Campbell River Project Water Use Plan

Upper and Lower Campbell and John Hart Reservoirs Survey

Implementation Year 2

Reference: JHTMON-2

Upper Campbell, Lower Campbell and John Hart Reservoirs and Elk Canyon Public Use and Perception Survey

Study Period: 2015/2016

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Down to Earth Biology

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EXECUTIVE SUMMARY

The Upper and Lower Campbell and John Hart Reservoirs and Elk Canyon Public Use and Perceptions Study (JHTMON 2) is a 10-year study that will monitor the use and perceptions of recreational users of the Campbell River Reservoir system. This project forms part of the Campbell River Water Use Plan and aims to monitor a selection of performance measures in order to evaluate public use and perceptions.

The study tools and methods were developed over the course of the first year (2014/2015). The first year of sampling was completed between August 2015 and July 2016, with sampling occurring in each of the four seasons. This report summarizes the findings from this first year of data collection.

A total of 1,987 visitors were surveyed between August 2015 and May 2016. Sampling was completed at eight sites in the project area. Of the eight locations, Elk Falls Lookout had the highest number of survey responses, followed by Elk Falls Campsite, and McIvor Lake.

The management questions addressed by the monitoring program explore how different operating regimes may influence public use and perceptions for river and reservoir users. A summary of the management questions, null hypotheses and results are outlined in Table 1.

The management question for reservoirs focused on determining if there was a relationship between the performance measures of public perceptions with average daily water elevations. No significant relationship was noted between daily average water elevation and all performance measures for reservoirs with the exception of Buttle Lake. At Buttle Lake, increased water levels were associated with more favourable perceptions.

For rivers, the key management question focused on identifying if there was a relationship between river discharge and the performance measures of public perceptions at riverine locations. Only one of the three performance measures resulted in a significant relationship, and only for one riverine sample location. A weak but significant correlation was noted at Quinsam River where increased water flow was significantly related to a decreasing influence on recreation experience.

The final management question focused on determining how riverine discharge might influence the recreation experience at Elk Falls. When visitor impressions and satisfaction were examined in relation to water flows, no significant relationship was identified.

Further insights into the relationship between reservoir operations and public perceptions were examined using a discrete choice experiment (DCE). The DCE provided an opportunity to measure preferences for different levels of environmental conditions as depicted in a series of reservoir scenarios. The results from the 1-class model suggest that attributes such as water level and type of shoreline substrate are influential on preferences for recreation at reservoirs, while other attributes (i.e., lakebed condition, type of boat ramp) were not significant. Further analysis of the DCE was completed using a selection of known class models (e.g., Campbell River residents, non-residents, campers, etc.) and a latent 4-class model to further explore

respondent preferences. These models suggest that while water level is consistently the most significant attribute for respondents, preferences for the various attributes do differ when segmenting groups.

Table 1. JHTMON2 - Status of management questions and hypotheses after 2015/2016 Study Year

Management Question	Null Hypotheses	2015/2016 Data Analysis Status
For Reservoirs: What is the relationship between reservoir operations and overall recreation benefit and does it lead to competing trade-offs between reservoir based and river based benefits?	$H_{0\text{-}A}$: Changes in overall satisfaction with the recreation experience, if they occur, are not related to reservoir operations.	1) *Influence on recreation experience* – Significant relationship at Buttle Lake only between water levels and influence on recreation experience with a strong, positive correlation.
		2) *Satisfaction with shoreline conditions* – Significant relationship at Buttle Lake only between water levels and satisfaction with shoreline conditions with a moderate, positive correlation.
		3) *Perception of safety* - Significant relationship at Buttle Lake only between water levels and perception of safety with a weak, positive correlation.
		4) *Satisfaction with access to beach* – Significant relationship at Buttle Lake only between water levels and satisfaction with beach access, with a moderate, positive correlation. *Satisfaction with access to water via boat launch* - Significant relationship at Buttle Lake only between water levels and satisfaction with water access via boat launch, with a moderate, positive correlation. *Satisfaction with access to water via shoreline* - Significant relationship at Buttle Lake only between water levels and satisfaction with water access via shoreline, with a strong, positive correlation.
For Rivers: What is the relationship between river discharge and respective riverine recreation/tourism benefits and is it such that it would necessitate trade-offs between recreation, fish and power benefits?	$H_{0\text{-}B}$: Changes in overall satisfaction with the recreation experience, if they occur, are not related to riverine discharge.	1) *Influence on recreation experience* – Significant relationship at Quinsam River only between river discharge and influence on recreation experience with a weak, negative correlation.
		2) *Satisfaction with shoreline conditions* – No significant relationship noted between riverine discharge and satisfaction with shoreline conditions at river locations.
		3) *Perception of safety* - No significant relationship noted between riverine discharge and perception of safety at river locations.
For Elk Canyon Falls: Is there a specific relationship between recreational value and incidence of high spill events and does this support the presently held belief that higher flows should be considered in the future?	$H_{0\text{-}C}$: Changes in overall satisfaction with the recreation experience of visitors to Elk Canyon Falls is not related to riverine discharges (i.e. spill events).	1) *Impressiveness of falls* – No significant relationship noted between riverine discharge and impressiveness of falls.
		2) *Satisfaction with experience* – No significant relationship noted between riverine discharge and satisfaction with experience at falls.

ACKNOWLEDGEMENTS

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1 INTRODUCTION

As an outcome of the Consultative Committee process (Campbell River Water Use Plan Consultative Committee, 2004), an objective for recreation and tourism in the Campbell River system was articulated: to enhance and protect the quality of recreation and tourism amenities and increase the quality of recreation and tourism opportunities with sustainable carrying capacities. This process determined preferred reservoir elevation ranges and flow rates which were then adopted in the Campbell River Water Use Plan (WUP). During the Consultative Committee process, preferred elevations, flow rates, weighting, seasons, etc. were determined first using professional judgement and local experience, and second, through a public perceptions study and interviews with local experts (BC Hydro, 2013). Following this approach, it was recognized that a more systematic and robust approach to valuing the recreation resource could be possible (BC Hydro, 2013).

This project aims to improve upon previous evaluations of recreation and tourism within the Campbell River system area (BC Hydro, 2013). It aims to systematically establish performance measures for a full range of recreational factors and evaluate the recreation and tourism opportunities through an on-going perception study. The Upper and Lower Campbell and John Hart Reservoirs and Elk Canyon Public Use and Perceptions Study (JHTMON 2) is a 10-year study that will monitor the use and perceptions of recreational and tourism users of the reservoirs, rivers and Elk Falls site within the Campbell River Reservoir system. This study is one of a series of monitoring programs that fulfills BC Hydro's obligations under the Campbell River WUP as approved by the Comptroller of Water Rights.

The study has included: the determination of performance measures in consultation with applicable government agencies, the development of impact hypotheses to address the management questions outlined in the project Terms of Reference (BC Hydro, 2013), sampling design and site selection, questionnaire and discrete choice experiment design, data collection, data entry and management, data analysis, and reporting. This report summarizes and synthesizes the results of the first year of data collection (2015/2016).

1.1 MANAGEMENT QUESTIONS AND OBJECTIVES

The management questions and objectives and hypotheses to the program were stated in the Terms of Reference (BC Hydro, 2013) and in the Year-1 implementation report (LKT and EDI, 2015). As described in these reports, the Campbell River Recreation Technical Committee identified three management questions to address through the monitoring study. The key management questions were:

1. For Reservoirs: What is the relationship between reservoir operations and overall recreation benefit and does it lead to competing trade-offs between reservoir based and river based benefits?

2. For Rivers: What is the relationship between river discharge and respective riverine recreation/tourism benefits and is it such that it would necessitate trade-offs between recreation, fish and power benefits?

3. For Elk Canyon Falls: Is there a specific relationship between recreational value and incidence of high spill events and does this support the presently held belief that higher flows should be considered in the future?

These research questions stem from the main objectives for this study which are to 1) develop a more rigorous approach to determining recreation and tourism performance measures for future WUP reviews and 2) carry out an explicit evaluation of the recreation quality achieved and the trade-offs made during this WUP.

1.2 MANAGEMENT HYPOTHESES

In response to the management questions, we devised the following research hypotheses to be tested by the monitoring program:

For Reservoirs:

The first research hypothesis addresses the relationship between reservoir operations and overall recreation benefits. For the purposes of this study, benefits have been defined as satisfaction with the recreational experience. Testing of this hypothesis is informed by responses to the public use and perceptions survey in association with reservoir operations data available from BC Hydro.

- $H_{0\text{-}A}$: Changes in overall satisfaction with the recreation experience at reservoirs, if they occur, are not related to reservoir operations.

The second part of the management question asks if reservoir operations lead to competing trade-offs between reservoir based and river based operations. This component of the management question will be explored by comparing the results of any relationship found between reservoir levels and satisfaction of reservoir recreationists with those of any relationship between riverine flows and satisfaction of riverine-based recreationists.

For Rivers:

This research hypothesis is associated with addressing the relationship between river discharge operations and riverine recreation benefits, as measured by satisfaction with the riverine recreation experience. Testing of these hypotheses is informed by responses to the public use and perceptions survey in association with riverine discharge data available from BC Hydro.

- $H_{0\text{-}B}$: Changes in overall satisfaction with the recreation experience at rivers, if they occur, are not related to riverine discharge.

For Elk Canyon Falls:

The final research hypothesis is associated with addressing the relationship between recreational value and incidence of high spill events at Elk Falls. Testing of these hypotheses is informed by responses to the public use and perceptions survey in association with riverine discharge data available from BC Hydro.

- $H_{0\text{-}C}$: Changes in overall satisfaction with the recreation experience of visitors to Elk Canyon Falls is not related to riverine discharges (i.e. spill events).

2 METHODOLOGY

The management questions and associated hypotheses are addressed by measuring specific parameters using a public use and perceptions survey along with available water level/river discharge data. This monitor has scheduled annual sampling for 10 years, with sampling occurring across all four seasons. Year 1 (2014/2015) was identified as being the developmental year of project. The first year of sampling began in August 2015, and included sampling sessions in the summer, fall, winter and spring, ending in May 2016. The data collected each sampling year is to be summarized annually in an interim report. A summary report is to be produced at the end of Year 5, and a comprehensive final report is to be produced at the end of the 10-year monitor. This report represents the first interim report, summarizing the results from the first year of sampling.

2.1 STUDY DESIGN

2.1.1 DETERMINATION OF PERFORMANCE MEASURES AND INFLUENTIAL FACTORS

As identified by BC Hydro, this study utilizes performance measures as a means of gauging success in the provision of quality recreational opportunities as they relate to water management in the Campbell River Reservoir system. Performance measures were determined by consulting with applicable government agencies and BC Hydro. Input was sought from land managers who have a mandate to provide and manage recreation opportunities that may be affected by water management (i.e. water levels in reservoirs, flows in rivers).

The primary government agencies that were consulted included BC Parks of the Ministry of Environment and the Recreation Sites and Trails Branch of Ministry of Forests, Lands and Natural Resource Operations (MFLNRO). Key informants from BC Parks and Recreation Sites and Trails Branch were engaged by a combination of phone calls, emails and a written exercise designed to address study questions. The compiled responses were then used to develop draft performance measures. These draft performance measures were developed specific to recreational issues associated with water management, as identified by the management agencies. These were subsequently discussed with the same key informants as well as with representatives from BC Hydro, until a final list of performance measures was established. The final performance measures are outlined in Table 2. Further details on the determination of performance measures are described in the Year 1 Implementation report (LKT and EDI, 2015).

Table 2. Water management issues and related performance measures

Management Issue	Performance Measure	Applies to: Reservoir/River/Both
Public safety	▪ Perception of safety while engaged in water-based recreation	Both

Management Issue	Performance Measure	Applies to: Reservoir/River/Both
Maintaining accessibility	▪ Satisfaction with accessibility to boat launch ▪ Satisfaction with accessibility to shoreline ▪ Satisfaction with accessibility to beach	Reservoir
Protecting shoreline condition for recreation	▪ Satisfaction with shoreline condition for recreation	Both
Maintaining quality recreation experience	▪ Influence of water levels/flows on recreation	Both

2.1.2 SAMPLING PLAN AND SITE SELECTION

2.1.2.1 Sampling Locations

Eight locations were selected for conducting surveys within the Campbell Reservoir system (see Figure 1). Sample sites were selected with the aim of maximizing sample size. BC Parks, Recreation Sites and Trails Branch of MFLNRO, and the City of Campbell River were consulted to identify the busiest recreation sites. Sampling was only conducted at sites that were officially open. As such, sampling did not occur at some locations during the off-season.

2.1.2.2 Sampling Frequency

Sampling over the course of the monitor has been scheduled to occur across all seasons of the year, including winter (October 22 to March 31), spring (April 1 to June 20), summer (June 21 to September 10) and fall (September 11 to October 21). Total sampling effort was set to 128 interview days, providing four interview days per site for the eight sites across four recreation seasons. Sampling dates were selected to overlap with public holidays and weekends to maximize sampling during periods of high visitation. Two sites were sampled concurrently by two employees the Laich-Kwil-Tach Environmental Assessment Ltd. Partnership (LKT), based in Campbell River, BC to promote spatial and temporal coverage. The sampling schedule for the first year of data collection is outlined in Table 3.

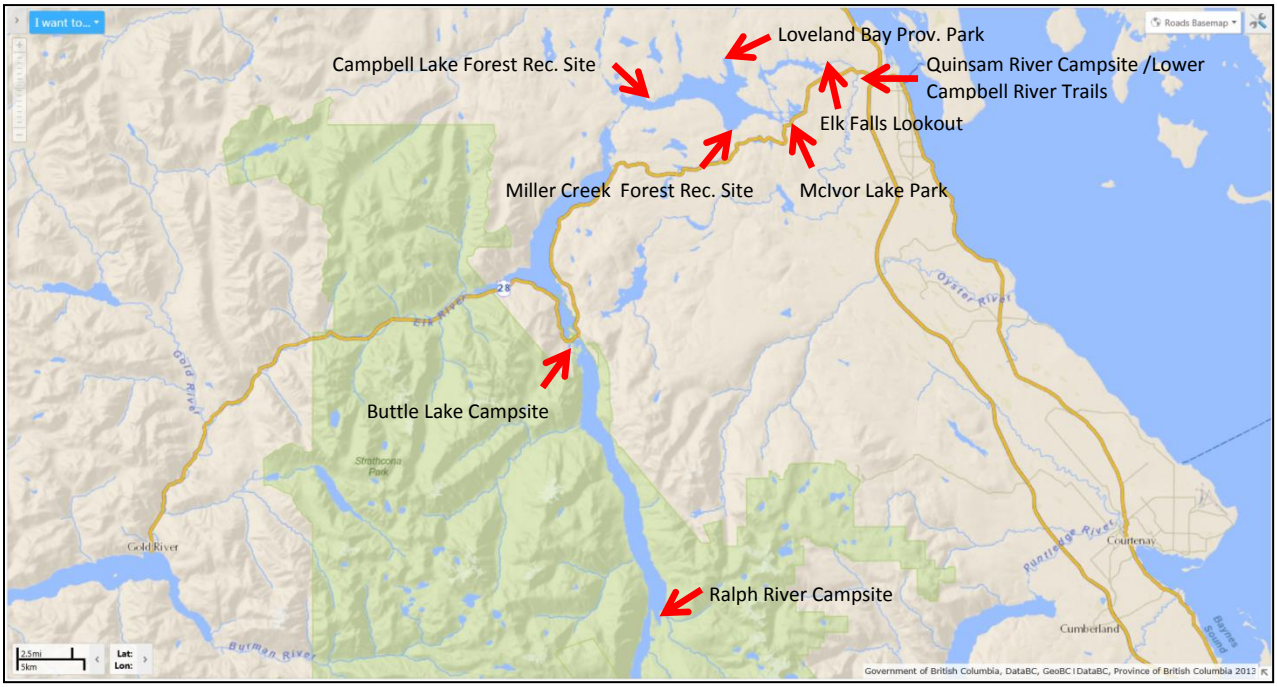


Figure 1. Map of sample locations (adapted from iMapBC)

Table 3. 2015/2016 sampling schedule for each season

2015/2016 Season	Scheduling
Summer	August 1-August 25, 2015 (Aug 1-4, Aug 7-10, Aug 13-16, Aug 22-25)
Fall	September 19-October 12, 2015 (Sept 19-22, Sept 25-28, Oct 1-4, Oct 9-12)
Winter	March 4-March 28, 2016 (Mar 4-7, Mar 10-13, Mar 19-22, Mar 25-28)
Spring	May 20-June 12, 2016 (May 20-23, May 28-31, Jun 3-6, Jun 9-12)

2.2 SURVEY DELIVERY

The public use and perceptions survey was designed to be delivered as an onsite survey, administered to visitors at sample sites. As practical, all parties at a sample site were approached for inclusion in this study. Sampling sessions were scheduled to occur on site between 9AM and 5PM. When possible, participation was requested after engaging in recreational activities although the survey was designed to be administered at any point during their trip. A representative from each party was asked to participate in the survey and asked to complete the questionnaire onsite. People who refused to participate were thanked for their time and not engaged further. Surveyors tracked the number of individuals they asked to complete the survey, the number who refused and the number who had already taken the survey in the past year. This information was used to calculate a response rate.

A standard introduction statement that summarized the cover letter accompanying the questionnaire was made to all prospective participants. If asked how the surveys would be used, people were told that the information would provide insights into public use and preferences for water management for BC Hydro. Contact information for the BC Hydro technical lead was provided on the survey in the event that anyone had questions or concerns about the project.

2.3 SURVEY DESIGN

The key components during the design phase of the base questionnaire and discrete choice analysis (DCE) included the following:

- Consultation with BC Hydro and the associated management agencies
- Determination of the Discrete Choice Experiment framework
- Design of the questionnaire and DCE survey tool
- Survey testing and refinements

2.3.1 PUBLIC USE AND PERCEPTIONS SURVEY

The main component of the public use survey was developed following social science best principles including those found in Dillman (2007) and Vaske (2008). Considerations were given towards ease of understanding and maximizing survey completion and return rates. The survey was designed to follow a logical flow of questioning and providing instructions to respondents that were clear and concise as possible. A key challenge to the development of the survey was that the same survey needed to be able to collect information about visitors' experiences at various types of waterbodies (e.g. reservoir, river, falls). The survey was designed so that respondents could relay perceptions about their experiences at multiple waterbody types, rather than just the one they were encountered at; individuals were asked to reply based on their experiences at the place they were encountered at that day (e.g., at a reservoir), as well as for other waterbody types they may have visited most recently on the same trip (e.g., at a river the previous day). This approach allowed for gathering more responses regarding each location type, as respondents often visited multiple waterbody types and locations during the same trip.

Testing of a draft survey was completed in April 2015 with a small focus group. The aim of the testing was to use a small number of test surveys to reveal overarching problems, such as awkward wordings, missing response categories, leading statements and issues with duration (e.g. survey too long). Following these revisions, several iterations of the survey were circulated and reviewed between May and July 2015 in order to discuss question content, ordering, wording, range of answer options and question instructions. Review was conducted primarily by representatives from BC Hydro, BC Parks and BC Recreation Sites and Trails. The survey went through numerous drafts and formats until a preferred design was established. The

questionnaire was printed in a booklet-style, with each page of the booklet being 5.5" by 8.5" (i.e., an 8.5" by 11" page, folded in half).

The questionnaire utilized a variety of survey question types, including check-list, Likert scale, and some open-ended quantitative questions. The full questionnaire has been designed to take a maximum of 15 minutes although most respondents will typically complete it much faster as only some sections will apply.

Questions were included in the survey to ensure that the impact hypotheses, outlined in Section 1.2 are addressed. The specific questions and how the questions relate to the impact hypotheses are described in further detail in Section 2.3.3. Questions were also included in the survey to directly address the performance measures developed in consultation with the regulatory agencies. Performance measures were addressed using Likert-type rating scales where respondents' attitudes are measured directly. Likert-type scales use fixed choice response formats and are designed to measure attitudes or opinions, typically on a 5 to 7 point scale. These ordinal scales measure levels of satisfaction/dissatisfaction, positive/negative influence, agreement/disagreement, etc.

In order to provide further context to recreational use within the study area, supplemental data was collected, both in the survey and through external data sources. Within the survey, questions were included to characterize respondents in terms of their demographics, recreational interests and habits. Further supplemental data is collected by surveyors in the field such as water levels and weather. Data for these influential factors is also gathered directly from BC Hydro (e.g., reservoir water levels and discharge, as available).

The questionnaire is composed of seven sections:

Section A: Current visit to the Campbell River Reservoir System

Section B: Visit to a Lake/Reservoir

Section C: Future Lake/Reservoir Visits

Section D: Visit to Elk Falls

Section E: Visit to a River

Section F: Past Visits to Campbell River Reservoir System

Section G: About You and Your Party

2.3.2 FUTURE LAKES/RESERVOIR VISITS DISCRETE CHOICE EXPERIMENT

In addition to the standard line of questioning, the survey integrated a stated preference feature (e.g., discrete choice experiment) to measure attitudes and preferences for different levels of environmental conditions.

