does not cover all fisheries that occur on Shuswap Lake. Aside from some intensive chinook salmon fishing there is a fishery that targets kokanee. Some intensive river mouth fisheries (e.g. Adams, Eagle rivers) are precluded from the survey since at least for rainbow trout they are catch and release fisheries hence a conservation stamp is not required thus not covered by the survey. Also not required to purchase a stamp is those who participate in the summer time kokanee fishery as well as those who only harvest small rainbow trout or char (< 50 cm). Therefore the SLAS survey results are incomplete or at least minimum estimates of the lakes’ annual fisheries.

As mentioned throughout this report the addition of more surveyed years is beginning to provide some sense of trends in the Shuswap Lake fisheries. The most accurate measure of angler use on Shuswap Lake is obtained from CSS sales provided by the Government Agent Revenue System

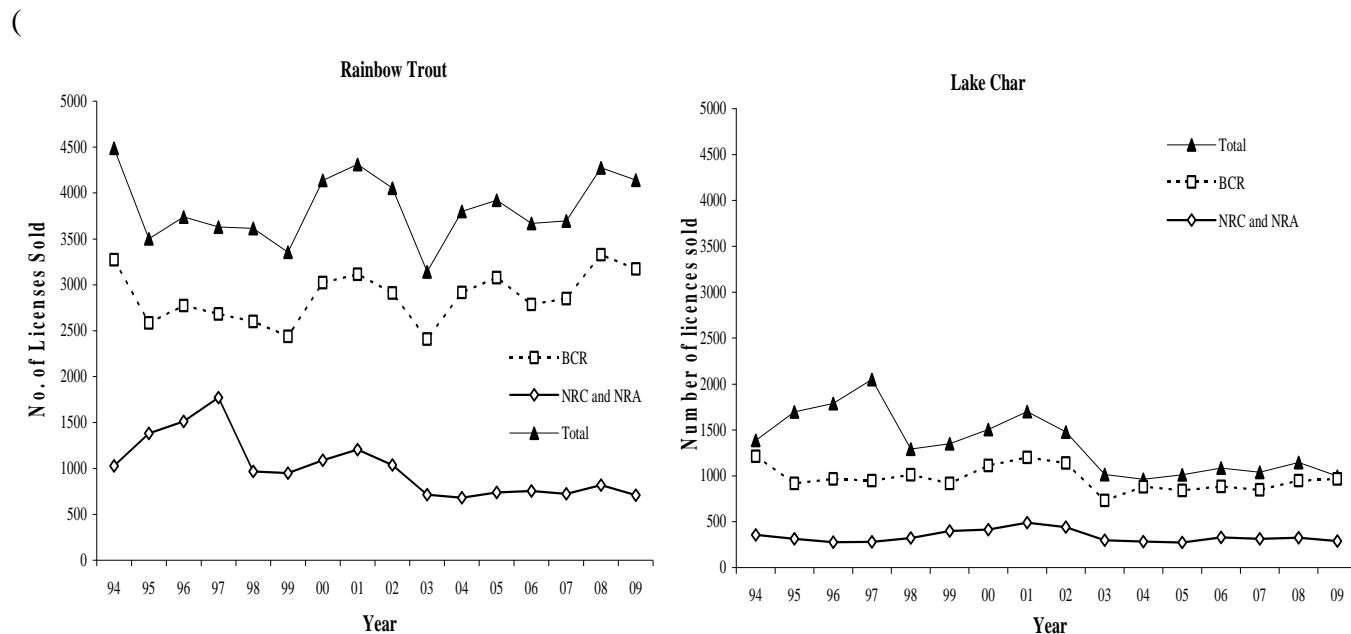


Figure 2). The 2009 CSS sales decreased by ~ 5% following a ~10% increase in 2008. Nevertheless, based on licence sales, there does seem to be an increase in angler use on the lake following a substantive decline from 2003-2007. Not surprisingly, in recent years BC residents represent the majority (~80%) of license sales, effort and catch on Shuswap Lake. The survey results also make it clear that the majority of effort and catch is primarily directed towards rainbow trout with far less effort (and catch) directed towards lake char. For every one char stamp there is about four rainbow stamps sold.

The 2009 effort estimate is the lowest yet recorded. Overall, the rainbow trout fishery appears to be fairly stable as indicated by the CPUE, especially for the smaller sizes. However the catch of the largest size trout appears to be in decline as well as their CPUE. Fortunately the harvest level of the largest trout is very low. The lake char data also indicates a steady state for all size fish. Similar to the rainbow trout scenario the largest lake char appear to be in decline based on their CPUE. There was a slight uptick in 2009 and the release rate for all char is very high.

In summary, rainbow trout fishing effort is about six times that estimated for lake char with a small decrease in total effort in 2009. This decreased effort resulted in decreases in estimated catch of trout and char. Total rainbow trout catch estimates have ranged from ~ 15,000-27,000 while annual harvest has been relatively low, not exceeding 6,000 with most of these fish > 50 cm. This latter point could be a concern in the future since fewer large trout have been caught and released in the last few years. Age of harvested fish should be monitored to guard against over harvest of the older fish. Overall, angler success rates are considered “good” at close to one fish per day. Success rates for the largest trout are low but comparable to that recorded for Kootenay Lake. In contrast, lake char fishing effort is considered to be low which is associated with a low success rate, possibly reflective of relatively low abundance. The 2009 CPUE for lake char increased slightly after three successive years of decline. Catch and harvest of lake char have remained low throughout recent years with effort decreasing over time. Importantly, understanding the effects of the fishery is crucial to managing lake char which are also

vulnerable to the alteration/degradation of spawning habitat as a result of foreshore development on Shuswap Lake.

RECOMMENDATIONS

1. Maintain the 2009 sample size for the 2010 survey in an effort to reduce variability as a result of lower percent of respondents.
2. A one page summary report of fisheries data derived from the Shuswap Lake Angler Survey questionnaire should be provided to anglers as part of the next questionnaire.
3. The data input from counterfoils and angler responses should continue to be entered consistently year to year preferably by one person.
4. Plan to conduct an annual creel census to validate the Shuswap Lake Angler Survey questionnaire data.
5. Implement the 2010 Shuswap Lake Angler Survey questionnaire survey by early February 2011.
6. An assessment of the Eagle River that is known to support large size rainbow trout should be planned for.

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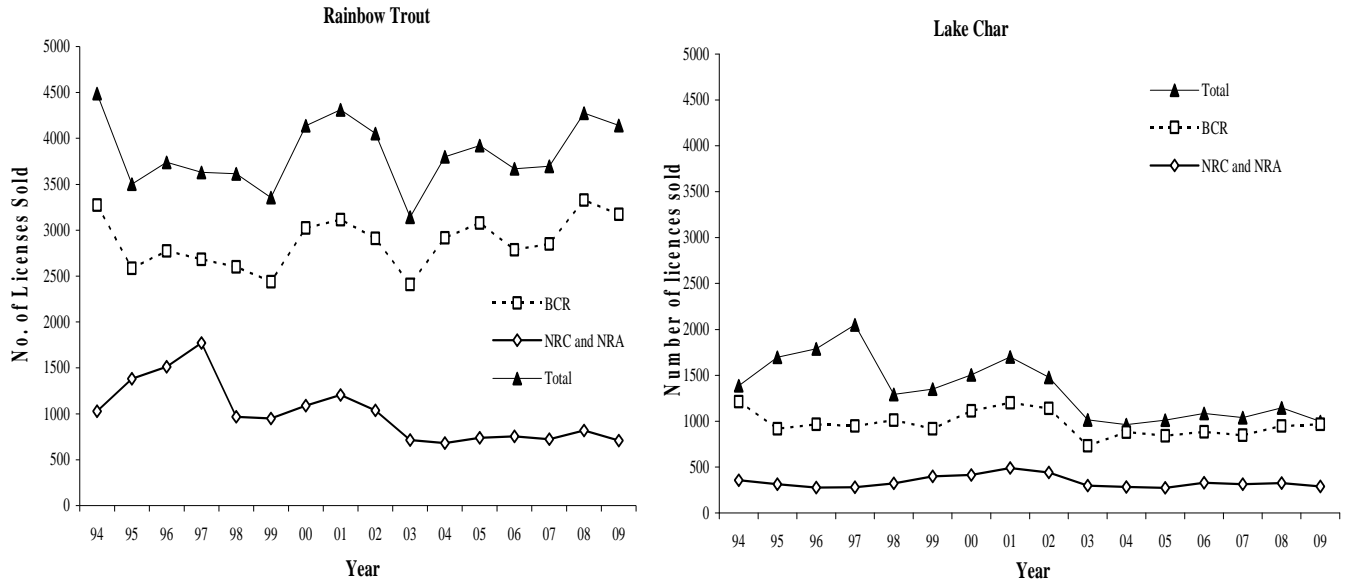


Figure 2. Annual Conservation Surcharge Stamp (CSS) sales by residency type for rainbow trout and lake char, 1994-2009.

