Seton and Anderson Lakes Kokanee and Char Assessment

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EXECUTIVE SUMMARY

In 2000, funds were provided by the Bridge Coastal Fish and Wildlife Restoration Program (BCRP) to the British Columbia Conservation Foundation (BCCF) to conduct an assessment of bull trout (*Salvelinus confluentus*) and kokanee (*Oncorhynchus nerka*) populations within Seton and Anderson Lakes. This study represents the first field surveys and documented review of information about the status and life history of kokanee populations within the Seton and Anderson Lakes watershed. The study, proposed by the Ministry of Water, Land and Air, adds to the limited information on bull trout abundance and spawning locations.

Spawning bull trout where enumerated through stream walks in two tributaries to the Portage River: Spider Creek and Whitecap Creek, in an attempt to determine run timing and peak of spawning activity. Bull trout in Gates Creek were also enumerated through a snorkel survey. During September and October 2000, stream walks were conducted on the lower sections of Whitecap and Spider Creeks where a peak count of approximately six adult bull trout were visually observed. One snorkel survey was conducted to enumerate bull trout within the lower reach of Gates Creek on August 29, 2000 downstream of the counting weir where seven bull trout were observed.

Information about kokanee in Seton and Anderson Lakes was gathered through a combination of literature, database and website reviews, interviews with First Nations and Department of Fisheries and Oceans (DFO) staff and limited field reconnaissance. The kokanee or gwenis (First Nation term - pronounced waneesh) population within Seton and Anderson Lakes appears to display unique physical characteristics, spawning behavior and spawning site selection. They are black in color and seem to utilize deep water habitats for spawning. Evidence of spawning activity in the system is difficult to determine and so far, is only apparent when the spawned out fish eventually float to the lake surface due to distended swim bladders (some still alive) and are predated on by eagles or harvested by First Nations as they wash onto the beaches. Spawning in Seton Lake may occur as early as late October and may continue into November. Anderson Lake kokanee appear at the surface much later, at the end of December and in January. Spawning time may be as early as late November or throughout December. First Nations, WLAP and BC Hydro have placed a high importance on understanding the status of kokanee within the two lake systems.

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1.0 INTRODUCTION

1.1 BACKGROUND

In 2000, following a proposal by WLAP, funds were provided by the Bridge Coastal Fish and Wildlife Restoration Program (BCRP) to the British Columbia Conservation Foundation (BCCF) to conduct an assessment of bull trout (*Salvelinus confluentus*) and kokanee (*Oncorhynchus nerka*) populations within Seton and Anderson Lakes. The Seton and Anderson Lakes watershed falls within BC Hydro's Bridge River/Coastal Generation Area, where BC Hydro operates two hydro-electric facilities: the Seton River power dam and the Shalath power generation facility. BC Rail tracks run the length of both lakes on the north side. It is unclear what effect hydro facilities including diversion of Bridge River water have had on bull trout and kokanee populations in the watershed. The Ministry of Water, Land and Air Protection (WLAP) and BC Hydro require current information on these fish species in order to guide reductions of any adverse impacts or to recover losses in fish production or habitat productive capacity related to hydroelectric development.

Bull trout are considered a blue-listed (threatened) species throughout British Columbia and an endangered species in the United States. Kokanee are a mid-trophic level species and key forage fish for bull trout and other predators (Andrusak, pers. comm.. 2001). Changes affecting their abundance can limit production of other species. Additionally, the kokanee or gwenis (First Nation term - pronounced waneesh) population within Seton and Anderson Lakes appears to display unique physical characteristics, spawning behavior and spawning site selection. First Nations, WLAP and BC Hydro have placed a high importance on determining the state of gwenis within the study area.

Note that the terms kokanee and gwenis are both used in this report to refer to the same fish.

1.2 OBJECTIVES

The primary objectives of the *Seton and Anderson Lakes Kokanee and Char Assessment* are to:

- Conduct stream walks and snorkel surveys within identified Seton and Anderson Lakes tributaries to enumerate spawning bull trout

- Summarize available fisheries information for the study area related to kokanee populations and distribution.

