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SITE C FISHERIES STUDIES
2010 REVELSTOKE RESERVOIR FISH INVENTORY

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Executive Summary

As part of the Site C Clean Energy Project, fisheries studies are presently underway to add to the existing baseline information and to address data gaps in order to assist in the environmental and regulatory review phase of the project. The prediction of the transition of fish species composition from the Peace River environment to the future reservoir is currently being assessed. Revelstoke Reservoir is considered a close surrogate to the future Site C reservoir based on physical environment and resident fish species prior to impoundment. The main objective of this project was to replicate previous fish sampling methods on Revelstoke Reservoir, to the degree possible, and compare the results with historical sampling data to assess changes in species composition over time. It is anticipated that the change in fish species composition in Revelstoke Reservoir, over time, will provide some insight to the potential changes in fish species in the Site C reservoir.

In 2010 sampling of the Revelstoke Reservoir was completed using both floating and sinking gill nets at sites located at the southern (Revelstoke Forebay), middle (Downie) and northern (Mica) portion of the reservoir. Sampling results were compared with historical data collected pre-impoundment (1980) and post-impoundment (1985, 1986 and 1996) to identify trends in species composition and relative abundance. Standard lake water quality data including dissolved oxygen and temperature profiles were also collected at each site. Sampling was completed in mid August, 2010.

The water quality results showed a strong thermocline at a depth of 13 m and surface temperatures of 19°C at the Revelstoke Forebay site. Surface temperatures were similar at the Downie site but the stratification was not observed, although temperature did decrease to approximately 10°C at a depth of 30 m, which was the same as at the Forebay site. Lastly, the Mica site had the lowest surface temperature of the three (9°C) which was relatively constant over the 5 m depth of the site. Dissolved oxygen was saturated over the entire profile at each site.

Fish sampling results identified a trend of increasing sport fish (Bull Trout, Kokanee, Mountain Whitefish, Rainbow Trout) relative abundance as sampling moved north in the reservoir. Mountain Whitefish were the most abundant species of sport fish followed by Bull Trout. Kokanee were only captured at the northern site (Mica) although the loss of the floating gill net at the mid-reservoir Downie site confounds the results. A strong sport fishery was present in the mid reservoir, targeting kokanee during the sampling period. In addition, hydroacoustic surveys have found Kokanee to be the most abundant species in the reservoir. Compared to the historical data, there has been a general decrease in sport fish relative abundance and an increase in non-sport fish relative abundance at the southern and middle portion of the reservoir.

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1.0 Introduction

As part of the Site C Clean Energy Project, fisheries studies are presently underway to add to the existing baseline information and to address data gaps in order to assist in the environmental and regulatory review phase of the project. The prediction of the transition of fish species composition from the Peace River environment to the future reservoir is currently being assessed. Revelstoke Reservoir is considered a close surrogate to the future Site C reservoir based on physical environment and resident fish species prior to impoundment. Triton Environmental Consultants Ltd. completed reconnaissance fish sampling in the Revelstoke Reservoir in 2010. The main objective was to replicate previous fish sampling methods on Revelstoke Reservoir, to the degree possible, and compare the results with historical sampling data to assess changes in species composition over time. It is anticipated that the change in fish species composition in Revelstoke Reservoir, over time, will provide some insight to the potential changes in fish species in the Site C reservoir.

1.1 Study Area

The study area for the 2010 Revelstoke Reservoir Inventory was the Revelstoke Reservoir on the upper Columbia River in British Columbia. The reservoir rests in the steep Columbia River Valley bounded by the Monashee Mountains on the west and the Selkirk Mountains on the east and was formed in 1984 by the completion of the Revelstoke Dam, which is about 6 km upstream of the city of Revelstoke. The reservoir is the second in a series of three hydroelectric reservoirs on the Canadian part of the Columbia River. To the north is Kinbasket Reservoir, which was formed by the construction of Mica Dam in 1973. Water drawn from the hypolimnion of Kinbasket Reservoir by Mica Dam is the primary inflow into Revelstoke Reservoir. Water drawn from the hypolimnion of Revelstoke Reservoir by Revelstoke Dam in turn flows into upper Arrow Lake, which, together with Lower Arrow Lake, was flooded by the construction of the Hugh Keenleyside Dam in 1968.

The construction of Revelstoke Dam and the filling of its reservoir have caused major changes to the local aquatic ecosystem, both upstream and downstream of the dam. The obvious changes included damming the upper Columbia River near Revelstoke, and thereby obstructing upstream fish passage. In addition, approximately 140 km of mountain river valley was inundated thereby submerging the narrow littoral zone and flood plain of the valley along with the lower reaches of over 30 tributaries.

Less obvious changes to the aquatic ecosystem included altering the physical structure of the water column from a shallow, high-energy vertically homogenous river to a deep, low-energy thermally-stratified lake. Water chemistry may also have changed with time due to a well-known "reservoir effect" (Kennedy and Walker, 1990). This almost always involves a rapid increase in nutrient and metal levels in a reservoir soon after filling due to the release of soil- and vegetation-bound nutrients and metals. This period of increase is invariably followed by the equally rapid depletion of nutrients and metals due to downstream transport. It is estimated that the Revelstoke Reservoir completed its depletion phase in 1987 and is currently classified as oligotrophic (Smith, 1990).

In terms of physical characteristics, there are many similarities between the Revelstoke reservoir and the Site C Reservoir. Both are relatively long and narrow with Revelstoke Reservoir being 140 km long, with an average width of less than 2 km, while Site C Reservoir will be 83 km long and 2 to 3 km wide. The total surface area of the Revelstoke Reservoir is 10,125 ha compared to 9,310 ha for Site C Reservoir. The depth of the Revelstoke Reservoir increases from less than 10 m at the tailrace of Mica Dam to 125 m in the forebay north of Revelstoke Dam and there is little littoral habitat due to the steep valley sides. This will be the same for the Site C Reservoir.

Both reservoirs have upstream impoundments and inundate the historic river channel. The Revelstoke Reservoir has a relatively stable surface elevation of 573 m with only minimal fluctuation. The Site C Reservoir will be similar with expected fluctuation of 1.8 m. Revelstoke reservoir has three major tributaries (Goldstream River, Downie Creek, and Bigmouth Creek), and over 30 smaller tributaries. Site C Reservoir will have two major tributaries (Moberly River and Halfway River and several smaller tributaries. In both cases, most of the tributaries are of glacial origin and so are cold and can carry substantial loads of glacial silt, especially during spring freshet.

1.2 Historic Gill Net Data

Although a substantial amount of historical fish sampling data exists for the Revelstoke Reservoir this report focused only on gill net sampling studies with comparable methodologies that could be replicated to a reasonable extent. The historic data used to form the baseline was collected from the following reports:

- *Mason, B.C. 1985. Revelstoke project, aquatic biology program interim report.*

  Report includes pre-impoundment data from various fish sampling techniques throughout the region. Gill net sampling is limited to two reservoir sites:
  1. 30 Mile Ferry – located approximately 25 km south of Downie Arm. Sampled on July 16 and August 27, 1980.
  2. Script Creek – located approximately 50 km north of Downie Arm. Sampled on July 23 and 26, 1980.

  Three gill nets of mesh sizes 4, 5 and 6 cm were set at each site for 24 hours. Details on whether the nets were sinking or floating and their orientation to shore was not reported. Lastly, only Mountain Whitefish (*Prosopium williamsoni*), Bull Trout (*Salvelinus confluentus*), and Rainbow Trout (*Oncorhynchus mykiss*) numbers are reported and it is unclear whether additional species were encountered but not reported.

- *Smith, H.A. 1986. Revelstoke Reservoir Fisheries Monitoring Program 1985.*

  Post- impoundment fish sampling within the Revelstoke Reservoir in the first year following reservoir filling. Sampling was at three sites along the 135 km length of the reservoir, providing general coverage of the reservoir and fish habitat:

1. Revelstoke forebay site (Station 103) located near the debris boom approximately 2 km upstream from the Revelstoke Dam (see figure 1). Sampling was conducted on the west side of the reservoir on July 17 and 18, 1985.
2. Downie Arm (Station 102) located approximately 58 km upstream of the Revelstoke dam site. Sampling was carried out on the west side of the reservoir during July 23 to 24, 1985.
3. Goldstream Creek (Station 102b) located approximately 25 km upstream of Downie Creek, was sampled on March 26 and 27, 1985.
4. Mica Tailrace (Station 101) was sampled on September 24, 1985.

Three "standard" gill nets were set at each site parallel to shore at depths of 10 m, 25 m, and 35 m with the exception of Goldstream Creek where nets were set perpendicular to shore. Each net consisted of 5 panels 15.2 m long x 2.4 m deep totalling 185.1 m^2. Mesh sizes were 3.8, 5.1, 6.4, 7.6 and 10.2 cm.

- *Fleming, H.O., and H.A. Smith. 1988. Revelstoke Reservoir Aquatic Monitoring Program 1986 Progress Report.*

  Post-impoundment fish sampling was completed at the same sites as Smith (1986) with the exception of the Goldstream Creek site, which was not sampled. Sampling followed the same methodology as Smith (1986) and was completed on the following dates:
  1. Revelstoke forebay site (Station 103): June 17 and October 18, 1986.
  2. Downie Arm (Station 102): June 20 and October 17, 1986.
  3. Mica Tailrace (Station 101): June 25 and October 16, 1986.

  Water quality sampling was also completed at the same sites in both 1985 and 1986:
  1. Revelstoke forebay site (Station 103): March (surface only), July and September, 1985; April, May, August and October, 1986.
  2. Downie Arm (Station 102): July and September, 1985; June, August, and October, 1986.
  3. Mica Tailrace (Station 101): March and September, 1985; June and October, 1986. This site was riverine at the time of sampling and therefore only surface data was collected.

- *Revelstoke Reservoir Aquatic Monitoring Program 1987 Progress Report (Author unknown)*

  Fleming and Smith (1988) make reference to sampling completed in 1987 however that report could not be located. A summary table containing percent composition of species caught for 1987 was located and has been used in this report. It is assumed the sampling in 1987 followed the same procedures and sites as in 1985 and 1986.

- *Perrin, C.J. 1996. An Assessment of Potential Effects of Altered Draw-Down on Benthic Invertebrate and Fish Abundance and Composition in the Littoral Zone of the Revelstoke Reservoir.*

Fish sampling was conducted in association with reservoir littoral productivity assessment. Three sites were sampled in August and October of 1995:

1. Powerline – located approximately 10 km upstream of Downie Arm in the reservoir.
2. Downie Arm – Site located within Downie Arm, east of the location of station 102 of Smith (1985) and Fleming and Smith (1988).
3. Downie d/s – located approximately 10 km downstream of Downie Arm in the reservoir.

Sampling was conducted using a floating and sinking gill net, each 91.5 m long and 2 m deep and consisting of 6 panels: 2.5, 3.8, 5.1, 6.4, 7.6 and 8.9 cm mesh sizes respectively. Nets were oriented parallel to shore.

1.3 Objectives

The main objective of this project was to replicate previous fish sampling methods on Revelstoke Reservoir, to the degree possible, and compare the results with historical sampling data to assess changes in species composition over time. Other tasks included:

- Collecting biological data (length, weight and age)
- Collect water quality data associated with secondary lake inventories.

2.0 Methods

2.1 Sample Sites

The 2010 sample sites were selected to correspond with the three locations that were sampled during the 1985 and 1986 post-impoundment sampling of Smith (1986) and Fleming and Smith (1988). Locating the sites in the same locations as two of the three historical reports would provide the best spatial comparison to historic data and the timing in August was set to correspond to a period prior to Kokanee beginning to stage for spawning activity. Perrin (1996) sites were located to the east side of the reservoir with one site in Downie Arm. This area is heavily utilized by campers and sport fishing activities, and therefore not ideal for gill net sampling. The three sites are summarized below and Figure 1 shows the approximate location of each:

1. Revelstoke Forebay – located at the south end of the reservoir within 2 km of Revelstoke Dam. Equivalent to station 103 in Smith (1986) and Fleming and Smith (1988).
2. Downie - located at mid reservoir along the west side opposite Downie Arm. Equivalent to station 102 in Smith (1986) and Fleming and Smith (1988).
3. Mica – Reservoir sampling at the north end of the reservoir approximately 7 km south of the Mica Dam. Equivalent to station 101 in Smith (1986) and Fleming and Smith (1988).

The 2010 sampling period was August 16 to 18, 2010. This was similar to Smith (1986) which had a single sampling in late summer. Smith and Fleming (1988) reported a spring and fall sampling while Perrin (1996) sampled in late summer and fall.

2.2 Water Quality

Water quality sampling followed the current standard methodology for Secondary Lake Inventory requirements (RIC, 2001). This included collection of the following water quality parameters at each site:

- Secchi Depth
- Water colour
- pH (surface and bottom)
- Conductivity (surface and bottom)
- Dissolved Oxygen (DO) profile
- Temperature profile

Dissolved oxygen and temperature profiles were collected using a YSI 85 DO/Conductivity/Salinity/Temperature meter while pH was measured with a handheld Hanna Combo Meter.

