

Columbia River Project Water Use Plan

Arrow Lakes Reservoir Operations Management Plan

Implementation Year 4

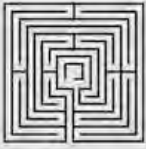
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*Arrow Reservoir Recreational Demand Study
Progress Report Year 4*

Study Period: 2012

**LEES + Associates
Vancouver, BC**

July 19, 2013



CLBMON 41 Arrow Reservoir Recreational Demand Study

Year 4 Progress Report

Study Period: 2012

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Year 4 Progress Report**

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Table 1. CLBMON-41 STATUS of OBJECTIVES, MANAGEMENT QUESTIONS and HYPOTHESES after Year 4

Objectives	Management Questions	Management Hypotheses	Year 4 (2012) Status
<p>The main objective of the study is to: 1) Relate volume and type of use by recreational users to Arrow Lakes Reservoir water levels.</p>	<p>The primary management question addressed by the program is whether different reservoir water levels affect the quantity and frequency of participation in water-based and shore-based recreational activities.</p>	<p>H0: Changes in recreational use of Arrow Lake Reservoir, if they occur, are not related to Arrow Lake Reservoir levels.</p>	<p>Results to date suggest changing water levels have an effect on recreational use of the Arrow Lakes, however there are other influences that need to be accounted for. Hypothesis cannot be rejected at this stage.</p>
	<p>A secondary management question is whether reservoir levels affect types of recreational activities.</p>	<p>H0A: Frequency of public use of Arrow Lake is not influenced by fluctuating reservoir water levels.</p>	<p>Year 4 results suggest the majority of respondents would return based on their experiences on the day that they visited the Arrow lakes. Hypothesis cannot be rejected at this stage.</p>
		<p>H0B: Volume of public use of Arrow Lake is not influenced by fluctuating reservoir water levels.</p>	<p>Results to date provide evidence of a modest relationship between the volume of public use and the reservoir water levels. Water levels account for 30.1% of the variation in visitor volume which suggests that other variables influence the volume of visitors (<i>e.g.</i>, environmental conditions, recreation specialization, and conflict experienced). Hypothesis cannot be rejected at this stage.</p>
		<p>H0C: The different types of public use are not affected by fluctuating water levels.</p>	<p>Results to date suggest if water levels to remain the same as they were when respondents' visited the Arrow Lakes, there would be minimal impact on the number of people visiting, despite their type of public use. If water levels were higher, fewer residents and swimmers would return. Fewer anglers would return if water levels were lower. Hypothesis cannot be rejected at this stage.</p>

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1. EXECUTIVE SUMMARY

The Arrow Lakes Reservoir has many designated and undesignated access points that residents and visitors use throughout the year for recreational activities including boating, fishing and shoreline use. One of the key factors affecting recreational quality and use is the ability to safely access the water or shoreline during different water levels for both water and shore-based activities.

BC Hydro currently makes operational decisions on the Arrow Lakes Reservoir by trading off power values for recreation values. Monitoring recreational demand in relation to water levels on the Arrow Reservoir was identified as one of the fundamental objectives of the Columbia River Water Use Plan (BC Hydro 2007). In 2009, BC Hydro initiated CLBMON 41. The main objective of this study is to relate volume, frequency, and type of use by recreational users to Arrow Lakes Reservoir water levels. The results will be used to generate year round use characteristics and determine how recreational use is tied to fluctuations in water level to inform decision making at the next Water Use Plan review.

To address the management questions (Table 1), specific parameters were measured through monitoring (traffic count and observational data collection) and interviews (on-site and on-line surveys). Sampling was conducted at 13 pre-selected, stratified monitoring sites comprised of 11 publicly accessible boat launches and 2 near shore parks.

H_{0A}: Frequency of public use of Arrow Lake is not influenced by fluctuating reservoir water levels.

The majority of respondents in 2012 would return based on their experiences on the day that they visited the Arrow Lakes; the environmental conditions did not seem to affect responses.

H_{0B}: Volume of public use of Arrow Lake is not influenced by fluctuating reservoir water levels.

Analysis indicates a modest relationship between the volume of public use and the water levels of the Arrow Lakes as measured at Nakusp. However, the modest amount of variation suggests that other variables influence the volume of visitors (*e.g.*, environmental conditions, recreation specialization, and conflict experienced).

H_{0C}: The different types of public use are not affected by fluctuating water levels.

If the water levels were the same as they were when respondents' visited the Arrow Lakes, almost all respondents would return; there were no significant differences between the seven

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types of public use that were examined. If the water levels were higher than they were when respondents' visited the Arrow Lakes, more residents and swimmers would go somewhere else. More anglers would go elsewhere if water levels were lower.

The relationship between water levels on the Arrow Lakes and the volume of visitor use is a complicated one. Although changing water levels do have an effect on the potential volume of visitors to the Arrow Lakes, there are other influences that need to be accounted for. The final comprehensive report (Year 5) will investigate the influence of other variables on the volume of visitor use.

2. INTRODUCTION

2.1 Background

The Arrow Lakes Reservoir has many designated and undesignated access points that residents and visitors use throughout the year for recreational purposes. One of the key factors affecting recreational quality and use is the ability to safely access the water or shoreline during different water levels for water-based and shore-based activities. Recreational activities on the Arrow include boating, fishing and shoreline use (swimming, nature walks, etc.). Different recreation activities may have different levels of preferred or optimal water levels.

During the Columbia River Water Use planning process, the Consultative Committee (CC) identified monitoring reservoir recreational demand (land-based, shoreline and boating) in relation to water levels on the Arrow Reservoir as one of the fundamental objectives of the Water Use Plan (BC Hydro 2007). The committee recognized that an increased understanding of recreational use patterns on the Arrow Lakes reservoir would inform operational decision making. These decisions must balance multiple interests including wildlife, recreation, fisheries, culture and heritage, shoreline conditions, and power generation on the reservoir.

The CC recommended a monitoring program to provide long-term measurement of recreation use on and near the waters of the Arrow Lakes from Revelstoke to the Hugh Keenleyside dam at Castlegar. BC Hydro seeks through this study to develop performance measures that link some aspects of recreation by locals/tourists to reservoir levels to inform decision making at the next Water Use Plan review. At the end of the five-year study horizon, the intent will be to establish a predictive model of recreational use on the Arrow Lakes Reservoir. "The goal of the study is therefore to establish a functional link between recreational use and water levels on Arrow Lakes Reservoir" (Terms of Reference, BC Hydro 2008, p. 2).

This study is one of a series of monitoring programs that fulfills BC Hydro's obligation under the Water Use Plan as approved by the Comptroller of Water Rights. This study is conducted in conjunction with CLBMON-14 Boat Ramp Use Study¹ and is scheduled for implementation over five years (2009-2014).

¹ CLBMON 14 is a 10-year study that will track use levels and user satisfaction at boat launch sites on the Arrow and Kinbasket Reservoirs where access improvements have been made. Due to significant similarities and overlaps between the two studies CLBMON 41 and 14 have been combined into one delivery model.

2.2 Management Questions and Objectives.

The monitoring objectives, management questions and hypotheses for CLBMON-41 were stated in the Terms of Reference for the project (BC Hydro 2008) and are restated below.

The main objective of the study is to relate volume and type of use by recreational users² to Arrow Lakes Reservoir water levels.

The primary management question addressed by the program is whether different reservoir water levels affect the quantity and frequency of participation in water-based and shore-based recreational activities. A secondary management question is whether reservoir levels affect types of recreational activities.

2.3 Management Hypotheses

Three management hypotheses frame this study:

H₀: Changes in recreational use of Arrow Lake Reservoir, if they occur, are not related to Arrow Lake Reservoir levels.

H_{0A}: Frequency of public use of Arrow Lake is not influenced by fluctuating reservoir water levels.

H_{0B}: Volume of public use of Arrow Lake is not influenced by fluctuating reservoir water levels.

H_{0C}: The different types of public use are not affected by fluctuating water levels.

2.3.1 Monitoring Program Rationale

As per the approach recommended in the project's Terms of Reference, this project is an observational study (*i.e.*, site-based inventory) supplemented with questionnaire-elicited data.

The general approach is:

“an observational study of within reservoir levels changes in recreation use at sites selected through a stratified random sampling design. Data will be collected through a combination of survey methods including observed distributions and activities, spot counts, vehicle counters and interviews at the boat access improvement sites on the Arrow Lakes Reservoir” (BC Hydro 2008, p. 6).

The analyses will relate changes in recreation use to water levels that recreational users experienced. Inferences about the causes of changes in types of recreation uses and the likely

² Groups under consideration include boaters, near-shore users and any other group deemed relevant to the study. Two broad classifications are used: resident and tourist.

effects of altered operating regime on recreation volume, frequency and type will be made using statistical models. The models will represent users' responses to the operating regime, environmental conditions, and other variables.

2.3.2 Theoretical Foundation for Examining Visitor Demand and Use

When assessing overall recreation use, it is also important to measure variables that inform the *subjective evaluation* element of visitor satisfaction. These variables include socioeconomic characteristics, level of experience, and attitudes and preferences about the context within which visitors are engaging in their recreation activity.

The underlying goal of recreation management is quality: visitors desire high quality recreation experiences. BC Hydro seeks to provide visitors with recreation opportunities that are both safe and high quality. Within the context of outdoor recreation management, quality has traditionally been measured in terms of visitor satisfaction (Manning, 1999). Satisfaction can be considered to be "a function of the degree of congruence between aspirations and the perceived reality of experience" (Bultena & Klessig, 1969, p. 349). Although there are no standardized measures of satisfaction (experiences are dynamic, evolve over time, and are context-dependent), most measures of satisfaction have been rooted in expectancy theory (Fishbein & Ajzen, 1975), which posits that people engage in outdoor recreation activities with the expectation that this engagement will fulfill particular needs, motivations, or other desires. Satisfaction is both multidimensional and relative (Figure 1): it is multidimensional as overall satisfaction is influenced by biophysical, social, and managerial elements/settings (*i.e.*, situational variables); satisfaction is relative as it is influenced by socioeconomic and cultural characteristics, levels of experience, and attitudes, preferences and norms (*i.e.*, subjective evaluations). Thus, satisfaction is a function of both the recreation setting and the participants.