- Conduct low level reconnaissance of areas within Seton and Anderson Lakes to determine possible location and timing of kokanee spawning and, if possible, collect biological samples.

2.0 STUDY AREA

The Seton and Anderson Lakes watershed encompasses an area of approximately 1039 km^2 within the WLAP Southern Interior Region and within the Lillooet Forest District of the Kamloops Forest Region and the Squamish Forest District of the Vancouver Forest Region. The Seton River (WSC 100-1235900-000 UTM 10.576204.5613960) is a fifth order tributary to the Fraser River with its confluence with the Fraser located in the village of Lillooet, B.C. The watershed contains two large water bodies, Anderson Lake and Seton Lake Reservoir. Seton Lake is within semi-arid climate zone while Anderson Lake is transitional to a coastal climate. The project study area encompasses only that area of the Seton and Anderson Lakes watershed located upstream of Seton Dam (Figure 1).

3.0 METHODS

3.1 BULL TROUT ASSESSMENT

Spawning bull trout where enumerated through stream walks in two tributaries to the Portage River: Spider Creek and Whitecap Creek, in an attempt to determine run timing and peak of spawning activity. Bull trout enumeration was confined to these two streams as they were both readily accessible and had good visibility for observing bull trout. A First Nation fisheries technician from the Cayoosh Creek Band was hired to conduct these stream walks and to collect the following data:

- Stream temperature
- No. of spawning bull trout observed
- No. of redds observed

Bull trout in Gates Creek were also enumerated in a snorkel survey conducted in August 2000. The snorkel survey was used to further determine pre-spawning, late-summer abundance and distribution of adult bull trout in the lower reach of Gates Creek. The snorkel survey was conducted by two biologists