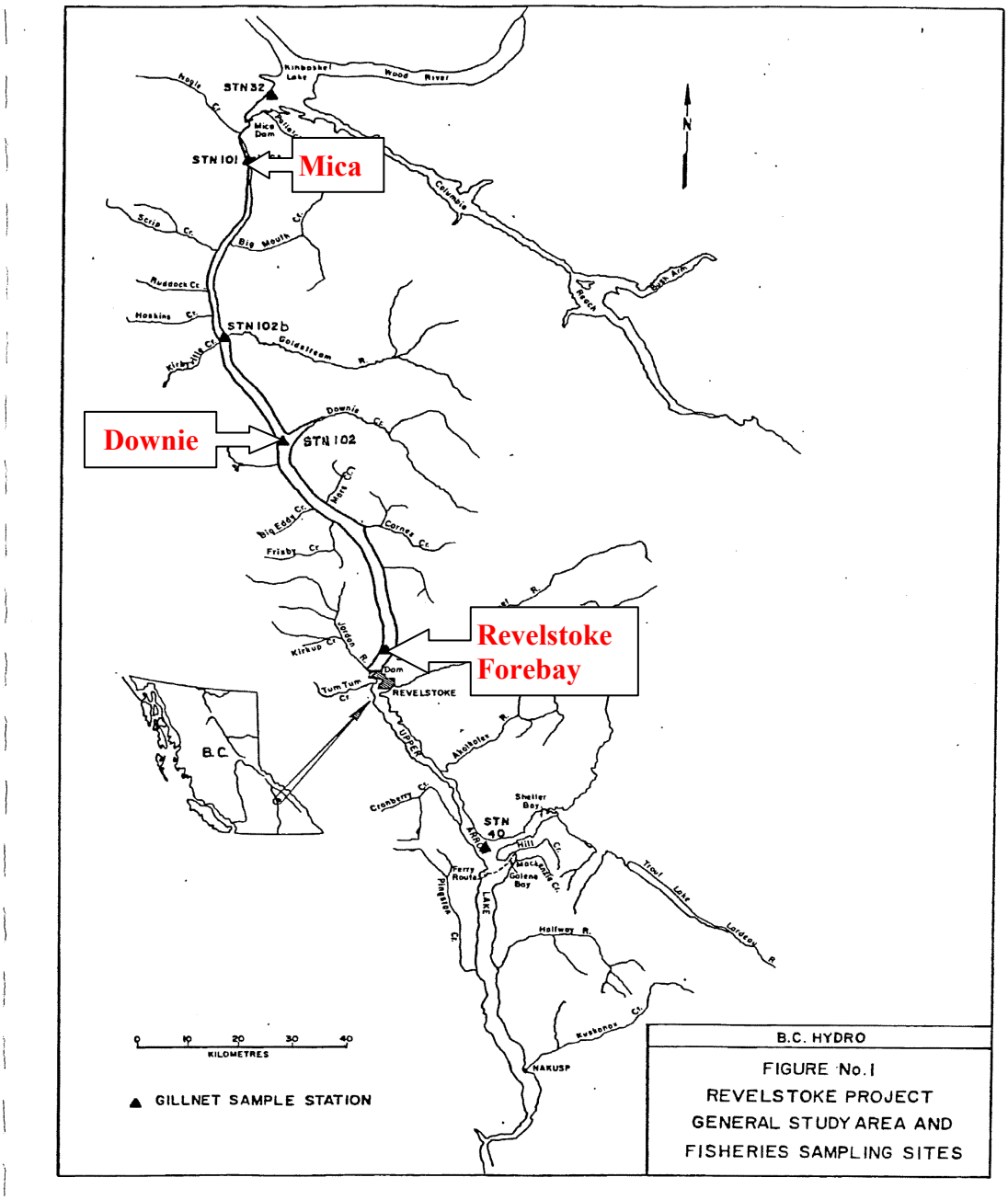

Figure 1. 2010 and historic gill net sampling locations in Revelstoke reservoir, 2010 Revelstoke Reservoir Inventory. Figure adapted from Smith (1986).

2.3 Fish Sampling

The goal of the 2010 Revelstoke Reservoir Inventory was to replicate previous gill net sampling to the degree possible. Fish sampling at each site was completed using both a floating and sinking gill net. The dimensions and mesh sizes of the nets used in the historical reports differed between the 1985/1986 sampling and the 1996 sampling. For the 2010 sampling the decision was made to use the same nets as were used by Perrin (1996). These nets are also consistent with those prescribed by the latest RIC standards for lake sampling.

Each of the floating and sinking nets in 2010 consisted of six 15.2 m long panels of different mesh sizes that were strung together in a "gang" to form a net 91.2 m long and 2.4 m deep (218.9 m^2). The individual nets were longer than those used by Smith (1986) and Fleming and Smith (1988), which were 76 m, but the same as those used by Perrin (1996). In terms of total area, 437.8 m^2 of net was used at each site in 2010 which is comparable to Perrin (1996). Smith (1986) and Fleming and Smith (1988) reported 3 nets were used at the Revelstoke Forebay and Downie sites for a total area of 547.2 m^2 however only 2 nets were used at Mica for a total area of 364.8 m^2.

Details on the panel order, mesh size, filament size and mean fork length of fish targeted by each panel for nets used in 2010 are summarized in Table 1. The mesh size is measured from knot to knot of a single, diagonally stretched mesh. Each mesh size is selective for a certain size of fish therefore, the individual panels used in the net have been chosen so the net is capable of catching a wide range of fish. The 2010 mesh sizes were the same as those used by Perrin (1996). Smith (1986) and Fleming and Smith (1988) used 5 panel nets that lacked the smallest mesh size suggesting their results may have underrepresented the smallest size class of fish (i.e. less than 114 mm). All other panels were consistent.

Table 1. Order, mesh size and filament size standard in relation to the mean fork length of fish caught.

Order	Mesh size	Filament size	Fish fork length
1	25 mm	0.20 mm	114 mm
2	76 mm	0.25 mm	345 mm
3	51 mm	0.20 mm	228 mm
4	89 mm	0.30 mm	380 mm
5	38 mm	0.20 mm	178 mm
6	64 mm	0.25 mm	280 mm

The 2010 study used one floating net and one sinking net, both of which were set overnight and perpendicular to shore. This was consistent with the Resource Inventory Committee (RIC) Lake Sampling procedure. The floating net was set directly offshore sampling the 2.4 m at the top of the water column. The sinking net was set 5 to 10 m offshore by connecting the nearshore end of the net to a rope that was tied off to shore and then setting the net from the end of the rope. The approximate depth of the sinking net was 5 to 15 m. In addition, sets of three gee traps were set

at three distinct locations along the nearshore zone of each site. These traps were set and recovered at approximately the same time as the gill nets. Compared to historical sampling, the 2010 procedure differed in that nets were set perpendicular to shore as opposed to parallel which was the orientation used in Perrin (1996) as well as Smith (1986) and Fleming and Smith (1988). Both the 2010 sampling and Perrin (1996) used a floating and sinking net at similar depth. However, Smith (1986) and Fleming and Smith (1988) sampled deeper habitats of 10, 25 and 35 m with no surface sampling, although the net set at the 35 m depth profile was suspended 10 m below the surface to sample limnetic species. A Ministry of Environment Small Lakes biologist indicated that while they had no empirical data regarding fish capture, orientation of gill nets was not thought to be a major influence in estimating abundance and species composition provided sites were associated with shore or shoal habitats (Pers. Comm. Andrew Klassen, MOE Kamloops).

Nets were set between 16:00 and 18:00 hours and were left to soak overnight, which was the same as in the historical studies. Retrieval was generally between 9 am and 12 pm. All fish captured were weighed (to the nearest 0.1 g) and measured (to the nearest mm) to a maximum of 30 per sport fish species (Bull Trout, Kokanee, Rainbow Trout, and Mountain Whitefish) and 15 for non-sport fish. Photographs were taken of all sport fish captured. Aging structures were taken from rainbow trout (scales), bull trout (leading pectoral fin ray and otolith), and burbot. Expired fish were necropsied for sex.

2.4 Data Compilation

Data from previous reports on reservoir fish captures was reviewed. Data sources included a report provided by BC Hydro, consultant data reports, and information from the Ministry of Environment. The reports that provided the bulk of the background data were:

Smith, H. A., 1986. *Revelstoke Reservoir Fish Monitoring Program 1985.* Prepared for BC Ministry of Environment.

Fleming, H.O. and H.A. Smith. 1988. *Revelstoke Reservoir Aquatic Monitoring Program 1986 Progress Report.* Prepared for BC Ministry of Environment.

Perrin, C. 1996. *An Assessment of the Potential Effects of Altered Draw-Down on Benthic Invertebrates and Fish Abundance and Composition in the Littoral Zone of the Revelstoke Reservoir.* Prepared for BC Hydro.

2.5 Data Analysis

Wherever possible, direct comparisons with the historical gillnet datasets were made in order to identify trends in the species composition of the Revelstoke Reservoir between 1985, 1986, 1996 and 2010. However, some assumptions had to be made in areas where the historical methodology was unclear. In addition, raw data files from the historical reports were not available so mean values and summary statistics presented in the reports had to be relied upon to form the historical baseline. As a result, no statistical analysis could be performed to compare the results

2.5.1 Water Quality

Other typical lake inventory samples for lab analysis and biological samples (i.e. chlorophyll, phytoplankton, and zooplankton) were beyond the scope of the 2010 project as the primary objective was to assess fish relative abundance. Comparisons with historical data was therefore limited to field measurements of the parameters listed in Section 2.2.

2.5.2 Fish

2.5.2.1 Abundance/Percent Composition

The numbers of fish caught in each of the floating and sinking gill nets was used to calculate a percent composition by species at each of the sites. These values were then compared with the historical percent composition of each species as reported in Smith (1986), Fleming and Smith (1988) and Perrin (1996).

2.5.2.2 Catch-per-unit-effort (CPUE)

Several metrics of CPUE can be calculated from the data collected. Review of the historical reports identified CPUE defined as catch/100 m^2 of net/24 hour period (Smith, 1986; Fleming and Smith, 1988), and catch/net/hour (Perrin, 1996). For Perrin (1996) the raw data to calculate the reported CPUE value was not included and therefore could not be converted to the metric used in the 1986 and 1988 reports. In addition, the Perrin (1996) results were made artificially high due to the presence of spawning Kokanee, which were not present during the 2010 sampling period. The lack of raw data prevents CPUE from being recalculated without Kokanee. As a result, CPUE for the 2010 sampling was calculated using the catch/100 m^2/24hr metric defined by Smith (1986) and Fleming and Smith (1988) and comparison of the 2010 results was limited to those reports.

3.0 Results

3.1 Water Quality

The temperature profile collected at the Revelstoke Forebay (Figure 2) exhibited a strong thermocline at a depth of 13 m and surface temperatures approaching 19°C. m. This was similar to data collected on July 23, 1985 (Fleming and Smith, 1988) which showed surface temperatures of approximately 19°C and a thermocline at a depth of approximately 15 m. Sampling completed that same year on September 23rd showed surface temperatures had dropped to approximately 11°C, and the thermocline had disappeared. Historical data suggests the site is typically thermally stratified from April through October (Fleming and Smith, 1988). Dissolved oxygen levels in 2010 were consistent with those recorded in both July and September 1985 which were classified as saturated. Surface conductivity was 88 µmhos/cm which was within the range observed in July and September 1985 (80 to 125 µmhos/cm, respectively). Surface pH was slightly higher than in 1985 (8.47 vs. 7.5). Secchi depth was 7.0 m.

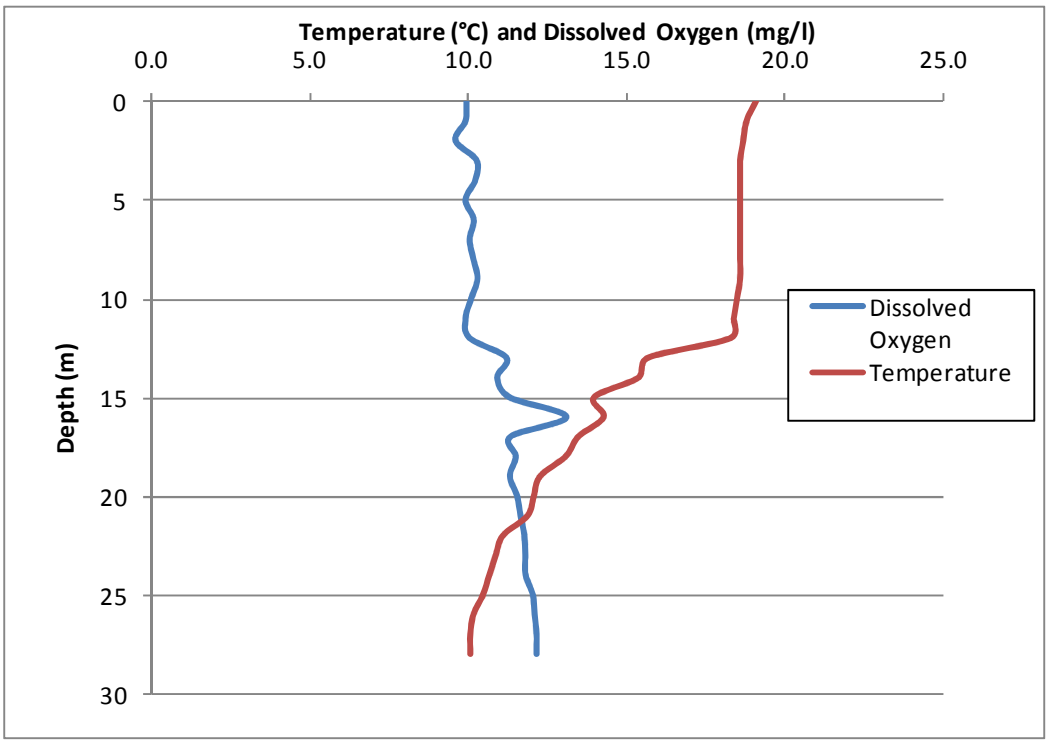

Figure 2. Dissolved oxygen and temperature profile at Revelstoke Forebay site (August 17, 2010). Data collected as part of the 2010 Revelstoke Reservoir Inventory.

Data from the Downie site showed that vertical thermal gradients were established but there was a lack of a strong thermocline (Figure 3). Temperatures decreased from a maximum of 19°C at the surface to approximately 10°C at a depth of 30 m. Data from Fleming and Smith (1988) report similar trends with temperatures decreasing from 12°C at the surface to 4°C at the bottom in June of 1986. Stronger stratification was observed in the August 1986 and September 1985 datasets, but in general showed the same trends. Dissolved oxygen was ranged from

approximately 10 mg/l at the surface to 11.5 mg/l at 30 m. This was consistent with the 1985 and 1986 data which were near 100% saturated for all samples (Fleming and Smith, 1988). Secchi depth was 6.0m.