The project uses stated preference surveys to examine decision influences by presenting respondents with hypothetical but realistic situations that may influence their choice to recreate. The project team constructed a discrete choice experiment (DCE) to identify preferences for recreational features affected by water use operations and to gather information about public use and perceptions on recreation in the Campbell Reservoirs to inform BC Hydro's Campbell River Water Use Plan.

Choice experiment methods were chosen as they allow respondents to simultaneously evaluate different conditions one might observe in a watershed, and address associated trade-offs in a comprehensive fashion. Choice experiments are used widely in resource management problems and environmental valuation settings (Adamowicz et al., 1998), as well as in limited water resource contexts (Haider and Rasid, 2002; Willis et al., 2005; Barton & Bergland, 2010; Thacher, 2011).

The research team designed and implemented a choice experiment using the following steps:

1. Adapt key recreational performance measures for application in a choice experiment

This step involved the translation of performance measures to variables that can be presented to survey respondents. The project completed this task by working with technical experts, recreation groups, and through extensive testing. Initial options were reviewed and prioritized in technical focus groups and refined in recreational and non-recreational focus groups. One-on-one testing further refined the attributes in the choice experiments described in step 2.

2. Design the survey instrument, including the stated preference choice sets

The project utilized the prioritized list of performance measures from step 1 to develop a recreational questionnaire. The primary purpose of the questionnaire is to present the stated preference choice experiment and collect relevant data into public use and preferences for water management. Design of the questionnaire included preparing questions to collect current recreational activities, satisfaction with their recreation experiences, and preferences as well as "warm" respondents to the conditions expressed in the choice experiment. Draft surveys were pre-tested to ensure lucidity and clarity of the questionnaire and choice experiment.

Discrete Choice Experiment Design

Within the choice experiment section of the survey, respondents are presented with the following scenario:

You will now be presented with six pairs of photos representing different hypothetical lake/reservoir conditions.

The conditions of Site A and Site B will differ in each of the following photo pairs. While some of the photos may not seem ideal, each one of them could occur under certain circumstances.

For each set of pictures please select whether you would choose to recreate in the area represented in Site A or Site B, or neither of them.

There are no right or wrong answers to these special type of research questions but it is important to regard them as real-world situations, in which the selected conditions are available to you. You will be asked to complete a total of six evaluations.

The scenario was developed based on outcomes from earlier consideration of lake/reservoir recreational values and performance measures. In the experiment, respondents are shown a set of two photos representing differing conditions in a representative reservoir of the Campbell River reservoir system.

Photos were digitally manipulated from a source photo to represent the varying levels and conditions shown in Table 4 were chosen in consultation of the above described process and are explained in the following:

Table 4. Attribute values in choice experiment

Attribute	Performance Measure	Levels
Quantity of Debris	Perception of safety	1) No Debris 2) Little Debris 3) Average Debris 4) A lot of Debris
Water Level	Protecting Visual Aesthetic	1) Low Low 2) Low 3) Average 4) High 5) High High
Shoreline Condition	Shoreline Condition for Recreation	1) Rocky 2) Sandy
Lakebed Condition		1) Sediment 2) Grass/Woody environment
Type of Boat Ramp	Access Features	1) None 2) Gravel road 3) Concrete pad

The operationalization of the choice experiment was through a statistical design that presented two photos in choice sets. Each choice set presents two recreational alternatives consisting of 5 elements (see Table 4). An "opt out" option was also given. Table 4 presents the photo elements as well as their levels and coding. The attributes of Quantity of Debris (4 levels), water level (5 levels), shoreline (2 levels), lake bed (2 levels) and boat ramp (3 levels) represents a 4x5x2x2x3 design with 240 possible combinations. To reduce the number of different combinations we used the SAS 9.3 experimental design macro *MktEx* to produce an orthogonal main effects fractional factorial design with minimal overlapping of attribute levels. Use of this

macro reduced the number of possible combinations to 48 combinations (see Table 5), blocked into four different versions of six choice sets (2 photos per set), reported as being optimally balanced with 99% D-efficiency.

Photo book preparation

The resulting 48 combinations are represented in Table 5. To prepare the photo representation of each combination, we utilized a base photo and layered in digital representations of each level. The result was a set of 48 photos numbered 1 – 48. Utilizing Adobe InDesign we prepared 4 photobooks containing photos 1-12, 13-24, 25-36, and 37-48. Photo sets were matched to Q15-Q20 in the questionnaire.

Table 5. Resulting combinations of features presented in choice experiment[1]

Photo Number	Debris Quantity	Water Level	Shoreline	Lakebed	Boat Ramp
1	(1)No Debris	(4) High	(2) Sand	(2) Grass/Woody environment	(1) None
2	(2)Little Debris	(5) High High	(1) Rocks	(1) Sediment	(2) Gravel road
3	(1)No Debris	(2) Low	(1) Rocks	(1) Sediment	(3) Concrete pad
4	(3)Average Debris	(2) Low	(1) Rocks	(1) Sediment	(3) Concrete pad
5	(4)A lot of Debris	(1) Low Low	(2) Sand	(2) Grass/Woody environment	(2) Gravel road
6	(3)Average Debris	(3) Average	(2) Sand	(2) Grass/Woody environment	(1) None
7	(4)A lot of Debris	(1) Low Low	(2) Sand	(1) Sediment	(3) Concrete pad
8	(3)Average Debris	(5) High High	(1) Rocks	(2) Grass/Woody environment	(1) None
9	(2)Little Debris	(2) Low	(2) Sand	(1) Sediment	(2) Gravel road
10	(4)A lot of Debris	(3) Average	(2) Sand	(2) Grass/Woody environment	(3) Concrete pad
11	(1)No Debris	(4) High	(1) Rocks	(1) Sediment	(2) Gravel road
12	(2)Little Debris	(1) Low Low	(1) Rocks	(2) Grass/Woody environment	(1) None
13	(3)Average Debris	(3) Average	(1) Rocks	(1) Sediment	(2) Gravel road
14	(2)Little Debris	(4) High	(2) Sand	(2) Grass/Woody environment	(3) Concrete pad
15	(1)No Debris	(1) Low Low	(2) Sand	(1) Sediment	(1) None
16	(4)A lot of Debris	(2) Low	(1) Rocks	(1) Sediment	(1) None
17	(3)Average Debris	(5) High High	(1) Rocks	(2) Grass/Woody environment	(3) Concrete pad
47	(4)A lot of Debris	(4) High	(1) Rocks	(1) Sediment	(3) Concrete pad
19	(2)Little Debris	(5) High High	(2) Sand	(1) Sediment	(2) Gravel road
20	(4)A lot of Debris	(3) Average	(1) Rocks	(1) Sediment	(1) None
21	(3)Average Debris	(2) Low	(2) Sand	(2) Grass/Woody environment	(2) Gravel road
22	(1)No Debris	(1) Low Low	(1) Rocks	(1) Sediment	(1) None
23	(2)Little Debris	(3) Average	(2) Sand	(2) Grass/Woody environment	(3) Concrete pad
24	(1)No Debris	(4) High	(1) Rocks	(2) Grass/Woody environment	(3) Concrete pad
25	(3)Average Debris	(1) Low Low	(2) Sand	(1) Sediment	(3) Concrete pad
26	(1)No Debris	(2) Low	(2) Sand	(2) Grass/Woody environment	(1) None
27	(3)Average Debris	(4) High	(1) Rocks	(1) Sediment	(2) Gravel road
28	(2)Little Debris	(3) Average	(2) Sand	(1) Sediment	(3) Concrete pad
29	(4)A lot of Debris	(4) High	(1) Rocks	(2) Grass/Woody environment	(2) Gravel road
30	(4)A lot of Debris	(5) High High	(1) Rocks	(2) Grass/Woody environment	(1) None

[1] Photo 18 and 47 are intentionally out of order so that no photo set presented two "HIGH HIGH" water conditions. This swap does not affect the DCE as the original photos were developed from a randomized block design.

31	(1)No Debris	(5) High High	(2) Sand	(1) Sediment	(3) Concrete pad
32	(4)A lot of Debris	(4) High	(2) Sand	(1) Sediment	(1) None
33	(2)Little Debris	(3) Average	(1) Rocks	(1) Sediment	(1) None
34	(1)No Debris	(3) Average	(2) Sand	(2) Grass/Woody environment	(2) Gravel road
35	(3)Average Debris	(2) Low	(1) Rocks	(2) Grass/Woody environment	(3) Concrete pad
36	(2)Little Debris	(1) Low Low	(1) Rocks	(2) Grass/Woody environment	(2) Gravel road
37	(4)A lot of Debris	(5) High High	(2) Sand	(2) Grass/Woody environment	(3) Concrete pad
38	(1)No Debris	(3) Average	(1) Rocks	(1) Sediment	(3) Concrete pad
39	(3)Average Debris	(1) Low Low	(2) Sand	(1) Sediment	(2) Gravel road
40	(4)A lot of Debris	(1) Low Low	(1) Rocks	(2) Grass/Woody environment	(2) Gravel road
41	(2)Little Debris	(4) High	(2) Sand	(1) Sediment	(1) None
42	(2)Little Debris	(2) Low	(1) Rocks	(2) Grass/Woody environment	(1) None
43	(3)Average Debris	(4) High	(2) Sand	(2) Grass/Woody environment	(1) None
44	(1)No Debris	(3) Average	(1) Rocks	(2) Grass/Woody environment	(2) Gravel road
45	(2)Little Debris	(1) Low Low	(1) Rocks	(2) Grass/Woody environment	(3) Concrete pad
46	(3)Average Debris	(5) High High	(2) Sand	(1) Sediment	(1) None
18	(1)No Debris	(5) High High	(2) Sand	(2) Grass/Woody environment	(2) Gravel road
48	(4)A lot of Debris	(2) Low	(2) Sand	(1) Sediment	(2) Gravel road

Figure 2 presents an example photo set from Book 1 of the field photo books. Site A represents conditions of *no debris*, *high water level*, *a sandy shoreline*, *grass/woody lakebed* (not visible), and *no boat ramp*. Site B represents *average debris*, *low water level*, *rocky shoreline*, *sediment lakebed* (not visible) and a *concrete boat ramp*.

Figure 2. Example photo comparison

3. Data Collection

Once the choice experiment was designed, data collection occurred through the use of the field survey. Recreationists participating in the study are shown a blocked set of six photo pairs from the four blocked sets. For the next respondent, another block of six choice pairs are drawn, until the pool of blocked sets is

exhausted; upon which another round of the photo sets would start. Respondents selected the recreation site they would most like visit (or neither) and continued to the next set until they completed six choice sets. The full questionnaire and sampling is described in the previous section.

2.3.3 IMPACT HYPOTHESES AND SURVEY DESIGN

The survey was designed to address the impact hypotheses while also incorporating the performance measures determined at the initial stages of the study design. The impact hypotheses have been divided according to location type within the reservoir system, including: reservoirs, rivers and Elk Falls.

For Reservoirs:

$H_{0\text{-}A}$: Changes in overall satisfaction with the recreation experience at reservoirs, if they occur, are not related to reservoir operations.

We used a two-pronged approach to address the changes in overall recreation benefits as they relate to reservoir operations. The first approach for testing this hypothesis uses respondents' perceptions and opinions regarding the performance indicators as gauges for recreation benefits. Q9, Q10, Q11, Q12 and Q14 in Section B: Visit to a Lake/Reservoir (Appendix B) of the survey present respondents with an opportunity to reflect on the conditions encountered and rate their experiences in relation to the performance measures. These performance measures, indicators of key elements of water management within the reservoirs, include perceptions as they relate to water levels, shoreline conditions, safety and access.

Additionally, the discrete choice experiment provides an alternative approach to addressing this hypothesis, albeit using a stated preference approach instead. The stated preference approach presents respondents with hypothetical scenarios of reservoir operations, represented by digitally altered pictures of a reservoir. This approach presents an alternative method to determining how changes to reservoir operations may change the desire for a recreationist to visit an area. Q15-Q20 in Section C: Future Lakes/Reservoir Visits provide the opportunity to evaluate changes in overall recreation benefits associated with reservoir operations using this approach.

For Rivers:

$H_{0\text{-}B}$: Changes in overall satisfaction with the recreation experience at rivers, if they occur, are not related to riverine discharge.

The approach for testing this hypothesis uses respondents' perceptions and opinions regarding the performance indicators as gauges for recreation benefits. Q30, Q31, and Q32 in Section E: Visit to a River of the survey present respondents with an opportunity to reflect on the conditions encountered on rivers in the reservoir system and rate their experiences in relation to relevant performance measures. These performance measures, indicators of key elements of water management within the reservoirs, include perceptions as they relate to water flows, shoreline conditions and safety.

For Falls:

$H_{0\text{-}C}$: Changes in overall satisfaction with the recreation experience of visitors to Elk Canyon Falls is not related to riverine discharges (i.e. spill events).

The approach for testing this hypothesis uses respondents' perceptions and opinions as gauges for recreation benefits. Q23 and Q24 in Section D: Visit to Elk Falls of the survey present respondents with an opportunity to reflect on the conditions encountered at the falls and rate their experiences. The proxy measures of benefits focus on satisfaction of their experience and how impressive they found the viewing experience to be.

Supporting Questions

Throughout the survey, a number of questions do not directly contribute to answering the impact hypotheses; rather, these other questions support the survey in a variety of manners. Some questions are included to guide respondents to the relevant sections of the survey. These skip logic instructions guide respondents through the questionnaire, directing respondents past sections that may not apply to them (e.g. Q5, Q21, Q25 and Q34). Other questions are included to provide opportunities to relate the respondents' answers to specific times and places (e.g. Q7, Q22 and Q27). This will allow respondents' experiences to be associated to actual BC Hydro data on reservoir/river conditions. Additional questions have been included to allow for additional segmentation and as explanatory variables, such as the activities respondents' participated in and demographic questions. Others allow for more detailed exploration of some of the perceptions of respondents, including the types of safety hazards encountered and activities that were precluded due to water conditions.

2.4 DATA ENTRY AND MANAGEMENT

The task of data entry and management is a key component of this project and required an organized database to store and manage data and facilitate statistical analyses. Data from the questionnaires and discrete choice experiment were entered into a common database (i.e., Microsoft Excel) as they were collected to the extent possible. The database was examined periodically through the data entry process to ensure consistency and highlight any potential data collection and entry issues. The database was designed to be easily exported to the preferred statistical analysis software packages, IBM SPSS Statistics and Latent Gold, and required appropriate variable labeling and coding of responses. Data were entered by technicians and checked by the study lead. Once all data were entered, the data were examined for outliers, protest votes and any obvious erroneous entries. Outliers were determined using an examination of box and whisker plots, a method for identifying data points that fall outside the usual range of values. A qualitative assessment was then used to determine whether to throw out the outliers. Three surveys were removed from consideration given extreme or unrealistic answers.

2.5 DATA ANALYSIS

2.5.1 BASIC QUESTIONNAIRE

Data analysis of the basic questionnaire questions focused on providing basic descriptive statistics and comparative analysis as was appropriate for the different types of data. Descriptive statistics were tabulated for each question. Categorical data was tabulated according to frequency of each potential response. Mean response, standard deviation and standard error were calculated for all questions that used interval data. All questionnaire responses are presented in Appendix A. When appropriate to the discussion of results, some data have been tabulated or presented graphically in the body of the report.

Analysis of the management questions involved identifying potential relationships between the performance indicators and the respective reservoir operations metrics. For reservoirs, correlations were examined between the indicators of safety, satisfaction and experience, and reservoir elevations; for rivers and Elk Falls, correlations were examined between indicators of satisfaction and experience, and discharge. Data for reservoir elevations and discharge were provided as daily averages by BC Hydro. The tests used for investigating these relationships were determined based on the type of statistical data (e.g. interval, ordinal or categorical), the nature of the relationship (e.g. linear, monotonic or non-linear), and type of distribution (e.g. parametric or non-parametric). Results for relevant survey questions were graphed using scatterplots in relation to the average daily elevation or discharge. The variables were tested for normal distribution and the appropriate correlation test selected (e.g., Pearson product-moment correlation or Spearman rank-order correlation coefficient).

2.5.2 DISCRETE CHOICE EXPERIMENT

Analysis of the choice experiment approach is grounded in Lancaster's attribute theory of value and consumer choice (Lancaster, 1966), and has an econometric foundation in random utility theory (McFadden, 1974). Random utility theory posits that choices can be modeled as a function of the attributes of the alternatives given (McFadden, 1974; Train, 2009). Thus, for reservoir recreationists it is assumed that the total utility they obtain from visiting the reservoir is the sum of the utility obtained from each of the reservoir's feature. We assume that an individual selects the alternative (i) that has the greatest overall utility and that each attribute contributes to a part of the compound utility of the alternative. This type of selection of compound part-worth utilities ($a_i = a_i^1, \ldots, a_i^n$) indicates that the overall utility (U_i) of the alternative chosen is greater than the utility of the other alternatives. The higher the part-worth the higher the impact the attribute has on overall utility. The total utility of the alternative (Ui) can be represented with a deterministic component ($V_{(ai)}$) and stochastic (error) component (εi):

$$U_i = V_{(a_i)} + \varepsilon_i$$

An alternative (*i*) is chosen over alternative (*j*) if and only if $U_i > U_j$ for all of *j* and *i*. The probability of choosing *i* over *j* can be calculated as:

$$Prob(i|C) = Prob\{V_i + \varepsilon_i > V_j + \varepsilon_j \; ; \forall j \in C\}$$

where C refers to the set of all possible alternatives.

To model recreationists across reservoir features we used Latent Gold 5.0 to estimate multiple multinomial logit models. A single class multinomial logit model was prepared focusing on the main effects of the experiment's attributes including Quantity of Debris, Water Level, Shore Line Features, Lakebed Features, and Boat Ramp Type.

Multiple single 'known class' segmentation models were prepared and differences between the following segment groups are reported: people who plan to recreate on the reservoir, Campbell River residents, non-Campbell River residents, campers only, Sightseeing falls, and hikers.

A latent 4-class multinomial logit model was prepared to explore directions for future analysis but is not discussed in detail. A latent class model relates preferences for the reservoir features in the discrete choice experiment to a set of latent variables. A class is characterized by similarities among recreationists that indicate like preference for reservoir features. The latent class model is presented to highlight differences but latent variables are not described.

3 RESULTS

3.1 GENERAL

A total of 1,987 surveys were completed over the first year of data collection. The response rate for the first year of data collection had to be calculated using only winter (March 2016) and spring (May/June 2016) data, as a total summary of visitors and those who declined to take the survey was not initially recorded. Over the winter and spring sampling sessions, 1640 individuals were asked to participate in the survey; of the 1640 who were asked, 274 had already completed the survey in the study year. The survey was completed by 970 individuals while 396 individuals declined, which represents a response rate of 71.0%.

Across the study year, summer had the highest number of responses (n=609), followed by winter (n=570) (Figure 3). The high number of surveys completed in the winter is likely attributed to the sample locations, which were limited in the winter to the high-use areas close to Campbell River, namely Elk Falls Provincial Park and McIvor Lake. The other sample locations were not open during the winter sampling period.

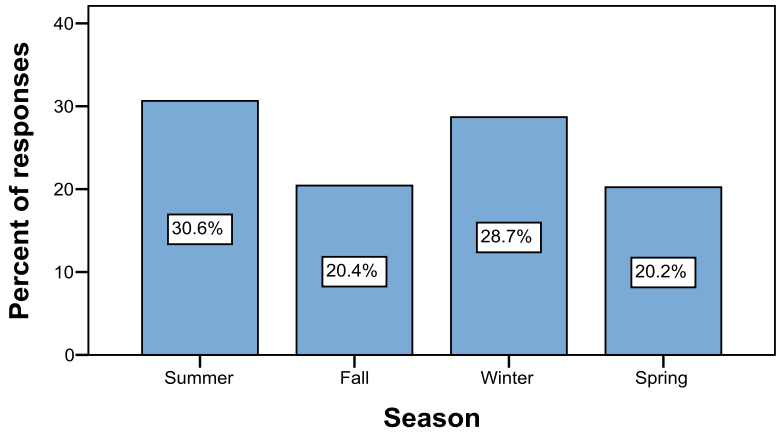


Figure 3. Percentage of the total number of questionnaires completed by season (n=1987)

Surveys were conducted at eight locations across the study area. Elk Falls Lookout had the highest number of survey responses (n=850). This location is close to Campbell River, receives high numbers of day users, has an extensive trail system that is an attraction to both local residents and visitors, and is open year-round. The areas with the second and third highest survey responses, Elk Falls Campsite and McIvor Lake, are also close to town, open year-round and popular areas for walking.