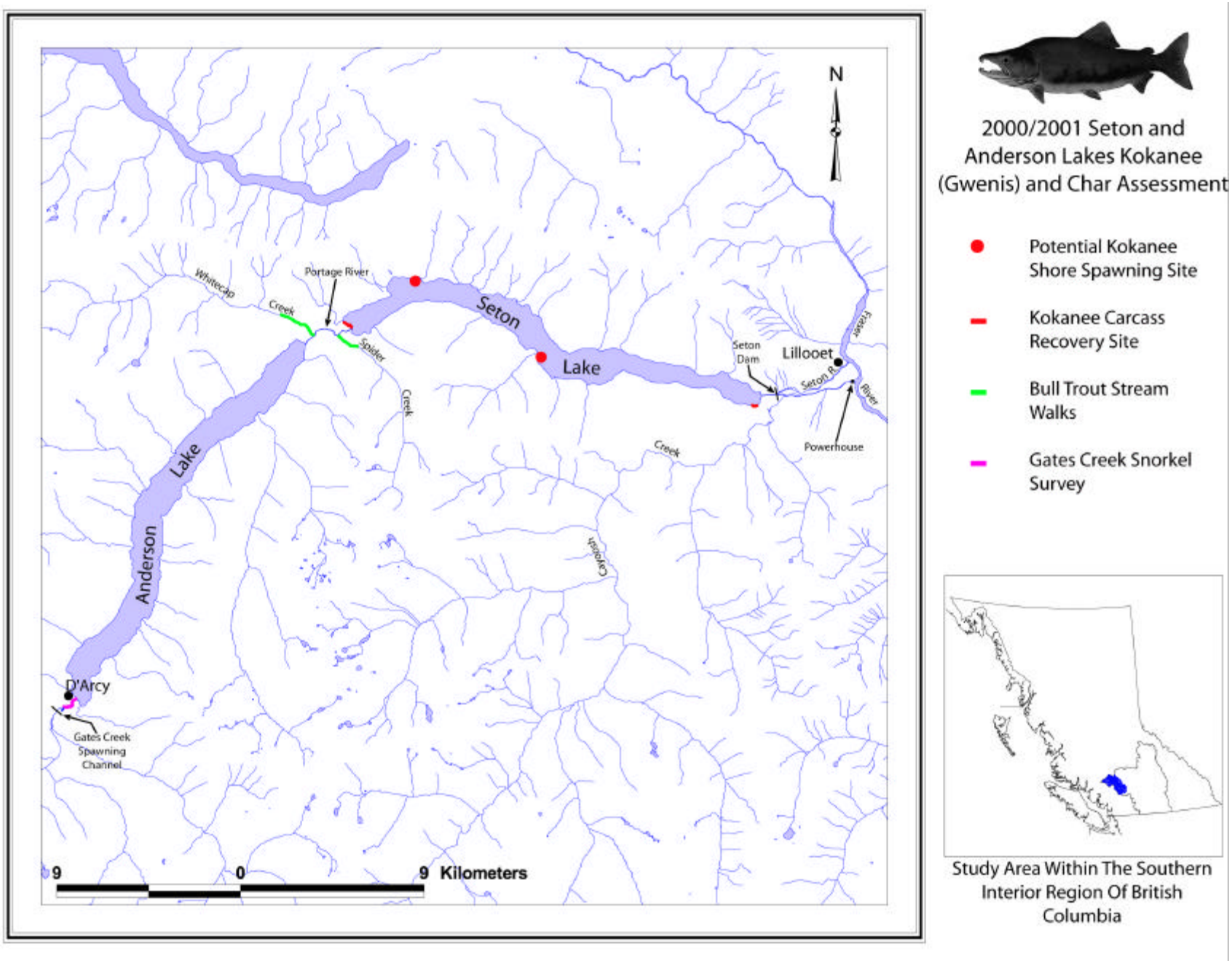

Figure 1. Seton and Anderson Lakes Study Area and Survey Sites

swimming the channel approximately 4 meters apart, to observe mid-channel and both sides of the stream. Representative portions of stream (riffle, pool and glide), as well as, sections suited to adult bull trout (deep pools, undercut banks, and LWD jams) were surveyed. Survey length (m), habitat type (riffle, pool, glide), number and species of fish observed, visibility (m), number of swimmers and site location were recorded for the section of river surveyed.

An attempt was also made to hire First Nation fisheries technicians working at the Gates Creek spawning channel to floy tag migrating bull trout. Unfortunately, due to the large spawning run of sockeye salmon present in the Gates system in 2000, the First Nations fisheries technicians did not have the time or personnel available to carry out tagging.

3.2 KOKANEE ASSESSMENT

Information about kokanee in Seton and Anderson Lakes was gathered through a combination of literature, database and website reviews, interviews with First Nations and Department of Fisheries and Oceans (DFO) staff and limited field reconnaissance.

On November 10, 2000 interviews were conducted with local First Nations people and a boat survey was conducted on Seton Lake for the purpose of identifying potential kokanee shore spawning habitat and to collect any biological samples available. During the field reconnaissance, potential spawning sites were recorded on NTS maps and later mapped using Arcview (Figure 1).

In the winter of 2001, post-spawn kokanee mortalities were collected along the east beach of Seton Lake by BCCF and First Nations technicians. A small number of samples from Anderson Lake were also available from past WLAP sampling for biological analysis. Basic biological information was collected from individual fish including:

- Length (mm)
- Weight (g)
- Sex (m / f)
- Aging structures (scale, otolith, fin ray)

Scale samples were photographed with a digital camera and images captured with PC software. When a sufficient sample size is available (i.e. 30 fish minimum each sex), age class structure can be evaluated.

4.0 RESULTS

4.1 BULL TROUT ASSESSMENT

Spider Creek and Whitecap Creek, tributaries to the Portage River, were surveyed for spawning bull trout and redds on four occasions between the last week of September and the second week of October of 2000 (Table 1).