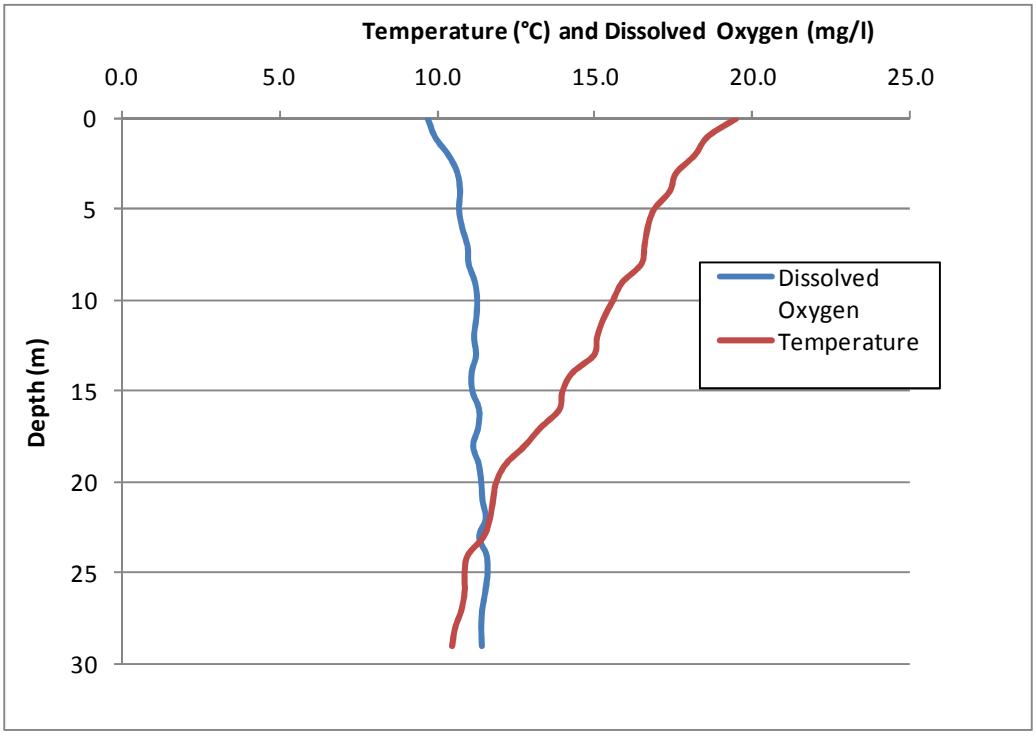

Figure 3. Dissolved oxygen and temperature profile at the Downie site (August 18th, 2010). Data collected as part of the 2010 Revelstoke Reservoir Inventory.

The Mica site had a maximum depth of approximately 5 m with both temperature and dissolved oxygen being relatively constant over that depth (Figure 4). Temperature decreased from 9.2°C at the surface to 8.1°C over the profile while DO increased from 11.6 mg/l to 12.3 mg/l. No stratification was observed and the cooler water was attributed to the release of hypolimnetic water from Kinbasket Reservoir at Mica Dam. Results were similar to that of historic data which showed consistent water temperatures and 100% DO saturation over the depth of the profile during all sampling events (Fleming and Smith, 1988). Secchi depth was 7.5 m.

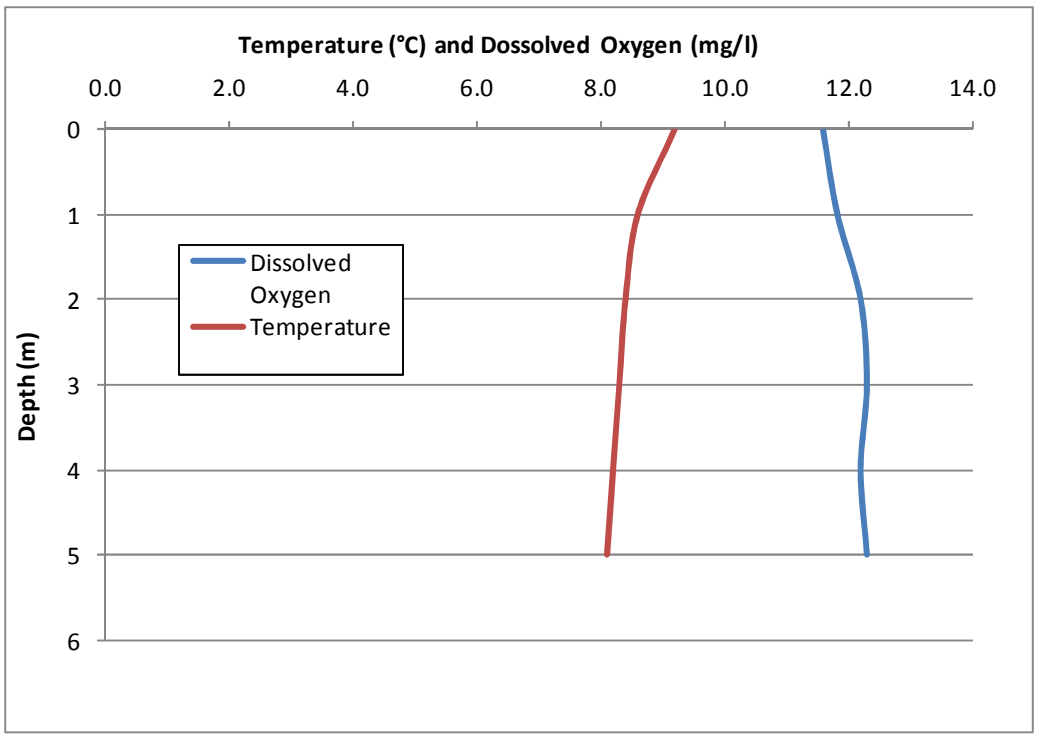

Figure 4. Dissolved oxygen and temperature profile at the Mica site (August 17th, 2010). Data collected as part of the 2010 Revelstoke Reservoir Inventory.

3.2 Fish Relative Abundance/Percent Composition

The 2010 fish sampling was completed on August 17th and 18th, 2010 and included both sinking and floating nets at all three sites (Revelstoke Forebay, Downie, and Mica). However, at the Downie site the floating net was stolen and as a result only sinking net data was available. Results of the 2010 fish sampling are presented in Table 2 and 3 and discussion of the individual sites follows.

Table 2. Summary of fish sampling results for the three sites sampled during the 2010 Revelstoke Reservoir Inventory.

Site	Bull Trout	Kokanee	Rainbow Trout	Burbot	Mountain Whitefish	Sucker	Pea-mouth	Red Side Shiners	Sculpins	Northern Pike-minnow	Total
Forebay	2	0	0	0	5	38	18	30	1	1	95
Forebay (%)	2.1%	0%	0%	0%	5.3%	40.0%	18.9%	31.6%	1.1%	1.1%	100%
Downie*	5	0	1	0	10	29	21	0	0	1	67
Downie (%)	7.5%	0%	1.5%	0%	14.9%	43.3%	31.3%	0%	0%	1.5%	100%
Mica	16	13	1	1	23	0	0	0	0	0	54
Mica (%)	29.6%	24.1%	1.9%	1.9%	42.6%	0%	0%	0%	0%	0%	100%
Total	23	13	2	1	38	67	39	30	1	2	216
Total (%)	10.7%	6.0%	0.9%	0.5%	17.6%	31.0%	18.1%	13.9%	0.5%	0.9%	100%

* Results from sinking net only due to loss of floating net.

Table 3. Summary of fish measurements for the three sites sampled during the 2010 Revelstoke Reservoir Inventory.

Fish Species	N	Average Length (mm)	Average Weight (g)	Range Length (mm)	Range Weight (g)	Average Condition Factor	Range in Condition Factor
Mountain Whitefish	38	252.3	212.4	130 - 350	27 - 445	1.15	0.85 - 1.39
Bull Trout	23	338.4	500.7	185 - 510	151 - 1462	1.02	0.83 - 1.26
Kokanee	13	277.9	240.4	240 - 320	153 - 308	1.11	0.92 - 1.27
Rainbow Trout	2	310	372.5	280 - 340	234 - 511	1.18	1.07 - 1.30
Burbot	1	460	490			0.5	
Long Nose Suckers	67	257.2	244.8	126 - 420	22 - 881	1.18	1.00 - 1.45
Pea Mouth Chub	39	211.1	116.5	119 - 250	73 - 173	1.15	0.94 - 1.44
Red Side Shiners	30	96.9	11.9	90 - 105	9.9 - 147	1.31	1.10 - 1.48
Northern Pikeminnow	1	305	359			1.27	
Sculpin	1	101	12.4			1.2	
Total	215						

3.2.1 Revelstoke Forebay Site

Longnose suckers (*Catostomus catostomus*) were the most common species encountered at the Revelstoke Forebay site comprising 40% of the catch (Figure 5). The majority were captured in the sinking net (35 of 38). Red-side Shiners (*Richardsonius balteatus*) were next most abundant comprising 31.6% of the catch, all of which was from the floating net. Peamouth (*Mylocheilus caurinus*) were the third most abundant at 18.9% with 12 of the 18 total being caught in the sinking net. Mountain Whitefish were the most abundant sport fish (5.3%) with 4 of the 5 caught in the sinking net. A total of 2 Bull Trout (2.1%) were captured both of which were in the sinking net. Other species captured included Northern Pikeminnow (*Ptychocheilus oregonensis*) and sculpins (*Cottus* sp.), with 1 individual of each being captured in the sinking net only. Kokanee (*O. nerka*), rainbow trout, and burbot (*Lota lota*) were not captured.

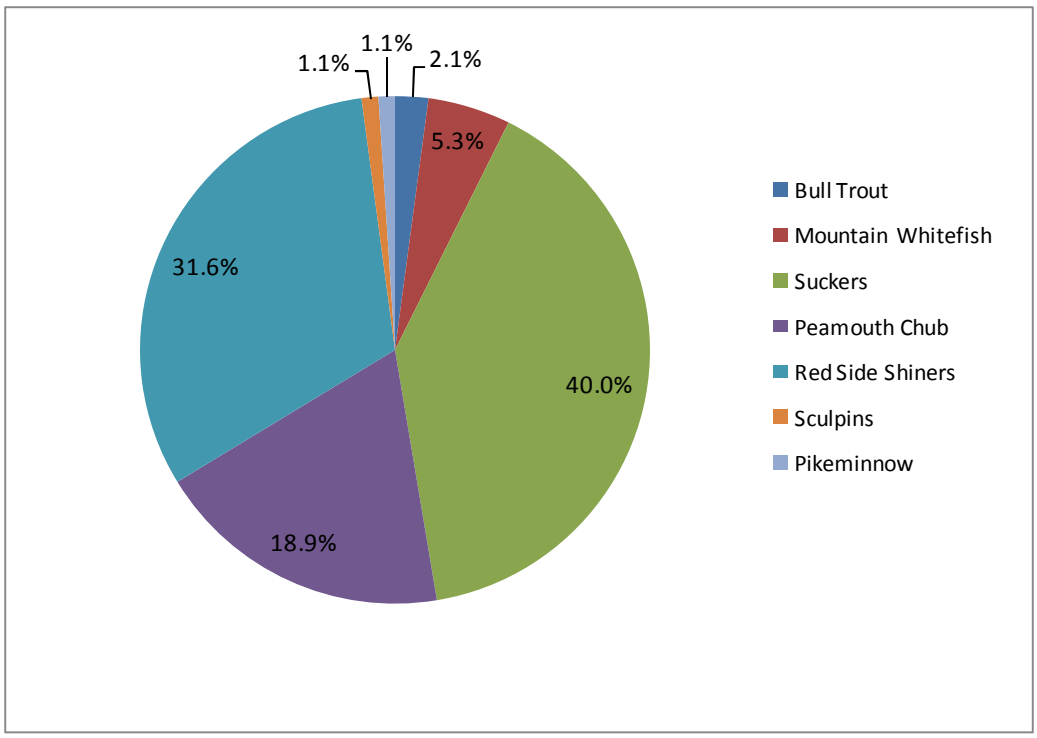

Figure 5. Revelstoke Forebay site relative abundance by species (sinking and floating net combined). Data collected as part of the 2010 Revelstoke Reservoir Inventory.

3.2.2 Downie Site

Only data from sinking nets were available for the Downie site due to the floating net being stolen from the site. Similar to the Revelstoke Forebay site, suckers were the most abundant (43.3%) followed by Peamouth (31.3%) (Figure 6). Mountain whitefish was the third most abundant species (n = 10, 14.9%) as well as the most abundant sport fish followed by Bull trout (n = 5, 7.5%). Only 1 rainbow trout (1.5%) was captured and all three species of sport fish increased in abundance at Downie compared to the Forebay site. Northern pikeminnow (1.5%) was the only other species captured. No Redside Shiners, Kokanee, Burbot or sculpin were captured at the site.

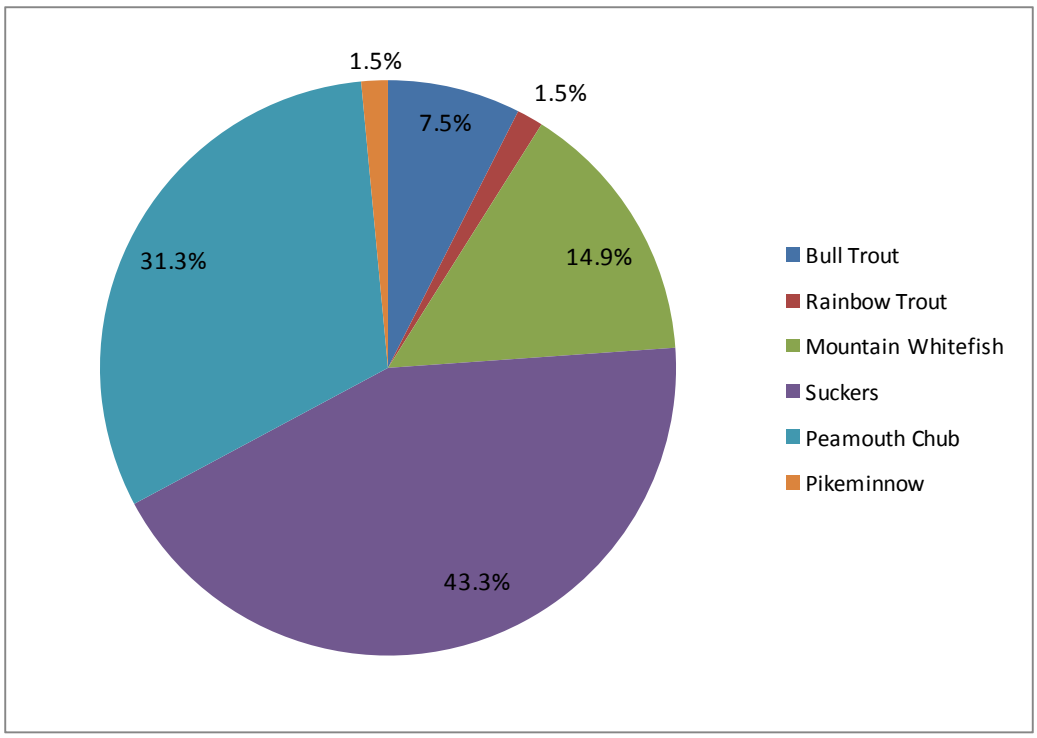

Figure 6. Downie site relative abundance by species (sinking net only). Data collected as part of the 2010 Revelstoke Reservoir Inventory.