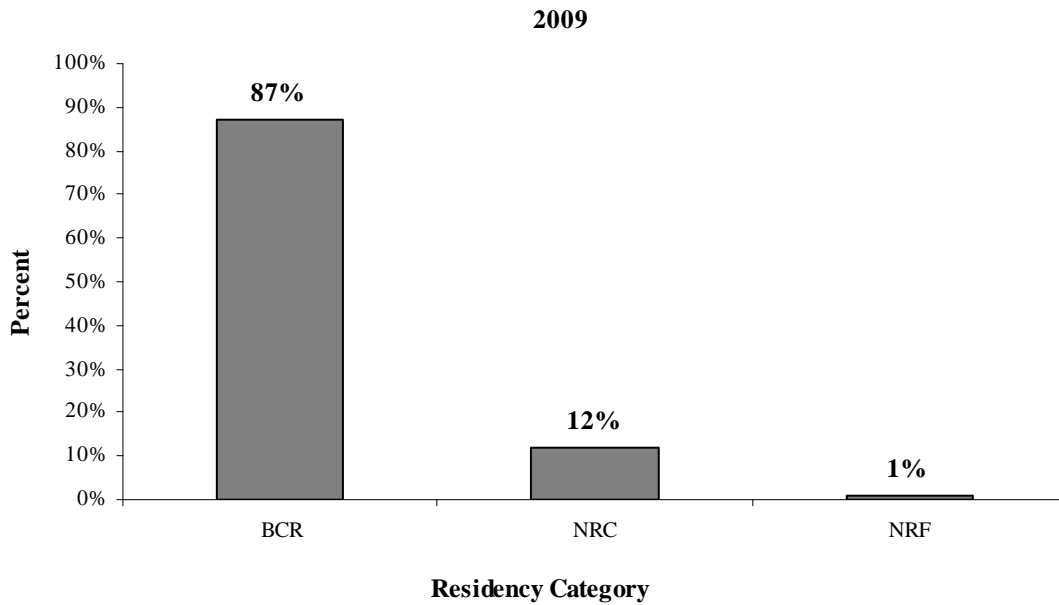


Figure 3. Composition of 2009 anglers by residence (n=833).

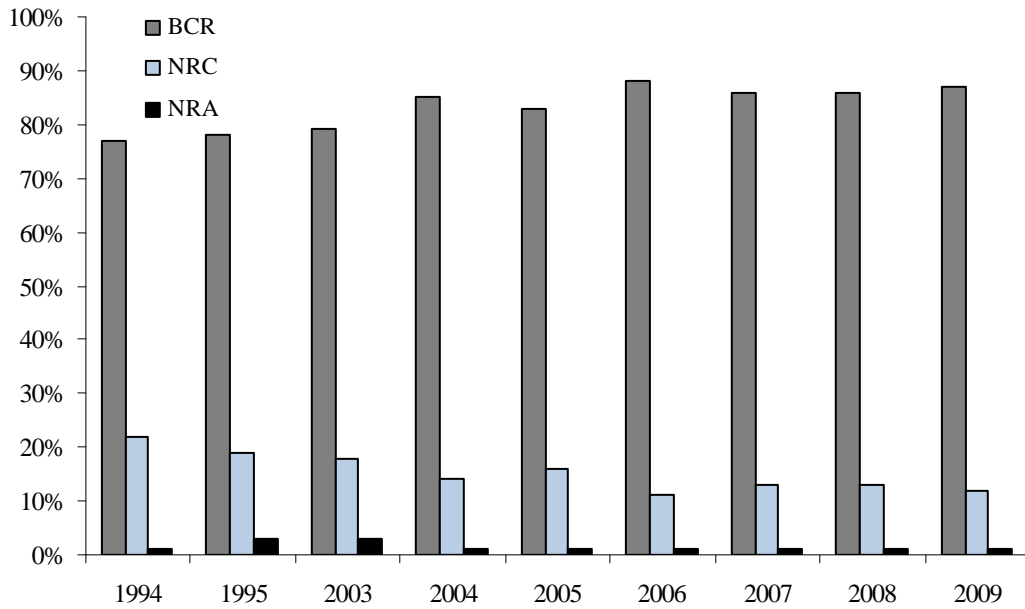


Figure 4. Composition anglers by residence from 1994, 1995, and 2003 to 2009.

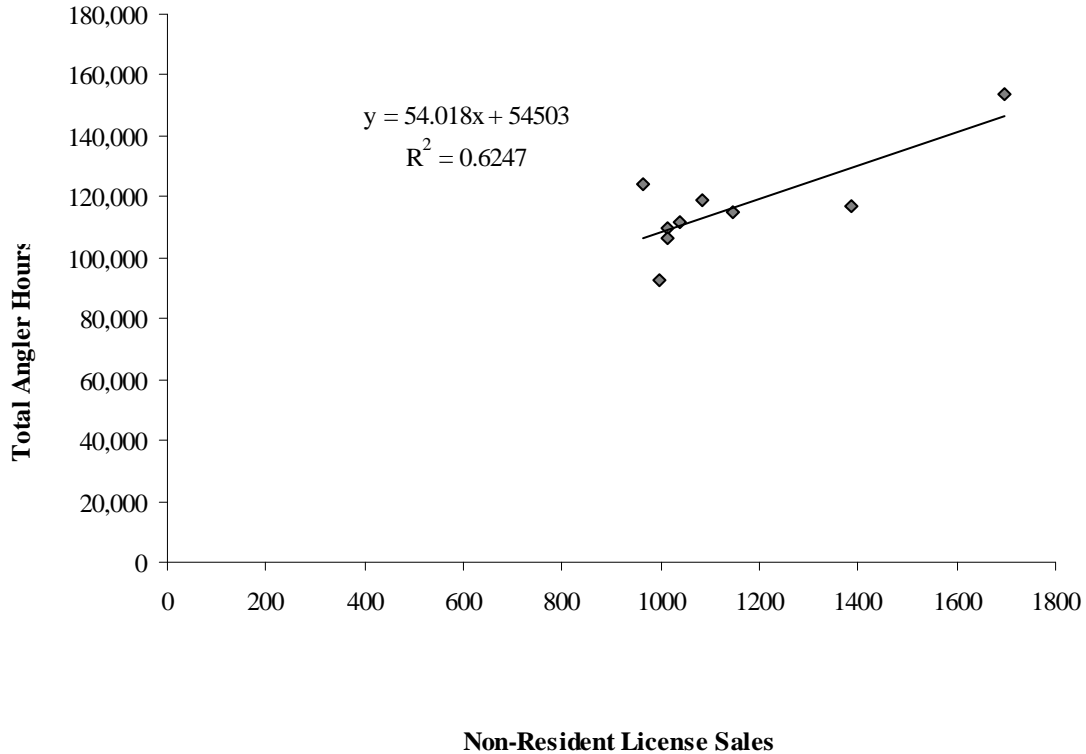


Figure 5. Relationship between non-resident angler hours and license sales from 1994, 1995 and 2003 to 2009.