Table 1. Portage River Tributary Bull Trout Spawner and Redd Surveys

	Water Temperature		No. of Bull Trout Observed		No. of Redds Observed	
Survey Date	Spider Creek	Whitecap Creek	Spider Creek	Whitecap Creek	Spider Creek	Whitecap Creek
27-Sep-00	6.0	5.5	4	0	0	0
2-Oct-00	6.0		6	5	3	2
6-Oct-00			5	5	2	2
12-Oct-00			5	6	2	2

Spawning bull trout were observed in Spider Creek on September 27 and October 2, 6 and 12, 2000, during all four surveys conducted. No bull trout were observed in Whitecap Creek on the 27th of September but bull trout were observed on October 2, 6 and 12, 2000. Spawner counts ranged from 0 – 6 during the survey period, with the highest count for Spider and Whitecap Creeks on October 2, 2000 (6 bull trout) and October 12, 2000 (6 bull trout), respectively.

No redds were observed in either stream during the September 27, 2000 survey. On October 2, 6 and 12, 2000, redd counts on Spider Creek ranged from 2-3 with the highest redd count on October 2, 2000. Redd counts for these surveys on Whitecap Creek never exceeded two fish.

One snorkel survey was conducted to enumerate bull trout within the lower reach of Gates Creek on August 29, 2000 downstream of the counting weir. Table 2 summarizes the total survey length, the number and species of fish observed, as well as, the number of swimmers and water visibility for each survey.

Table 2. Gates Creek Snorkel Survey Data

Location	Date	Water Temp. (C)	Water Flow (cms)*	Visibility (m)	No. Observers	Survey Length (m)	No. Fish Observed		Habitat Type
							RB	BT	
Gates Creek	29-Aug-00	15.0	N/A	4.0	2	1000.0	2	7	pool

The snorkel survey conducted in Gates Creek was timed to coincide with the estimated spawning migration of bull trout. Of the seven bull trout observed, all were associated with spawning salmon in pool habitat. Sexual maturity could not be determined.

4.2 KOKANEE ASSESSMENT

4.2.1 Existing Information

Fisheries information for the study area related to kokanee populations and distribution is limited. An electronic search of the online Can. Journal of Fisheries and Aquatic Sciences publication and of the University of BC electronic card library did not turn up any specific information on Seton and Anderson Lake kokanee or gwenis. An internet search utilizing the Google web browser did provide some additional information on kokanee shore spawning in the United States and the Okanagan, but there was no indication that these fish displayed the unique coloration and deep water spawning habitat preference as found in Seton and Anderson Lakes. Deep water habitat is referred to as a depth which would cause swim bladder distension with a rise to the surface. Surveys of typical spawning kokanee which utilize shore spawning up to depths of 20 ft in Adams Lake or spawn in streams never revealed any swim bladder distension or floating after dying, further suggesting that the Seton and Anderson Lake kokanee are displaying unique spawning behavior.

WLAP has received anecdotal reports of dark colored kokanee from Dunn Lake washing onto the Dunn Lake coho fence in December but no samples or photographs have been documented (Tisdale, pers. comm.. 2002). The Dunn Hatchery technicians suggest that these fish are lake spawners as they never see them spawning in the creeks at either end of Dunn Lake (Dunn Hatchery, pers. comm. 2003).

Interviews with First Nations provided a better assessment of historical context, spawning timing and mortality locations plus some insight into potential effects of the Carpenter Lake diversion.

Historically, First Nations reported large populations of gwenis in both lakes for many years (Geen and Andrew, 1961). This unique population of fish referred in earlier reports (Babcock 1903) as *Everman* was found in Seton Lake in October and in Anderson Lake in November. First Nations referred to these small fish as gwenis and stressed that these fish were historically a critical food source during winter for First Nation people, as well as, for many birds and other animals. First Nations report that post-spawn gwenis come to the surface in two meters to twenty meters of water, often still alive. Swim bladders are often distended. After spawning, these fish floated to the surface and died. The carcasses drifted to shore, depending on prevailing winds, where they would be harvested and consumed whole as a winter supplemental diet (Shields, pers.comm. 2000). The fish themselves are unique from typical kokanee populations due to their small size and coloration. The fish are of a dark mottled coloration with no visible, vivid red coloration, which distinguishes the majority of kokanee populations (Figures 2 and 3). Their flesh is also white in appearance. However, these fish are not considered a separate species of kokanee. Samples evaluated several years ago by the University of B.C. were confirmed to be *O. nerka (*Hume pers. comm. 2002). Seton Lake fish are apparently smaller than their counterparts in

Figure 2. Kokanee (gwenis) samples from Anderson Lake showing dark coloration.