3.2.3 Mica Site

All of the fish captured at the Mica site were sport fish and all increased in abundance as compared to the Revelstoke Forebay and Downie sites. Mountain whitefish was most abundant comprising 42.6% of the catch, followed in order of decreasing abundance by Bull Trout (29.6%), Kokanee (24.1%), Rainbow Trout (1.9%), and Burbot (1.9%) (Figure 7). Both Kokanee and Rainbow Trout were only captured in the floating net whereas Burbot and Mountain Whitefish were only captured in the sinking net. Bull Trout were captured in both but the majority were in the sinking net (81%).

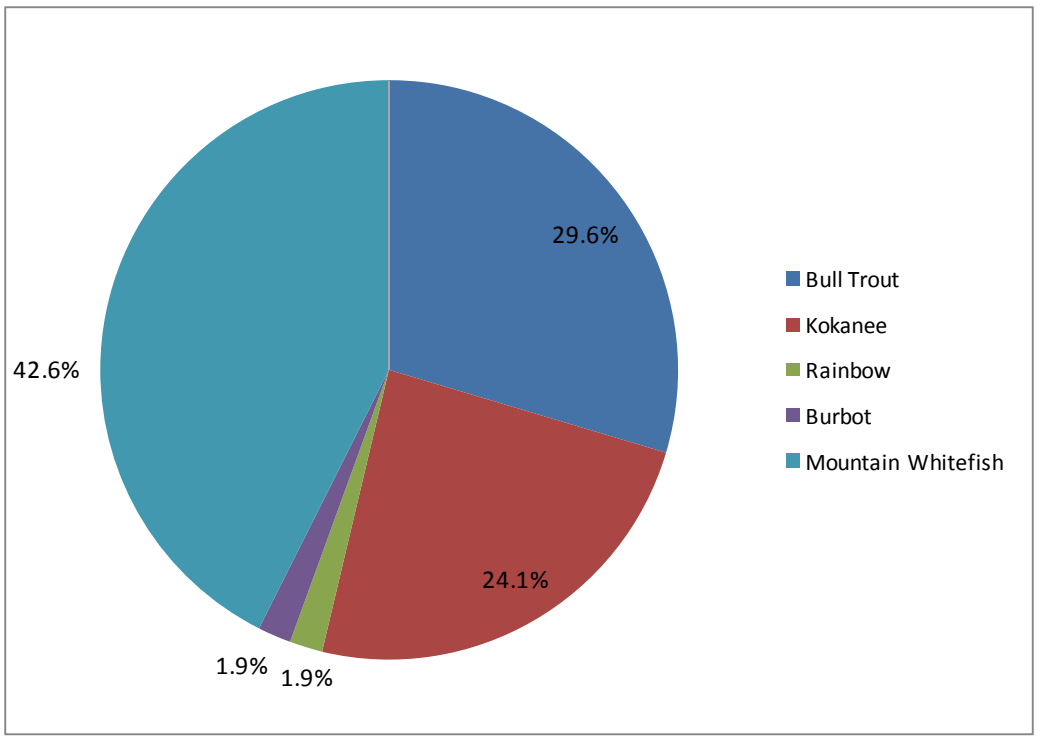

Figure 7. Mica abundance by species (sinking and floating net combined). Data collected as part of the 2010 Revelstoke Reservoir Inventory.

3.2.3.1 Comparison between Sites (2010)

Equal comparison between sites was limited by the loss (vandalism) of the floating net at the Downie site. However, sinking net capture data can be compared as it was collected consistently at all three sites. Consequently, this comparison does not adequately represent abundance and composition of pelagic species (primarily Kokanee) typically captured by floating net methods. However, no Kokanee were captured at the Revelstoke Forebay site so the under-representation would be limited to Downie and Mica.

Species captured with sinking nets varied between sites (Figure 8). Mica was the most northern site and closest to the Mica Dam. Dominant species at that site were Mountain Whitefish (43%) and Bull Trout (30%). A single Burbot was caught, representing 2% of total catch. The mid-reservoir Downie site was dominated by suckers (43%), followed by Peamouth (31%), Mountain Whitefish (15%), and Bull Trout (7%). A single Rainbow Trout and a single Northern Pikeminnow were captured representing 2% of total catch per species. Lastly the Revelstoke Forebay site was the southern-most site and suckers were the most dominant species (64%). Peamouth were the subdominant species at 32% of total composition. Mountain Whitefish, Bull Trout, sculpins and Northern Pikeminnow were also captured with each species representing less than 10% of total species.

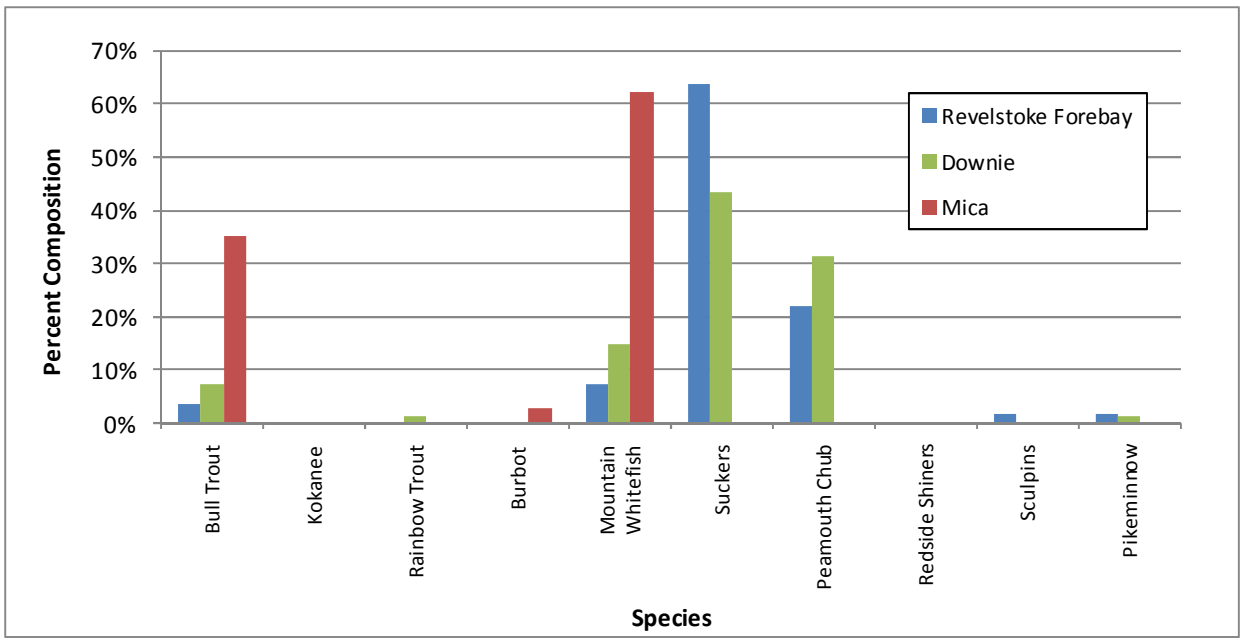

Figure 8. Species relative abundance by site, 2010 Revelstoke Reservoir Inventory. Sinking net data only.

Mountain Whitefish and Bull Trout were the most abundant species by composition at the Mica Site and showed a decrease in abundance as the sites got farther south towards the forebay. At the Mica location, cold water from the hypolimnion behind Mica Dam flows into the Revelstoke Reservoir. The cooler water at the northern end of the reservoir may explain the shift to sport fish and away from the warm water species (i.e. non-gamefish) that dominated the Revelstoke Forebay site.

At the Downie site, located mid-reservoir the thermocline (Figure 3) was unpronounced and inconsistent as compared to the Revelstoke Forebay site where a strong thermocline was established. Species composition was more evenly distributed at the Downie site with a mix of sport and non-sport species. However, the lack of a floating net at that site does weight the data towards more benthic species. Results from Perrin (1996) indicate high abundance of Kokanee in floating nets, suggest that floating nets captures would have included Kokanee.

At time of sampling, Kokanee behaviour was pelagic in nature and thus comparison of this species using sinking net results is not possible. Inclusion of the floating net data for the Revelstoke Forebay site and Mica site show that similar to Bull Trout and Mountain Whitefish, Kokanee also tend to increase in relative abundance further up the reservoir. Figure 9 also emphasizes the shift from non-sport species such as suckers, Peamouth and Redside Shiners, Northern Pikeminnow, and sculpins at the Revelstoke Forebay to sport species such as Bull Trout, Kokanee, Mountain Whitefish, and Rainbow Trout at Mica.

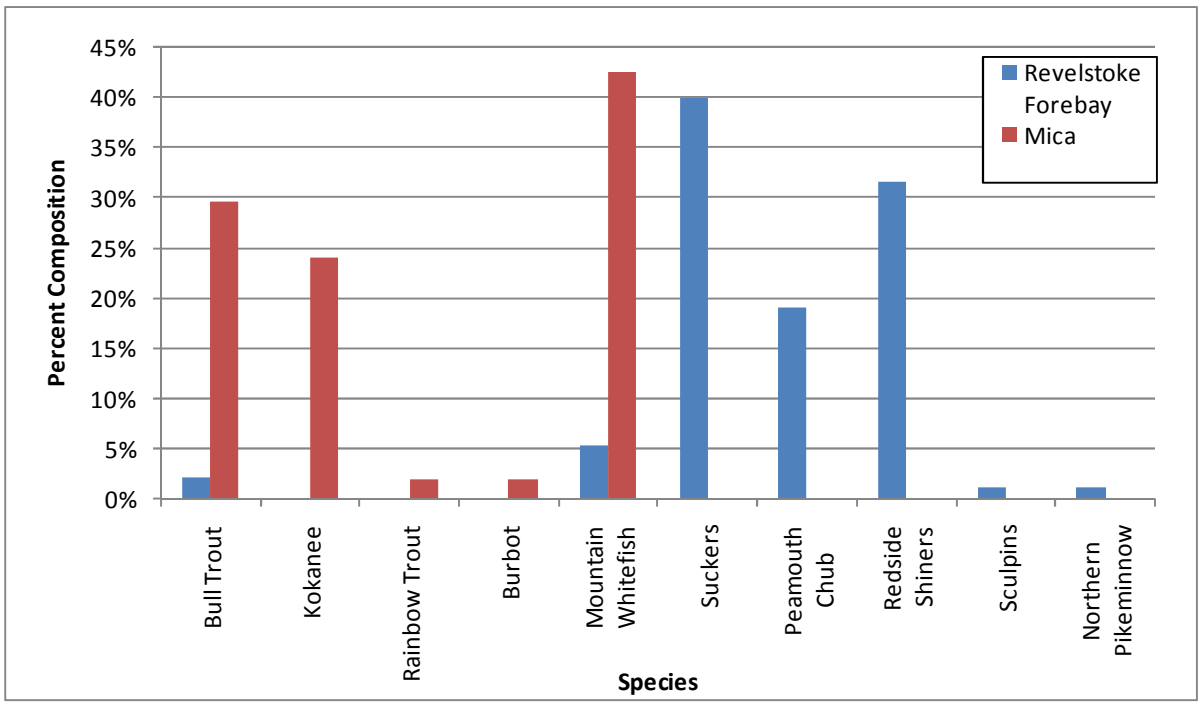

Figure 9. Comparison of species composition for Revelstoke Forebay Site and Mica Site (floating and sinking data pooled). Data from the 2010 Revelstoke Reservoir Inventory.

3.2.3.2 Comparison between 1985 and 2010 Data

Data from the Smith (1986), Fleming and Smith (1988) and Perrin (1996) were used to compare percent composition of the 10 species in the reservoir post-impoundment from 1985 to 2010. Data from Mason (1985) provides an indication of pre-impoundment conditions in 1980 (Figure 10). As outlined in section 1.2, there are differences in the sampling sites, methodology and reporting between the studies which need to be kept in mind. However, the results do indicate trends in species assemblages and relative abundances in the reservoir over time.

In regards to sport fish, Rainbow Trout composition appears to be less in 2010 than in 1985. Kokanee composition was greater in 2010 than 1985/86, even without the pelagic sampling at the Downie site. Perrin (1996) had the highest composition of Kokanee which may be due to the location of sampling within the Downie Arm (as opposed to in the reservoir adjacent to the arm) and timing of sampling overlapping the spawning period. Bull Trout composition does not appear to have changed significantly from 1985 to 2010.

Mountain Whitefish composition has changed significantly from 1985 to 2010. Pre-impoundment (1980), Mountain Whitefish composition was 97% (Mason, 1985) while in 1985, Mountain Whitefish observations were 80.7% of total fish captured. The following year it had dropped to 60% and was at 7% in 1996. In 2010, Mountain Whitefish comprised only 17.6% of the catch with the majority found in the northern end of the reservoir.

In regards to non-sport fish, suckers and Peamouth have all increased in abundance. Redside Shiners also appear to have increased in 2010 however all were caught in the floating net which might explain the absence from the 1985/1986 datasets. In addition, it is not clear from the pre-impoundment data if no non-sport fish were caught or if they simply were not reported.

