Campbell River Project Water Use Plan

Upper and Lower Campbell and John Hart Reservoirs Public Us and Perception Survey

Implementation Year 5

Reference: JHTMON-2

Upper and Lower Campbell and John Hart Reservoirs and Elk Canyon PublicUse and Perception Study -Year 5 Progress Report

Study Period: 2019

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EXECUTIVE SUMMARY

As an outcome of the Campbell River Water Use Plan (WUP) Consultative Committee process, 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 WUP. Since then, it has been recognized that a more systematic and robust approach to valuing the recreation resource could be possible.

As part of the updated Campbell River WUP, 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. The project aims to monitor a selection of performance measures to gauge public perception and preferences and evaluate how they might relate to different water management regimes.

The study tools and methods were developed during the first year of implementation between May 2014 and July 2015. Four periods of data collection and analyses have been completed, beginning with Year 2 of the study (August 2015 to July 2016). Year 3 of the study ran between August 2016 and December 2017. This study period was extended in order to synchronize future reporting with the start of the calendar year. Year 4 of the study ran between January 2018 and December 2018, and Year 5 ran between January 2019 and December 2019. This report summarizes all results to date including Year 5 and provides comparisons of responses across the full study period. No data collection has occurred since 2019 due to the COVID-19 pandemic. Year 6 of data collection is scheduled to resume in spring 2022.

A total of 654 visitors were surveyed in Year 5 and 4,226 since Year 1. Sampling was focused on eight sites in the project area.

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 on reservoirs use focused on determining if there was a relationship between the performance measures of public perceptions with average daily water elevations. Data were analysed as aggregated across all study years. Significant relationships were noted between daily average water elevation and all performance measures, although not always for each reservoir. At Buttle Lake, in particular, higher water elevations were associated with increased satisfaction. Responses to the reservoir-related management questions were frequently significantly different between study years. In general, the greatest change was a general increase in the frequency of respondents reporting water elevations had no influence or that this was not applicable. The frequency of negative responses has remained consistently low.

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. A significant relationship was identified at Campbell River where increased discharge tended to have a positive influence on recreation

experience. No other significant relationships were noted for Campbell or Quinsam Rivers. Similar to the reservoirs, the distribution of responses in regard to the performance measures was significantly different between years and seems associated largely with an increased frequency of visitors reporting that water flows had no influence on their 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 relationships were identified. Rather, responses were overwhelmingly positive in all flow conditions.

A discrete choice experiment (DCE) was implemented to model the relationship between reservoir operations and public perceptions for the Lower Campbell reservoir. The DCE was adapted from the Upper Campbell experiment, but with lakebed features removed as these were found to not influence decisions in early analysis. The Lower Campbell reservoir DCE identified a preference in this reservoir for lower-than-average water levels, which differed from the Upper Campbell DCE, where higher-than-average water levels were preferred. A Decision Support System was developed for Lower Campbell reservoir. The Decision Support System builds off of the DCE and allows users to evaluate how changes to specific attributes, such as water elevations, will affect visitor preferences to recreate at the site. The DSS is described in Section 3.5 of this report.

Table 1. JHTMON2 - Status of management questions and hypotheses for 2019 (Year 5) Study Period

Management Question	Null Hypotheses	2019 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-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[1] noted at Buttle Lake and Lower Campbell Reservoir** between water levels and recreation experience with a **positive correlation**.
		2) *Satisfaction with shoreline conditions* – **Significant relationship noted at Buttle Lake and Lower Campbell Lake** between water levels and satisfaction with shoreline conditions at reservoir locations with a **positive correlation**.
		3) *Perception of safety* – **Significant relationship noted at Buttle Lake** between water levels and perception of safety with a **positive correlation**.
		4) *Satisfaction with access to beach* – **Significant relationship noted at Buttle Lake** between water levels and satisfaction with beach access at reservoir locations with a **positive correlation**. *Satisfaction with access to water via boat launch* – **Significant relationship noted at all 3 reservoirs** between water levels and satisfaction with water access via boat launch with a **positive correlation**. *Satisfaction with access to water via shoreline* – **Significant relationship noted at Buttle Lake and Lower Campbell Reservoir** between water

[1] Statistical significance of relationships assumes an alpha of 0.05 or 95% confidence.

		levels and satisfaction with water access via shoreline with **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-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 noted at Campbell River** between river discharge and influence on recreation experience with a **weak, positive correlation**.
		2) *Satisfaction with shoreline conditions* – **No significant relationships noted at either river** between river discharge and satisfaction with shoreline conditions.
		3) *Perception of safety* – **No significant relationships noted at either river** between river discharge and perception of safety.
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-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 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 data collection completed to date (2015 to 2019). Unlike previous years, the management questions are analysed in aggregate for all study periods. In addition, general descriptive results are presented for 2019. Data collection from 2019 is referred to as "Year 5". Additionally, data for management questions are presented categorized by study year to indicate changes in responses through time.

Previous reports have summarized data collected in the years between August 2015 and July 2016, referred to as Year 2 in this report, August 2016 and December 2017, referred to as Year 3, and January 2018 and December 2018, referred to as Year 4. Year 3 was extended to align the study with the calendar year (i.e., January to December). Year 1 of the study focused on the development and testing of the sampling design and study tools.

1.1 MANAGEMENT QUESTIONS AND OBJECTIVES

The management questions, 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, recreation benefits are assumed to be synonymous with positive perceptions of their 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.

- $\mathbf{H_{0\text{-}A}}$: 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. The first year of the project (2014/2015) focused on the study design. Data collection has occurred over four study years to date, including Year 2 (August 2015-July 2017), Year 3 (August 2015-December 2017) and Year 4 (January 2018-December 2018). This report picks up after Year 4 of the study, summarizing all data collected between January 2019 and December 2019, referred to as Year 5 in this report.

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, Natural Resource Operations and Rural Development (MFLNRORD). 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	Applicable Management Hypotheses*
Public safety	▪ Perception of safety while engaged in water-based recreation	Both	H_{0-A} (reservoirs) H_{0-B} (rivers)

Management Issue	Performance Measure	Applies to: Reservoir/River/ Both	Applicable Management Hypotheses*
Maintaining accessibility	▪ Satisfaction with accessibility to boat launch ▪ Satisfaction with accessibility to shoreline ▪ Satisfaction with accessibility to beach	Reservoir	H_{0-A} (reservoirs)
Protecting shoreline condition for recreation	▪ Satisfaction with shoreline condition for recreation	Both	H_{0-A} (reservoirs) H_{0-B} (rivers)
Maintaining quality recreation experience	▪ Influence of water levels/flows on recreation	Both	H_{0-A} (reservoirs) H_{0-B} (rivers)

* Management hypotheses outlined in Section 1.2

2.1.2 SAMPLING PLAN AND SITE SELECTION

2.1.2.1 Sampling Locations

Sample sites were selected with the aim of maximizing sample size at locations where BC Hydro has operational influence on water conditions (e.g., elevation, flow rate). BC Parks, Recreation Sites and Trails Branch of MFLNRO, and the City of Campbell River were consulted to identify the busiest recreation sites within the study area. Sampling was only conducted at sites that were officially open. As such, sampling did not occur at some locations during the off-season.

Eight locations were originally selected for conducting surveys within the Campbell Reservoir system (see Figure 1). An additional sampling location was added at Strathcona Lodge on Upper Campbell Reservoir to gather additional data of visitor use for this reservoir in Year 4. Subsequently, McIvor Lake was removed as a sampling site in Year 4 as water elevation data is not available at this location, thus preventing analysis of the management questions.

2.1.2.2 Sampling Frequency

Sampling over the course of the monitoring program has been scheduled to occur across as many of the seasons of the year as possible while still aligning with the operational season of the various recreation areas. Sampling was completed between March 15 to April 2 (winter), May 17 to June 29 (spring), August 4 to August 27 (summer) and September 1 to September 29 (fall). As with previous study years, timing of sampling was adjusted to coincide with the operational dates of the provincial campgrounds and recreation sites.

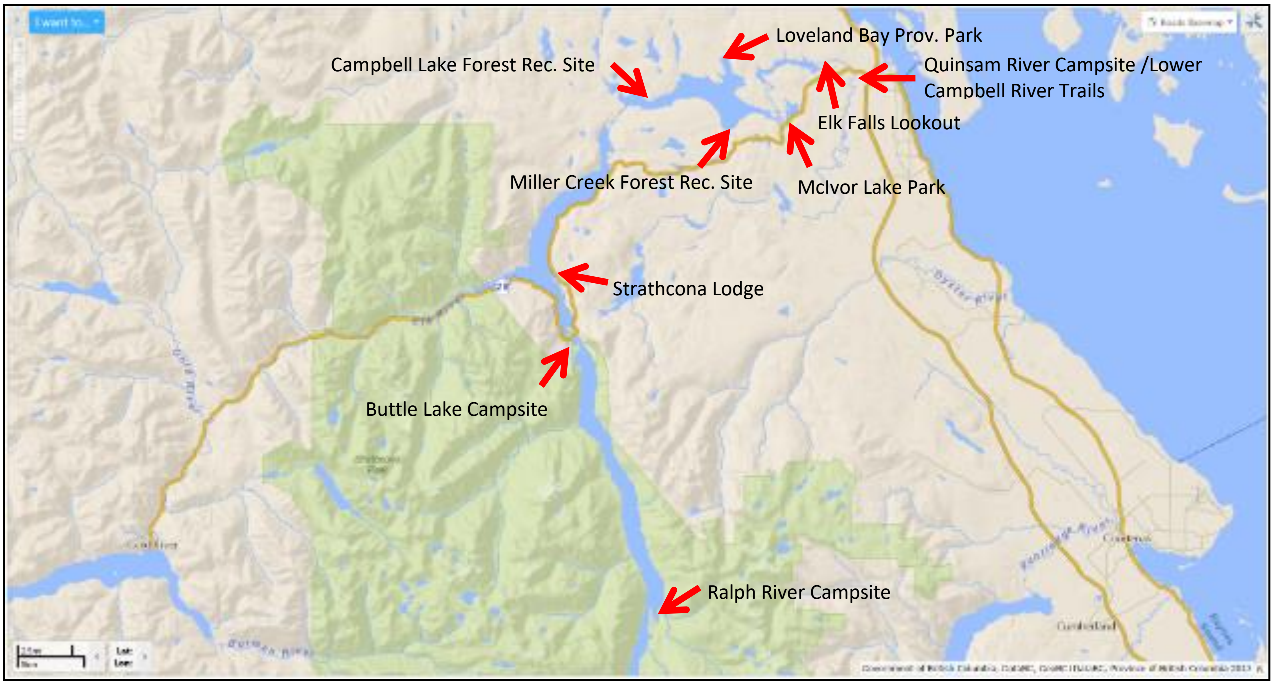

Figure 1. Map of sample locations (adapted from iMapBC)

Total sampling effort was set to 128 interview days per calendar year, providing approximately four interview days per site for the eight major sites across four recreation seasons. Interview days were distributed across the sampling periods and sampling sites, with an effort to sample the various locations on as many different days (and thus different water elevations/flows) as was practical. Additionally, sampling dates were selected to overlap with public holidays and weekends to maximize sampling during periods of high visitation. Two sites were generally sampled concurrently by two surveyors in the morning, and two different sites were surveyed concurrently in the afternoon to promote spatial and temporal coverage. Surveying was completed by employees from the Laich-Kwil-Tach Environmental Assessment Ltd. Partnership (LKT), based in Campbell River, BC

Table 3. Year 5 (January 2019 – December 2019) sampling schedule for each season

Season	Scheduling
Winter (2019)	March 15-April 2, 2019 (Mar 15-19, Mar 21-25, Mar 29-Apr 2)
Spring (2019)	May 17-June 29, 2019 (May 17-20, May 24-27, May 30-Jun 2, Jun 6-9, Jun 14-17, Jun 20-23, Jun 26-29)
Summer (2019)	August 3-August 26, 2019 (Aug 3-6, Aug 9-12, Aug 15-18, Aug 23-26)
Fall (2019)	September 1-September 29, 2019 (Sept 1-3, Sept 6-10, Sept 12-16, Sept 21-24, Sept 27-29)

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. A party was considered a singular person visiting the area alone or a collection of recreationists that were visiting and recreating in the area as a group. A person from each party was asked to participate in the survey and asked to complete the questionnaire onsite. 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. People who refused to participate were thanked for their time and no longer engaged; an invitation to participate was then extended to another willing representative of the same party. 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. The length of time required to complete the survey ranged depending on the visitation of the respondent, with most respondents completing the survey within 15-25 minutes.

2.3 SURVEY DESIGN

The key components during the original 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 based on Upper Campbell Reservoir
- Design of the questionnaire and DCE survey tool
- Survey testing and refinements

In addition, several other additional scope items have since been added to the study, including:

- Digitization of survey for delivery using electronic tablets (*implemented in Year 4*)
- Development of Decision Support System for Upper Campbell Reservoir based on the results from the original DCE (*implemented in Year 4*)
- Design and delivery of a new DCE survey based on Lower Campbell Reservoir (*implemented in Year 4*)
- Development of Decision Support System for Lower Campbell Reservoir based on the results on the new DCE (*implemented in Year 5*)
- Design and delivery of a new DCE survey based on Campbell River (*to be implemented in Year 6*)

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 were 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 are collected by surveyors in the field such as water levels and weather. Data for these influential factors are 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 that could hypothetically be encountered while recreating at the reservoirs (e.g., water levels, shoreline 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 utilized a discrete choice experiment (DCE) tool 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. A DCE was developed based on Upper Campbell Reservoir in Year 1, and a second DCE was developed based on Lower Campbell Reservoir in Year 4 and delivered in Year 5. A third DCE, based on Campbell River, is planned for Year 6.

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 results from the Upper Campbell Reservoir DCE are discussed in the JHTMON-2 Year 2-4 Progress Reports (2015-2018). In 2018, the research team designed and implemented a second DCE, based on Lower Campbell Reservoir and was implemented in 2019. This new choice experiment followed a similar framework as the previous DCE, and used the following steps:

1. <u>Adapt key recreational performance measures for application in a choice experiment</u>

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. <u>Design the survey instrument, including the stated preference choice sets</u>

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.

Lower Campbell Reservoir Discrete Choice Experiment Design Summary

The Lower Campbell Reservoir DCE (like the Upper Campbell DCE) is a discrete choice experiment in which respondents indicate their preference for recreating in hypothetical conditions (presented as a choice set) that might be found in the Lower Campbell Reservoir.

In each choice set, each participant will select their preferred site of two site alternatives (or select 'neither') shown with systematically varied reservoir attributes. Reservoir conditions will be presented in a different way in each of the alternatives for lake level, shoreline conditions, boat ramp features, and debris. Photographic representation will represent each site and respondents will choose: 1) which of the two sites they would prefer to recreate at, or 2) if they would prefer not to recreate at either.

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 and updated based on empirical results from the Upper Campbell DCE.

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
Type of Boat Ramp	Access Features	1) None 2) Gravel Road 3) Concrete Pad

* Note that

In regards specifically to the attribute of "Water Level", five categories of water level were considered, ranging from Low Low to High High. These five categories of water levels were then related to actual water elevations in Lower Campbell Reservoir based on the distribution of historic water elevation data. The following elevations (measured in meters above sea level) are described in Table 5.

Table 5. Lower Campbell DCE Water Levels and corresponding water elevations.

Water Level	Elevation (masl)	Elevation Range (m)
Low low	<176.24	-
Low	176.24 - 176.68	0.44
Average	176.68 - 177.12	0.44
High	177.12 - 177.56	0.44
High high	>177.56	-

Two design options were considered for the Lower Campbell Reservoir DCE:

A. <u>Repeat using the same design as Upper Campbell DCE:</u>

Given that the Lower Campbell Reservoir experiment features similar attributes as the Upper Campbell Reservoir, option 1 would utilize the same design as previously generated for the Upper Campbell DCE. This would potentially allow for attribute comparison between reservoir sites as the distribution and choice sets between Upper Campbell / Lower Campbell would match (e.g., Choice set 1 for Upper Campbell would be the same as Choice set 1 for Lower Campbell).

B. Generate New Design:

An alternative to using the existing Upper Campbell design would be to generate a new design for the Lower Campbell Reservoir.

While a new design would feature similar attributes as those found in the Upper Campbell DCE, the allocation of choice sets would differ given the random distribution of attributes presented when preparing a new choice design. This new allocation of attributes would provide a second point of validation of recreational values in the Campbell River system and therefore design option B was selected.

Final operationalization of the choice experiment was from option B using a statistical design that presented two photos in choice sets. Each choice set presents two recreational alternatives consisting of 4 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), and boat ramp (3 levels) represents a 4x5x2x3 design with 120 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 6), blocked into four different versions of six choice sets (2 photos per set), reported as being optimally balanced with >90% D-efficiency. Optimal designs maximize the D-efficiency, which is a criterion on the variance of the parameter estimates. The D-efficiency of the standard fractional factorial is 100%, but it is not possible to achieve 100% D-efficiency without all variances of the attributes so reduced options are used. Anything above 80% is considered good and acceptable.

Photo book preparation

The resulting 48 combinations are represented in Table 6. To prepare the photo representation of each combination, we utilized a base photo (and a series of reference photos) from Lower Campbell Reservoir, and layered in digital representations of each level. Visual representations of water levels were prepared from historical operational levels providing a more realistic presentation of conditions but reduced visual variance between water levels. 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 6. Resulting combinations of features presented in Lower Campbell choice experiment

Photo Number	Debris Quantity	Water Level*	Shoreline	Boat Ramp
1	(4) A lot of Debris	(4) High	(1) Rocks	(2) Gravel road
2	(3) Average Debris	(1) Low low	(2) Sand	(3) Concrete pad
3	(1) No Debris	(2) Low	(1) Rocks	(3) Concrete pad
4	(2) Little Debris	(3) Average	(2) Sand	(2) Gravel road
5	(3) Average Debris	(3) Average	(1) Rocks	(3) Concrete pad
6	(4) A lot of Debris	(5) High high	(2) Sand	(2) Gravel road
7	(2) Little Debris	(2) Low	(1) Rocks	(2) Gravel road

8	(1) No Debris	(1) Low low	(2) Sand	(1) None
9	(1) No Debris	(5) High high	(1) Rocks	(3) Concrete pad
10	(4) A lot of Debris	(4) High	(2) Sand	(1) None
11	(2) Little Debris	(5) High high	(2) Sand	(1) None
12	(3) Average Debris	(2) Low	(1) Rocks	(2) Gravel road
13	(1) No Debris	(2) Low	(2) Sand	(2) Gravel road
14	(4) A lot of Debris	(1) Low low	(1) Rocks	(3) Concrete pad
15	(2) Little Debris	(2) Low	(1) Rocks	(1) None
16	(3) Average Debris	(4) High	(2) Sand	(2) Gravel road
17	(2) Little Debris	(1) Low low	(1) Rocks	(2) Gravel road
18	(1) No Debris	(3) Average	(2) Sand	(1) None
19	(4) A lot of Debris	(3) Average	(2) Sand	(3) Concrete pad
20	(3) Average Debris	(4) High	(1) Rocks	(1) None
21	(1) No Debris	(4) High	(2) Sand	(3) Concrete pad
22	(2) Little Debris	(5) High high	(1) Rocks	(1) None
23	(1) No Debris	(5) High high	(1) Rocks	(2) Gravel road
24	(3) Average Debris	(2) Low	(2) Sand	(1) None
25	(1) No Debris	(2) Low	(2) Sand	(2) Gravel road
26	(3) Average Debris	(4) High	(1) Rocks	(1) None
27	(4) A lot of Debris	(1) Low low	(1) Rocks	(2) Gravel road
28	(1) No Debris	(5) High high	(2) Sand	(3) Concrete pad
29	(4) A lot of Debris	(3) Average	(1) Rocks	(1) None
30	(2) Little Debris	(1) Low low	(2) Sand	(2) Gravel road
31	(1) No Debris	(3) Average	(1) Rocks	(1) None
32	(3) Average Debris	(5) High high	(2) Sand	(3) Concrete pad
33	(3) Average Debris	(3) Average	(1) Rocks	(3) Concrete pad
34	(1) No Debris	(4) High	(2) Sand	(2) Gravel road
35	(2) Little Debris	(4) High	(1) Rocks	(3) Concrete pad
36	(4) A lot of Debris	(1) Low low	(2) Sand	(1) None
37	(2) Little Debris	(4) High	(1) Rocks	(3) Concrete pad
38	(3) Average Debris	(1) Low low	(2) Sand	(2) Gravel road
39	(4) A lot of Debris	(3) Average	(2) Sand	(3) Concrete pad
40	(1) No Debris	(1) Low low	(1) Rocks	(1) None
41	(3) Average Debris	(5) High high	(1) Rocks	(2) Gravel road
42	(2) Little Debris	(4) High	(2) Sand	(3) Concrete pad
43	(4) A lot of Debris	(5) High high	(1) Rocks	(3) Concrete pad
44	(2) Little Debris	(3) Average	(2) Sand	(2) Gravel road
45	(1) No Debris	(3) Average	(1) Rocks	(2) Gravel road
46	(4) A lot of Debris	(2) Low	(2) Sand	(1) None
47	(4) A lot of Debris	(1) Low low	(1) Rocks	(3) Concrete pad
48	(3) Average Debris	(5) High high	(2) Sand	(1) None

* Water level categories (Low low, Low, Average, High, High high) have been aligned with specific ranges of water elevations in Lower Campbell Reservoir. Elevation ranges were determined based on distributions of historic water elevation data for the reservoir. The corresponding water elevations for each category are described in Section 0.

Figure 2 presents an example photo set from Book 1 of the field photo books. Site A represents conditions of *average debris*, *low low water level*, *a sandy shoreline*, and *a concrete boat ramp*. Site B represents *a lot of debris*, *high water level*, *a sandy shoreline*, and *no boat ramp*.

Book # 1 Photo Group 1 - SITE A

Book # 1 Photo Group 1 - SITE B

Figure 2. Example photo comparison for the Lower Campbell DCE

3. <u>Data Collection</u>

Data collection for the Lower Campbell Reservoir DCE (like the Upper Campbell Reservoir DCE) occurred through the use of the field survey. Recreationists participating in the study were shown a blocked set of six photo pairs from four blocked sets. For the next respondent, another block of six choice pairs were drawn, until the pool of blocked sets was exhausted; upon which another round of the photo sets gets started. Respondents selected the recreation site they would most like to visit (or neither) and continued to the next set until they completed six choice sets. The full questionnaire and sampling are 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.

<u>For Reservoirs:</u>

$H_{0\text{-}A}$: 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. Questions Q9, Q10, Q11, Q12 and Q14 in Section B: Visit to a Lake/Reservoir (Appendix D) 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. Unlike the revealed preference approach which rely on respondents recounting their experience while recreating at the reservoirs and rivers, the stated preference approach, which is based on hypothetical photo scenarios, provides opportunities to explore a broad range of water management scenarios without actually having to release (or retain) water. This approach addresses practical challenges when trying to a) test the extreme ends (e.g., high high or low low) of the reservoir levels; and b) test multiple water levels with the same recreationist whereby that person can actually trade-off difference scenarios with one another. Neither of these opportunities can be practically achieved in a real-life setting. This approach presents an alternative method to determining how changes to reservoir operations may change the desire for a recreationist to visit an area. Questions 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. Questions 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. Questions 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). With the digitization of the survey in this study year, these skip logic questions automatically move respondents through the questionnaire without having to follow instructions. 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. In previous years, data from the questionnaires and discrete choice experiment were manually entered into a common database (i.e., Microsoft Excel) by a technician, ideally as the surveys were collected. With the move away from paper surveys to a digitized survey administered using an electronic tablet in this study year, data entry was automated, occurring daily when the electronic devices were synchronized with the database at the end of each survey day. The database was examined periodically to ensure that surveys were being synchronized with the database and to highlight any potential data collection 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 outlying data. In particular, the variables that seemed to be prone to extreme or unrealistic answers were associated with respondents recounting whether they had visited any other locations on their current trip. Based on the outliers, it is evident that some respondents were reporting visits to different locations based on completely different trips in the study area, rather than their current trip. For example, a local visitor who was visiting Elk Falls just for the day should only be answering questions related to places they visited that day. If they visited a different location in the study area a week or month before, they should not be reporting on it, as this is considered a different trip.

In general, all responses that referred to visits occurring greater than seven days in the past were removed. This approach was implemented for two reasons. First, experiences that occur in the past are prone to recall bias which can lead to recollection error. Second, this approach helps ensure that respondents were only referring to their current trip. In total, three responses regarding visitor experiences at the reservoirs, and two responses regarding experiences at the falls were removed during the analysis of the management questions due potential recollection error, or due to extreme, 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 (i.e., numeric) data. For the management questions, data have been presented in aggregate for the entire study as well as by study year in order to provide some context to changes in responses through time. 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.

2.5.1.1 Relationship of satisfaction scores with lake elevation, river flow, or falls flow

Analysis of the management questions involved identifying potential relationships between the performance indicators and the respective reservoir operations metrics. For reservoirs, questions that asked respondents about their perceptions of safety, satisfaction and experience (measured on a 5-point Likert scale from 1-*very dissatisfied* to 5-*very satisfied*) were related to reservoir elevations on the day of their visit. For rivers and Elk Falls, indicators of safety, satisfaction and experience were related to river discharge on the day of their visit.

Day-specific reservoir elevations were obtained directly from BC Hydro as daily averages (m) for Upper Campbell Reservoir, Lower Campbell Reservoir and Buttle Lake. Day-specific data for river flow discharge (m^3/s), used in the analysis for rivers and Elk falls, were obtained through the Water Office of Environment Canada. The reference water stations used for river discharge were:

- CAMPBELL RIVER NEAR CAMPBELL RIVER (08HD003)
- QUINSAM RIVER NEAR CAMPBELL RIVER (08HD005)

In previous years, correlational analyses were used to examine these relationships. While being the conventional method, this approach only accounts for variation between person-to-person in their satisfaction scores at a particular day and water condition. As noted by Dr. Carl Schwarz (pers. comm. April 12, 2018), respondents do not only vary in their perceptions and satisfaction when visiting the location on the same date; there may also be day-specific effects. For example, respondents may tend to generally give higher scores on sunny days than on rainy days for the same lake elevation, river flow, or falls flow. In this case, multiple respondents measured on the same day are pseudo-replicates (Hurlbert, 1984) and resulting standard errors of the slope will be under-reported and reported p-values will tend to be too small (i.e., too many false positives).

One robust approach to address this additional variation is using a mixed linear model. For example, if the relationship between ratings for satisfaction and lake elevation is of interest, the mixed linear model is:

$$Score \sim Elevation + \text{DateOfVisit}(R)$$

where *Score* represents the satisfaction rating; *Elevation* represents the lake elevation; and *DateOfVisit(R)* represents the (random) effect of the date the lake was visited. The random day-specific-effects account for effects that change at the day level (e.g., respondents may generally be more satisfied when the weather is fine than when the weather is poor). We have used the mixed linear model in the subsequent analyses for the management questions.

2.5.1.2 Relationship of satisfaction scores with weather

As part of the mixed linear models, we also investigated the impact of weather and elevation on the satisfaction score. Weather was recorded into six categories while administering the survey: sun; cloud; mixed sun and cloud; rain; snow; and wind. Given the few observations for snowy and windy conditions, these were dropped from the analysis. Note that it is possible that the weather recorded at the time the respondent answered the questionnaire may not correspond exactly with the weather on the date that the respondents visited the lake, river, or falls. This mismatch may tend to add noise to the relationship and make it harder to detect effects.

We considered a mixed linear model again, with the addition of the (reduced) weather variable. Two models were fit. First is a model to see if there is evidence that the effect of elevation is different under different weather conditions (non-parallel slopes):

$$Score \sim Elevation + Weather(C) + Elevation{:}Weather(C) + \text{DateOfVisit}(R)$$

where Weather(C) is the effect of the categorical weather variable and the Elevation:Weather(C) term represents the interaction between the effect of elevation and the effect of weather (i.e. non-parallel slopes). If the p-value for this term is small, it indicates evidence that the slopes are non-parallel.

If there is no evidence of non-parallelism, then the parallel-slope model:

$$Score \sim Elevation + Weather(C) + +\text{DateOfVisit}(R)$$

is fit. The p-value with the Weather(C) term, now indicates if there is evidence that the mean score differs among the weather classes after adjusting for the effect of elevation.

Note that certain weather conditions have larger sample sizes than other weather conditions; for weather conditions with large sample sizes, the power to detect non-parallelism and effects of weather on the mean score will be higher than for weather conditions with small sample sizes.

2.5.1.3 Changes in responses over time

To provide a context of change in responses through time, comparisons across the different study years have also been provided for the management questions. The statistical tests used for investigating any significant differences were determined based on such factors as the type of data, nature of the distribution, and the homogeneity of variance. The management questions, using Likert Scale rating categories, are considered categorical data (e.g., satisfaction with recreational experience) and were examined using Pearson Chi-Square to identify if the proportion of responses was significantly different between years. Post-hoc pairwise comparison tests using the Bonferroni correction were then run to identify which responses were significantly different between years.

2.5.2 DISCRETE CHOICE EXPERIMENT

For 2019, analysis was completed for the Lower Campbell Reservoir Discrete Choice Experiment. A Decision Support System for Lower Campbell Reservoir was developed based on the data from 2019. DCE data has been analyzed using Latent Gold 5.0 to estimate multiple multinomial logit models.

Joint analysis of Year 2-4 Upper Campbell DCE data is still recommended to allow for further analysis of classes presented in earlier analysis. This would simply be a repeat of earlier analysis but using the full 2-4 year dataset. 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.

As discussed in Section 2.3.2, a discrete choice experiment based on Campbell River is to be developed and implemented in Year 6 to examine choice behaviours related to recreation in the riverine environment. A preliminary design framework was completed, and some initial photos were collected in 2019, although further design refinement, testing and implementation is currently on-going. The Campbell River DCE is intended to be completed and implemented in Year 6 of the study, which was originally scheduled for 2020. Due to COVID-19, Year 6 of data collection was postponed and is anticipated to occur in 2022.

2.6 POWER ANALYSIS AND REFINEMENT OF SAMPLING PLAN

A power analysis was completed by Dr. Carl Schwarz using data from Year 2 and Year 3 to help provide further direction regarding the necessary sampling effort to avoid a Type II error. A Type II error is the probability of accepting the null hypothesis when we actually should have rejected it. In this study, a Type II error would mean we concluded that there was no relationship between a performance measure and water elevation/flow when in fact there was. The standard target power of 0.80 was used.

A couple conclusions were drawn based on a review of the data and the power analysis. First, a review of the data suggests that the current approach to data analyses (i.e., correlational analysis), while being the conventional method, may not be the most appropriate approach. Correlational analysis, as utilized in this study, accounts for variation between person-to-person in their satisfaction scores at a particular day (and water level). However, an additional source of variation may be associated with day-specific effects, and not solely associated with water level. These day-specific effects could be related to external factors such as weather or season. A more sophisticated and appropriate approach to analysis would be the application of a linear mixed model (pers. comm., Dr. C. Schwarz, April 12, 2018). Linear mixed models can be considered for future years of data analyses.

Power analyses were completed for each management question at each location with available hydrometric data. This included Upper Campbell Reservoir, Lower Campbell Reservoir and Buttle Lake, Campbell River and Quinsam River, and Elk Falls. To determine the amount of sampling effort required to achieve a power of 0.80, a range of total number of respondents and total number of sampling days were considered while using the trends observed (from Year 2 and Year 3) for each management question. The number of respondents tested ranged from 500 to 1500 at each location, while the total number of sampling days tested ranged from 20 to 60 days at each location. The analyses assumed that number of sampling days were allocated as evenly as possible across the full range of water elevation/flow conditions experienced at each location. For the power analysis, water conditions were grouped into periods of low, medium and high. For example, for Buttle Lake, while testing the power that is achievable using 20 days of sampling, the model would assume that 7 days were allocated to low water level periods, 7 days were allocated to high water levels and 6 were allocated to medium water levels).

Following evaluations of the data by Dr. Carl Schwarz using the results from linear mixed models for each management question and location, it was determined that a target power of 0.80 is not achievable regardless of the total number of interviews or sample days for the reservoir management questions. The evaluation identified that responses at the reservoirs were characterized by large day effects, resulting in a lot of variation. Several models were investigated to try and explain the large day-specific variation, including weather and season, but none improved the fit of the model.

In regard to the riverine management questions, it is not possible to reach a power of 0.80 with only 20 days of sampling at each river location. Forty (40) days of sampling and over approximately 900 respondents at each riverine location would be required to achieve a power of 0.80 in the evaluation of most riverine management questions. Two exceptions were noted for the riverine management questions (i.e., Q30 – Perceptions of river safety at Quinsam River and Q32 – Influence of river flow at Campbell River), where a power of 0.80 is not achievable regardless of the total number of interviews or sample days. Similar to the reservoirs, day-specific effects were too large to achieve the desired power, and these effects could not be explained by attributes such as weather and season.

Lastly, the power analyses for the management questions associated with water flows and Elk Falls were also evaluated for required sampling days and total respondents. Q23 (i.e., Impressiveness of falls) could achieve a power of 0.80 with 500 respondents and 20 days of sampling split across the range of flow conditions. Q24 (i.e., Satisfaction with experience at falls) is estimated as requiring at least 40 days of sampling split evenly across water flow levels and 500 respondents to achieve this power.

Based on these findings, the level of sampling required to achieve the desired power of 0.80 will be either very difficult or impossible to implement. In the case of all reservoir-related management questions and some riverine management questions, the high day-effects coupled with the low effect of water conditions on the performance measures, makes achieving the power prohibitive regardless of the number of sampling days or number of respondents. In the cases where the power may be attainable with enough sampling effort, we are also faced with logistical and operational obstacles. These include: limitations to budget to increase number of sampling days, seasonal closures of parks and recreational sites that prevent sampling during the highest and lowest water conditions, and the conflict of coordinating sampling efforts across different location types and varying water levels (e.g. when it is optimal timing based on water flows to sample at river sites, it may not be optimal timing to sample at reservoir sites).

In our best effort to address these short-comings, sampling for 2019 utilized predictions of reservoir elevations provided by BC Hydro to time surveying to high, medium and low conditions. Sampling, however, was still limited to the operational season of the parks and recreation areas. The provincial campsites and recreation sites generally open April or May, and close in mid-September to October. To increase the number of days, sampling at each location was split into half-days, so that the same amount of sampling effort at each location could be spread across more days.

3 RESULTS

3.1 GENERAL

Over the course of Year 5, 3298 individuals were asked if they would complete the survey. Of those, 2644 individuals did not participate in the survey. Many individuals reported that they had completed the survey in the past year (325) and were not eligible to participate, although most did not provide a rationale for not participating. In total, 654 people agreed to complete the survey in 2019, which represents a response rate of 20%. This is comparable to the previous study year which had a response rate of 21% although lower than earlier study years (Figure 3). Since the beginning, 4226 people have participated in the survey.

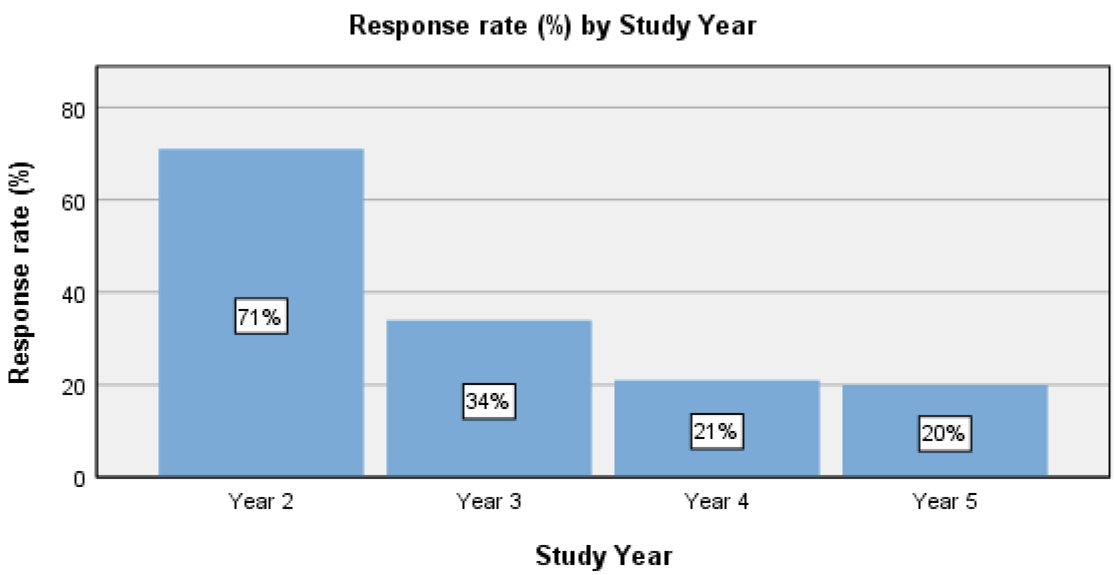

Figure 3. Response rate for each study year

In Year 5, summer had the highest number of responses (n=297), followed by spring (n=174) (Figure 4). This has typically been the case across all study years. The timing of the survey was developed to coincide with the recreation season and encourage capturing as wide a range of water elevation/flow conditions as possible.