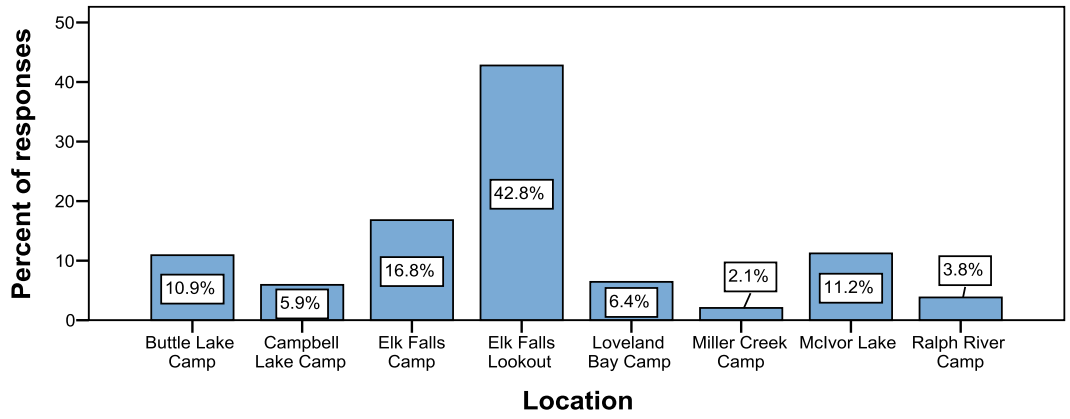


Figure 4. Percent of survey responses according to sample location (n=1987)

The average trip length spent in the Campbell River reservoir system by respondents was 3.59 days (n=1836, s=10.038), with a median and mode of 1 day. For accommodation, most respondents (38.6%) reported not staying in the area, which is consistent with the high frequency of day visitors. The most popular form of accommodation for those staying in the area was trailer/5th wheel (17.2%). Camping was most frequently noted (32.3%) as the most important activity in respondents' decision to visit the Campbell River reservoir system, followed by sight-seeing of the waterfalls (24.4%).

Most respondents (68.6%) reported visiting the study area before while 31.4% were visiting for the first time. Of those who had visited the area before, the highest frequency of visits were reported in the summer; 73.3% of respondents who had visited the Campbell River reservoir system before reported visiting for 4 days or more on average annually in the summer.

The frequencies for all survey questions are summarized in the appendices. In addition, the following sections examine those survey questions that specifically address the management hypotheses for this project.

3.2 MANAGEMENT HYPOTHESIS – LAKES/RESERVOIRS

The management hypothesis for lakes/reservoirs in the Campbell River reservoir systems is stated as:

$H_{0\text{-}A}$: Changes in overall satisfaction with the recreation experience at reservoirs, if they occur, are not related to reservoir operations.

We tested this hypothesis by comparing perceptions of safety, satisfaction and experience with average daily water elevations at three reservoirs: Buttle Lake, Upper Campbell Reservoir and Lower Campbell Reservoir. Responses to Q9, Q11, Q12 and Q14 in Section B: Visit to a Lake/Reservoir (Appendix B) of the survey were graphed using scatterplots in relation to the average daily elevation. A line of best fit was applied on the scatterplots to visually illustrate the general trends in the scatterplot data. The line of best fit, which is derived from the Pearson product moment correlation, was used visually to demonstrate general trends

only; as the data being examined were ordinal and non-parametric, the Pearson product moment correlation was not the most appropriate test to indicate the strength of the relationship in the data analysis.

A more appropriate test for examining correlation between ordinal variables (i.e., Likert scales) and interval data (i.e., average daily elevation) is Spearman rank-order correlation coefficient (Spearman's correlation, for short). Spearman's correlation is a non-parametric measure of the strength and direction of association that exists between two variables measured on at least an ordinal scale. Unlike Pearson product-moment correlation, variables in the Spearman's correlation can be ordinal, as well as interval or ratio. Spearman's correlation also assumes that there is a monotonic relationship between the two variables. A monotonic relationship is when either the variables increase in value together, or as one variable value increases, the other variable value decreases. The scatterplots show this general trend.

Water levels, measured as daily average elevation, were only available for three reservoirs: Buttle Lake, Lower Campbell Reservoir and Upper Campbell Reservoir. Analyses were completed separately for each reservoir as operational water levels (e.g., maximum reservoir elevation) differed between reservoirs, preventing direct comparisons.

3.2.1 INFLUENCE OF WATER LEVEL ON RECREATION EXPERIENCE

In Question 9 of the survey, respondents were asked to rate how water levels influenced their recreation experience at the time of their visit on a scale of 1 to 5 (with 1 being "very negative" and 5 being "very positive"). In general, almost half of all respondents reported that water levels at the time of their visit had either a somewhat positive or very positive influence on their recreation experience at the reservoir, although a large percentage (31.3%) reported that water levels had no influence on their recreation experience at the reservoir (Figure 5).

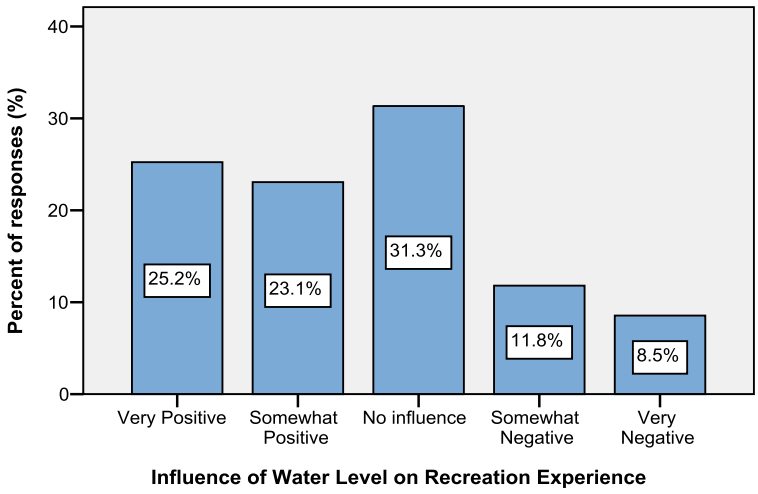
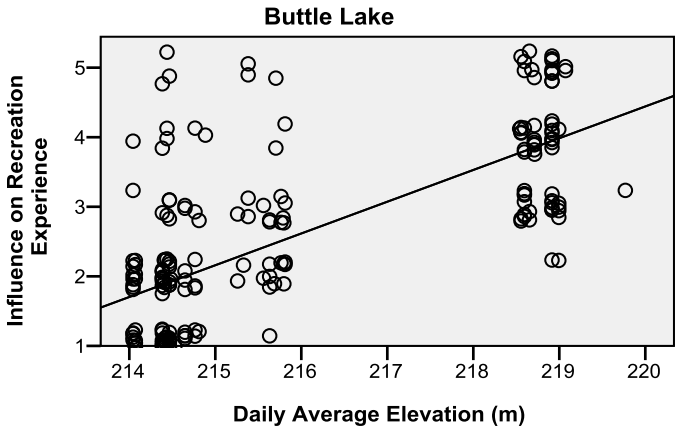


Figure 5. Frequency of responses for influence of water level on recreation experience at reservoirs (n=737)

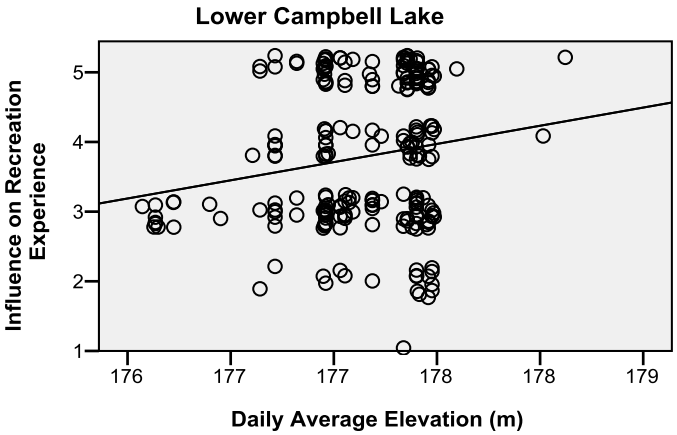
Scatterplots were developed to depict the influence of water levels on respondents' recreation experience in relation to daily average water elevation for the reservoirs (see Figure 6, Figure 7 and Figure 8). With the range of water levels at each reservoir, a strong trend is only evident at Buttle Lake, where respondents were exposed to a greater range of water levels. Strong trends were not evident in the scatterplots at Lower Campbell Reservoir, where the range of water levels experienced at the reservoir was narrow, or at Upper Campbell Reservoir, where few people reported engaging in water-based recreation.

A Spearman's rank-order correlation was run to examine this relationship. There was a strong correlation between influence on recreation experience and water levels for Buttle Lake, which was statistically significant (n=202, r_s=0.639, p=0.000). As daily average elevation of water decreased, more respondents felt water levels were having a negative influence on their recreation experience. Neither Lower Campbell nor Upper Campbell Reservoirs resulted in a significant correlation.



Influence on Recreation Experience (1=Very Negative, 2=Somewhat negative, 3=No influence, 4=Somewhat positive, 5=Very positive)

Figure 6. Influence of water level on recreation experience in relation to average daily water level for Buttle Lake (n=202)



Influence on Recreation Experience (1=Very Negative, 2=Somewhat negative, 3=No influence, 4=Somewhat positive, 5=Very positive)

Figure 7. Influence of water level on recreation experience in relation to average daily water level for Lower Campbell Reservoir (n=229)

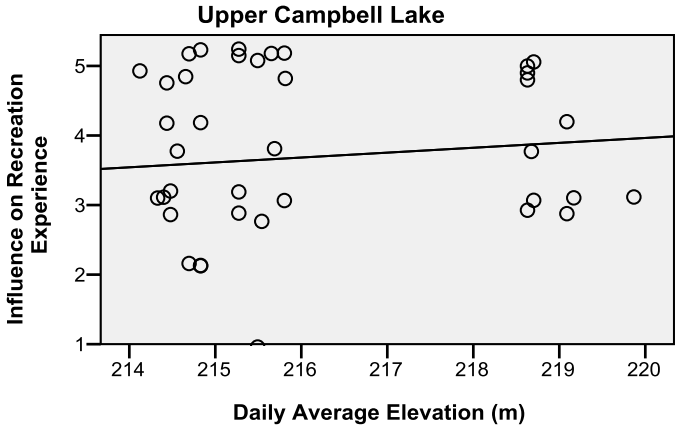


Figure 8. Influence of water level on recreation experience in relation to average daily water level for Upper Campbell Reservoir (n=40)

3.2.2 SATISFACTION WITH SHORELINE CONDITIONS

In Question 11, respondents were asked to rate how satisfied they were with shoreline conditions while engaged in water-based recreation at the time of their visit on a scale of 1 to 5 (with 1 being "very dissatisfied" and 5 being "very satisfied"). Respondents were generally satisfied with shoreline conditions at the reservoirs, with the majority (67.9%) of respondents reporting that they were either "somewhat satisfied" or "very satisfied"

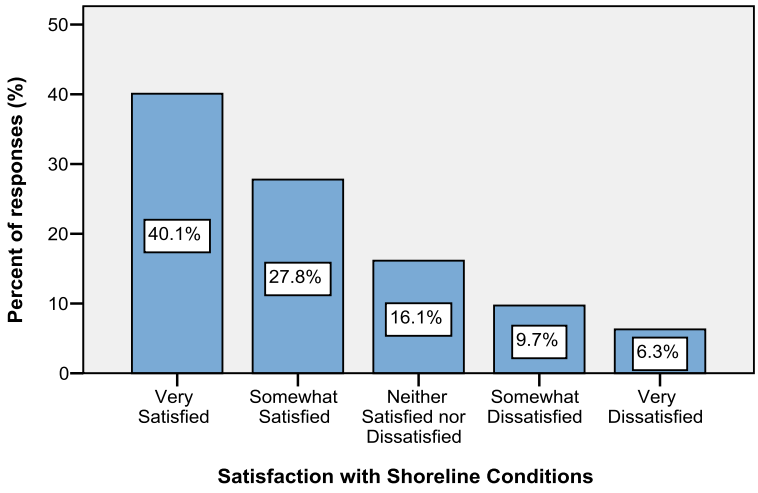
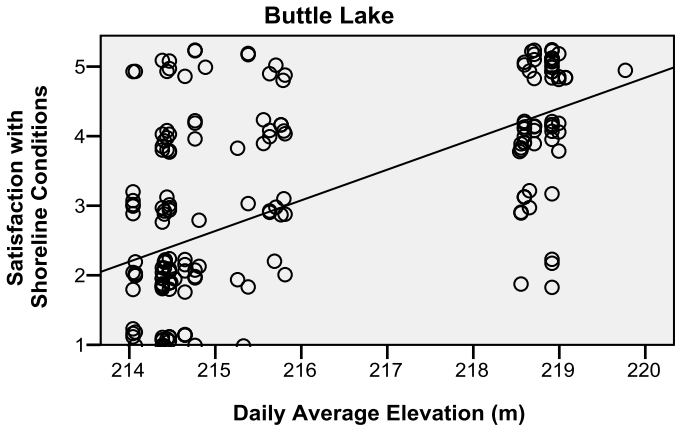


Figure 9. Frequency of responses for satisfaction with shoreline conditions at reservoirs (n=731)

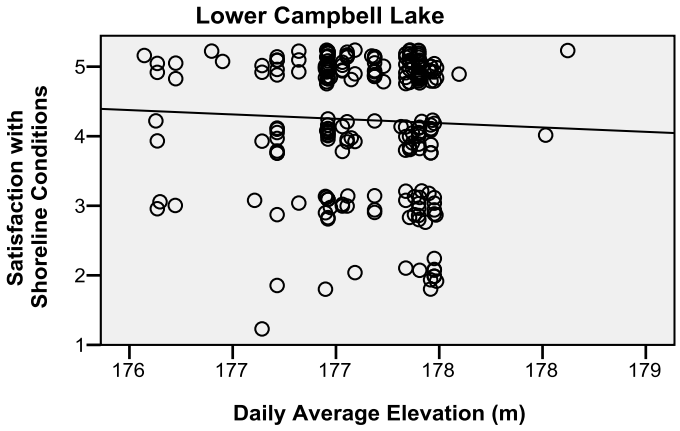
Scatterplots were developed to depict the satisfaction with shoreline conditions in relation to daily average water elevation for the reservoirs (see Figure 10, Figure 11 and Figure 12). Respondents from Buttle Lake reported a tendency to report being more satisfied with shoreline conditions when water levels were higher. No strong trends were evident in the scatterplots at Lower Campbell and Upper Campbell Reservoirs.

A Spearman's rank-order correlation was run to examine this relationship. There was a moderate correlation between satisfaction with shoreline condition and water levels for Buttle Lake, which was statistically significant (n=200, r_s=0.591, p=0.000). As daily average elevation of water increased, satisfaction with shoreline conditions also increased. Neither Lower Campbell nor Upper Campbell Reservoirs resulted in a significant correlation.



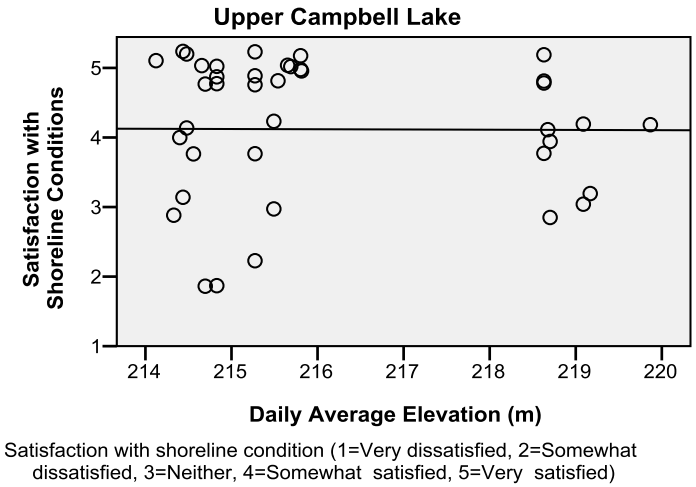
Satisfaction with shoreline condition (1=Very dissatisfied, 2=Somewhat dissatisfied, 3=Neither, 4=Somewhat satisfied, 5=Very satisfied)

Figure 10. Satisfaction with shoreline conditions in relation to daily average water level for Buttle Lake (n=200)



Satisfaction with shoreline condition (1=Very dissatisfied, 2=Somewhat dissatisfied, 3=Neither, 4=Somewhat satisfied, 5=Very satisfied)

Figure 11. Satisfaction with shoreline conditions in relation to daily average water level for Lower Campbell Reservoir (n=229)



Satisfaction with shoreline condition (1=Very dissatisfied, 2=Somewhat dissatisfied, 3=Neither, 4=Somewhat satisfied, 5=Very satisfied)

Figure 12. Satisfaction with shoreline conditions in relation to daily average water level for Upper Campbell Reservoir (n=40)

3.2.3 PERCEPTION OF SAFETY

Question 12 asked respondents to rate how safe they felt engaging in water-based activities on a scale of 1 to 5 (with 1 being "very unsafe" and 5 being "very safe") given water levels at the time of their visit. The majority of respondents (54.5%) reported feeling "very safe" while recreating at a reservoir within the Campbell Reservoir system.

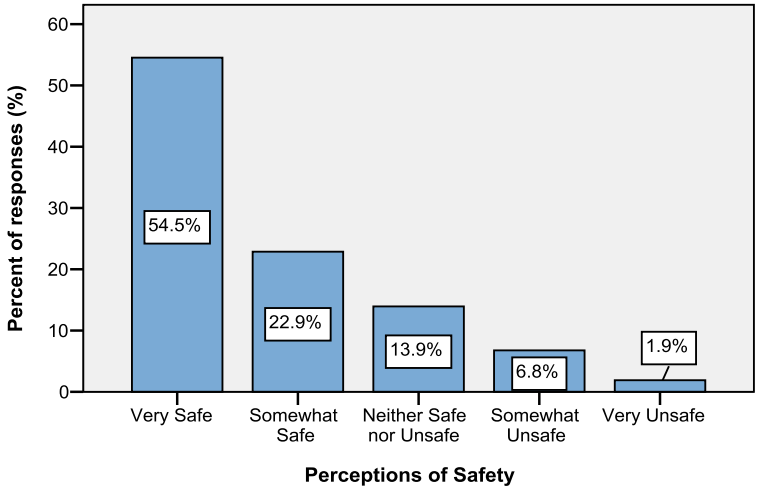


Figure 13. Frequency of responses for perception of safety while recreating at reservoirs (n=739)

Scatterplots were developed to depict respondents' perception of safety in relation to daily average water elevation for the reservoirs (see Figure 14, Figure 15 and Figure 16). A general trend is most evident at Buttle Lake. A Spearman's rank-order correlation was run to examine this relationship. There was a weak but significant correlation between perceptions of safety and water levels for Buttle Lake (n=199, r_s=0.374,

p=0.000), where an increase in reservoir elevation results in an increased sense of safety. Neither Lower Campbell nor Upper Campbell Reservoirs resulted in a significant correlation.

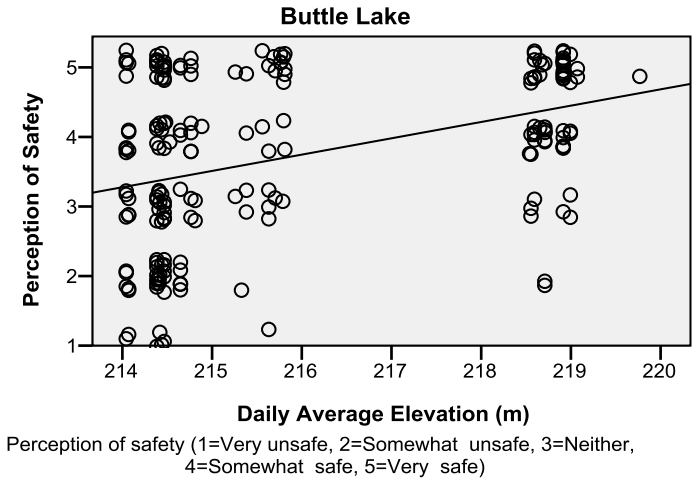


Figure 14. Perception of safety in relation to daily average water level for Buttle Lake (n=199)

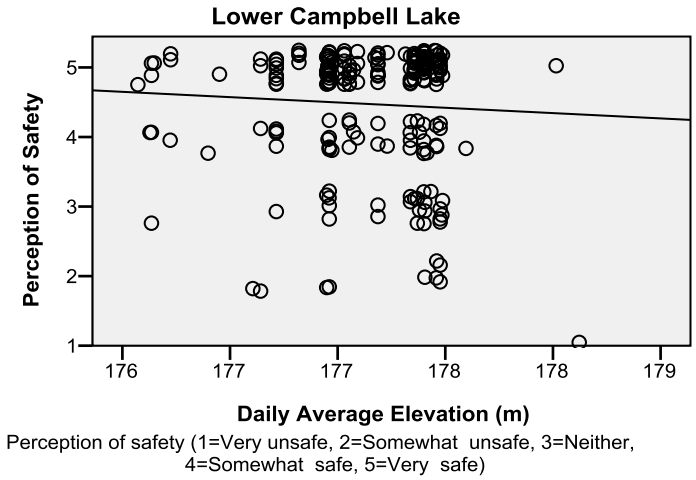


Figure 15. Perception of safety in relation to daily average water level for Lower Campbell Reservoir (n=229)

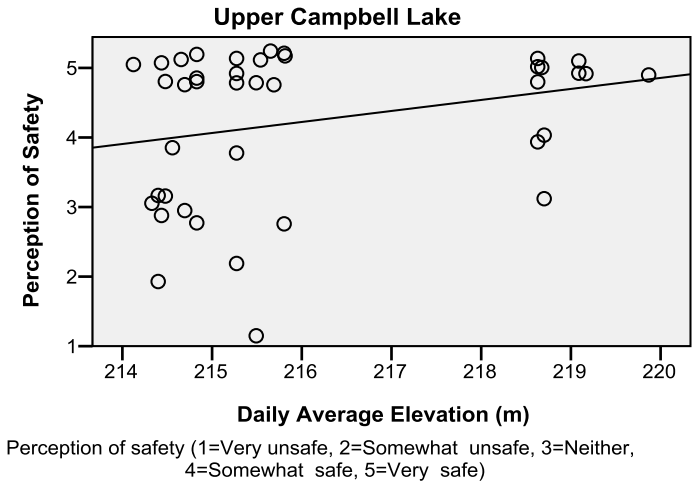


Figure 16. Perception of safety in relation to daily average water level for Upper Campbell Reservoir (n=40)

3.2.4 SATISFACTION WITH ACCESS

Question 14 of the survey asked respondents to rate how satisfied they were with access to the reservoir on a scale of 1 to 5 (with 1 being "very dissatisfied" and 5 being "very satisfied") at the time of their visit. Three options for access were rated, including access to beach, access to the water via a boat launch, and access to the water via the shoreline.