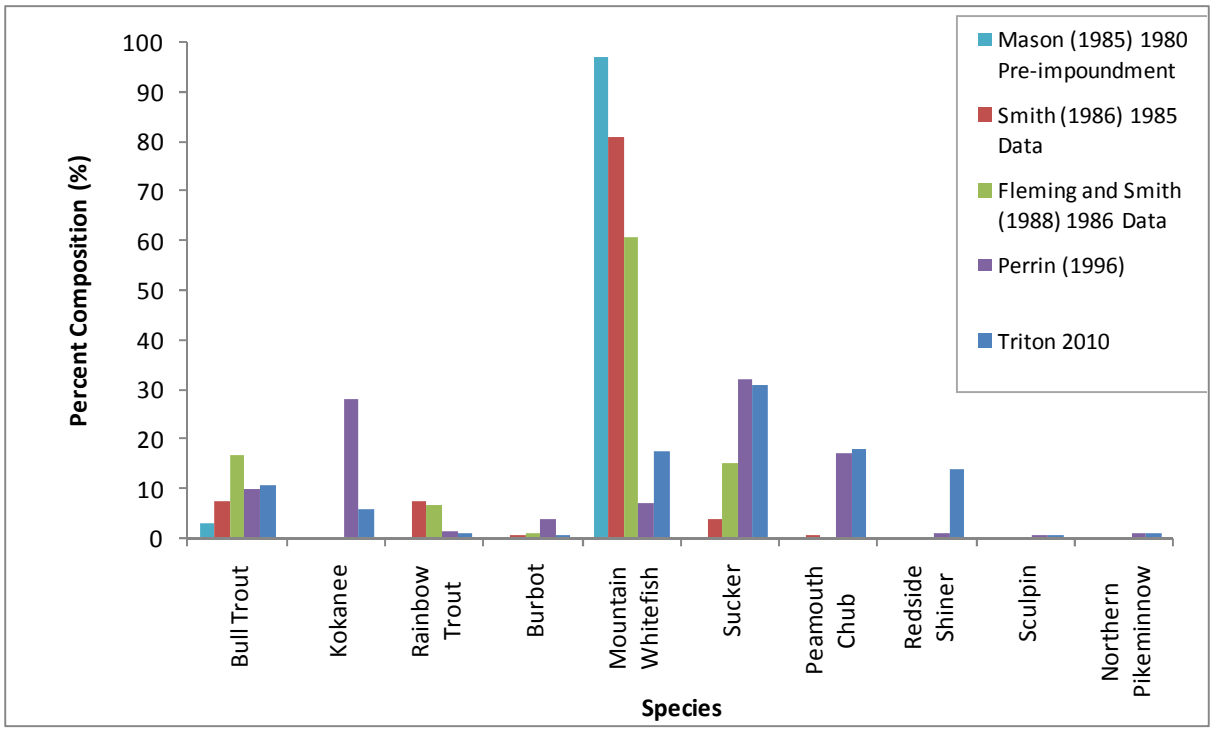

Figure 10. Comparison of percent composition of species captured in the Revelstoke Reservoir, 1980 to 2010.

In order to determine whether the trend of sport fish increasing in relative abundance at the north end of the reservoir has been observed historically, the combined percent composition of the sport fish species (i.e. Bull Trout, Rainbow Trout, Mountain Whitefish, and Kokanee) at each of the three sites were summarized (Figure 11). The results show that in 1985, sport fish distribution was relatively constant across the reservoir. In 1986, all of the sites decreased with the Mica site showing the largest decrease of approximately 30%. The 1996 data was only collected from mid reservoir but it shows the trend of decreasing sport fish abundance at that site had continued. By 2010, the relative abundance of sport fish had further decreased at the Forebay and Downie sites while the Mica site had increased substantially, this shift due to the increasing presence of non-sport fish in the mid to southern portions of the reservoir.

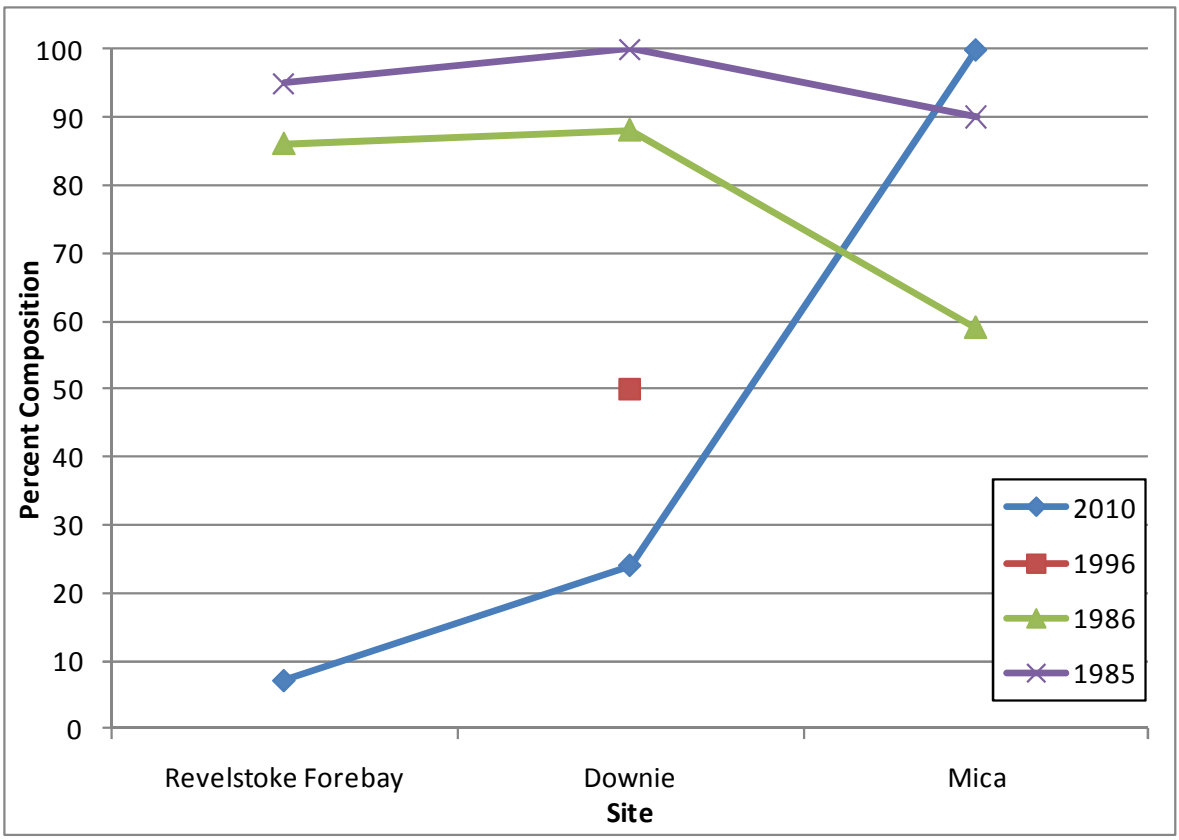

Figure 11. Percent composition of sport fish species from Revelstoke Reservoir sites in 1985 (Smith, 1986), 1986 (Fleming and Smith, 1988), 1996 (Perrin, 1996), and 2010 (Triton, 2011).

3.3 CPUE

The 2010 sampling results were used to calculate CPUE (fish/100 m^2/24 hr) for each of the three sites. At the Revelstoke Forebay site (Figure 12), suckers had the highest CPUE (7.50) followed by Redside Shiner (5.92) and Peamouth (3.55). Other species captured included Mountain Whitefish (0.99), Bull Trout (0.39), sculpins (0.20), and Northern Pikeminnow (0.20). Compared to the 1985 and 1986 data, there has been a large increase in non-sport fish CPUE, and a decrease in sport fish CPUE, particularly mountain whitefish.

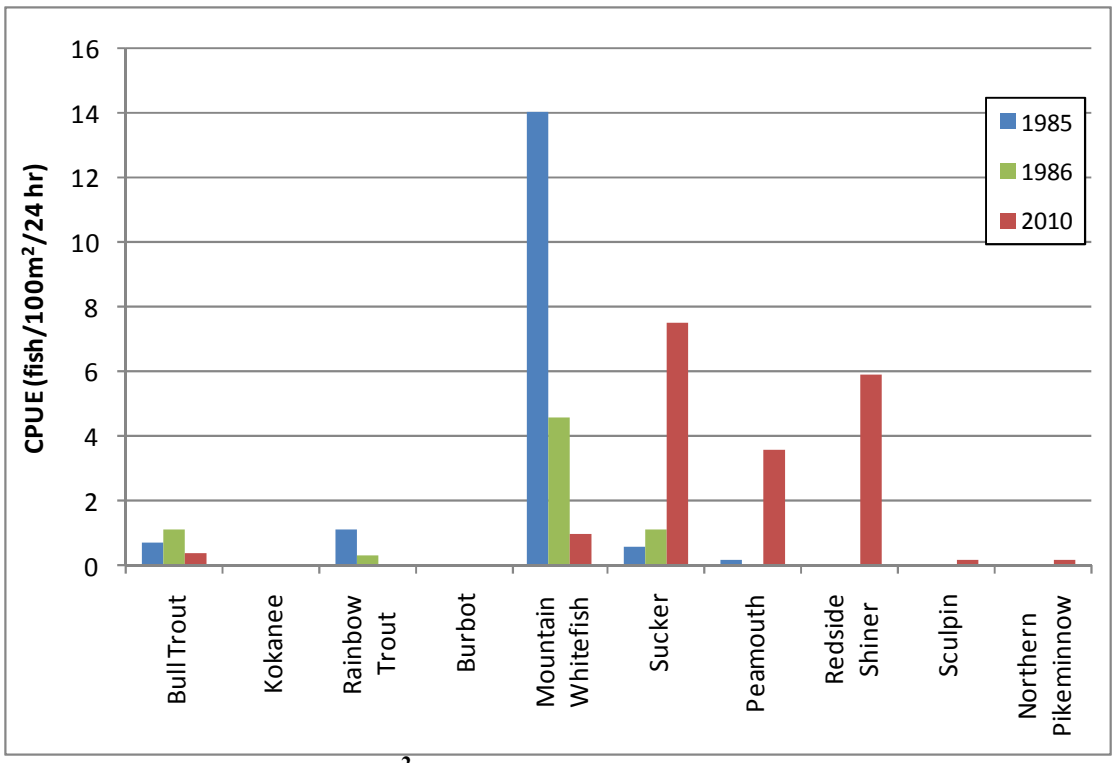

Figure 12. CPUE (fish/100m^2/24hr) at Reservoir Forebay site for species captured in 1985 (Smith, 1986), 1986 (Fleming and Smith, 1988), and 2010 (Triton, 2011).

At the Downie site (Figure 13) suckers had the highest CPUE in 2010 (20.31) followed by Peamouth (14.71), Mountain Whitefish (7.0), and Bull Trout (3.50). Rainbow Trout and Northern Pikeminnow were the only other species captured, both with CPUE of 0.70 fish/100 m^2/24 hr. Compared to 1985 and 1986, there was an increase in Bull Trout, suckers, Peamouth and Northern Pikeminnow, but a slight decrease in Rainbow Trout and Mountain Whitefish.

At the Mica site (Figure 14), Mountain Whitefish had the highest CPUE in 2010 (4.09) followed by Bull Trout (2.84) and Kokanee (2.31). Rainbow Trout and Burbot were the only other species captured, both with CPUE of 0.18 fish/100 m^2/24 hr. Compared to 1985 and 1986, there was an increase in CPUE of Bull Trout, Kokanee, and Burbot, but a decrease in rainbow trout, mountain whitefish, and suckers (Figure 14). No non-sport fish were captured at the Mica site in 2010 while suckers were the only non-sport fish captured there in 1985 and 1986.

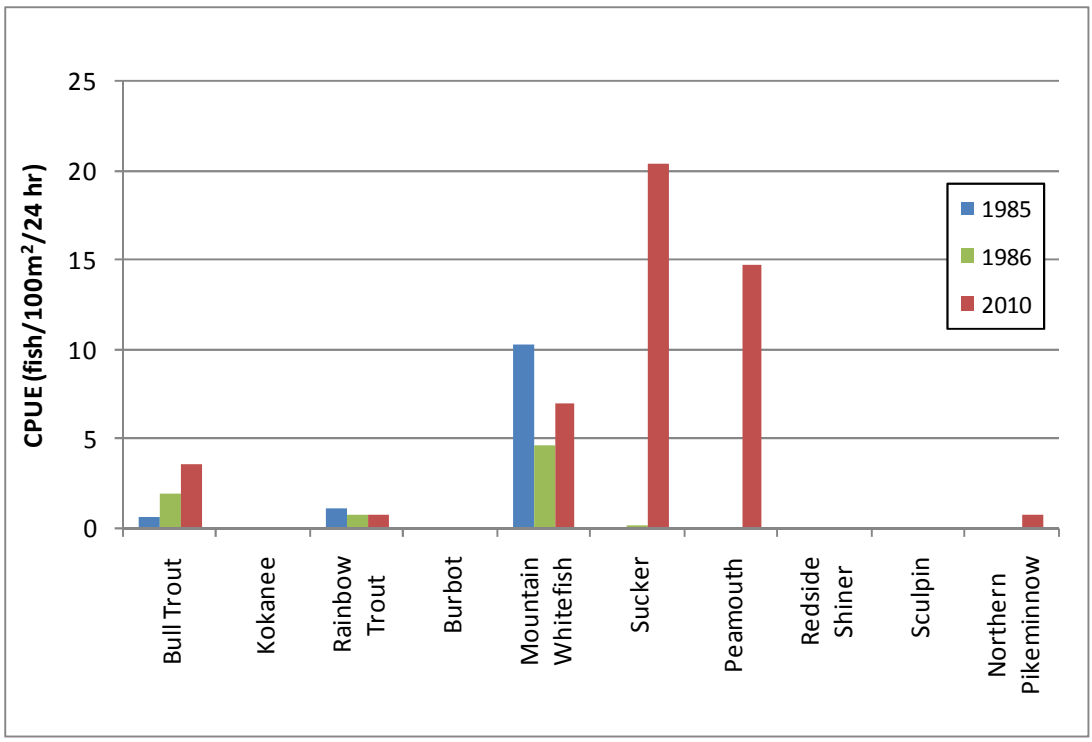

Figure 13. CPUE (fish/100m^2/24hr) at the Downie site for species captured in 1985 (Smith, 1986), 1986 (Fleming and Smith, 1988), and 2010 (Triton, 2011).