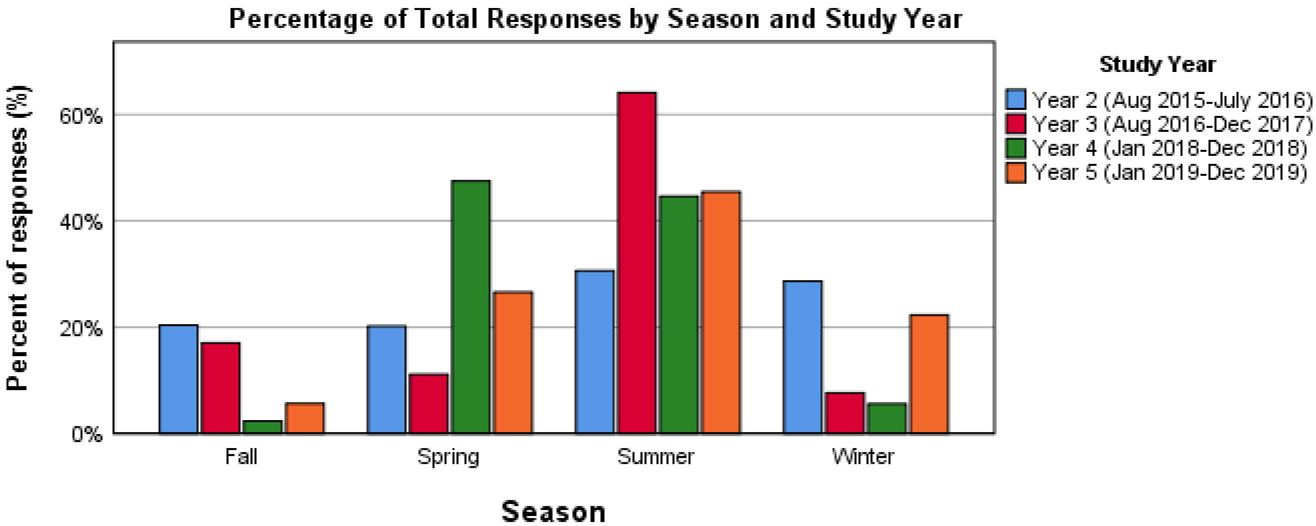

Figure 4. Percentage of the total number of questionnaires completed by season and study year

Surveys were focused on eight locations across the study area. In Year 5, Elk Falls Lookout (Elk Falls Provincial Park) had the highest number of survey responses (n=211) (Figure 5). This location is close to Campbell River, open year-round and a popular area for walking for both locals and visitors. The area with the second highest survey responses was Quinsam Camp (Elk Falls Provincial Park Campsite) which is also close to town, receives both overnight and day users, is adjacent to an extensive trail system, and is open year-round.

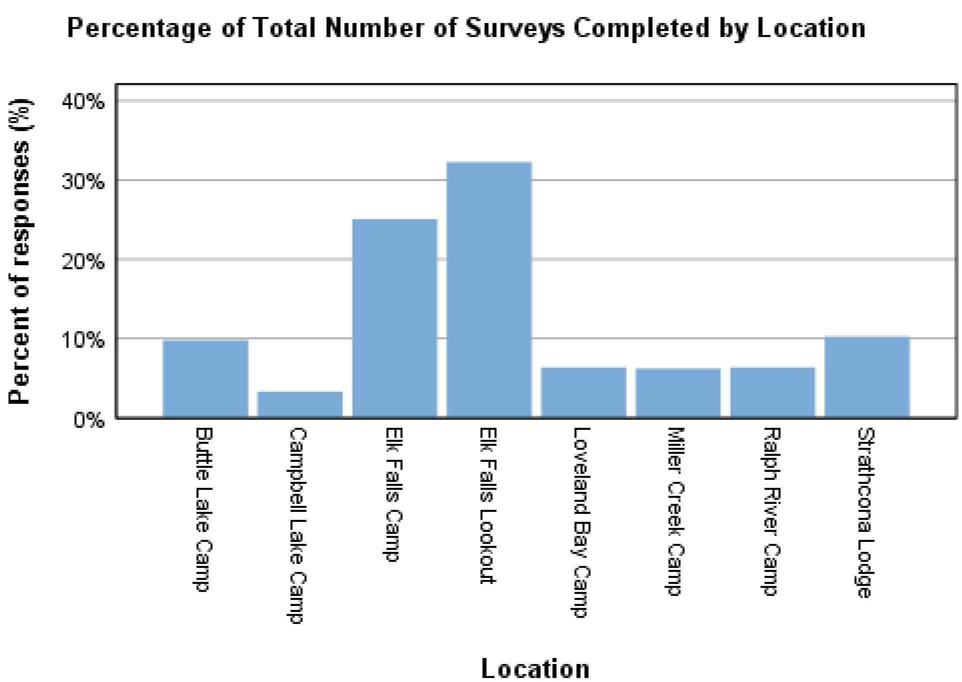

Figure 5. Percent of survey responses according to sample location in Year 5 (n=654)

The average trip length spent in the Campbell River reservoir system by respondents was 2.74 days in Year 5 (n=653, s=3.012), with a median of 2 and mode of 1 day. Mann-Whitney U tests were used to examine differences in trip length between study years because trip lengths were non-parametrically distributed. Average trip length was not significantly different between Year 2 and Year 5 (U=581388, p=0.215), although it was significantly lower in Year 5 than Year 3 (U=241574, p=0.000) and Year 4 (U=133057, p=0.000) (Figure 6). Similar differences were identified in previous years. The differences can largely be explained by variations in response rates at Elk Falls Lookout and near Quinsam and Campbell Rivers, which is comprised largely of day visitors.

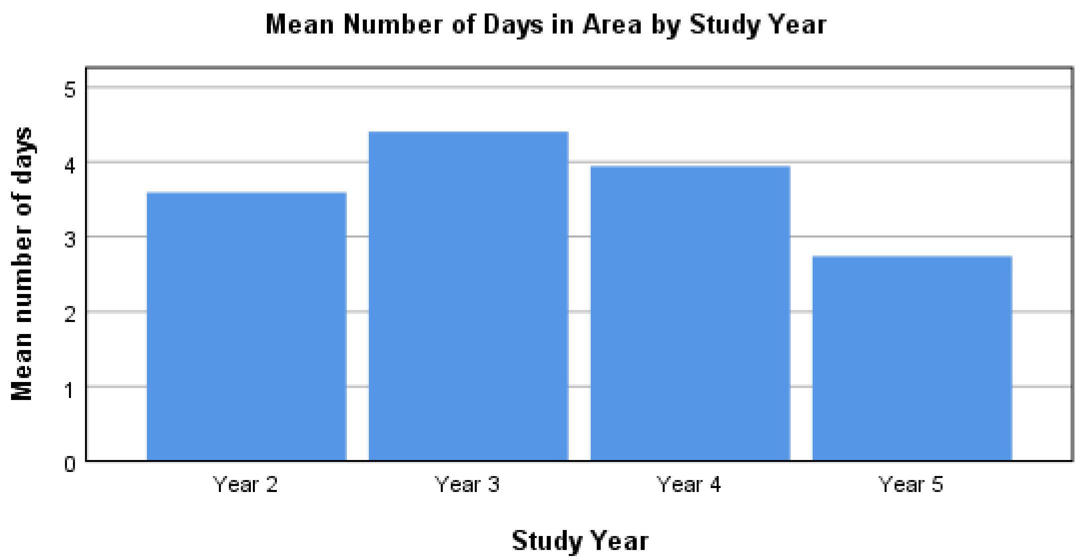

Figure 6. Mean number of days spent in area on trip by study year

In Year 5, 44% of respondents reported being day visitors only, meaning they could be residents or visitors who just were passing through for the day (Figure 7). When respondents were asked their city of residence, almost half (47%) in Year 5 reported they were from Campbell River. The proportion of day visitors has fluctuated over the course of the study, largely explained by variable response rates at popular day use areas such as Elk Falls Lookout and along Campbell River near Quinsam Campground, where day visitors are more likely to be encountered.

Overnight visitors comprised 56% of the respondents in Year 5. The most popular forms of accommodation for those staying in the area was trailer (38%), followed by tent (25%). Camping was most frequently noted (33%) as the most important activity in respondents' decision to visit the Campbell River reservoir system, followed by hiking and walking in the area (28%).

Most respondents (62%) reported visiting the study area before while 38% were visiting for the first time. Of those who had visited the area before, the highest frequency of visits was reported in the summer; 80% of respondents who had visited the Campbell River reservoir system before reported visiting 4 days or more on average annually each summer. This implies that most respondents tend to be regular visitors, spending multiple days in the area each year.

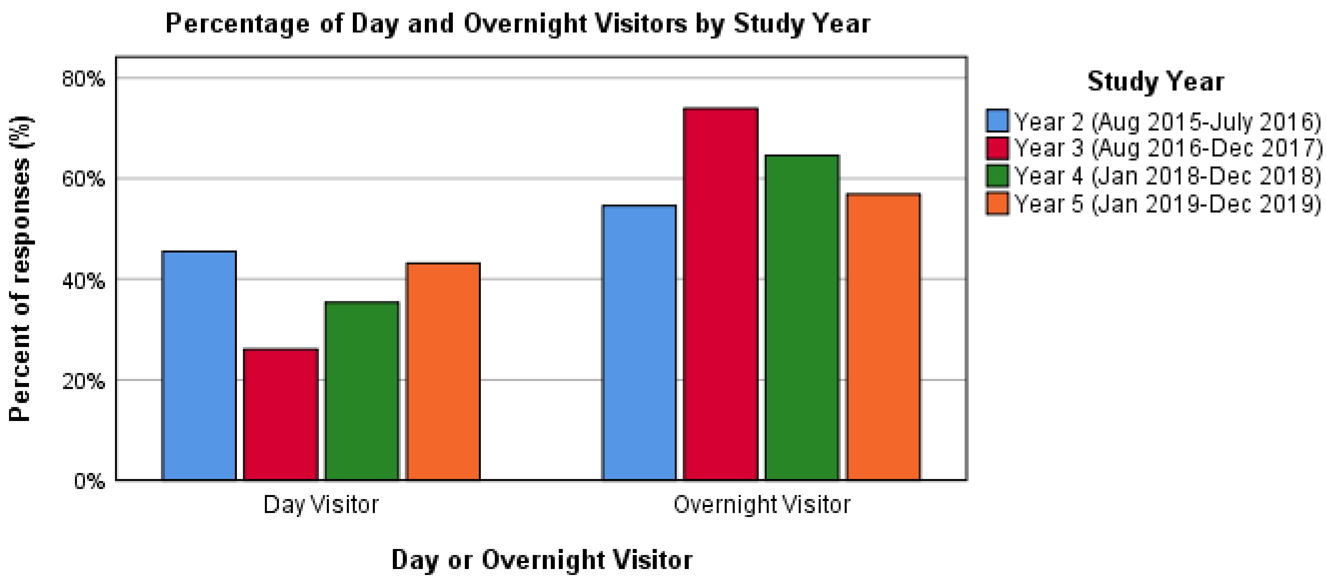

Figure 7. Percentage of day visitors and overnight visitors by study year

The frequencies for all survey questions are summarized in the appendices, with responses being categorized by study year. 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 Questions Q9, Q11, Q12 and Q14 in Section B: Visit to a Lake/Reservoir (see Appendix D) of the survey were graphed using scatterplots in relation to the average daily elevation.

In this study year, correlations between water elevations and the various performance measures were tested using a mixed linear model. In previous analyses, we used a Spearman's correlation. The mixed linear model is a more robust method as it addresses two sources of variation: between respondents and between days. Additionally, the management questions were examined with a mixed linear model for relationships with weather to determine if this was an influential variable in satisfaction scores. The impact of weather on these relationships was also investigated after adjusting for lake elevation on respondents' recreation experience. Scatterplots have been used to depict these relationships and are presented in Appendix B.

Pearson Chi-Square tests were used to identify if the proportion of responses were significantly different between years. Post-hoc pairwise comparison tests using the Bonferroni correction were then used to identify which responses were significantly different.

It is important to note that lake elevation is highly confounded with year, with some years having much lower water elevations than others. For example, lower elevations were generally encountered during the surveys in 2015 and higher elevations encountered in 2017. Consequently, conclusions must be interpreted carefully because year-specific effects could be causing the changes in visitor satisfaction rather than lake elevation.

3.2.1 WATER ELEVATION OF RESERVOIRS

Water levels, measured as daily average elevation in metres, were gathered from BC Hydro Generation Operations. Water levels are only available for three reservoirs in the study area: Buttle Lake, Lower Campbell Reservoir and Upper Campbell Reservoir. Analyses were completed separately for each reservoir as differences in operational water levels (e.g., maximum reservoir elevation) and topography prevent direct comparisons between reservoirs. A summary of water elevations from the BC Hydro data set are provided in Table 7.

Using monitoring data attained through BC Hydro, the mean daily average elevations for Year 5 of the study were 217.08 m for Buttle Lake, 217.07 m for Upper Campbell Reservoir, and 176.87 m for Lower Campbell Reservoir. Buttle Lake and Upper Campbell Reservoir are expected to share similar water elevations due to their direct connectivity.

Table 7. Summary of water elevation data (in meters) for reservoirs in Year 5 (Jan 2019-Nov 2019)

	Upper Campbell Reservoir (meters)	Buttle Lake (meters)	Lower Campbell Reservoir (meters)
Mean	216.19	216.28	176.54
Median	216.32	216.31	176.24
Std. Deviation	1.715	1.571	.654
Variance	2.940	2.470	.428
Minimum	213.01	213.94	175.72
Maximum	220.60	220.56	177.93

Water elevations measured throughout the year were compared to those water elevations encountered during the sampling at each reservoir to identify how representative sampling was of the true range of water elevations. As water elevation data was not normally distributed, a One-Sample Wilcoxon Signed Rank Test was used to determine if the median daily water elevations that were encountered during sampling were the same as those observed for the entire year. Significant differences in median water elevation were observed between the dates sampled and actual water elevations throughout the year for Buttle Lake ($n=42$, $p=0.001$) and Upper Campbell Reservoir ($n=34$, $p=0.002$). Lower Campbell Reservoir was not significantly different ($n=31$, $p=0.056$). Water elevations at Buttle Lake and Upper Campbell Reservoir had lower median water elevations encountered during sampling when compared to the full range of elevations in the year. This is not entirely unexpected as high water levels are more common in the off-season when fewer people are recreating and taking the survey.

3.2.2 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"). Across all study years, about half (50%) of 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 (Figure 8). In Year 5, this proportion was substantially lower with only 19% of all respondents reporting a positive influence; rather, majority of respondents (62%) in Year 5 reported that lake levels did not influence their recreation experience (Figure 9).

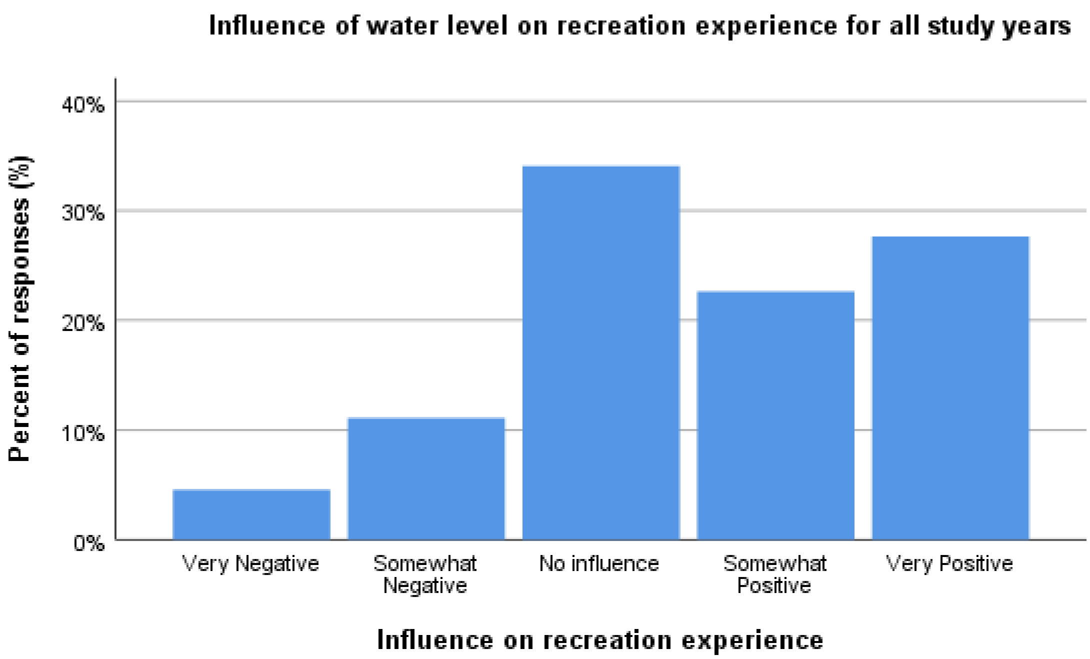

Figure 8. Influence of water level on recreation experience for all study years

Relationship between Recreation Experience and Water Elevation

Significant correlations were identified between the influence on recreation experience and water elevations for two reservoirs. Respondents reported a tendency to report a more positive influence on their recreation experience when water levels were higher for Buttle Lake (p=<0.001) and Lower Campbell Reservoir (p=<0.001) although this relationship may be somewhat confounded with year-specific effects. No strong trends were evident at the Upper Campbell Reservoir (p=0.334). Scatterplots depicting the influence of water levels on recreation experience in relation to daily average water elevation for the reservoirs are presented in Appendix B – Figure 1.

The impact of general weather conditions (e.g. overcast, sunny, raining) was also investigated after adjusting for lake elevation on respondents' recreation experience (Appendix B – Figure 2). There was no evidence of a differential effect of elevation depending on broad weather categories (i.e., all of the p-values for the non-parallel effect are large); and there was no evidence of a difference in mean score depending on weather for any reservoir. As such, it is unlikely that broad weather categories have had significant influences on respondents' recreational experience in Campbell Reservoir system.

Differences in Responses between Study Years

When the proportion of responses are compared between study years, significantly differences are noted (Pearson's χ^2= 189.108, p=0.000) (Figure 9). A post-hoc pairwise comparison of each category (using the Bonferroni correction) was used to identify what these differences were. A pairwise comparison determined that, in particular, respondents in Year 5 had a significantly greater proportion of "no influence" responses (Z=9.657, p=0.000) and a lower proportion of "somewhat positive" (Z=-6.565, p=0.000) and "very positive" (Z-5.257, p=0.000) responses than other study years. Also, respondents in Year 2 had a significantly greater proportion of "very negative" responses compared to other years (Z=6.936, p=0.000), while in Year 3, respondents had a significantly lower proportion of "very negative" responses (Z=-4.562, p=0.000) compared to other study years.

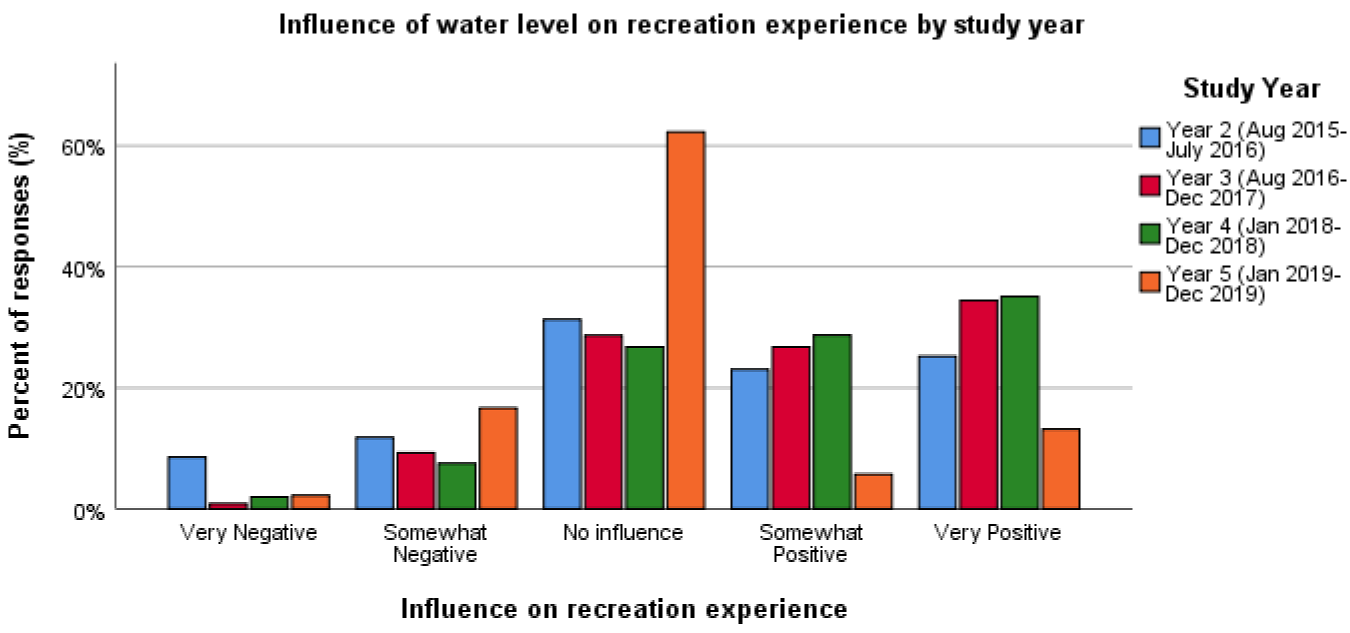

Figure 9. Frequency of responses for influence of water level on recreation experience at reservoirs by study year (n=1693)

The influence of weather does not appear to explain the differences in responses from year to year, although large year-specific variation is evident. Other explanatory factors were not explored, although possibilities could include differences in elevation between study years, a change in shoreline conditions experienced by respondents (although unlikely), a change in the population sample (e.g., a growing segment of visitors who may no longer be participating due to survey fatigue) or change in response associated with visitors completing the survey on a different medium (i.e., on an e-tablet).

3.2.3 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"). Across all study years, 68% of respondents reported that they were either "somewhat satisfied" or "very satisfied" (Figure 10). Considering only responses from Year 5, this proportion was slightly lower, with 54% of respondents reporting that they were either "somewhat satisfied" or "very satisfied" (Figure 11).

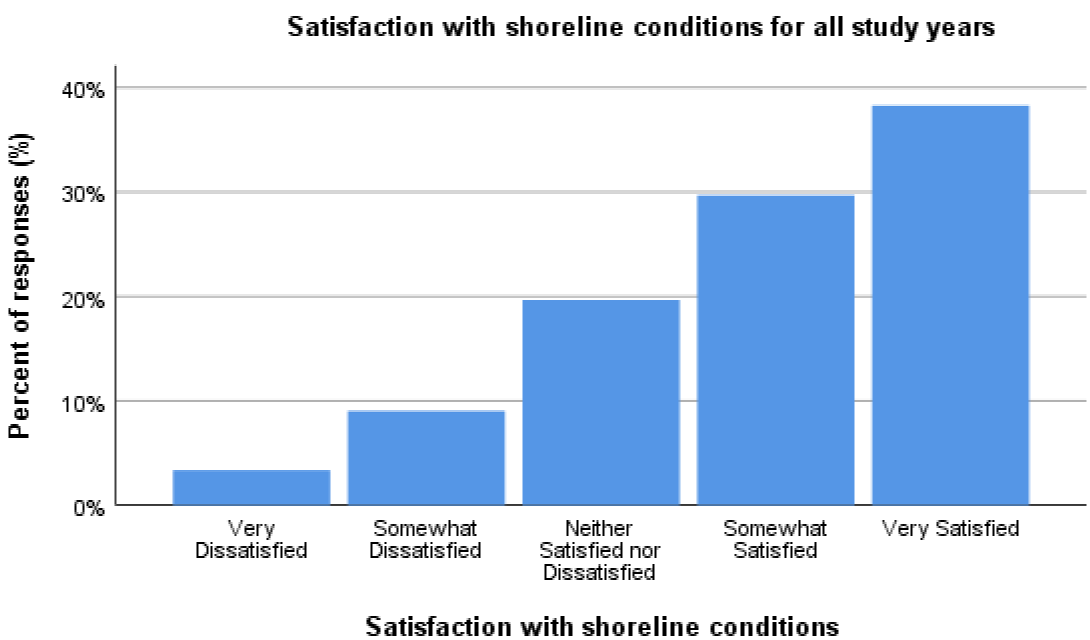

Figure 10. Satisfaction with shoreline conditions for all study years

Relationship between Satisfaction with Shoreline Conditions and Water Elevation

Respondents from Buttle Lake reported a tendency to report being more satisfied with shoreline conditions when water levels were higher ($p=<0.001$). The relationship was not as evident for Lower Campbell Lake although still significant (although this may be confounded with year-specific effects) ($p=0.001$). No strong trends were evident at the Upper Campbell Reservoir ($p=0.849$). Scatterplots depicting the satisfaction with shoreline conditions in relation to daily average water elevation for the reservoirs are presented in Appendix B – Figure 3.

The impact of weather conditions was also investigated after adjusting for lake elevation on the satisfaction score (Appendix B – Figure 4). There was no evidence of a differential effect of elevation depending on weather (i.e., all of the p-values for the non-parallel effect are large); and there was only evidence of a difference in mean score depending on weather after adjusting for elevation for Upper Campbell Lake.

Differences in Responses between Study Years

When responses are compared between study years, differences in satisfaction with shoreline conditions are noted (Pearson's χ^2=100.708, p=0.000) (Figure 11). A pairwise comparison of each category using the Bonferroni correction identified several significant differences across the years. These differences must be interpreted with caution as the comparisons do not consider differences in elevations encountered from year to year or other day-specific variation (e.g., weather).

The proportions of respondents responding that they were "neither satisfied nor dissatisfied" with shoreline conditions has apparently shifted. A significantly lower proportion of respondents replied they were "neither satisfied nor dissatisfied" in Year 2 (Z=-3.162, p=0.002) and Year 3 (Z=-3.174, p=0.002) while a significantly greater proportion replied they were "neither satisfied nor dissatisfied" in Year 4 (Z=4.607, p=0.000) and Year 5 (Z=3.894, p=0.000).

Other changes that have been observed include a disproportionately higher level of respondents being "somewhat dissatisfied" with shoreline condition in Year 5 (Z=3.029, p=0.002). We also observed a significantly greater proportion of respondents in Year 2 (Z=5.827, p=0.000) respond that they were "very dissatisfied" compared to other years and significantly fewer in Year 3 (Z=-3.892, p=0.000). Despite the variability in responses over the years in the proportion of respondents replying they were "somewhat satisfied" or "very satisfied", these proportions were not identified as being significantly different.

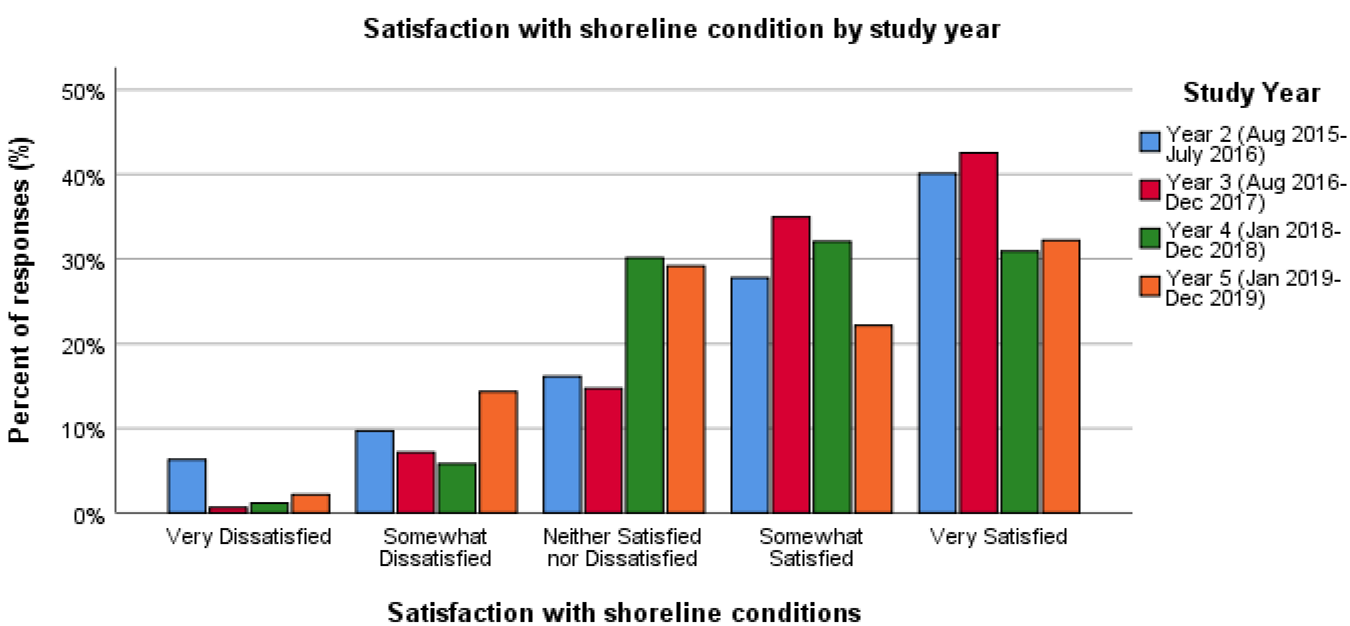

Figure 11. Frequency of responses for satisfaction with shoreline conditions at reservoirs by study year (n=1695)

The influence of weather does not appear to explain the differences in responses from year to year, although large year-specific variation is evident. Other explanatory factors were not explored but could include differences resulting from changing site conditions, visitor demographics or even the survey tool (i.e., e-tablet).

3.2.4 PERCEPTION OF SAFETY

In Question 12, respondents rated 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. For all study years, the majority of respondents (53%) reported feeling "very safe" while recreating at a reservoir within the Campbell Reservoir system (Figure 12). In Study Year 5, the proportion of respondents reporting they felt "very safe" was 58% (Figure 13).

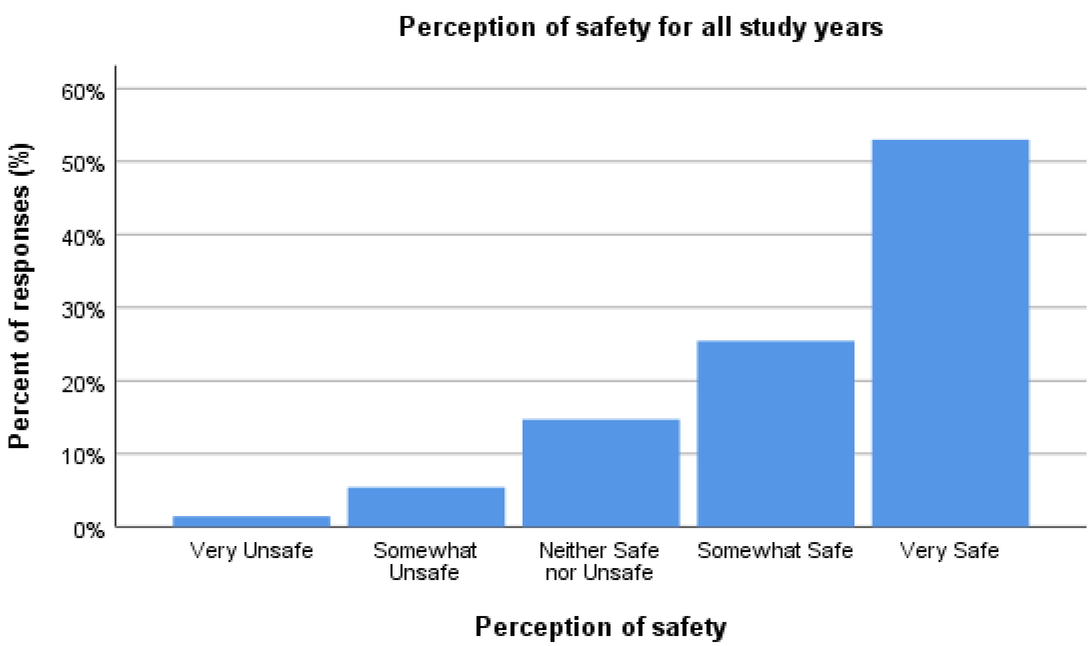

Figure 12. Perception of safety for all study years

Relationship between Perception of Safety and Water Elevation

Respondents from Buttle Lake tended to report feeling safer when water levels were higher ($p<0.001$). While a similar trend was noted for Lower Campbell Reservoir, the relationship was not significant ($p=0.060$). No strong trends were evident at the Upper Campbell Reservoir ($p=0.178$). Scatterplots were developed to depict the relationship between perception of safety and lake elevation for each reservoir with elevational data and are presented in Appendix B – Figure 5.

The impact of weather was also investigated after adjusting for lake elevation on the perception of safety score (Appendix B – Figure 6). There was no evidence of a differential effect of elevation depending on weather (i.e., all of the p-values for the non-parallel effect are large); and no evidence of a differential mean score among weather conditions (after adjusting for elevation). Based on this, it is unlikely that general weather has had a significant influence on respondents' perception of safety.

Differences in Responses between Study Years

When responses were compared between study years, significant differences in distribution were detected (Pearson's χ^2=61.817, p=0.000) (Figure 13). A pairwise comparison of each category using the Bonferroni correction identified several significant differences across the years. Significantly fewer respondents reported feeling "very safe" in Year 4 than in other years (Z=-4.40, p=0.000). Similarly, in Year 4, a greater proportion of visitors reported that they felt "neither safe nor unsafe" while recreating in the area (Z=4.472, p=0.000). In Year 3, a significantly lower proportion of respondents reported feeling "neither safe nor unsafe" (Z=-3.468, p=0.001). Although other proportions are noted as fluctuating over time, these were not determined to be significant.

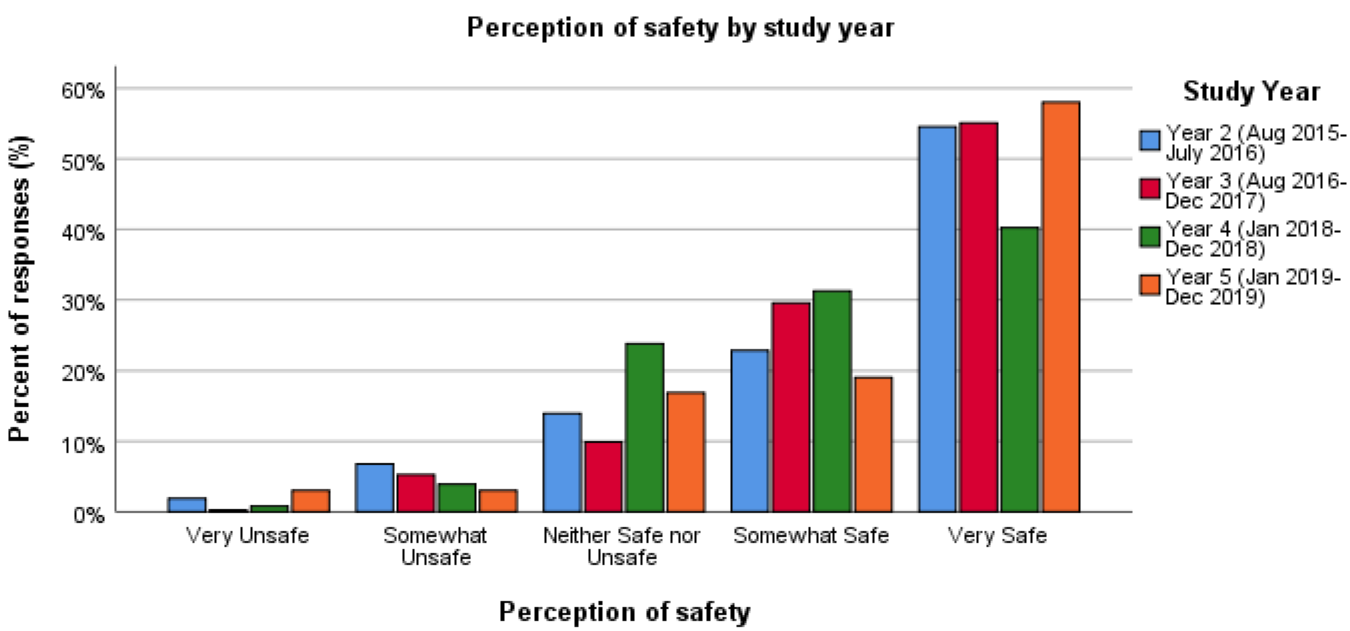

Figure 13. Frequency of responses for perception of safety while recreating at reservoirs by study year (n=1700)

As noted above, weather does not appear to explain the differences in responses from year to year. Other explanatory factors were not explored, although possibilities could be related to changes in demographics, unidentified changes site conditions or something unknown.

3.2.5 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.

3.2.5.1 Access to Beach

A small percentage of respondents (3%) felt that the question was not applicable. For those that responded, the majority of respondents at reservoirs (73%) were either "very satisfied" or "somewhat satisfied" with access to the beach (Figure 14) across all study years. In Year 5, about 65% reported being "very satisfied" or "somewhat satisfied" (Figure 15).