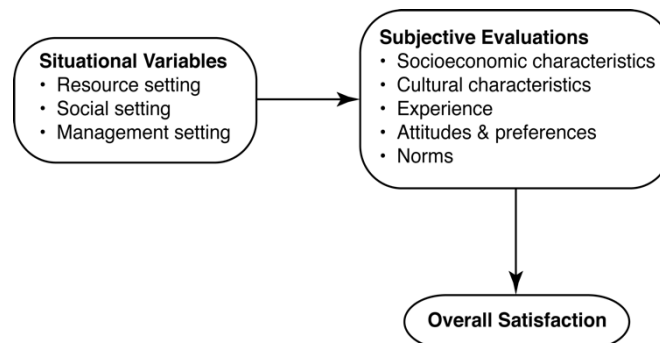


Figure 1. Conceptual model of recreation satisfaction (Manning, 1999).

Visitor satisfaction is a useful and appropriate framework for the present study: if people are not satisfied with their experiences on the Arrow Lakes Reservoir, they may seek alternative opportunities elsewhere. However, understanding visitors' satisfaction with their experiences on the Arrow Lakes Reservoir requires other information in addition to the specific monitoring parameters that have been identified for this project. While reservoir water level is the main variable, it is necessary to consider and control for other variables that may influence visitor use of the Arrow Lakes Reservoir.

In the context of the present study, the resource setting (*i.e.*, biophysical setting) includes water levels, and meteorological data. For example, weather does affect recreation use: if visitor use was measured during a very wet year, one might expect lower visitor turnout; if weather was not accounted for, the predictive models may over- or underestimate the influence of water levels on recreation use. The social setting is concerned with the interactions that visitors have with other visitors; social setting is often measured in terms of social carrying capacity, which can be measured by identifying the degree of user conflicts and crowding that are experienced. For example, if visitor use was measured at a site where there has been a history of conflicts between visitors or where visitors have felt crowded, one might expect low repeat visitor use as people seek alternative opportunities free from conflict and crowding independent of water levels. Lastly, the management setting of the Arrow Lakes Reservoir is multi-jurisdictional (*e.g.*, municipal land, Crown land, BC Parks) as different agencies are responsible for managing access to the Arrow Lakes Reservoir. For example, the frequency and level of maintenance of the facilities, such as the parking lot and boat ramp, may affect visitor satisfaction.

3. METHODS

To address the management questions and supporting hypotheses, specific parameters to be monitored over the five-year period include:

“types of recreation activity, user classification (resident, tourist), distribution of activities, frequency of activities, reservoir levels and meteorological data (wind, waves, precipitation, air and water temperature). This information is considered necessary to confirm/refute assumptions about the importance of timing, frequency and duration of reservoir levels changes on recreation activities. Vehicle counters will be installed at each of the boat access sites on Arrow Lakes Reservoir to monitor the number of vehicles using the ramp facilities” (Terms of Reference, BC Hydro 2008, p.7).

Sampling is conducted in spring, summer, and fall seasons over the five year study horizon. Sampling intensity is higher during the summer due to the proportional increase in volume, the diversity of recreational activities during this period, and the longer season (as spring and fall on-water recreation seasons are limited by snow, cold weather, and hours of daylight). The data will be analyzed to determine the degree to which water levels affect recreation use of the Arrow Lakes Reservoir.

This section is presented under the following headings:

- Sampling Sites
- Traffic Data Collection;
- Observational Data Collection;
- Sampling Design;
- Survey Delivery;
- Survey Design, and
- Sampling Analyses.

The project methodology including sampling sites, collection methods, sampling design, survey delivery and survey design was vetted and approved by the study team in advance of the Year 1 pilot season (Fall 2009). Reviewers included the LEES+Associates team and BC Hydro (Public Use Management, Stakeholder Engagement Group, and the Water License Requirements Program). The Survey Questionnaire was also reviewed by an individual at the *Science Policy and Economics Section, British Columbia Ministry of Environment*, and members of the *Collaborative for Advanced Landscape Planning* at the *University of British Columbia*.

3.1 Sampling sites

Field sampling occurred at 13 access sites representing the three sections of the Arrow Lakes Reservoir (*i.e.*, Upper, Middle, and Lower Arrow Lakes Reservoir; see Table 2, Figure 2). The study area was divided into three geographical units in terms of broad accessibility, *i.e.*, distance to the sites from urban centres. The three sections of the Arrow Lakes Reservoir are:

1. Upper Arrow Lakes from Revelstoke to Galena Bay
2. Middle Arrow Lakes from Shelter Bay to Edgewood
3. Lower Arrow Lakes from Renata to Hugh Keenleyside Dam.

Sampling sites were chosen to reflect relatively high use locations that provide access to the water or shoreline for water-based and shore-based activities. The sampling sites include all 11 publicly accessible boat launches on the Arrow Lakes³ plus two day use areas associated with the boat launches (Table 2). Final site selection was confirmed by the study team and BC Hydro following a reconnaissance visit by the study team to all potential sites, as well as discussions with local forestry officers, park rangers, elected officials, and launch clubs.

Table 2. Sampling locations.

Upper Arrow Lakes Reservoir	Middle Arrow Lakes Reservoir	Lower Arrow Lakes Reservoir
Revelstoke Boat Launch	Nakusp Beach (Day Use) [†]	Syringa Creek Park (Day Use) [†]
Eagle Bay Boat Launch	Nakusp Boat Launch	Syringa Creek Park Boat Launch
Shelter Bay Boat Launch	McDonald Creek Boat Launch	Anderson Point Boat Launch ⁴
	Burton Historic Park Boat Launch	
	Burton South Boat Launch ⁵	
	Fauquier Park Boat Launch	
	Edgewood Park Boat Launch	

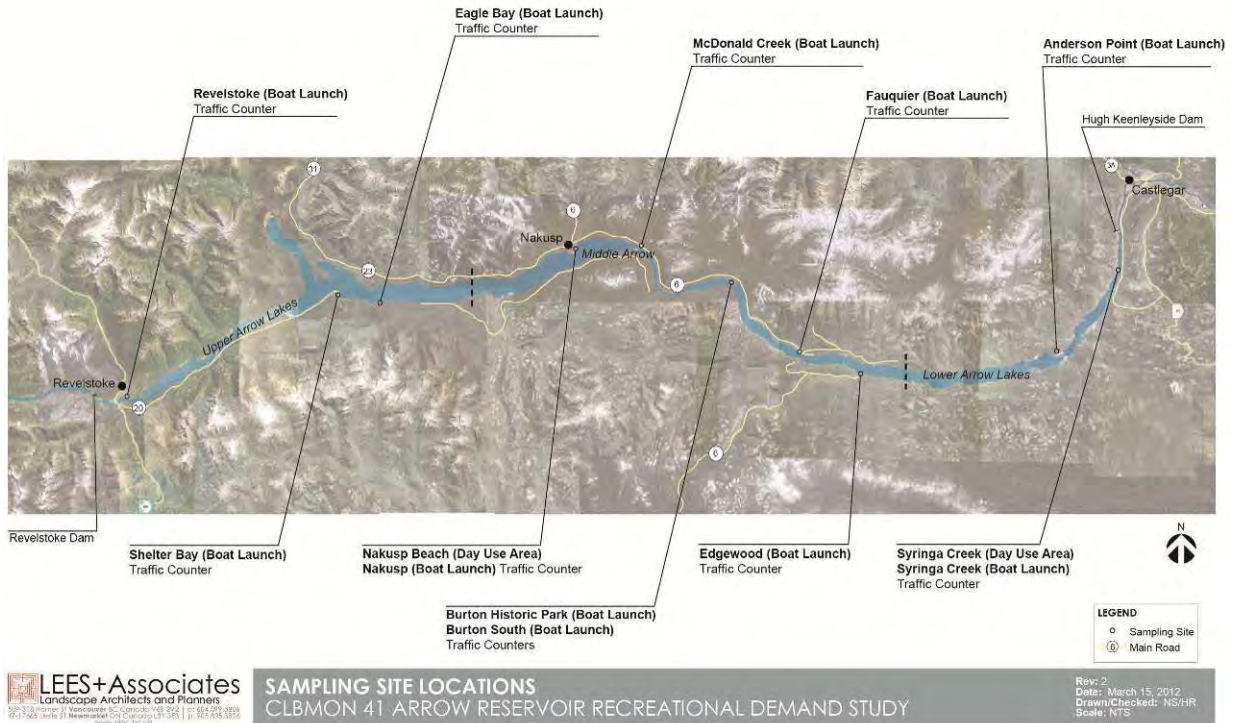
[†] No ramp access or vehicle counter at these locations

³ Recreational boat access is also provided by a private facility called Scotties Marina (the only site which charges a user fee), and numerous undesignated launch facilities.

⁴ Anderson Point (Boat Launch) was added to the study in April 2010 in conjunction with CLBMON 14 Boat Ramp Use Study.

⁵ Burton South (Boat Launch) was added in August 2011. This site has a traffic counter only; no field sampling was undertaken.

Figure 2. Sampling locations map



3.2 Traffic Data Collection

3.2.1 Vehicle counter installation and settings

Vehicle counters were installed year round at all study locations that have boat ramp access (*i.e.*, all monitoring sites except Syringa Creek Day Use and Nakusp Beach Day Use, see Figure 2). TRAFx G3 magnetic field controlled vehicle counters were selected for use, as they are the preferred and recommended traffic counter of BC Parks, Parks Canada, and the U.S. National Parks Service.