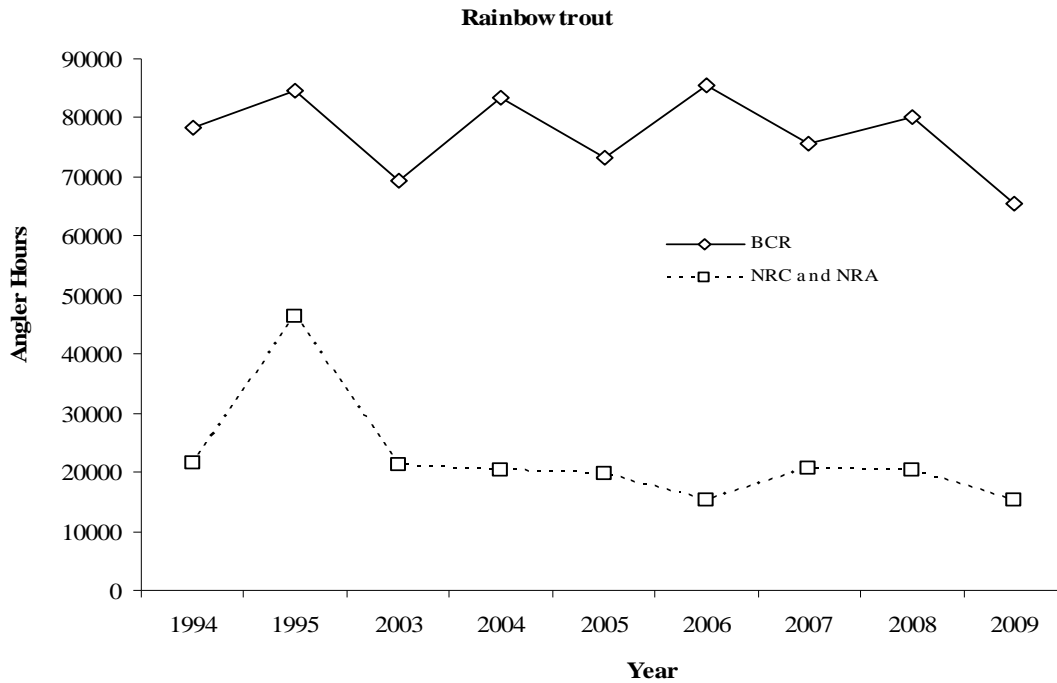


Figure 6. Trend in BC resident and non-resident angler hours for rainbow trout from 1994, 1995 and 2003 to 2009.

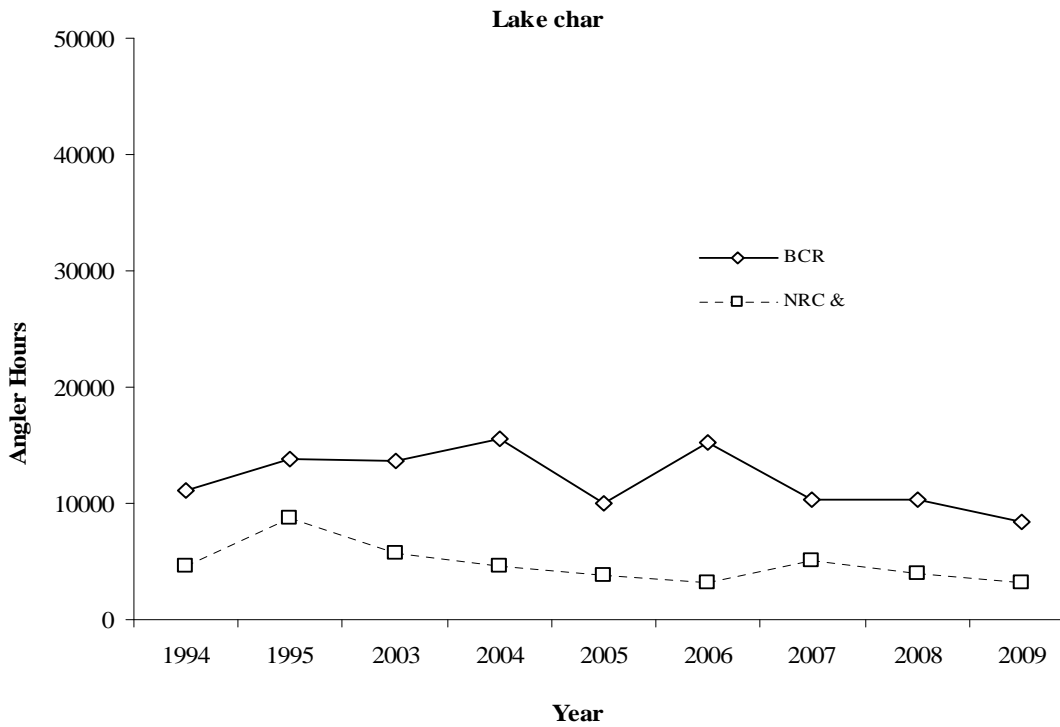


Figure 7. Trend in BC resident and non-resident angler hours for lake char from 1994, 1995 and 2003 to 2009.

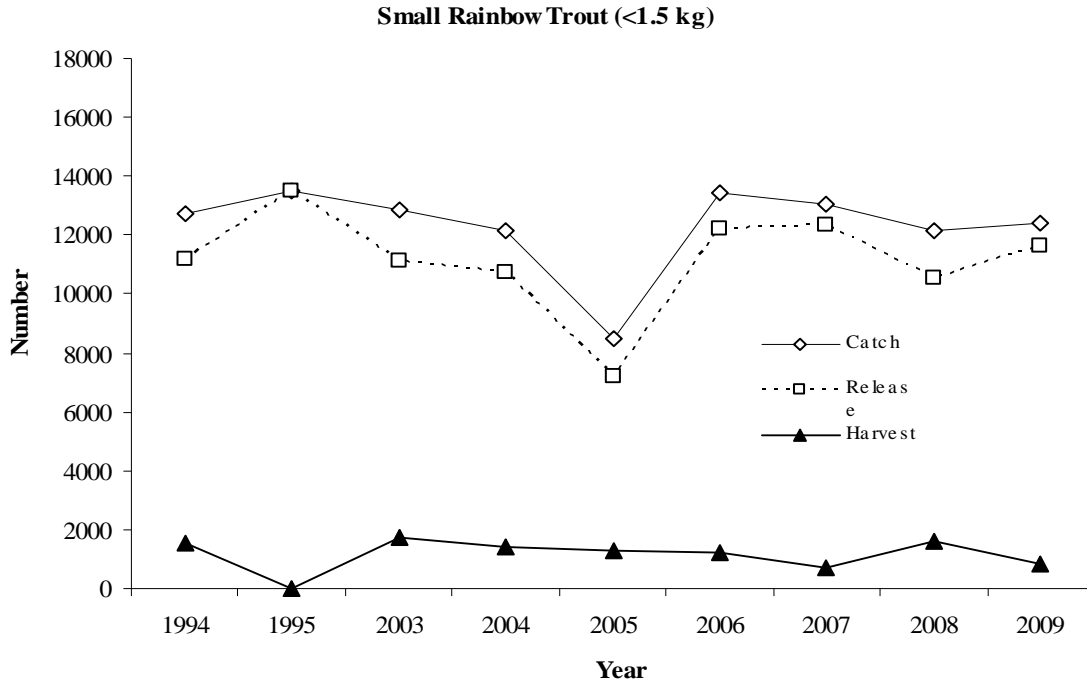


Figure 8. Shuswap Lake estimated catch, release, and harvest of rainbow trout <1.5 kg, 1994, 1995 and 2003 to 2009.