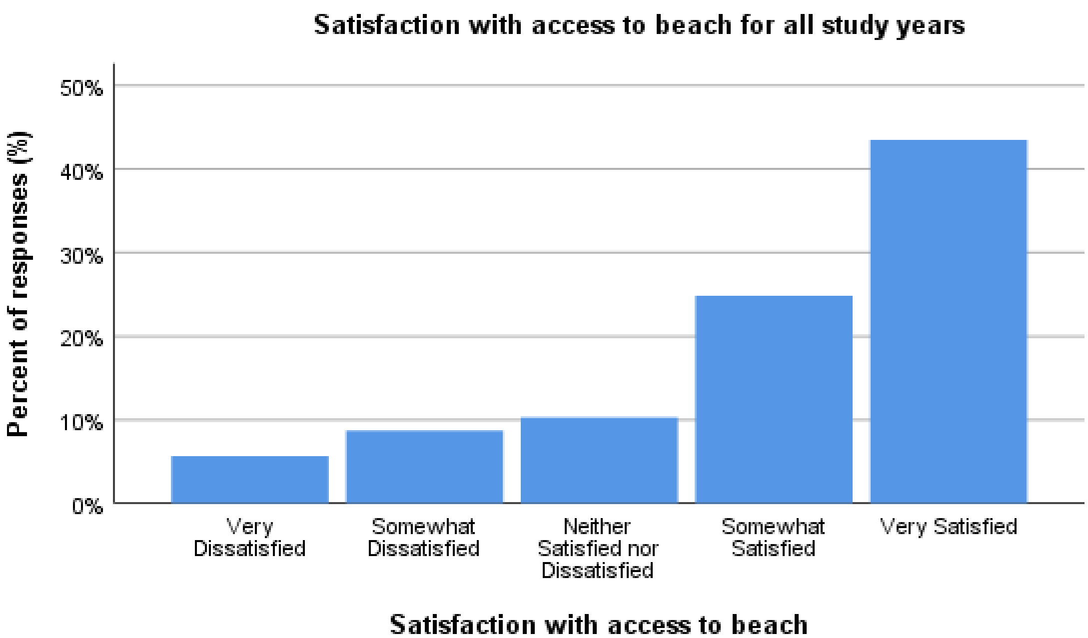

Figure 14. Satisfaction with access to beach for all study years

Relationship between Satisfaction with Access to Beach and Water Elevation

Respondents from Buttle Lake reported a tendency to have a higher satisfaction with access to the beach when water levels were higher (p=<0.001). The relationship was not evident for Lower Campbell Lake (p=0.117) or Upper Campbell Reservoir (p=0.925). Scatterplots were developed to depict the relationship between satisfaction with access to the beach and lake elevation and are presented in Appendix B – Figure 7. As evident in the scatterplot, lake elevation is highly variable between years and may have some confounding influence on satisfaction.

The impact of general weather conditions (e.g. overcast, sunny, raining) was also investigated after adjusting for lake elevation on respondents' satisfaction with beach access (Appendix B – Figure 8). There was no evidence of a differential effect of elevation depending on weather (i.e., all of the p-values for the non-parallel effect are large); and there was only evidence of a difference in mean score depending on weather after adjusting for elevation for Lower Campbell Lake (p=0.011), but the effect size appears to be small.

Differences in Responses between Study Years

When responses are compared between study years, significant differences in distribution were detected (Pearson's χ^2=59.859, p=0.000) across years (Figure 15). Following the removal of respondents who said the question was not applicable, a pairwise comparison of each category was completed, revealing several significant differences across the years. In Year 5, the proportion of respondents reporting being "neither satisfied nor dissatisfied" was significantly greater (Z=3.089, p=0.002) than other years. Additionally, a greater proportion of respondents reported they were "very dissatisfied" in Year 2 (Z=4.167, p=0.000) and a smaller proportion of respondents reported they were "very dissatisfied" in Year 3 (Z=-3.306, p=0.001). Lastly, in Year 4, we observed a smaller proportion of respondents reported they were "very satisfied" (Z=-3.088, p=0.002) compared to other years.

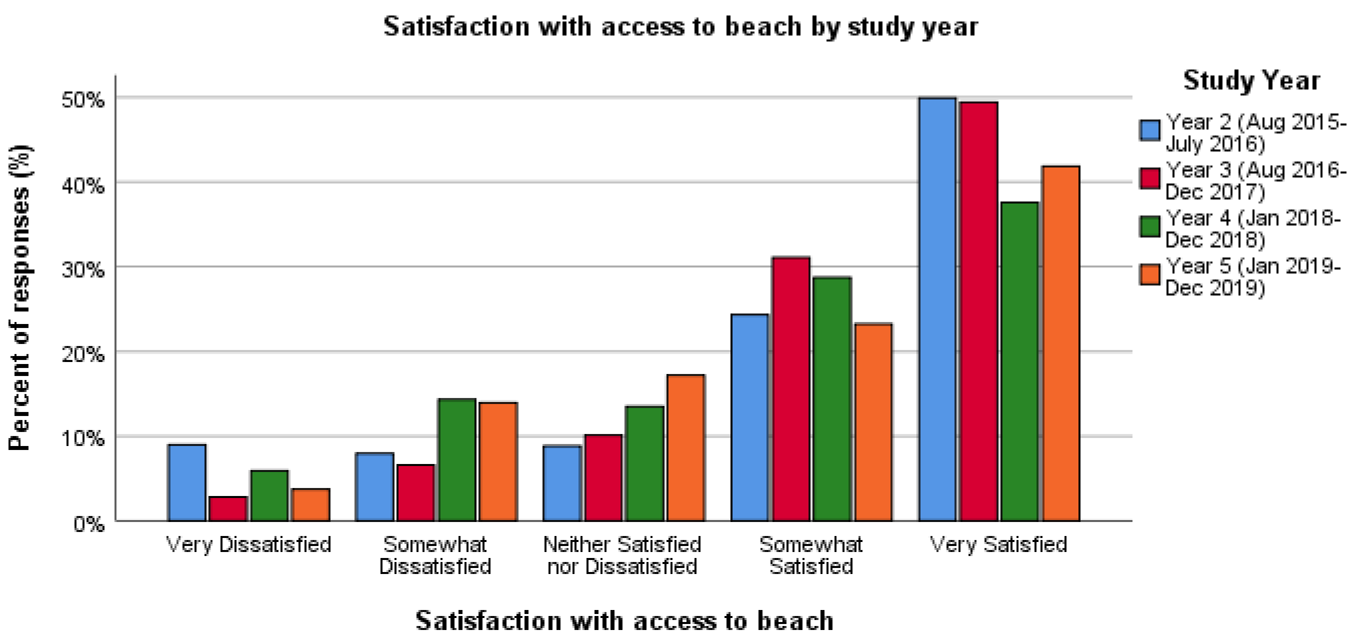

Figure 15. Satisfaction with access at reservoirs to beach for all respondents by study year (n=1544)

As noted above, the influence of weather does not appear to explain the differences in responses from year to year, although large year-specific variation is evident. Other explanatory factors were not explored but could include differences resulting from changing site conditions, visitor demographics or even the survey tool (i.e., e-tablet).

3.2.5.2 Access to Water via Boat Launch

When respondents were asked to rate their satisfaction with access to the water via boat launches, the majority (63%) reported that this did not apply, implying that most of the people surveyed in 2019 did not use boat launches while recreating at reservoirs. After removing non-applicable responses, the majority of respondents (60%) reported that they were either "very satisfied" or "somewhat satisfied" with access to water via boat launches across all study years (Figure 16). In Year 5, about 41% of respondents reported being “very satisfied” or “somewhat satisfied” (Figure 17).

Relationship between Satisfaction with Access to Water via Boat Launch and Water Elevation

For all three reservoirs (Buttle Lake, p=<0.001; Lower Campbell Reservoir, p=0.004; Upper Campbell Reservoir, p=0.003), respondents reported a tendency to have a higher satisfaction with access to the water via the boat launches when water levels were higher when data from all years were examined. Scatterplots were developed to depict the relationship between satisfaction with access to water via boat launch and lake elevation and are presented in Appendix B – Figure 9.

There was no evidence of a differential effect of elevation depending on weather (i.e., all of the p-values for the non-parallel effect are large) for any of the reservoirs; and there was no evidence of a differential mean score among weather conditions (after adjusting for elevation) (Appendix B – Figure 10).

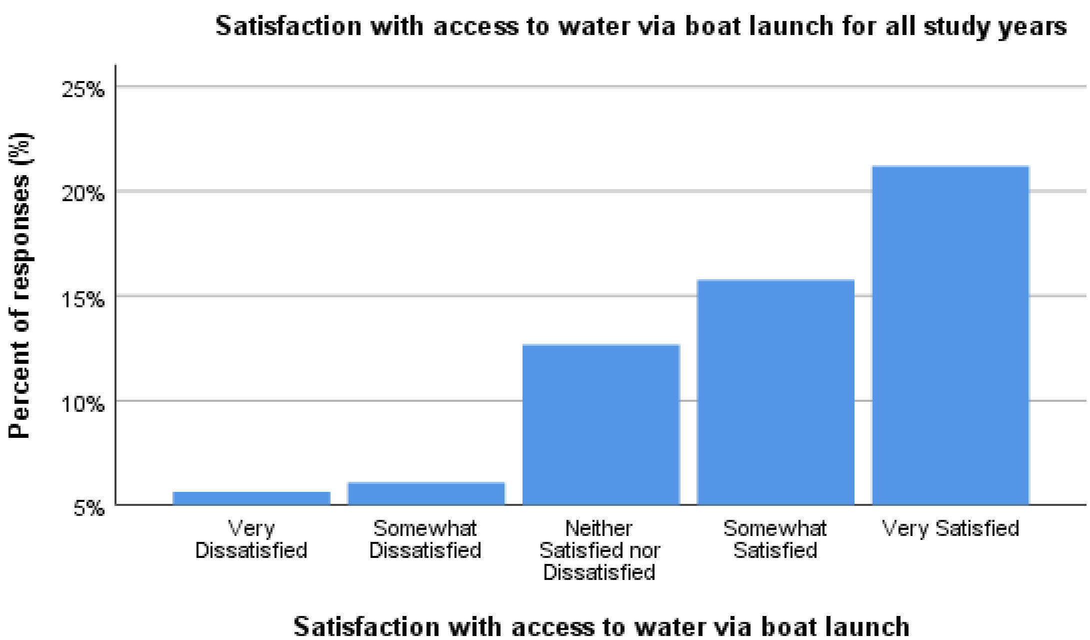

Figure 16. Satisfaction with access to water via boat launch for all study years

Differences in Responses between Study Years

When results are compared between study years, the proportion of responses are noted as being significantly different (Pearson's χ^2=60.711, p=0.000). Following removal of those that responded the question was not applicable, a pairwise comparison of each category using the Bonferroni correction identified only two significant differences across the years. Significant differences in distributions across the years included a greater proportion of respondents in Year 2 who reported being “very dissatisfied” (Z=4.278, p=0.000), and a lower proportion of respondents in Year 3 who reported being “very dissatisfied” with access to the water from boat launches at the time of their visit (Z=-4.798, p=0.000) (Figure 17).

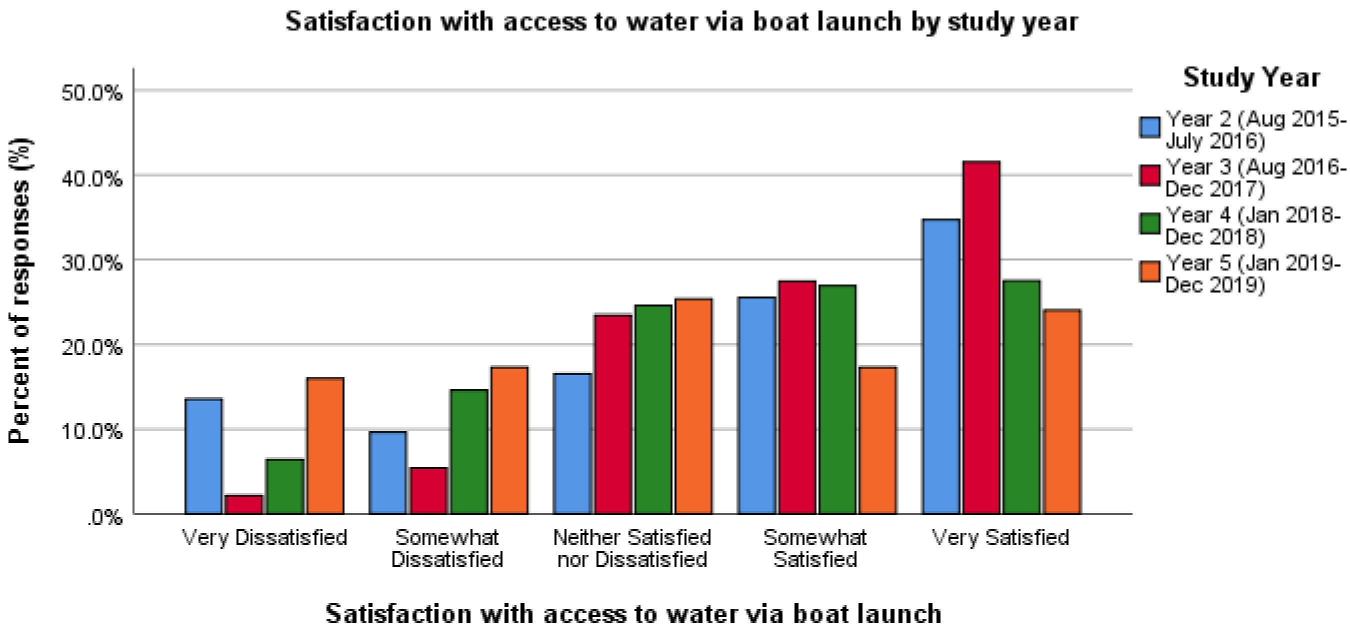

Figure 17. Satisfaction with access at reservoirs to water via boat launch for all respondents by study year (n=958)

As noted above, weather does not appear to explain the differences in responses from year to year. Other explanatory factors were not explored, although possibilities could be related to a change in the population sample (e.g. higher proportion of day visitors surveyed), or an unidentified change in site conditions.

3.2.5.3 Access to Water via Shoreline

In 2019, only a small proportion (2%) of respondents replied that the question did not apply. These were subsequently removed from the analysis. Across all study years, the majority of respondents (67%) reported feeling "very satisfied" or "somewhat satisfied" when respondents were asked to rate their satisfaction with access to the water via the shoreline within the Campbell Reservoir system across all study years). In Year 5, about 56% of respondents reported being "very satisfied" or "somewhat satisfied" (Figure 19).

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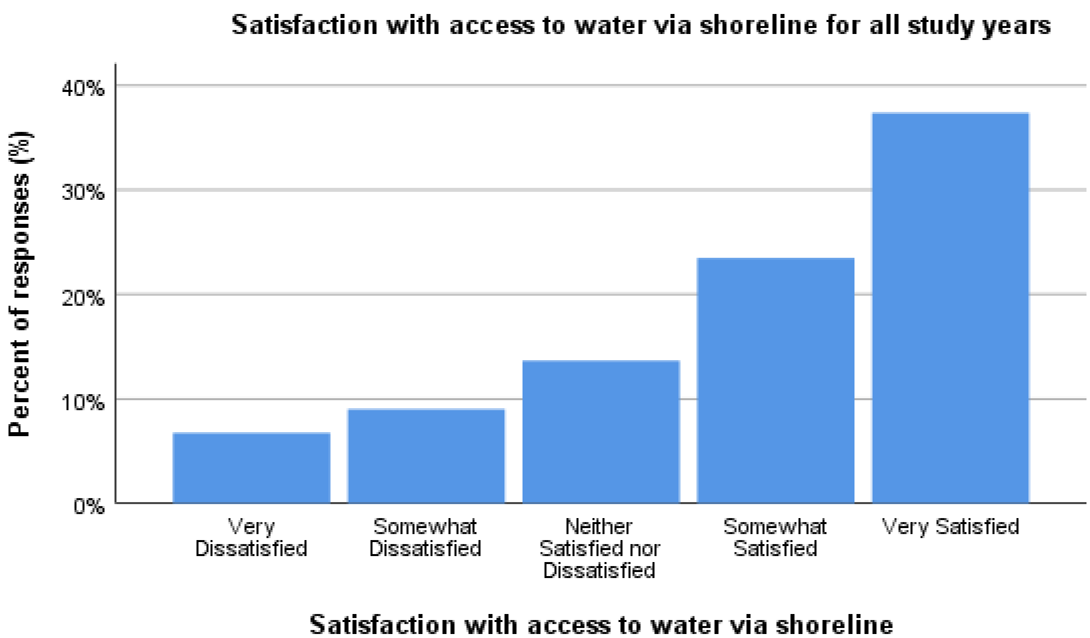


Figure 18. Satisfaction with access to water via shoreline for all study years

Relationship between Satisfaction with Access to Water via Shoreline and Water Elevation

Respondents from Buttle Lake (p=<0.001) and Lower Campbell Reservoir (p=0.006) reported a tendency to have greater satisfaction with access to the water via the shoreline when water levels were higher when all study years were considered. The relationship was not as strong for Lower Campbell Lake (and may be confounded with year-specific effects). No significant trends were evident at the Upper Campbell Reservoir. Scatterplots were developed to depict the relationship between satisfaction with access to water via shoreline and lake elevation and are presented in Appendix B – Figure 11.

There was some weak evidence of a differential trend depending on weather for Upper Campbell Lake (p=0.048) (Appendix B – Figure 12). There was only evidence of a difference in mean score depending on weather after adjusting for elevation for Lower Campbell Lake (p=0.013).

Differences in Responses between Study Years

When results are compared between study years, the distribution of responses differed significantly across study years (Pearson's χ^2=63.828, p=0.000) (Figure 19). Following removal of those that responded the question did not apply, a post-hoc pairwise comparison identified multiple significant differences in the responses across the years. In Year 5, we observed a greater proportion of respondents who reported being "neither satisfied or dissatisfied" (Z=3.693, p=0.002), while in Year 2, a smaller proportion reported being "neither satisfied nor dissatisfied" (Z=-3.064, p=0.002). Other significant differences were noted in the proportion of respondents who were "very dissatisfied" with access to water via the shoreline, with a higher proportion in Year 2 (Z=4.294, p=0.000) and a lower proportion in Year 3 (Z=-4.898, p=0.000).

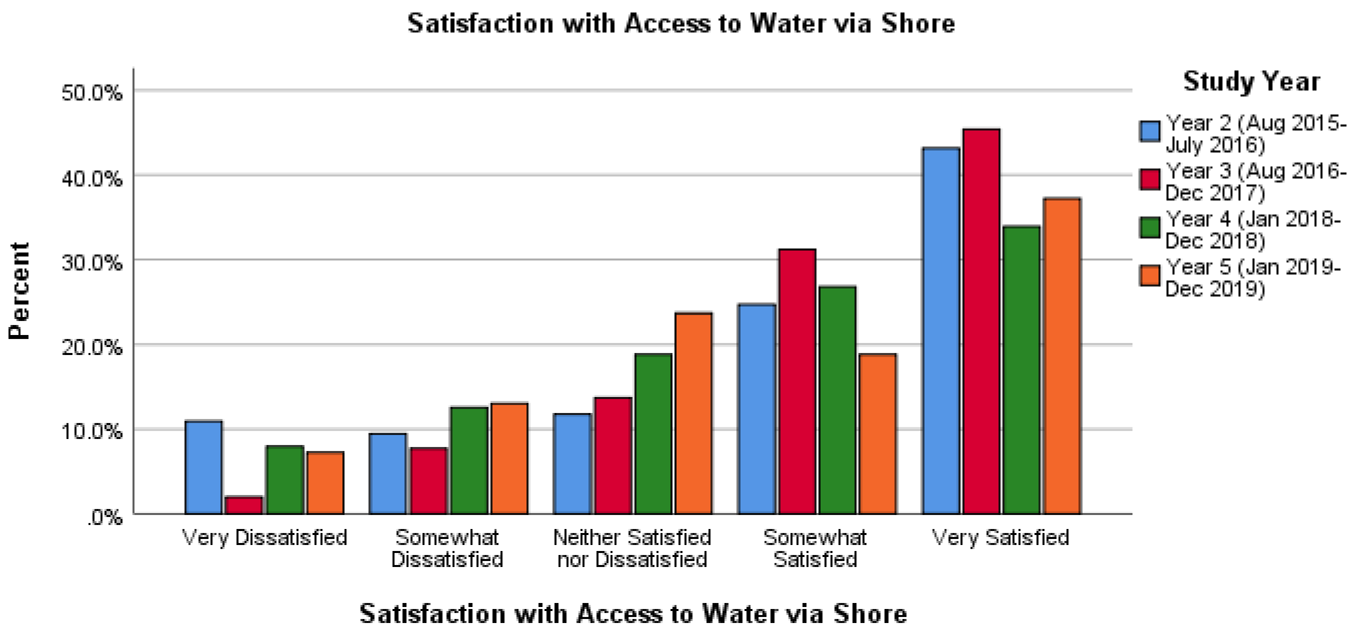


Figure 19. Satisfaction with access at reservoirs to water via shoreline for all respondents by study year (n=1459)

As noted above, weather may have had an influence on satisfaction scores although this significant relationship was only observed at Upper Campbell Reservoir. Other explanatory factors were not explored.

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 D) of the survey were graphed using scatterplots in relation to the average daily water flow.

To address the management questions, correlations between flow rates and the various riverine performance measures were tested using mixed linear models. Additionally, mixed linear models were used to determine if weather was an influential variable in satisfaction scores. Scatterplots have been used to depict these relationships and are presented in Appendix B. Pearson Chi-Square tests were used to identify if the proportion of responses were significantly different between years. Post-hoc pairwise comparison tests using the Bonferroni correction were then used to identify which responses were significantly different between years.

Similar to the reservoirs and water elevations, river flow rate is highly confounded with year for Quinsam River, where higher flows were generally found in 2016. There is less confounding effect for Campbell River because a range of flows were observed for all years.

3.3.1 FLOW RATES OF RIVERS

River discharge or flow rate, measured as daily average flow rate in cubic metres per second (m^3/s), was gathered for two rivers: Quinsam River and Campbell River. Water flow data were attained from Environment Canada from the following stations:

- For Quinsam River: Quinsam R nr Campbell R
- For Campbell River: Campbell R nr Campbell R

Analyses had to be completed separately for the two rivers as volumes differ greatly between the two systems, and thus were not directly comparable. Daily average flow rates are summarized in Table 8. Based on the monitoring data, the mean daily average flow rates for Year 5 of the study were 81.02 m^3/s for Campbell River and 6.62 m^3/s for Quinsam River.

Table 8. Summary of water flow data (in cubic meters/second) for rivers in Year 5 (Jan 2019 - Dec 2019)

	Campbell River (m^3/s)	Quinsam River (m^3/s)
Mean	81.02	6.62
Median	75.30	4.69
Std. Deviation	50.52	7.28
Variance	2551.83	53.04
Minimum	28.60	1.91
Maximum	254.00	62.00

Water flow data measured throughout the year were compared to those flow rates encountered during the sampling at Campbell River and Quinsam River to identify how representative sampling was of the true range of water flows. As water flow data were not normally distributed, a One-Sample Wilcoxon Signed Rank Test was used to determine if the median daily water flow that were encountered during sampling were the same as those actually observed for the entire year. A significant difference in median water flow rates was observed between the dates sampled and actual water flows observed throughout the year for Campbell River ($n=46$, $p=0.000$) but not for Quinsam River ($n=14$, $p=0.074$). At Campbell River, sampling tended to capture more lower flow conditions than encountered throughout the year, which is to be expected given high waters often occur in the off-season when fewer people are recreating and taking the survey.

3.3.2 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. Approximately 57% of respondents reported that water flow had either a "somewhat positive" or "very positive" influence on their recreation experience at the rivers (Figure 20). In Year 5, this proportion was lower with 33% of respondents reporting water flows had a positive influence on their river experience. This lower proportion of positive responses in Year 5 was balanced by a much larger proportion of respondents (65%) who replied that the water flows had no influence on their recreation experience when compared to previous years (Figure 21).

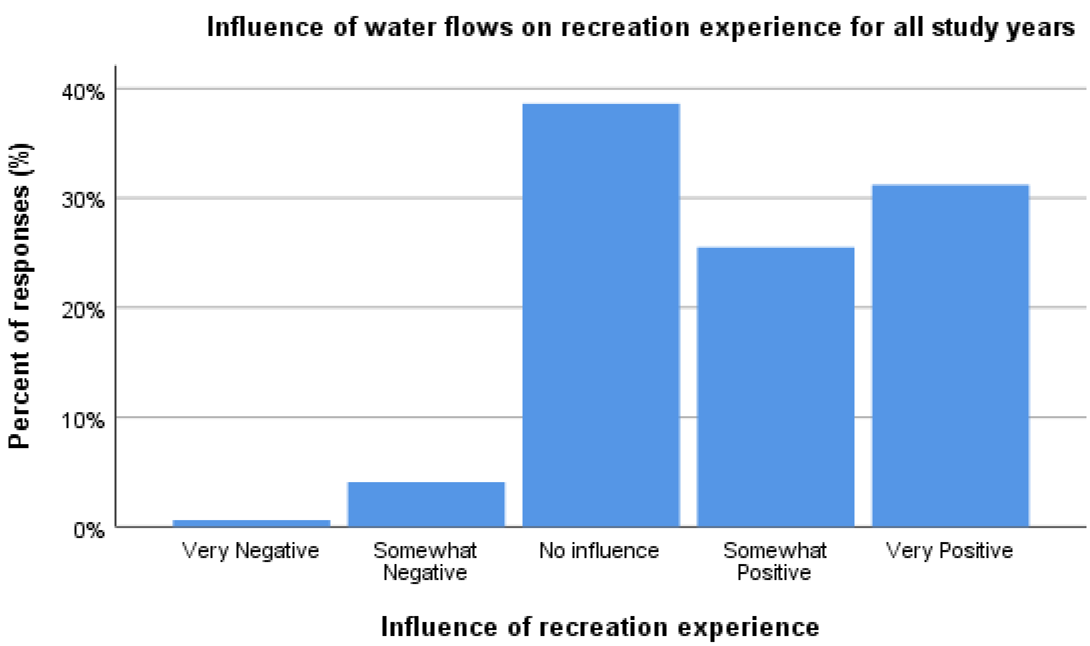


Figure 20. Influence of water flows on recreation experience for all study years

Relationship between Recreation Experience and Flow Rates

Respondents reported a slight tendency to report a more positive influence on their recreation experience when flow rates were higher for Campbell River ($p=0.023$). The opposite tendency was observed for Quinsam River where satisfaction tended to be slightly lower at higher flows ($p=0.018$) although the results at Quinsam River seem likely to be confounded by year-specific effects. Analysis was completed again for Quinsam River, removing flows greater than 20 m^3/s, to examine if these higher flows were confounding the results. Without the highest flows, there was no evidence that river flow had an influence on recreation experience ($p=0.229$). Scatterplots were developed to depict the influence of water flows on recreation experience in relation to daily average water flows for the rivers and presented in Appendix B – Figure 13.

The impact of weather was also investigated after adjusting for flow rates on respondents' recreation experience (Appendix B – Figure 14). There was no evidence of a differential effect of average flow rate depending on weather (i.e., all of the p-values for the non-parallel effect are large); and there was no evidence of a difference in mean score among weather conditions for either river. As such, weather has not had a significant influence on respondents' recreational experience at the rivers.

Differences in Responses between Study Years

When the proportion of responses are compared between study years, significant differences are noted (Pearson's χ^2=109.321, p=0.000) (Figure 21). Using a pairwise comparison of each category (using the Bonferroni correction), several specific categories were identified as differing from each other. In Year 5, a significantly greater proportion of respondents than other study years replied that river flows had no influence on their experience (Z=7.448, p=0.000). Additionally, significantly fewer respondents replied that water flows had a somewhat positive influence (Z=-3.995, df=1, p=0.000) or very positive influence (Z=-3.278, p=0.001) in 2019. In Year 4, a disproportionate number of respondents reported a very positive influence of river flows (Z=5.342, p=0.000) and a subsequent lower proportion of respondents reporting that water flows had no influence (Z=-3.514, p=0.000). In Year 3, a disproportionate number of respondents reported having a somewhat positive experience (Z=4.347p=0.000) and a subsequent lower proportion reported water flows had no influence (Z=-5.241, p=0.000).

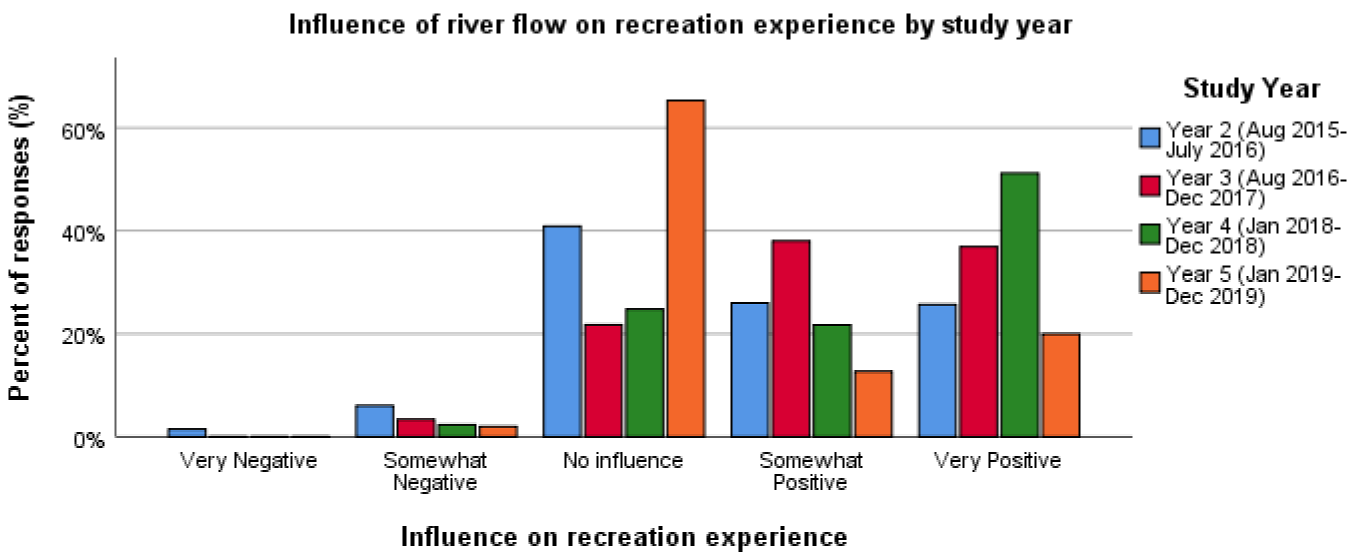


Figure 21. Frequency of responses for influence of river flow on experience while recreating at the river by study year (n=808)

The influence of weather does not appear to explain the differences in responses from year to year, although large year-specific variation is evident. Other explanatory factors were not explored.

3.3.3 SATISFACTION WITH SHORELINE CONDITIONS

Question 31 asked 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 (72%) of respondents reporting that they were either "somewhat satisfied" or "very satisfied" (Figure 22). In Year 5, 68% of respondents reported similarly (Figure 23).

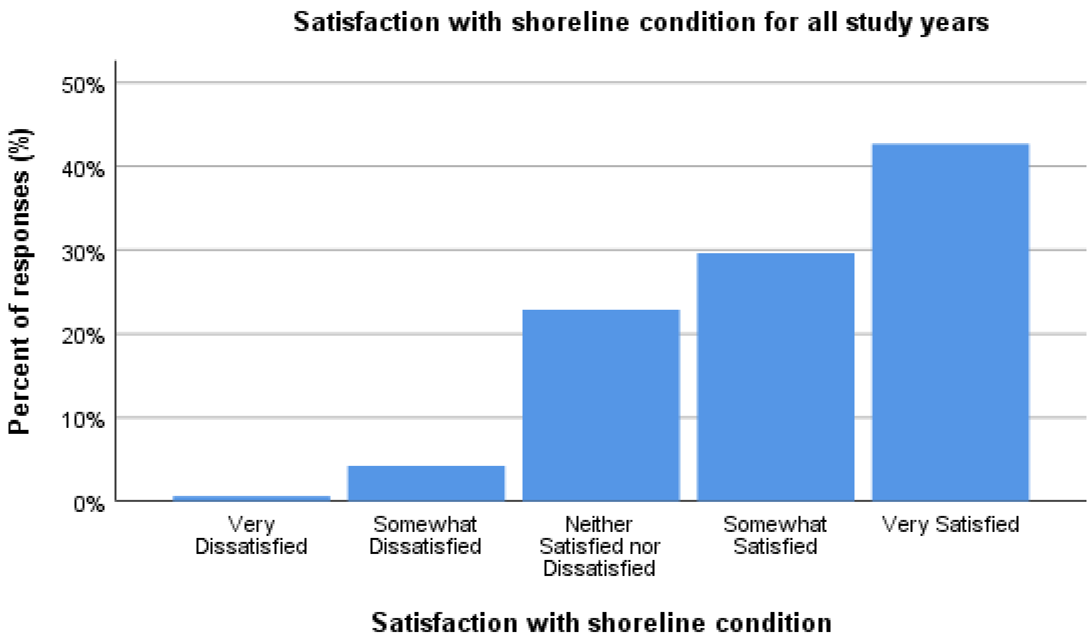


Figure 22. Satisfaction with riverine shoreline conditions for all study years

Relationship between Satisfaction with Shoreline Conditions and Flow Rates

No significant trends were noted between satisfaction with shoreline condition and water flow rates for either Campbell River ($p=0.297$) or Quinsam River ($p=0.229$). Analysis was completed again for Quinsam River, removing flows greater than 20 m^3/s, to examine if these higher flows were confounding the results. Without the high flows, there was still no evidence that river flow had an influence on satisfaction with shoreline conditions ($p=0.994$). Scatterplots depicting satisfaction with shoreline conditions in relation to daily average water flows for the rivers are presented in Appendix B – Figure 15.

There was no evidence of a differential effect of average flow rate for the river depending on weather (i.e., all of the p-values for the non-parallel effect are large); and there was no evidence of a differential mean score among weather conditions (after adjusting for river flow) (Appendix B – Figure 16).

Differences in Responses between Study Years

The responses are noted as being significantly different across the years (Pearson's $\chi^2=26.337$, df=12, $p=0.010$). Overall, the data suggests that there is some statistically significant difference between satisfaction with shoreline conditions between study years, but a pairwise comparison of each category (using the Bonferroni correction) could not identify which specific categories differ significantly from each other. Figure 23 depicts the frequency of responses.

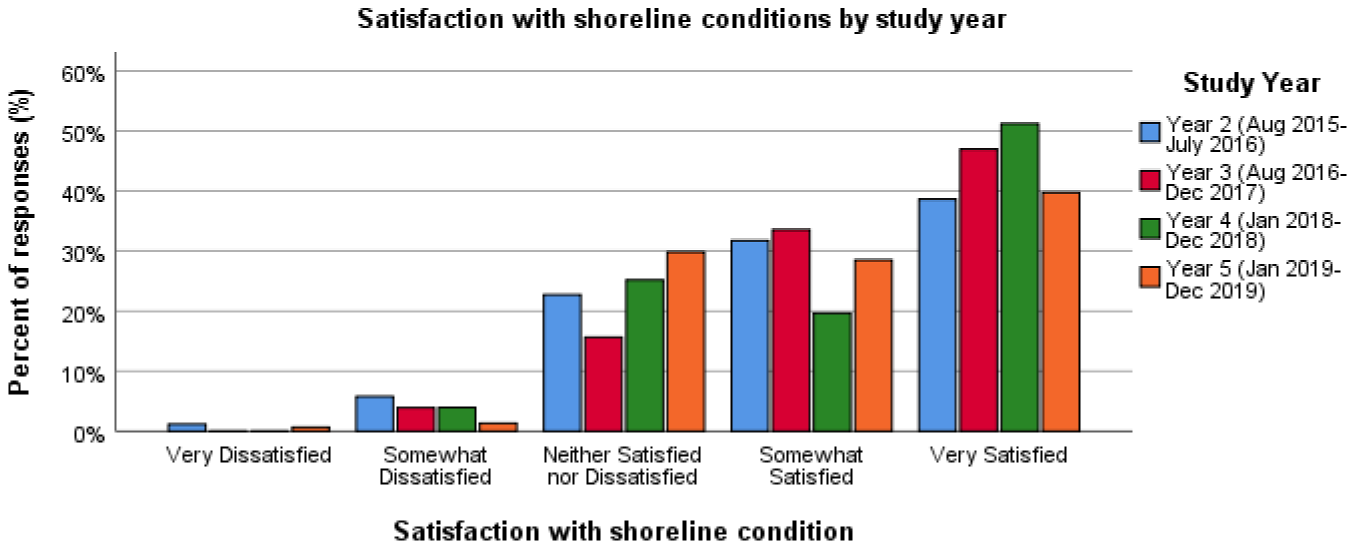


Figure 23. Frequency of responses for satisfaction with shoreline conditions at rivers by study year (n=804)

3.3.4 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. Approximately half of respondents (56%) reported feeling "very safe" while recreating at a river within the Campbell Reservoir system across all study years (Figure 24). In Year 5, this figure was higher, with 69% reporting feeling "very safe" (Figure 25).