Vehicle counters were configured and installed as per the manufacturers specifications (see Appendix A – TRAFx Vehicle Counters) to monitor the number of vehicles using the ramp facilities. Counter sensitivity and delay settings were configured to most accurately record traffic at each site, in order to achieve a level of accuracy that will permit conclusive answers to the hypotheses. Traffic counters remain in place year-round and continue to collect vehicle counts. Counters remained in-situ during construction periods for applicable boat ramps; however these periods have been excluded from the data (Table 3). Counters were removed during the high water period experienced in July and August 2012 (Table 4).

Annual Traffic Counts are collected and automatically compiled by the TRAFx DataNet system for each full calendar year. This is done to standardize the calculation and application of average daily use to missing data. The system then enables the selection of any time period across years for calculating and reporting daily, weekly and monthly counts, averages and comparisons. Further discussion of annual traffic count calculations and how the counters work can be found in Appendix A.

Table 3. Construction periods (Years 1-4).

Location	Construction Period		
McDonald Creek	2010-05-16	to	2010-07-01
Fauquier	2010-05-31	to	2010-09-21
Anderson Point	2012-05-14	to	2012-06-12

Note: the above dates are excluded in the data.

Table 4. High water periods (Years 1-4)

Location	High Water Period		
Edgewood Boat Launch	2012-07-06	to	2012-08-15
Fauquier Boat Launch	2012-07-06	to	2012-08-15
McDonald Creek	2012-07-06	to	2012-08-15
Revelstoke Boat Launch	2012-07-06	to	2012-08-15
Eagle Bay	2012-07-06	to	2012-08-15
Burton Boat Launch	2012-07-06	to	2012-08-15
Shelter Bay	2012-07-06	to	2012-08-15
Syringa Creek	2012-07-06	to	2012-08-15

Note: Year 4 (2012) produced an excessively high water year with a sustained water level of 1446 feet elevation (or about 2 feet above normal pond level of 1444') for six weeks of the summer beginning July 6th. Counters at the above ramps were removed to prevent water damage thus no readings were taken during these periods.

3.3 Observational Data Collection

The surveyors collected observational data about the visitors that they encountered, photographs of site conditions and natural conditions (Table 5). These observations consider information on visitors including number of people seen, gender and age range, recreational activities, and number and origin of cars in the parking lot. They also consider information on natural conditions that can affect the level and nature of recreational usage, such as weather and reservoir conditions including waves, precipitation, wind, percent cloud cover, and air temperature. The

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observational data were assessed using standardized forms developed for this purpose (Appendix H). Definitions used to record observed weather, waves, wind, cloud cover, air and water temperatures are also included in Appendix H.

Table 5. Observational data: variables collected each field day.

Observation	Description
Number of people seen	<ul style="list-style-type: none"> This information provides an overall sense of the level of activity that day, and recording the number of people approached provides a basis for calculating a response rate for the on-site survey. Party size was also recorded where possible to compare with established Park stats⁶.
Gender and age range	<ul style="list-style-type: none"> Total male or female Age range (1-10, 11-15, 16-20, 21-30, 31-40, 41-50, 51-60, 61-70, 71+)
Activities	<ul style="list-style-type: none"> Type of recreational activity observed
Number of cars in parking lot (and origin)	<ul style="list-style-type: none"> The number and origin of license plates was recorded through continuous observation to provide information about the number of parties using the facilities, visitors' place of residence and rough travel distance. A systematic tally system was used in conjunction with the surveys to minimize double counting.
Site photography	<ul style="list-style-type: none"> Photographic records of sample sites to capture site conditions. Photos taken at the same angle, at the same time to facilitate comparison.
Weather*	<ul style="list-style-type: none"> General descriptions to supplement individual measurements
Presence of waves*	<ul style="list-style-type: none"> Wave height and formation.
Wind*	<ul style="list-style-type: none"> Wind direction and an estimate of speed (Beaufort Scale).
Percent cloud cover*	<ul style="list-style-type: none"> An assessment of the amount of sky/sun obscured by clouds.
Air temperature*	<ul style="list-style-type: none"> Recorded in Celsius.
Water temperature*	<ul style="list-style-type: none"> Recorded in Celsius.

* Note: environmental data collected each field day at 13h00.

3.4 Sampling Design

This section outlines the sampling design including details about the methods of data collection for the on-site survey, online survey and observational data collection.

Thirteen sampling sites were chosen to represent the three sections of the Arrow Lakes Reservoir (*i.e.*, Upper, Middle, and Lower Arrow Lakes Reservoir; Table 2). Eleven of the thirteen sites have boat launches. Intensive surveying occurred at all sites in order to provide a comprehensive assessment of Arrow Lakes Reservoir recreational use, user preferences for conditions, and user attitudes about management.

⁶ BC Parks party size data are determined by number of people in group divided by the number of groups. Averages have been developed over years of surveys.

The sampling periods were designed to maximize the response to the user survey and to capture a broad selection of outdoor recreation participants. The sampling strategy adopted in this project provides a random sample that is stratified by four factors: (1) section of the Arrow Lakes Reservoir; (2) season (the number of sample days in each season is proportional to the number of days in that season); (3) type of day (*i.e.*, weekends, week days, holidays); and (4) the time of day that sampling occurs (*i.e.*, morning or afternoon). Over the course of the five-year sampling horizon, this approach will provide a representative sample of visitors to the Arrow Lakes Reservoir.

As in years 1 – 3, three sites were sampled during each survey day – one sample site from each section of the Arrow Lakes Reservoir. Survey days at sample sites were randomly selected as per Gregoire & Buhyoff (1999). Data collection for Year 4 commenced Monday June 18, 2012⁷ and finished Monday, October 29, 2012 (See Appendix C – Sampling Schedule). As a further step to ensure the representation of a wide range of outdoor recreation activities and respondents, surveyors were on-site during randomly selected six-hour periods (8:00 am to 2:00 pm or 2:00pm to 7:00pm in summer; and 8:30 am to 2:30 pm or 10:30 am to 4:30 pm⁸ in spring and fall.

Recreational users were surveyed at publicly accessible boat launches and near shore parks. An entry/exit intercept survey method was selected over a mail-out survey as comprehensive lists of people who visit the Arrow Lakes Reservoir are not available (*viz.* Dillman *et al.*, 2002) and the participation of a broad selection (*i.e.*, water and shoreline recreationists) of visitors to the Arrow Lakes Reservoir is desired. A limitation of this sample approach is that respondents are self-selected based on their choice of recreation location and their decision to participate in the survey; people who have ceased visiting the Arrow Lakes Reservoir (for any reason) are excluded from the sample. Information about the use (or non-use) of the Arrow Lakes Reservoir (and reasons for non-use) needed to be gathered from a broader sample of regional residents. To address this limitation, an online survey was administered in order to capture the attitudes, behaviours, and preferences of a broader set of people in and around the Arrow Lakes Reservoir. This convenience sample was invited to participate in the online survey through a press release and announcement sent to local newspapers by BC Hydro (see Appendix J).

⁷ The 2012 sampling start date was later than previous years; deferment requested by BC Hydro.

⁸ The six hour sampling period is based on successful application in previous recreational studies undertaken by the study team. An overlap of morning and afternoon periods ensures surveyors capture the higher use time over lunch hour. In 2012, summer sampling hours were shifted to capture more 'evening' recreationists.

3.5 Survey Delivery

The visitor survey is designed to be delivered in two formats over the course of this project: (1) an on-site survey, administered to visitors to sample sites; and (2) an online survey, administered to regional residents to capture a broader range of attitudes and opinions about recreational use (or non-use) of the Arrow Lakes Reservoir.

3.5.1 On-site Survey

Wherever possible, all parties at a sample site were approached for inclusion in this study. People were approached *after* using a boat ramp facility so that their responses would be based on their use of the facilities that day. Except where single-family parties are identified, all party members were asked to participate in the survey; when families were identified, only one representative was asked to participate in the survey; however, if other members of the party wished to participate they were welcomed to do so. Respondents completed the questionnaires on-site. The number of people approached for inclusion in the study was recorded to permit the calculation of response rate. Number of parties and total number of people on-site was also recorded. On sampling days with high attendance (such as long weekends, or Canada Day), the total number of visitors was estimated. People who refused to participate were thanked for their time and were not engaged further. A standard introduction statement was made to all prospective participants that summarized the cover letter that accompanied the questionnaire. If asked what the surveys would be used for, people were told that the information would be used to inform the development of strategies to guide the management of water flows in the Arrow Lakes Reservoir. Contact information for the project team was provided in the event that anyone had questions or concerns about the project.

3.5.2 Online Survey

An online version of the survey was developed for a sample of regional residents to capture a broader range of attitudes and opinions about recreational use (or non-use) of the Arrow Lakes Reservoir. As mentioned above, this survey is also available for on-site visitors that preferred to provide their information online. The online survey is identical to the on-site survey and is available at www.arrow-kinbasket-recreation-survey.ca.

3.6 Survey Design

The Visitor Survey questionnaire employed in this study was developed using the principles of the *Tailored Design Method*. This method identifies procedures to maximize survey return rates and minimize survey error (Salant & Dillman, 1994; Dillman, 2000), including questionnaire layout considerations. The questionnaire was designed to ensure a logical flow of the questions, and that the wording of the questions and instructions to the respondents be clear and as brief as possible. A key requirement of the questionnaire was that it be suitable for repeated delivery at

multiple locations in order that a better understanding of recreation use trends and of visitors' attitudes about the management of the Arrow Lakes Reservoir be identified.

After an initial scoping exercise (which produced three drafts of potential questions) the Arrow Lakes Visitor Survey questionnaire underwent seven drafts before being finalized. Three initial drafts (*i.e.*, scoping documents) provided a comprehensive set of questions (and different wordings of questions). The objective of these early drafts was to (1) demonstrate different approaches that could be taken in a survey of visitors to the Arrow Lakes, (2) ensure that the questionnaire would be consistent with BC Hydro goals and objectives, (3) ensure that the questionnaire met the data requirements of the project, and (4) ensure that the questionnaire was amenable to potential respondents (*i.e.*, interesting, easy to follow, and phrased and laid out in a manner that could be answered consistently). Subsequent drafts of the questionnaire were circulated in order to promote discussion around suggested changes in question ordering, question wording, answer options, and/or question instructions. Reviewers included the LEES+Associates team, BC Hydro (Public Use Management, Stakeholder Engagement Group, and the Water License Requirements Program), an individual at the *Science Policy and Economics Section, British Columbia Ministry of Environment*, and members of the *Collaborative for Advanced Landscape Planning* at the *University of British Columbia*.