3.2.4.1 Access to Beach

Collectively, the majority of respondents at reservoirs (68.8%) were either "very satisfied" or "somewhat satisfied" with access to the beach (Figure 17).

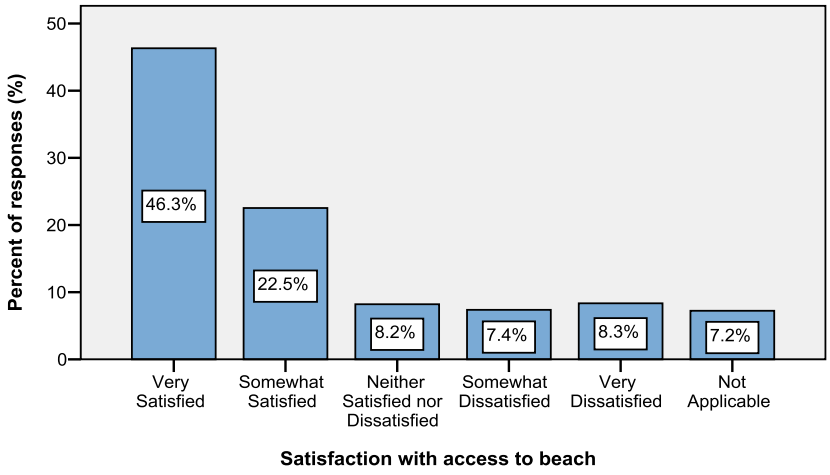
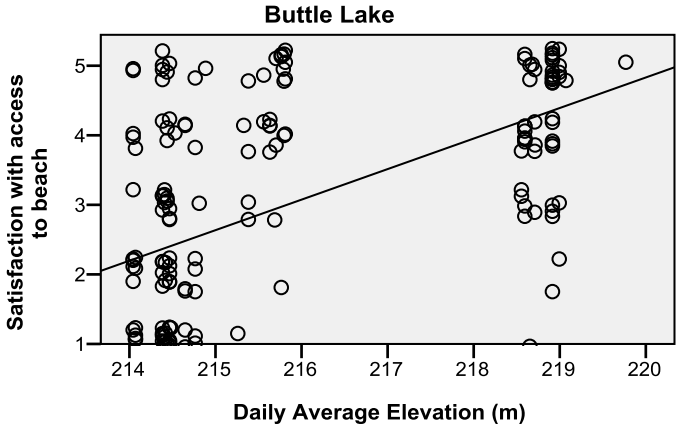


Figure 17. Satisfaction with access at reservoirs to beach for all respondents (n=719)

Scatterplots were developed for Buttle Lake, Upper Campbell and Lower Campbell to depict satisfaction with access in relation to daily average water elevation for the reservoirs (see Figure 18, Figure 19 and Figure 20). At Buttle Lake, respondents report increasing satisfaction with access to beaches in relation to increasing water levels (Figure 18). Based on a Spearman's rank-order correlation test, the relationship between satisfaction with beach access and water levels for Buttle Lake is of moderate strength and statistically significant (n=183, r_s=0.586, p=0.000). Neither Lower Campbell nor Upper Campbell Reservoirs resulted in a significant correlation.



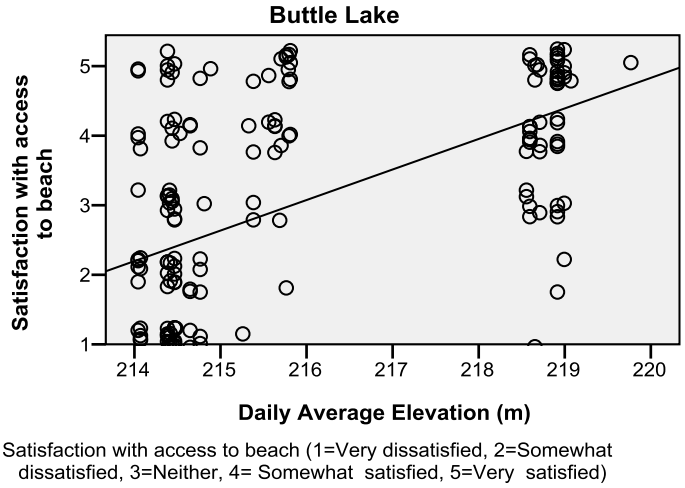


Figure 18. Satisfaction with access to the beach in relation to daily average water level for Buttle Lake (n=183)

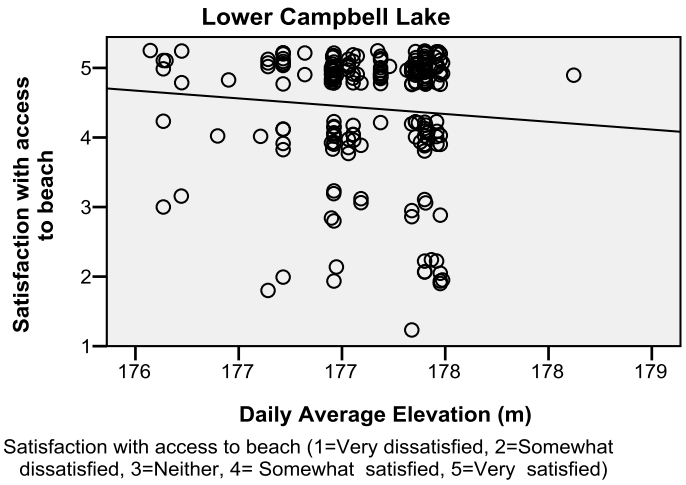


Figure 19. Satisfaction with access to the beach in relation to daily average water level for Lower Campbell Reservoir (n=214)

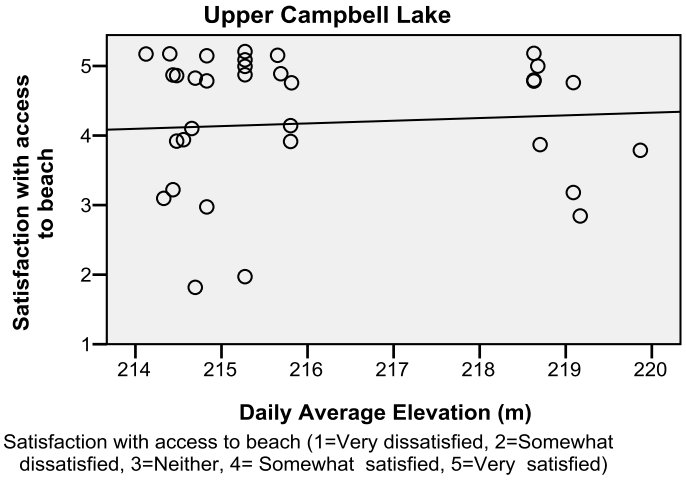


Figure 20. Satisfaction with access to the beach in relation to daily average water level for Upper Campbell Reservoir (n=34)

3.2.4.2 Access to Water via Boat Launch

When respondents were asked to rate their satisfaction with access to the water via boat launches, the greatest proportion of respondents (37.9%) reported that this did not apply, implying that most people did not use boat launches while recreating at reservoirs. A total of 37.5% of respondents reported that they were either "very satisfied" or "somewhat satisfied" with access to water via boat launches.

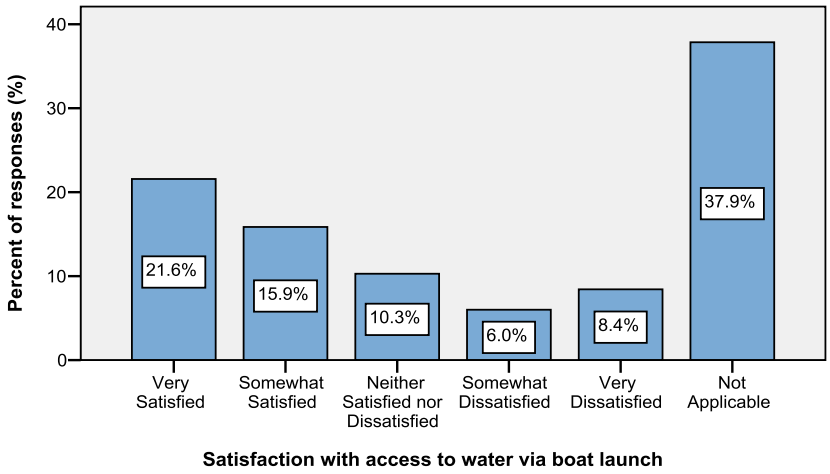


Figure 21. Satisfaction with access at reservoirs to water via boat launch for all respondents (n=700)

Scatterplots were developed to depict respondents' satisfaction with access to the reservoirs via boat launches in relation to daily average water elevation (see Figure 22, Figure 23 and Figure 24). A general trend is most evident at Buttle Lake. A Spearman's rank-order correlation was run to examine this relationship. There was a moderate, significant correlation between satisfaction with access to water via boat launches and water levels for Buttle Lake (n=130, r_s=0.586, p=0.000), where an increase in reservoir elevation results in increased satisfaction with water access using the boat launches. Neither Lower Campbell nor Upper Campbell Reservoirs resulted in a significant correlation.

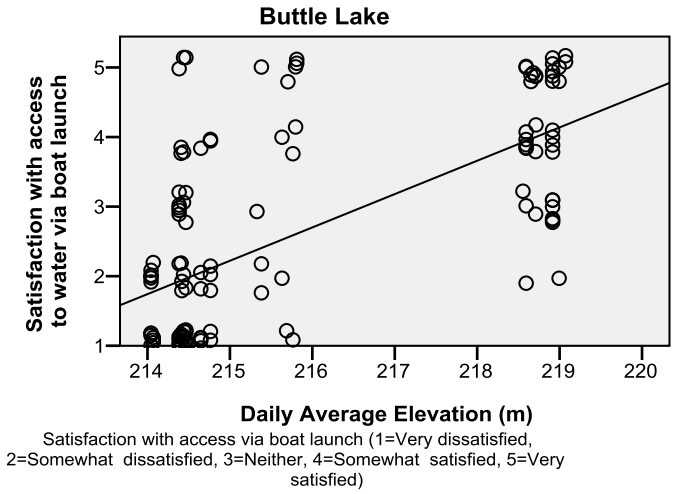


Figure 22. Satisfaction with access to the water via boat launch in relation to daily average water level for Buttle Lake (n=130)

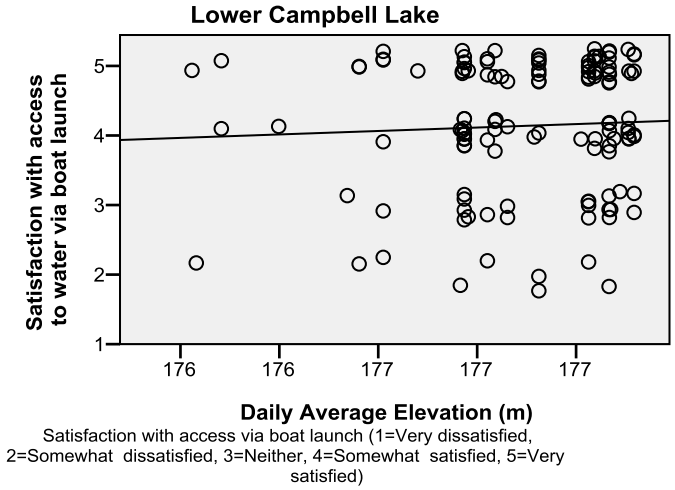


Figure 23. Satisfaction with access to the water via boat launch in relation to daily average water level for Lower Campbell Reservoir (n=129)

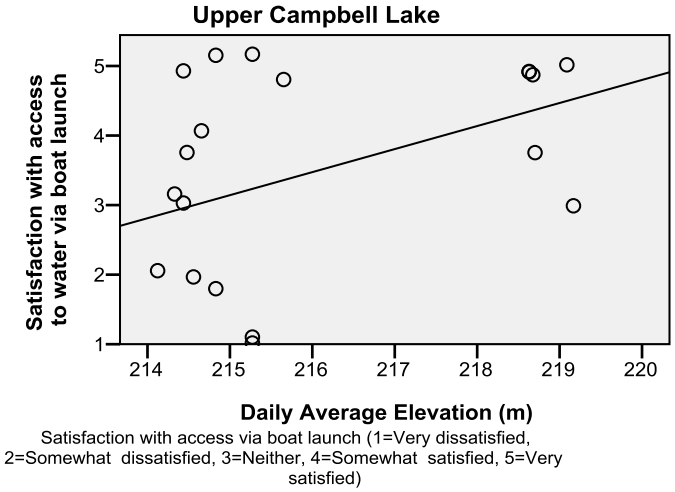


Figure 24. Satisfaction with access to the water via boat launch in relation to daily average water level for Upper Campbell Reservoir (n=20)

3.2.4.3 Access to Water via Shoreline

A total of 58.5% of respondents reported that they were either "very satisfied" or "somewhat satisfied" when respondents were asked to rate their satisfaction with access to the water via the shoreline (see Figure 25).

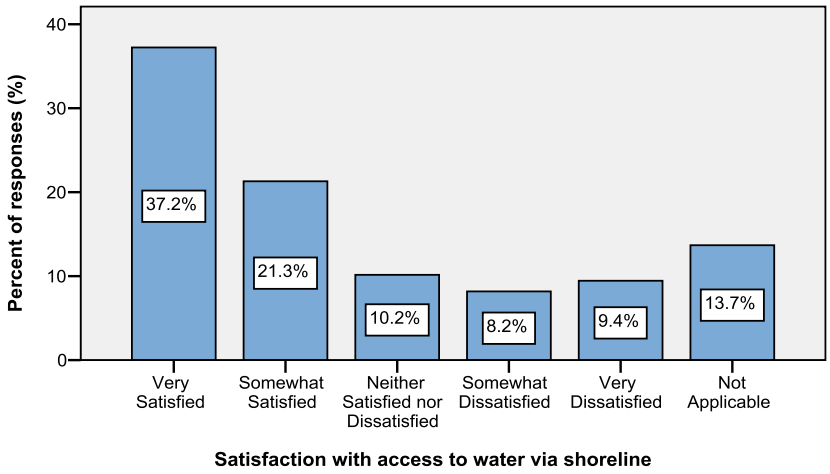


Figure 25. Satisfaction with access at reservoirs to water via shoreline for all respondents (n=709)

Satisfaction with access to the water via the shoreline was graphed in relation to daily average water elevation in scatterplots for Buttle Lake, Upper Campbell Reservoir and Lower Campbell Reservoir (see Figure 26, Figure 27 and Figure 28). As with the other reservoir performance measures, satisfaction with access to the water via the shoreline increased in relation to water levels at Buttle Lake. A Spearman's rank-order correlation identified a highly-significant relationship at Buttle Lake (n=169, r_s=0.603, p=0.000). Neither Lower Campbell nor Upper Campbell Reservoirs resulted in a significant correlation.

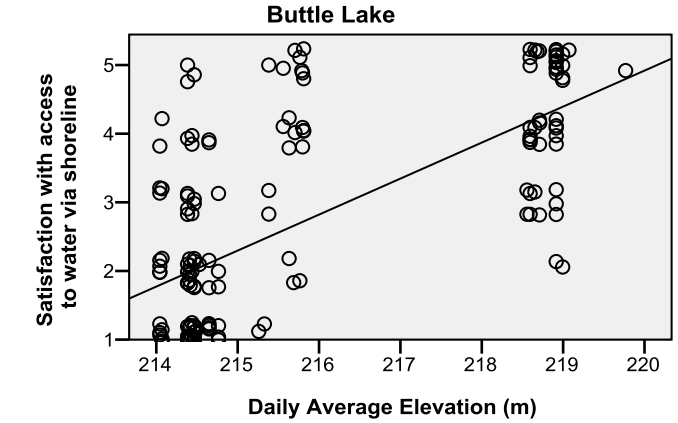
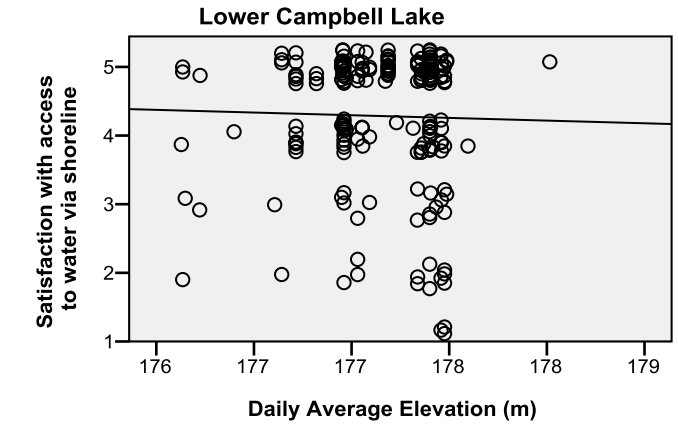
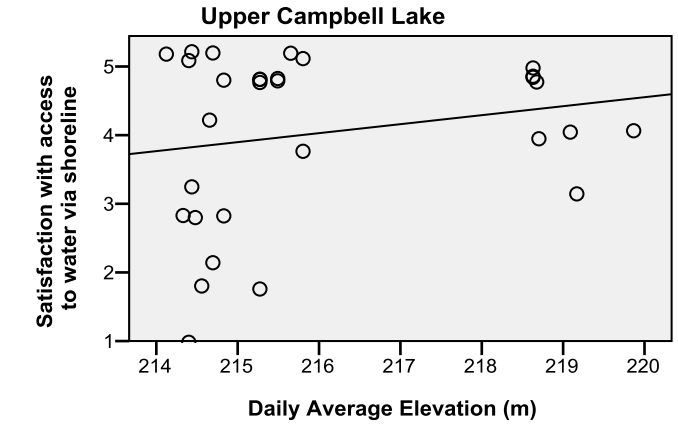


Figure 26. Satisfaction with access to the water via shoreline in relation to daily average water level for Buttle Lake (n=169)



Satisfaction with access via shoreline (1=Very dissatisfied, 2=Somewhat dissatisfied, 3=Neither, 4=Somewhat satisfied, 5=Very satisfied)

Figure 27. Satisfaction with access to the water via boat launch in relation to daily average water level for Lower Campbell Reservoir (n=199)



Satisfaction with access via shoreline (1=Very dissatisfied, 2=Somewhat dissatisfied, 3=Neither, 4=Somewhat satisfied, 5=Very satisfied)

Figure 28. Satisfaction with access to the water via boat launch in relation to daily average water level for Upper Campbell Reservoir (n=30)

3.3 MANAGEMENT HYPOTHESIS – RIVERS

The management hypothesis for rivers in the Campbell River reservoir systems is stated as:

$H_{0\text{-}B}$: Changes in overall satisfaction with the recreation experience at rivers, if they occur, are not related to riverine discharge.

We tested this hypothesis by comparing perceptions of safety, satisfaction and experience with average daily flow rates for two rivers in the study area: Quinsam River and Campbell River. Responses to Q30, Q31 and Q32 in Section E: Visits to Rivers (Appendix B) of the survey were graphed using scatterplots in relation to the average daily water flow. As with previous scatterplots, a line of best fit was applied to illustrate the general trends, although this is simply for illustrative purposes only. Rather, correlations were tested using the Spearman rank-order correlation coefficient.

River discharge, measured as daily average flow rate, was gathered for two rivers: Quinsam River and Campbell River. Water flow data was provided from BC Hydro from the "Quinsam River near Campbell River" station and the "Campbell River near Campbell River" station. Analyses had to be completed separately for the two rivers as volumes differ greatly between the two systems, and thus were not directly comparable.