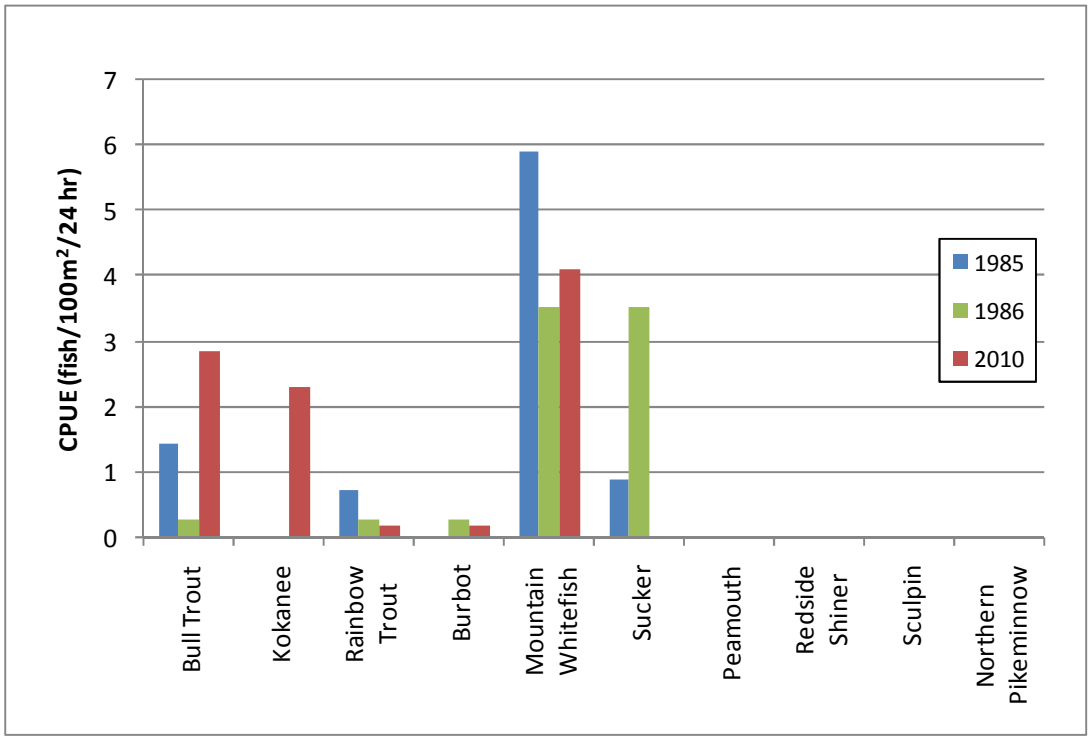

Figure 14. CPUE (fish/100m^2/24hr) at the Mica site for species captured in 1985 (Smith, 1986), 1986 (Fleming and Smith, 1988), and 2010 (Triton, 2011).

The combined CPUE results (Figure 15) show that in 2010, suckers and Peamouth had the highest CPUE overall (1.98 and 1.15, respectively) while Rainbow Trout and Northern Pikeminnow (0.06) and Burbot and sculpins (0.03) were the lowest. Compared to 1985 and 1986, all of the non-sport fish increased in CPUE while all of the sport fish, with the exception of Kokanee, decreased. Species captured in 2010 that were not captured in 1985 included Kokanee, Burbot, Reside Shiner, sculpin, and Northern Pikeminnow. Species captured in 2010 that were not captured in 1986 include Kokanee, Peamouth, Redside Shiner, sculpin and Northern Pikeminnow. For the species that were caught in all years, the largest decrease in CPUE was Mountain Whitefish (10 to 1.12 fish/100m^2/24hr) and Rainbow Trout (0.97 to 0.06 fish/100m^2/24hr). The largest increase in CPUE for fish caught in both years was Peamouth (0.06 to 1.15 fish/100m^2/24hr) and suckers (0.49 to 1.98 fish/100m^2/24hr).

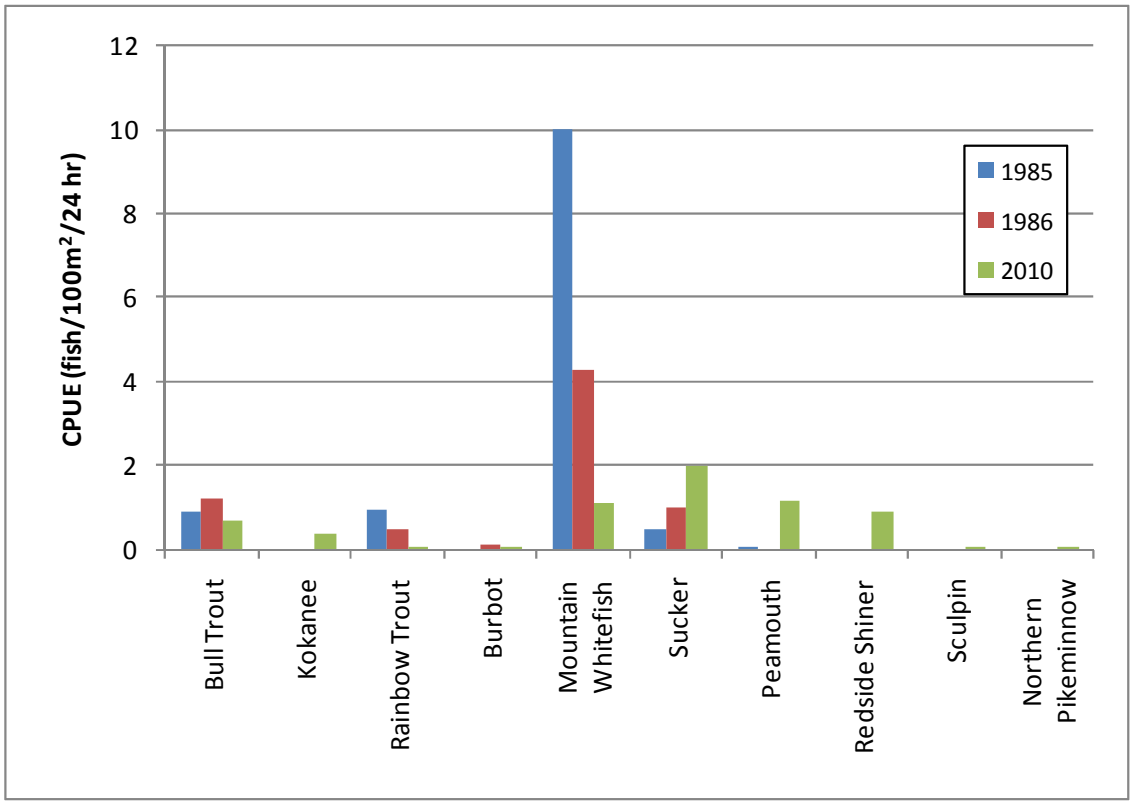

Figure 15. CPUE (fish/100m^2/24hr) at all Revelstoke reservoir sites sampled in 1985 (Smith, 1986), 1986 (Fleming and Smith, 1988), and 2010 (Triton, 2011).

4.0 Discussion

2010 gill net sampling within the Revelstoke reservoir inferred that there has been an overall increase in relative abundance of non-sport fish species to sport fish species over the age of the reservoir. This trend has been witnessed in older reservoirs in the vicinity of the Revelstoke Reservoir (Kinbasket, Upper Arrow Lake, Watshan and Brilliant Reservoirs) with a strong relationship of increasing percent of non-sport fish with reservoir age (Smith, 1986). Based on this relationship the expected percentage of coarse fish in the Revelstoke Reservoir was 61% which approximate the pooled coarse fish composition in observed 2010 (63%). One notable exception is the limited contribution of Northern Pikeminnow in the coarse fish assemblage. Smith (1986) identifies numerically dominant populations of Northern Pikeminnow in the Watshan and Brilliant Reservoir. Upper Arrow Northern Pikeminnow comprised less than 10% of the population. Only two Northern Pikeminnow were captured in the Revelstoke Reservoir in 2010. In addition based on 1985 gillnet captures Northern Pikeminnow were absent from the Kinbasket Reservoir. It is therefore unclear whether Northern Pikeminnow will follow the same trajectory as they have in other reservoirs and become a numerically dominant species in the Revelstoke Reservoir, due in part to lack of recruitment into the reservoir from either upstream or downstream direction. In addition to differences in recruitment potential from upstream, other factors that likely influence fish assemblages that could vary between the reservoirs include physical habitat conditions, productivity, and availability of critical habitats such as spawning areas.

Relative Bull Trout CPUE was similar to earlier data however Mountain Whitefish and Rainbow Trout abundance has decreased. The relative abundance of suckers and other non-sport fish have increased supporting the hypothesis that species composition would shift towards non-sport fish species with reservoir age (Smith, 1986).

It was observed that species assemblages also varied spatially within the reservoir. In particular the 2010 gill net data suggest a shift from sport fish dominated assemblages in the north (Mica) to non-sport fish dominated assemblages in the south (Revelstoke Forebay) and the mid reservoir site (Downie) somewhat intermediary in distribution of sport and non-sport fish. These differences may be related to the spatial shift in thermal conditions in the reservoir. The northern site has a thermal regime established by hypolimnetic releases from the Kinbasket Reservoir. Cooler water temperatures persist for a distance down the reservoir which provides preferred conditions for sport fish. Alternatively, the Revelstoke Forebay had strong thermal stratification and relatively warm surface temperatures of 19°C. These conditions would be considered less favourable for sport fish but suitable for non-sport species. The thermal stratification at mid-reservoir (Downie) was not strong but surface temperatures were similar to the southern sample site (19°C), resulting in a mixed assemblage.

Of note, hydroacoustic surveys over the last two decades have found that Kokanee are by far the most numerically abundant fish species and largest biomass in the Revelstoke Reservoir, which was not reflected in this inventory.

5.0 References

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APPENDIX 1

FIELD DATA

2010 Revelstoke Reservoir Fish Data

Site No.	Location	Capture Method	Species	Fish Length (mm)	Fish Weight (g)	Sex	Age* Fin Rays/ Scales	Age Otoliths
Forebay	2 km N of Dam	GN (Sink)	MW	290.0	280.0	M		
Forebay	2 km N of Dam	GN (Sink)	MW	320.0	402.0	F		
Forebay	2 km N of Dam	GN (Sink)	MW	280.0	298.0	M		
Forebay	2 km N of Dam	GN (Sink)	MW	249.0	164.0	F		
Forebay	2 km N of Dam	GN (Sink)	BT	239.0	151.0	Im		
Forebay	2 km N of Dam	GN (Sink)	BT	254.0	157.0	Im		
Forebay	2 km N of Dam	GN (Sink)	LSU	300.0	334.0			
Forebay	2 km N of Dam	GN (Sink)	LSU	280.0	257.0			
Forebay	2 km N of Dam	GN (Sink)	LSU	290.0	260.0			
Forebay	2 km N of Dam	GN (Sink)	LSU	260.0	240.0			
Forebay	2 km N of Dam	GN (Sink)	LSU	250.0	209.0			
Forebay	2 km N of Dam	GN (Sink)	LSU	400.0	787.0			
Forebay	2 km N of Dam	GN (Sink)	LSU	170.0	58.0			
Forebay	2 km N of Dam	GN (Sink)	LSU	173.0	57.0			
Forebay	2 km N of Dam	GN (Sink)	LSU	210.0	114.0			
Forebay	2 km N of Dam	GN (Sink)	LSU	250.0	190.0			
Forebay	2 km N of Dam	GN (Sink)	LSU	225.0	134.0			
Forebay	2 km N of Dam	GN (Sink)	LSU	216.0	146.0			
Forebay	2 km N of Dam	GN (Sink)	LSU	198.0	105.0			
Forebay	2 km N of Dam	GN (Sink)	LSU	315.0	386.0			
Forebay	2 km N of Dam	GN (Sink)	LSU	327.0	440.0			
Forebay	2 km N of Dam	GN (Sink)	LSU	248.0	159.0			
Forebay	2 km N of Dam	GN (Sink)	LSU	215.0	114.0			
Forebay	2 km N of Dam	GN (Sink)	LSU	180.0	63.0			

2010 Revelstoke Reservoir Fish Data

Site No.	Location	Capture Method	Species	Fish Length (mm)	Fish Weight (g)	Sex	Age* Fin Rays/ Scales	Age Otoliths
Forebay	2 km N of Dam	GN (Sink)	LSU	310.0	376.0			
Forebay	2 km N of Dam	GN (Sink)	LSU	239.0	156.0			
Forebay	2 km N of Dam	GN (Sink)	LSU	125.0	22.0			
Forebay	2 km N of Dam	GN (Sink)	LSU	210.0	119.0			
Forebay	2 km N of Dam	GN (Sink)	LSU	229.0	157.3			
Forebay	2 km N of Dam	GN (Sink)	LSU	210.0	121.0			
Forebay	2 km N of Dam	GN (Sink)	LSU	225.0	125.0			
Forebay	2 km N of Dam	GN (Sink)	LSU	286.0	284.0			
Forebay	2 km N of Dam	GN (Sink)	LSU	214.0	121.0			
Forebay	2 km N of Dam	GN (Sink)	LSU	160.0	45.4			
Forebay	2 km N of Dam	GN (Sink)	LSU					
Forebay	2 km N of Dam	GN (Sink)	LSU					
Forebay	2 km N of Dam	GN (Sink)	LSU					
Forebay	2 km N of Dam	GN (Sink)	LSU					
Forebay	2 km N of Dam	GN (Sink)	LSU					
Forebay	2 km N of Dam	GN (Sink)	LSU					
Forebay	2 km N of Dam	GN (Sink)	LSU					
Forebay	2 km N of Dam	GN (Sink)	PMC	205.0	103.0			
Forebay	2 km N of Dam	GN (Sink)	PMC	200.0	95.0			
Forebay	2 km N of Dam	GN (Sink)	PMC	190.0	78.0			
Forebay	2 km N of Dam	GN (Sink)	PMC	210.0	99.0			
Forebay	2 km N of Dam	GN (Sink)	PMC	210.0	99.0			
Forebay	2 km N of Dam	GN (Sink)	PMC	210.0	99.0			
Forebay	2 km N of Dam	GN (Sink)	PMC	213.0	109.0			
Forebay	2 km N of Dam	GN (Sink)	PMC	228.0	145.0			