Relationship between Perception of Safety and Flow Rates

No significant relationships were noted between perception of safety and water flow rates for either Campbell River ($p=0.342$) or Quinsam River ($p=0.195$). Analysis was completed again for Quinsam River, removing flows greater than 20 m^3/s, to examine if these higher flows were confounding the results. Without the high flows, there was still no evidence that river flow had an influence on perceptions of safety ($p=0.168$). Scatterplots depicting perception of safety in relation to daily average water flows for the rivers are presented in Appendix B – Figure 17.

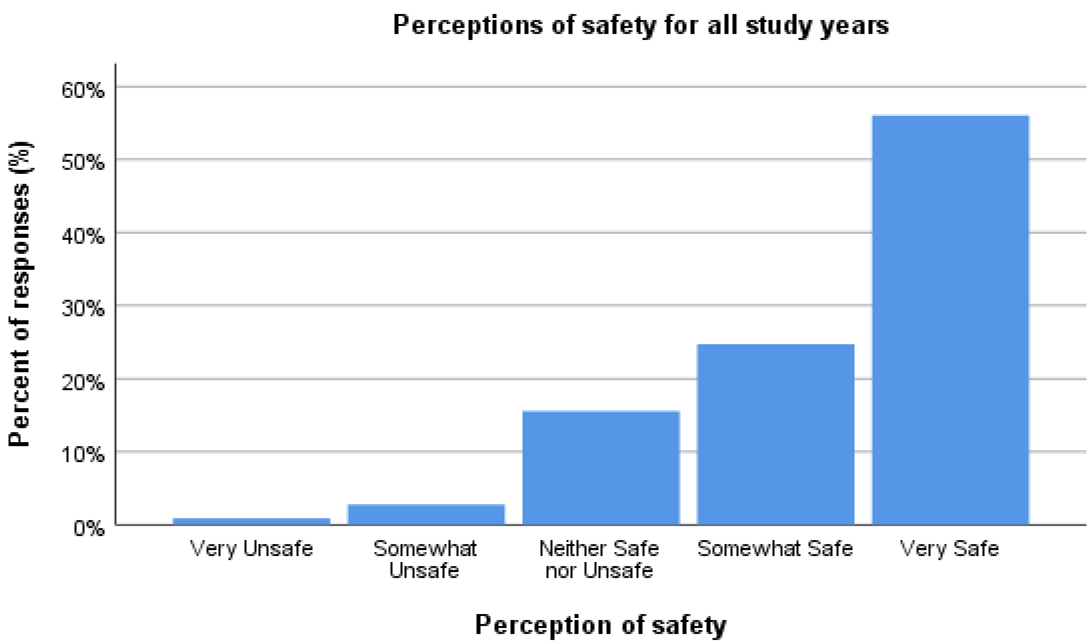


Figure 24. Perception of safety for all study years

There was evidence that the perception of safety as a function of river flow differed among weather conditions for Quinsam River (p=0.001), but this appears to be due to a single data point in the lower right of the plot (see Appendix B – Figure 18). After removing the high flows from the Quinsam River data set, there was no evidence that the perception of safety as a function of river flow differed among weather conditions (p=0.993).

Differences in Responses between Study Years

The responses are noted as being significantly different across the years (Pearson's χ^2=22.221, p=0.035). Using a post-hoc pairwise comparison of each category (using the Bonferroni correction), only one significant difference was noted across study years, with a disproportionate number of respondents reporting feeling "very safe" in Year 5 (Z=3.357, p=0.002) (Figure 25).

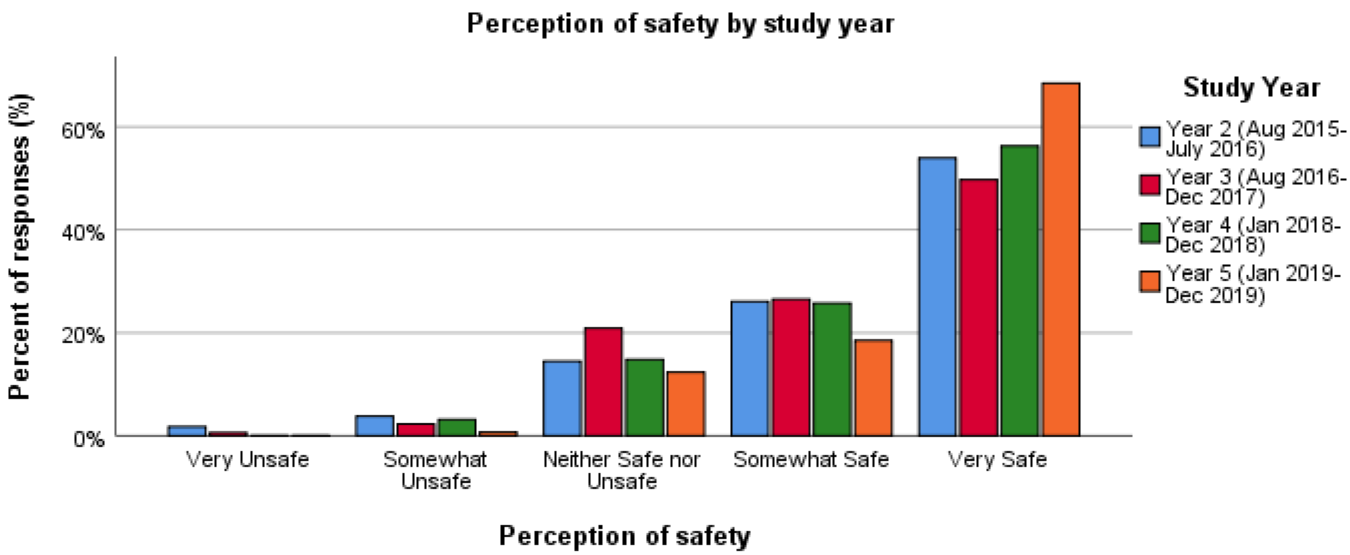


Figure 25. Frequency of responses for perception of safety while recreating at rivers by study year (n=796)

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 D) of the survey were graphed using scatterplots in relation to the average daily water flow.

To address the management questions, correlations between flow rates and the various riverine performance measures were tested using mixed linear models. Additionally, mixed linear models were used to determine if weather was an influential variable in satisfaction scores. Scatterplots have been used to depict these relationships. Pearson Chi-Square tests were used to identify if the proportion of responses for each management question were significantly different between years. Post-hoc pairwise comparison tests using the Bonferroni correction were then used to identify which responses were significantly different between years.

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

3.4.1 IMPRESSIVENESS OF FALLS

Question 23 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 generally felt the falls were impressive with the majority (94%) of respondents reporting that they were "very impressive" or "somewhat impressive" (Figure 26). In 2019, about 91% of respondents reported similarly.

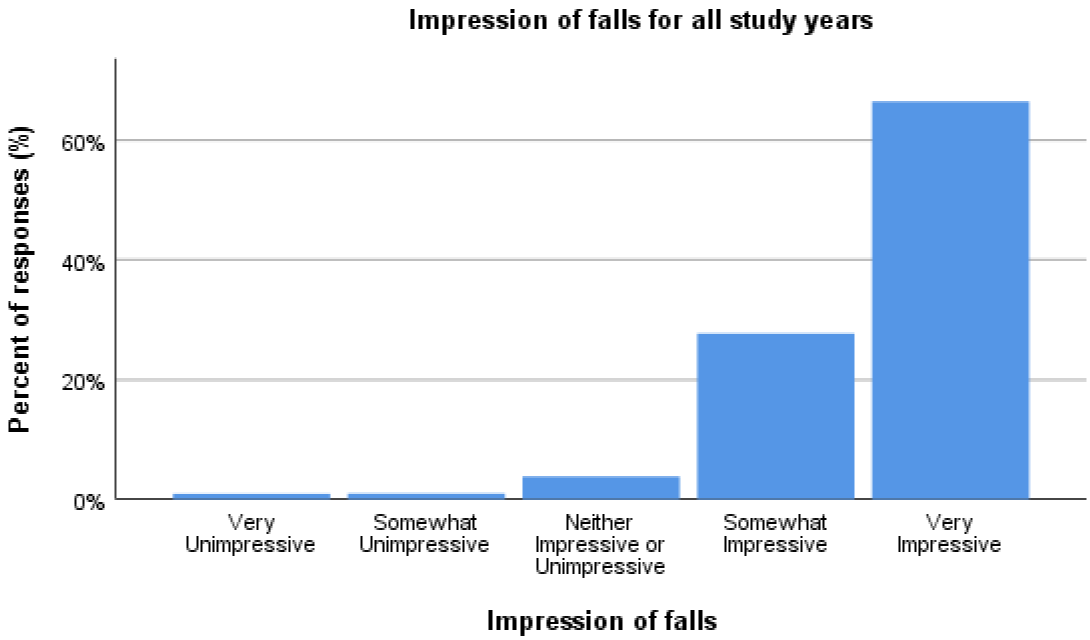


Figure 26. Impression of falls for all study years

Relationship between Recreation Experience and Flow Rates

The impact of weather was also investigated after adjusting for the falls flow rate. No significant trend was noted between respondents' reporting of impression of the falls and daily average water flows (p=0.802). Scatterplots were developed to depict the relationship between water flows and the impressiveness of the falls and are presented in Appendix B – Figure 19.

There was no evidence the effect of flow rate on impressiveness of the falls varied across weather conditions (p=0.189) (Appendix B – Figure 20). Other explanatory variables were not explored.

Differences in Responses between Study Years

A statistical difference was identified between the distribution of responses across the five study years (Pearson's χ^2=76.407, p=0.000) (Figure 27). Using a pairwise comparison of each category (using the Bonferroni correction), several specific categories were identified as differing from each other. In Year 5, a significantly greater proportion of respondents was identified as responding that the falls were very impressive (Z=3.439, p=0.001), with a corresponding drop in those responding that the falls were somewhat impressive (Z=-4.735, p=0.000). Also, in Year 5 a small but significantly greater proportion of respondents reported the falls were very unimpressive (Z=5.141, p=0.000). Differences were also noted in Year 4, with a disproportionately higher number of respondents reporting the falls were very impressive (Z=3.416, p=0.001) and fewer reporting they were somewhat impressive (Z=-4.281, p=0.000). Year 2 had a higher proportion of respondents reporting the falls were somewhat impressive (Z=3.665, p=0.000).

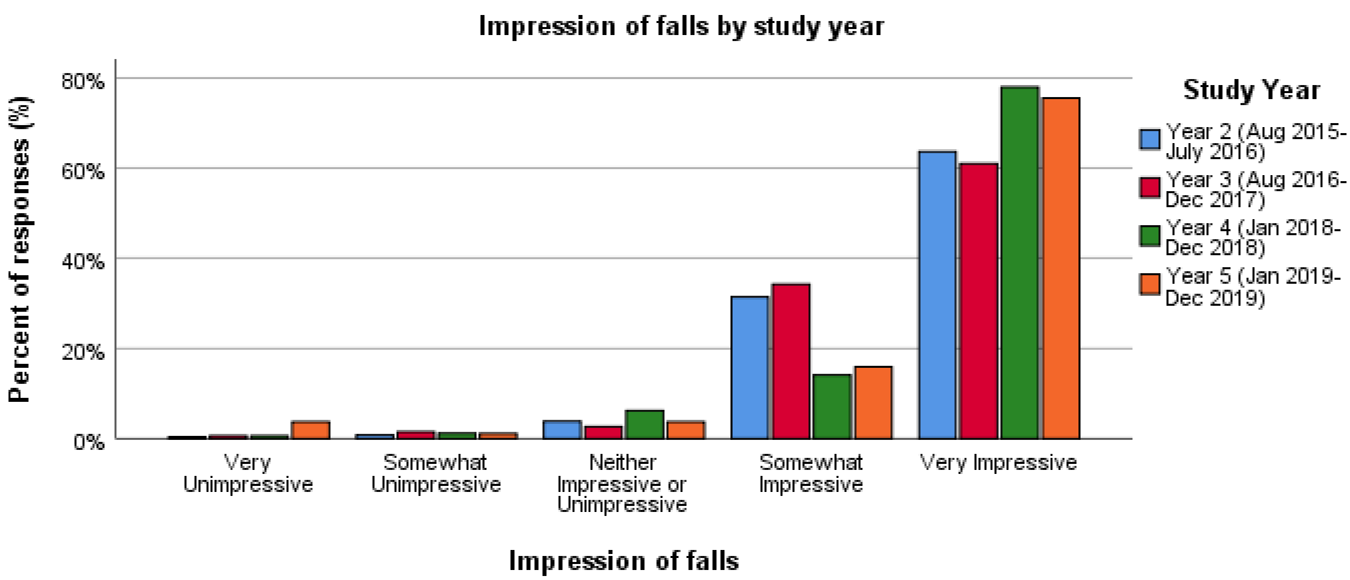


Figure 27. Frequency of responses for impressiveness of Elk Falls by study year (n=1707)

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 96% stating they were either "very satisfied" or "somewhat satisfied" (Figure 28); the frequency of response was similar in Year 5 (2019) with 93.2% responding they were somewhat or very satisfied.

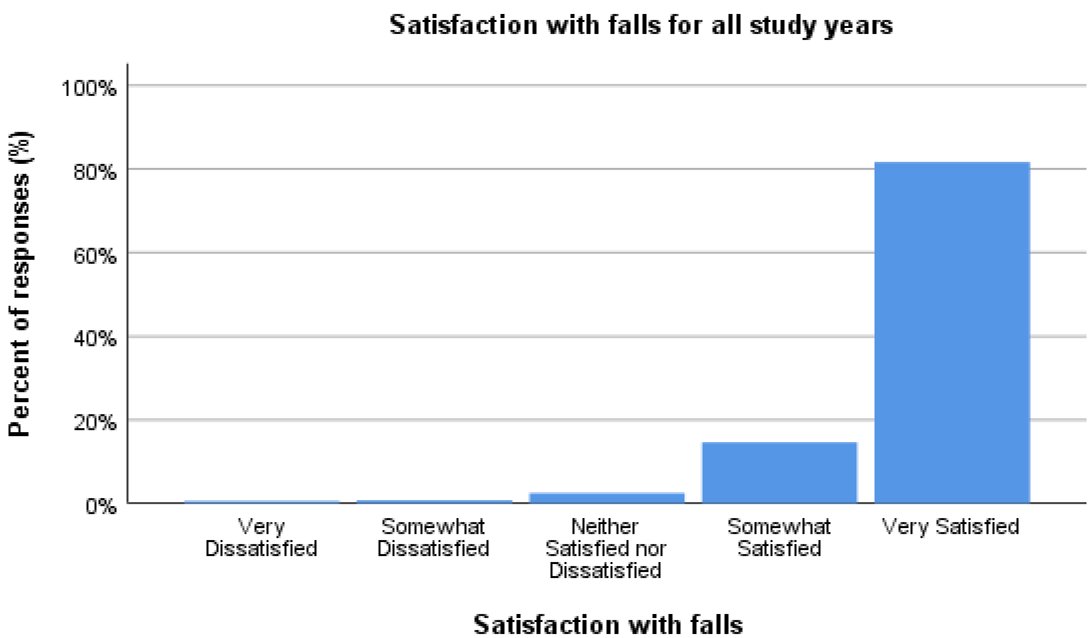


Figure 28. Satisfaction with viewing experience at falls for all study years

Relationship between Recreation Experience and Flow Rates

No significant relationship was identified between water flows and satisfaction with the viewing experience at the falls (p=0.759). Scatterplots were developed to depict the relationship and are presented in Appendix B – Figure 21.

The impact of weather was also investigated after adjusting for the falls flow rate. There was no evidence the effect of flow rate on impressiveness of the falls varied across weather conditions (p=0.827) (Appendix B – Figure 22). Other explanatory factors such as differences in site conditions (e.g., change in the flow rates between years or other unidentified site changes), or changes in the population were not explored.

Differences in Responses between Study Years

No statistical difference was identified between the distribution of responses between study years (Pearson's $\chi 2=24.033$, p=0.020).

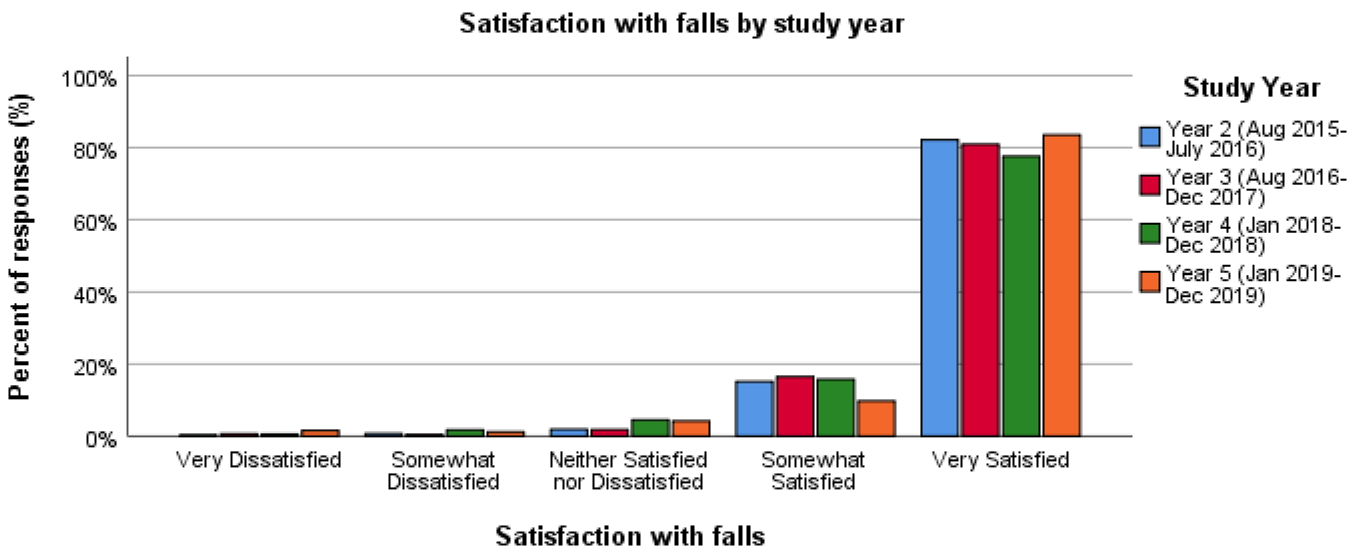


Figure 29. Frequency of responses for satisfaction with experience at Elk Falls by study year (n=1703)

3.5 LOWER CAMPBELL DISCRETE CHOICE EXPERIMENT

The Lower Campbell Discrete Choice Experiment was introduced in Year 5 to evaluate choices and preferences based on conditions at the Lower Campbell Reservoir. A total of 632 respondents completed the full choice experiment and provide data for the analysis. This DCE was evaluated using three different modeling approaches:

1. 'Single-class' multinomial logit model – This model analysed the results of all respondents collectively as one group, or 'class'

2. 'Known class' multinomial logit models – These models analysed the results using known variables to define segmented groups into multiple known classes for analysis and comparison.

3. 4-Class Latent multinomial logit model – This model uses analysis techniques to automatically identify and group responses into 4 classes drawing on all variables and attributes in the dataset. This model is introduced but not discussed in the results.

Results for the general single-class model are presented below. Results for the known-class and 4-class latent models are discussed briefly, with the tabulated analysis provided in Appendix C.

3.5.1 SINGLE-CLASS MULTINOMIAL LOGIT MODEL

The single-class multinomial logit model of the responses (i.e. the model that uses all responses together) provided several interesting outcomes. First, similar to the Upper Campbell DCE, respondents continued to indicate a preference for water levels that were not 'High high' (i.e. the extremely highest water levels) (see

Table 9). Excluding the extreme 'Low low' and 'High high' water conditions from analysis, respondents were more likely to prefer 'High' water levels for the Upper Campbell reservoir system and 'Low' water levels for the Lower Campbell reservoir. It is important to note that the preference for 'Low' water levels in the general 1-class model for Lower Campbell may reflect high variability amongst respondents. This is supported by the 4-class latent model (see below in Section 3.5.2 and Appendix C), where the model identified one group of respondents with a strong preference for 'Low' water conditions (Class 3) and other groups with preferences for 'High' water conditions. This strong preference for low water levels by one group influences the overall 1-class model and suggests distinct differences (i.e., "heterogeneity") in the respondents that visited the Lower Campbell reservoir during the sampling period.

Another observation from the 1-class model for Lower Campbell was that respondents indicated a preference for no woody debris in the lake and on the shore, similar to the Upper Campbell system. In contrast, preferences for shoreline preferences differed between the Lower Campbell vs Upper Campbell models, in that respondents indicated a preference for rocky shores for the Lower Campbell reservoir and sandy shorelines for the Upper Campbell reservoir.

Table 9. Results of the 1-Class multinomial logit model testing effects of reservoir features (n=632)

Attribute and Attribute Level[a]	Estimate[b]	p-value
Quantity of Debris		
(1) No Debris	**1.1205**	1.00E-131
(2) Little Debris	0.1736	
(3) Average Debris	-0.2892	
(4) A lot of Debris	**-1.0049**	
Water Level		
(1) Low low	0.3344	6.60E-83
(2) Low	0.4815	
(3) Average	0.3542	
(4) High	-0.0991	
(5) High high	**-1.0709**	
Shoreline Features		
(1) Rocks	0.0357	1.80E-01
(2) Sand	-0.0357	
Boat Ramp Type		
(1) None	0.0366	0.014
(2) Gravel road	-0.094	
(3) Concrete pad	**1.5044**	

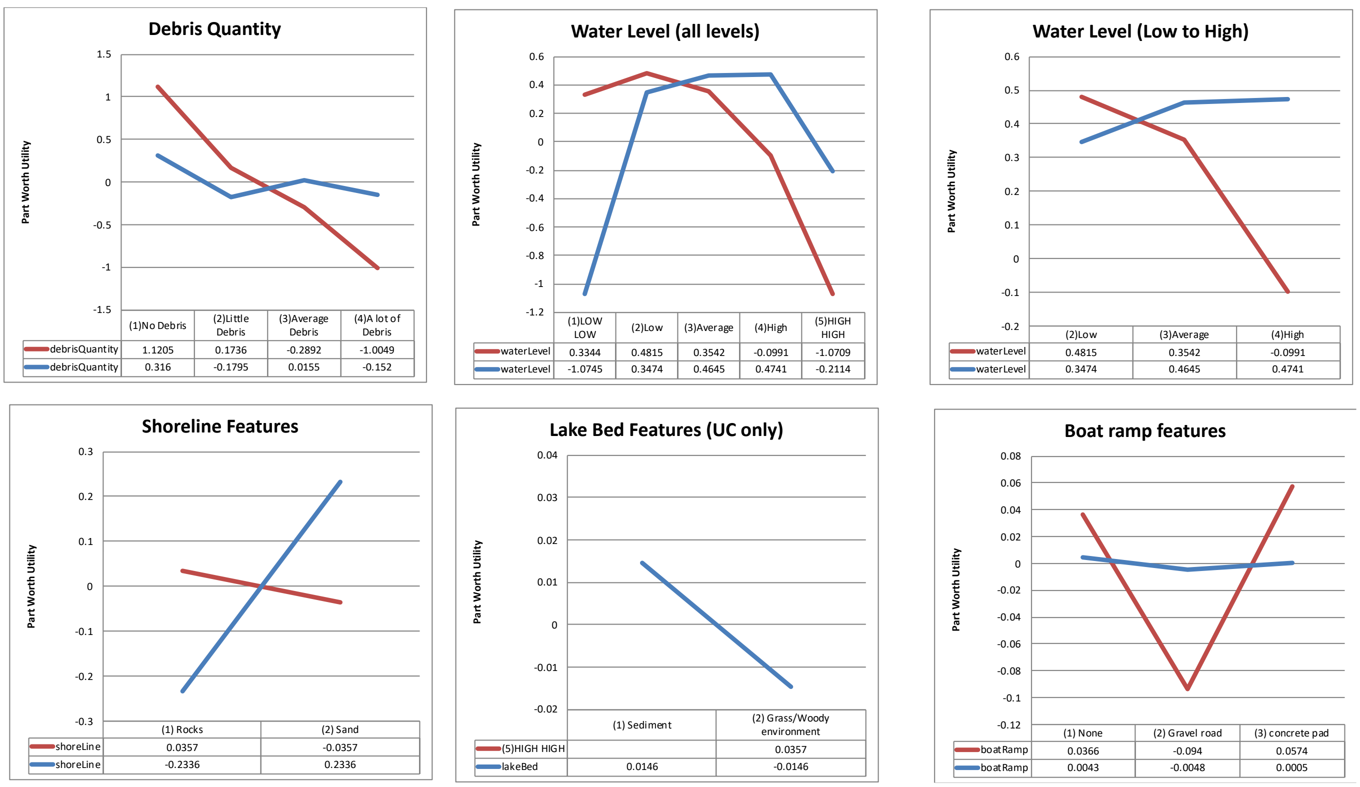
[a] Rho^2=.3277

[b] Note that the Estimate indicates the strength of the preference (values further from 0 indicate a stronger preference) and whether it is a negative preference (-) or a positive preference (+)

Lastly, the 1-class model for Lower Campbell reservoir indicates that the type of boat ramp is significant in respondents' choice of reservoir recreation, different from the Upper Campbell reservoir. For Lower Campbell, respondents typically favoured concrete boat launches (see Table 9). This result may again be related to a highly heterogeneous group of respondents, who had distinct differences in preference for boat ramp types. When results were examined using a 4-Class model (see below in Section 3.5.2 and Appendix C), differences in perceptions were noted. Two of the 4 classes (Class 1 and Class 3) strongly preferred concrete boat launches, while one class (Class 4) strongly preferred no boat launches at all.

Differences in respondent preferences between the Lower Campbell reservoir (shown in red) and Upper Campbell reservoir (shown in blue) samples are shown in Figure 30. As indicated, utility curves are similar across samples. A notable difference is the sharp decline in the utility coefficient shown for gravel roads and the overall decrease in utility for High water level for the Lower Campbell reservoir.

Figure 30. Comparison of Upper Campbell reservoir (Blue) and Lower Campbell reservoir (Red) 1-class multinomial logit model coefficients*



* For interpretation, the x-axis 'part-worth utility' equates to 'importance' to respondents. The closer to zero (0), the less important an attribute is considered. Negative numbers indicate a negative influence or 'dislike' while positive numbers imply a positive influence or 'like'.

3.5.2 KNOWN CLASS AND LATENT CLASS MODELS

For the known class models, specific "chosen" user groups were investigated manually using an array of known respondent characteristics, such as preferred recreational activity and visitor status, to examine preferences. Tabulated results of this analysis are provided in Appendix B. Specific known classes that were investigated included: Boaters; Campers only, Hikers, Campbell River residents; Non-Campbell River residents, People who plan to recreate on the reservoir; and People planning on sightseeing at the falls.

In general, the preferences of boaters at Lower Campbell differed the most compared to the general 1-class model results as they strongly preferred average and high water levels. In contrast, several groups had no significant differences from the 1-class model (e.g. non-Campbell River residents, Campers). The known class comparisons for the Lower Campbell shows that respondents continue to be relatively homogenous in their negative perception of extremely high (i.e. 'High high') water conditions.

The other method of analysis that was employed to evaluate the LCDCE results was a 4-class latent model. This model assigns respondents to one of a designated number of classes (in this case, 4 classes were selected) based on similar groups of responses. In this 4-class latent model, all reservoir features are influential on the respondents' selections and differences between classes exist. The 4-class latent model suggests that for 27% of recreationists, 'High' water levels are most preferred (see Class 2 in Table 2-Appendix C). Those same recreationists also prefer concrete boat ramps. For 20% (see Class 3 in Table 2-Appendix C) of recreationists, the 'Low low' level of water is highly preferred. Those same recreationists indicate negative preference for 'High' and 'High high' water levels. Given how different these classes present their preferences for water level, further analysis of latent variables could help explain differences between classes.

3.6 LOWER CAMPBELL DECISION SUPPORT SYSTEM

To study the effects of the Lower Campbell preferences across all attributes – as opposed to individual parameter estimates – on people's recreational choices, a decision support system was developed for the Lower Campbell in Microsoft Excel. The Lower Campbell Decision Support System (LCDSS) is based on the parameter estimates of the statistical model developed by analyzing Year 5 data, which predicts the likelihood of choice for any one scenario (i.e., combinations of attributes) in the context of the presented alternatives. The LCDSS uses the results from the choice experiment to create a model that predicts the proportion of recreationists who would choose to recreate at the reservoir given the specified reservoir features.

Like the Upper Campbell Decision Support System, the LCDSS is based on the combined effect attribute preferences have on individual choices. The LCDSS features a regression model (see equation below) used to predict the probability individual *i* selects alternative *j* at replication *t* given attribute values z_{it}^{att} and predictor values z_{it}^{pre} for all responses y_{it}. The conditional logit model has the form (Vermunt and Magidson 2005):

$$P\left(y_{it} = j \middle| z_{it}^{att}, z_{it}^{pre}\right) = \frac{\exp\left(\eta_{j|z_{it}}\right)}{\sum_{j'=1}^{J} \exp\left(\eta_{j'|z_{it}}\right)}$$

The likelihood of recreationist choosing to recreate at a given reservoir is indicated by the above regression model. This model forms the basis of the LCDSS, where we use the parameter estimates (i.e., part worth utility) gathered during the choice experiment to calculate overall utility of different management scenarios allowing us to approximate the probability of choice for one alternative over another. Changes in the exponent of the sum of utilities (i.e., preference values for each of the reservoir attributes or conditions) for a given reservoir can thus change the likelihood (i.e., %) of that reservoir being chosen by recreationists. In its simplest form, a DSS can be designed in Microsoft Excel, by replicating the layout of the DCE in the survey (i.e., in this case with the scenarios A and B, as well as a choose neither option). After programming, the levels for each attribute can be changed and the program calculates the likelihood of choice for any one of the scenarios. Adjusting reservoir features reveals the relative market share.

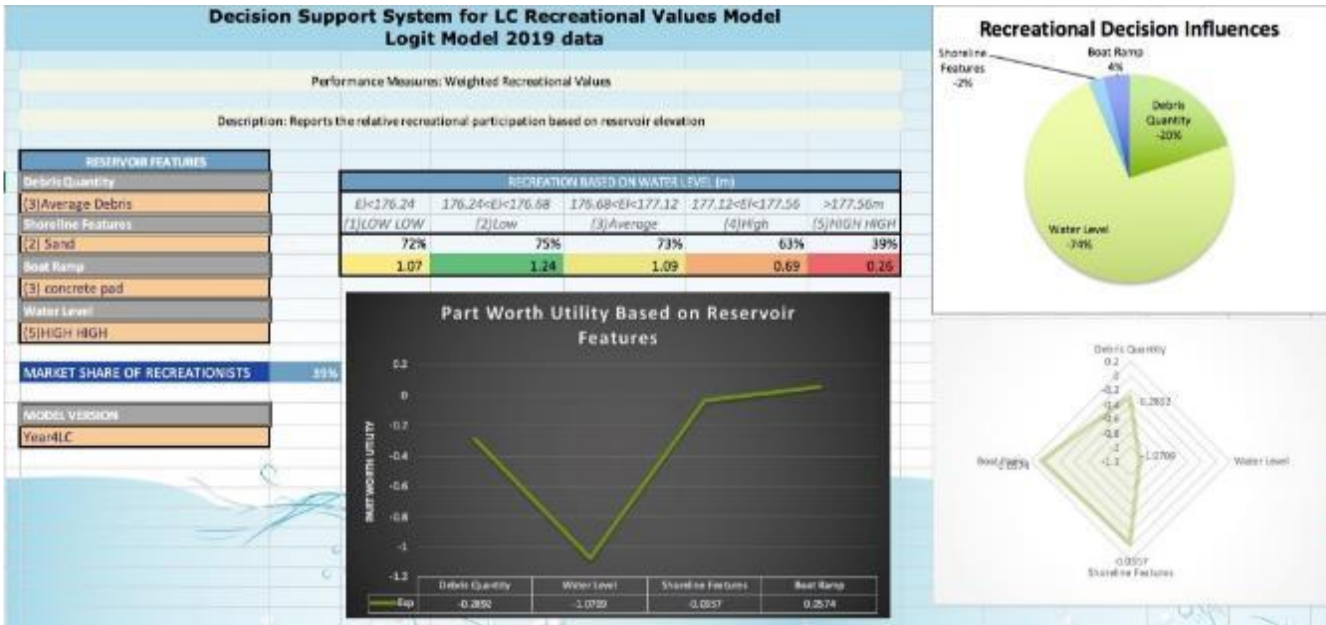


Figure 31. Screenshot of the Lower Campbell Decision Support System in Microsoft Excel

Various iterations of analysis or 'scenarios' were examined using the LCDSS, including an examination of:

- Combination of reservoir features that is <u>most</u> likely to elicit recreational visits (i.e. combination of features that are most likely to attract visits)
- Combination of reservoir features that is <u>least</u> likely to elicit recreational visits (i.e. combination of features that are least likely to attract visits)
- Combination of reservoir features where water level is most likely influences recreational decisions
- Combination of reservoir features that best represents the <u>actual</u> conditions at Lower Campbell Reservoir

Based on these scenarios, the LCDSS resulted in the following observations:

- Reservoirs featuring ***no debris, rocky shores, and a concrete boat launch pad*** typically elicit more visits than other combinations of reservoir conditions
- Reservoirs featuring ***a lot of debris, sandy shores, and gravel boat launch pad*** typically elicit fewer visits than other combinations of reservoir conditions
- Water level is the most influential on recreationist decisions to visit when there is ***little debris, rocky shores, and no boat launches***.

The full results of these scenarios are found in Appendix C.

Of particular interest is the combination of features that best represents the actual site conditions observed at Lower Campbell Reservoir. Existing reservoir conditions in the Lower Campbell Reservoir are best represented by: ***average debris levels, no boat launch, and a rocky shoreline.*** The relative market share for these conditions (compared to the status quo of choosing neither) is shown in Figure 32.

RECREATION BASED ON WATER LEVEL (m)				
El<176.24	*176.24<El<176.68*	*176.68<El<177.12*	*177.12<El<177.56*	*>177.56m*
(1)LOW LOW	*(2)Low*	*(3)Average*	*(4)High*	*(5)HIGH HIGH*
73%	76%	74%	64%	40%
1.12	1.30	1.15	0.73	0.28

Figure 32. Market share (% of recreationists choosing to recreate at the reservoir compared to not going) of recreationists visiting the existing Lower Campbell Reservoir with average debris, rocky shores, and no boat launch by water level. Total utility at each water level is shown below % values.

This scenario, designed to most closely resemble the actual conditions of Lower Campbell Reservoir indicates that low water conditions tend to be favored over average water levels, but that high-high water conditions are particularly undesirable and lead to a lower percentage of recreationists choosing to recreate at the reservoir.

Using the LCDSS, resource managers can evaluate how changes in some features may influence visitation and overall satisfaction in Lower Campbell Reservoir. For example, based on the findings presented in the LCDSS, there may be opportunities to increase the appeal of Lower Campbell reservoir through the addition of a concrete boat launch and undertaking wood debris removal.

4 DISCUSSION

Investigations of public use and perceptions of the Campbell Reservoir system have now been completed for 4.5 years (August 2015 to December 2019), revealing some insightful observations. In general, respondents have had favourable perceptions of their experiences at the reservoirs, rivers and waterfalls as gauged by the performance measures.

Perceptions at the reservoirs were generally positive for all performance measures. The performance measure with the highest overall frequency of positive responses was the perception of safety. In contrast, the performance measures with the highest frequency of negative responses across all study years were about access. In particular, access to the water via boat launches and via the shoreline had the highest frequencies of negative responses with 18-19% of respondents reporting they were either somewhat or very dissatisfied. In Year 5, these two performance measures for access had particularly high frequencies of negative responses.

Consistent with previous years, the majority of negative responses were from respondents at Buttle Lake. Part of this response is likely explained by a high frequency of negative responses during Year 2 of the study when Buttle Lake experienced very low water elevations that likely had a negative influence on visitors' access. Very low water elevations like this have not been observed in the other reservoirs or in different years. A high frequency of negative responses was also experienced in Year 5, particularly at both Buttle Lake and Upper Campbell Reservoir and to a lesser extent at Lower Campbell Reservoir, although the reason for this difference in Year 5 is unclear.

The management question for reservoirs focused on identifying and characterizing any significant relationships between water elevations and the selected performance measures of public use and recreational experience. Significant positive relationships between water elevations and visitor perceptions were identified at Buttle Lake and Lower Campbell Reservoir, where higher water levels were generally correlated with more positive experiences. Almost no significant relationships were noted at Upper Campbell Reservoir. Significant relationships with water elevations were also noted at Buttle Lake and Lower Campbell Reservoir for satisfaction with shoreline conditions; satisfaction with access to the water via boat launches; and access to the water via the shoreline. Other reservoir performance measures, including perception of safety and satisfaction with access to the beach, were only significant at Buttle Lake but again with more positive perceptions associated with higher water elevations.