3.3.1 INFLUENCE OF WATER FLOW ON RECREATION EXPERIENCE

Question 30 asked respondents to rate how water flows influenced their recreation experience on a scale of 1 to 5 (with 1 being "very negative" and 5 being "very positive") given river conditions at the time of their visit. A large proportion of respondents (40.9%) reported that water flow had no influence on their recreation experience at the rivers, although collectively, more than half of respondents (51.7%) stated that water flows at the time of their visit had a "somewhat positive" or "very positive" influence.

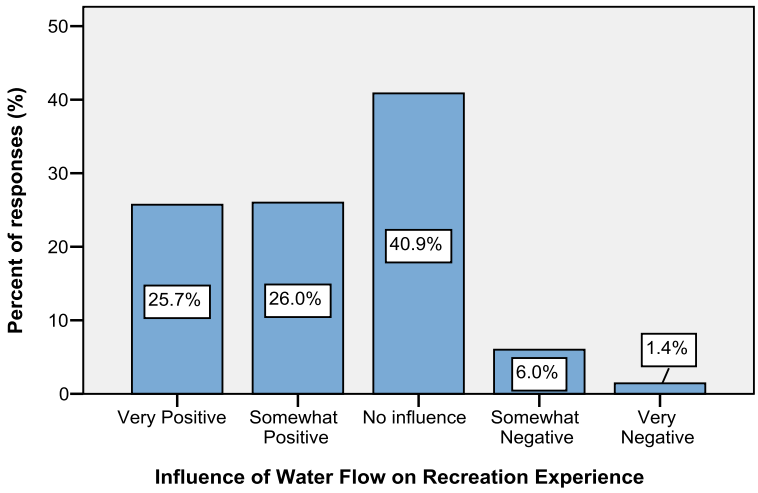
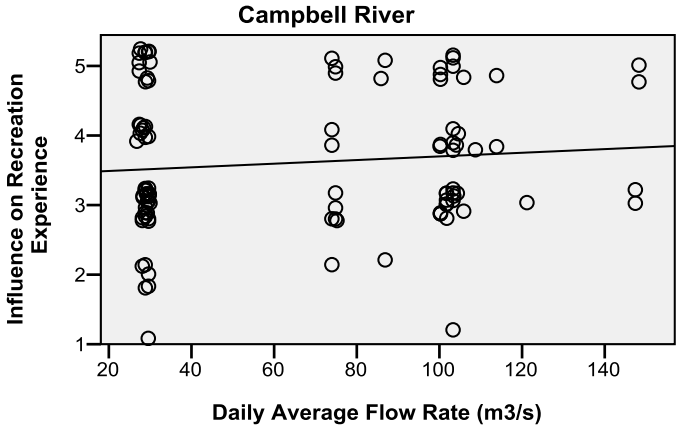


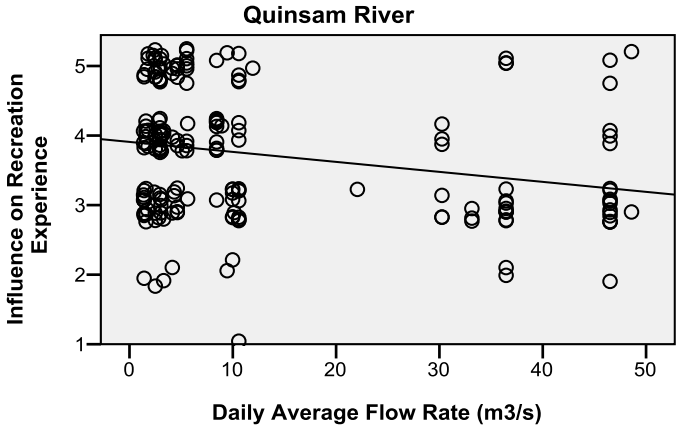
Figure 29. Frequency of responses for perception of safety while recreating at reservoirs (n=350)

The influence of water flows on respondents' recreation experience was graphed in relation to daily average water flows for the rivers as scatterplots (see Figure 30 and Figure 31). No strong trends were apparent in the scatterplots for Quinsam River and Campbell River. A Spearman's rank-order correlation was run to examine this relationship. A weak but significant correlation was noted at Quinsam River where increased water flow related to a decreasing influence on recreation experience (n=189, r_s=-0.196, p=0.007). No significant relationship was noted for Campbell River.



Influence on Recreation Experience (1=Very Negative, 2=Somewhat negative, 3=No influence, 4=Somewhat positive, 5=Very positive)

Figure 30. Influence of water flows on recreation experience in relation to average daily water flow for Campbell River (n=102)



Influence on Recreation Experience (1=Very Negative, 2=Somewhat negative, 3=No influence, 4=Somewhat positive, 5=Very positive)

Figure 31. Influence of water flows on recreation experience in relation to average daily water flow for Quinsam River (n=189)

3.3.2 SATISFACTION WITH SHORELINE CONDITIONS

Question 31 asks riverine visitors to rate how satisfied they were with shoreline conditions while engaged in water-based recreation at the time of their visit on a scale of 1 to 5 (with 1 being "very dissatisfied" and 5 being "very satisfied"). Respondents were generally satisfied with shoreline conditions along the rivers, with the majority (70.3%) of respondents reporting that they were either "somewhat satisfied" or "very satisfied"

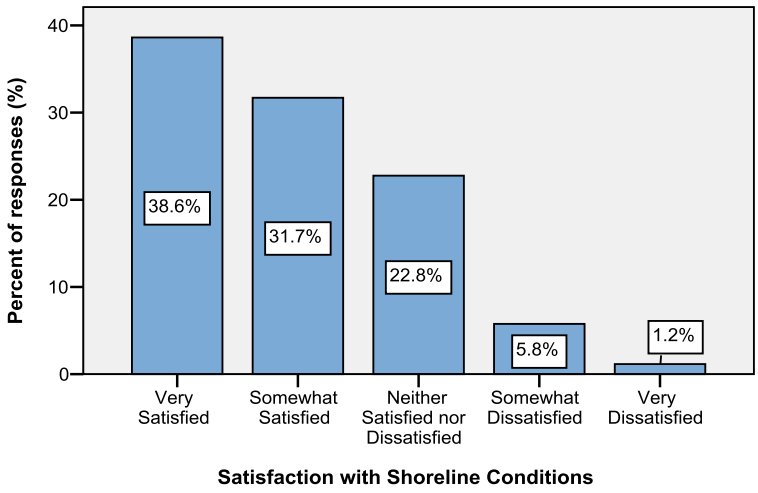


Figure 32. Frequency of responses for satisfaction with shoreline conditions at rivers (n=347)

Scatterplots were developed to depict the satisfaction with shoreline conditions in relation to daily average water flows for the rivers although no clear trend was noted (see Figure 33 and Figure 34). A Spearman's rank-order correlation was run to examine this relationship but no significant correlation was identified for either river.

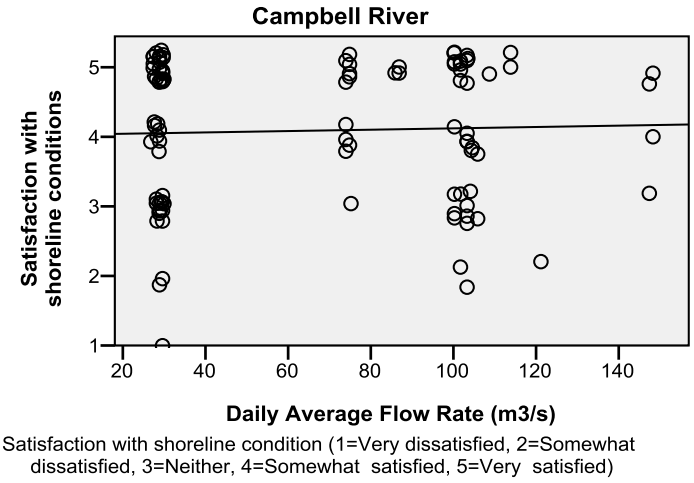


Figure 33. Satisfaction with shoreline conditions in relation to daily average water flow for Campbell River (n=101)

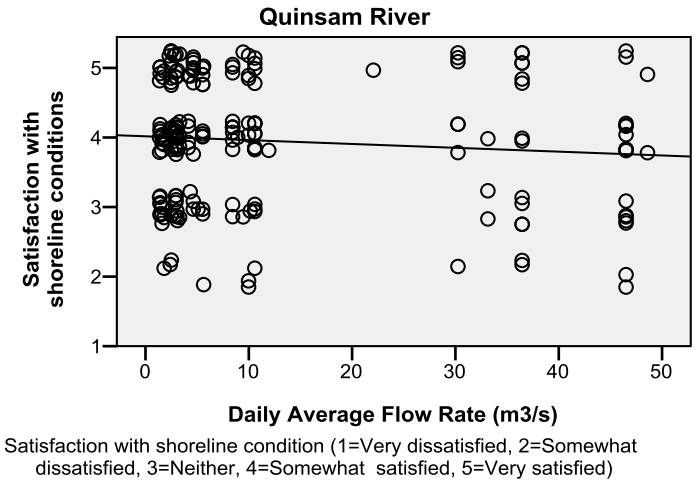


Figure 34. Satisfaction with shoreline conditions in relation to daily average water flow for Quinsam River (n=189)

3.3.3 PERCEPTION OF SAFETY

In Question 32, respondents were asked to rate how safe they felt engaging in water-based activities at the rivers on a scale of 1 to 5 (with 1 being "very unsafe" and 5 being "very safe") given water levels at the time of their visit. The majority of respondents (53.9%) reported feeling "very safe" while recreating at a reservoir within the Campbell Reservoir system.

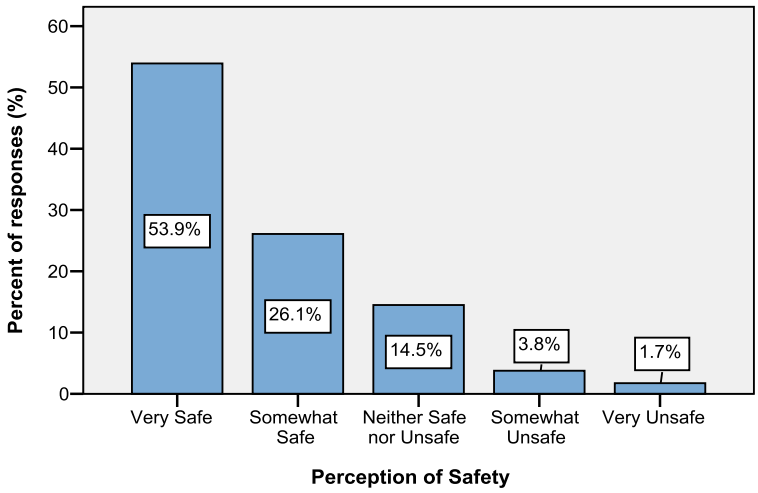


Figure 35. Frequency of responses for perception of safety while recreating at rivers (n=345)

Scatterplots were developed to depict respondents' perception of safety in relation to daily average water flows for the rivers (see Figure 36 and Figure 37). A Spearman's rank-order correlation was run to examine this relationship but no significant correlation was identified for either river.

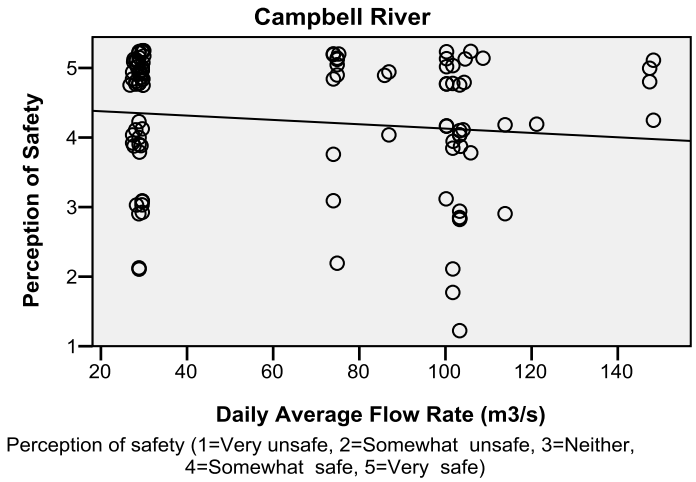


Figure 36. Perception of safety in relation to daily average water flows for Campbell River (n=102)

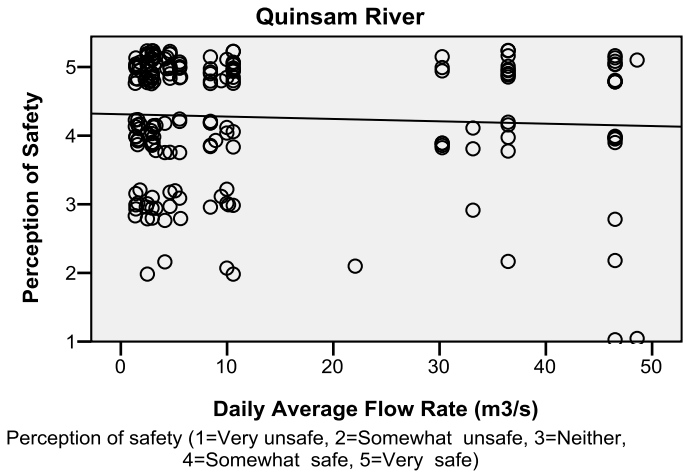


Figure 37. Perception of safety in relation to daily average water flows for Quinsam River (n=187)

3.4 MANAGEMENT HYPOTHESIS – FALLS

The management hypothesis for rivers in the Campbell River reservoir systems is stated as:

$H_{0\text{-}C}$: Changes in overall satisfaction with the recreation experience of visitors to Elk Canyon Falls is not related to riverine discharges (i.e. spill events).

We tested this hypothesis by comparing visitor satisfaction and impressiveness at Elk Falls with average daily flow rates for Campbell River. Responses to Q23 and Q24 in Section D: Visit to Elk Falls (Appendix B) of the survey were graphed using scatterplots in relation to the average daily water flow. A line of best fit was applied on the scatterplots to illustrate the general trends, although the method used to apply the line of best fit, the Pearson product-moment correlation, is not appropriate for this type of data. As noted in the

sections on reservoirs and rivers, a more appropriate test for examining correlation between ordinal variables (i.e., Likert scales) and interval data (i.e., average daily elevation) is Spearman rank-order correlation coefficient.

River discharge for Elk Falls, measured as daily average flow rate, was gathered from BC Hydro for Campbell River using data from the "Campbell River near Campbell River" station.

3.4.1 IMPRESSIVENESS OF FALLS

Question 32 asks respondents to rate how impressive Elk Falls were at the time of their visit on a scale of 1 to 5 (with 1 being "very unimpressive" and 5 being "very impressive"). Most respondents reported that they were either "very impressed" (63.7%) or "somewhat impressed" (31.4%) by Elk Falls at the time of their visit (Figure 38).

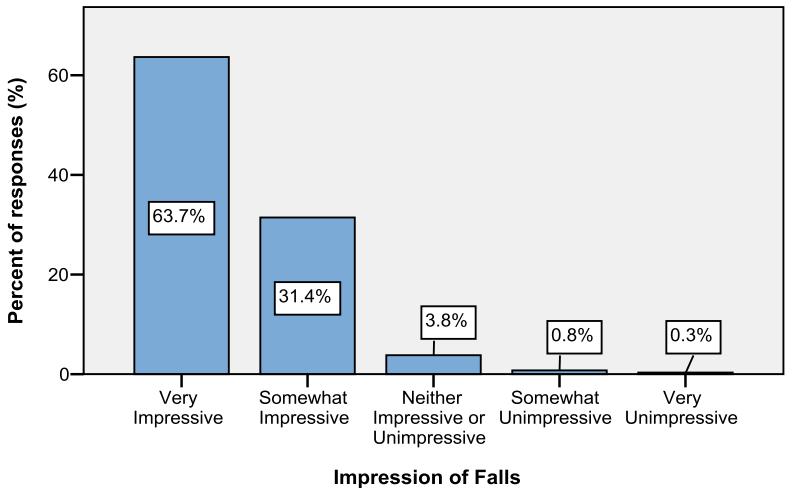


Figure 38. Frequency of responses for impressiveness of Elk Falls (n=918)

A scatterplot was developed to depict respondents' ratings of impressiveness of the falls in relation to daily average water flows for Campbell River (see Figure 39). A Spearman's rank-order correlation was run to examine this relationship but no significant correlation was identified suggesting that discharge does not influence visitors' impression of Elk Falls.

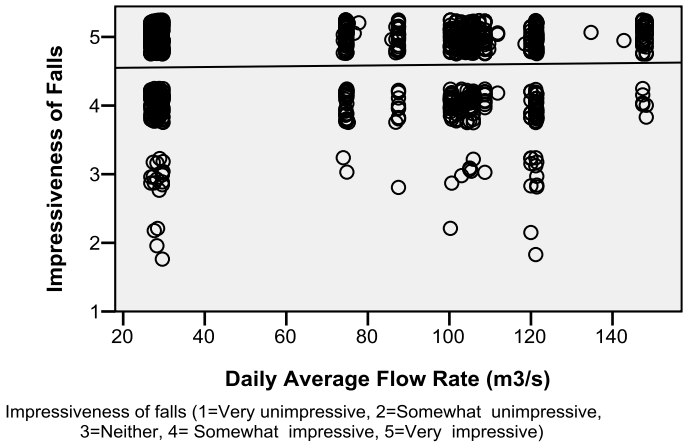


Figure 39. Impressiveness of falls in relation to daily average water flows for Elk Falls (n=900)

3.4.2 SATISFACTION WITH EXPERIENCE AT FALLS

In Question 24, respondents were asked to rate how satisfied they were with the viewing experience at Elk Falls on a scale of 1 to 5 (with 1 being "very dissatisfied" and 5 being "very satisfied"). Respondents reported a high degree of satisfaction with their experience at Elk Falls with 82.1% stating they were "very satisfied" (Figure 38).

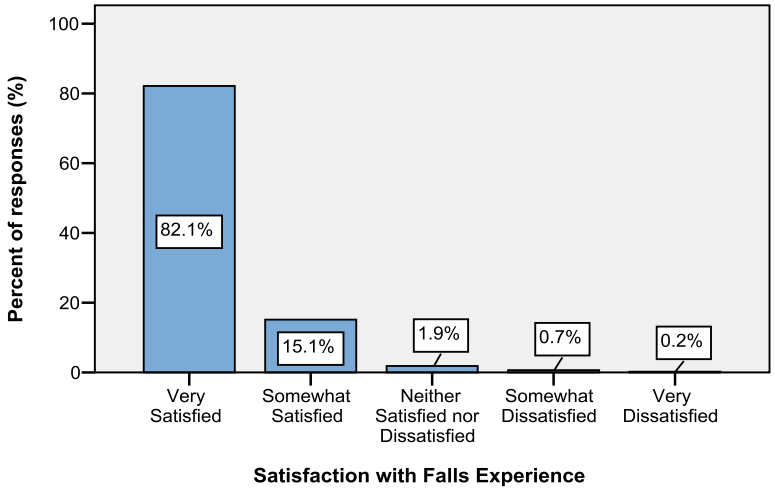


Figure 40. Frequency of responses for satisfaction with experience at Elk Falls (n=918)

A scatterplots of respondents' ratings of satisfaction at the falls in relation to daily average water flows for Campbell River does not indicate any notable trend (see Figure 41). A Spearman's rank-order correlation was run to examine this relationship but no significant correlation was identified suggesting that discharge does not influence visitors' impression of Elk Falls.

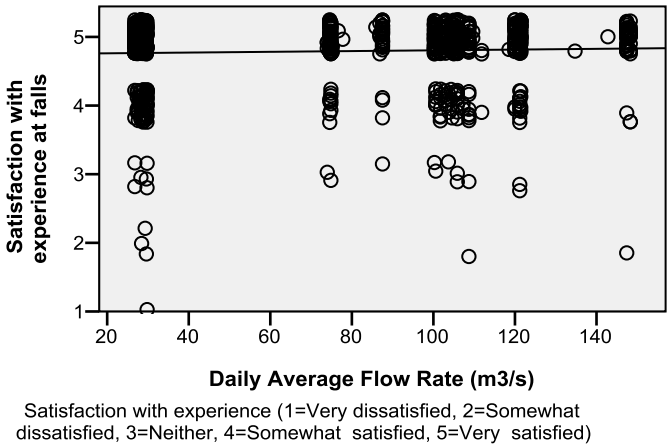


Figure 41. Satisfaction with experience at falls in relation to daily average water flow (n=899)

3.5 DISCRETE CHOICE EXPERIMENT

The results are organized as follows: first, the single class multinomial logit model is presented, showing overall recreationist attitudes and preferences toward reservoir features; second, the 'known class' multinomial logit models profiling different preferences segmented groups is presented and discussed; third, the 4 class multinomial logit model is presented but not discussed. A total of 1130 respondents completed the full choice experiment and provide data for the analysis.