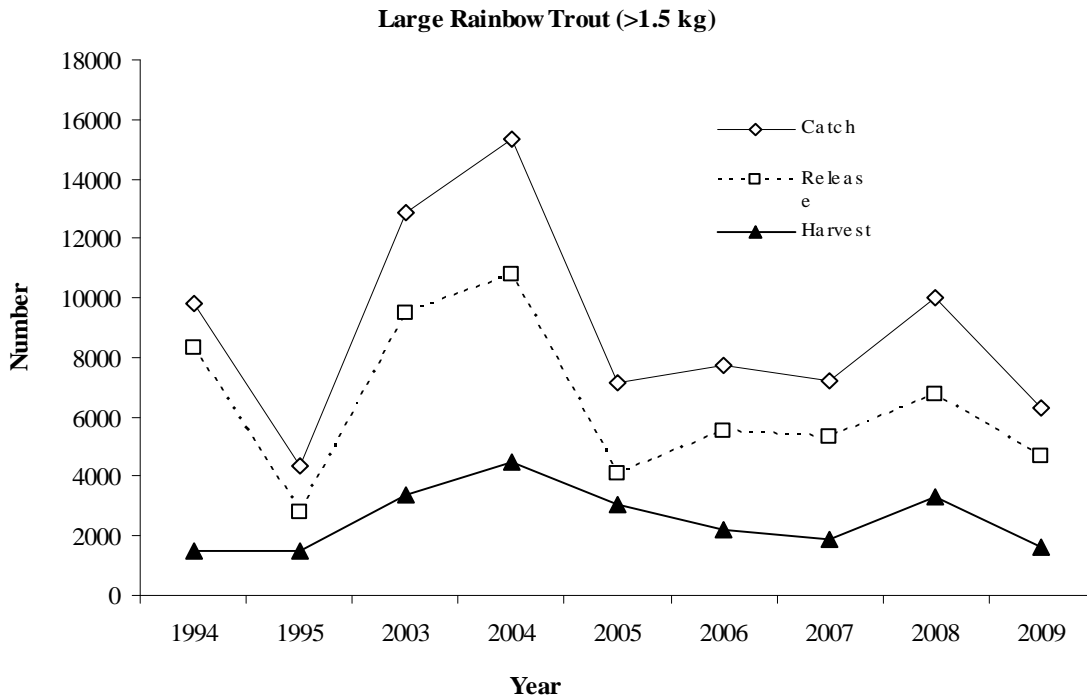


Figure 9. Shuswap Lake estimated catch, release, and harvest of rainbow trout >1.5 kg, 1994, 1995 and 2003 to 2009.

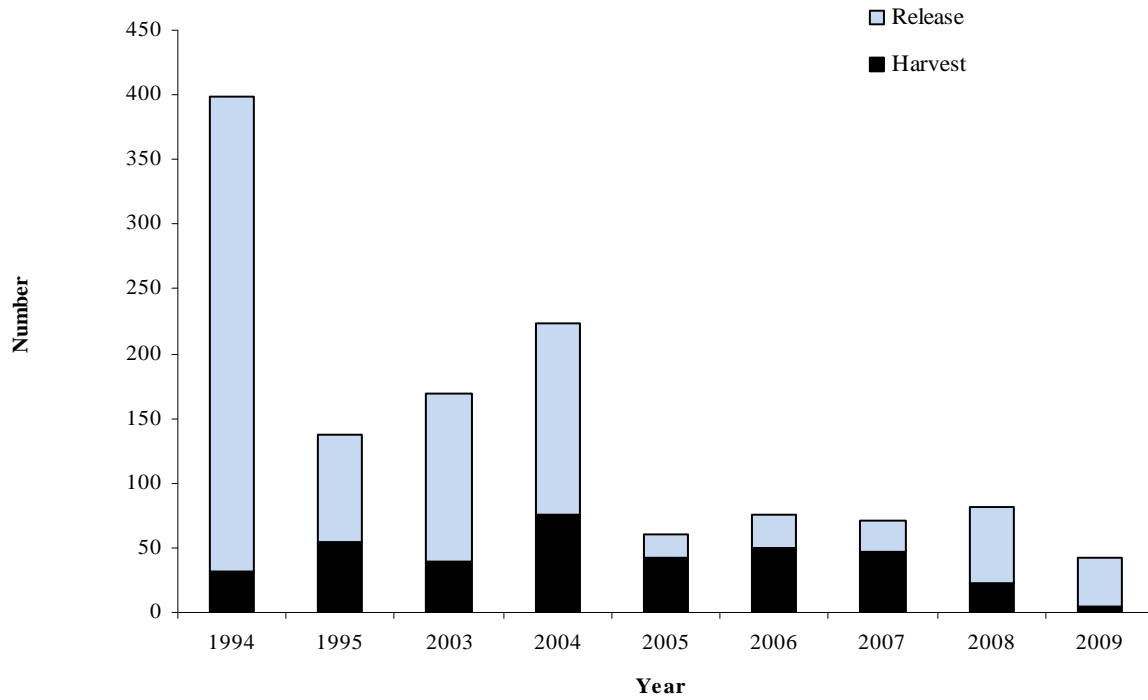


Figure 10. Shuswap Lake estimated catch, release, and harvest of rainbow trout 3-6 kg 1994, 1995 and 2003 to 2009.

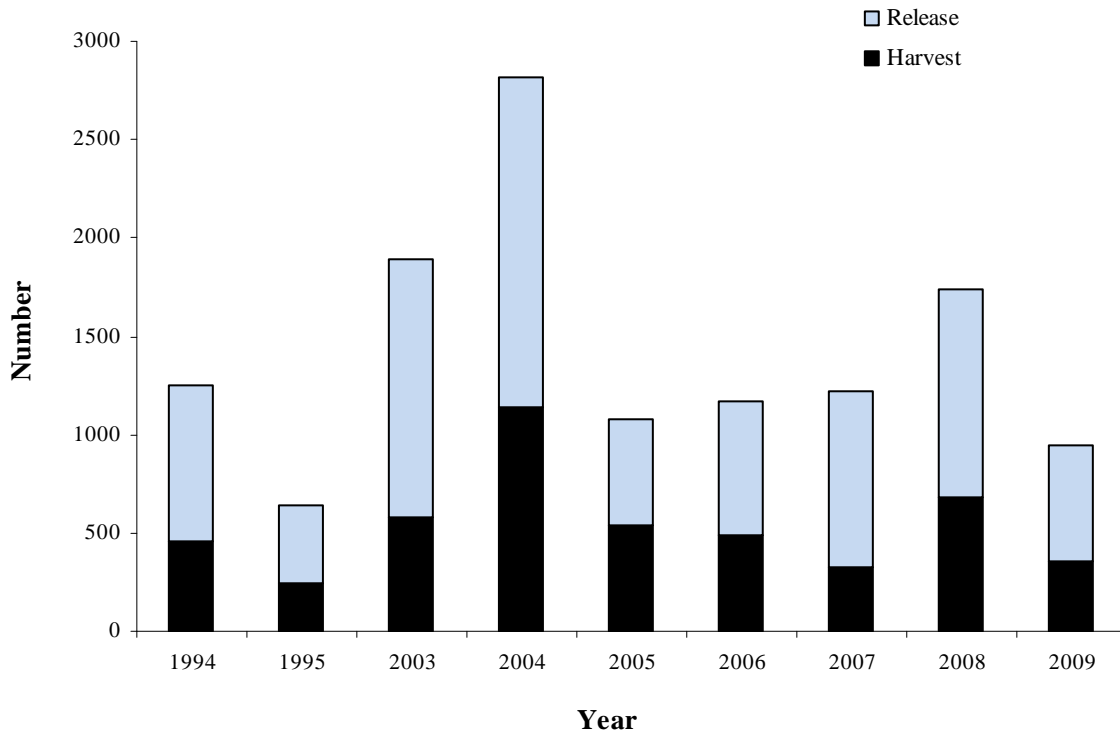


Figure 11. Shuswap Lake estimated catch, release, and harvest of rainbow trout >6 kg, 1994, 1995 and 2003 to 2009. Note y axis scale difference.