2010 Revelstoke Reservoir Fish Data

Site No.	Location	Capture Method	Species	Fish Length (mm)	Fish Weight (g)	Sex	Age* Fin Rays/ Scales	Age Otoliths
Forebay	2 km N of Dam	GN (Sink)	PMC	193.0	88.0			
Forebay	2 km N of Dam	GN (Sink)	PMC	200.0	94.0			
Forebay	2 km N of Dam	GN (Sink)	PMC	169.0	59.0			
Forebay	2 km N of Dam	GN (Sink)	PMC	245.0	142.0			
Forebay	2 km N of Dam	GN (Sink)	NPC	183.0	58.0			
Forebay	2 km N of Dam	GN (Sink)	CAS	101.0	12.4			
Forebay	2 km N of Dam	GN (Float)	MW					
Forebay	2 km N of Dam	GN (Float)	LSU	310.0	354.0			
Forebay	2 km N of Dam	GN (Float)	LSU	320.0	328.0			
Forebay	2 km N of Dam	GN (Float)	LSU	240.0	162.0			
Forebay	2 km N of Dam	GN (Float)	PMC	235.0	155.0			
Forebay	2 km N of Dam	GN (Float)	PMC	215.0	115.0			
Forebay	2 km N of Dam	GN (Float)	PMC	217.0	113.0			
Forebay	2 km N of Dam	GN (Float)	PMC	215.0	129.0			
Forebay	2 km N of Dam	GN (Float)	PMC	224.0	162.0			
Forebay	2 km N of Dam	GN (Float)	PMC	225.0	142.0			
Forebay	2 km N of Dam	GN (Float)	RSS	100.0	12.4			
Forebay	2 km N of Dam	GN (Float)	RSS	96.0	12.1			
Forebay	2 km N of Dam	GN (Float)	RSS	94.0	10.7			
Forebay	2 km N of Dam	GN (Float)	RSS	96.0	11.4			
Forebay	2 km N of Dam	GN (Float)	RSS	94.0	12.3			
Forebay	2 km N of Dam	GN (Float)	RSS	93.0	11.3			
Forebay	2 km N of Dam	GN (Float)	RSS	100.0	14.3			
Forebay	2 km N of Dam	GN (Float)	RSS	104.0	14.7			
Forebay	2 km N of Dam	GN (Float)	RSS	93.0	9.9			

2010 Revelstoke Reservoir Fish Data

Site No.	Location	Capture Method	Species	Fish Length (mm)	Fish Weight (g)	Sex	Age* Fin Rays/ Scales	Age Otoliths
Forebay	2 km N of Dam	GN (Float)	RSS	96.0	11.3			
Forebay	2 km N of Dam	GN (Float)	RSS	105.0	12.7			
Forebay	2 km N of Dam	GN (Float)	RSS	102.0	12.7			
Forebay	2 km N of Dam	GN (Float)	RSS	96.0	11.9			
Forebay	2 km N of Dam	GN (Float)	RSS	90.0	9.9			
Forebay	2 km N of Dam	GN (Float)	RSS	95.0	10.9			
Forebay	2 km N of Dam	GN (Float)	RSS					
Forebay	2 km N of Dam	GN (Float)	RSS					
Forebay	2 km N of Dam	GN (Float)	RSS					
Forebay	2 km N of Dam	GN (Float)	RSS					
Forebay	2 km N of Dam	GN (Float)	RSS					
Forebay	2 km N of Dam	GN (Float)	RSS					
Forebay	2 km N of Dam	GN (Float)	RSS					
Forebay	2 km N of Dam	GN (Float)	RSS					
Forebay	2 km N of Dam	GN (Float)	RSS					
Forebay	2 km N of Dam	GN (Float)	RSS					
Forebay	2 km N of Dam	GN (Float)	RSS					
Forebay	2 km N of Dam	GN (Float)	RSS					
Forebay	2 km N of Dam	GN (Float)	RSS					
Forebay	2 km N of Dam	GN (Float)	RSS					
Forebay	2 km N of Dam	GN (Float)	RSS					
Mica	Top Site	GN (Float)	BT	370.0	421.0		2+	
Mica	Top Site	GN (Float)	BT	440.0	789.0		4+	
Mica	Top Site	GN (Float)	BT	470.0	1159.0	M	3+	7
Mica	Top Site	GN (Float)	KO	240.0	153.0	M	3+	
Mica	Top Site	GN (Float)	KO	245.0	156.0	F	2+	
Mica	Top Site	GN (Float)	KO	250.0	177.0	F	3+	
Mica	Top Site	GN (Float)	KO	250.0	178.0	F	3+	

2010 Revelstoke Reservoir Fish Data

Site No.	Location	Capture Method	Species	Fish Length (mm)	Fish Weight (g)	Sex	Age* Fin Rays/ Scales	Age Otoliths
Mica	Top Site	GN (Float)	KO	270.0	247.0		3+	
Mica	Top Site	GN (Float)	KO	275.0	265.0	M	2+	
Mica	Top Site	GN (Float)	KO	285.0	263.0	M	3+	
Mica	Top Site	GN (Float)	KO	290.0	271.0	M	2+	
Mica	Top Site	GN (Float)	KO	290.0	250.0	F	2+	
Mica	Top Site	GN (Float)	KO	298.0	271.0		2+	
Mica	Top Site	GN (Float)	KO	300.0	308.0		2+	
Mica	Top Site	GN (Float)	KO	300.0	286.0	M	2+	
Mica	Top Site	GN (Float)	KO	320.0	300.0		2+	
Mica	Top Site	GN (Float)	RB	280.0	234.0	M	3+	
Mica	Top Site	GN (Sink)	BT	350.0	432.0		2+	
Mica	Top Site	GN (Sink)	BT	365.0	480.0		2+	
Mica	Top Site	GN (Sink)	BT	320.0	325.0		3	
Mica	Top Site	GN (Sink)	BT	340.0	401.0		1+	
Mica	Top Site	GN (Sink)	BT	400.0	804.0		3+	
Mica	Top Site	GN (Sink)	BT	510.0	1435.0	M	4+	5
Mica	Top Site	GN (Sink)	BT	420.0	687.0			
Mica	Top Site	GN (Sink)	BT	450.0	1114.0	M	4+	
Mica	Top Site	GN (Sink)	BT	340.0	387.0	F	2+	
Mica	Top Site	GN (Sink)	BT	510.0	1462.0	M	7+	7
Mica	Top Site	GN (Sink)	BT	265.0	179.0	IMM	2	
Mica	Top Site	GN (Sink)	BT	285.0	258.0	IMM	3	
Mica	Top Site	GN (Sink)	BT	270.0	185.0	IMM	2	
Mica	Top Site	GN (Sink)	BB	460.0	490.0	M	10	
Mica	Top Site	GN (Sink)	MW	185.0	65.0			
Mica	Top Site	GN (Sink)	MW	200.0	79.0	IMM		
Mica	Top Site	GN (Sink)	MW	280.0	258.0	M		
Mica	Top Site	GN (Sink)	MW	315.0	412.0	F		
Mica	Top Site	GN (Sink)	MW	270.0	259.0	F		
Mica	Top Site	GN (Sink)	MW	285.0	290.0	M		
Mica	Top Site	GN (Sink)	MW	270.0	257.0	M		
Mica	Top Site	GN (Sink)	MW	300.0	355.0	F		
Mica	Top Site	GN (Sink)	MW	270.0	274.0	M		
Mica	Top Site	GN (Sink)	MW	330.0	381.0	M		
Mica	Top Site	GN (Sink)	MW	275.0	284.0	M		
Mica	Top Site	GN (Sink)	MW	300.0	283.0	F		
Mica	Top Site	GN (Sink)	MW	270.0	217.0	M		
Mica	Top Site	GN (Sink)	MW	310.0	353.0	M		
Mica	Top Site	GN (Sink)	MW	350.0	445.0	M		
Mica	Top Site	GN (Sink)	MW	225.0	116.0	F		
Mica	Top Site	GN (Sink)	MW	280.0	242.0	F		
Mica	Top Site	GN (Sink)	MW	300.0	360.0	F		
Mica	Top Site	GN (Sink)	MW	310.0	302.0	M		
Mica	Top Site	GN (Sink)	MW	190.0	720.0	IMM		

2010 Revelstoke Reservoir Fish Data

Site No.	Location	Capture Method	Species	Fish Length (mm)	Fish Weight (g)	Sex	Age* Fin Rays/ Scales	Age Otoliths
Mica	Top Site	GN (Sink)	MW	170.0	56.0	IMM		
Mica	Top Site	GN (Sink)	MW	135.0	31.0	IMM		
Mica	Top Site	GN (Sink)	MW	130.0	27.0	IMM		
Downie	Mid Lake	GN (Sink)	BT	185.0	66.0	IMM	2	
Downie	Mid Lake	GN (Sink)	BT	195.0	81.0	IMM	2	
Downie	Mid Lake	GN (Sink)	BT	250.0	152.0	IMM	2	
Downie	Mid Lake	GN (Sink)	BT	255.0	157.0	IMM	3	
Downie	Mid Lake	GN (Sink)	BT	300.0	235.0	F	4	
Downie	Mid Lake	GN (Sink)	LSU	165.0	50.0	IMM		
Downie	Mid Lake	GN (Sink)	LSU	175.0	56.0	IMM		
Downie	Mid Lake	GN (Sink)	LSU	215.0	109.0	IMM		
Downie	Mid Lake	GN (Sink)	LSU	225.0	117.0	IMM		
Downie	Mid Lake	GN (Sink)	LSU	270.0	226.0	M		
Downie	Mid Lake	GN (Sink)	LSU	280.0	236.0	M		
Downie	Mid Lake	GN (Sink)	LSU	285.0	238.0	M		
Downie	Mid Lake	GN (Sink)	LSU	295.0	284.0	M		
Downie	Mid Lake	GN (Sink)	LSU	295.0	280.0	F		
Downie	Mid Lake	GN (Sink)	LSU	305.0	328.0	M		
Downie	Mid Lake	GN (Sink)	LSU	325.0	395.0	F		
Downie	Mid Lake	GN (Sink)	LSU	330.0	436.0	M		
Downie	Mid Lake	GN (Sink)	LSU	405.0	957.0			
Downie	Mid Lake	GN (Sink)	LSU	420.0	881.0			
Downie	Mid Lake	GN (Sink)	LSU					
Downie	Mid Lake	GN (Sink)	LSU					
Downie	Mid Lake	GN (Sink)	LSU					
Downie	Mid Lake	GN (Sink)	LSU					
Downie	Mid Lake	GN (Sink)	LSU					
Downie	Mid Lake	GN (Sink)	LSU					
Downie	Mid Lake	GN (Sink)	LSU					
Downie	Mid Lake	GN (Sink)	LSU					
Downie	Mid Lake	GN (Sink)	LSU					
Downie	Mid Lake	GN (Sink)	LSU					
Downie	Mid Lake	GN (Sink)	LSU					
Downie	Mid Lake	GN (Sink)	LSU					
Downie	Mid Lake	GN (Sink)	LSU					
Downie	Mid Lake	GN (Sink)	LSU					
Downie	Mid Lake	GN (Sink)	LSU					
Downie	Mid Lake	GN (Sink)	MW	185.0	67.0	IMM		
Downie	Mid Lake	GN (Sink)	MW	185.0	66.0	IMM		
Downie	Mid Lake	GN (Sink)	MW	190.0	77.0	M		
Downie	Mid Lake	GN (Sink)	MW	220.0	91.0	M		
Downie	Mid Lake	GN (Sink)	MW	225.0	126.0	F		
Downie	Mid Lake	GN (Sink)	MW	225.0	129.0	M		
Downie	Mid Lake	GN (Sink)	MW	225.0	117.0	M		

2010 Revelstoke Reservoir Fish Data

Site No.	Location	Capture Method	Species	Fish Length (mm)	Fish Weight (g)	Sex	Age* Fin Rays/ Scales	Age Otoliths
Downie	Mid Lake	GN (Sink)	MW	225.0	110.0	M		
Downie	Mid Lake	GN (Sink)	MW	275.0	215.0	F		
Downie	Mid Lake	GN (Sink)	MW	290.0	298.0	M		
Downie	Mid Lake	GN (Sink)	NPM	305.0	359.0	M		
Downie	Mid Lake	GN (Sink)	PMC	190.0	73.0	IMM		
Downie	Mid Lake	GN (Sink)	PMC	190.0	80.0			
Downie	Mid Lake	GN (Sink)	PMC	200.0	103.0	M		
Downie	Mid Lake	GN (Sink)	PMC	210.0	105.0	M		
Downie	Mid Lake	GN (Sink)	PMC	210.0	117.0	F		
Downie	Mid Lake	GN (Sink)	PMC	210.0	117.0	F		
Downie	Mid Lake	GN (Sink)	PMC	215.0	97.0	IMM		
Downie	Mid Lake	GN (Sink)	PMC	220.0	100.0			
Downie	Mid Lake	GN (Sink)	PMC	225.0	127.0	IMM		
Downie	Mid Lake	GN (Sink)	PMC	225.0	127.0	M		
Downie	Mid Lake	GN (Sink)	PMC	235.0	145.0	F		
Downie	Mid Lake	GN (Sink)	PMC	240.0	157.0	M		
Downie	Mid Lake	GN (Sink)	PMC	240.0	149.0	F		
Downie	Mid Lake	GN (Sink)	PMC	245.0	150.0	M		
Downie	Mid Lake	GN (Sink)	PMC	250.0	173.0	F		
Downie	Mid Lake	GN (Sink)	PMC					
Downie	Mid Lake	GN (Sink)	PMC					
Downie	Mid Lake	GN (Sink)	PMC					
Downie	Mid Lake	GN (Sink)	PMC					
Downie	Mid Lake	GN (Sink)	PMC					
Downie	Mid Lake	GN (Sink)	PMC					
Downie	Mid Lake	GN (Sink)	RB	340.0	511.0	F		

* Ages denoted with a "+" are unresolved. Ether scales were resorbed in Kokanee due to proximity to spawning timing, or for Fin Rays in bull trout no nucleus was found.