In spring 2010, Section 6 of the visitor questionnaire was amended to include four questions pertaining specifically to boat ramp usage to address the management hypotheses for CLBMON 14 Boat Ramp Use Study⁹. The other sections remained the same. The questionnaire has also retained the same format - a four-page booklet (two 8.5" by 11" sheets printed on both sides, stapled in the top left corner) that comprehensively measures people's use of, and attitudes about, recreation on the Arrow Lakes.

The questions permit the isolation of variables to characterize outdoor recreation use and water level preferences in the Arrow Lakes Reservoir. Recreationists are not a homogeneous group (Bryan, 1977; Manning, 1999; Salz *et al.*, 2001; Rollins & Robinson, 2002), as participants differ in their values, the activities that they pursue, preferred settings, desired experiences, and motivations for participating (Choi *et al.*, 1994); however, the variation among preferences, attitudes, and behaviours can be explained by the recreation specialization framework (Bryan, 1977; McFarlane *et al.*, 1998). Understanding the desires and needs of recreationists is important for the management of outdoor recreation (McFarlane, 1994). As the recreation specialization framework can provide a basis for the differentiation of recreationists holding various goals, preferences, and behaviors (McFarlane, 2001), it was used to frame the collection of recreation

⁹ As per the Terms of Reference for CLBMON 14 Boat Ramp Use Study.

data, as it provides a coherent and comprehensive approach, and addresses the issue of engagement in multiple activities, which can violate statistical assumptions about independent samples (Jackson, 1986). These measurement protocols follow standard practices and are appropriate for a project of this type. The questionnaire is composed of seven sections:

- Section 1: Arrow Lakes Outdoor Recreation Activities.
- Section 2: Important Outdoor Recreation Activities.
- Section 3: Arrow Lake Outdoor Recreation Experiences.
- Section 4: Use and Familiarity of Arrow Lakes.
- Section 5: Arrow Lakes Outdoor Recreation Management.
- Section 6: Arrow Lakes Outdoor Recreation Experiences.
- Section 7: Demographics.

Table 6. Relation of questionnaire subsections to management hypotheses.

Management hypothesis	Related Questionnaire Subsection
H _{0A} – frequency of public use of Arrow Lake is not influenced by fluctuating reservoir water levels	Section 1: Arrow Lakes Outdoor Recreation Activities
	Section 5: Arrow Lakes Outdoor Recreation Management
	Section 6: Outdoor Recreation Experiences
H _{0B} – volume of public use of Arrow Lake is not influenced by fluctuating reservoir water levels	Section 3: Outdoor Recreation Experiences
	Section 4: Use and Familiarity
H _{0C} – the different types of public use are not affected by fluctuating water levels.	Section 1: Arrow Lakes Outdoor Recreation Activities
	Section 2: Important Outdoor Recreation Activities
	Section 5: Arrow Lakes Outdoor Recreation Management
	Section 7: Demographics

Given that visitor satisfaction is multidimensional, data collection in this study takes advantage of the different elements of this study (*i.e.*, observational data and questionnaire-elicited data). Table 7 illustrates the links between the specific monitoring parameters identified in the project's *Terms of Reference* (BC Hydro 2008) and the mode of measurement.

Table 7. Links between monitoring parameters and mode of measurement.

Specific Monitoring Parameters	Mode of Measurement	Unit of Measurement
1. Types of recreation activity	<ul style="list-style-type: none"> • <i>Detailed Daily Sample Summary</i> form. • Questionnaire: Question 1. 	Descriptions
2. Volume of recreation use	<ul style="list-style-type: none"> • Field Crew: vehicle counters and <i>Detailed Daily Sample Summary</i> form. 	# of vehicles # of people in group
3. User classification (<i>i.e.</i> , resident, tourist)	<ul style="list-style-type: none"> • Questionnaire: Question 7. • Field Crew: <i>Site and Survey Log</i> 	Age range who travelled > 80km
4. Distribution of activities	<ul style="list-style-type: none"> • Measured by stratifying observed recreation activities by sample sites. 	
5. Frequency of activities	<ul style="list-style-type: none"> • Questionnaire: Question 1; Question 2. 	
6. Reservoir levels	<ul style="list-style-type: none"> • Data supplied by BC Hydro; to be matched up with sampling times. 	Meters
7. Meteorological data (<i>i.e.</i> , weather, waves, wind, sky conditions, air and water temperature). Collected by survey crews at 13h00 each day on-site.	<ul style="list-style-type: none"> • Field Crew: <i>Site and Survey Log</i> <p>Weather</p> <p>Presence of waves</p> <p>Wind</p> <p>Percent cloud cover</p> <p>Air temperature</p> <p>Water temperature</p>	<p>General descriptions</p> <p>Wave height & frequency</p> <p>Beaufort scale</p> <p>Assessment of sky/sun obscured by clouds</p> <p>Recorded in Celsius</p> <p>Recorded in Celsius</p>

To address H_{0A} (frequency of public use of Arrow Lake is not influenced by fluctuating reservoir water levels), data are required about how often people come to the Arrow Lakes Reservoir and whether or not people will return based on the water levels that they experienced.

To address H_{0B} (volume of public use of Arrow Lake is not influenced by fluctuating reservoir water levels), data are required about numbers of people visiting the Arrow Lakes Reservoir.

To address H_{0C} (different types of public use are not affected by fluctuating water levels), data are required about the different activities that occur on and near the Arrow Lakes Reservoir, as well as an assessment of influence of water levels by activity.

For each hypothesis, we need to control for the influence of other variables (*e.g.*, management setting¹⁰ or meteorological data). The following demonstrates how the data captured by each section of the questionnaire will address the study's management questions, and how the questions address the theoretical framework of the study.

Section 1: Arrow Lakes Outdoor Recreation Activities

The questions in this section (Figure 3) ask about the recreation activities done on the water or onshore of the Arrow Lakes. The questions provide an assessment of the different activities that each respondent engages in. This can help to inform the likelihood of visitors substituting activities *vs.* opportunities (*i.e.*, location) if satisfaction is not achieved. These questions address H_{0A} by measuring the frequency of use by season. As information is also collected about the types of activities that take place on the water or onshore of the Arrow Lakes Reservoir, the frequency of use can be stratified by activity. These questions also inform H_{0C} by measuring the different types of recreation activity that take place on the water or onshore of the Arrow Lakes Reservoir.

Indicate ALL of the activities that you do ON THE WATER or ON THE SHORE of the Arrow Lakes.

<input type="checkbox"/> Fishing	<input type="checkbox"/> Beach activities	<input type="checkbox"/> Hunting	<input type="checkbox"/> Mushroom picking
<input type="checkbox"/> Boating (motor cruising)	<input type="checkbox"/> Nature study	<input type="checkbox"/> Scenic viewing	<input type="checkbox"/> Berry picking
<input type="checkbox"/> Canoeing/kayaking	<input type="checkbox"/> Bird watching	<input type="checkbox"/> Picnicking	<input type="checkbox"/> Drawing/painting/photography
<input type="checkbox"/> Swimming	<input type="checkbox"/> Wildlife viewing	<input type="checkbox"/> Camping	<input type="checkbox"/> Cross-country skiing
<input type="checkbox"/> Waterskiing	<input type="checkbox"/> Horseback riding	<input type="checkbox"/> Walking/hiking	<input type="checkbox"/> Snowmobiling
<input type="checkbox"/> Wind surfing	<input type="checkbox"/> ATV/Trail bike/4 × 4	<input type="checkbox"/> Mountain biking	<input type="checkbox"/> Other: _____

On average, how many DAYS PER SEASON do you visit the Arrow Lakes?

Spring: _____ days/season Summer: _____ days/season

Fall: _____ days/season Winter: _____ days/season

<p>What recreation activities did you do TODAY on the water or on the shore of the Arrow Lakes?</p>	<p>Are you participating in this activity today as a paying customer of a commercial recreation or tourism operator/guide?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No Please elaborate:</p>
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Figure 3. Section 1 questions.

Section 2: Important Outdoor Recreation Activities

Section 2 asks about respondents' most important outdoor recreation activities. These questions inform H_{0C} by providing information about the type of user in terms of intra-activity characteristics. Recreationist may partake in a range of activities. This question provides an assessment of individual's degree of recreation specialization, which accounts for intra-activity variation (Bryan, 1977; McFarlane, 2001; Scott & Shafer, 2001).

¹⁰ *e.g.*, municipal land, Crown land, BC Parks, as different agencies are responsible for managing access to the Arrow Lakes Reservoir.

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Of all of the activities that you do on the water or on the shore of the Arrow Lakes, which one is the **MOST IMPORTANT?** *Identify only one activity.*

My most important recreation activity is: _____

How many years have you done this activity? _____ years.

On a scale of 1 to 5, with 1 being **BEGINNER** and 5 being **EXPERT**, how skilled are you at this activity?

Beginner (1) (2) (3) (4) (5) Expert

On a scale of 1 to 5, with 1 being **NOT IMPORTANT AT ALL** and 5 being **VERY IMPORTANT**, how important is this activity to your lifestyle?

Not important at all (1) (2) (3) (4) (5) Very important

Who do you usually do this recreation activity with? Check only one.

Alone Family Friends Clubs People from work Other: _____

On average, how many DAYS PER SEASON do you do this activity?

Spring: _____ days/season Summer: _____ days/season

Fall: _____ days/season Winter: _____ days/season

Figure 4. Section 2 questions.

Section 3: Arrow Lakes Outdoor Recreation Experiences.

This section has two parts. The first part (Figure 5) asks about some of the experiences that respondents may have had while visiting the Arrow Lakes for recreation activities. These two questions provide information about social settings by eliciting individual's encounter norms to provide an assessment of crowding (Manning, 1999; Vaske & Donnelly, 2002).