The 1-class multinomial logit model of the responses to the six choice tasks is shown in Table 6. The model provides three significant observations. First, respondents indicated significant preferences for water levels that were not 'LOW LOW' or 'HIGH HIGH'. That is, respondents were more likely to choose reservoir conditions that did not include these water levels. Excluding 'LOW LOW' and 'HIGH HIGH' conditions, respondents were more likely to prefer higher water levels. Respondents gained 36% more utility (personal value) from high water conditions over low water conditions. Second, the model indicates that sandy shorelines were preferred over rocky shorelines and that no debris was most preferred by respondents, although some respondents did indicate a preference for average levels of debris. The known class analysis reveals these respondents to be people who primarily do not plan to recreate on the lake (e.g. campers, those visiting rivers).

Third and contrary to our expectations, the 1-class model indicates that neither lakebed features nor the type of boat ramp was significant in respondents' choice of reservoir recreation. The explanation for this result may lie in the great number of recreational activities planned by respondents and indeed a brief exploration of a multiclass model (see Table 8) suggests that lakebed features and boat ramp type are significant for some recreationists and provides a suggestion for future analysis.

Table 6. Results of the 1-Class multinomial logit model testing effects of reservoir features (n=1130)

Attribute and Attribute Level	Estimate	p-value
Quantity of Debris		
(1) No Debris	0.316	1.00E-25
(2) Little Debris	-0.1795	
(3) Average Debris	0.0155	
(4) A lot of Debris	-0.152	
Water Level		
(1) LOW LOW	-1.0745	1.80E-152
(2) Low	0.3474	
(3) Average	0.4645	
(4) High	0.4741	
(5) HIGH HIGH	-0.2114	
Shoreline Features		
(1) Rocks	-0.2336	1.00E-33
(2) Sand	0.2336	
Lakebed Features		
(1) Sediment	0.0146	0.46
(2) Grass/Woody environment	-0.0146	
Boat Ramp Type		
(1) None	0.0043	0.98
(2) Gravel road	-0.0048	
(3) Concrete pad	0.0005	

[a]Rho^2=.0807

Table 7 presents a comparison of multiple 'known class' models with set membership based on respondent identification as people who plan (or do not plan) to recreate on the reservoir, Campbell River residents, non-Campbell River residents, campers only, people planning on sightseeing the falls, and hikers. Differences from the 1-class multinomial logit model are highlighted in bold text. The comparison shows that while respondents were homogenous in their preferences for 'LOW LOW' and 'HIGH HIGH' water conditions and shoreline features (with respondents preferring sand over rocky shorelines), differences are present between respondent types for debris quantity, lakebed features, and boat ramp types. Recreationists who were planning to recreate on the reservoir preferred average water levels above all other water levels. These recreationists also did not prefer reservoir conditions with any level of debris. Hikers as well did not prefer reservoir conditions with any debris. Recreationists who did not plan to recreate on the reservoir expressed a negative preference for gravel type boat launches. Non-Campbell River residents, hikers, and those recreationists planning on sightseeing the falls most preferred average water levels. Recreationists who were planning to recreate on the reservoir, and non-Campbell River residents expressed a negative preference for concrete boat ramps while hikers expressed a preference for reservoirs containing concrete boat ramps.

Table 7. Results of the "known class" multinomial logit model testing effects of reservoir features

Attribute and attribute level	People who plan to recreate on the lake n= 584	People who do not plan to recreate on the lake n= 488	Campbell River residents n- 407	Non-Campbell River residents n= 723	Campers only n= 481	Sightseeing falls n= 131	Hikers only n= 114
Quantity of Debris	**Part-worth utility estimates**						
(1) No Debris	0.3028	0.3347	0.3169	0.3147	0.3253	0.5457	0.4290
(2) Little Debris	-0.1310	-0.2109	-0.0511	-0.2546	-0.2129	-0.3245	-0.2279
(3) Average Debris	***-0.0422***	0.0772	-0.0105	0.0324	0.0594	0.1366	***-0.1368***
(4) A lot of Debris	-0.1296	-0.2009	-0.2553	-0.0926	-0.1718	-0.3579	-0.0642
Water Level							
(1) LOW LOW	-1.3276	-0.9151	-0.9497	-1.1513	-1.2860	-1.2686	-0.8277
(2) Low	0.5100	0.2030	0.3231	0.3623	0.4915	0.2702	0.3000
(3) Average	***0.6500***	0.2868	0.3512	***0.5264***	0.6219	***0.5367***	***0.3535***
(4) High	0.5522	0.4276	0.4450	0.4965	0.6490	0.4658	0.1681
(5) HIGH HIGH	-0.3846	-0.0024	-0.1696	-0.234	-0.4764	-0.0041	0.0060
Shore Line Features							
(1) Rocks	-0.2358	-0.2449	-0.2331	-0.2348	-0.3084	-0.3462	-0.1625
(2) Sand	0.2358	0.2449	0.2331	0.2348	0.3084	0.3462	0.1625
Lakebed Features							
(1) Sediment	***-0.0046***	0.0465	***-0.0028***	0.0231	0.0948	0.0369	***-0.0533***
(2) Grass/Woody environment	0.0046	-0.0465	0.0028	-0.0231	-0.0948	-0.0369	0.0533
Boat Ramp Type							
(1) None	0.0064	0.002	0.0387	***-0.0159***	0.0011	0.0059	***-0.0347***
(2) Gravel road	***0.0287***	-0.043	-0.0598	***0.0282***	-0.0203	-0.0262	-0.0613
(3) Concrete pad	***-0.0352***	0.041	0.021	***-0.0124***	0.0192	0.0203	0.0959

*Bold italic text highlights differences from the 1-class multinomial logit model

The expression of preferences in Table 6 and Table 7 suggests that water level is most significant for recreationists considering reservoir features. A sandy shoreline with no debris is most preferred but some differences do exist between recreationists. Table 8 highlights the results of a 4-class latent model in which all reservoir features are significant ($p < .05$) and differences between classes exist. The 4-class latent model suggests that for 29% of recreationists, 'HIGH HIGH' water levels are most preferred (see Class 2). For 35.7% (see Class 1) of recreationists, gravel road and concrete boat ramps are preferred with 19.5% (see class 3) of recreationists only preferring concrete boat ramps. Conversely, 15.7% (see Class 4) of recreationists indicate negative preference for concrete boat ramps. Further analysis of latent variables can help explain differences between classes.

Table 8. Results of the 4-Class latent class model testing effects of reservoir features

Attribute and Attribute Level	Class 1	Class 2	Class 3	Class 4	p-value
Proportion of recreationists	**0.3574 n≅403**	**0.2908 n≅328**	**0.1946 n≅220**	**0.1572 n≅178**	
	Part-worth utility estimates				
Quantity of Debris					
(1) No Debris	-0.1099	0.6098	0.7436	1.0913	2.40E-20
(2) Little Debris	0.1211	0.0306	-0.5356	-0.4629	
(3) Average Debris	0.2384	-0.4068	-0.3102	-0.1675	
(4) A lot of Debris	-0.2497	-0.2335	0.1021	-0.4609	
Water Level					
(1) LOW LOW	0.153	-2.17174	0.47396	-1.3024	3.30E-84
(2) Low	-0.4952	0.49808	0.70994	0.7393	
(3) Average	-0.3336	0.57999	0.5382	1.4329	
(4) High	0.115	0.58382	0.46647	-0.0711	
(5) HIGH HIGH	0.5608	***0.50984***	-2.18857	-0.7987	
Shore Line Features					
(1) Rocks	-0.1664	-0.2306	-0.8922	-0.1543	1.70E-06
(2) Sand	0.1664	0.2306	0.8922	0.1543	
Lakebed Features					
(1) Sediment	-0.0132	0.0423	0.2089	0.323	0.00066
(2) Grass/Woody environment	0.0132	-0.0423	-0.2089	-0.323	
Boat Ramp Type					
(1) None	-0.1859	0.2671	-0.2539	0.4951	5.30E-09
(2) Gravel road	***0.047***	0.1684	-0.2875	0.1014	
(3) Concrete pad	***0.139***	-0.4355	***0.5414***	-0.5965	

*Bold italic text highlights differences from the 1-class multinomial logit model

4 DISCUSSION

The first year of data collection has provided an initial understanding of public perceptions of recreational use within the Campbell Reservoir system, and how different operating regimes may influence perceptions. The analysis has also provided a general characterization of the people, activities and patterns of use in the study area.

In general, respondents had favourable perceptions of their experiences at the reservoirs, rivers and waterfalls as gauged by the performance measures. For reservoirs, the performance measure with the highest frequency of positive responses was regarding perceptions of safety, where 54.5% of reservoir visitors reported feeling "very safe" while engaged in recreation at a reservoir. In contrast, the two performance measures with the lowest frequency of positive responses were the influence of water level on visitors' experience at the reservoirs, and satisfaction with access to water via boat launch. Regarding the influence of

water level on visitor experience, the frequency of positive responses (48.3% of respondents replied "very positive" or "somewhat positive") still was greater than the negative responses (20.3% of respondents replied "somewhat negative" or "very negative") although a large proportion (31.3%) of respondents reported that water level had no influence on their recreation experience. This implies that water levels are not that influential to a substantial proportion of reservoir visitors. These visitors could have been engaged in activities that are not as sensitive to water levels at the reservoirs, such as hiking and camping. Regarding satisfaction with access to water via boat launches, positive responses were generally lower due to the high proportion of respondents (37.9%) who responded that the question did not apply.

The frequency of responses for performance measures at the river locations showed both similarities and differences with the responses at the reservoirs. As with the reservoirs, perception of safety at rivers had the highest frequency of positive responses, with 53.9% of river visitors reporting feeling "very safe" while engaged in recreation at a river. Also similar to the responses at the reservoirs, the influence of water flow on riverine recreation resulted in a high frequency (40.9%) of respondents replying that water flows had no influence on their recreation experience. This could be as a result of a large proportion of river visitors being engaged in recreational activities that are not necessarily water-based (e.g. hiking and dog-walking).

Compared to the river and reservoir locations, Elk Falls had the highest frequency of positive responses overall. Over 97% of respondents at Elk Falls reported being "very satisfied" or "somewhat satisfied" with their recreation experience, and 95.1% of respondents at Elk Falls described the waterfalls as being "very impressive" or "somewhat impressive". When these performance measures were examined in relation to water flows, as per the management question for Elk Falls, it is evident that flow rate does not appear to have any significant relationship to the impression or satisfaction of visitors to the falls. Rather, visitors to Elk Falls seem to have a positive experience regardless of the flow, based on the flow conditions experienced by respondents through Year 1 of data collection.

The management question for reservoirs involved comparing the performance measures with average daily water elevations. A significant relationship was noted between daily average water elevation for all performance measures for reservoirs, but only at Buttle Lake. No significant relationships were noted for Upper or Lower Campbell Reservoirs. The rationale for why significant relationships were noted at Buttle Lake but not the other two reservoirs was not analysed at this point in the study. However, possible explanations could include: the morphology of Buttle Lake could make the location more dramatically influenced by changes in water elevation (e.g. extensive drawdown zone, higher cover of woody debris); or simply, low visitation could result in a sample size that is too small at some locations to determine a significant relationship (e.g. Upper Campbell Reservoir). In the case of Buttle Lake, perceptions of safety, satisfaction and experience all had significant relationships to reservoir operations. For all performance measures, increases in water levels at Buttle Lake resulted in more positive perceptions.

Of the three performance measures used to evaluate the management question for rivers, only one scenario resulted in a significant relationship. A weak but significant correlation was noted at Quinsam River where increased water flow was significantly related to a decreasing influence on recreation experience. This suggests that riverine visitors to Quinsam River tend to have more positive recreational experiences as water

flow decreases. Aside from this, however, water flows in the riverine locations did not correlate with changes in public perceptions.

The results from the reservoir and river analyses also provide some context for how reservoir operations may influence the experience at riverine locations. The management of riverine flows may often come with a trade-off of water levels in the reservoirs. As noted in the results, the relationship between water flows and satisfaction of riverine-based recreationists was not definitive. A significant but weak relationship was identified for Quinsam River, where decreased water flows in the river were related to more positive recreational experiences. However, no significant relationship was identified for Campbell River. In contrast, higher water elevations at reservoirs were associated with more positive recreational experiences, but only at Buttle Lake. These outcomes suggest that reservoir and river based operations could complement one another in some settings (e.g., maintaining higher water elevations in the reservoirs and lower flows in the rivers to achieve greater satisfaction with both user groups), although, given the lack of significant relationship in all locations, this does not appear to be the case with certainty.

The discrete choice experiment provides additional insights regarding different management scenarios in the reservoirs and supported many of the observations made with the basic questionnaire. Although some differences in results are noted, the general findings of the discrete choice experiments support the observed relationship between water levels and public perceptions. While the 1-class multinomial logit model indicated significant preferences for water levels that were not in the extremes (i.e., not 'LOW LOW' or 'HIGH HIGH'), when these extreme conditions were excluded from the DCE analysis, respondents were more likely to prefer higher water levels. This finding was consistent for the 1-class multinomial logit model as well as for all the 'known class' models that were tested (i.e, the known and multi-latent classes models indicate that only a smaller group of respondents had a negative perception of 'LOW LOW' conditions while another group had a negative perception of 'HIGH HIGH' conditions). The responses from the basic questionnaire do not indicate a decline in positive perceptions at the highest water levels, although the rational for this could be that respondents never experienced extreme 'High High' levels at any of the reservoirs during the survey.

Beyond the preferences for water levels, the analysis of the DCE presented some interesting results in regards to the other reservoir attributes that were explored. Not surprisingly, the 1-class model indicates that respondents tend to prefer sandy shorelines over rocky shorelines, and that no debris was most preferred by respondents. Contrary to expectations, the 1-class model indicates that neither lakebed features nor the type of boat ramp were significant in respondents' choice of reservoir. The explanation for this could lie in the broad diversity of recreation activities respondents were involved with, ranging from more land-based activities (e.g., camping, hiking) to water-based activities (e.g., fishing, power boating). Preferences for different lake features are anticipated to be significant depending on recreation activities. This hypothesis was tested briefly with a latent 4-class model (e.g., a model which groups similar answers into 4 groups of respondents), with results suggesting that lakebed features and boat ramp type are significant for some recreationists. This analysis suggested that there are significant differences between recreationists and as such, further analysis of known class and latent 4-class models may provide a more refined portrayal and

additional insights of reservoir preferences, providing some direction for potential future analysis with the DCE.

To date, the analysis associated with this monitor contributes to our understanding of public use and perceptions in the Campbell Reservoir system but also highlights areas for further investigation or refinement. The lack of significant results for some of the management questions at some locations may highlight the potential value in sampling across a broader range of reservoir and riverine conditions (i.e., sample during extreme water levels and discharge events). Additionally, the very large response of visitors at Elk Falls Lookout/suspension bridge day use area suggests that less sampling effort might be needed at this location. Some of this effort could be focused on the river and reservoir sampling locations. In addition to changes to the sampling approach, future comparative analysis may also be expanded to help explain some of the current results. Examples of potential explanatory variables could include preferred recreation activity or location of residence.

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APPENDIX A. BASIC DESCRIPTIVE STATISTICS OF RESPONSES FOR SURVEY QUESTIONS

1. How many days are you spending in the Campbell River Reservoir System on this trip?

N	Valid	1836
	Missing	151
Mean		3.59
Median		1.00
Mode		1
Std. Deviation		10.038
Minimum		1
Maximum		248

2. If staying overnight in the Campbell River system area, what type of accommodation are you using?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Cabin	55	2.8	3.5	3.5
	Camper	182	9.2	11.5	15.0
	Motorhome	123	6.2	7.8	22.8
	Multiple	33	1.7	2.1	24.9
	No	609	30.6	38.6	63.5
	Other	109	5.5	6.9	70.5
	Tent	195	9.8	12.4	82.8
	Trailer	271	13.6	17.2	100.0
	Total	1577	79.4	100.0	
Missing	System	410	20.6		
Total		1987	100.0		

3. What activity was the most important for you in your decision to visit the Campbell River Reservoir system for this trip?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Beach activities	26	1.3	1.5	1.5
	Power boating	37	1.9	2.1	3.6
	Camping	569	28.6	32.3	35.8
	Canoeing	6	.3	.3	36.2
	Sight-seeing (dam)	9	.5	.5	36.7
	Dog-walking	174	8.8	9.9	46.5
	Sight-seeing (falls)	431	21.7	24.4	71.0
	Fishing	80	4.0	4.5	75.5
	Hiking	278	14.0	15.8	91.3
	Kayaking	13	.7	.7	92.0
	Other	29	1.5	1.6	93.7

	Picnicking	10	.5	.6	94.2
	Swimming	81	4.1	4.6	98.8
	Waterskiing	6	.3	.3	99.1
	Wildlife viewing	14	.7	.8	99.9
	Windsurfing	1	.1	.1	100.0
	Total	1764	88.8	100.0	
Missing	System	223	11.2		
Total		1987	100.0		

4. Which areas in the Campbell River system have you visited or anticipate visiting for recreational activities for recreational activities on this trip?

		Responses		
		N	Percent	Percent of Cases
Areas visited during trip	Elk Falls	914	31.3%	50.9%
	Campbell River	359	12.3%	20.0%
	Lower Campbell Reservoir	341	11.7%	19.0%
	Upper Campbell Reservoir	163	5.6%	9.1%
	Quinsam River	370	12.7%	20.6%
	Salmon River	69	2.4%	3.8%
	McIvor Lake	314	10.8%	17.5%
	Buttle Lake	358	12.3%	19.9%
	Other	31	1.1%	1.7%
Total		2919	100.0%	162.6%

5. Have you recreated on the water or on the shore of any lakes/reservoirs in the Campbell River system during this trip?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	924	46.5	56.4	56.4
	Yes	714	35.9	43.6	100.0
	Total	1638	82.4	100.0	
Missing	System	349	17.6		
Total		1987	100.0		

6. Which lake/reservoir did you recreate at most recently on this trip?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Buttle Lake	213	10.7	29.2	29.2
	Lower Campbell Reservoir	239	12.0	32.8	62.0
	McIvor Lake	224	11.3	30.7	92.7
	Upper Campbell Reservoir	45	2.3	6.2	100.0
	Other	8	.4	1.1	93.8
	Total	729	36.7	100.0	
Missing	System	1258	63.3		
Total		1987	100.0		

Other lakes/reservoirs:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Fry Lake	6	.3	85.7	85.7
	Quinsam Lake	1	.1	14.3	100.0
	Total	7	.4	100.0	
Missing	System	1980	99.6		
Total		1987	100.0		

7. When was your most recent visit to this lake/reservoir?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Other	36	1.8	5.0	5.0
	Today	550	27.7	76.3	81.3
	Two days ago	30	1.5	4.2	85.4
	Yesterday	105	5.3	14.6	100.0
	Total	721	36.3	100.0	
Missing	System	1266	63.7		
Total		1987	100.0		

8. During your most recent visit to this lake/reservoir, what activities did you participate in?

		Responses		
		N	Percent	Percent of Cases
Lake Activities	Camping	432	17.4%	58.4%
	Windsurfing	4	0.2%	0.5%
	Waterskiing	19	0.8%	2.6%
	Swimming	313	12.6%	42.3%
	Beach activities	259	10.4%	35.0%
	Viewing falls	110	4.4%	14.9%
	Power boating	97	3.9%	13.1%
	Fishing	174	7.0%	23.5%
	Kayaking	121	4.9%	16.4%
	Picnicking	97	3.9%	13.1%
	Dog walking	258	10.4%	34.9%
	Viewing dam	64	2.6%	8.6%
	Canoeing	50	2.0%	6.8%
	Hiking/Walking	305	12.3%	41.2%
	Wildlife Viewing	137	5.5%	18.5%
	Sailing	1	0.0%	0.1%
	Other	41	1.7%	5.5%
Total		2482	100.0%	335.4%

Other activities respondents reported participating in:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ATV	7	.4	16.7	16.7
	Biking	13	.7	31.0	47.6
	Diving	3	.2	7.1	54.8
	Geocaching	1	.1	2.4	57.1
	Group function	1	.1	2.4	59.5
	Hunting	2	.1	4.8	64.3
	Metal detection	1	.1	2.4	66.7
	Mushroom picking	4	.2	9.5	76.2
	Paddleboarding	5	.3	11.9	88.1
	Photography	1	.1	2.4	90.5
	Playing with kids	1	.1	2.4	92.9
	Sightseeing (general)	1	.1	2.4	95.2
	Work	2	.1	4.8	100.0
	Total	42	2.1	100.0	
Missing	System	1945	97.9		

Total		1987	100.0		

9. Based on your most recent activities at the lake/reservoir, how did water levels influence your recreation experience?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Positive	186	9.4	25.2	25.2
	Somewhat Positive	170	8.6	23.1	48.3
	No influence	231	11.6	31.3	79.6
	Somewhat Negative	87	4.4	11.8	91.5
	Very Negative	63	3.2	8.5	100.0
	Total	737	37.1	100.0	
Missing	System	1250	62.9		
Total		1987	100.0		

10. Thinking of the lake/reservoir that you recreated at most recently, were there any water-based or shore-based activities that you were going to participate in that you were unable to do specifically because of the water level?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	651	32.8	84.8	84.8
	Yes	117	5.9	15.2	100.0
	Total	768	38.7	100.0	
Missing	System	1219	61.3		
Total		1987	100.0		

Activities identified that respondents were unable to do because of the water level:

		Responses		
		N	Percent	Percent of Cases
Activity Not Able To Do	Beach activities	16	10.5%	13.9%
	Fishing	24	15.8%	20.9%
	Access	6	3.9%	5.2%
	Power boating	28	18.4%	24.3%
	Canoeing	8	5.3%	7.0%
	Swimming	40	26.3%	34.8%
	Kayaking	11	7.2%	9.6%
	Picnicking	2	1.3%	1.7%
	Rafting	2	1.3%	1.7%
	Windsurfing	2	1.3%	1.7%
	Paddleboarding	3	2.0%	2.6%

	Waterskiing	5	3.3%	4.3%
	Walking	5	3.3%	4.3%
Total		152	100.0%	132.2%

11. Based on your most recent activities at the lake/reservoir, how satisfied were you with the shoreline conditions while engaged in water-based recreation?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Satisfied	293	14.7	40.1	40.1
	Somewhat Satisfied	203	10.2	27.8	67.9
	Neither Satisfied nor Dissatisfied	118	5.9	16.1	84.0
	Somewhat Dissatisfied	71	3.6	9.7	93.7
	Very Dissatisfied	46	2.3	6.3	100.0
	Total	731	36.8	100.0	
Missing	System	1256	63.2		
Total		1987	100.0		

12. Based on your most recent activities at the lake/reservoir, how safe did you feel engaging in water-based recreation given water levels at that time?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Safe	403	20.3	54.5	54.5
	Somewhat Safe	169	8.5	22.9	77.4
	Neither Safe nor Unsafe	103	5.2	13.9	91.3
	Somewhat Unsafe	50	2.5	6.8	98.1
	Very Unsafe	14	.7	1.9	100.0
	Total	739	37.2	100.0	
Missing	System	1248	62.8		
Total		1987	100.0		

13. What conditions, if any, did you encounter during your time recreating at the lake/reservoir that posed a safety concern to you?