Some caution must be taken in interpreting the relationship between water levels and the performance measures because year-specific effects (e.g., weather conditions, temperatures) could be contributing to changes in visitor responses. Weather data was used to see how influential this might be on the relationship, but the effect was not determined to be significant.

Results from the Lower Campbell DCE (LCDCE) consistently indicate that very-high water elevations (i.e. >177.56 m) are not preferred, which was the same for respondents of the Upper Campbell DCE. Unlike respondents of the Upper Campbell DCE, who tended to prefer higher-than-average water levels, respondents of the Lower Campbell DCE tended to prefer lower-than-average water elevation (176.24-176.68m). Further investigation of the LCDCE suggests that preferences may be split amongst respondents of the Lower Campbell DCE, with some having a stronger preference for lower water levels and others (e.g. boaters) indicating a preference for higher levels. Another interesting result for the LCDCE was the importance of boat ramps. Unlike in the UCDCE, the presence and/or type of boat launch significantly influenced respondents' choice of reservoir. Some respondents preferred concrete boat launches and others no boat launch at all. These differences can be explored further in future study years to see how the type of user group (e.g., power boaters, fishers, beach users) might influence perceptions.

The management question for rivers was similar to reservoirs, focusing on the relationship between water flow rates and the selected measures of use and recreational experience. Respondents generally had positive perceptions about their recreational experience at riverine environments in the Campbell River reservoir system. The performance measure with the highest frequency of positive responses was perception of safety, with a total of 56% of respondents reported feeling "very safe" while recreating. As with the reservoirs, perception of safety has continued to be the performance measure with the highest frequency of positive responses from year to year at the river locations. Year 5 in particular had a particularly high frequency (69%) of respondents reporting feeling "very safe" compared to all previous study years, although the reason for this shift is unclear. Negative responses for performance measures at the riverine locations were consistently very low (i.e., less than 5%).

There were significant differences in the distribution of responses among years in all three riverine performance measures. The most notable of these was a shift in how respondents perceived river flows and its influence on their recreation experience. In Year 5, a greater proportion of respondents reported that river flows at the time of their visit had no influence on their recreation experience. The rationale for a shift in responses is unclear. General weather conditions (e.g. sun, cloud, rain) have not been found to explain the differences, although this could be explored further to see if specific climatic conditions (e.g. amount of precipitation) had an influence. At this time, we are unaware of any specific activities or site conditions that may have unusually influenced responses, nor is there any indication that the type of visitor has changed.

The only significant positive relationship between river flow rate and the riverine performance measures was at Campbell River, where increased flow rates were positively correlated with recreation experience. A significant negative correlation was noted between flow rates and recreation experience for Quinsam River although this result may be related to exceptionally high flows in 2016 (the relationship was no longer significant when that year was removed from the analysis).

Elk Falls had the highest frequency of positive responses overall. Respondents overwhelmingly reported being both satisfied with their recreational experience and that the falls were impressive. These results imply that respondents have positive experiences at Elk Falls regardless of flow rates in the river and that changes to river flows rates will not likely change visitors' experience at this location.

In addition to findings specific to each location type (i.e., reservoirs, rivers, falls), the study aims to identify any potential relationships and trade-offs for visitor experience between location types as a result of water management in the reservoir system. Water management of the reservoirs has an inevitable effect on downstream riverine flows. For example, retaining higher water elevations within the reservoirs will generally result in a reduction in water flows in the rivers downstream; similarly, maintaining base flows in the rivers may require drawing down reservoir water elevations. The hypothesis is that management of the reservoirs may result in a trade-off to water flows in the rivers, and subsequently influence visitor experiences at riverine locations. As noted in the results, the relationship between water flows and satisfaction of riverine-based recreationists was not definitive. Results support that higher flow rates were associated with more positive recreation experiences, although this relationship was weak and only detected at Campbell River (not Quinsam River). No other performance measures at either location had a significant relationship with river flows.

In the context of trade-offs, this suggests that changes to reservoir water elevations can potentially have a minor but detectable influence on the visitor experience of riverine users. Maintaining higher water elevations in the reservoirs with corresponding lower flows in the rivers might increase satisfaction for reservoir users while slightly reducing satisfaction for river users. Given the lack of significant relationships in all river and reservoir locations, however, this relationship remains uncertain. Future surveying using a discrete choice experiment focused on rivers and using results from the reservoir-based DCEs may be able to provide more clarity.

In Year 5, a Decision Support System based on the Lower Campbell DCE was developed, similar to the one developed based on the Upper Campbell DCE in Year 4. The Lower Campbell Decision Support System (LCDSS) can be used to model how changes to water elevation (and other attributes like shoreline conditions, boat launch facilities, etc.) will influence the perceptions of recreationists and recreationists' decisions to recreate. The LCDSS can be utilized and shared between stakeholders to demonstrate the affect that management decisions can have on recreational experiences.

In conclusion, continued data collection has provided a deeper understanding of public perceptions of recreational use in the study area and revealed further insights into how different operating regimes may influence perceptions. The analyses have also provided a general characterization of the people, activities and patterns of use in the study area.

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APPENDIX A. SUMMARY TABLES OF DESCRIPTIVE STATISTICS

1. a) Are you a day visitor or overnight visitor?

		Frequency				Percent				Valid Percent				Cumulative Percent			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	Day Visitor	835	258	188	270	42.0	25.0	33.9	41.3	45.5	26.1	35.4	43.1	45.5	26.1	35.4	43.1
	Overnight Visitor	1002	731	343	356	50.4	70.9	61.9	54.4	54.5	73.9	64.6	56.9	100.0	100.0	100.0	100.0
	Total	1837	989	531	626	92.5	95.9	95.8	95.7	100.0	100.0	100.0	100.0				
Missing	System	150	42	23	28	7.5	4.1	4.2	4.3								
Total		1987	1031	554	654	100.0	100.0	100.0	100.0								

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

		Study Year			
		Year 2	Year 3	Year 4	Year 5
N	Valid	1837	989	531	626
	Missing	150	42	23	28
Mean		1.55	1.74	1.65	1.57
Median		2.00	2.00	2.00	2.00
Mode		2	2	2	2
Std. Deviation		.498	.439	.479	.496
Variance		.248	.193	.229	.246
Minimum		1	1	1	1
Maximum		2	2	2	2

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

	Responses											
	N				Percent				Percent of Cases			
	True Study Year				True Study Year				True Study Year			
	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Tent	226	231	89	105	22.0	30.7	24.9	25.4	23.3	32.2	25.9	29.7
Motorhome	130	141	54	40	12.6	18.7	15.1	9.7	13.4	19.7	15.7	11.3
Trailer	292	182	132	158	28.4	24.2	36.9	38.3	30.2	25.4	38.5	44.6
Camper	204	112	41	29	19.8	14.9	11.5	7.0	21.1	15.6	12.0	8.2
Cabin	62	24	32	39	6.0	3.2	8.9	9.4	6.4	3.3	9.3	11.0
Hotel	38	36	6	15	3.7	4.8	1.7	3.6	3.9	5.0	1.7	4.2
Friend/Family	73	22	3	20	7.1	2.9	.8	4.8	7.5	3.1	.9	5.6
Rental/BnB	4	5	1	7	.4	.7	.3	1.7	.4	.7	.3	2.0
Total	1029	753	358	413	100.0	100.0	100.0	100.0	106.3	105.0	104.4	116.7

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			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	Beach	26	8	10	26	1.3	.8	1.8	4.0	1.5	.8	1.9	4.2	1.5	.8	1.9	4.2
	Boat	37	12	4	3	1.9	1.2	.7	.5	2.1	1.2	.8	.5	3.6	2.0	2.7	4.6
	Camp	569	533	247	203	28.6	51.7	44.6	31.0	32.3	53.7	47.1	32.5	35.8	55.7	49.8	37.2
	Canoe	6	2	2	7	.3	.2	.4	1.1	.3	.2	.4	1.1	36.2	55.9	50.2	38.3
	Dam	9	10		2	.5	1.0		.3	.5	1.0		.3	36.7	57.0		38.6
	Dog	174	42	49	23	8.8	4.1	8.8	3.5	9.9	4.2	9.4	3.7	46.5	61.2	59.5	42.3
	Falls	431	178	33	69	21.7	17.3	6.0	10.6	24.4	17.9	6.3	11.1	71.0	79.1	65.8	53.4
	Fish	80	28	29	20	4.0	2.7	5.2	3.1	4.5	2.8	5.5	3.2	75.5	82.0	71.4	56.6

	Hike	278	54	81	176	14.0	5.2	14.6	26.9	15.8	5.4	15.5	28.2	91.3	87.4	86.8	84.8
	Kayak	13	7	7	11	.7	.7	1.3	1.7	.7	.7	1.3	1.8	92.0	88.1	88.2	86.5
	Other	29	1	8	5	1.5	.1	1.4	.8	1.6	.1	1.5	.8	93.7	88.2	89.7	87.3
	Picnic	10	3	6	9	.5	.3	1.1	1.4	.6	.3	1.1	1.4	94.2	88.5	90.8	88.8
	Sailing		1		1		.1		.2		.1		.2		88.6		88.9
	Sightseeing		38	36	57		3.7	6.5	8.7		3.8	6.9	9.1		92.4	97.7	98.1
	Swim	81	63	12	9	4.1	6.1	2.2	1.4	4.6	6.4	2.3	1.4	98.8	98.8	100.0	99.5
	Waterski	6	2		2	.3	.2		.3	.3	.2		.3	99.1	99.0		99.8
	Wildlife	14	9		1	.7	.9		.2	.8	.9		.2	99.9	99.9		100.0
	Windsurf	1	1			.1	.1			.1	.1			100.0	100.0		
	Total	1764	992	524	624	88.8	96.2	94.6	95.4	100.0	100.0	100.0	100.0				
Missing		223	39	30	30	11.2	3.8	5.4	4.6								
Total		1987	1031	554	654	100.0	100.0	100.0	100.0								

Other Activities:

		Frequency				Percent				Valid Percent				Cumulative Percent			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	None	1987	1031	546	649	100.0	100.0	98.6	99.2	100.0	100.0	98.6	99.2	100.0	100.0	98.6	99.2
	Biking			2				.4				.4				98.9	
	Jogging				1				.2				.2				99.4
	Park				2				.3				.3				99.7
	Bike				1				.2				.2				99.8
	Relaxing			1				.2				.2				99.1	
	Visiting			4				.7				.7				99.8	
	Wedding			1	1			.2	.2			.2	.2			100.0	100.0
	Total			554	654			100.0	100.0			100.0	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			
		True Study Year				True Study Year				True Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Areas Visited	Elk Falls	914	327	126	288	31.3	22.6	18.6	29.0	50.9	33.5	24.2	47.5
	Campbell River	359	132	79	181	12.3	9.1	11.7	18.2	20.0	13.5	15.2	29.9
	Lower Campbell Reservoir	341	238	105	89	11.7	16.5	15.5	9.0	19.0	24.4	20.2	14.7
	Upper Campbell Reservoir	163	99	63	105	5.6	6.8	9.3	10.6	9.1	10.1	12.1	17.3
	Quinsam River	370	236	128	153	12.7	16.3	18.9	15.4	20.6	24.2	24.6	25.2
	Salmon River	69	25	5	5	2.4	1.7	.7	.5	3.8	2.6	1.0	.8
	McIvor Lake	314	133	37	28	10.8	9.2	5.5	2.8	17.5	13.6	7.1	4.6
	Buttle Lake	358	246	130	128	12.3	17.0	19.2	12.9	19.9	25.2	25.0	21.1
	Other	31	10	5	17	1.1	.7	.7	1.7	1.7	1.0	1.0	2.8
Total		2919	1446	678	994	100.0	100.0	100.0	100.0	162.6	148.2	130.4	164.0

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			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	No	924	493	254	382	46.5	47.8	45.8	58.4	56.4	52.2	47.4	59.5	56.4	52.2	47.4	59.5
	Yes	714	451	282	260	35.9	43.7	50.9	39.8	43.6	47.8	52.6	40.5	100.0	100.0	100.0	100.0
	Total	1638	944	536	642	82.4	91.6	96.8	98.2	100.0	100.0	100.0	100.0				
Missing		349	87	18	12	17.6	8.4	3.2	1.8								
Total		1987	1031	554	654	100.0	100.0	100.0	100.0								

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

		Frequency				Percent				Valid Percent				Cumulative Percent			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	Buttle Lake	213	161	103	85	10.7	15.6	18.6	13.0	29.2	34.4	36.9	32.6	29.2	34.4	36.9	32.6
	Lower Campbell	239	181	99	84	12.0	17.6	17.9	12.8	32.8	38.7	35.5	32.2	62.0	73.1	72.4	64.8
	McIvor Lake	224	88	34	8	11.3	8.5	6.1	1.2	30.7	18.8	12.2	3.1	92.7	91.9	84.6	67.8
	Upper Campbell	45	36	37	75	2.3	3.5	6.7	11.5	6.2	7.7	13.3	28.7	100.0	100.0	100.0	100.0
	Other	8	2	6	9	.4	.2	1.1	1.4	1.1	.4	2.2	3.4	93.8	92.3	86.7	71.3
	Total	729	468	279	261	36.7	45.4	50.4	39.9	100.0	100.0	100.0	100.0				
Missing		1258	563		393	63.3	54.6		60.1								
	System			275				49.6									
Total		1987	1031	554	654	100.0	100.0	100.0	100.0								

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

		Frequency				Percent				Valid Percent				Cumulative Percent			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	Today	550	354	208	178	27.7	34.3	37.5	27.2	76.3	76.3	74.6	69.8	81.3	83.6	80.3	72.5
	Yesterday	105	57	44	64	5.3	5.5	7.9	9.8	14.6	12.3	15.8	25.1	100.0	100.0	100.0	100.0
	2 days ago	30	19	11	6	1.5	1.8	2.0	.9	4.2	4.1	3.9	2.4	85.4	87.7	84.2	74.9
	Other	36	34	16	7	1.8	3.3	2.9	1.1	5.0	7.3	5.7	2.7	5.0	7.3	5.7	2.7
	Total	721	464	279	255	36.3	45.0	50.4	39.0	100.0	100.0	100.0	100.0				
Missing		1266	567		399	63.7	55.0		61.0								
	System			275				49.6									
Total		1987	1031	554	654	100.0	100.0	100.0	100.0								

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

		Responses											
		N				Percent				Percent of Cases			
		True Study Year				True Study Year				True Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Q8 Lake Activities[a]	Camping	432	342	163	138	17.4	17.9	20.3	14.4	58.4	71.8	59.9	56.3
	Windsurfing	4	5	1	1	.2	.3	.1	.1	.5	1.1	.4	.4
	Waterskiing	19	19	3	1	.8	1.0	.4	.1	2.6	4.0	1.1	.4
	Swimming	313	275	53	23	12.6	14.4	6.6	2.4	42.3	57.8	19.5	9.4
	Beach activities	259	204	59	134	10.4	10.7	7.4	14.0	35.0	42.9	21.7	54.7
	Viewing falls	110	70	10	4	4.4	3.7	1.2	.4	14.9	14.7	3.7	1.6
	Power boating	97	88	31	24	3.9	4.6	3.9	2.5	13.1	18.5	11.4	9.8
	Fishing	174	142	86	72	7.0	7.4	10.7	7.5	23.5	29.8	31.6	29.4
	Kayaking	121	124	68	103	4.9	6.5	8.5	10.8	16.4	26.1	25.0	42.0
	Picnicking	97	89	62	26	3.9	4.6	7.7	2.7	13.1	18.7	22.8	10.6
	Dog walking	258	141	67	53	10.4	7.4	8.4	5.5	34.9	29.6	24.6	21.6
	Viewing dam	64	40		2	2.6	2.1		.2	8.6	8.4		.8
	Canoeing	50	44	11	42	2.0	2.3	1.4	4.4	6.8	9.2	4.0	17.1
	Hiking/Walking	305	209	88	151	12.3	10.9	11.0	15.8	41.2	43.9	32.4	61.6
	Wildlife Viewing	137	96	21	6	5.5	5.0	2.6	.6	18.5	20.2	7.7	2.4
	Sailing	1	5		2	.0	.3		.2	.1	1.1		.8
	Other	16	5	4	4	.6	.3	.5	.4	2.2	1.1	1.5	1.6
	Sightseeing	1		43	115	.0		5.4	12.0	.1		15.8	46.9
	SUP	5	6	9	22	.2	.3	1.1	2.3	.7	1.3	3.3	9.0
	ATV	7	5	3	5	.3	.3	.4	.5	.9	1.1	1.1	2.0
	Biking	13	5	19	30	.5	.3	2.4	3.1	1.8	1.1	7.0	12.2
Total		2483	1914	801	958	100.0	100.0	100.0	100.0	335.5	402.1	294.5	391.0

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			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	Very Positively	186	163	89	30	9.4	15.8	16.1	4.6	25.2	34.4	35.0	13.2	100.0	100.0	100.0	100.0
	Somewhat Positively	170	127	73	13	8.6	12.3	13.2	2.0	23.1	26.8	28.7	5.7	74.8	65.6	65.0	86.8
	No influence	231	136	68	142	11.6	13.2	12.3	21.7	31.3	28.7	26.8	62.3	51.7	38.8	36.2	81.1
	Somewhat Negatively	87	44	19	38	4.4	4.3	3.4	5.8	11.8	9.3	7.5	16.7	20.4	10.1	9.4	18.9
	Very Negatively	63	4	5	5	3.2	.4	.9	.8	8.5	.8	2.0	2.2	8.5	.8	2.0	2.2
	Total	737	474	254	228	37.1	46.0	45.8	34.9	100.0	100.0	100.0	100.0				
Missing	System	1250	557	300	426	62.9	54.0	54.2	65.1								
Total		1987	1031	554	654	100.0	100.0	100.0	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			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	No	651	446	251	218	32.8	43.3	45.3	33.3	84.8	94.3	96.9	94.0	84.8	94.3	96.9	94.0
	Yes	117	27	8	14	5.9	2.6	1.4	2.1	15.2	5.7	3.1	6.0	100.0	100.0	100.0	100.0
	Total	768	473	259	232	38.7	45.9	46.8	35.5	100.0	100.0	100.0	100.0				
Missing		1219	558	295	422	61.3	54.1	53.2	64.5								
Total		1987	1031	554	654	100.0	100.0	100.0	100.0								

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			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	Very Satisfied	293	202	80	74	14.7	19.6	14.4	11.3	40.1	42.5	30.9	32.2	100.0	100.0	100.0	100.0
	Somewhat Dissatisfied	71	34	15	33	3.6	3.3	2.7	5.0	9.7	7.2	5.8	14.3	16.0	7.8	6.9	16.5
	Neither Satisfied nor Dissatisfied	118	70	78	67	5.9	6.8	14.1	10.2	16.1	14.7	30.1	29.1	32.1	22.5	37.1	45.7
	Somewhat Satisfied	203	166	83	51	10.2	16.1	15.0	7.8	27.8	34.9	32.0	22.2	59.9	57.5	69.1	67.8
	Very Dissatisfied	46	3	3	5	2.3	.3	.5	.8	6.3	.6	1.2	2.2	6.3	.6	1.2	2.2
	Total	731	475	259	230	36.8	46.1	46.8	35.2	100.0	100.0	100.0	100.0				
Missing		1256	556	295	424	63.2	53.9	53.2	64.8								
Total		1987	1031	554	654	100.0	100.0	100.0	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			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	Very Safe	403	261	103	134	20.3	25.3	18.6	20.5	54.5	55.1	40.2	58.0	100.0	100.0	100.0	100.0
	Somewhat Safe	169	140	80	44	8.5	13.6	14.4	6.7	22.9	29.5	31.3	19.0	45.5	44.9	59.8	42.0
	Neither Safe nor Unsafe	103	47	61	39	5.2	4.6	11.0	6.0	13.9	9.9	23.8	16.9	22.6	15.4	28.5	22.9
	Somewhat Unsafe	50	25	10	7	2.5	2.4	1.8	1.1	6.8	5.3	3.9	3.0	8.7	5.5	4.7	6.1
	Very Unsafe	14	1	2	7	.7	.1	.4	1.1	1.9	.2	.8	3.0	1.9	.2	.8	3.0
	Total	739	474	256	231	37.2	46.0	46.2	35.3	100.0	100.0	100.0	100.0				
Missing		1248	557	298	423	62.8	54.0	53.8	64.7								
Total		1987	1031	554	654	100.0	100.0	100.0	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			
		Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Q13 Safety Concerns[a]	Floating Debris	74	23	5	3	7.8	4.1	1.7	1.0	10.2	5.0	1.9	1.4
	Visible Stumps	172	92	56	73	18.2	16.4	19.1	23.8	23.7	19.9	21.5	32.9
	Hidden Stumps	199	128	30	72	21.1	22.9	10.2	23.5	27.4	27.7	11.5	32.4
	Boat Launch Conditions	56	10	6	21	5.9	1.8	2.0	6.8	7.7	2.2	2.3	9.5
	Other	45	18	11	6	4.8	3.2	3.8	2.0	6.2	3.9	4.2	2.7
	No Safety Concerns	398	289	185	132	42.2	51.6	63.1	43.0	54.7	62.6	70.9	59.5
Total		944	560	293	307	100.0	100.0	100.0	100.0	129.8	121.2	112.3	138.3

a. Group

Other safety concerns mentioned for lakes/reservoirs (cumulative across all study years):

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	4146	98.1	98.1	98.1
	Aquatic vegetation	2	.0	.0	98.2
	Broken glass on beach	3	.1	.1	98.2
	Broken glass/garbage	11	.3	.3	98.5
	Chains at end of dock	5	.1	.1	98.6
	Cut trees	1	.0	.0	98.6
	Dead fish	1	.0	.0	98.7
	Debris	1	.0	.0	98.7
	Dogs	2	.0	.0	98.7

	Hazard tree	1	.0	.0	98.7
	Low levels	1	.0	.0	98.8
	Massive outflow	1	.0	.0	98.8
	Mud	1	.0	.0	98.8
	Muddy bottom	14	.3	.3	99.1
	Mushy bottom	1	.0	.0	99.2
	No beach	2	.0	.0	99.2
	Other visitors	1	.0	.0	99.2
	Rocks	1	.0	.0	99.3
	Slippery conditions	4	.1	.1	99.4
	Steep shoreline	2	.0	.0	99.4
	Strong current	2	.0	.0	99.5
	Swimmers itch	5	.1	.1	99.6
	Swimmers itch and smel	1	.0	.0	99.6
	Trail conditions	2	.0	.0	99.6
	Unsafe boating/jet ski	5	.1	.1	99.8
	Wildlife	3	.1	.1	99.8
	Winds	2	.0	.0	99.9
	Wood debris on beach	5	.1	.1	100.0
	Total	4226	100.0	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			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	Very Satisfied	333	210	89	90	16.8	20.4	16.1	13.8	46.3	45.5	34.4	40.7	92.8	92.0	91.5	97.3
	Somewhat Satisfied	162	132	68	50	8.2	12.8	12.3	7.6	22.5	28.6	26.3	22.6	46.5	46.5	57.1	56.6
	Neither Satisfied nor Dissatisfied	59	43	32	37	3.0	4.2	5.8	5.7	8.2	9.3	12.4	16.7	23.9	18.0	30.9	33.9
	Somewhat Dissatisfied	53	28	34	30	2.7	2.7	6.1	4.6	7.4	6.1	13.1	13.6	15.7	8.7	18.5	17.2
	Very Dissatisfied	60	12	14	8	3.0	1.2	2.5	1.2	8.3	2.6	5.4	3.6	8.3	2.6	5.4	3.6
	Not Applicable	52	37	22	6	2.6	3.6	4.0	.9	7.2	8.0	8.5	2.7	100.0	100.0	100.0	100.0
	Total	719	462	259	221	36.2	44.8	46.8	33.8	100.0	100.0	100.0	100.0				
Missing		1268	569	295	433	63.8	55.2	53.2	66.2								
Total		1987	1031	554	654	100.0	100.0	100.0	100.0								

b) the water via a boat launch?

		Frequency				Percent				Valid Percent				Cumulative Percent			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	Very Dissatisfied	59	6	11	12	3.0	.6	2.0	1.8	8.4	1.5	4.4	5.9	8.4	1.5	4.4	5.9
	Somewhat Dissatisfied	42	15	25	13	2.1	1.5	4.5	2.0	6.0	3.7	10.0	6.4	14.4	5.1	14.5	12.3
	Neither Satisfied nor Dissatisfied	72	65	42	19	3.6	6.3	7.6	2.9	10.3	15.9	16.9	9.4	24.7	21.0	31.3	21.7
	Somewhat Satisfied	111	76	46	13	5.6	7.4	8.3	2.0	15.9	18.5	18.5	6.4	40.6	39.5	49.8	28.1
	Very Satisfied	151	115	47	18	7.6	11.2	8.5	2.8	21.6	28.0	18.9	8.9	62.1	67.6	68.7	36.9
	Not Applicable	265	133	78	128	13.3	12.9	14.1	19.6	37.9	32.4	31.3	63.1	100.0	100.0	100.0	100.0
	Total	700	410	249	203	35.2	39.8	44.9	31.0	100.0	100.0	100.0	100.0				

Missing		1287	621	305	451	64.8	60.2	55.1	69.0								
Total		1987	1031	554	654	100.0	100.0	100.0	100.0								

c) the water via the shoreline?

		Frequency				Percent				Valid Percent				Cumulative Percent			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	Very Dissatisfied	67	8	19	15	3.4	.8	3.4	2.3	9.4	1.8	7.5	7.1	9.4	1.8	7.5	7.1
	Somewhat Dissatisfied	58	31	30	27	2.9	3.0	5.4	4.1	8.2	7.0	11.8	12.8	17.6	8.8	19.3	19.9
	Neither Satisfied nor Dissatisfied	72	55	45	49	3.6	5.3	8.1	7.5	10.2	12.4	17.7	23.2	27.8	21.3	37.0	43.1
	Somewhat Satisfied	151	125	64	39	7.6	12.1	11.6	6.0	21.3	28.3	25.2	18.5	49.1	49.5	62.2	61.6
	Very Satisfied	264	182	81	77	13.3	17.7	14.6	11.8	37.2	41.2	31.9	36.5	86.3	90.7	94.1	98.1
	Not Applicable	97	41	15	4	4.9	4.0	2.7	.6	13.7	9.3	5.9	1.9	100.0	100.0	100.0	100.0
	Total	709	442	254	211	35.7	42.9	45.8	32.3	100.0	100.0	100.0	100.0				
Missing		1278	589	300	443	64.3	57.1	54.2	67.7								
Total		1987	1031	554	654	100.0	100.0	100.0	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			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	No	837	576	357	364	42.1	55.9	64.4	55.7	47.7	63.7	66.5	56.8	47.7	63.7	66.5	56.8
	Yes	919	328	180	277	46.3	31.8	32.5	42.4	52.3	36.3	33.5	43.2	100.0	100.0	100.0	100.0
	Total	1756	904	537	641	88.4	87.7	96.9	98.0	100.0	100.0	100.0	100.0				
Missing		231	127	17	13	11.6	12.3	3.1	2.0								
Total		1987	1031	554	654	100.0	100.0	100.0	100.0								

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

		Frequency				Percent				Valid Percent				Cumulative Percent			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	Today	815	261	116	214	41.0	25.3	20.9	32.7	89.3	80.8	64.4	77.3	92.0	84.5	72.2	82.7
	Yesterday	46	33	34	30	2.3	3.2	6.1	4.6	5.0	10.2	18.9	10.8	100.0	100.0	100.0	100.0
	2 days ago	27	17	16	18	1.4	1.6	2.9	2.8	3.0	5.3	8.9	6.5	95.0	89.8	81.1	89.2
	Other	25	12	14	15	1.3	1.2	2.5	2.3	2.7	3.7	7.8	5.4	2.7	3.7	7.8	5.4
	Total	913	323	180	277	45.9	31.3	32.5	42.4	100.0	100.0	100.0	100.0				
Missing		1074	708	374	377	54.1	68.7	67.5	57.6								
Total		1987	1031	554	654	100.0	100.0	100.0	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			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	Very Unimpressive	3	2	1	10	.2	.2	.2	1.5	.3	.6	.6	3.7	.3	.6	.6	3.7
	Somewhat Unimpressive	7	5	2	3	.4	.5	.4	.5	.8	1.5	1.1	1.1	1.1	2.1	1.7	4.8
	Neither Impressive or Unimpressive	35	9	11	10	1.8	.9	2.0	1.5	3.8	2.6	6.2	3.7	4.9	4.7	7.9	8.5
	Somewhat Impressive	289	117	25	43	14.5	11.3	4.5	6.6	31.4	34.3	14.1	15.9	36.3	39.0	22.0	24.4
	Very Impressive	585	208	138	204	29.4	20.2	24.9	31.2	63.7	61.0	78.0	75.6	100.0	100.0	100.0	100.0
	Total	919	341	177	270	46.3	33.1	31.9	41.3	100.0	100.0	100.0	100.0				
Missing		1068	690	377	384	53.7	66.9	68.1	58.7								
Total		1987	1031	554	654	100.0	100.0	100.0	100.0								

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

		Frequency				Percent				Valid Percent				Cumulative Percent			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	Very Satisfied	754	275	138	223	37.9	26.7	24.9	34.1	82.1	80.9	77.5	83.5	100.0	100.0	100.0	100.0
	Somewhat Satisfied	139	56	28	26	7.0	5.4	5.1	4.0	15.1	16.5	15.7	9.7	17.9	19.1	22.5	16.5
	Neither Satisfied nor Dissatisfied	17	6	8	11	.9	.6	1.4	1.7	1.9	1.8	4.5	4.1	2.7	2.6	6.7	6.7
	Somewhat Dissatisfied	6	1	3	3	.3	.1	.5	.5	.7	.3	1.7	1.1	.9	.9	2.2	2.6
	Very Dissatisfied	2	2	1	4	.1	.2	.2	.6	.2	.6	.6	1.5	.2	.6	.6	1.5
	Total	918	340	178	267	46.2	33.0	32.1	40.8	100.0	100.0	100.0	100.0				
Missing		1069	691	376	387	53.8	67.0	67.9	59.2								
Total		1987	1031	554	654	100.0	100.0	100.0	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			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	No	1233	721	390	475	62.1	69.9	70.4	72.6	77.5	81.1	73.9	73.9	77.5	81.1	73.9	73.9
	Yes	358	168	138	168	18.0	16.3	24.9	25.7	22.5	18.9	26.1	26.1	100.0	100.0	100.0	100.0
	Total	1591	889	528	643	80.1	86.2	95.3	98.3	100.0	100.0	100.0	100.0				
Missing		396	142	26	11	19.9	13.8	4.7	1.7								
Total		1987	1031	554	654	100.0	100.0	100.0	100.0								

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

		Responses											
		N				Percent				Percent of Cases			
		Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
River Location[a]	Quinsam River	224	133	88	73	58.8	72.3	63.8	44.0	62.6	76.0	63.8	44.0
	Campbell River	137	42	47	85	36.0	22.8	34.1	51.2	38.3	24.0	34.1	51.2
	Salmon River	5	3		1	1.3	1.6		.6	1.4	1.7		.6
	Other	15	6	3	7	3.9	3.3	2.2	4.2	4.2	3.4	2.2	4.2
Total		381	184	138	166	100.0	100.0	100.0	100.0	106.4	105.1	100.0	100.0

a. Group

Other rivers (cumulative across all study years):

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Applicable	4198	99.3	99.3	99.3
	Cervus Creek	1	.0	.0	99.4
	Elk River	8	.2	.2	99.6
	Myra Creek	2	.0	.0	99.6
	Oyster River	3	.1	.1	99.7
	Ralph	1	.0	.0	99.7
	Ralph River	11	.3	.3	100.0
	Shepherds Creek	1	.0	.0	100.0
	Wolf River	1	.0	.0	100.0
	Total	4226	100.0	100.0	

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

		Frequency				Percent				Valid Percent				Cumulative Percent			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	Other	23	11	8		1.2	1.1	1.4		6.6	6.6	5.9		6.6	6.6	5.9	
	Today	244	134	111	126	12.3	13.0	20.0	19.3	70.3	80.2	81.6	78.3	76.9	86.8	87.5	78.3
	2 days ago	28	9	1	6	1.4	.9	.2	.9	8.1	5.4	.7	3.7	85.0	92.2	88.2	82.0
	Yesterday	52	13	16	29	2.6	1.3	2.9	4.4	15.0	7.8	11.8	18.0	100.0	100.0	100.0	100.0
	Total	347	167	136	161	17.5	16.2	24.5	24.6	100.0	100.0	100.0	100.0				
Missing		1640	864	418	493	82.5	83.8	75.5	75.4								
Total		1987	1031	554	654	100.0	100.0	100.0	100.0								

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

		Responses								Percent of Cases			
		N				Percent							
		Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
River Activities[a]	Camping	121	103	35	41	16.7	24.3	13.2	10.4	33.8	58.5	26.9	26.1
	Fishing	89	67	53	46	12.3	15.8	19.9	11.6	24.9	38.1	40.8	29.3
	Swimming	24	17	5	7	3.3	4.0	1.9	1.8	6.7	9.7	3.8	4.5
	Beach activities	26	18	3	5	3.6	4.2	1.1	1.3	7.3	10.2	2.3	3.2
	Boating	5	2	1		.7	.5	.4		1.4	1.1	.8	
	Hiking/Walking	155	76	68	126	21.4	17.9	25.6	31.9	43.3	43.2	52.3	80.3
	Picnicking	31	22	12	21	4.3	5.2	4.5	5.3	8.7	12.5	9.2	13.4
	Dog walking	90	47	35	28	12.4	11.1	13.2	7.1	25.1	26.7	26.9	17.8
	Canoeing	6	1	1	1	.8	.2	.4	.3	1.7	.6	.8	.6
	Kayaking	5	6	2	4	.7	1.4	.8	1.0	1.4	3.4	1.5	2.5
	Wildlife Viewing	73	22	16	46	10.1	5.2	6.0	11.6	20.4	12.5	12.3	29.3
	Sightseeing	86	41	33	66	11.9	9.7	12.4	16.7	24.0	23.3	25.4	42.0
	Other	13	2	2	4	1.8	.5	.8	1.0	3.6	1.1	1.5	2.5
Total		724	424	266	395	100.0	100.0	100.0	100.0	202.2	240.9	204.6	251.6

a. Group

Other activities respondents reported participating in (cumulative across all study years):

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Applicable	4207	99.6	99.6	99.6
	Biking	4	.1	.1	99.6
	Exploring	1	.0	.0	99.7

	Goldpanning	1	.0	.0	99.7
	Photography	4	.1	.1	99.8
	Play in water	1	.0	.0	99.8
	Playing with ch	3	.1	.1	99.9
	Running	1	.0	.0	99.9
	snorkelling	1	.0	.0	99.9
	Tubing	1	.0	.0	100.0
	Work	2	.0	.0	100.0
	Total	4226	100.0	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			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	No	354	164	126	147	17.8	15.9	22.7	22.5	93.9	98.2	96.9	95.5	93.9	98.2	96.9	95.5
	Yes	23	3	4	7	1.2	.3	.7	1.1	6.1	1.8	3.1	4.5	100.0	100.0	100.0	100.0
	Total	377	167	130	154	19.0	16.2	23.5	23.5	100.0	100.0	100.0	100.0				
Missing		1610	864	424	500	81.0	83.8	76.5	76.5								
Total		1987	1031	554	654	100.0	100.0	100.0	100.0								

Activities identified that respondents were unable to do because of the river flow conditions (cumulative across all study years):

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Applicable	4194	99.2	99.2	99.2
	Boating	1	.0	.0	99.3
	Camping	1	.0	.0	99.3