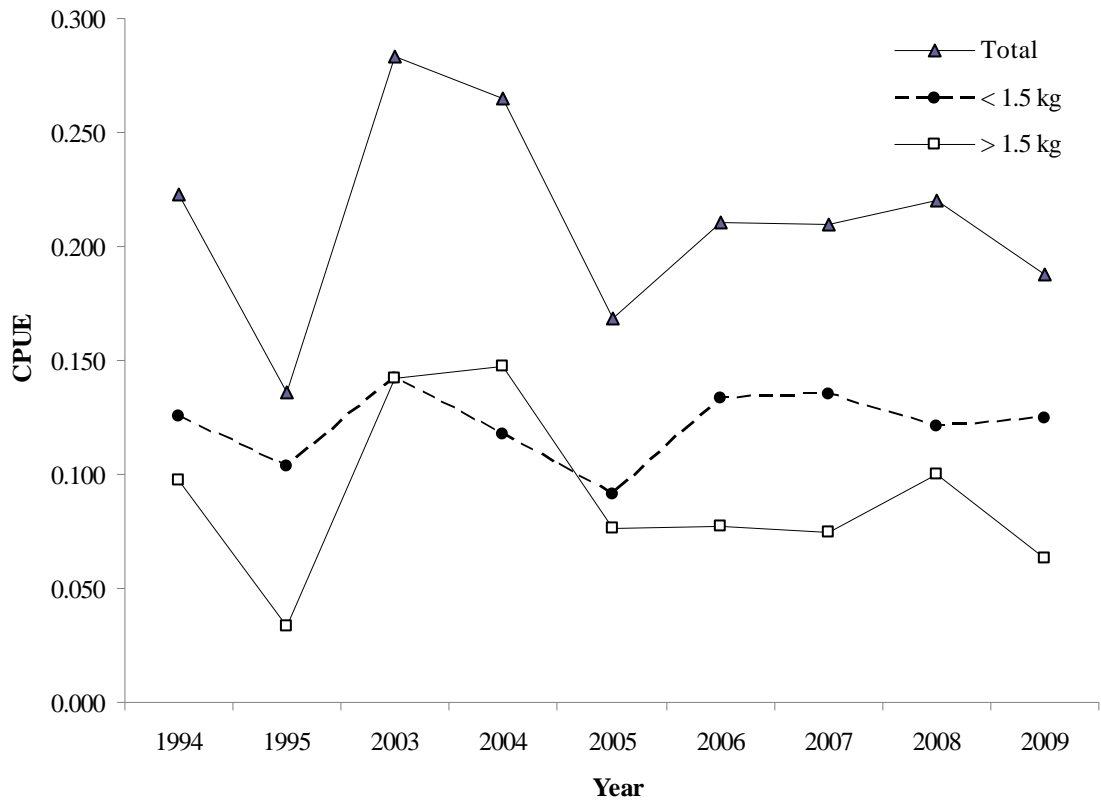


Figure 12. Angler success (catch per angler hour or CPUE) for overall rainbow trout catch, <1.5 kg and >1.5 kg size categories from 1994, 1995 and 2003-2009.

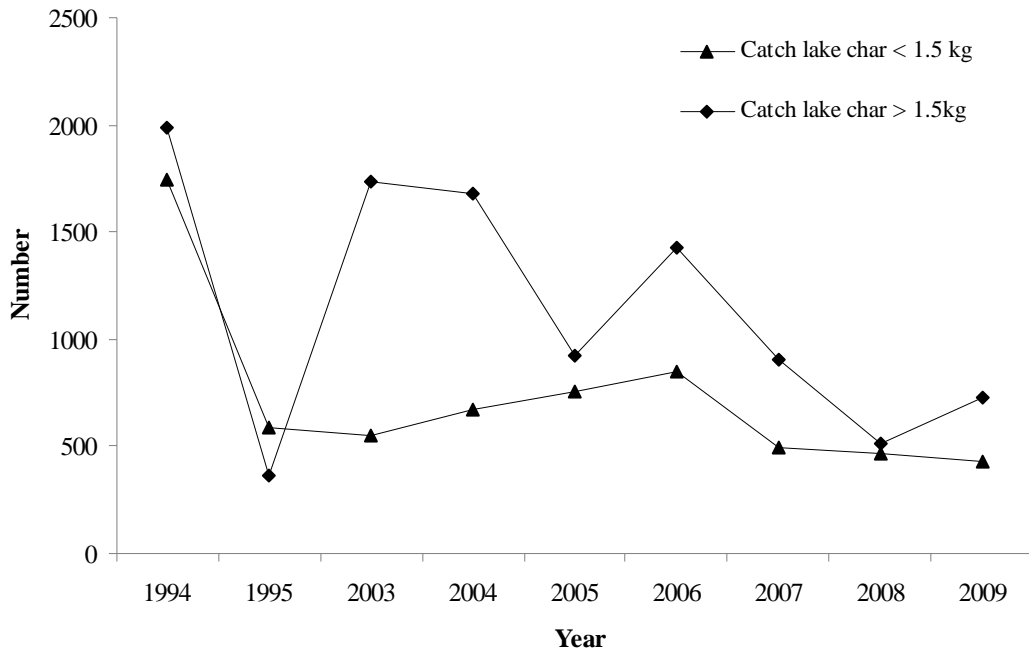


Figure 13. Estimated catch, release and harvest of Shuswap Lake lake char < 1.5 kg and >1.5 kg 1994-2009

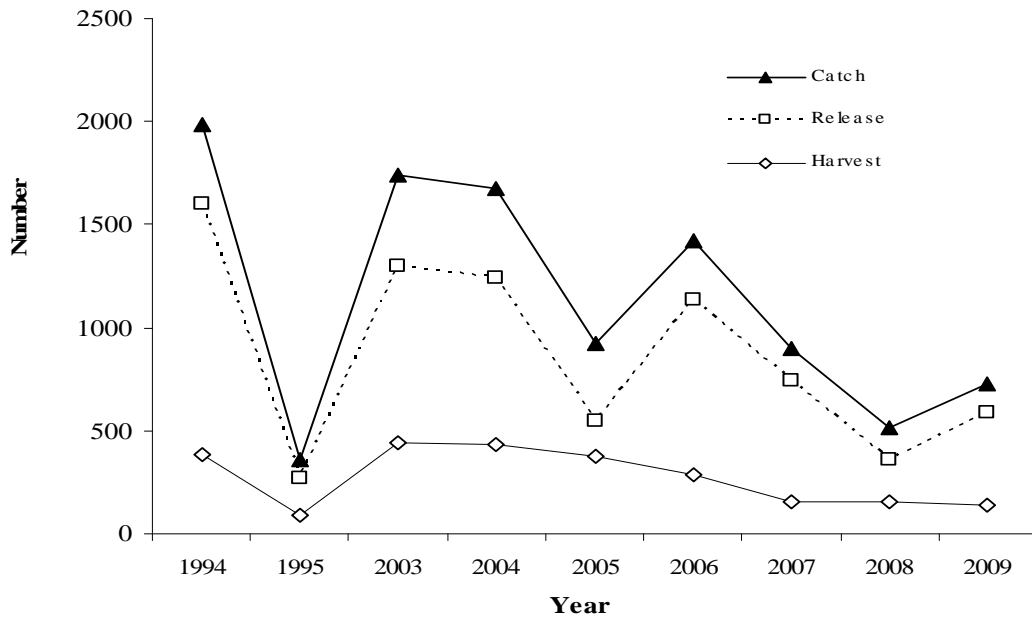


Figure 14. Shuswap Lake estimated catch, release, and harvest of lake char >1.5 kg, 1994, 1995 and 2003 to 2009.