Consider how many people you are comfortable seeing while you are visiting the Arrow Lakes and complete the following statement:

It is OK to have as many as _____ encounters per day.

OR

It doesn't matter to me how many people I see.

For each season below, indicate on a scale of 1-9 how crowded you have felt while visiting the Arrow Lakes.

Spring: (1) (2) (3) (4) (5) (6) (7) (8) (9)
Not at all crowded Somewhat crowded Moderately crowded Extremely crowded

Summer: (1) (2) (3) (4) (5) (6) (7) (8) (9)
Not at all crowded Somewhat crowded Moderately crowded Extremely crowded

Fall: (1) (2) (3) (4) (5) (6) (7) (8) (9)
Not at all crowded Somewhat crowded Moderately crowded Extremely crowded

Winter: (1) (2) (3) (4) (5) (6) (7) (8) (9)
Not at all crowded Somewhat crowded Moderately crowded Extremely crowded

Consider how many people you are comfortable seeing while you are visiting the Arrow Lakes and complete the following statement:

It is OK to have as many as _____ encounters per day.

OR

It doesn't matter to me how many people I see.

For each season below, indicate on a scale of 1-9 how crowded you have felt while visiting the Arrow Lakes.

Spring: (1) (2) (3) (4) (5) (6) (7) (8) (9)
Not at all crowded Somewhat crowded Moderately crowded Extremely crowded

Summer: (1) (2) (3) (4) (5) (6) (7) (8) (9)
Not at all crowded Somewhat crowded Moderately crowded Extremely crowded

Fall: (1) (2) (3) (4) (5) (6) (7) (8) (9)
Not at all crowded Somewhat crowded Moderately crowded Extremely crowded

Winter: (1) (2) (3) (4) (5) (6) (7) (8) (9)
Not at all crowded Somewhat crowded Moderately crowded Extremely crowded

Figure 5. Section 3 questions, part 1.

The second part addresses recreation conflicts (Figure 6). Recreation conflict occurs when the presence, behaviour, or values of an individual or group interferes with another individual or group (Vaske, *et al.*, 2007). This question provides information about the social setting by asking whether individuals have encountered any conflicts with other recreation visitors.

Figure 6. Section 3 questions, part 2.

Section 4: Use and Familiarity of Arrow Lakes.

This section includes two questions. The first question (Figure 7) asks about respondents' use of, and familiarity with, the Arrow Lakes. People can have multiple motivations for engaging in recreation activities, which may include enjoyment from the activity itself, socialization, as well as other benefits (Driver *et al.*, 1991). An understanding of people's motivations for pursuing recreation activities in the Arrow Lakes Reservoir helps to inform the attitudes and preferences element of the *subjective evaluation* component of the satisfaction model.

Figure 7. Section 4 questions, part 1.

The second question (Figure 8) addresses respondents' knowledge about the management goals of the Arrow Reservoir. People engage in outdoor recreation activities with the expectation that this engagement will fulfill particular needs, motivations, or other desires (Fishbein & Ajzen, 1975; Manning, 1999). Understanding individual's expectations informs their recreation satisfaction. If people are not aware of the management goals for the Arrow Lakes Reservoir, their expectations may not be realistic, and their satisfaction affected.

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The Arrow Lakes serves many purposes. In your opinion, what are the 3 most important management goals for the Arrow Lakes? Place a 1, 2, or 3 beside your choices (with 1 being the most important management goal).

Rank

_____ Provide local employment

_____ Safety for reservoir users

_____ Provide recreation opportunities

_____ Flood control

_____ Electricity generation

_____ Provide habitat for aquatic species

_____ Other _____

The Arrow Lakes serves many purposes. In your opinion, what are the 3 most important management goals for the Arrow Lakes? Place a 1, 2, or 3 beside your choices (with 1 being the most important management goal).

Rank

_____ Provide local employment

_____ Safety for reservoir users

_____ Provide recreation opportunities

_____ Flood control

_____ Electricity generation

_____ Provide habitat for aquatic species

_____ Other _____

Figure 8. Section 4 questions, part 2.

Section 5: Arrow Lakes Outdoor Recreation Management.

This section has two parts. The first part of this section (Figure 9) asks about how respondents feel about the management of recreation on the Arrow Lakes. Although there are not any standardized measures of visitor satisfaction, a common approach is to gauge overall satisfaction through the use of multiple-item measures of satisfaction that are context specific (Manning, 1999). This question provides an overall assessment of visitor satisfaction, which will be used to test the relationship of water levels to visitor use.

The management of the Arrow Lakes seeks to balance many tasks. Please indicate your satisfaction with management activities.

Never
Rarely
Sometimes
Frequently
Always

On the whole, are you satisfied with water levels on the Arrow Lakes? 1 2 3 4 5

On the whole, do you have satisfying experiences on the water or onshore of the Arrow Lakes? 1 2 3 4 5

On the whole, are you satisfied with the conditions of the boat ramps on the Arrow Lakes? 1 2 3 4 5

On the whole, are you satisfied with the parking lot conditions when you visit the Arrow Lakes? 1 2 3 4 5

On the whole, are you satisfied with the management of the Arrow Lakes? 1 2 3 4 5

Figure 9. Section 5 questions, part 1.

The second part of this section (Figure 10) directly addresses H_{0A} as it explicitly asks whether respondents will return based on the water levels that they have experienced. This question also addresses H_{0C} as the stated relationship between water levels and likelihood of returning to the Arrow Lakes Reservoir can be stratified by activity. This question informs the conceptual model of satisfaction by examining the link between Resource Setting and likelihood of returning (*i.e.*, achieved satisfaction).

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<p>Compared to the water levels that you experienced today, how might different water levels affect your use of the Arrow Lakes for recreation activities?</p> <p style="text-align: right; font-size: small;">I will come back I will go somewhere else Not sure</p> <p>If the water level is the same as today... <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>If the water level is higher than today... <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>If the water level is lower than today... <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>Please elaborate:</p>	<p>Compared to the water levels that you experienced today, how might different water levels affect your use of the Arrow Lakes for recreation activities?</p> <p style="text-align: right; font-size: small;">I will come back I will go somewhere else Not sure</p> <p>If the water level is the same as today... <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>If the water level is higher than today... <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>If the water level is lower than today... <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>Please elaborate:</p>
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Figure 10. Section 5 questions, part 2.

Section 6: Arrow Lakes Outdoor Recreation Experiences.

This section has three parts (Figure 11, 12, and 13) which ask about respondents' recreation experiences on the Arrow Lakes. The first part of this section establishes respondents' familiarity with the Arrow Lakes Reservoir by asking about the length of time that they have used the area for outdoor recreation. The degree of familiarity influences visitors' expectations, which has an effect on their degree of satisfaction.

How long have you been coming to the Arrow Lakes for recreation activities? _____ years.

Based on your experience today, will you come back to the Arrow Lakes for recreation activities?

Yes No **Please elaborate:**

Figure 11. Section 6 questions, part 1.

The second part includes 4 questions related to respondents' experience while using boat ramp facilities (Figure 12). These questions address H_{OC} by asking about people's motivations, and their degree of satisfaction.

<p>Which boat ramp facility do you usually use on the Arrow Lakes?</p>	<p>Why did you come to this boat ramp facility today?</p>
<p>What did you LIKE MOST about the boat ramp facility that you visited today?</p>	<p>What did you LIKE LEAST about the boat ramp facility that you visited today?</p>

Figure 12. Section 6, part 2, questions pertaining to boat ramp use.

Respondents are also asked where they first heard about recreation opportunities near and on the reservoir (Figure 13).

**How did you first hear about recreation opportunities and activities near and on the Arrow Lakes?
Check all that apply.**

<input type="checkbox"/> Tourism information booth	<input type="checkbox"/> Family	<input type="checkbox"/> BC Hydro web site
<input type="checkbox"/> Tourism information brochures	<input type="checkbox"/> Friends	<input type="checkbox"/> BC Hydro facility (e.g., Revelstoke Dam)
<input type="checkbox"/> Tourism operators	<input type="checkbox"/> BC Parks	<input type="checkbox"/> BC Hydro bill
<input type="checkbox"/> Private marinas	<input type="checkbox"/> BC Forest Service	<input type="checkbox"/> Other: _____

Figure 13. Section 6 questions, part 3.

Section 7: Demographics.

Section 7 collects basic information about respondents' demographic characteristics. These questions provide explicit information about individuals' place of residence, which informs the user classification as either resident or tourist (*i.e.*, travelled more than 80km (Murphy, 1991)). They also provide information about user socioeconomic characteristics, which addresses H_{0c}. This question provides data about socioeconomic characteristics, which addresses the *subjective evaluation* component of the conceptual model of satisfaction.

What year were you born in? 19 ____ What community do you live in? _____

Gender: Male Female How long have you lived in your community? ____ years.

Please list any outdoor recreation clubs or organizations that you belong to.

Do you have any additional comments about recreation on the water or on the shore of the Arrow Lakes?

Figure 14. Section 7 questions.

3.7 Survey Analyses

3.7.1 Data Entry QA/QC

The data from all completed questionnaires were entered (twice) into two SPSS databases to facilitate the verification of data for keying errors, and accuracy and consistency in data coding (Salant & Dillman, 1994). Each completed questionnaire was compared among the two datasets such that each cell (each answer to a question) was verified using the Identify Duplicate Cases function in SPSS (if two cases are identified as being duplicates, then it is assumed that they have been entered correctly). When discrepancies were identified, the appropriate questionnaire was consulted and the necessary correction was made. The resultant dataset can be considered to be free of errors from data entry. The data were checked for "protest votes" (*i.e.*, outliers or

obvious patterns such as multiple responses from the same IP address); when these were identified they were checked against the corresponding questionnaire. No obvious “protest votes” were identified.