	Canoeing	2	.0	.0	99.4
	Cliff jumping	1	.0	.0	99.4
	Fishing	9	.2	.2	99.6
	handicap access	1	.0	.0	99.6
	Hiking/Walking	3	.1	.1	99.7
	Low water	2	.0	.0	99.7
	Rapids	1	.0	.0	99.8
	Swimming	4	.1	.1	99.9
	Tubing	6	.1	.1	100.0
	Total	4226	100.0	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			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	Very Positively	90	66	66	30	4.5	6.4	11.9	4.6	25.7	36.9	51.2	20.0	100.0	100.0	100.0	100.0
	Somewhat Positively	91	68	28	19	4.6	6.6	5.1	2.9	26.0	38.0	21.7	12.7	74.3	63.1	48.8	80.0
	No influence	143	39	32	98	7.2	3.8	5.8	15.0	40.9	21.8	24.8	65.3	48.3	25.1	27.1	67.3
	Somewhat Negatively	21	6	3	3	1.1	.6	.5	.5	6.0	3.4	2.3	2.0	7.4	3.4	2.3	2.0
	Very Negatively	5				.3				1.4				1.4			
	Total	350	179	129	150	17.6	17.4	23.3	22.9	100.0	100.0	100.0	100.0				
Missing		1637	852	425	504	82.4	82.6	76.7	77.1								
Total		1987	1031	554	654	100.0	100.0	100.0	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			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	Very Satisfied	134	84	65	60	6.7	8.1	11.7	9.2	38.6	46.9	51.2	39.7	100.0	100.0	100.0	100.0
	Somewhat Satisfied	110	60	25	43	5.5	5.8	4.5	6.6	31.7	33.5	19.7	28.5	61.4	53.1	48.8	60.3
	Neither Satisfied nor Dissatisfied	79	28	32	45	4.0	2.7	5.8	6.9	22.8	15.6	25.2	29.8	29.7	19.6	29.1	31.8
	Somewhat Dissatisfied	20	7	5	2	1.0	.7	.9	.3	5.8	3.9	3.9	1.3	6.9	3.9	3.9	2.0
	Very Dissatisfied	4			1	.2			.2	1.2			.7	1.2			.7
	Total	347	179	127	151	17.5	17.4	22.9	23.1	100.0	100.0	100.0	100.0				
Missing		1640	852	427	503	82.5	82.6	77.1	76.9								
Total		1987	1031	554	654	100.0	100.0	100.0	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			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	Very Safe	186	88	72	100	9.4	8.5	13.0	15.3	53.9	49.7	56.3	68.5	100.0	100.0	100.0	100.0
	Somewhat Safe	90	47	33	27	4.5	4.6	6.0	4.1	26.1	26.6	25.8	18.5	46.1	50.3	43.8	31.5
	Neither Safe nor Unsafe	50	37	19	18	2.5	3.6	3.4	2.8	14.5	20.9	14.8	12.3	20.0	23.7	18.0	13.0
	Somewhat Unsafe	13	4	4	1	.7	.4	.7	.2	3.8	2.3	3.1	.7	5.5	2.8	3.1	.7
	Very Unsafe	6	1			.3	.1			1.7	.6			1.7	.6		
	Total	345	177	128	146	17.4	17.2	23.1	22.3	100.0	100.0	100.0	100.0				
Missing		1642	854	426	508	82.6	82.8	76.9	77.7								
Total		1987	1031	554	654	100.0	100.0	100.0	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			
		Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
River Hazards[a]	High flows	73	6	9		19.6	3.4	6.9		22.7	3.5	7.0	
	Floating debris	28	10	2	2	7.5	5.7	1.5	1.4	8.7	5.8	1.6	1.4
	Poor access conditions	53	4	5	6	14.2	2.3	3.8	4.1	16.5	2.3	3.9	4.2
	Exposed hazards	16	8	2		4.3	4.6	1.5		5.0	4.6	1.6	
	Other	22	5		3	5.9	2.9		2.1	6.8	2.9		2.1
	None	181	142	113	134	48.5	81.1	86.3	92.4	56.2	82.1	88.3	93.7
Total		373	175	131	145	100.0	100.0	100.0	100.0	115.8	101.2	102.3	101.4

a. Group

Other safety concerns mentioned for rivers (cumulative across all study years):

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Applicable	4196	99.3	99.3	99.3
	Bears	2	.0	.0	99.3
	Boat launch	1	.0	.0	99.4
	Erosion of trails and banks	5	.1	.1	99.5
	High flows	1	.0	.0	99.5
	Lack of pedestrian bridge	1	.0	.0	99.5
	Low flows	4	.1	.1	99.6
	Massive waterfall	1	.0	.0	99.6
	Muddy shore/bank	6	.1	.1	99.8
	Slippery rocks	1	.0	.0	99.8

	Swimming	1	.0	.0	99.8
	Traffic	1	.0	.0	99.9
	Trails not appropriate for all access	1	.0	.0	99.9
	Turbid water	1	.0	.0	99.9
	Woody debris	4	.1	.1	100.0
	Total	4226	100.0	100.0	

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

		Frequency Study Year				Percent Study Year				Valid Percent Study Year				Cumulative Percent Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	No	1130	522	369	397	56.9	50.6	66.6	60.7	69.0	57.8	69.1	61.7	69.0	57.8	69.1	61.7
	Yes	508	381	165	246	25.6	37.0	29.8	37.6	31.0	42.2	30.9	38.3	100.0	100.0	100.0	100.0
	Total	1638	903	534	643	82.4	87.6	96.4	98.3	100.0	100.0	100.0	100.0				
Missing	Blank	349	128	20		17.6	12.4	3.6									
	System				11				1.7								
Total		1987	1031	554	654	100.0	100.0	100.0	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			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	Never	151	59	33	36	7.6	5.7	6.0	5.5	14.3	13.4	9.2	9.4	89.8	86.8	89.1	94.2
	Less than once	37	12	4	2	1.9	1.2	.7	.3	3.5	2.7	1.1	.5	75.5	73.4	79.9	84.8
	Once	108	58	39	22	5.4	5.6	7.0	3.4	10.2	13.2	10.9	5.8	100.0	100.0	100.0	100.0
	2-3 days	196	74	80	79	9.9	7.2	14.4	12.1	18.5	16.8	22.3	20.7	18.5	16.8	22.3	20.7
	4 days plus	567	237	202	242	28.5	23.0	36.5	37.0	53.5	53.9	56.4	63.5	72.0	70.7	78.8	84.3
	Total	1059	440	358	381	53.3	42.7	64.6	58.3	100.0	100.0	100.0	100.0				
Missing	Blank	71				3.6											
	System	857	591	196	273	43.1	57.3	35.4	41.7								
	Total	928				46.7											
Total		1987	1031	554	654	100.0	100.0	100.0	100.0								

b) Summer

		Frequency				Percent				Valid Percent				Cumulative Percent			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	Never	33	9	6	11	1.7	.9	1.1	1.7	3.1	1.9	1.7	2.8	91.7	93.2	96.7	96.9
	Less than once	35	3	6	5	1.8	.3	1.1	.8	3.3	.6	1.7	1.3	88.6	91.4	95.0	94.1
	Once	88	33	12	12	4.4	3.2	2.2	1.8	8.3	6.8	3.3	3.1	100.0	100.0	100.0	100.0
	2-3 days	128	68	46	50	6.4	6.6	8.3	7.6	12.0	14.0	12.7	12.9	12.0	14.0	12.7	12.9
	4 days plus	779	373	291	309	39.2	36.2	52.5	47.2	73.3	76.7	80.6	79.8	85.3	90.7	93.4	92.8
	Total	1063	486	361	387	53.5	47.1	65.2	59.2	100.0	100.0	100.0	100.0				
Missing	Blank	67				3.4											

	System	857	545	193	267	43.1	52.9	34.8	40.8								
	Total	924				46.5											
Total		1987	1031	554	654	100.0	100.0	100.0	100.0								

c) Winter

		Frequency				Percent				Valid Percent				Cumulative Percent			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	Never	317	181	189	130	16.0	17.6	34.1	19.9	31.0	44.9	53.4	39.4	88.2	88.3	89.5	88.5
	Less than once	74	25	22	31	3.7	2.4	4.0	4.7	7.2	6.2	6.2	9.4	57.2	43.4	36.2	49.1
	Once	121	47	37	38	6.1	4.6	6.7	5.8	11.8	11.7	10.5	11.5	100.0	100.0	100.0	100.0
	2-3 days	135	27	41	43	6.8	2.6	7.4	6.6	13.2	6.7	11.6	13.0	13.2	6.7	11.6	13.0
	4 days plus	377	123	65	88	19.0	11.9	11.7	13.5	36.8	30.5	18.4	26.7	50.0	37.2	29.9	39.7
	Total	1024	403	354	330	51.5	39.1	63.9	50.5	100.0	100.0	100.0	100.0				
Missing	Blank	106				5.3											
	System	857	628	200	324	43.1	60.9	36.1	49.5								
	Total	963				48.5											
Total		1987	1031	554	654	100.0	100.0	100.0	100.0								

d) Fall

		Frequency				Percent				Valid Percent				Cumulative Percent			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	Never	204	134	137	66	10.3	13.0	24.7	10.1	19.7	31.9	38.8	19.3	89.1	87.4	90.1	86.3
	Less than once	64	14	11	18	3.2	1.4	2.0	2.8	6.2	3.3	3.1	5.3	69.4	55.5	51.3	67.0
	Once	113	53	35	47	5.7	5.1	6.3	7.2	10.9	12.6	9.9	13.7	100.0	100.0	100.0	100.0
	2-3 days	197	57	60	66	9.9	5.5	10.8	10.1	19.0	13.6	17.0	19.3	19.0	13.6	17.0	19.3
	4 days plus	458	162	110	145	23.0	15.7	19.9	22.2	44.2	38.6	31.2	42.4	63.2	52.1	48.2	61.7

	Total	1036	420	353	342	52.1	40.7	63.7	52.3	100.0	100.0	100.0	100.0				
Missing	Blank	94				4.7											
	System	857	611	201	312	43.1	59.3	36.3	47.7								
	Total	951				47.9											
Total		1987	1031	554	654	100.0	100.0	100.0	100.0								

36. What is your gender?

		Frequency				Percent				Valid Percent				Cumulative Percent			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	Female	358	416	314	321	18.0	40.3	56.7	49.1	42.6	45.9	60.9	50.5	42.6	45.9	60.9	50.5
	Male	483	490	202	315	24.3	47.5	36.5	48.2	57.4	54.1	39.1	49.5	100.0	100.0	100.0	100.0
	Total	841	906	516	636	42.3	87.9	93.1	97.2	100.0	100.0	100.0	100.0				
Missing	Blank	1146	125	38		57.7	12.1	6.9									
	System				18				2.8								
Total		1987	1031	554	654	100.0	100.0	100.0	100.0								

37. What is your current age?

		Frequency				Percent				Valid Percent				Cumulative Percent			
		Study Year				Study Year				Study Year				Study Year			
		Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5	Year 2	Year 3	Year 4	Year 5
Valid	Under 25	189	91	41	22	9.5	8.8	7.4	3.4	11.0	10.1	7.9	3.4	100.0	100.0	100.0	100.0
	25-34	233	107	91	97	11.7	10.4	16.4	14.8	13.5	11.9	17.6	15.2	13.5	11.9	17.6	15.2
	35-44	374	194	139	190	18.8	18.8	25.1	29.1	21.7	21.5	26.9	29.7	35.2	33.4	44.6	44.8
	45-54	318	164	95	137	16.0	15.9	17.1	20.9	18.5	18.2	18.4	21.4	53.7	51.6	63.0	66.3
	55-64	321	183	78	120	16.2	17.7	14.1	18.3	18.6	20.3	15.1	18.8	72.3	71.8	78.1	85.0

	64 plus	288	163	72	74	14.5	15.8	13.0	11.3	16.7	18.1	14.0	11.6	89.0	89.9	92.1	96.6
	Total	1723	902	516	640	86.7	87.5	93.1	97.9	100.0	100.0	100.0	100.0				
Missing	Blank	264	129	38		13.3	12.5	6.9									
	System				14				2.1								
Total		1987	1031	554	654	100.0	100.0	100.0	100.0								

38. How many people are in your party today?

		Study Year			
		Year 2	Year 3	Year 4	Year 5
N	Valid	1688	849	505	628
	Missing	299	182	49	26
Mean		3.42	3.79	3.39	3.47
Median		2.50	3.00	3.00	3.00
Mode		2	2	2	2
Std. Deviation		2.911	3.224	2.462	4.055
Variance		8.474	10.397	6.064	16.444
Minimum		1	1	1	1
Maximum		38	48	24	60

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

a) City

b) Province/State

c) Country

a) City (cumulative across study years):

City	Frequency	Percent	Valid Percent	Cumulative Percent
100 Mile House	3	.1	.1	.1
Aarau	1	.0	.0	.1
Abbotsford	2	.0	.1	.2
Adebude	1	.0	.0	.2
Adelaide	2	.0	.1	.3
Aerdenhout	1	.0	.0	.3
Agassiz	2	.0	.1	.3
Airdrie	2	.0	.1	.4
Aix-en Provence	1	.0	.0	.4
Alabama	1	.0	.0	.4
Aldergrove	1	.0	.0	.5
Alert Bay	6	.1	.2	.6
Amstelveen	1	.0	.0	.7
Amsterdam	1	.0	.0	.7
Andrew	1	.0	.0	.7
Arbury	1	.0	.0	.8
Arkansas	1	.0	.0	.8
Arnhem	2	.0	.1	.8
Ashcroft	1	.0	.0	.9
Asheville	1	.0	.0	.9
Atlanta	1	.0	.0	.9
Augsburg	1	.0	.0	1.0
Austin	1	.0	.0	1.0

City	Frequency	Percent	Valid Percent	Cumulative Percent
Baden-bad	1	.0	.0	1.0
Balmertown	1	.0	.0	1.0
Banff	1	.0	.0	1.1
Barcelona	1	.0	.0	1.1
Barendrecht	1	.0	.0	1.1
Barry	1	.0	.0	1.1
Basel	1	.0	.0	1.2
Bavaria	1	.0	.0	1.2
Beaver Dam	2	.0	.1	1.3
Bedford	1	.0	.0	1.3
Bella Bella	1	.0	.0	1.3
Bellevue	1	.0	.0	1.3
Bellingham	2	.0	.1	1.4
Berkeley	2	.0	.1	1.5
Bern	1	.0	.0	1.5
Billercay	1	.0	.0	1.5
Black Creek	27	.6	.8	2.3
Bowser	5	.1	.1	2.4
Brampton	1	.0	.0	2.4
Brandon	1	.0	.0	2.5
Breda	1	.0	.0	2.5
Brier	1	.0	.0	2.5
Brugge	1	.0	.0	2.6
Bruno	1	.0	.0	2.6
Brush Prairie	1	.0	.0	2.6

City	Frequency	Percent	Valid Percent	Cumulative Percent
Burnaby	10	.2	.3	2.9
Burns Lake	2	.0	.1	2.9
Bury st edmunds	1	.0	.0	3.0
Byron Bay	1	.0	.0	3.0
Cairing	1	.0	.0	3.0
Calgary	48	1.1	1.3	4.4
California	2	.0	.1	4.4
Cambridge	1	.0	.0	4.5
Campbell River	1546	36.6	43.3	47.8
Canmore	3	.1	.1	47.9
Cardiff	1	.0	.0	47.9
Chemainus	2	.0	.1	48.0
Cheticamp	1	.0	.0	48.0
Chicago	1	.0	.0	48.0
Chilliwack	6	.1	.2	48.2
Claresholm	1	.0	.0	48.2
Cobble Hill	3	.1	.1	48.3
Cobourg	1	.0	.0	48.3
Cochrane	2	.0	.1	48.4
Coeur d alene	1	.0	.0	48.4
Cold Lake	1	.0	.0	48.4
Comic valley	1	.0	.0	48.5
Comox	170	4.0	4.8	53.2
Comox Valley	2	.0	.1	53.3
Conception Bay	1	.0	.0	53.3

City	Frequency	Percent	Valid Percent	Cumulative Percent
Coombs	5	.1	.1	53.4
Copenhagen	1	.0	.0	53.5
Coquitlam	5	.1	.1	53.6
Cortez	1	.0	.0	53.6
Cortez Island	4	.1	.1	53.8
Coupeville	2	.0	.1	53.8
Courtenay	182	4.3	5.1	58.9
Cowichan	2	.0	.1	59.0
Cowichan Bay	1	.0	.0	59.0
Cowichan Station	1	.0	.0	59.0
Cowichan Valley	2	.0	.1	59.1
Cranbrook	5	.1	.1	59.2
Creston	1	.0	.0	59.2
Crofton	2	.0	.1	59.3
Culemborg	1	.0	.0	59.3
Cumberland	32	.8	.9	60.2
Cupertino	1	.0	.0	60.3
Dallas	1	.0	.0	60.3
Damme	1	.0	.0	60.3
Danville	1	.0	.0	60.3
Dawson	1	.0	.0	60.4
Delta	4	.1	.1	60.5
Den Bosch	1	.0	.0	60.5
Denman Island	2	.0	.1	60.6
Denver	3	.1	.1	60.7

City	Frequency	Percent	Valid Percent	Cumulative Percent
Deverta	1	.0	.0	60.7
Dewsbury	1	.0	.0	60.7
Dresden	1	.0	.0	60.7
Dronten	1	.0	.0	60.8
Drumheller	1	.0	.0	60.8
Duncan	48	1.1	1.3	62.1
Ead	1	.0	.0	62.2
Ede	1	.0	.0	62.2
Edihborn	1	.0	.0	62.2
Edmonton	39	.9	1.1	63.3
Eindhaven	1	.0	.0	63.3
El Selvado	1	.0	.0	63.4
Ely	1	.0	.0	63.4
Enter	1	.0	.0	63.4
Erfurt	1	.0	.0	63.5
Errington	1	.0	.0	63.5
Eugene	1	.0	.0	63.5
Eymet	1	.0	.0	63.5
Fanny Bay	2	.0	.1	63.6
Fernie	1	.0	.0	63.6
Fort Collins	1	.0	.0	63.6
Fort Langley	1	.0	.0	63.7
Fort MacMurray	4	.1	.1	63.8
Fort Worth	2	.0	.1	63.8
Franaker	1	.0	.0	63.9

City	Frequency	Percent	Valid Percent	Cumulative Percent
Frankfurt	5	.1	.1	64.0
Fraser Valley	1	.0	.0	64.0
French Creek	1	.0	.0	64.1
Freusburg	1	.0	.0	64.1
Gabriola Island	4	.1	.1	64.2
Gibsons	3	.1	.1	64.3
Gold River	29	.7	.8	65.1
Goodlands	1	.0	.0	65.1
Gouda	1	.0	.0	65.2
Grande Cache	1	.0	.0	65.2
Grande Prairie	4	.1	.1	65.3
Green Bay	1	.0	.0	65.3
Gremolle	1	.0	.0	65.4
Guelph	1	.0	.0	65.4
Hagen	1	.0	.0	65.4
Hamilton	2	.0	.1	65.5
Hanley	1	.0	.0	65.5
Harrison Mills	2	.0	.1	65.6
Hayling Island	1	.0	.0	65.6
Heidelberg	1	.0	.0	65.6
Herentals	1	.0	.0	65.6
Hinton	1	.0	.0	65.7
Holberg	1	.0	.0	65.7
Hong Kong	1	.0	.0	65.7
Hoorn	1	.0	.0	65.8

City	Frequency	Percent	Valid Percent	Cumulative Percent
Hope	1	.0	.0	65.8
Hornby Island	2	.0	.1	65.8
Houston	2	.0	.1	65.9
Howe Island	1	.0	.0	65.9
Hubbards	1	.0	.0	65.9
Jasper	1	.0	.0	66.0
Kamloops	24	.6	.7	66.6
Kampen	1	.0	.0	66.7
Kansas	2	.0	.1	66.7
Kelowna	21	.5	.6	67.3
Kiel	1	.0	.0	67.3
Kingston	2	.0	.1	67.4
Kitimat	1	.0	.0	67.4
Kolin	1	.0	.0	67.5
Kyoto	1	.0	.0	67.5
La-Crete	1	.0	.0	67.5
Lacombe	1	.0	.0	67.5
Ladner	2	.0	.1	67.6
Ladysmith	14	.3	.4	68.0
Lake Cowichan	3	.1	.1	68.1
Lake Stevens	1	.0	.0	68.1
Langley	11	.3	.3	68.4
Lantzville	8	.2	.2	68.6
Lenexa	1	.0	.0	68.7
Lethbridge	4	.1	.1	68.8

City	Frequency	Percent	Valid Percent	Cumulative Percent
Limage	1	.0	.0	68.8
Lisatore	1	.0	.0	68.8
London	7	.2	.2	69.0
Los Angeles	2	.0	.1	69.1
Loveland	1	.0	.0	69.1
Lucerne	1	.0	.0	69.1
Luebeck	1	.0	.0	69.2
Mackay	1	.0	.0	69.2
Makawao	1	.0	.0	69.2
Malahat	1	.0	.0	69.3
Maniwaki	1	.0	.0	69.3
Maple Ridge	8	.2	.2	69.5
Massena	1	.0	.0	69.5
Medicine Hat	3	.1	.1	69.6
Medstead	1	.0	.0	69.6
Melbourne	1	.0	.0	69.7
Merville	3	.1	.1	69.8
Mexico City	1	.0	.0	69.8
Michigan	1	.0	.0	69.8
Midway	1	.0	.0	69.8
Milano	1	.0	.0	69.9
Mill Bay	6	.1	.2	70.0
Mississippi	1	.0	.0	70.1
Monterey	1	.0	.0	70.1
Montpellier	1	.0	.0	70.1

City	Frequency	Percent	Valid Percent	Cumulative Percent
Montreal	2	.0	.1	70.2
Moscow	1	.0	.0	70.2
Mt. Curry	1	.0	.0	70.2
Mt. Vernon	1	.0	.0	70.3
Munich	3	.1	.1	70.3
N.Augusta	1	.0	.0	70.4
Nanaimo	168	4.0	4.7	75.1
Nanoose Bay	11	.3	.3	75.4
Neuburg	1	.0	.0	75.4
New Westminster	4	.1	.1	75.5
New York	2	.0	.1	75.6
Newcastle	1	.0	.0	75.6
Nice	1	.0	.0	75.6
nieuwebreg	1	.0	.0	75.7
Nivenille	1	.0	.0	75.7
North Saanich	1	.0	.0	75.7
North Vancouver	7	.2	.2	75.9
Norwich	1	.0	.0	76.0
Nymengen	1	.0	.0	76.0
Nyrerdal	1	.0	.0	76.0
Oakbay	1	.0	.0	76.0
Okanogan	1	.0	.0	76.1
Oliver	1	.0	.0	76.1
Olympia	1	.0	.0	76.1
Othmarsingen	1	.0	.0	76.1

City	Frequency	Percent	Valid Percent	Cumulative Percent
Ottawa	7	.2	.2	76.3
Oyster River	1	.0	.0	76.4
Palmerston North	1	.0	.0	76.4
Paris	3	.1	.1	76.5
Parksville	61	1.4	1.7	78.2
Peace River	2	.0	.1	78.3
Pemberton	1	.0	.0	78.3
Penatang	1	.0	.0	78.3
Penticton	2	.0	.1	78.4
Perth	4	.1	.1	78.5
Phoenix	3	.1	.1	78.6
Pianwa	1	.0	.0	78.6
Pine Lake	1	.0	.0	78.6
Planet earth	1	.0	.0	78.6
Plano	1	.0	.0	78.7
Port Alberni	34	.8	1.0	79.6
Port Alice	2	.0	.1	79.7
Port Angeles	1	.0	.0	79.7
Port Coquitlam	4	.1	.1	79.8
Port Hardy	18	.4	.5	80.3
Port McNeil	6	.1	.2	80.5
Portland	7	.2	.2	80.7
Pouch River	1	.0	.0	80.7
Powell River	9	.2	.3	81.0
Poznan	1	.0	.0	81.0

City	Frequency	Percent	Valid Percent	Cumulative Percent
Prince Albert	1	.0	.0	81.0
Prince George	5	.1	.1	81.2
Prince Rupert	1	.0	.0	81.2
Pt. Edward	1	.0	.0	81.2
Pt. Roberts	1	.0	.0	81.3
Quadra	3	.1	.1	81.3
Quadra Island	8	.2	.2	81.6
Qualicum	3	.1	.1	81.6
Qualicum Beach	18	.4	.5	82.1
Quardra Island	1	.0	.0	82.2
Queens	2	.0	.1	82.2
Quesnel	1	.0	.0	82.3
Red Deer	3	.1	.1	82.3
Regina	6	.1	.2	82.5
Reno	1	.0	.0	82.5
Revelstoke	1	.0	.0	82.6
Richmond	14	.3	.4	83.0
Rio Vista	1	.0	.0	83.0
Rocky Mountain House	4	.1	.1	83.1
Romo	1	.0	.0	83.1
Rotorua	1	.0	.0	83.2
Rotterdam	1	.0	.0	83.2
Royston	1	.0	.0	83.2
Russia	1	.0	.0	83.2

City	Frequency	Percent	Valid Percent	Cumulative Percent
Saanich	5	.1	.1	83.4
Saanicton	1	.0	.0	83.4
Sacramento	3	.1	.1	83.5
Saffron	1	.0	.0	83.5
Salmon Arm	1	.0	.0	83.5
Salt Spring Island	6	.1	.2	83.7
San Diego	1	.0	.0	83.7
San Francisco	1	.0	.0	83.8
San Jose	1	.0	.0	83.8
San Juan Islands	1	.0	.0	83.8
SanRafael	1	.0	.0	83.9
Santa Cruz	1	.0	.0	83.9
Santa Fay	1	.0	.0	83.9
Sardis	1	.0	.0	83.9
Saskatoon	6	.1	.2	84.1
Sayward	7	.2	.2	84.3
Seaton	1	.0	.0	84.3
Seattle	25	.6	.7	85.0
Senneterre	1	.0	.0	85.1
Seoul	1	.0	.0	85.1
Shawnigan Lake	10	.2	.3	85.4
Sheabogenbosch	1	.0	.0	85.4
Sherwood Park	1	.0	.0	85.4
Sidney	9	.2	.3	85.7
Singapore	1	.0	.0	85.7

City	Frequency	Percent	Valid Percent	Cumulative Percent
Slave Lake	1	.0	.0	85.7
Sooke	17	.4	.5	86.2
Squamish	2	.0	.1	86.3
St. Albert	2	.0	.1	86.3
St. John's	1	.0	.0	86.4
St.Helens	1	.0	.0	86.4
Stevenage	1	.0	.0	86.4
Stoney Plain	1	.0	.0	86.4
Strasbourg	1	.0	.0	86.5
Stratford	2	.0	.1	86.5
Stutgart	1	.0	.0	86.5
Sudbury	1	.0	.0	86.6
Sunshine Coast	1	.0	.0	86.6
Surrey	21	.5	.6	87.2
Sussex	1	.0	.0	87.2
Sydney	1	.0	.0	87.2
Tacoma	4	.1	.1	87.4
Tahsis	2	.0	.1	87.4
Tangstedt	1	.0	.0	87.4
Terrace	1	.0	.0	87.5
Tewksbury	1	.0	.0	87.5
Tianjin	1	.0	.0	87.5
Tilburg	2	.0	.1	87.6
Tofino	9	.2	.3	87.8
Toronto	19	.4	.5	88.4

City	Frequency	Percent	Valid Percent	Cumulative Percent
Toulouse	1	.0	.0	88.4
Traralgch	1	.0	.0	88.4
Traverse City	1	.0	.0	88.5
Troy	1	.0	.0	88.5
Truro	1	.0	.0	88.5
Tulalip	2	.0	.1	88.6
Ucluelet	2	.0	.1	88.6
University Place	1	.0	.0	88.6
Utrecht	4	.1	.1	88.8
Valkenswaard	1	.0	.0	88.8
Vancouver	72	1.7	2.0	90.8
Vancouver WA	1	.0	.0	90.8
Vanderhoof	1	.0	.0	90.9
Vernon	14	.3	.4	91.3
Victoria	262	6.2	7.3	98.6
Villingen	1	.0	.0	98.6
Vojens	1	.0	.0	98.7
Voorburg	1	.0	.0	98.7
Vulcan	1	.0	.0	98.7
Wagga Wagga	1	.0	.0	98.7
Wailuku	1	.0	.0	98.8
Warburg	1	.0	.0	98.8
Washington DC	1	.0	.0	98.8
Waterloo	1	.0	.0	98.9
Wellington	2	.0	.1	98.9

City	Frequency	Percent	Valid Percent	Cumulative Percent
West Vancouver	1	.0	.0	98.9
Wetaskiwin	2	.0	.1	99.0
Whistler	2	.0	.1	99.0
White Rock	6	.1	.2	99.2
Wigton	1	.0	.0	99.2
Williams Lake	1	.0	.0	99.3
Wiltshire	1	.0	.0	99.3
Winchester	1	.0	.0	99.3
Windsor	2	.0	.1	99.4
Winnipeg	5	.1	.1	99.5
Wolverhampton	1	.0	.0	99.6
Woods Hole	1	.0	.0	99.6
Worchester	1	.0	.0	99.6
Worthing	1	.0	.0	99.6
Woss	2	.0	.1	99.7
Yakima	1	.0	.0	99.7
Yarmouth	1	.0	.0	99.7
Yellowknife	1	.0	.0	99.8
Youbou	1	.0	.0	99.8
Zeballos	5	.1	.1	99.9
Zumbudwae	1	.0	.0	100.0
Zurich	1	.0	.0	100.0
Total	3568	84.4	100.0	
Missing	658	15.6		
Total	4226	100.0		

b) Province/State (cumulative across study years):

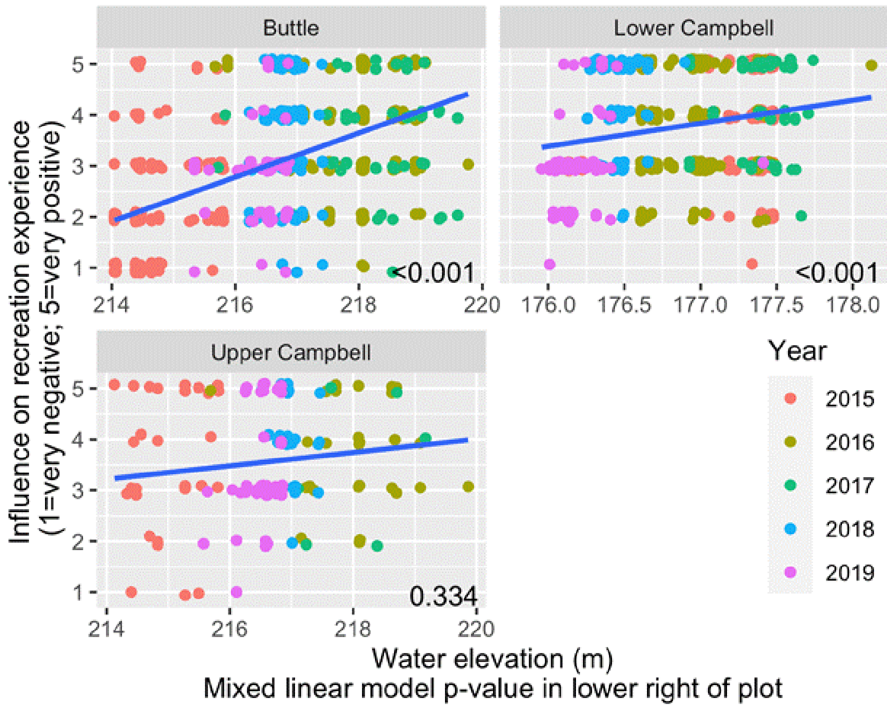
Country	Frequency	Percent	Valid Percent	Cumulative Percent
AB	141	3.3	4.1	4.1
AL	1	.0	.0	4.1
AR	1	.0	.0	4.1
AZ	4	.1	.1	4.2
BC	3104	73.5	89.4	93.7
CA	21	.5	.6	94.3
Cam	1	.0	.0	94.3
CO	5	.1	.1	94.4
DC	1	.0	.0	94.5
FL	2	.0	.1	94.5
Gel	1	.0	.0	94.6
HI	2	.0	.1	94.6
IL	1	.0	.0	94.6
KA	2	.0	.1	94.7
KS	1	.0	.0	94.7
MA	3	.1	.1	94.8
MB	9	.2	.3	95.1
MI	2	.0	.1	95.1
MS	1	.0	.0	95.2
NB	1	.0	.0	95.2
NC	2	.0	.1	95.2
NL	2	.0	.1	95.3
NM	1	.0	.0	95.3
NS	5	.1	.1	95.5
NV	1	.0	.0	95.5
NWT	1	.0	.0	95.5
NY	3	.1	.1	95.6
ON	57	1.3	1.6	97.3
OR	11	.3	.3	97.6
QC	5	.1	.1	97.7
SA	2	.0	.1	97.8
SC	1	.0	.0	97.8
SK	15	.4	.4	98.2
Suf	1	.0	.0	98.3
TX	5	.1	.1	98.4
Val	1	.0	.0	98.4
WA	50	1.2	1.4	99.9
WI	2	.0	.1	99.9
Wis	1	.0	.0	100.0
YK	1	.0	.0	100.0
Subtotal	3471	82.1	100.0	
Missing	755	17.9		
Total	4226	100.0		

c) Country (cumulative across study years):

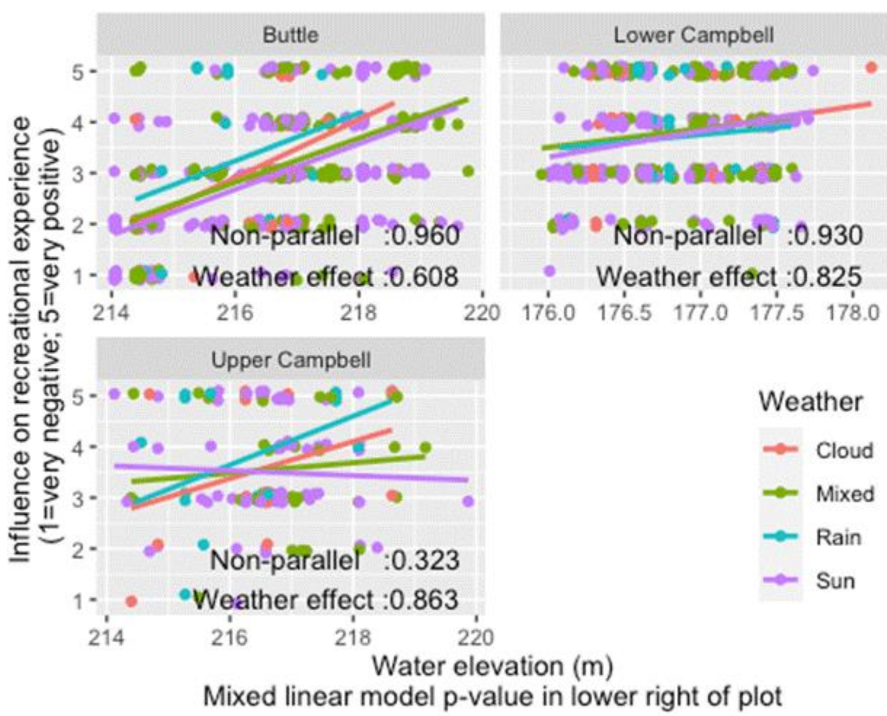
	Frequency	Percent	Valid Percent	Cumulative Percent
Australia	17	.4	.5	.5
Austria	1	.0	.0	.5
Belgium	2	.0	.1	.5
Brussels	1	.0	.0	.6
Canada	3351	79.3	91.9	92.5
China	4	.1	.1	92.6
Denmark	5	.1	.1	92.8
England	13	.3	.4	93.1
France	11	.3	.3	93.4
Germany	32	.8	.9	94.3
Holland	8	.2	.2	94.5
Italy	3	.1	.1	94.6
Japan	4	.1	.1	94.7
Mexico	2	.0	.1	94.8
Netherlands	29	.7	.8	95.6
New Zealand	4	.1	.1	95.7
Poland	1	.0	.0	95.7
Russia	3	.1	.1	95.8
Singapore	1	.0	.0	95.8
South Korea	1	.0	.0	95.8
Spain	1	.0	.0	95.9
Sweden	1	.0	.0	95.9
Switzerland	9	.2	.2	96.1

	Texas	1	.0	.0	96.2
	Netherlands	1	.0	.0	96.2
	UK	12	.3	.3	96.5
	USA	126	3.0	3.5	100.0
	Wales	1	.0	.0	100.0
	Subtotal	3645	86.3	100.0	
	Missing	581	13.7		
Total		4226	100.0		

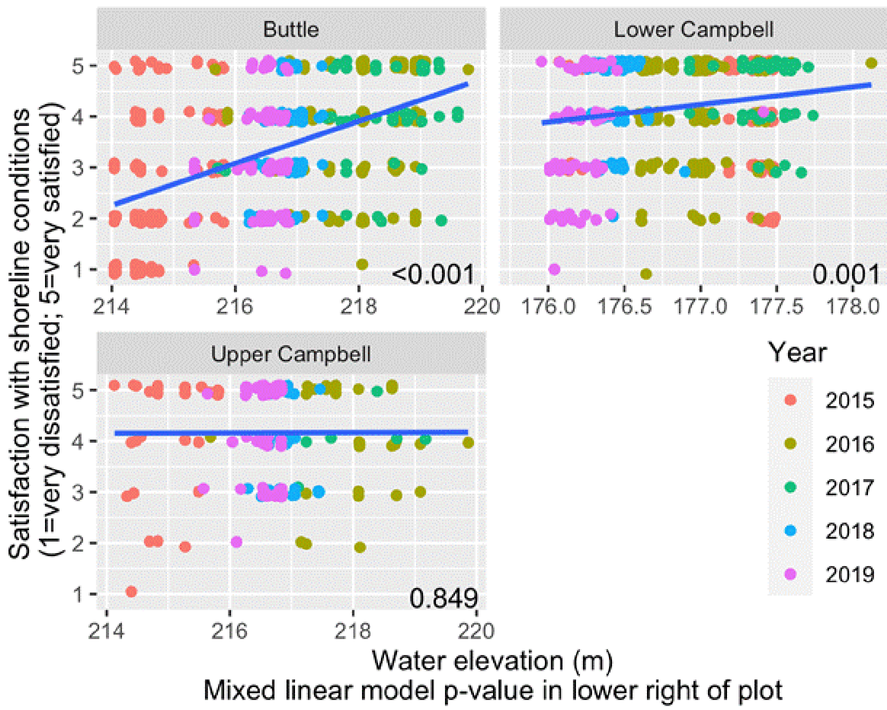
APPENDIX B. SCATTERPLOTS FOR MANAGEMENT QUESTIONS



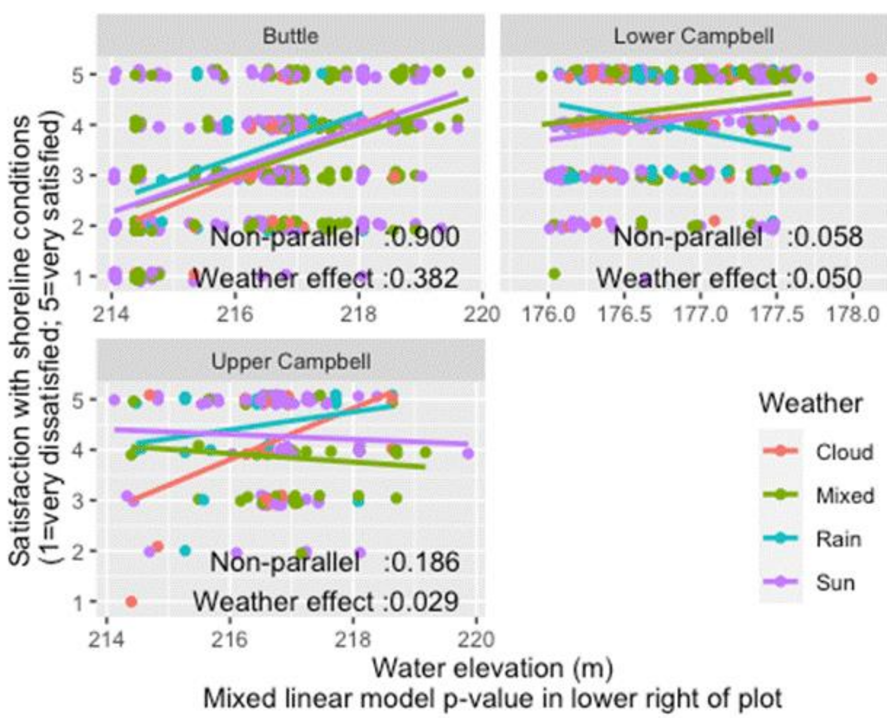
Appendix B Figure 1. Scatterplots of influence of water levels on recreation experience and daily average water elevation