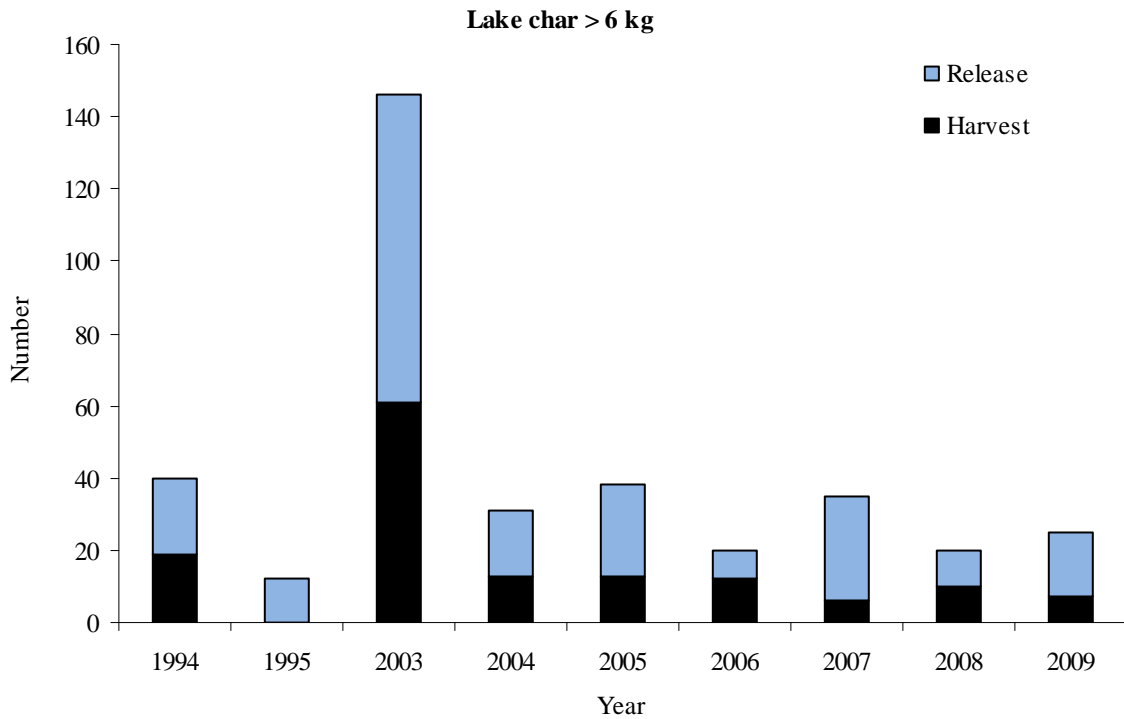


Figure 15. Shuswap Lake estimated harvest of lake char > 6 kg, 1994, 1995 and 2003 to 2009.

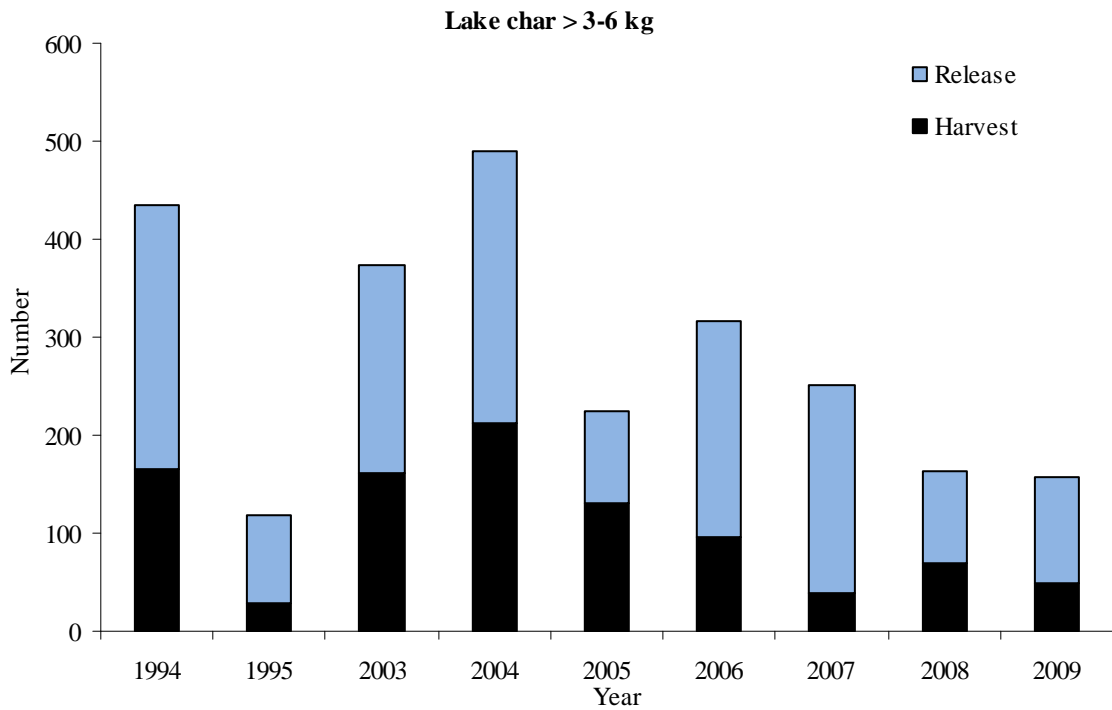


Figure 16. Shuswap Lake estimated catch, release, and harvest of lake char 3-6 kg, 1994, 1995 and 2003 to 2009.

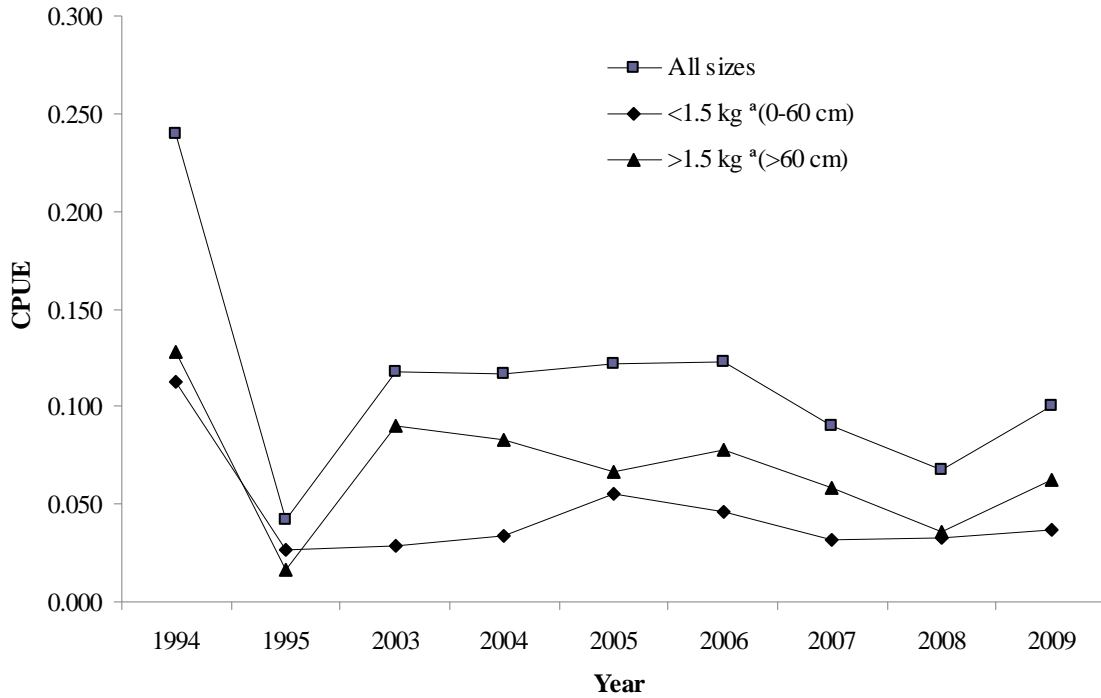


Figure 17. Shuswap Lake estimated catch, release, and harvest of lake char < 1.5 kg and >1.5 kg, 1994, 1995 and 2003 to 2009.