		Responses		
		N	Percent	Percent of Cases
Lake Safety Concerns	Floating Debris	74	7.8%	10.2%
	Visible Stumps	172	18.2%	23.7%
	Hidden Stumps	199	21.1%	27.4%
	Boat Launch Conditions	56	5.9%	7.7%
	Other	45	4.8%	6.2%
	No Safety Concerns	398	42.2%	54.7%
Total		944	100.0%	129.8%

Other safety concerns mentioned for lakes/reservoirs:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Broken glass/garbage	7	.4	16.7	16.7
	Dead fish	1	.1	2.4	19.0
	Dogs	1	.1	2.4	21.4
	Low levels	1	.1	2.4	23.8
	Muddy bottom	14	.7	33.3	57.1
	No beach	2	.1	4.8	61.9
	Rocks	1	.1	2.4	64.3
	Steep shoreline	2	.1	4.8	69.0
	Strong current	2	.1	4.8	73.8
	Swimmers itch	1	.1	2.4	76.2
	Trail conditions	2	.1	4.8	81.0
	Unsafe boating/jet ski	3	.2	7.1	88.1
	Winds	1	.1	2.4	90.5
	Wood debris on beach	4	.2	9.5	100.0
	Total	42	2.1	100.0	
Missing	System	1945	97.9		
Total		1987	100.0		

14. Given the water levels at the time, how satisfied were you during your most recent activities at the reservoir with access to…:

a) the beach?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Satisfied	333	16.8	46.3	46.3
	Somewhat Satisfied	162	8.2	22.5	68.8
	Neither Satisfied nor Dissatisfied	59	3.0	8.2	77.1
	Somewhat Dissatisfied	53	2.7	7.4	84.4
	Very Dissatisfied	60	3.0	8.3	92.8
	Not Applicable	52	2.6	7.2	100.0
	Total	719	36.2	100.0	
Missing	System	1268	63.8		
Total		1987	100.0		

b) the water via a boat launch?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Satisfied	151	7.6	21.6	21.6
	Somewhat Satisfied	111	5.6	15.9	37.4
	Neither Satisfied nor Dissatisfied	72	3.6	10.3	47.7
	Somewhat Dissatisfied	42	2.1	6.0	53.7
	Very Dissatisfied	59	3.0	8.4	62.1
	Not Applicable	265	13.3	37.9	100.0
	Total	700	35.2	100.0	
Missing	System	1287	64.8		
Total		1987	100.0		

c) the water via the shoreline?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Satisfied	264	13.3	37.2	37.2
	Somewhat Satisfied	151	7.6	21.3	58.5
	Neither Satisfied nor Dissatisfied	72	3.6	10.2	68.7
	Somewhat Dissatisfied	58	2.9	8.2	76.9
	Very Dissatisfied	67	3.4	9.4	86.3
	Not Applicable	97	4.9	13.7	100.0

	Total	709	35.7	100.0	
Missing	System	1278	64.3		
Total		1987	100.0		

15. NOTE: Questions 15-20 in the survey are associated with the Discrete Choice Experiment and are summarized in the body of the report.

21. Have you visited Elk Falls during this trip?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	837	42.1	47.7	47.7
	Yes	919	46.3	52.3	100.0
	Total	1756	88.4	100.0	
Missing	3	231	11.6		
Total		1987	100.0		

22. When was your most recent visit to Elk Falls?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Other	25	1.3	2.7	2.7
	Today	815	41.0	89.3	92.0
	Two days ago	27	1.4	3.0	95.0
	Yesterday	46	2.3	5.0	100.0
	Total	913	45.9	100.0	
Missing	System	1074	54.1		
Total		1987	100.0		

23. Just based on water flows you observed at the falls on your most recent visit, how impressive would you rate Elk Falls?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Impressive	585	29.4	63.7	63.7
	Somewhat Impressive	289	14.5	31.4	95.1
	Neither Impressive or Unimpressive	35	1.8	3.8	98.9
	Somewhat Unimpressive	7	.4	.8	99.7
	Very Unimpressive	3	.2	.3	100.0
	Total	919	46.3	100.0	
Missing	System	1068	53.7		
Total		1987	100.0		

24. How satisfied were you with your viewing experience of Elk Falls?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Satisfied	754	37.9	82.1	82.1
	Somewhat Satisfied	139	7.0	15.1	97.3
	Neither Satisfied nor Dissatisfied	17	.9	1.9	99.1
	Somewhat Dissatisfied	6	.3	.7	99.8
	Very Dissatisfied	2	.1	.2	100.0
	Total	918	46.2	100.0	
Missing	System	1069	53.8		
Total		1987	100.0		

25. Have you recreated on the water or on the shore of any rivers in the Campbell River system during this trip?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1233	62.1	77.5	77.5
	Yes	358	18.0	22.5	100.0
	Total	1591	80.1	100.0	
Missing	System	396	19.9		
Total		1987	100.0		

26. Which river did you recreate at most recently on this trip?

		Responses		
		N	Percent	Percent of Cases
River Visited	Quinsam River	224	58.8%	62.6%
	Campbell River	137	36.0%	38.3%
	Salmon River	5	1.3%	1.4%
	Other	15	3.9%	4.2%
Total		381	100.0%	106.4%

Other rivers:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Cervus Creek	1	.1	6.7	6.7
	Elk River	6	.3	40.0	46.7
	Myra Creek	1	.1	6.7	53.3
	Oyster River	2	.1	13.3	66.7
	Ralph River	4	.2	26.7	93.3
	Wolf River	1	.1	6.7	100.0

	Total	15	.8	100.0	
Missing	System	1972	99.2		
Total		1987	100.0		

27. When was your most recent visit to this river?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Other	23	1.2	6.6	6.6
	Today	244	12.3	70.3	76.9
	Two days ago	28	1.4	8.1	85.0
	Yesterday	52	2.6	15.0	100.0
	Total	347	17.5	100.0	
Missing	5	1640	82.5		
Total		1987	100.0		

28. During your most recent visit to this river, what activities did you participate in?

		Responses		
		N	Percent	Percent of Cases
River Activities	Camping	121	16.7%	33.8%
	Fishing	89	12.3%	24.9%
	Swimming	24	3.3%	6.7%
	Beach activities	26	3.6%	7.3%
	Boating	5	0.7%	1.4%
	Hiking/Walking	155	21.4%	43.3%
	Picnicking	31	4.3%	8.7%
	Dog walking	90	12.4%	25.1%
	Canoeing	6	0.8%	1.7%
	Kayaking	5	0.7%	1.4%
	Wildlife Viewing	73	10.1%	20.4%
	Sightseeing	86	11.9%	24.0%
	Other	13	1.8%	3.6%
Total		724	100.0%	202.2%

Other activities respondents reported participating in:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Biking	2	.1	16.7	16.7
	Exploring	1	.1	8.3	25.0
	Gold panning	1	.1	8.3	33.3
	Photography	2	.1	16.7	50.0

	Playing with children	3	.2	25.0	75.0
	Running	1	.1	8.3	83.3
	Snorkeling	1	.1	8.3	91.7
	Work	1	.1	8.3	100.0
	Total	12	.6	100.0	
Missing	System	1975	99.4		
Total		1987	100.0		

29. Thinking of the river that you recreated at most recently, were there any water-based activities that you were going to participate in that you were unable to do specifically because of the river-flow conditions?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	354	17.8	93.9	93.9
	Yes	23	1.2	6.1	100.0
	Total	377	19.0	100.0	
Missing	System	1610	81.0		
Total		1987	100.0		

Activities identified that respondents were unable to do because of the river flow conditions:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Camping	1	.1	4.5	4.5
	Canoeing	1	.1	4.5	9.1
	Fishing	8	.4	36.4	45.5
	Hiking/Walking	3	.2	13.6	59.1
	Low water	2	.1	9.1	68.2
	Swimming	4	.2	18.2	86.4
	Tubing	3	.2	13.6	100.0
	Total	22	1.1	100.0	
Missing	System	1965	98.9		
Total		1987	100.0		

30. Based on your most recent activities at the river, how did water flows influence your recreation experience?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Positive	90	4.5	25.7	25.7
	Somewhat Positive	91	4.6	26.0	51.7
	No influence	143	7.2	40.9	92.6
	Somewhat Negative	21	1.1	6.0	98.6

	Very Negative	5	.3	1.4	100.0
	Total	350	17.6	100.0	
Missing	System	1637	82.4		
Total		1987	100.0		

31. Based on your most recent activities at the river, how satisfied were you with the shoreline conditions while engaged in water-based recreation?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Satisfied	134	6.7	38.6	38.6
	Somewhat Satisfied	110	5.5	31.7	70.3
	Neither Satisfied nor Dissatisfied	79	4.0	22.8	93.1
	Somewhat Dissatisfied	20	1.0	5.8	98.8
	Very Dissatisfied	4	.2	1.2	100.0
	Total	347	17.5	100.0	
Missing	System	1640	82.5		
Total		1987	100.0		

32. Based on your most recent activities at the river, how safe did you feel engaging in water-based recreation given the current water flow?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Safe	186	9.4	53.9	53.9
	Somewhat Safe	90	4.5	26.1	80.0
	Neither Safe nor Unsafe	50	2.5	14.5	94.5
	Somewhat Unsafe	13	.7	3.8	98.3
	Very Unsafe	6	.3	1.7	100.0
	Total	345	17.4	100.0	
Missing	System	1642	82.6		
Total		1987	100.0		

33. What conditions, if any, did you encounter during your time recreating on the river that posed a safety concern to you?

		Responses		
		N	Percent	Percent of Cases
River Safety Concerns	High flows	73	19.6%	22.7%
	Floating debris	28	7.5%	8.7%
	Poor access conditions	53	14.2%	16.5%
	Exposed hazards	16	4.3%	5.0%
	Other	22	5.9%	6.8%

	None	181	48.5%	56.2%
Total		373	100.0%	115.8%

Other safety concerns mentioned for rivers:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Bears	2	.1	8.3	8.3
	Boat launch	1	.1	4.2	12.5
	Erosion of trails and banks	5	.3	20.8	33.3
	High flows	1	.1	4.2	37.5
	Lack of pedestrian bridge	1	.1	4.2	41.7
	Low flows	3	.2	12.5	54.2
	Muddy shore/bank	6	.3	25.0	79.2
	Slippery rocks	1	.1	4.2	83.3
	Trails not appropriate for all access	1	.1	4.2	87.5
	Woody debris	3	.2	12.5	100.0
	Total	24	1.2	100.0	
Missing	System	1963	98.8		
Total		1987	100.0		

34. Is this your first visit to the Campbell River system?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1109	55.8	68.6	68.6
	Yes	508	25.6	31.4	100.0
	Total	1617	81.4	100.0	
Missing		370	18.6		
Total		1987	100.0		

35. On average, how many days per season do you typically visit the Campbell River system?

a) Spring

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	151	13.4	14.3	89.8
	Less than once	37	3.3	3.5	75.5
	Once	108	9.6	10.2	100.0
	2-3 days	196	17.3	18.5	18.5
	4 days plus	567	50.2	53.5	72.0
	Total	1059	93.7	100.0	
Missing	System	71	6.3		

Total		1130	100.0		

b) Summer

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	33	2.9	3.1	91.7
	Less than once	35	3.1	3.3	88.6
	Once	88	7.8	8.3	100.0
	2-3 days	128	11.3	12.0	12.0
	4 days plus	779	68.9	73.3	85.3
	Total	1063	94.1	100.0	
Missing	System	67	5.9		
Total		1130	100.0		

c) Winter

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	317	28.1	31.0	88.2
	Less than once	74	6.5	7.2	57.2
	Once	121	10.7	11.8	100.0
	2-3 days	135	11.9	13.2	13.2
	4 days plus	377	33.4	36.8	50.0
	Total	1024	90.6	100.0	
Missing	System	106	9.4		
Total		1130	100.0		

d) Fall

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	204	18.1	19.7	89.1
	Less than once	64	5.7	6.2	69.4
	Once	113	10.0	10.9	100.0
	2-3 days	197	17.4	19.0	19.0
	4 days plus	458	40.5	44.2	63.2
	Total	1036	91.7	100.0	
Missing	System	94	8.3		
Total		1130	100.0		

36. What is your gender?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	358	18.0	42.6	42.6
	Male	483	24.3	57.4	100.0
	Total	841	42.3	100.0	
Missing	System	1146	57.7		
Total		1987	100.0		

37. What is your current age?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Under 25	189	9.5	11.0	100.0
	25-34	233	11.7	13.5	13.5
	35-44	374	18.8	21.7	35.2
	45-54	318	16.0	18.5	53.7
	55-64	321	16.2	18.6	72.3
	64 plus	288	14.5	16.7	89.0
	Total	1723	86.7	100.0	
Missing	System	264	13.3		
Total		1987	100.0		

38. How many people are in your party today?

Party Size

N	Valid	1688
	Missing	299
Mean		3.42
Median		2.50
Mode		2
Std. Deviation		2.911
Minimum		1
Maximum		38

39. Where do you currently reside (i.e., where you have lived for more than 6 months out of the past year)?

a) City

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	100 Mile House	1	.1	.1	.1
	Aarau	1	.1	.1	.1
	Abottsford	1	.1	.1	.2
	Adebude	1	.1	.1	.2
	Adelaide	2	.1	.1	.4
	Aerdenhout	1	.1	.1	.4
	Agassiz	2	.1	.1	.6
	Alabama	1	.1	.1	.6
	Aldergrove	1	.1	.1	.7
	Alert Bay	3	.2	.2	.9
	all over BC	1	.1	.1	.9
	Amstelveen	1	.1	.1	1.0
	Amsterdam	1	.1	.1	1.1
	Andrew	1	.1	.1	1.1
	Arbury	1	.1	.1	1.2
	Arkansas	1	.1	.1	1.2
	Augsburg	1	.1	.1	1.3
	Baden-bad	1	.1	.1	1.4
	Balmertown	1	.1	.1	1.4
	Banff	1	.1	.1	1.5
	Barcelona	1	.1	.1	1.5
	Bavaria	1	.1	.1	1.6
	Berkeley	1	.1	.1	1.7
	Black Creek	14	.7	.9	2.5
	Bowser	3	.2	.2	2.7
	Brandon	1	.1	.1	2.8
	Brugge	1	.1	.1	2.8
	Bruno	1	.1	.1	2.9
	Brush Prairie	1	.1	.1	3.0
	Burnaby	3	.2	.2	3.2
	Burns Lake	2	.1	.1	3.3
	Byron Bay	1	.1	.1	3.3
	Cairing	1	.1	.1	3.4
	Calgary	25	1.3	1.5	4.9
	California	2	.1	.1	5.1

	Campbell River	701	35.3	43.3	48.4
	Camrose	1	.1	.1	48.4
	Chemainus	1	.1	.1	48.5
	Chicago	1	.1	.1	48.5
	Chilliwack	3	.2	.2	48.7
	Cobble Hill	3	.2	.2	48.9
	Cobourg	1	.1	.1	49.0
	Cochrane	2	.1	.1	49.1
	Cold Lake	1	.1	.1	49.2
	Comox	90	4.5	5.6	54.7
	Copenhagen	1	.1	.1	54.8
	Coquitlam	2	.1	.1	54.9
	Coupeville	2	.1	.1	55.0
	Courtenay	100	5.0	6.2	61.2
	Cowichan Bay	1	.1	.1	61.3
	Cowichan Station	1	.1	.1	61.3
	Cranbrook	2	.1	.1	61.5
	Creston	1	.1	.1	61.5
	Crofton	1	.1	.1	61.6
	Cumberland	9	.5	.6	62.1
	Cupertino	1	.1	.1	62.2
	Damme	1	.1	.1	62.3
	Danville	1	.1	.1	62.3
	Denman Island	2	.1	.1	62.4
	Denver	3	.2	.2	62.6
	Drumheller	1	.1	.1	62.7
	Duncan	15	.8	.9	63.6
	Ead	1	.1	.1	63.7
	Ede	1	.1	.1	63.7
	Edmonton	21	1.1	1.3	65.0
	El Selvado	1	.1	.1	65.1
	Erfurt	1	.1	.1	65.2
	Errington	1	.1	.1	65.2
	Fort Collins	1	.1	.1	65.3
	Fort MacMurray	4	.2	.2	65.5
	French Creek	1	.1	.1	65.6
	Freusburg	1	.1	.1	65.7
	Gabriola Island	3	.2	.2	65.8
	Gibsons	2	.1	.1	66.0
	Gold River	12	.6	.7	66.7
	Grande Prairie	3	.2	.2	66.9

	Gremolle	1	.1	.1	67.0
	Hamilton	1	.1	.1	67.0
	Harrison Mills	2	.1	.1	67.1
	Heidelberg	1	.1	.1	67.2
	Hinton	1	.1	.1	67.3
	Holberg	1	.1	.1	67.3
	Hoorn	1	.1	.1	67.4
	Hope	1	.1	.1	67.4
	Hornby Island	1	.1	.1	67.5
	Houston	1	.1	.1	67.6
	Howe Island	1	.1	.1	67.6
	Jasper	1	.1	.1	67.7
	Kamloops	8	.4	.5	68.2
	Kansas	2	.1	.1	68.3
	Kelowna	5	.3	.3	68.6
	Kiel	1	.1	.1	68.7
	Kitimat	1	.1	.1	68.7
	Kyoto	1	.1	.1	68.8
	Ladner	2	.1	.1	68.9
	Ladysmith	4	.2	.2	69.2
	Lake Cowichan	3	.2	.2	69.4
	Lake Stevens	1	.1	.1	69.4
	Langley	4	.2	.2	69.7
	Lantzville	6	.3	.4	70.0
	Limage	1	.1	.1	70.1
	London	3	.2	.2	70.3
	Los Angeles	2	.1	.1	70.4
	Lucerne	1	.1	.1	70.5
	Luebeck	1	.1	.1	70.5
	Maniwaki	1	.1	.1	70.6
	Maple Ridge	2	.1	.1	70.7
	Medicine Hat	3	.2	.2	70.9
	Merville	2	.1	.1	71.0
	Mexico City	1	.1	.1	71.1
	Midway	1	.1	.1	71.2
	Milano	1	.1	.1	71.2
	Mill Bay	2	.1	.1	71.3
	Montpellier	1	.1	.1	71.4
	Montreal	2	.1	.1	71.5
	Munich	1	.1	.1	71.6
	Nanaimo	74	3.7	4.6	76.2