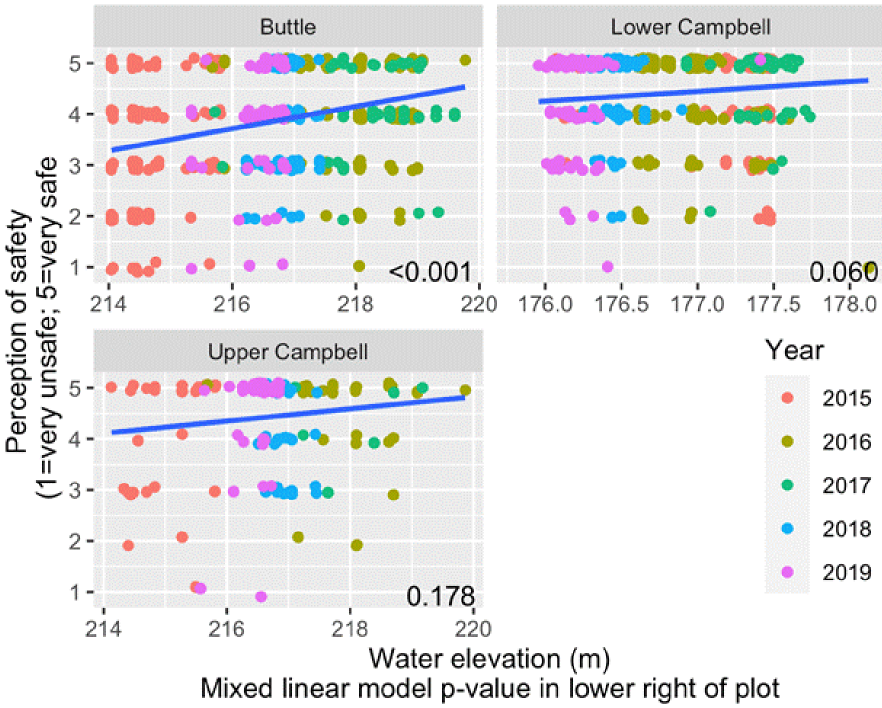
Appendix B Figure 2. Effect of weather on relationship between influence of water level on recreation experience and daily average water elevation



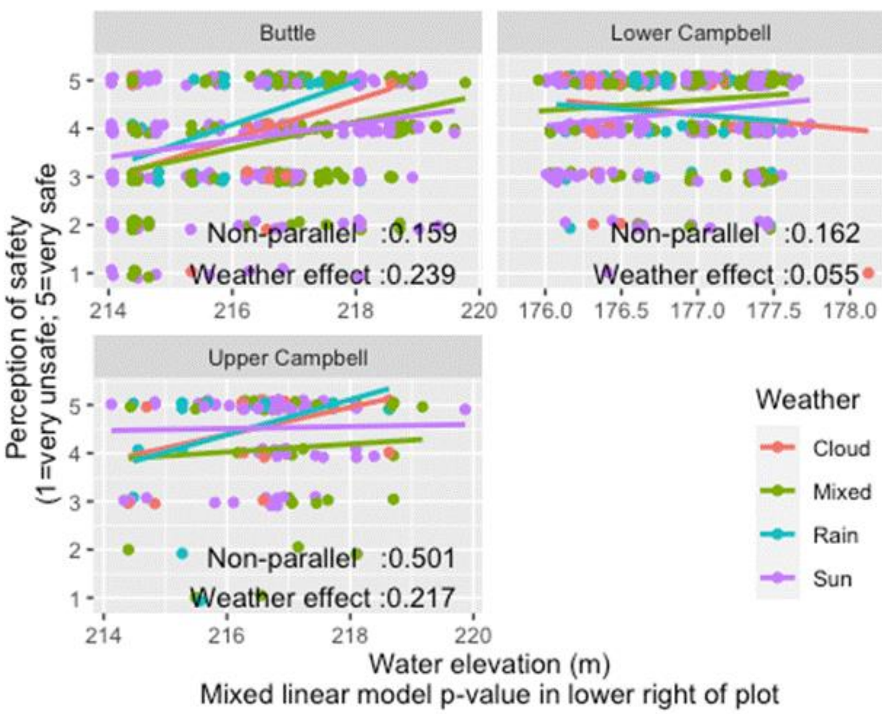
Appendix B Figure 3. Scatterplots of satisfaction with shoreline condition and daily average water elevation



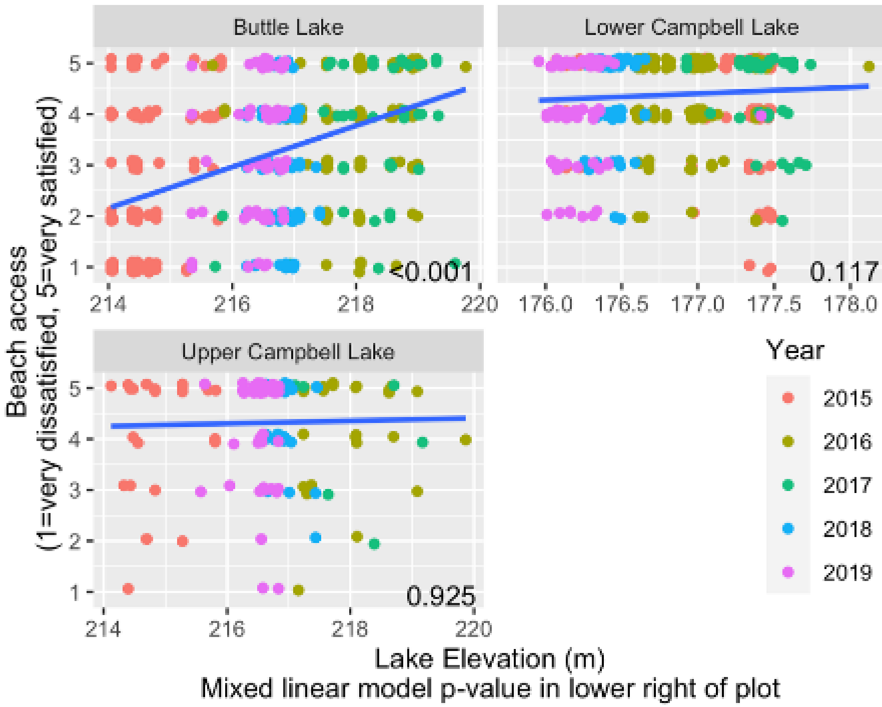
Appendix B Figure 4. Effect of weather on relationship between satisfaction with shoreline condition and daily average water elevation



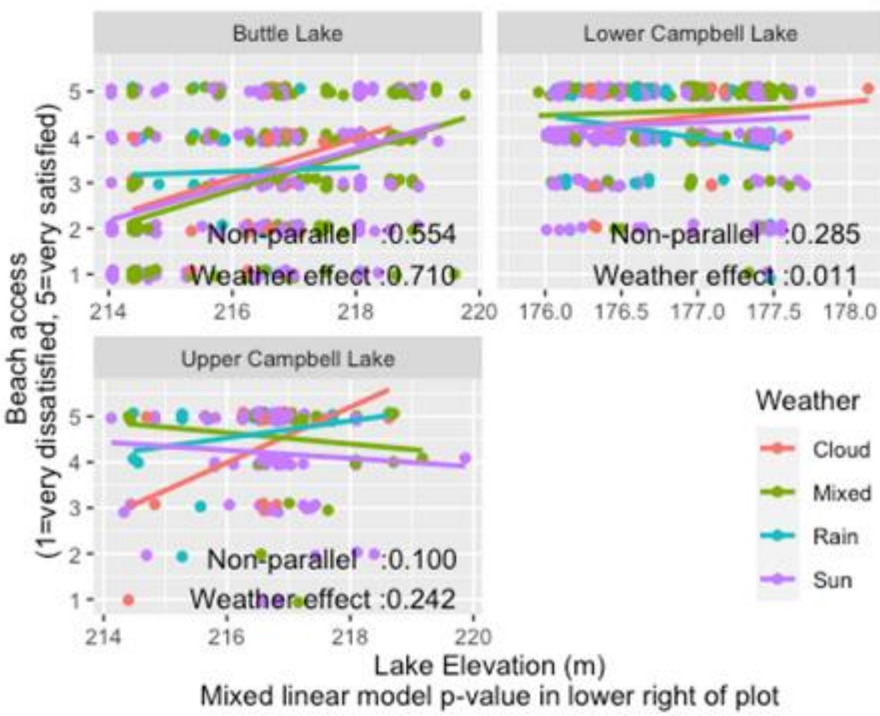
Appendix B Figure 5. Scatterplots of perception of safety and daily average water elevation



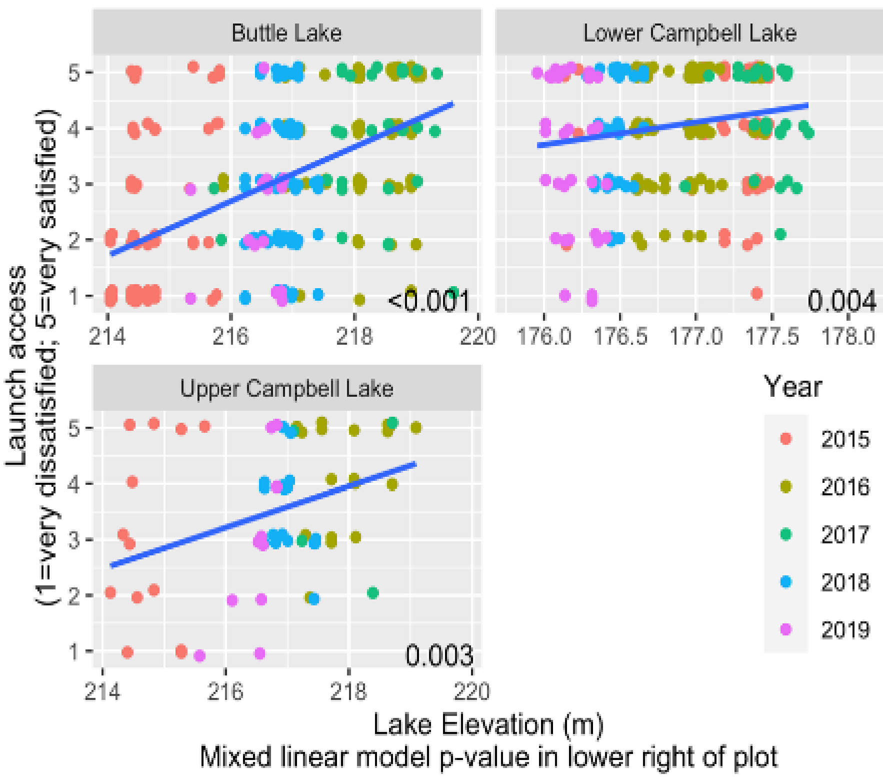
Appendix B Figure 6. Effect of weather on relationship between perception of safety and daily average water elevation



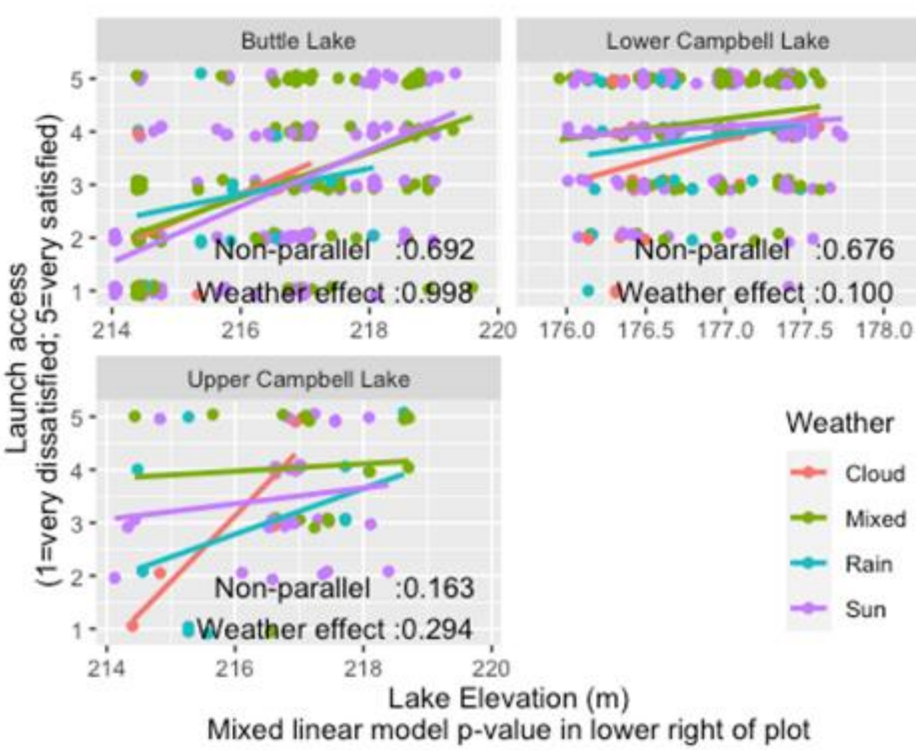
Appendix B Figure 7. Scatterplots of satisfaction with access to beach and daily average water elevation



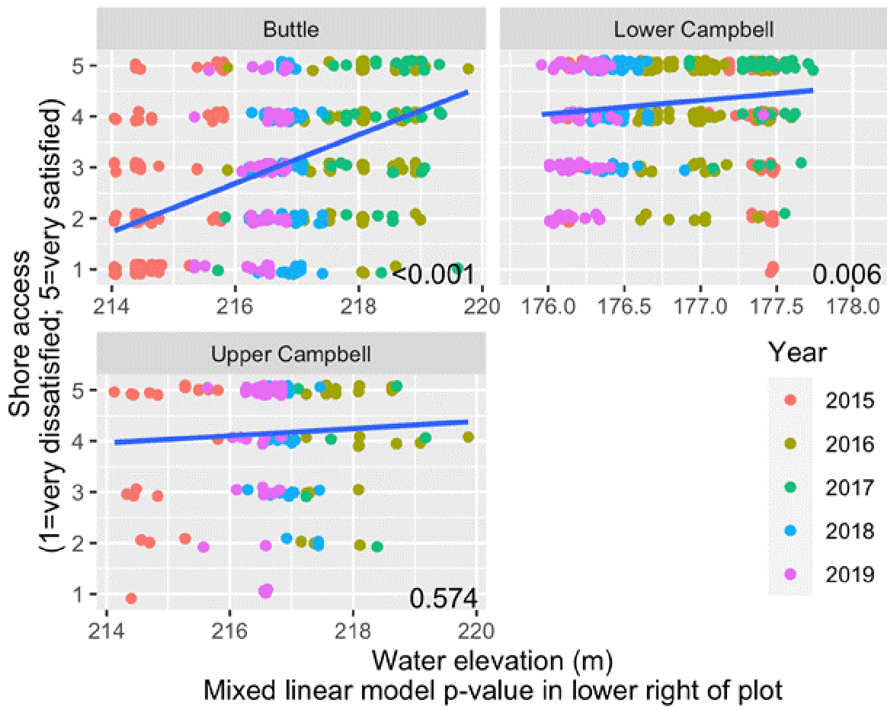
Appendix B Figure 8. Effect of weather on relationship between satisfaction with access to beach and daily average water elevation



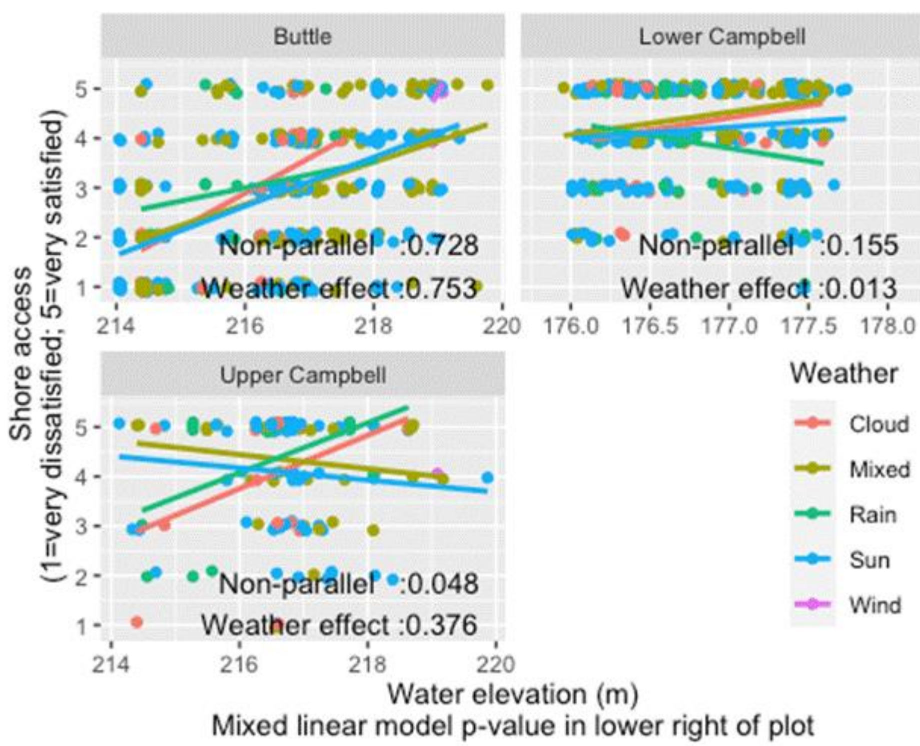
Appendix B Figure 9. Scatterplots of satisfaction with access to water via boat launch and daily average water elevation



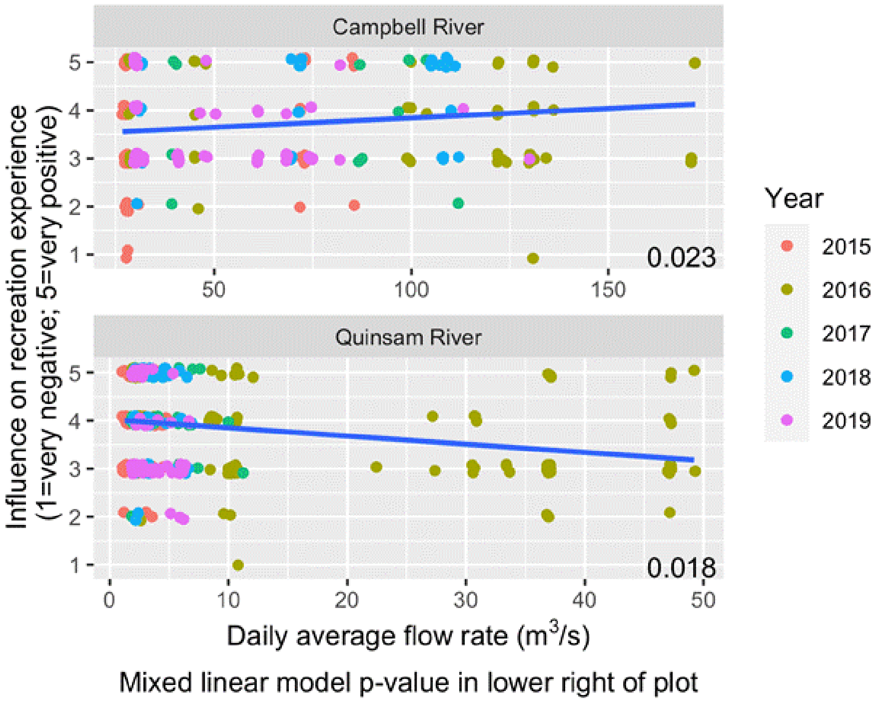
Appendix B Figure 10. Effect of weather on relationship between satisfaction with access to water via boat launch and daily average water elevation



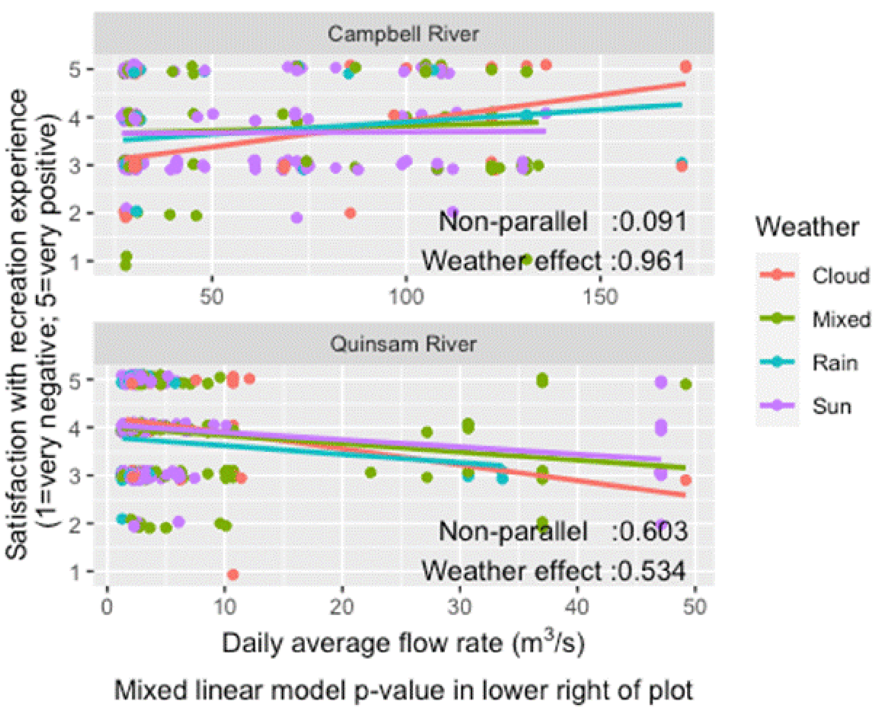
Appendix B Figure 11. Scatterplots of satisfaction with access to water via shoreline and daily average water elevation



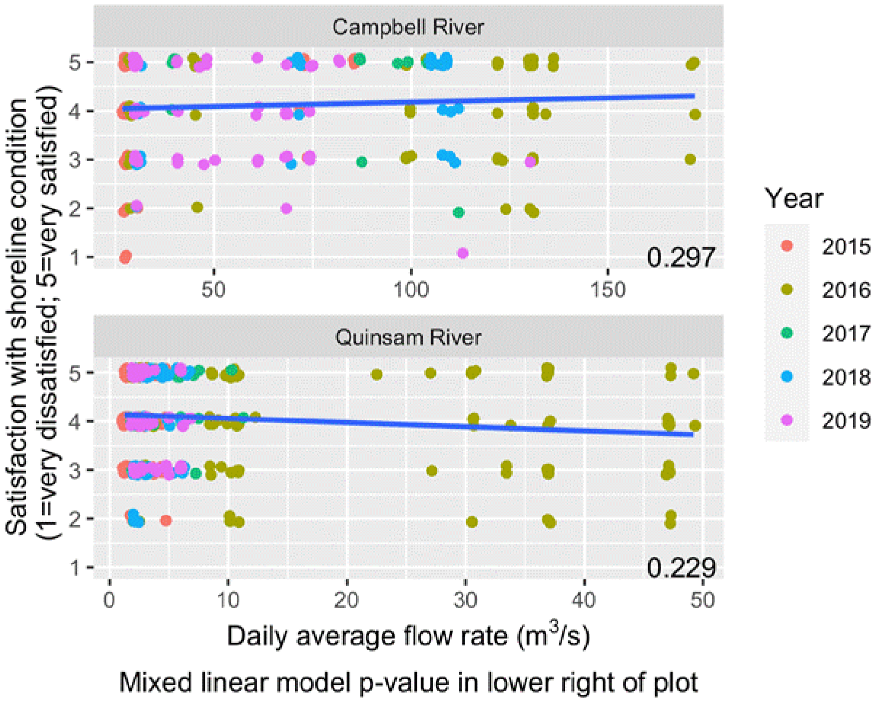
Appendix B Figure 12. Effect of weather on relationship between satisfaction with access to water via shoreline and daily average water elevation



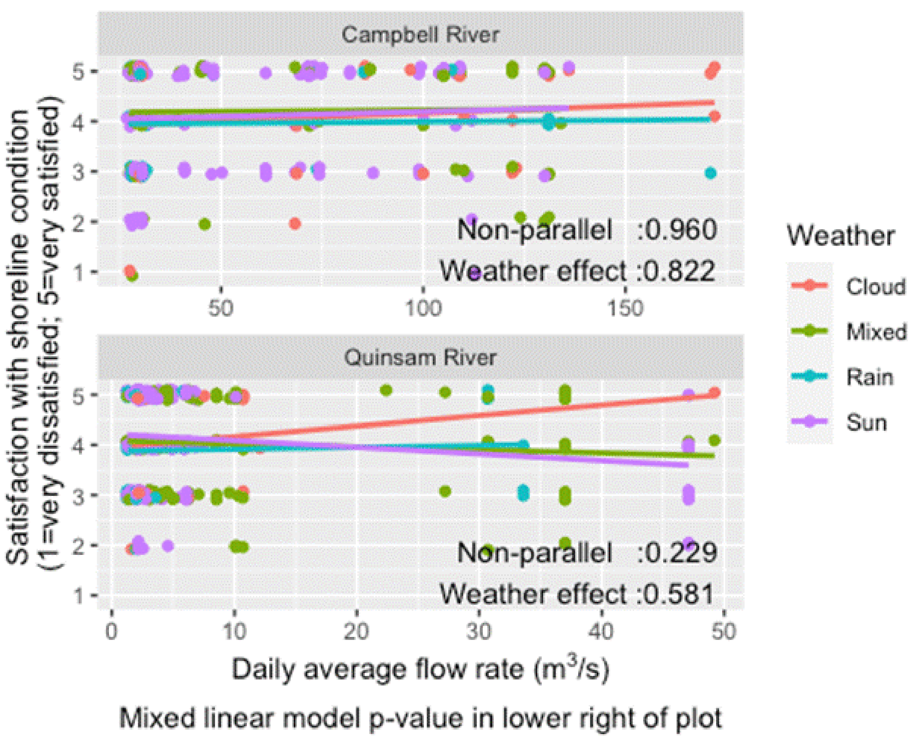
Appendix B Figure 13. Scatterplots of influence of water flows on recreation experience and daily average flow rate



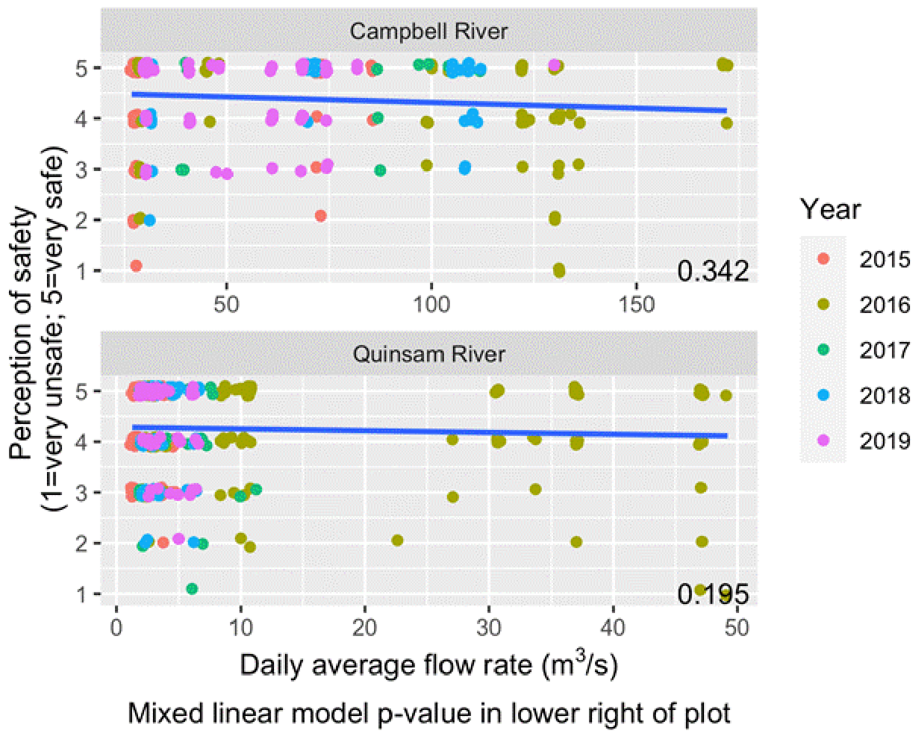
Appendix B Figure 14. Effect of weather on relationship between influence of water flows on recreation experience and daily average flow rate



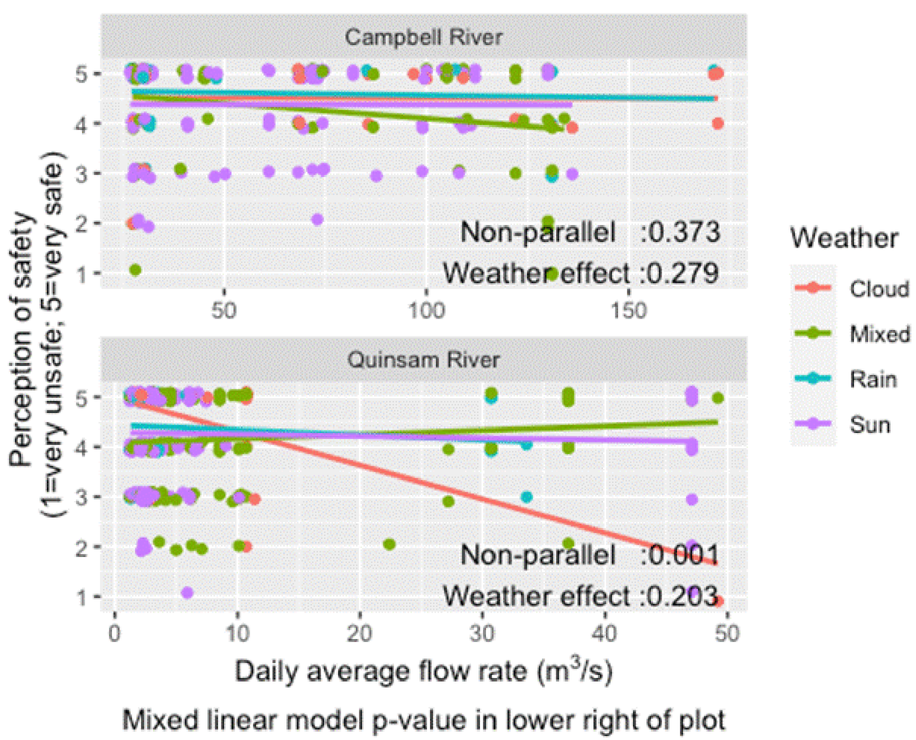
Appendix B Figure 15. Scatterplots of satisfaction with river shoreline conditions and daily average flow rate



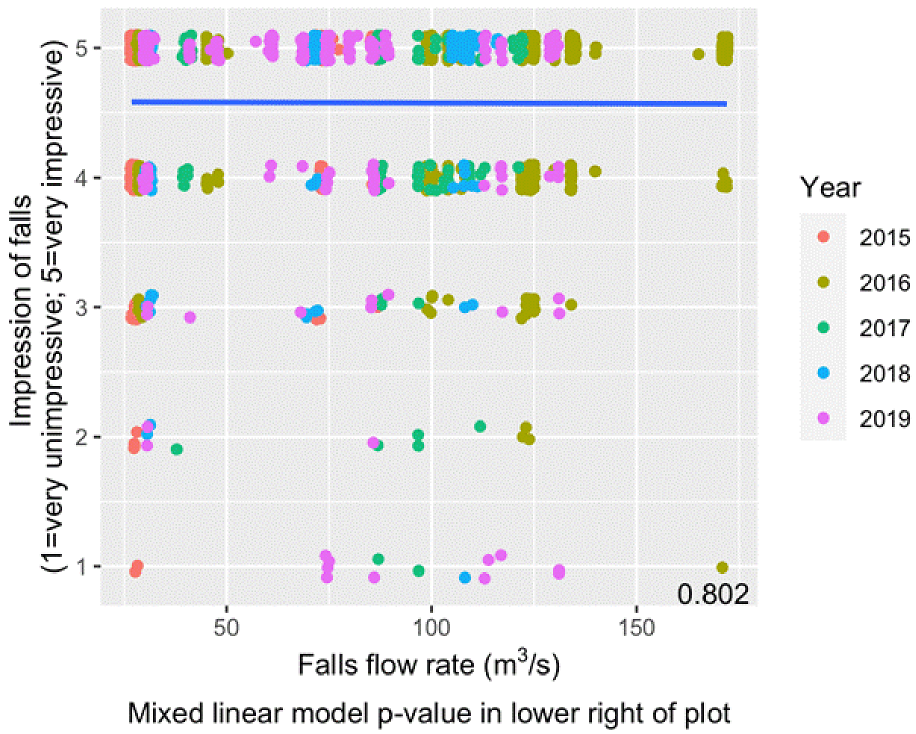
Appendix B Figure 16. Effect of weather on relationship between satisfaction with river shoreline conditions and daily average flow rate



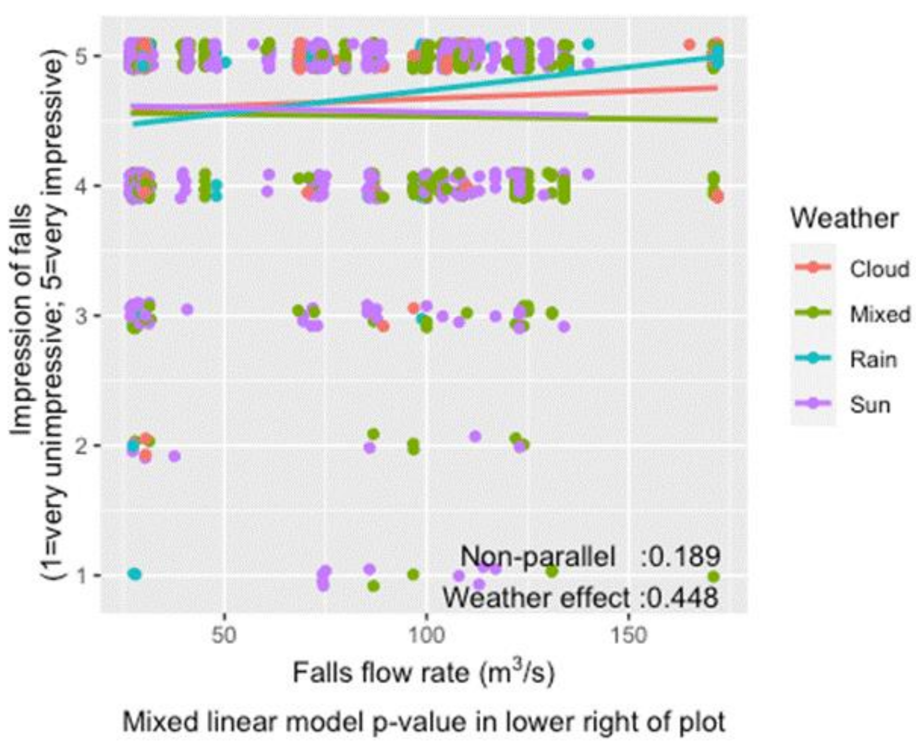
Appendix B Figure 17. Scatterplots of perception of safety and daily average flow rate



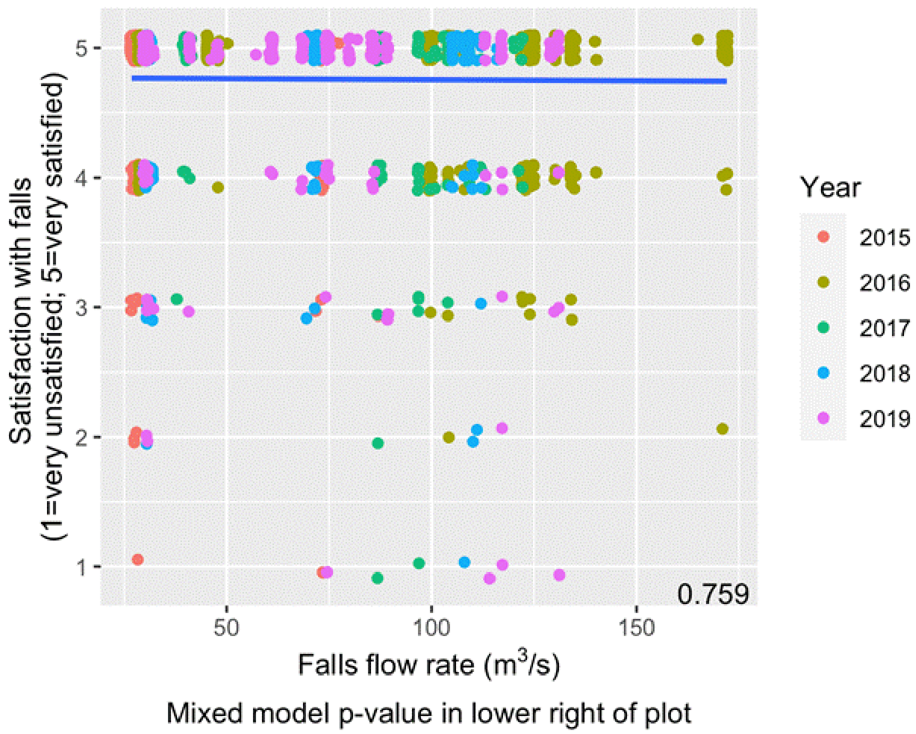
Appendix B Figure 18. Effect of weather on relationship between perception of safety and daily average flow rate



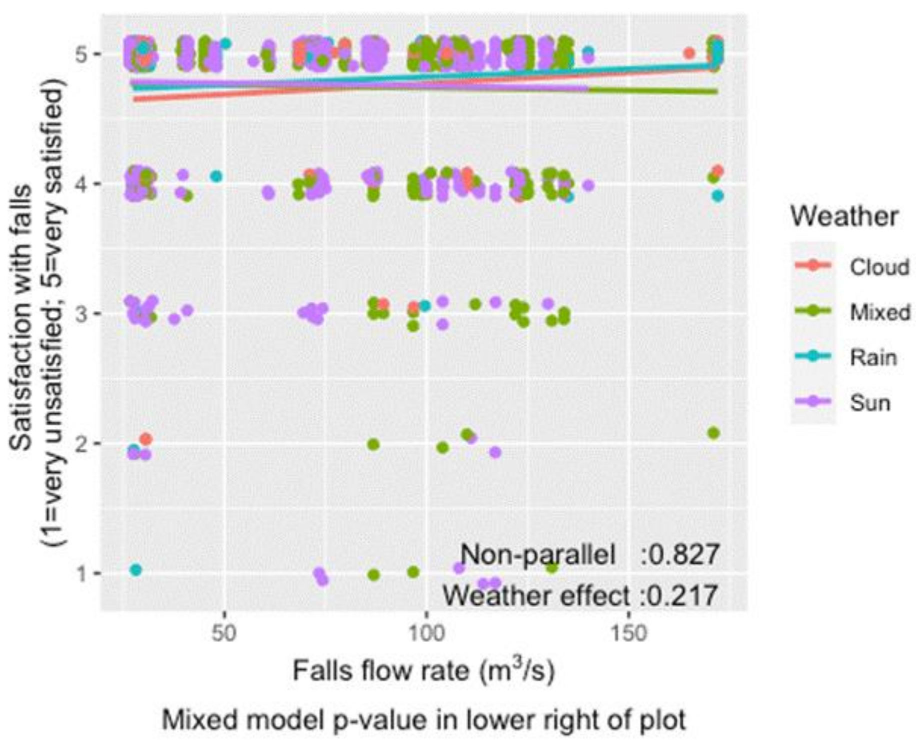
Appendix B Figure 19. Scatterplot of impressiveness of falls and daily average flow rate



Appendix B Figure 20. Effect of weather on relationship between impressiveness of falls and daily average flow rate



Appendix B Figure 21. Scatterplot of satisfaction with viewing experience at the falls and daily average flow rate



Appendix B Figure 22. Effect of weather on relationship between satisfaction of viewing experience at falls and daily average flow rate

APPENDIX C. LOWER CAMPBELL RESERVOIR DECISION CHOICE EXPERIMENT KNOWN AND 4-CLASS MODEL RESULTS

LOWER CAMPBELL RESERVOIR DCE – KNOWN CLASS AND 4-CLASS LATENT MODEL RESULTS

KNOWN-CLASS MULTINOMIAL LOGIT MODELS

Known class models were used to manually investigate the preferences of specific "chosen" user groups. Appendix Table 1 presents a comparison of multiple 'known class' models based on respondent identification as: Boaters; 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 at the falls, and Hikers.