3.7.2 *Survey Responses*

Survey responses have been summarized for each question for each year (2009-2012) and presented in Appendix E. Where there are statistically significant differences between responses for sample years, they have been noted. Methods of analysis for the interim examination of the management hypotheses are discussed below.

3.7.3 *Management Hypothesis H_{0A}: Frequency of public use of Arrow Lake is not influenced by fluctuating reservoir water levels.*

The likelihood of respondents returning to the Arrow Lakes for recreation activities was assessed for each sample day in 2012; this was also done for the question that asked whether different water levels might affect respondents’ use of the Arrow lakes for recreation activities.

3.7.4 *Management Hypothesis H_{0B}: Volume of public use of Arrow Lake is not influenced by fluctuating reservoir water levels.*

A linear regression was used to investigate whether fluctuating reservoir water levels influenced the volume of public use of the Arrow Lakes between 2009 and 2012. The daily average water level (m) at Nakusp was the independent variable, and the summed daily traffic counter total was the dependent variable; results were graphed with a line of best fit.

3.7.5 *Management Hypotheses H_{0C}: The different types of public use are not affected by fluctuating water levels.*

Seven different public use groups were identified to examine whether different types of public use were affected by fluctuating water levels. These groups were delineated based on the recreation activities that were engaged in the day that respondents completed their questionnaires. The seven groups were: residents and tourists, three water-based activities (boaters/non-boaters, anglers/non-anglers, and swimmers/non-swimmers), and three shore-based activities (campers/non-campers, people engaged in beach activities/not engaged in beach activities, and walkers/hikers and non-walkers/hikers. Independent sample t-tests were employed to test whether there were any differences between the members/non-members of each of these groups for respondents’ satisfaction with water levels on the Arrow Lakes. Chi-square tests were employed to test whether there were any differences between the members/non-members of

each of these groups for the likelihood of respondents returning if water levels were the same, higher, or lower than the water levels experienced the day that the Arrow Lakes was visited.

4. RESULTS

4.1 Limitations of Study:

A limitation to data collection included the need to remove counters (or exclude counter data) for extended periods due to the presence of construction activity on the boat ramps. Periods when counters were removed are noted in Tables 3 and 4. Timely reporting of planned construction periods in future years will help ensure that counters are removed for the minimum length of time. For example, the Anderson Point traffic counter was removed on May 14, 2012 in response to planned road construction activities. The planned activities were subsequently deferred and the counter was re-installed one month later on June 12, 2012.

Year 4 produced an excessively high water year with a sustained water level of 1446 feet elevation (or about 2 feet above normal pond level (1444')) for six weeks of the summer beginning July 6, 2012. This created a number of operational challenges to data collection during the busiest boating periods. To protect the sensitive electronic traffic counters from being submerged and water damaged, the counters were removed from all but Anderson Point, Nakusp and Syringa Creek. This limited the ability to measure recreational activity when water levels were 'artificially' high. While we feel confident in providing the best estimates available for use during the high water period, the data should be interpreted with caution. More accurate counts during the high water period would help to give a better sense of what happens when BCH raises the water during peak recreation periods. Alternatives such as relocating counters will be considered if high water occurs in future years - provided the physical design of the ramps permits relocation and the counters will not be exposed to tampering.

4.2 Year 4 Results:

A total of 3,051 visitors were encountered at sample sites on the Arrow Lakes between June 18 and October 29, 2012. Field staff asked 749 visitors to participate in the survey; 550 completed questionnaires were returned, which represents an overall response rate of 80.9% (Table 8). The frequencies of completed questionnaires by season are illustrated in Appendix D – Completed Questionnaires by Sample Date. The frequencies of completed returns by sample date are illustrated in Figure 15. No individuals completed the web-based survey in 2012. Complete summaries of survey and traffic results are provided in Appendices E and F.

Table 8. Arrow Lakes visitors encountered and survey response rates, 2012.

Season	# Visitors Encountered	# Visitors Asked to Participate	# Previously Completed [†]	# Completed Questionnaires	Response Rate
Summer	2,813	673	50	511	82.0%
Fall	238	76	19	39	68.4%
TOTAL	3,051	749	69	550	80.9%

[†] Visitors who have previously completed the survey in this sampling year.

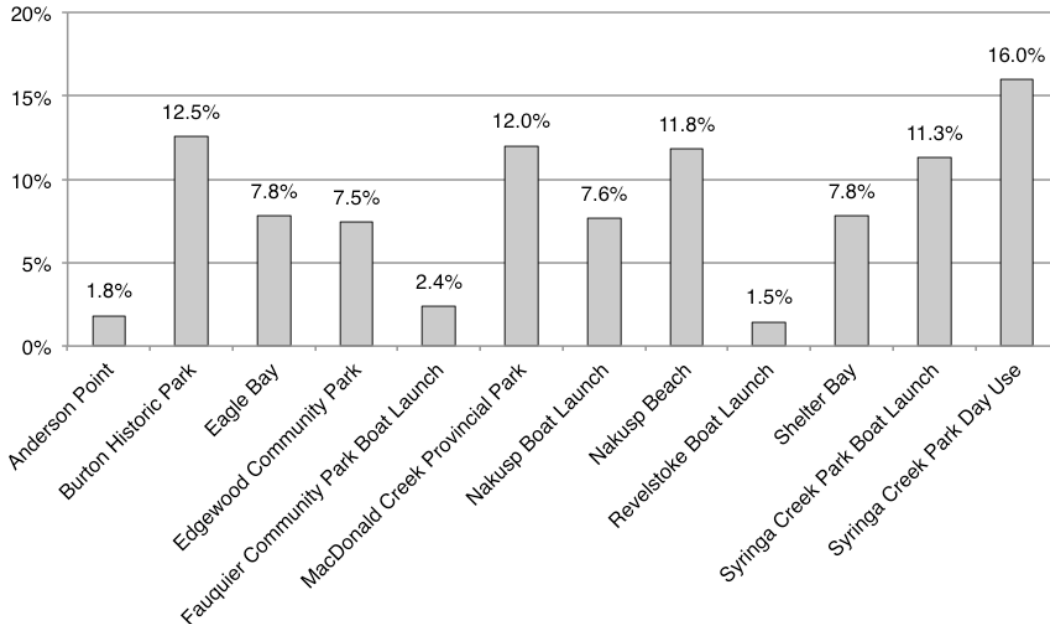


Figure 15. Completed questionnaires by sample location (n = 550).

4.3 Management Hypothesis H_{0A}:

H_{0A}: Frequency of public use of Arrow Lake is not influenced by fluctuating reservoir water levels.

Respondents in 2012 indicated that based on their experiences on the day that they visited the Arrow Lakes, they would return for outdoor recreation activities (Table 9).

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Table 9. Based on your experience today, will you come back to the Arrow Lakes for recreation activities? (2012; n = 524)

Sample Date	Water Level (m)	n	Will return to Arrow Lakes
2012/06/18	437.08	19	100.00%
2012/06/21	437.82	17	100.00%
2012/06/23	438.21	32	100.00%
2012/06/27	439.13	13	92.31%
2012/07/02	439.77	26	96.15%
2012/07/05	440.23	9	100.00%
2012/07/15	440.37	20	95.00%
2012/07/21	440.48	33	90.91%
2012/07/29	440.16	26	100.00%
2012/08/05	439.71	63	100.00%
2012/08/06	439.69	38	97.37%
2012/09/01	436.55	54	100.00%
2012/09/02	436.41	24	100.00%
2012/09/08	435.71	37	100.00%
2012/09/10	435.44	32	100.00%
2012/09/21	434.83	21	95.24%
2012/09/27	434.25	17	100.00%
2012/09/28	434.17	7	71.43%
2012/10/03	433.97	10	100.00%
2012/10/08	434.15	11	100.00%
2012/10/13	434.29	12	100.00%
2012/10/21	434.27	1	100.00%
2012/10/29	434.30	2	100.00%

Table 10. Compared to the water levels that you experienced today, how might different water levels affect your use of the Arrow Lakes for recreation activities (2012)?

Sample Date	Water Level (m)	I will come back if the water levels are...		
		lower than today (n = 414).	the same as today (n = 447).	higher than today (n = 418).
2012/06/18	437.08	73.3%	85.7%	85.7%
2012/06/21	437.82	75.0%	94.1%	93.8%
2012/06/23	438.21	65.2%	96.2%	84.0%
2012/06/27	439.13	70.0%	100.0%	75.0%
2012/07/02	439.77	100.0%	94.1%	75.0%
2012/07/05	440.23	100.0%	100.0%	85.7%
2012/07/15	440.37	93.8%	82.4%	50.0%
2012/07/21	440.48	100.0%	61.5%	42.9%
2012/07/29	440.16	100.0%	85.7%	52.6%
2012/08/05	439.71	96.0%	98.1%	81.3%
2012/08/06	439.69	97.1%	94.6%	72.4%
2012/09/01	436.55	84.8%	98.1%	91.8%
2012/09/02	436.41	68.8%	88.9%	87.5%
2012/09/08	435.71	88.9%	100.0%	96.8%
2012/09/10	435.44	75.0%	100.0%	95.7%
2012/09/21	434.83	68.8%	73.7%	78.9%
2012/09/27	434.25	90.0%	100.0%	100.0%
2012/09/28	434.17	50.0%	62.5%	87.5%
2012/10/03	433.97	100.0%	100.0%	100.0%
2012/10/08	434.15	100.0%	100.0%	90.0%
2012/10/13	434.29	100.0%	100.0%	100.0%
2012/10/21	434.27	100.0%	100.0%	100.0%
2012/10/29	434.30	100.0%	100.0%	100.0%

4.4 Management Hypothesis H_{0B}:

H_{0B}: Volume of public use of Arrow Lake is not influenced by fluctuating reservoir water levels.

A linear regression of all sample years (2009 - 2012) indicated that there was a modest relationship between the volume of public use and the water levels of the Arrow Lakes as measured at Nakusp ($F(1, 1141) = 491.755, p < .001; R^2 = 0.301, \beta = 0.549, p < .001$). This indicates that the water level of the Arrow Lakes can account for 30.1% of the variation in visitor volume (Figure 16), which suggests that other variables influence the volume of visitors.