Figure 3. Kokanee sample from Adams Lake shore spawners showing typical red coloration.

Anderson Lake. Little is known regarding spawning locations in either system. They are believed to be deep water or shoal spawners since no documentation of these fish has been noted in any tributary streams or on shallow beaches.

Deep water spawning kokanee are known to occur on submerged rip-rap in Cor'de'leune Lake in the U.S. (Parkinson, pers. comm. 2002) and on deep shoals in Alouette Lake in B.C. (Ashley, pers. comm. 2000), however, these may or may not be related to Seton and Anderson kokanee spawning traits. Lake shore spawning kokanee occur in Okanagon Lake on sloping, cobble beaches (Andrusak, pers. comm., 2002) and in Adams Lake on pebble beaches. All of these habitat types are found in Seton and Anderson Lakes.

According to First Nations and current populations within both systems are thought to have severely depressed populations compared to historical records. This is supported by recollections of long-time local residents (Belle, pers. comm. 2002) and places the major decline in the last few decades.

4.2.2 Field Reconnaissance

The first field reconnaissance for kokanee was conducted in summer 2000 to document potential locations for spawning. No specific sites were identified in discussions with First Nations representatives, only general locations of spawning or floater activity.

The second field reconnaissance was a boat survey on Seton Lake on November 10, 2000 for the purpose of identifying kokanee shore spawning habitat. Original information gathered from local First Nations people indicated that spawning had occurred in early October and this was an attempt to observe any remaining spawning fish, as well as, collect any "floaters" which may still be present on the lake or on the shoreline. However, during the course of the survey, additional First Nations people contacts stated that they believed that spawning actually occurs in mid December to early January, which coincides with anecdotal information for spawning in Anderson Lake. Historically, First Nations people described waiting for the first south wind to occur during the spawning period and they would gather kokanee from the shoreline as they were pushed towards the beach. Most First Nations people would go to Anderson Lake during this wind event, as the fish there were generally larger (~ 300 mm) than those in Seton Lake (150 – 200 mm).

A third field reconnaissance was conducted on December 4, 2001 following reports to the Ministry of WLAP of carcasses on the beaches of Seton Lake. The majority of the specimens observed in the field at this time were in an advanced state of decay and collection of samples for biological analysis was not possible. Heavy predator scavenging was noted and likely contributed to only one whole fish being observed. Fortunately, an independent survey was conducted two weeks before the December 4, 2000 (mid-November) BCCF survey by a local Cayoose Creek Band fisheries technician. A total of 585 kokanee carcasses were observed on a pebble dominated beach near the dam on Seton Lake. The fish are not thought to have spawned at the outlet, but were transported there by wind. Limited biological sampling was conducted at this time, as even then, many specimens were in an advanced stage of decomposition (Bonnie Adolph, pers. comm. 2001) only ten specimens were gill plate punched for DNA analysis, sexed, and measured for length. Spawn assessments were also performed and this information was submitted to DFO (contacts Mike Flynn, Bridget Payne in Kamloops). Occasional carcasses were reported at the outlet of Seton Lake for several weeks after this survey. The following biological information comes from Bonnie Adolph's 2000 samples and several older samples (1995 data) submitted to WLAP.

Seton Lake fish samples averaged around 200 millimeters where the Anderson Lake fish were larger at around 300 millimeters. Fork lengths for all samples collected are displayed in Fig. 3. The graph is consistent with First Nations reports of larger fish in Anderson. This may greater growth rate for Anderson or different age at spawning, however, no detailed age analysis has been conducted. Biological sampling was conducted on 3 specimens collected from Seton Lake in 2001 and 5 specimens collected between January 2000 and 2002 from Anderson Lake.