	Nanoose Bay	7	.4	.4	76.6
	Neuburg	1	.1	.1	76.7
	New Westminster	4	.2	.2	76.9
	Newcastle	1	.1	.1	77.0
	Nivenille	1	.1	.1	77.0
	North Vancouver	4	.2	.2	77.3
	Norwich	1	.1	.1	77.3
	Okanogan	1	.1	.1	77.4
	Oliver	1	.1	.1	77.5
	Ottawa	4	.2	.2	77.7
	Oyster River	1	.1	.1	77.8
	Palmerston North	1	.1	.1	77.8
	Paris	3	.2	.2	78.0
	Parksville	30	1.5	1.9	79.9
	Peace River	2	.1	.1	80.0
	Pemberton	1	.1	.1	80.0
	Penticton	2	.1	.1	80.2
	Perth	4	.2	.2	80.4
	Phoenix	2	.1	.1	80.5
	Port Alberni	15	.8	.9	81.5
	Port Alice	2	.1	.1	81.6
	Port Angeles	1	.1	.1	81.7
	Port Hardy	9	.5	.6	82.2
	Port McNeil	2	.1	.1	82.3
	Powell River	3	.2	.2	82.5
	Prince Albert	1	.1	.1	82.6
	Prince George	3	.2	.2	82.8
	Pt. Edward	1	.1	.1	82.8
	Pt. Roberts	1	.1	.1	82.9
	Quadra Island	4	.2	.2	83.1
	Qualicum Beach	12	.6	.7	83.9
	Quardra Island	1	.1	.1	83.9
	Queens	2	.1	.1	84.1
	Quesnel	1	.1	.1	84.1
	Red Deer	2	.1	.1	84.2
	Regina	1	.1	.1	84.3
	Revelstoke	1	.1	.1	84.4
	Richmond	5	.3	.3	84.7
	Rio Vista	1	.1	.1	84.7
	Rotterdam	1	.1	.1	84.8
	Russia	1	.1	.1	84.9

	Saanich	3	.2	.2	85.1
	Saanicton	1	.1	.1	85.1
	Salmon Arm	1	.1	.1	85.2
	Salt Spring Island	5	.3	.3	85.5
	San Diego	1	.1	.1	85.5
	San Francisco	1	.1	.1	85.6
	San Jose	1	.1	.1	85.7
	Santa Cruz	1	.1	.1	85.7
	Santa Fay	1	.1	.1	85.8
	Sardis	1	.1	.1	85.9
	Saskatoon	1	.1	.1	85.9
	Sayward	2	.1	.1	86.0
	Seattle	7	.4	.4	86.5
	Senneterre	1	.1	.1	86.5
	Seoul	1	.1	.1	86.6
	Shawnigan Lake	5	.3	.3	86.9
	Sidney	4	.2	.2	87.2
	Singapore	1	.1	.1	87.2
	Slave Lake	1	.1	.1	87.3
	Sooke	10	.5	.6	87.9
	Squamish	1	.1	.1	88.0
	St. Albert	1	.1	.1	88.0
	St. John's	1	.1	.1	88.1
	Stutgart	1	.1	.1	88.1
	Sunshine Coast	1	.1	.1	88.2
	Surrey	8	.4	.5	88.7
	Sussex	1	.1	.1	88.8
	Tilburg	2	.1	.1	88.9
	Tofino	1	.1	.1	88.9
	Toronto	4	.2	.2	89.2
	Toulouse	1	.1	.1	89.3
	Traralgch	1	.1	.1	89.3
	Traverse City	1	.1	.1	89.4
	Troy	1	.1	.1	89.4
	Utrecht	2	.1	.1	89.6
	Valkenswaard	1	.1	.1	89.6
	Vancouver	36	1.8	2.2	91.8
	Vanderhoof	1	.1	.1	91.9
	Vernon	3	.2	.2	92.1
	Victoria	105	5.3	6.5	98.6
	Vojens	1	.1	.1	98.6

	Vulcan	1	.1	.1	98.7
	Waterloo	1	.1	.1	98.8
	Wellingonton	1	.1	.1	98.8
	West Vancouver	1	.1	.1	98.9
	Wetaskiwin	1	.1	.1	98.9
	White Rock	2	.1	.1	99.1
	Wigton	1	.1	.1	99.1
	Winchester	1	.1	.1	99.2
	Winnipeg	2	.1	.1	99.3
	Wolverhampton	1	.1	.1	99.4
	Woods Hole	1	.1	.1	99.4
	Worthing	1	.1	.1	99.5
	Woss	1	.1	.1	99.6
	Yarmouth	1	.1	.1	99.6
	Yellowknife	1	.1	.1	99.7
	Youbou	1	.1	.1	99.8
	Zeballos	3	.2	.2	99.9
	Zurich	1	.1	.1	100.0
	Total	1619	81.5	100.0	
Missing	System	368	18.5		
Total		1987	100.0		

b) Province/State

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	AB	73	3.7	4.7	4.7
	AL	1	.1	.1	4.8
	AR	1	.1	.1	4.8
	AZ	2	.1	.1	5.0
	BC	1407	70.8	90.7	95.6
	CA	13	.7	.8	96.5
	CO	4	.2	.3	96.7
	IL	1	.1	.1	96.8
	KA	2	.1	.1	96.9
	MA	1	.1	.1	97.0
	MB	5	.3	.3	97.3
	MI	1	.1	.1	97.4
	NB	1	.1	.1	97.4
	NC	1	.1	.1	97.5
	NL	1	.1	.1	97.6
	NM	1	.1	.1	97.6

	NS	1	.1	.1	97.7
	NWT	1	.1	.1	97.7
	ON	14	.7	.9	98.6
	QC	4	.2	.3	98.9
	SA	1	.1	.1	99.0
	SK	3	.2	.2	99.2
	TX	1	.1	.1	99.2
	WA	12	.6	.8	100.0
	Total	1552	78.1	100.0	
Missing	25	435	21.9		
Total		1987	100.0		

c) Country

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Australia	12	.6	.7	.7
	Austria	1	.1	.1	.8
	Belgium	1	.1	.1	.9
	Canada	1514	76.2	92.3	93.1
	China	1	.1	.1	93.2
	Denmark	3	.2	.2	93.4
	England	3	.2	.2	93.5
	France	8	.4	.5	94.0
	Germany	16	.8	1.0	95.0
	Holland	2	.1	.1	95.1
	Italy	2	.1	.1	95.2
	Japan	3	.2	.2	95.4
	Mexico	2	.1	.1	95.6
	Netherlands	13	.7	.8	96.3
	New Zealand	2	.1	.1	96.5
	Russia	2	.1	.1	96.6
	Singapore	1	.1	.1	96.6
	South Korea	1	.1	.1	96.7
	Spain	1	.1	.1	96.8
	Sweden	1	.1	.1	96.8
	Switzerland	4	.2	.2	97.1
	UK	6	.3	.4	97.4
	USA	42	2.1	2.6	100.0
	Total	1641	82.6	100.0	
Missing	24	346	17.4		

Total	1987	100.0		

APPENDIX B. CAMPBELL RESERVOIRS PUBLIC USE AND PERCEPTIONS SURVEY

Campbell Reservoirs Public Use and Perceptions Study - 2015

On behalf of BC Hydro and Power Authority Act, the Laich-Kwil-Tach Environmental Assessment Ltd. Partnership (LKT) is conducting a study about public use and perceptions on recreation in the Campbell Reservoirs. We would appreciate if you could complete this survey. The results will provide insights into public use and preferences for water management.

Participation in the survey is voluntary and you may refuse to participate at any time. You may skip any questions if you are not comfortable answering, although we encourage you to complete the survey as thoroughly as possible.

All information that you provide are confidential and anonymous; results will only be presented in tabulated form and not individually. Please do not write your name anywhere on this questionnaire.

If you have any questions about why BC Hydro is conducting this research, please contact Phil Bradshaw – Project Manager, BC Hydro at 604-528-1693.

Thanks for your time and enjoy your stay!

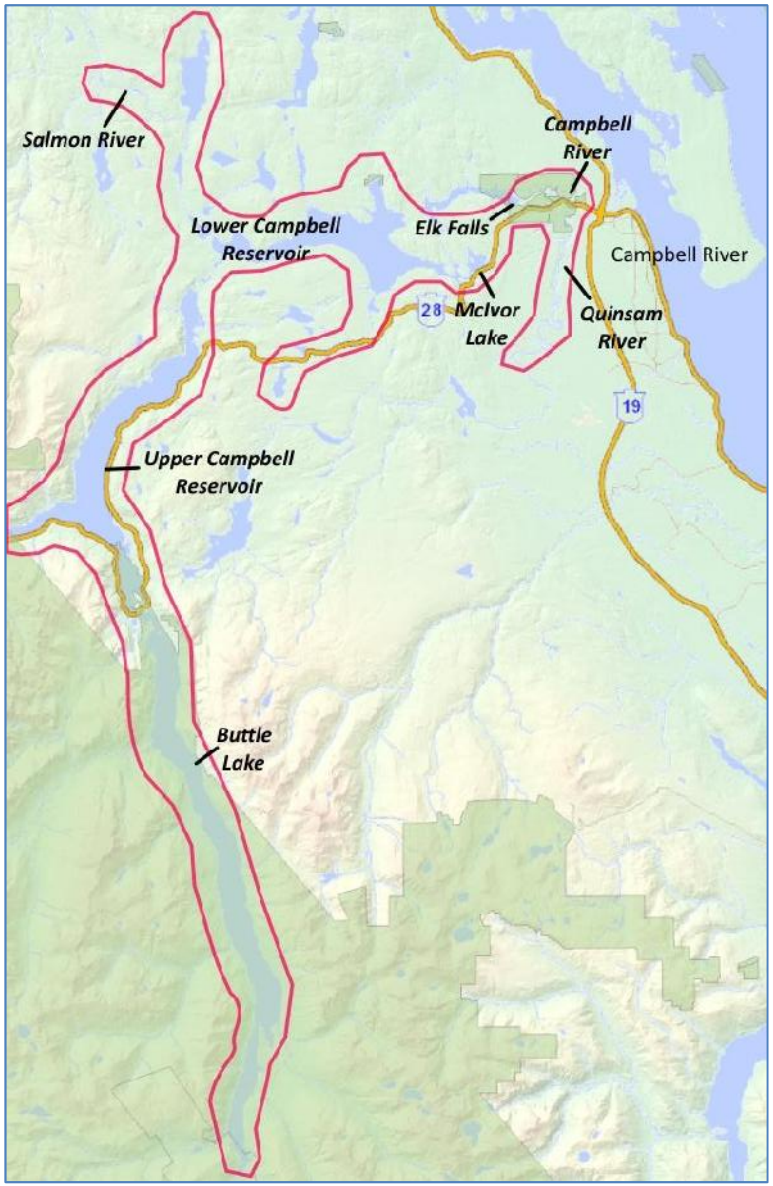
Laich-Kwil Tach Environmental Assessment Ltd. Partnership

EDI

BC hydro

Map of Campbell River Reservoir System

The Campbell River system is outlined in red below and is comprised of a number of lakes/reservoirs and rivers that are used by outdoor recreationists.



To Be Completed By Surveyor:		
Date: dd/mm/yyyy	**Time:**	**Number:**
Location:	**Location Type:** Reservoir/River/Falls	
Weather: sun / mixed / cloud / rain / snow / wind		
Water level/flow rate: high / medium / low		
Completed Survey This Year: yes / no		
Reservoir Photo Book #: 1 / 2 / 3 / 4		

SECTION A: Current Visit to the Campbell River Reservoir System

1. How many days are you spending in the Campbell River Reservoir System on this trip? _____ day(s)

Please refer to the map on Page 2 for the Campbell River system area.

2. If staying overnight in the Campbell River system area, what type of accommodation are you using? (*Check all that apply*)

- ☐ Tent
- ☐ Camper/Van/Tent Trailer
- ☐ Motorhome
- ☐ Cabin/Lodge
- ☐ Trailer/5th Wheel
- ☐ Other *[Explain]:*_____
- ☐ Not staying in area

3. What **one** activity was the **most important** for you in your decision to visit the Campbell River Reservoir system for this trip? (*Check only one*)

- ☐ Camping
- ☐ Power boating
- ☐ Canoeing
- ☐ Windsurfing
- ☐ Fishing
- ☐ Hiking/walking
- ☐ Waterskiing
- ☐ Kayaking
- ☐ Wildlife viewing
- ☐ Swimming
- ☐ Picnicking
- ☐ Sailing
- ☐ Beach activities
- ☐ Dog-walking
- ☐ Other: _____ (please specify)
- ☐ Sight-seeing (falls)
- ☐ Sight-seeing (dam)

4. Which areas in the Campbell River system have you visited or anticipate visiting for recreational activities on this trip?

Please refer to the map on Page 2 if it will assist you.

- ☐ Elk Falls
- ☐ Quinsam River
- ☐ Campbell River
- ☐ Salmon River
- ☐ Lower Campbell Reservoir
- ☐ McIvor Lake
- ☐ Upper Campbell Reservoir
- ☐ Buttle Lake
- ☐ Other (please specify):_____

SECTION B: Visit to a Lake/Reservoir

This next section of the survey asks about your most recent visit to a lake/reservoir within the Campbell River Reservoir System.

5. Have you recreated on the water or on the shore of any **lakes/reservoirs** in the Campbell River system during this trip?

- ☐ No → **Skip to Section C: Future Lake/Reservoir Visits**
- ☐ Yes → **Continue to next question**

6. Which **lake/reservoir** did you recreate at most recently on this trip? (*Check only one*)

Please refer to the map on Page 2 if it will assist you.

- ☐ McIvor Lake
- ☐ Upper Campbell Reservoir
- ☐ Lower Campbell Reservoir
- ☐ Buttle Lake
- ☐ Other (please specify):_____

7. When was your most recent visit to this **lake/reservoir**?

- ☐ Today
- ☐ Yesterday
- ☐ Two days ago
- ☐ Other: _____ days ago (please specify)

8. During your most recent visit to this **lake/reservoir**, what activities did you participate in? (*Check all that apply*)

☐ Camping	☐ Power boating	☐ Canoeing
☐ Windsurfing	☐ Fishing	☐ Hiking/walking
☐ Waterskiing	☐ Kayaking	☐ Wildlife viewing
☐ Swimming	☐ Picnicking	☐ Sailing
☐ Beach activities	☐ Dog-walking	☐ Other: _____ (please specify)
☐ Sight-seeing (falls)	☐ Sight-seeing (dam)	

9. Based on your most recent activities at the **lake/reservoir**, how did water levels influence your recreation experience? (*Check only one*)

☐ Very positive influence
☐ Somewhat positive influence
☐ No influence
☐ Somewhat negative influence
☐ Very negative influence

10. Thinking of the **lake/reservoir** that you recreated at most recently, were there any water-based or shore-based activities that you were going to participate in that you were unable to do specifically because of the water level?

☐ No
☐ Yes → Activity Type: _____

11. Based on your most recent activities at the **lake/reservoir**, how satisfied were you with the shoreline conditions while engaged in water-based recreation? (*Check only one*)

Shoreline conditions refer to the type of substrate, presence of woody debris, presence of vegetation, etc.

☐ Very satisfied
☐ Somewhat satisfied
☐ Neither satisfied nor dissatisfied
☐ Somewhat dissatisfied
☐ Very dissatisfied

12. Based on your most recent activities at the **lake/reservoir**, how safe did you feel engaging in water-based recreation given water levels at that time? (*Check only one*)

☐ Very safe
☐ Somewhat safe
☐ Neither safe nor unsafe
☐ Somewhat unsafe
☐ Very unsafe

13. What conditions, if any, did you encounter during your time recreating at the **lake/reservoir** that posed a safety concern to you? (*Check all that apply*)

☐ Floating debris	☐ Boat launch conditions
☐ Visible stumps	☐ Other:_____
☐ Hidden stumps	☐ No safety concerns

14. Given the water levels at the time, how satisfied were you during your most recent activities at the reservoir with access to the… (*Check only one for each*)

	…beach?	…water via a boat launch?	…water via the shoreline?
Very satisfied	☐	☐	☐
Somewhat satisfied	☐	☐	☐
Neither satisfied nor dissatisfied	☐	☐	☐
Somewhat dissatisfied	☐	☐	☐
Very dissatisfied	☐	☐	☐
Not applicable	☐	☐	☐

SECTION C: Future Lake/Reservoir Visits

You will now refer to the photo book you received, where you will be presented with six pairs of photos representing different hypothetical lake/reservoir conditions.

The conditions of Site A and Site B will differ in each of the following photo pairs. While some of the photos may not seem ideal, each one of them could occur under certain circumstances.

For each set of pictures please select whether you would choose to recreate in the area represented in Site A or Site B, or neither of them.

There is no right or wrong answers to these special types of research questions but it is important to regard them as real-world situations, in which the selected conditions are available to you. You will be asked to complete a total of six evaluations.

After you complete this section, please resume the survey at ***Section D: Visit to Elk Falls.***

Book #:_____ (*please enter Book number*)

15. For photo pair 1, I would choose to recreate at:
☐ Site A ☐ Site B ☐ Neither site

16. For the photo pair 2, I would choose to recreate at:
☐ Site A ☐ Site B ☐ Neither site

17. For photo pair 3, I would choose to recreate at:
☐ Site A ☐ Site B ☐ Neither site

18. For photo pair 4, I would choose to recreate at:
☐ Site A ☐ Site B ☐ Neither site

19. For photo pair 5, I would choose to recreate at:
☐ Site A ☐ Site B ☐ Neither site

20. For photo pair 6, I would choose to recreate at:
☐ Site A ☐ Site B ☐ Neither site

SECTION D: Visit to Elk Falls

21. Have you visited **Elk Falls** during this trip?
☐ No → **Skip to Section E: Visits to Rivers**
☐ Yes → **Continue to next question**

22. When was your most recent visit to Elk Falls?
☐ Today ☐ Yesterday
☐ Two days ago ☐ Other: _____ days ago (please specify)

23. Just based on the water flows you observed at the falls on your most recent visit, how impressive would you rate Elk Falls?
☐ Very impressive
☐ Somewhat impressive
☐ Neither impressive nor unimpressive
☐ Somewhat unimpressive
☐ Very unimpressive

24. How satisfied were you with your viewing experience of Elk Falls? (*Check only one*)
☐ Very satisfied
☐ Somewhat satisfied
☐ Neither satisfied nor dissatisfied
☐ Somewhat dissatisfied
☐ Very dissatisfied

SECTION E: Visits to Rivers

25. Have you recreated on the water or on the shore of any **rivers** in the Campbell River system during this trip?

☐ No → **Skip to Section F: Past Visits to Area**
☐ Yes → **Continue to next question**

26. Which **river** did you recreate at most recently on this trip (*Check only one*)?

Please refer to the map on Page 2 if it will assist you.

☐ Quinsam River
☐ Campbell River
☐ Salmon River
☐ Other (please specify):_____

27. When was your most recent visit to this **river**?

☐ Today
☐ Yesterday
☐ Two days ago
☐ Other: _____ days ago (please specify)

28. During your most recent visit to this **river**, what activities did you participate in? (*Check all that apply*)

☐ Camping
☐ Power boating
☐ Canoeing
☐ Fishing
☐ Hiking/walking
☐ Kayaking
☐ Swimming
☐ Picnicking
☐ Wildlife viewing
☐ Beach activities
☐ Dog-walking
☐ Sight-seeing
☐ Other: _____ (please specify)

29. Thinking of the **river** that you recreated at most recently, were there any water-based activities that you were going to participate in that you were unable to do specifically because of the river-flow conditions?

☐ No
☐ Yes → Activity Type: _____

30. Based on your most recent activities at the **river**, how did **water flows** influence your recreation experience? (*Check only one*)

☐ Very positive influence
☐ Somewhat positive influence
☐ No influence
☐ Somewhat negative influence
☐ Very negative influence

31. Based on your most recent activities at the **river**, how satisfied were you with the **shoreline conditions** while engaged in water-based recreation? (*Check only one*)

Shoreline conditions refer to the type of substrate, presence of woody debris, presence of vegetation, etc.

☐ Very satisfied
☐ Somewhat satisfied
☐ Neither satisfied nor dissatisfied
☐ Somewhat dissatisfied
☐ Very dissatisfied

32. Based on your most recent activities at the **river**, how safe did you feel engaging in water-based recreation given the current **water flow**? (*Check only one*)

☐ Very safe
☐ Somewhat safe
☐ Neither safe nor unsafe
☐ Somewhat unsafe
☐ Very unsafe

33. What conditions, if any, did you encounter during your time recreating on the **river** that posed a safety concern to you? (*Check all that apply*)

☐ High flows
☐ Exposed hazards (rocks, logjam)
☐ Floating debris
☐ Other:_____
☐ Poor access conditions
☐ None

SECTION F: Past Visits to Campbell River Reservoir System

34. Is this your first visit to the Campbell River system?

☐ Yes → **Skip to Section G: About You and Your Party**
☐ No → **Continue to next question**

35. On average, how many days per season do you typically visit the Campbell River system? (*Check only one per season*)

	Never	Less than once	Once	2-3 days	4 days or more
Spring	☐	☐	☐	☐	☐
Summer	☐	☐	☐	☐	☐
Winter	☐	☐	☐	☐	☐
Fall	☐	☐	☐	☐	☐

SECTION G: About You and Your Party

36. What is your gender?

☐ Male ☐ Female

37. What is your current age?

☐ Under 25 ☐ 45-54
☐ 25-34 ☐ 55-64
☐ 35-44 ☐ 64+

38. How many people are in your party today? _____ people

39. Where do you currently reside (i.e., where you have lived for more than 6 months out of the past year)? (*Check all that apply*)

City/Town:_____ Country: _____

40. Do you have any additional comments about recreation on the water in the Campbell River system? (*In consideration of privacy, do not identify yourself or other specific individuals in your written comments. Any comments including self-identification or identification of third parties will be discarded.*)

Thank you again for your participation