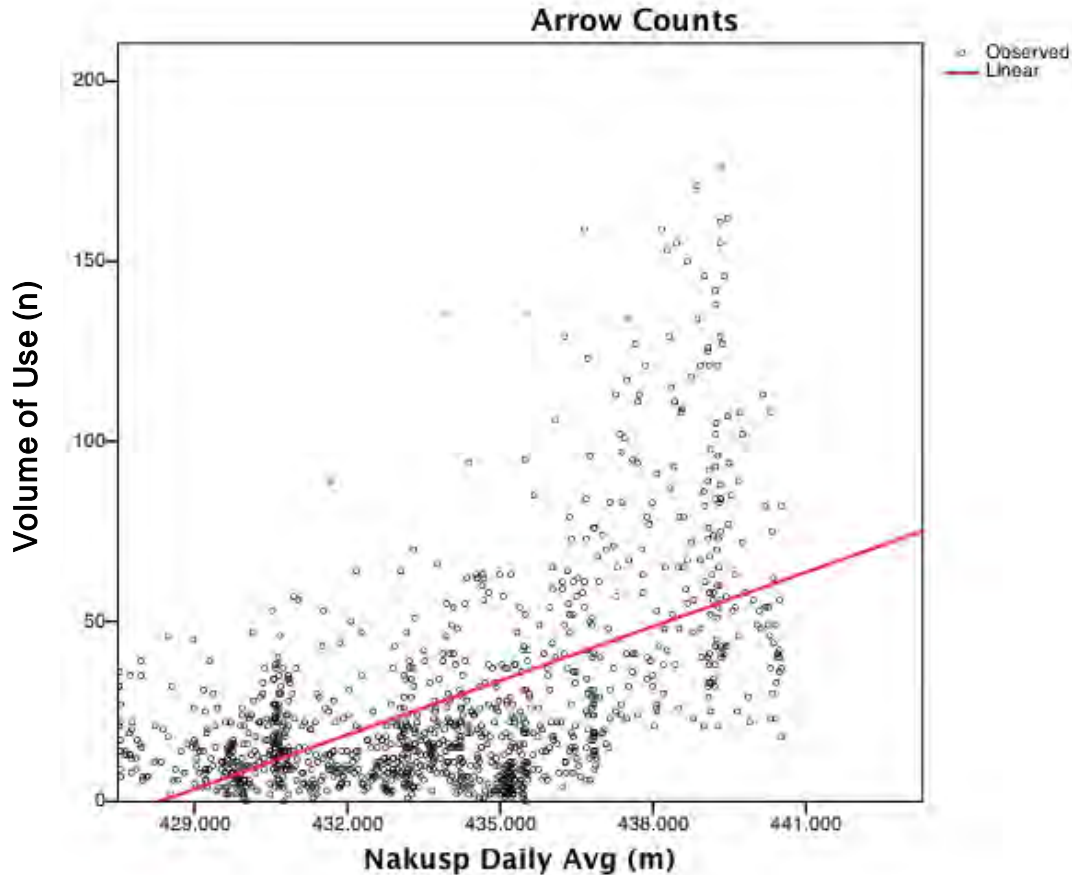


Figure 16. Volume of public use (2009 - 2012) and Arrow Lakes water levels at Nakusp (m).

Traffic counters indicate 8,946 boat launches this year, a 17% decrease in use from 2011 and 23% lower than 2010. Another indication of boating use on the Arrow Lakes in 2012 comes from comparing use at Syringa Creek and Nakusp as those counters were not removed during the high water period and represent 68% of all the boating use. Use at Syringa Creek decreased by 15% and use at Nakusp decreased by 8% in 2012. Use at Syringa Creek decreased during all months including those with regular water levels. Use at Nakusp decreased during the high water period only. All counter locations recorded between 8% and 57% fewer users than last year. The greatest percentage decreases were noted at: Burton (-57%), Edgewood (-46%) and McDonald Creek (-39%).

4.5 Management Hypothesis H0C:

H_{0C}: The different types of public use are not affected by fluctuating water levels.

An examination of overall satisfaction with water levels on the Arrow Lakes reveals significant differences between several public uses (Table 11). Tourists had a higher mean satisfaction than

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residents; non-boaters had a higher mean satisfaction than boaters; non-anglers had a higher mean satisfaction than anglers; swimmers had a higher mean satisfaction than non-swimmers; campers had a higher mean satisfaction than non-campers; people engaged in beach activities had a higher mean satisfaction than people not engaged in beach activities; and walkers/hikers had a higher mean satisfaction than non-walkers/hikers did.

Table 11. Overall satisfaction with water levels on the Arrow Lakes by different public uses (2009 - 2012).

Type of Public Use	n	Mean	95% CI	SD	t	df	p
Tourist	1,635	3.96	± 0.09	1.884	5.911	845.653	0.000
Resident	427	3.46	± 0.14	1.444			
Non-Boaters	1712	3.93	± 0.09	1.896	5.682	709.086	0.000
Boaters	350	3.47	± 0.13	1.270			
Non-Anglers	1457	3.93	± 0.10	1.899	3.009	1349.940	0.003
Anglers	605	3.68	± 0.13	1.574			
Non-Swimmers	1687	3.80	± 0.09	1.826	- 2.851	2060	0.004
Swimmers	375	4.10	± 0.18	1.736			
Non-Campers	1733	3.81	± 0.08	1.796	- 2.548	2060	0.011
Campers	329	4.09	± 0.20	1.886			
Non-Beach-Activities	1758	3.83	± 0.09	1.836	- 1.877	440.711	0.061
Beach Activities	304	4.02	± 0.19	1.664			
Non-Walkers/Hikers	1643	3.81	± 0.09	1.781	- 1.987	2060	0.047
Walkers/Hikers	419	4.01	± 0.18	1.927			

If the water levels were the same as they were when respondents' visited the Arrow Lakes, almost all respondents would return; there were no significant differences between the seven types of public use that were examined (Table 12). If the water levels were higher than they were when respondents' visited the Arrow Lakes, an average of four out of five respondents would return; however, more residents than tourists would go somewhere else if water levels were higher, and more swimmers than non-swimmers would go somewhere else if water levels were higher (Table 13). If the water levels were lower than they were when respondents' visited the Arrow Lakes, an average of four out of five respondents would return; however, more anglers than non-anglers would go elsewhere if water levels were lower (Table 14).

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Table 12. How similar water levels may affect different uses of the Arrow Lakes (2009 - 2012).

Type of Public Use	n	If the water levels are the same as today...		χ^2	df	p	Phi
		I will come back	I will go somewhere else				
Tourist	1,430	95.3%	4.7%	0.586	1	0.444	0.018
Resident	372	94.3%	5.7%				
Non-Boaters	1,488	95.3%	4.7%	0.590	1	0.442	0.018
Boaters	314	94.3%	5.7%				
Non-Anglers	1,251	95.1%	4.9%	0.000	1	0.983	0.001
Anglers	551	95.1%	4.9%				
Non-Swimmers	1,453	94.8%	5.2%	1.251	1	0.263	- 0.026
Swimmers	349	96.3%	3.7%				
Non-Campers	1,486	94.9%	5.1%	0.973	1	0.324	- 0.023
Campers	316	96.2%	3.8%				
Non-Beach-Activities	1,522	94.9%	5.1%	0.651	1	0.420	- 0.019
Beach Activities	280	96.1%	3.9%				
Non-Walkers/Hikers	1,425	95.3%	4.7%	0.484	1	0.487	0.016
Walkers/Hikers	377	94.4%	5.6%				

Table 13. How higher water levels may affect different uses of the Arrow Lakes (2009 - 2012).

Type of Public Use	n	If the water levels are higher than today...		χ^2	df	p	Phi
		I will come back	I will go somewhere else				
Tourist	1,368	88.8%	11.2%	7.279	1	0.007	0.065
Resident	359	83.6%	16.4%				
Non-Boaters	1,419	88.2%	11.8%	1.406	1	0.236	0.029
Boaters	308	85.7%	14.3%				
Non-Anglers	1197	87.4%	12.6%	0.417	1	0.519	- 0.016
Anglers	530	88.5%	11.5%				
Non-Swimmers	1,403	89.7%	10.3%	26.153	1	0.000	0.123
Swimmers	324	79.3%	20.7%				
Non-Campers	1,431	88.1%	11.9%	0.824	1	0.364	0.022
Campers	296	86.1%	13.9%				
Non-Beach-Activities	1,464	88.5%	11.5%	4.782	1	0.029	0.053
Beach Activities	263	83.7%	16.3%				
Non-Walkers/Hikers	1,367	87.3%	12.7%	0.879	1	0.349	- 0.023
Walkers/Hikers	360	89.2%	10.8%				

Table 14. How lower water levels may affect different uses of the Arrow Lakes (2009 - 2012).

Type of Public Use	n	If the water level is lower than today...		χ^2	df	p	Phi
		I will come back	I will go somewhere else				
Tourist	1,247	82.6%	17.4%	0.282	1	0.595	- 0.013
Resident	352	83.8%	16.2%				
Non-Boaters	1,308	83.7%	16.3%	3.668	1	0.055	0.048
Boaters	291	79.0%	21.0%				
Non-Anglers	1,105	84.8%	15.2%	9.403	1	0.002	0.077
Anglers	494	78.5%	21.5%				
Non-Swimmers	1,283	82.1%	17.9%	2.861	1	0.091	- 0.091
Swimmers	316	86.1%	13.9%				
Non-Campers	1,328	83.0%	17.0%	0.076	1	0.782	0.007
Campers	271	82.3%	17.7%				
Non-Beach-Activities	1,346	83.1%	16.9%	0.232	1	0.630	0.012
Beach Activities	253	81.8%	18.2%				
Non-Walkers/Hikers	1,275	82.7%	17.3%	0.173	1	0.677	- 0.010
Walkers/Hikers	324	83.6%	16.4%				

5. DISCUSSION

5.1 Management Hypothesis H_{0A}:

H_{0A}: Frequency of public use of Arrow Lake is not influenced by fluctuating reservoir water levels.