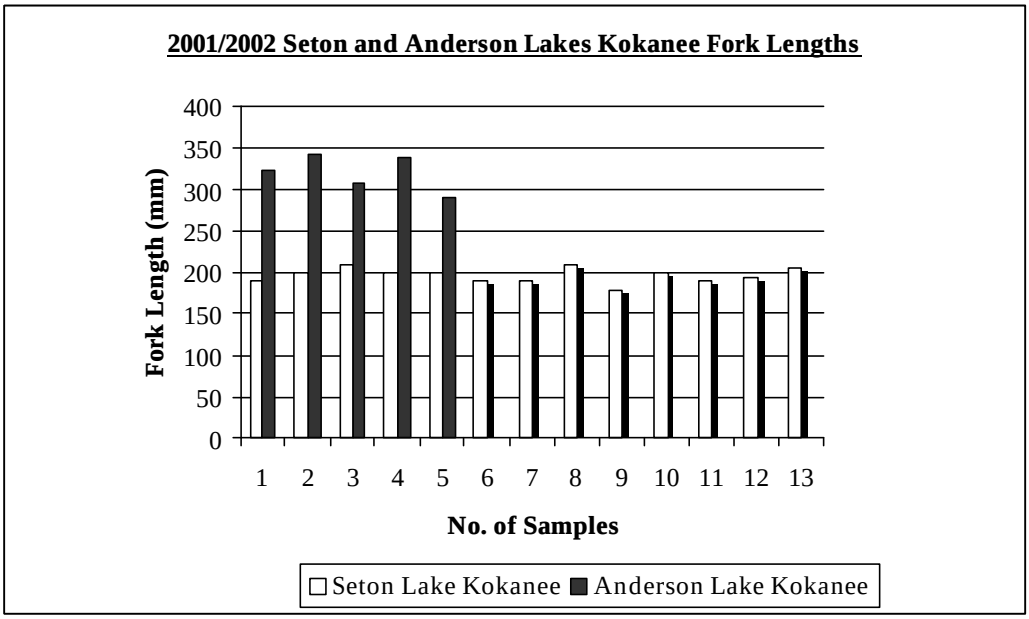

Figure 4. Fork Lengths of Seton and Anderson Lakes kokanee sampled in 2001/2002.

The field reconnaissance for kokanee in 2000/2001 only identified general locations where spawning may occur and where spawned out fish may accumulate (Figure 1). Actual spawning escapement for 2000/2001 was thought to be very low. The Lillooet office of the DFO received no reports of dead kokanee on the beaches that fall (Grantham, pers. comm. 2001) so no enumeration of carcasses and biological sample collection was possible until fall, 2001.

The balance of the field and office work was completed after March 31, 2001, including preparation of this report, with in-kind support from WLAP, BCCF and First Nations.

5.0 DISCUSSION

5.1 BULL TROUT ASSESSMENT

Data collected for bull trout during this project adds to initial reconnaissance work done for WLAP in 1999 to fill data gaps for the Lillooet LRMP. (Chamberlain and O'Brien 1999) Annual data collection such as spawner numbers would help to provide an index of trends and status of the bull trout resource on a year to year basis.

In 2000, concentrations of bull trout were observed in Spider and Whitecap Creeks. These two streams feed into the Seton Reservoirs largest tributary, the Portage River. The Portage River, while apparently not utilised for spawning by bull trout, may act as a rearing area for juvenile bull trout and as an important area of concentrated foraging for adult and sub-adult bull trout. As reported by Chamberlain and O'Brien (1999), the Portage River is also the historically confirmed location of Dolly Varden (*Salvelinus malma*) in the study area. In 1999, the lower portions of Spider and Whitecap Creeks were observed to have numerous bull trout spawning from the confluence of the Portage River up to naturally occurring waterfalls. During both the September and October 2000 field surveys, stream walks were conducted on the lower sections of Whitecap and Spider Creeks. During these walks a peak count of approximately six adult bull trout were visually observed in Spider and Whitecap Creeks. In 1999, 20 and eight bull trout were observed in Spider and Whitecap Creeks, respectively. No conclusions are possible from this limited information; however, the counts further confirm the utilization of both streams by spawning bull trout.