APPENDIX 2

PHOTO LOG

Photo 1. Site 1 Sinking net- Lower Site. Bull Trout. Aug 18 2010(Photo ID 9392)

Photo 2. Site 1 Sinking net- Lower Site Bull Trout Aug 18 2010 (Photo ID 9394)

Photo 3. Site 2 Floating net –Upper Site Bull Trout Aug 18 2010 (Photo ID 9416)

Photo 4. Site 2 Floating net – Upper Site Bull Trout Aug 18 2010 (Photo 9418)

Photo 5. Site 2 Floating net –Upper Site Bull Trout Aug 18 2010 (Photo ID 9419)

Photo 6. Site 2 Floating net – Upper Site Rainbow Trout Aug 18 2010 (Photo ID 9420)

Photo 7. Site2 Floating net –Upper Site Kokanee Aug 18 2010 (Photo ID 9421)

Photo 8. Site 2 Floating net – Upper Site Kokanee Aug 18 2010 (Photo ID 9422)

Photo 9. Site 2 Floating net – Upper Site Kokanee Aug 18 2010 (Photo ID 9423)

Photo 10. Site 2 Floating net – Upper Site Kokanee Aug 18 2010 (Photo ID 9424)

Photo 11. Site 2 Floating net – Upper Site Kokanee Aug 18 2010 (Photo ID 9425)

Photo 12. Site 2 Floating net – Upper Site Kokanee Aug 18 2010 (Photo ID 9426)

Photo 13. Site 2 Floating net – Upper Site Kokanee Aug 18 2010 (Photo ID 9427)

Photo 14. Site 2 Floating net – Upper Site Kokanee Aug 18 2010 (Photo ID 9428)

Photo 15. Site 2 Floating net – Upper Site Kokanee Aug 18 2010 (Photo ID 9429)

Photo 16. Site 2 Sinking net – Upper Site Kokanee Aug 18 2010 (Photo ID 9430)

Photo 17. Site 2 Sinking net – Upper Site Bull Trout Aug 18 2010 (Photo ID 9431)

Photo 18. Site 2 Sinking net – Upper Site Bull Trout Aug 18 2010 (Photo ID 9432)

Photo 19. Site 2 Sinking net – Upper Site Bull Trout Aug 18 2010 (Photo ID 9433)

Photo 20. Site 2 Sinking net – Upper Site Bull Trout Aug 18 2010 (Photo ID 9434)

Photo 21. Site 2 Sinking net – Upper Site Bull Trout Aug 18 2010 (Photo ID 9435)

Photo 22. Site 2 Sinking net – Upper Site Bull Trout Aug 18 2010 (Photo ID 9439)

Photo 23. Site 2 Sinking net – Upper Site Bull Trout Aug 18 2010 (Photo ID 9436)

Photo 24. Site 2 Sinking net – Upper Site Bull Trout Aug 18 2010 (Photo ID 9437)

Photo 25. Site 2 Sinking net – Upper Site Bull Trout Aug 18 2010 (Photo ID 9440)

Photo 26. Site 2 Sinking net – Upper Site Bull Trout Aug 18 2010 (Photo ID 9441)

Photo 27. Site 2 Sinking net – Upper Site Bull Trout Aug 18 2010 (Photo ID 9442)

Photo 28. Site 2 Sinking net – Upper Site Bull Trout Aug 18 2010 (Photo ID 9443)

Photo 29. Site 2 Sinking net – Upper Site Burbot Aug 18 2010 (Photo ID 9444)

Photo 30. Site 2 Sinking net – Upper Site Mountain Whitefish Aug 18 2010 (Photo ID 9445)

Photo 31. Site 2 Sinking net – Upper Site Mountain Whitefish Aug 18 2010 (Photo ID 9446)

Photo 32. Site 2 Sinking net – Upper Site Mountain Whitefish Aug 18 2010 (Photo ID 9447)

Photo 33. Site 2 Sinking net – Upper Site Mountain Whitefish Aug 18 2010 (Photo ID 9448)

Photo 34. Site 2 Sinking net – Upper Site Mountain Whitefish Aug 18 2010 (Photo ID 9449)

Photo 35. Site 2 Sinking net – Upper Site Mountain Whitefish Aug 18 2010 (Photo ID 9450)

Photo 36. Site 2 Sinking net – Upper Site Mountain Whitefish Aug 18 2010 (Photo ID 9451)

Photo 37. Site 2 Sinking net – Upper Site Mountain Whitefish Aug 18 2010 (Photo ID 9452)

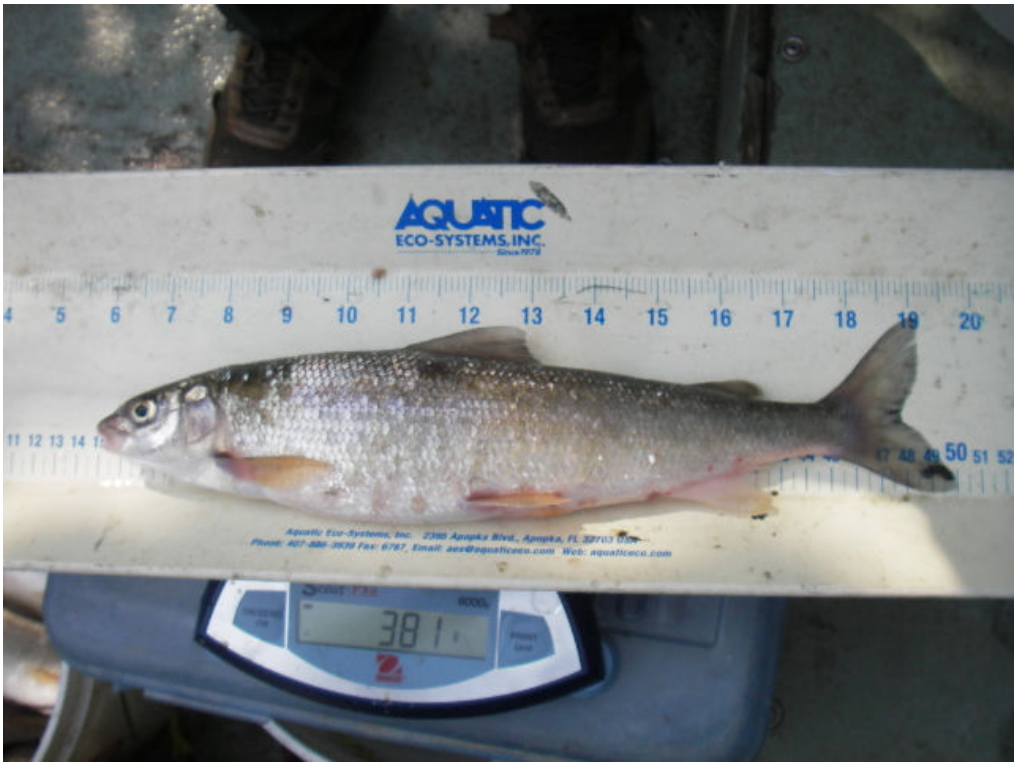

Photo 38. Site 2 Sinking net – Upper Site Mountain Whitefish Aug 18 2010 (Photo ID 9453)

Photo 39. Site 2 Sinking net – Upper Site Mountain Whitefish Aug 18 2010 (Photo ID 9454)

Photo 40. Site 2 Sinking net – Upper Site Mountain Whitefish Aug 18 2010 (Photo ID 9455)

Photo 41. Site 2 Sinking net – Upper Site Mountain Whitefish Aug 18 2010 (Photo ID 9456)

Photo 42. Site 2 Sinking net – Upper Site Mountain Whitefish Aug 18 2010 (Photo ID 9457)

Photo 43. Site 2 Sinking net – Upper Site Mountain Whitefish Aug 18 2010 (Photo ID 9458)

Photo 44. Site 2 Sinking net – Upper Site Mountain Whitefish Aug 18 2010 (Photo ID 9459)

Photo 45. Site 2 Sinking net – Upper Site Mountain Whitefish Aug 18 2010 (Photo ID 9460)

Photo 46. Site 2 Sinking net – Upper Site Mountain Whitefish Aug 18 2010 (Photo ID 9461)

Photo 47. Site 2 Sinking net – Upper Site Mountain Whitefish Aug 18 2010 (Photo ID 9462)

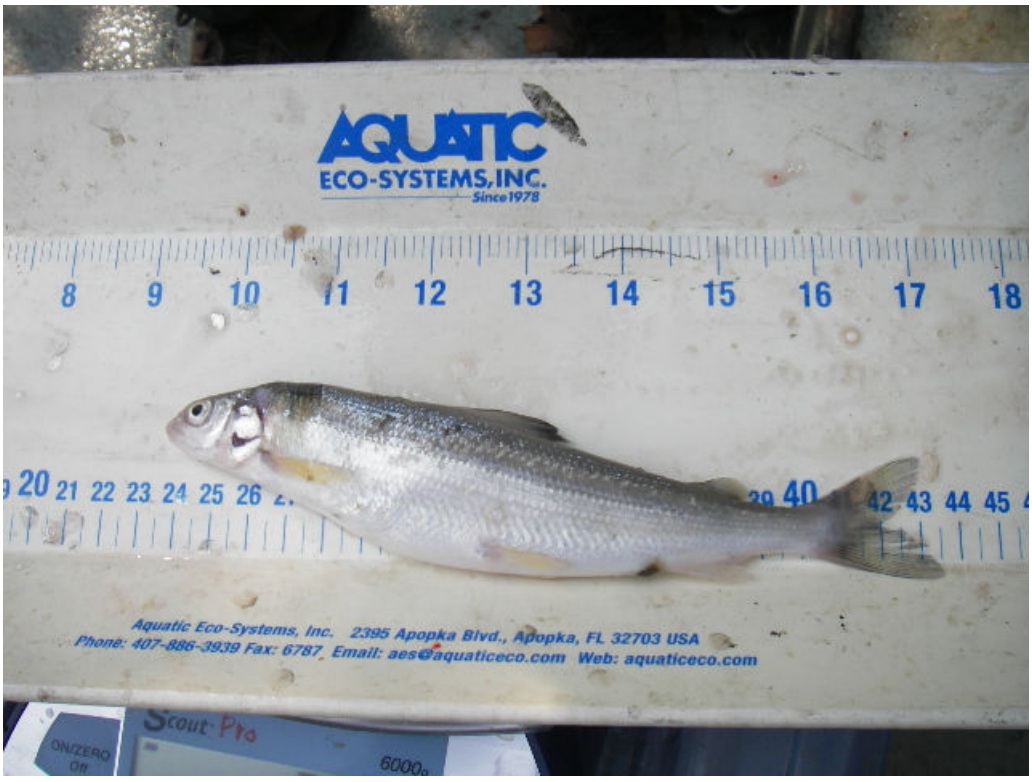

Photo 48. Site 2 Sinking net – Upper Site Mountain Whitefish Aug 18 2010 (Photo ID 9463)

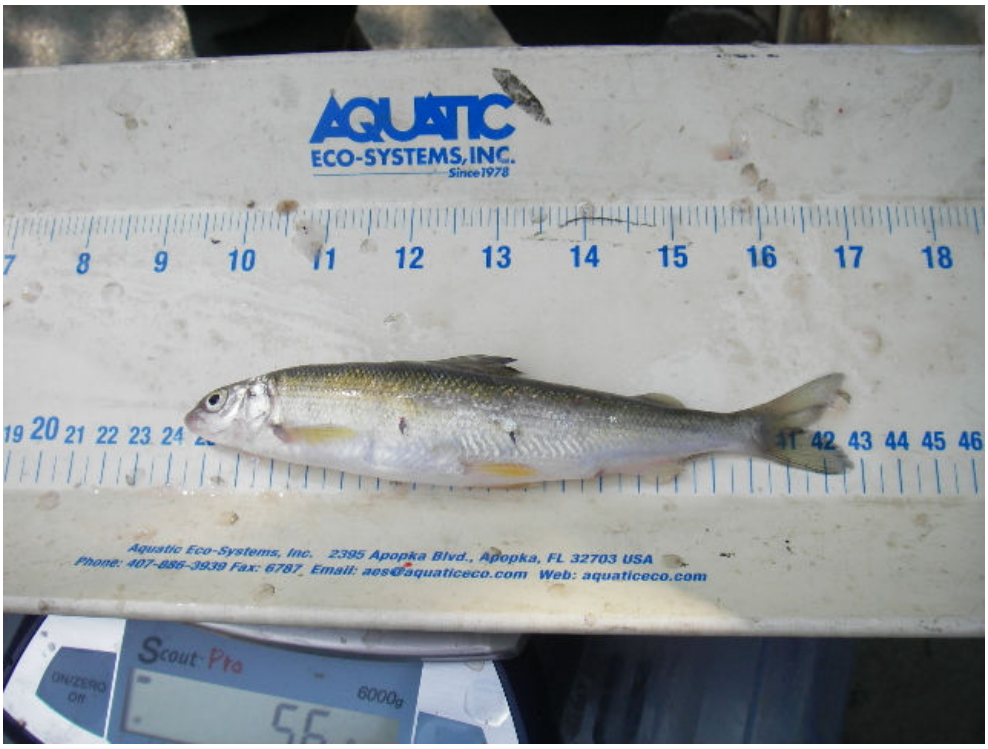

Photo 49. Site 2 Sinking net – Upper Site Mountain Whitefish Aug 18 2010 (Photo ID 9464)

Photo 50. Site 2 Sinking net – Upper Site Mountain Whitefish Aug 18 2010 (Photo ID 9465)

Photo 51. Site 2 Sinking net – Upper Site Mountain Whitefish Aug 18 2010 (Photo ID 9466)

Photo 52. Site 3 Sinking net – Middle Site Rainbow Trout Aug 19 2010 (Photo ID 9476)

Photo 53. Site 3 Sinking net – Middle Site Bull Trout Aug 19 2010 (Photo ID 9477)

Photo 54. Site 3 Sinking net – Middle Site Bull Trout Aug 19 2010 (Photo ID 9478)

Photo 55. Site 3 Sinking net – Middle Site Bull Trout Aug 19 2010 (Photo ID 9479)

Photo 56. Site 3 Sinking net – Middle Site Bull Trout Aug 19 2010 (Photo ID 9480)

Photo 57. Site 3 Sinking net –Middle Site Bull Trout Aug 19 2010 (Photo ID 9481)

Photo 58. Site 3 Sinking net – Middle Site Mountain Whitefish Aug 19 2010 (Photo ID 9482)

Photo 59. Site 3 Sinking net – Middle Site Mountain Whitefish Aug 19 2010 (Photo ID 9483)

Photo 60. Site 3 Sinking net –Middle Site Mountain Whitefish Aug 19 2010 (Photo ID 9484)

Photo 61. Site 3 Sinking net – Middle Site Mountain Whitefish Aug 19 2010 (Photo ID 9485)

Photo 62. Site 3 Sinking net – Middle Site Mountain Whitefish Aug 18 2010 (Photo ID 9486)

Photo 63. Site 3 Sinking net – Middle Site Mountain Whitefish Aug 18 2010 (Photo ID 9487)

Photo 64. Site 3 Sinking net – Middle Site Mountain Whitefish Aug 18 2010 (Photo ID 9488)

Photo 65. Site 3 Sinking net – Middle Site Mountain Whitefish Aug 18 2010 (Photo ID 9489)

Photo 66. Site 3 Sinking net – Middle Site Mountain Whitefish Aug 18 2010 (Photo ID 9490)

Photo 67. Site 3 Sinking net – Middle Site Mountain Whitefish Aug 18 2010 (Photo ID 9491)