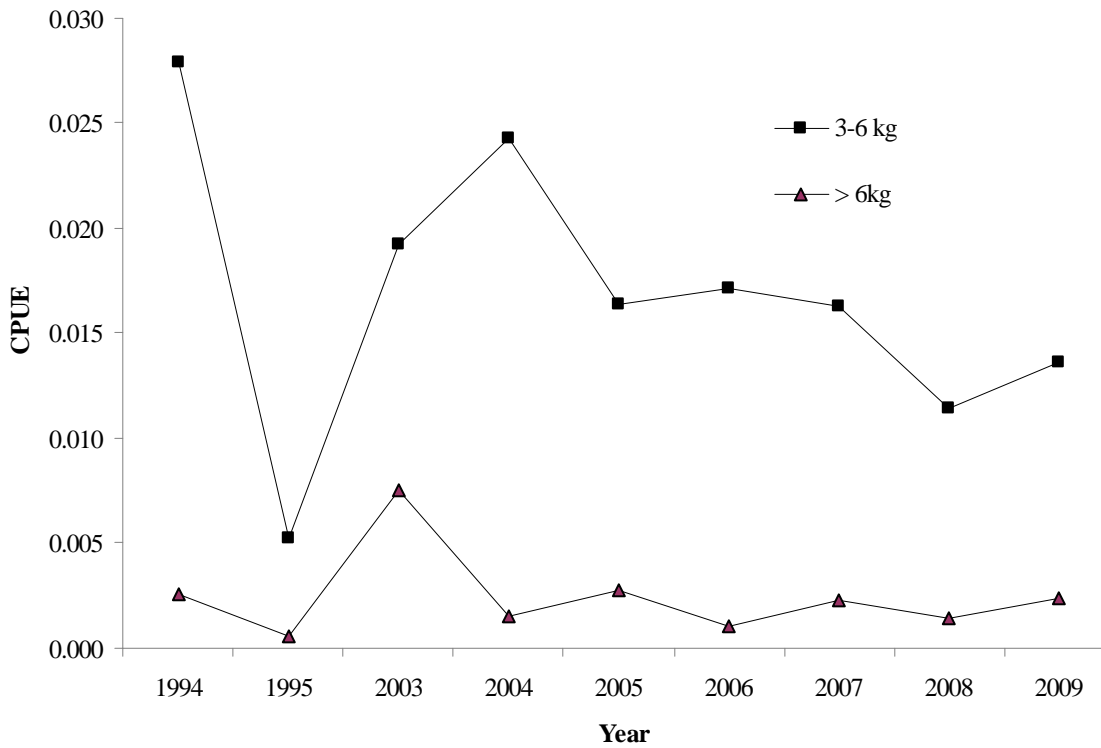


Figure 18. Angler success (catch per angler hour or CPUE) for lake char catch, 3-6 kg and >6 kg size categories from 1994, 1995 and 2003-2009.

Appendix 1. Definitions

Discussion in this report often refers to several key words or abbreviations that are defined as follows:

Year

Since the majority of fishing on Shuswap Lake occurs from April to December the calendar year (e.g., 2006) is used for reporting all data except license sales.

Fiscal Year

Fiscal year is used in this report when referencing license sales since Shuswap Lake licenses are sold from April 1 to March 31 (e.g., 2006/2007).

Catch

Means the catch of a fish regardless of whether or not the fish was kept or released.

Harvest

Means a fish that was caught and kept.

Angler Residency

BCR means a resident of British Columbia.

NRC means a resident of Canada other than British Columbia.

NRA means a non-resident living outside of Canada.

Piscivorous Rainbow Trout and Lake Char

It is generally assumed that any trout or char caught in Shuswap Lake >3 kg (piscivorous or opportunistic feeders) are the populations of concern.

Success Rate

Means the average catch of a fish per hour (CPUE).

Licence

Means the annual or short-term licence required to fish.

Stamp

Means that the special licence is required to harvest Shuswap Lake rainbow trout and lake char that is affixed to the fishing licence. In this report it is referred to as the SLAS.



This project was funded by the Habitat Conservation Trust Foundation. The Habitat Conservation Trust Foundation was created by an act of the legislature to preserve, restore and enhance key areas of habitat for fish and wildlife throughout British Columbia.



Anglers, hunters, trappers and guides contribute to Trust Foundation projects through license surcharges. Tax deductible donations to assist in the work of the Trust Foundation are also welcomed.

Appendix 2. Shuswap Lake Angling Questionnaire 2007-2008.

**SHUSWAP LAKE
ANGLING QUESTIONNAIRE 2009-2010**

PLEASE COMPLETE AND RETURN BY APRIL 30, 2010

«NAME», «NAME»
«ADDRESS»
«CITY» «PROV» «PC»

1. Please indicate your residence status (a) and the type of angling licence (b) purchased for 2009-2010 season:

- | | | | |
|-------------------------|--------------------------|-----------|--------------------------|
| (a) BC Resident | <input type="checkbox"/> | (b) 1 DAY | <input type="checkbox"/> |
| Non-resident (Canadian) | <input type="checkbox"/> | 8 DAY | <input type="checkbox"/> |
| Non-resident (Foreign) | <input type="checkbox"/> | ANNUAL | <input type="checkbox"/> |

2. Did you fish for **rainbow trout** or **lake trout** (lake char) on Shuswap Lake between April 1, 2009 and March 31, 2010? Please check one.

- NO (Please return this questionnaire in the envelope provided.)
- YES (Please ensure each angler responds **individually** to the questions and return in the envelope provided.)

3. How many days did you fish on Shuswap Lake for **rainbow trout** between April 1, 2009 and March 31, 2010?

_____ number of days fished _____ estimate the average number of hours fished per day

4. How many days did you fish on Shuswap Lake for **lake trout** (lake char) between April 1, 2009 and March 31, 2010?

_____ number of days fished _____ estimate the average number of hours fished per day

5. What size was the **rainbow trout** you harvested and/or released?

	Number Harvested (kept)	Number Released
Smaller than 1.5 kg (3 lbs)	_____	_____
1.5 to 3 kg (3 to 7 lbs)	_____	_____
3 to 6 kg (7 to 13 lbs.)	_____	_____
Over 6 kg (over 13 lbs.)	_____	_____

6. From 2005 – 2009 about 200 **rainbow trout** were tagged each year with a loop tag below the dorsal fin (see next page). If you captured one or more rainbow trout with a tag, please indicate the following for each fish:

Month of Capture	Tag Color	Tag Number	Capture Location	Harvested or Released	Previously Reported to Fish and Wildlife Branch? (yes/no)

Turn page over please

7. What size was the **lake trout** (lake char) you harvested and/or released?

	Number Harvested (kept)	Number Released
Smaller than 1.5 kg (3 lbs.)	_____	_____
1.5 to 3 kg (3 to 7 lbs.)	_____	_____
3 to 6 kg (7 to 13 lbs.)	_____	_____
Over 6 kg (over 13 lbs.)	_____	_____

8. From 2004 to 2009 about 200 **lake trout** (lake char) were tagged each year with a loop tag below the dorsal fin (see below). If you captured one or more lake trout with a tag, please indicate the following for each fish.

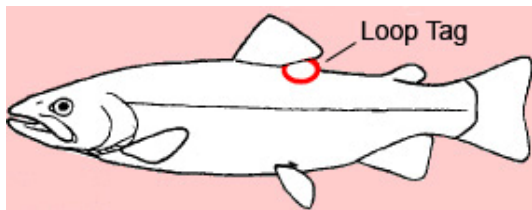
Month of Capture	Tag Color	Tag Number	Capture Location	Harvested or Released	Previously Reported to Fish and Wildlife Branch? (yes/no)

9. How many **bull trout** (Dolly Varden) did you: harvest _____ release _____

The following space is provided for your comments regarding fisheries management, regulations and enforcement on Shuswap Lake.

In 2003, the Fish and Wildlife Branch of Ministry of Environment in Kamloops BC initiated an HCTF funded project to assess rainbow trout and lake char in Shuswap Lake to ensure their sustainability and thereby maintain and improve fishing opportunities. This project will be ongoing over the next several years, and will include the following components: a) tagging rainbow trout and lake char b) conducting this angler questionnaire on the sport fishery; and, c) estimating annual fishing mortality rate on each species.