Through comparison of interpretive maps, Chamberlain and O'Brien (1999) indicated that the majority of bull trout habitat in the study area is located in the Gates Creek Watershed. Both adult and juvenile bull trout have been observed throughout the mainstem of Gates Creek. Adult bull trout observed in the lower portion of Gates Creek during the August 29, 2000 snorkel survey may be fish destined to migrate upstream to spawning areas within the Gates Creek mainstem or key tributaries. It was unfortunate that the large sockeye run made it impossible for staff to tag migrating bull trout at the Gates Creek spawning channel as it may have provided some additional insight into interaction with the channel and counting fences, spawning distribution and run timing if followed up by visual surveys. It's possible that the suspected, later mainstem Gates Creek spawning group of bull trout is affected more than the earlier migration timing of fish that are thought to spawn in key tributaries (Chamberlain and O'Brien, 1999).

Field surveys conducted for this study further confirmed spawning locations and general timing, but the actual timing of the start, peak and conclusion of migration and spawning is not possible without more detailed surveys. Bull trout were observed during the first stream walk conducted in late September, so the first arrival of these fish prior to this count is unknown. Subsequent counts after the Oct 12, 2000 survey were suspended due to funding limitations and therefore estimated total spawner abundance (peak count) or conclusion of spawning activity is not possible.

A more accurate estimate of the bull trout spawner populations in these systems could be determined using the area-under-the-curve (AUC) method (Ames 1984; Hilborn et al. 1999), by conducting more intensive surveys to collect data on observed spawner abundance, residency time and observer efficiency. Good access to bull trout spawning areas with concentrations of bull trout and the fact that spawners are readily visible would make this type of project viable in these systems. Prior to undertaking this type of study, however a good study design is mandatory. Bull trout migrations, timing and spawner distribution could be evaluated using radio telemetry as carried out in a recent study in the Adams Lake watershed (O'Brien and Chamberlain 2003).

5.2 KOKANEE ASSESSMENT

The Seton and Anderson Lakes kokanee utilize shore spawning and/or deep water habitats for spawning within these lakes. There were no reports of tributary spawning, with the exception of Darcy Creek. Evidence of spawning activity in the system is difficult to determine and so far, is only apparent when the spawned out fish eventually float to the lake surface (some still alive) and are predated on by eagles or harvested by First Nations as they wash onto the beaches. First Nations, WLAP and BC Hydro have placed a high importance on understanding the status of kokanee within the two lake systems. Populations of this species are reliably reported to be well below historical levels, however, the 2001 brood year saw an increase in numbers from previous years, possibly indicating a strong year class. Spawning in Seton Lake may occur as early as late October and may continue into November. Future sampling effort should be directed at and just prior to these times. Anderson Lake kokanee appear at the surface much later, at the end of December and in January. Spawning time may be as early as late November or throughout December.

Factors affecting kokanee survival and growth are not well understood at the present time. Reduced productivity related to water quality following diversion of Bridge River water into Seton Lake was documented by Geen and Andrew, (1961). There are no obvious factors are causing a decline in Anderson Lake kokanee nor is there any historical, quantitative comparison data for the

abundance of adult spawners either stock. Trawl surveys were carried out in the 1970's, 1980's in 2000 and again in 2001. In fall, 2000, fall density of *Onchorhynchus nerka* fry was 1,057 kg/ha (Shortreed et al. 2000). The fry were smaller than expected but plankton biomass was high. This is consistent with the late spawning and subsequent late emergence of kokanee fry in Anderson. Strontium/calcium ratios in otoltihs confirmed that most of these fry (95%) were kokanee, not sockeye. Sockeye are present in the Gates Creek watershed but fry data suggests that they migrate through Anderson Lake to Seton Lake. (Geen and Andrew 1961). Shortreed et al. (2000) concluded that Anderson Lake is a productive lake with substantially underutilized rearing capacity for *O. nerka*. In Seton Lake, Shortreed et al. (2000) found that sockeye and kokanee fry were both present at a measure of 289 kg/ha and were larger than in Anderson Lake. They described Seton Lake as a productive lake with substantially underutilized rearing capacity. The reason for the size differences between Seton and Anderson Lake fish are unknown but could be due to:

- Different age at spawning
- Different juvenile/sub-adult densities
- Different competition with young sockeye for food between the two lakes
- Differing productivity

Anecdotal reports suggest that Anderson fish were always larger.