As with Upper Campbell reservoir samples, there are differences between these known classes and the general 1-class model noted in **bold** and outlined. In general, the preferences of boaters at Lower Campbell differed the most compared to the general 1-class model results as they strongly preferred average and high water levels. In contrast, several groups had no significant differences from the 1-class model (e.g. non-Campbell River residents, Campers). The known class comparisons for the Lower Campbell shows that respondents continue to be homogenous in their negative perception of extremely high (i.e. 'High high') water conditions.

Appendix Table 1. Results of the "known class" multinomial logit model testing effects of reservoir features

Attribute and Attribute Level	Boaters only	People who plan to recreate on the lake	People who do not plan to recreate on the lake	Campbell River residents	Non-Campbell River residents	Campers only	Sightseeing Falls	Hikers only
	n=22	n=255	n=365	n=269	n=363	n=197	n=69	n=173
Quantity of Debris								
(1)No Debris	1.9212	1.3855	0.9626	1.0946	1.1473	1.2924	1.2013	1.0773
(2)Little Debris	**-0.1282**	0.3248	0.1158	0.2456	0.1212	0.2666	**-0.1442**	0.1369
(3)Average Debris	-0.1814	-0.4248	-0.2156	-0.3482	-0.2447	-0.3364	**0.1069**	-0.3095
(4)A lot of Debris	-1.6116	-1.2855	-0.8628	-0.9920	-1.0237	-1.2225	-1.1640	-0.9046
Water Level								
(1)Low low	0.2439	0.4848	0.2491	0.4202	0.2706	0.6534	0.5565	0.1992
(2)Low	0.2599	0.5029	0.4893	0.5690	0.4287	0.6066	0.5262	0.5432
(3)Average	0.4916	0.4659	0.2978	0.3440	0.3597	0.4534	0.2055	0.2535
(4)High	**0.4531**	-0.1554	-0.0494	-0.1205	-0.0897	-0.3129	-0.0943	-0.1095
(5)High high	-1.4485	-1.2982	-0.9868	-1.2128	-0.9693	-1.4006	-1.1938	-0.8864
Shoreline Features								
(1) Rocks	**-0.0272**	0.0389	0.0383	**-0.0249**	0.0760	0.0023	0.1073	0.0749
(2) Sand	**0.0272**	-0.0389	-0.0383	**0.0249**	-0.0760	-0.0023	-0.1073	-0.0749
Boat Ramp Type								
(1) None	0.2747	0.0319	0.0362	0.0415	0.0296	0.0697	0.0636	**-0.0341**
(2) Gravel road	**0.0126**	-0.1415	-0.0660	-0.0326	-0.1428	-0.0109	-0.2244	-0.1507
(3) Concrete pad	**-0.2874**	0.1097	0.0298	-0.0089	0.1132	-0.0588	0.1608	0.1848

FOUR-CLASS MULTINOMIAL LOGIT MODEL

Appendix Table 2 highlights the results of a 4-class latent model in which all reservoir features are highly significant (p <.01) and differences between classes exist. The 4-class latent model suggests that for 27% of recreationists, 'High' water levels are most preferred (see Class 2). Those same recreationists also prefer concrete boat ramps. For 20% (see Class 3) of recreationists, the 'Low low' level of water is highly preferred. Those same recreationists indicate negative preference for 'High' and 'High high' water levels. Given how different these classes present their preferences for water level, further analysis of latent variables could help explain differences between classes.

Appendix Table 2. 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	**33.94% n≅215**	**27.12% n≅171**	**19.82% n≅125**	**19.11% n≅121**	
	Part-worth utility estimates				
Quantity of Debris					
(1) No Debris	7.9777	-0.0503	1.9830	3.6413	2.7E-53
(2) Little Debris	-0.0589	0.0287	0.7987	1.3701	
(3) Average Debris	-4.6463	0.0567	0.1111	0.3175	
(4) A lot of Debris	-3.2726	-0.0352	-2.8928	-5.3289	
Water Level					
(1) Low low	-3.6752	-0.1269	3.4259	0.5507	5.2E-40
(2) Low	4.5785	-0.2064	1.0148	1.3470	
(3) Average	5.6038	0.0098	1.6821	0.3876	
(4) High	-1.1804	0.2893	-0.4677	-0.3768	
(5) High high	-5.3267	0.0343	-5.6551	-1.9085	
Shore Line Features					
(1) Rocks	1.8240	0.0033	-0.4823	-0.3787	0.00014
(2) Sand	-1.8240	-0.0033	0.4823	0.3787	
Boat Ramp Type					
(1) None	-1.8155	0.0786	0.1496	0.4896	0.000028
(2) Gravel road	0.8057	0.0007	-0.8998	-0.0375	
(3) Concrete pad	1.0098	-0.0793	0.7502	-0.4521	

APPENDIX D. LOWER CAMPBELL RESERVOIR DECISION SUPPORT SYSTEM SCENARIOS

LOWER CAMPBELL RESERVOIR DCE - DECISION SUPPORT SYSTEM SCENARIOS AND OUTCOMES

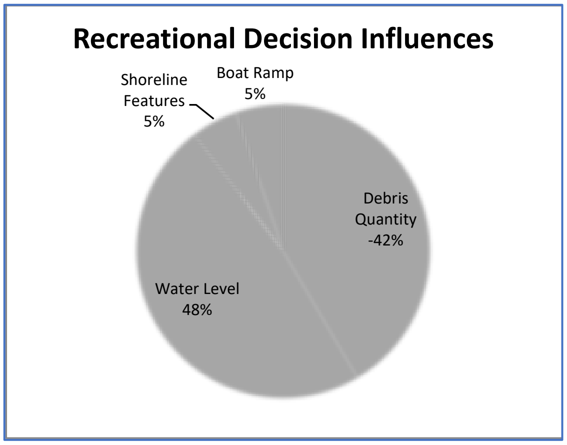
Scenario 1. Reservoir conditions most characteristic of Lower Campbell Reservoir

Existing reservoir conditions in the Lower Campbell Reservoir present the following combination of features: ***No boat launch, rocky shoreline, and average debris levels.*** The relative market share for these conditions (compared to the status quo of choosing neither) is shown in Appendix C Figure 1. This scenario, designed to most closely resemble the actual conditions of Lower Campbell Reservoir indicates that low water conditions tend to be slightly favored over average water levels, but that high-high water conditions are particularly undesirable and lead to a lower percentage of recreationists choosing to recreate at the reservoir. The relative scale of each reservoir feature contributing to the decision of recreationists visiting a reservoir is shown in Appendix C Figure 2.

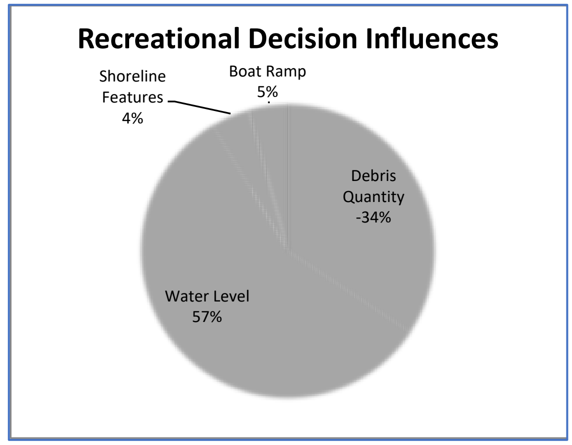
RECREATION BASED ON WATER LEVEL (m)				
El<176.24	*176.24<El<176.68*	*176.68<El<177.12*	*177.12<El<177.56*	*>177.56m*
(1)LOW LOW	*(2)Low*	*(3)Average*	*(4)High*	*(5)HIGH HIGH*
73%	76%	74%	64%	40%
1.12	1.30	1.15	0.73	0.28

Appendix C Figure 1. Market share (% of recreationists choosing to recreate at the reservoir compared to not going) of recreationists visiting the existing Lower Campbell Reservoir with average debris, rocky shores, and no boat launch by water level. Total utility at each water level is shown below % values.

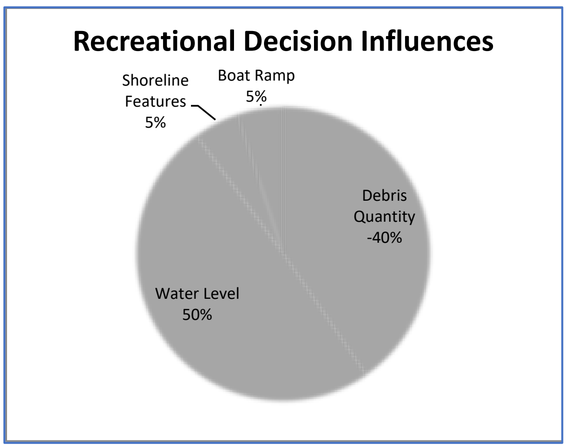
(1) Low low



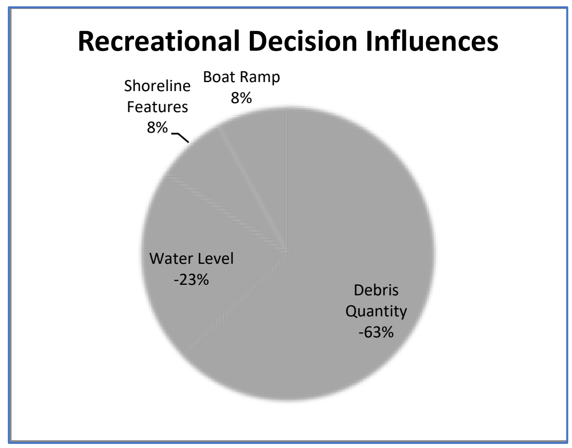
(2) Low



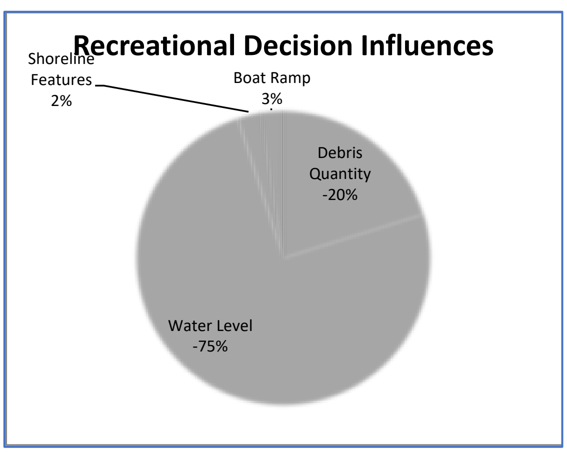
(3) Average



(4) High



(5) High high



Appendix C Figure 2. Relative scale of each reservoir feature contributing to the decision of recreationists visiting the existing Lower Campbell reservoir with average debris, rocky shores, sediment lakebeds, and no boat launch by water level. Negative (-%) values indicate negative utility for the reference attribute level.

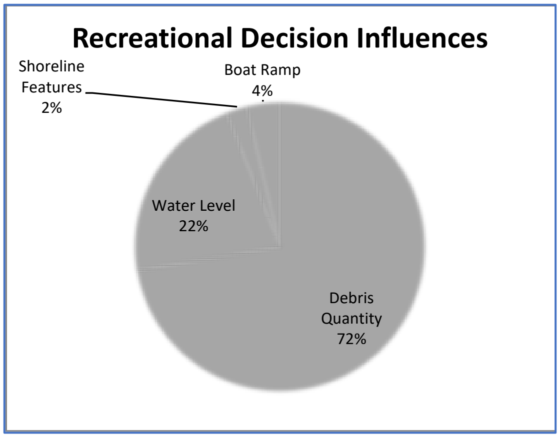
Scenario 2. Reservoir features most likely to elicit recreational visits

Based on individual preferences expressed in the regression model, reservoirs featuring ***no debris, rocky shores, and a concrete boat launch pad*** would elicit more visits than other reservoir conditions. The relative market share for these conditions (compared to the status quo of choosing neither) is shown in Appendix C Figure 3 and the relative scale of each reservoir feature contributing to the decision of recreationists visiting a reservoir is shown in Appendix C Figure 4.

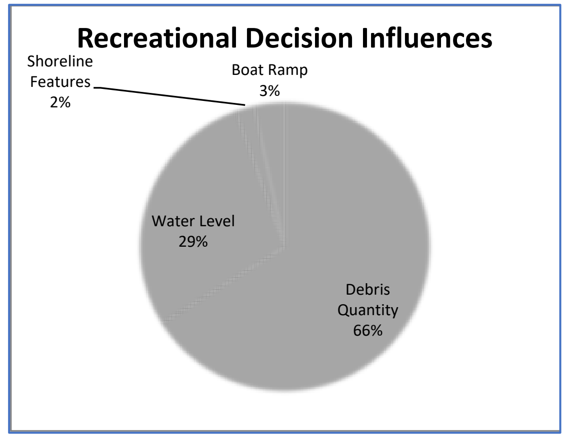
RECREATION BASED ON WATER LEVEL (m)				
El<176.24	*176.24<El<176.68*	*176.68<El<177.12*	*177.12<El<177.56*	*>177.56m*
(1)LOW LOW	*(2)Low*	*(3)Average*	*(4)High*	*(5)HIGH HIGH*
92%	93%	92%	88%	74%
4.70	5.45	4.80	3.05	1.15

Appendix C Figure 3. Market share (% of recreationist choosing to recreate at the reservoir compared to choosing neither) of recreationists visiting a reservoir with no debris, rocky shores, and a concrete boat launch pad by water level. Total utility at each water level is shown below % values.

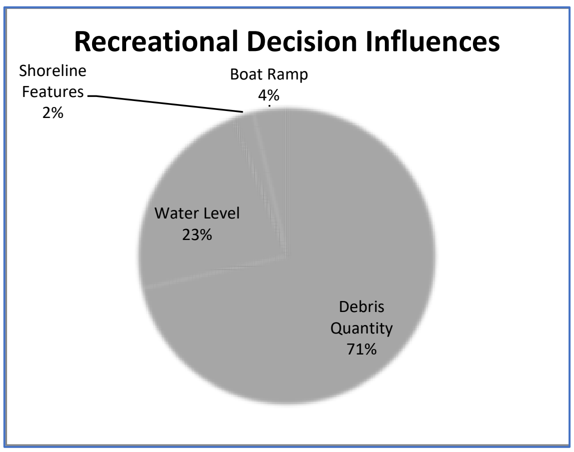
(1) Low low



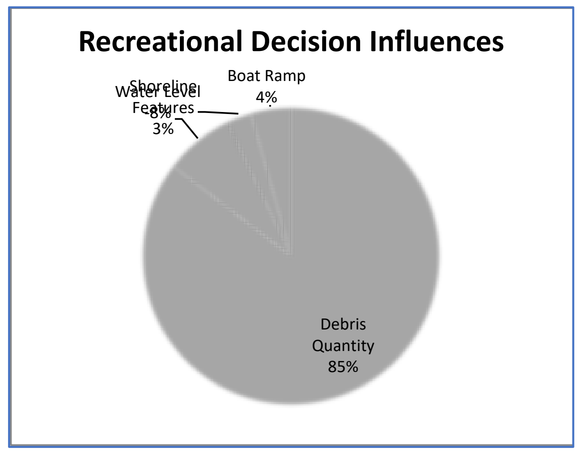
(2) Low



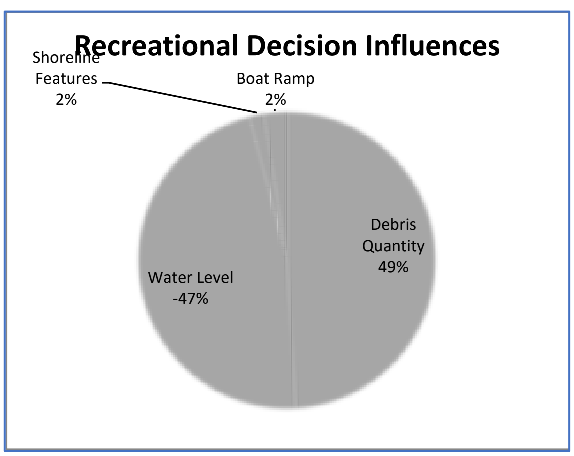
(3) Average



(4) High



(5) High high



Appendix C Figure 4. **Relative scale of each reservoir feature contributing to the decision of recreationists visiting a reservoir with no debris, rocky shores, and a concrete boat launch pad by water level. Negative (-%) values indicate negative utility for the reference attribute level.**

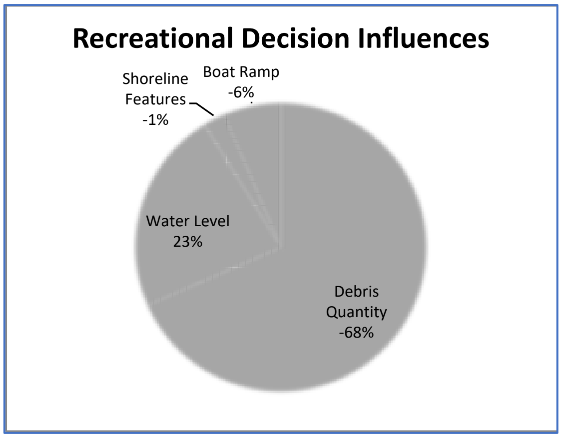
Scenario 3. Reservoir features least likely to elicit recreational visits

Based on individual preferences expressed in the regression model, reservoirs featuring ***a lot of debris, sandy shores, and gravel road boat launch pad*** would elicit fewer visits than other reservoir conditions. The relative market share for different water levels with these set of reservoir conditions (compared to choosing neither site) is shown in Appendix C Figure 5 and the relative scale of each reservoir feature contributing to the decision of recreationists visiting a reservoir is shown in Appendix C Figure 6.

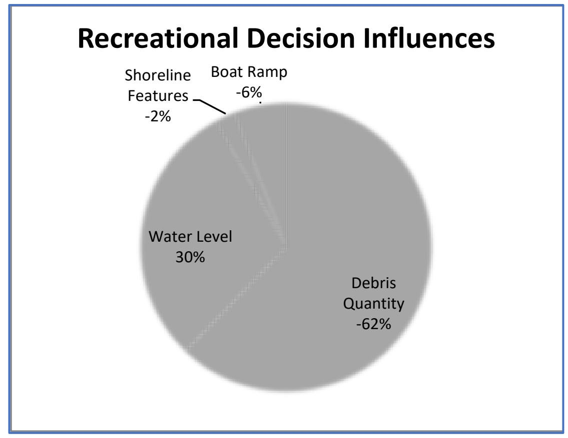
RECREATION BASED ON WATER LEVEL (m)				
El<176.24	*176.24<El<176.68*	*176.68<El<177.12*	*177.12<El<177.56*	*>177.56m*
(1)LOW LOW	*(2)Low*	*(3)Average*	*(4)High*	*(5)HIGH HIGH*
52%	56%	53%	42%	21%
0.45	0.52	0.46	0.29	0.11

Appendix C Figure 5. Market share (% of recreationist choosing to recreate at the reservoir compared to choosing neither) of recreationists visiting a reservoir with a lot of debris, sandy shores and a gravel boat launch by water level. Total utility at each water level is shown below % values.

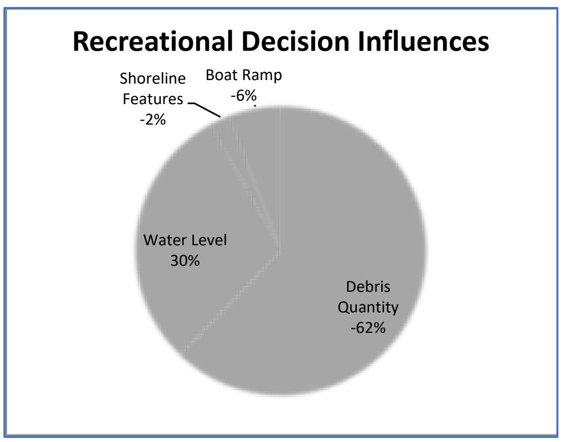
(1) Low low



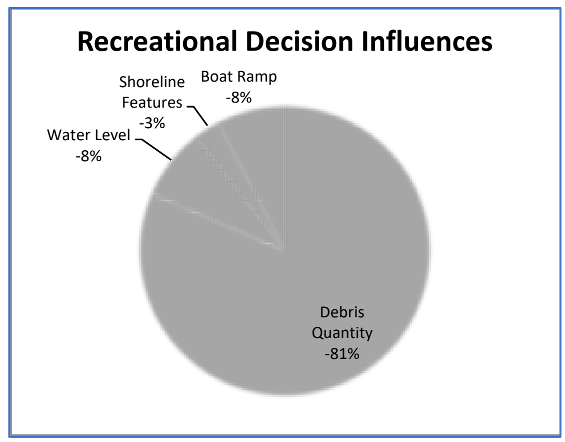
(2) Low



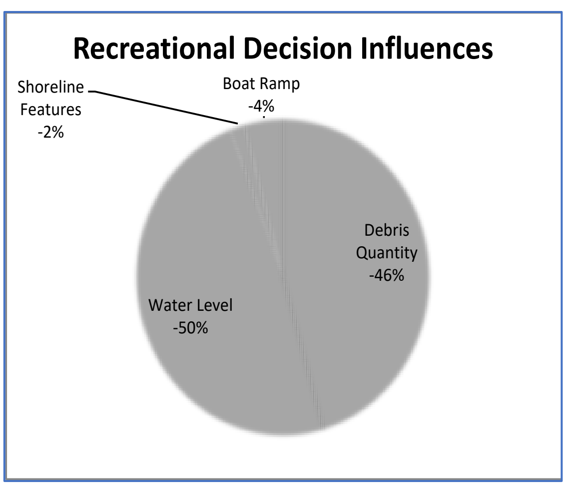
(3) Average



(4) High



(5) High high



Appendix C Figure 6. Relative scale of each reservoir feature contributing to the decision of recreationists visiting a reservoir with a lot of debris, sandy shores and a gravel boat launch by water level. Negative (-%) values indicate negative utility for the reference attribute level.

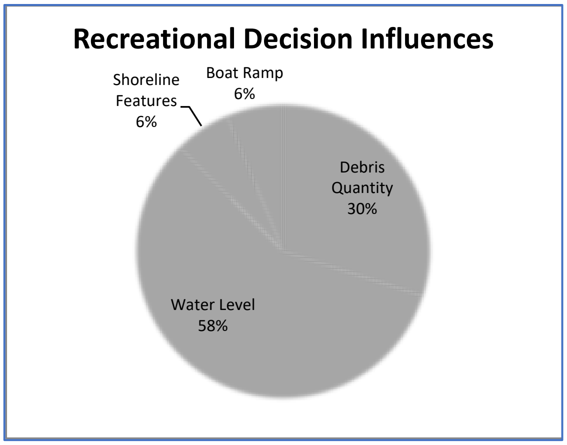
Scenario 4. Reservoir conditions where water level most likely influences recreational decisions

Examining individual preferences for each reservoir feature (e.g. debris, shoreline, boat launch, and water level) reveals the combination of features where water level is most likely to influence recreationist decisions to recreate at the reservoir (i.e. the levels for debris, shoreline, sediment features, and boat launch have the least impact, leaving water level the most influencing factor in the decision). These reservoirs feature ***little debris, rocky shores, and no boat launches***. The relative market share for this combination of reservoir features (compared to the status quo of choosing neither) is shown in Appendix C Figure 7 and the relative scale of each reservoir feature contributing to the decision of recreationists visiting a reservoir is shown in Appendix C Figure 8.

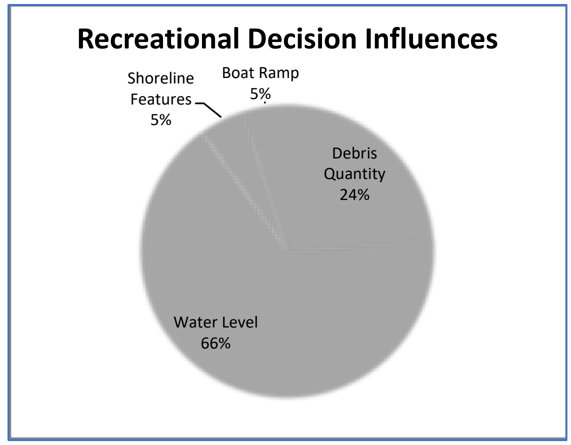
RECREATION BASED ON WATER LEVEL (m)				
El<176.24	176.24<El<176.68	176.68<El<177.12	177.12<El<177.56	>177.56m
(1)LOW LOW	(2)Low	(3)Average	(4)High	(5)HIGH HIGH
81%	83%	82%	74%	52%
1.79	2.07	1.82	1.16	0.44

Appendix C Figure 7. Market share (% of recreationist choosing to recreate at the reservoir compared to not going) of recreationists visiting a reservoir with little debris, rocky shores, and no boat launches by water level. Total utility at each water level is shown below % values.

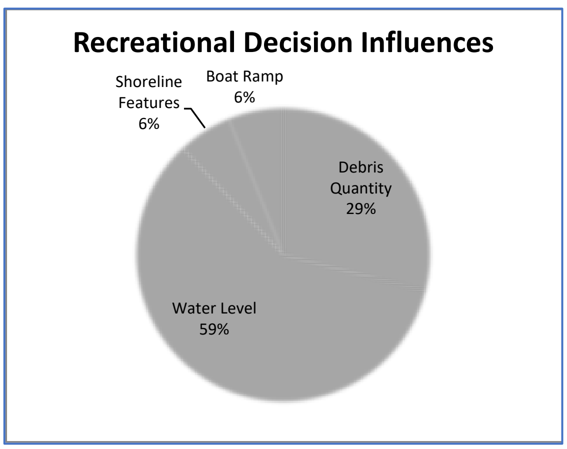
(1)Low low



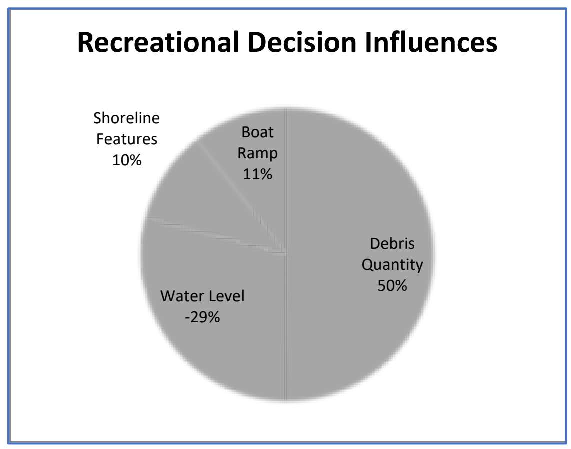
(2) Low



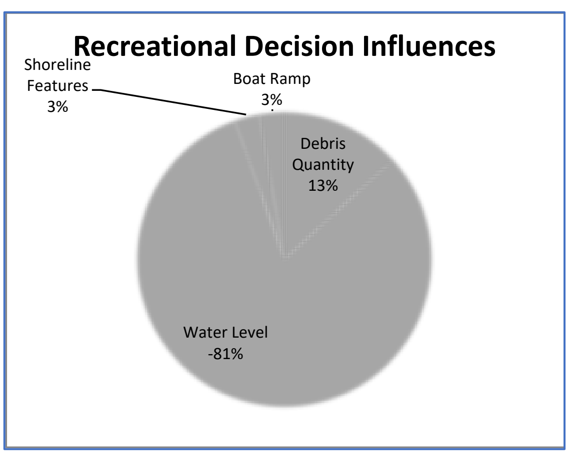
(3) Average



(4) High



(5) High high



Appendix C Figure 8. **Relative scale of each reservoir feature contributing to the decision of recreationists visiting a reservoir with little debris, rocky shores, and no boat launches by water level. Negative (-%) values indicate negative utility for the reference attribute level.**

APPENDIX E. CAMPBELL RESERVOIRS PUBLIC USE AND PERCEPTIONS SURVEY

Campbell Reservoirs Public Use and Perceptions Study

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 in 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!

v1

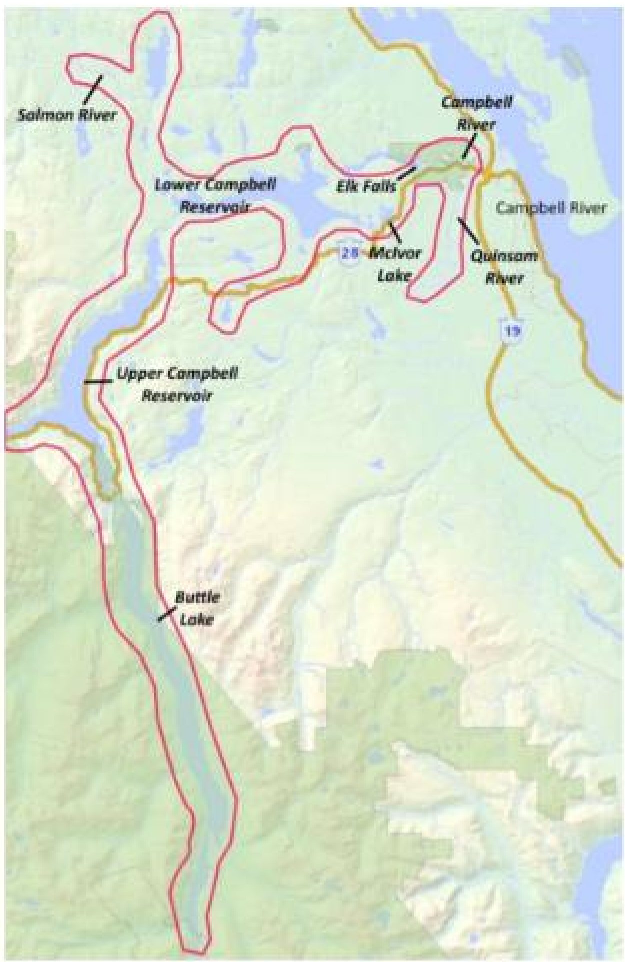
Laich-Kwil Tach
Environmental
Assessment Ltd.
Partnership

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.



← Campbell Reservoirs Survey

To Be Completed By Surveyor

Date & Time*

2019-02-11 04:01:04 PM

Location*

Weather*

Sun	Mixed	Cloud	Rain	Snow

Survey completed this year?*

No	Yes

DCE Photo Book #*

1	2	3	4

Prev   Cancel   Next

SECTION A: Current Visit to the Campbell River Reservoir System

Show map of Campbell River Reservoir System?

No | Yes

1.a. Are you currently engaged in a day trip or an overnight trip in the Campbell River Reservoir System?

Day Trip | Overnight Trip

1.b. If staying overnight, how many days are you spending in the Campbell River Reservoir System on this trip?

0 − +

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

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

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

Campbell Reservoirs Survey

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.

Show map of Campbell River Reservoir System?

No | Yes

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

No | Yes

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

Buttle Lake | Lower Campbell Reservoir | McIvor Lake
Upper Campbell Reservoir | Other

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

Today | Yesterday | Two days ago | Other

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

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

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

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?

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

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?

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)

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)

a. beach?

b. water via a boat launch?

c. water via the shoreline?

Prev | Cancel | Next

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.

15. For photo pair 1, I would choose to recreate at:

Site A	Site B	Neither site

16. For 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

Show map of Campbell River Reservoir System?

No	Yes

21. Have you visited Elk Falls during this trip?

No	Yes

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

Today	Yesterday	Two days ago	Other

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

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

SECTION E: Visits to Rivers

Show map of Campbell River Reservoir System?

No | Yes

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

No | Yes

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

Campbell River | Quinsam River | Salmon River | Other

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

Today | Yesterday | Two days ago | Other

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

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

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

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

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

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?

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) +

SECTION F: Past Visits to Campbell River Reservoir System

Show map of Campbell River Reservoir System?

No	Yes

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

No	Yes

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

Winter

0	<1	1	2-3	4+

Spring

0	<1	1	2-3	4+

Summer

0	<1	1	2-3	4+

Fall

0	<1	1	2-3	4+

SECTION G: About You

36. What is your gender?

Female | Male

37. What is your current age?

38. How many people are in your party today?

0 − +

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

Province

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