Fish tagging programs are a valuable tool used by fishery managers for assessing fish populations. Tagging can yield a wealth of information including fish movements, migration patterns, and statistics such as mortality rates and harvest levels. This information is important to fisheries management, leading to healthier fish stocks and improved angling opportunities. As part of this project, rainbow trout and lake char are being tagged in Shuswap Lake with a colored loop tag just below the dorsal fin (see Figure).



How You Can Help

You can help to ensure the success of this project by keeping a record of the number of hours you fished per day, the number of days fished, and the number and size of rainbow trout, lake trout, and bull trout that you catch, keep, and release.

As well, please keep an eye out for tagged fish and note the color of the tag. Questions 6 and 8 of this questionnaire pertain to this tagging program. If you prefer, you can also report this information by telephoning 1-800-388-1606 or by mail to the Kamloops office of the Ministry of Environment at: 1259 Dalhousie Drive, Kamloops, BC, V2C 5Z5.

Project Progress Summary:

We have recently completed the 5th year of a 5 year tagging project, and again tagged 200+ rainbow trout in the spring 2009 , using both Floy tags (loop tags) and radio/acoustic tags, and 200+ lake char in the fall, using Floy tags. Radio/acoustic tags are small transmitters which are surgically implanted into the fish body cavity and used to track movements and detect the presence of fish at the end of the fishing season. Tag return information collected from this questionnaire continues to be critical data required to provide us with an estimate of the fishing rate for these species. The time that anglers put in to responding to it is greatly appreciated. .

Appendix 3. Shuswap Lake catch, release, harvest for rainbow trout 1994-1995 and 2003-2008 (extrapolated values).

Appendix 3 Shuswap Lake catch, release, harvest for Rainbow Trout 1994-1995 & 2003-2009 (extrapolated values)

Year	Total	RBT <1.5kg ^a (0-50 cm)			RBT >1.5kg ^a (>50cm)			RBT 1.5-3kg ^a (50-60 cm)			RBT 3-6kg ^a (65-75cm)			RBT >6kg ^a (>75cm)		
	Catch	Catch	Release	Harvest	Catch	Release	Harvest	Catch	Release	Harvest	Catch	Release	Harvest	Catch	Release	Harvest
1994	22,514	12,699	11,185	1,514	9,815	8,301	1,514	8,168	7,142	1,026	1,248	792	456	399	367	32
1995 ^a	17,842	13,514	13,503	11	4,328	2,825	1,503	3,546	2,340	1,206	644	402	242	138	83	55
2003	25,718	12,850	11,144	1,706	12,868	9,491	3,377	10,808	8,048	2,760	1,891	1,313	578	169	130	39
2004	27,502	12,172	10,748	1,424	15,330	10,819	4,511	12,285	8,992	3,293	2,822	1,680	1,142	223	147	76
2005	15,634	8,509	7,204	1,305	7,125	4,068	3,057	5,984	3,507	2,477	1,080	543	537	61	18	43
2006	21,170	13,441	12,202	1,239	7,729	5,537	2,193	6,479	4,822	1,657	1,174	688	486	76	27	49
2007	20,252	13,046	12,317	729	7,206	5,373	1,833	5,919	4,436	1,483	1,216	890	326	71	47	24
2008	22,179	12,150	10,546	1,604	10,029	6,734	3,295	8,214	5,627	2,587	1,734	1,048	686	81	59	22
2009	18,707	12,422	11,618	804	6,285	4,686	1,599	5,292	4051	1241	950	597	353	43	38	5

^a 1995 only, rainbow trout size category was surveyed by length denoted in columns above

Appendix 4. Rainbow Trout CPUE

Year	Total	Rainbow trout CPUE 1994-1995 and 2003-2009				
		<1.5 kg *(0-50 cm)	>1.5 kg *(>50 cm)	1.5-3 kg *(50-65 cm)	3-6 kg *(65-75 cm)	>6 kg *(>75 cm)
1994	0.222	0.125	0.097	0.081	0.012	0.0039
1995*	0.136	0.103	0.033	0.027	0.005	0.0011
2003	0.284	0.142	0.142	0.119	0.021	0.0019
2004	0.265	0.117	0.148	0.118	0.027	0.0021
2005	0.168	0.092	0.077	0.064	0.012	0.0007
2006	0.211	0.134	0.077	0.064	0.012	0.0008
2007	0.210	0.135	0.075	0.061	0.013	0.0007
2008	0.220	0.121	0.100	0.082	0.017	0.0008
2009	0.187	0.124	0.063	0.053	0.010	0.0004

* surveyed by length

Appendix 5. Shuswap Lake catch, release, harvest for lake char 1994-1995 and 2003-2008 (extrapolated values).

Appendix 5 Shuswap Lake catch,release, harvest for Lake Char 1994-1995 & 2003-2008 (extrapolated values)

Year	Total Catch	LCH <1.5 kg ^a (0-60cm)			LCH >1.5 kg ^a (>60cm)			LCH 1.5-3kg ^a (60-67cm)			LCH 3-6kg ^a (67-80cm)			LCH >6kg ^a (>80cm)		
		Catch	Release	Harvest	Catch	Release	Harvest	Catch	Release	Harvest	Catch	Release	Harvest	Catch	Release	Harvest
1994	3,731	1,744	1,744	0	1,987	1,604	383	1,513	1,314	199	434	269	165	40	21	19
1995 ^a	952	589	589	0	363	273	90	233	172	61	118	89	29	12	12	0
2003 ^b	2,291	553	509	44	1,738	1,295	443	1,219	999	220	373	211	162	146	85	61
2004	2,348	673	619	54	1,675	1,241	434	1,154	946	208	490	277	213	31	18	13
2005	1,678	757	593	164	921	546	375	658	427	231	225	94	131	38	25	13
2006	2,270	845	795	50	1,425	1,138	287	1,089	910	179	316	220	96	20	8	12
2007	1,396	494	475	19	902	745	157	616	504	112	251	212	39	35	29	6
2008	977	465	399	66	512	357	155	328	253	75	164	94	70	20	10	10
2009	1,159	431	397	34	728	590	138	542	464	78	158	108	50	28	18	10

^a 1995 only, lake char size category was surveyed by length denoted in columns above

^b denotes reconciled 2003 lake char data using average effort (19,397) from 1994,1995 and 2004

Appendix 6. Lake Char CPUE.

Lake char CPUE 1994-1995 and 2003-2008

Year	Total	<1.5 kg ^a(0-60 cm)	>1.5 kg ^a(>60 cm)	1.5-3 kg ^a(60-67 cm)	3-6 kg ^a(67-80 cm)	>6 kg ^a(>80 cm)
1994	0.24	0.11	0.13	0.10	0.03	0.003
1995^a	0.04	0.03	0.02	0.01	0.01	0.001
2003^b	<i>0.12</i>	<i>0.03</i>	<i>0.09</i>	<i>0.06</i>	<i>0.02</i>	<i>0.008</i>
2004	0.12	0.03	0.08	0.06	0.02	0.002
2005	0.12	0.06	0.07	0.05	0.02	0.003
2006	0.12	0.05	0.08	0.06	0.02	0.001
2007	0.09	0.03	0.06	0.04	0.02	0.002
2008	0.07	0.03	0.04	0.02	0.01	0.001
2009	0.10	0.04	0.06	0.05	0.01	0.002

^a surveyed by length

^b denotes 2003 error in lake char survey question

Appendix 7. Shuswap Lake annual bull trout catch data from 1994 to 2008

	Shuswap Lake Bull Trout		
Year	Total Catch	Released	Harvest
1994 ^a	170	140	30
1995 ^b	238	190	48
2003 ^b	326	232	94
2004	242	198	44
2005	295	249	46
2006	684	578	106
2007	495	447	47
2008	527	450	77
2009	485	450	35