First Nations have expressed serious concerns about the decline of kokanee. Archival reports from local residents (Belle, pers. comm. 2002) are that in the past, the dead fish were piled three feet high and four feet wide along the beaches. No explanations of the causes for decline are possible at this time; however, there are some factors to consider in future evaluations. Seton Lake fluctuates about 40 cm. daily. Shallow, beach spawning kokanee could be affected by this fluctuation, however, anecdotal information and inflated swim bladders on post-spawners suggests deep water spawning.

Alternatively, diversions for power generation introduce sediments that may accumulate on the lake bottom. The Carpenter/Bridge diversions account for two-thirds of the water volume that enters Seton Lake annually. In 2001, field crews sampling for heavy metals were collecting "fine mud" from several locations in Seton Lake (Aquilibrium Consulting 2001). Similar sampling could not be completed in Anderson, where sampling equipment encountered rock bottom substrate. A second, possibly related, anecdotal report comes from First Nations observations of post-spawning kokanee, surfacing after spawning with silt-choked gills (Shields, pers. comm. 2000). In 2001, the same First Nations observer saw no evidence of silt in the gills of kokanee carcasses. Further work is

required to determine actual spawning sites before any evaluation of the effects of any sediment accumulations on spawning sites or spawning fish is possible.

Limnological changes from the Bridge River watershed diversions are considered to be contributing factors to reduction of zooplankton production and growth of sockeye (and presumably kokanee). An earlier study (Geen and Andrew 1961) and recent work (Shortreed et. al. 2000) measured the fall euphotic zone in Seton at half the depth of Anderson Lake. However, as previously discussed, Seton Lake is producing below its capacity. This data was included in this report for only one year, 2000, and many other factors including year to year variability affect overall productivity.

Further evaluation of historical trawl data and any subsequent DFO work on the two lakes after 2000 is recommended. Results from data collection after 2000 years data may lend further insight. Certainly, any reduction in productive capacity could affect both juvenile sockeye and kokanee production in a similar manner. Further investigation into differences in productivity between the two lakes is recommended to identify potential limiting factors to kokanee production.

6.0 RECOMMENDATIONS

This study represents the first field surveys and documented review of information about the status and life history of kokanee populations within the Seton and Anderson Lakes study area. The study adds limited information on bull trout abundance and spawning locations. The following recommendations could answer important questions concerning both of these species and shed light on several issues that deserve further attention:

6.1 BULL TROUT

- Conduct yearly monitoring of known bull trout populations to monitor abundance trend data and general stock status.
- Spawner population estimates for Spider and Whitecap Creeks (and possibly Gates Creek) could be determined by conducting more intensive surveys and collecting data for the area-under-the-curve (AUC) method.
- As recommended by Chamberlain and O'Brien (1999), marking and recapture at the Gates Creek spawning channel of spawning adults and/or juveniles from Gates Creek would help identify temporal impacts by life-history type.
- Radio-tagging of bull trout during early spring to late summer at the mouth of Gates Creek or other locations and utilizing fixed and mobile tracking could provide useful run timing and spawning distribution data and insight into bull trout interaction with the spawning channel and counting fences.

6.2 KOKANEE

- Continue and expand annual field reconnaissance in Seton and Anderson Lakes to determine kokanee spawn timing, possibly identify spawning habitat, and to collect biological samples to provide trend data and stock status.
- Further evaluate historical trawl data and any subsequent DFO work on the two lakes after 2000.
- Design and conduct a more intensive study on Seton and Anderson Lakes in an attempt to firmly establish kokanee life history, spawn timing, identify critical spawning habitat, enumerate spawning kokanee, estimate spanner populations, as well as, to identify key limiting factors to kokanee production.

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APPENDIX A: FINANCIAL STATEMENT