The majority of respondents in 2012 would return based on their experiences on the day that they visited the Arrow lakes; the environmental conditions did not seem to affect responses. Based on the average responses from 2012 to the questions that asked whether different water levels would affect people's likelihood of returning to the Arrow Lakes, fewer respondents (5.17%) would return if water levels were lower, as well as if water levels were higher (8.2% decline).

5.2 Management Hypothesis H_{0B}:

H_{0B}: Volume of public use of Arrow Lake is not influenced by fluctuating reservoir water levels.

The linear regression of all sample years indicated a modest relationship between the volume of public use and the water levels of the Arrow Lakes as measured at Nakusp. However, the amount of variation explained by this relationship was modest, which suggests that other variables

influence the volume of visitors (*e.g.*, environmental conditions, recreation specialization, and conflict experienced).

Traffic counters indicate a 17% decrease in use from 2011 and 23% lower than 2010. The greatest percentage decreases were noted at: Burton (-57%), Edgewood (-46%) and McDonald Creek (-39%). The reduction in overall boat launches this year was likely due to a high water period of 1446 feet (2' above normal pond level of 1444') experienced for six weeks of the summer beginning July 6, 2012. During the high water period surveyors observed a prolonged presence of floating debris that clogged some boat ramps and created boating safety hazards on the water.

Figure 17. Anderson Point, July 15, 2012



Floating debris blocked some boat ramps during the high water period.

5.3 Management Hypothesis H_{0C}:

H_{0C}: The different types of public use are not affected by fluctuating water levels.

Tourists, non-boaters, non-anglers, swimmers, campers, people engaged in beach activities, and walkers/hikers had a higher mean satisfaction with water levels on the Arrow Lakes than their counter-parts did. Although residents, boaters and anglers, non-swimmers, people not engaged in beach activities, and non-walkers/hikers were not as satisfied as their counter parts, their mean satisfaction levels were above the median. Although these differences were statistically significant, they do not appear to be substantive differences.

Were water levels to remain the same as they were when respondents' visited the Arrow Lakes, there would be minimal impact on the number of people visiting, despite their type of public use. Fewer people would return to the Arrow Lakes for recreation activities if water levels were higher

than those experienced the day the reservoir was visited; more residents and swimmers would go elsewhere than other groups. A similar pattern was evident activities if water levels were lower than those experienced the day the reservoir was visited; fewer anglers would return in higher water level conditions.

6. CONCLUSIONS

The majority of respondents in 2012 would return based on their experiences on the day that they visited the Arrow lakes, thus indicating a reasonable level of satisfaction with recreation opportunities and management practices.

A linear regression of all sample years indicated a modest relationship between the volume of public use and the water levels of the Arrow Lakes as measured at Nakusp. However, the amount of variation explained by this relationship was modest, which suggests that other variables influence the volume of visitors (*e.g.*, environmental conditions, recreation specialization, and conflict experienced). Management practices at sites managed by agencies other than BC Hydro (i.e., BC Parks), may have an influence. For example, frequency of snow plowing, winter access and debris removal will impact the ability of users to safely access boat ramps at low and high water.

Although not monitored as a specific parameter, it is notable that both survey respondents and surveyors reported issues with floating debris at the boat ramps during peak use months in 2012. During the period above full pool (from July 6 to August 15, 2012) surveyors observed a greater than normal volume of driftwood and debris on the lake caused by the high water. This made access at the boat launches more difficult, and likely caused the overall decline in usage in 2012.

The relationship between the water levels on the Arrow Lakes and the volume of visitor use is a complicated one. Although changing water levels do have an effect on the potential volume of visitors to the Arrow Lakes, there are other influences that need to be accounted for. The final comprehensive report (Year 5) will investigate the influence of other variables on the volume of visitor use.

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APPENDIX A – TRAFx VEHICLE COUNTERS

How were traffic counters used in this study?

TRAFx G3 magnetic field controlled vehicle counters were selected for use in this study as they are the preferred and recommended traffic counter of BC Parks, Parks Canada and the US National Parks Service. Traffic counters were configured and installed at 11 boat launch facilities on the Arrow Lakes Reservoir. This includes Syringa Creek, Shelter Bay, Nakusp, Eagle Bay, McDonald Creek, Burton Historic Park, Revelstoke, Edgewood, Fauquier, and Anderson Point. In 2011, an additional traffic counter was installed at the Burton South boat launch. The settings used are as follows:

Table 15. Traffic counter settings at Arrow Lakes.

Location	Mode	Period	Delay	Threshold	Rate
Revelstoke	VEH_2s	000	120	16	S
Eagle Bay	VEH_2s	000	120	16	S
Shelter Bay	VEH_2s	000	120	16	S
Nakusp	VEH_4d	000	96	16	S
McDonald Creek	VEH_2s	000	120	16	S
Burton	VEH_2s	000	120	16	S
Burton South	VEH_2s	000	120	16	S
Fauquier	VEH_2s	000	120	16	S
Edgewood	VEH_2s	000	120	16	S
Syringa Creek	VEH_4d	000	96	16	S
Anderson Point	VEH_2s	000	120	16	S

Notes: Mode: Veh_2s = single lane traffic; Veh_4d = double lane traffic
 Period = 000: means timestamps
 Delay: 8 = 1 sec; 96 = 12 sec; 120 = 15 sec
 Threshold: Range is 3-16; 16 is least sensitive¹¹
 Rate: S is slow (<50 km/h)

Settings were monitored and adjusted in the first year of study (2009–2010). They will continue to at the current settings unless a problem arises.

How does the traffic counter work?

Ferrous metal (i.e., metals with iron content) objects distort the earth's magnetic field as they move through it. Pure aluminum (non-alloy aluminum) will not be detected. Moving the counter (i.e., pointing it in different compass directions, tilting it, jiggling or jolting it) will also cause counts

¹¹ Counter thresholds were adjusted to the least sensitive setting that would still trip the counter when a vehicle passes through. This also prevented the count of bicycles, and smaller metal objects.

to occur. This is because the earth's magnetic field has different strengths for different directions and tilts, and the counter senses this.

As vehicles move, they disturb the earth's magnetic field. The TRAFx vehicle counter digitizes and analyzes these disturbances using highly sophisticated hardware and software. Thus, as a vehicle passes within the detection zone it changes the earth's magnetic field in that area which triggers a count. Different modes are used to meet the particular needs and traffic pattern of a given site. That is why the modes and sensitivity settings were selected at each site to best reflect the local conditions.

Can the vehicle counter be buried? Does it perform differently when buried?

Yes, it can be buried. Because it responds to changes in the earth's magnetic field, the TRAFx Vehicle Counter functions the same whether the counter is buried or installed above ground.

Will the counter still function if a vehicle parks over or near the counter?

Yes. Unlike most other types of vehicle counters, the TRAFx vehicle counter will automatically adjust to the presence of a vehicle parked over top or nearby, and continue to function properly. Likewise, if the counter is placed near a metal pole (e.g., signpost) or similar static metal object (e.g., guard rail, cattleguard, bridge beam etc.) it will automatically adjust to its presence.

How were annual traffic counts calculated?

TRAFx DataNet traffic count estimates follow the most widely accepted vehicle traffic calculation methods used in North America. This system is used by the US Army Corps of Engineers, US Bureau of Land Management, US Fish and Wildlife, US Forest Service, US National Parks Service, Parks Canada, most Canadian provincial and territorial governments, and numerous countries in Europe and the South Pacific.

Annual Traffic Counts are collected and automatically compiled by the TRAFx DataNet system for each full calendar year. This is done to standardize the calculation and application of average daily use to missing data. The system then enables the selection of any time period across years for calculating and reporting daily, weekly and monthly counts, averages and comparisons.

The Annual Traffic Summary shows estimated total yearly counts by recording the total daily counts and calculating the average daily count for that month, then applying that average daily count to missing data periods (such as partial months due to mid-month start date or interruptions due to data downloads, dead batteries or missing data). Thus, if a given counter has at least one day of counts in a month but is also missing at least one day of counts that month, the TRAFx

Datanet will apply the monthly average daily count to only those days where data has been interrupted or is missing. If the counter had been operating without interruption during a day or month and there was absolutely no traffic recorded, the TRAFx DataNet calculates a '0' traffic count for that day or month. For years with complete months of missing data (not zero counts, but actually missing data) an annual average daily traffic count (AADT) is applied to all days within a missing month. The total estimate for the year is generated by adding the recorded and calculated counts.

How were boat launch counts calculated?

To get an accurate count at a boat launch it is necessary to apply additional factors, including:

- Filter — a 12-17 second delay is applied (12 seconds on double lane ramps and 17 seconds on single lane ramps) to remove any multiple counts within those intervals to reduce the possibility of multiple counts for a single launch.
- Divide by two — as a vehicle must pass the counter twice to launch a boat (going into the water loaded and coming out empty) the count is divided by two.
- Adjustment Factor of '0.5' — as a vehicle must make two trips per boating experience (one to launch the boat and another to load the boat) the count is again multiplied by 0.5 (or in other words again divided by two).

(TRAFx, 2010)

APPENDIX B – ARROW LAKES VISITOR SURVEY



LEES + Associates
RESEARCH & PLANNING

604 899 3806 | www.elac.bc.ca

Arrow Lakes Recreation Survey

- The purpose of this survey is to obtain information about recreation use of the Arrow Lakes.
- Participation in this study is completely voluntary; you may refuse to participate at any time.
- You may skip any question that you do not feel comfortable answering, although we encourage you to complete all questions if possible.
- The survey will take about 5 to 10 minutes to complete.

All information resulting from this study will be kept strictly confidential. Please do not write your name anywhere on this questionnaire. Individual responses will not be made available to anyone outside of the *Arrow Lakes Recreation Survey Research Team (LEES + Associates)*.

If you have any questions about this research, or would like further information, please do not hesitate to contact LEES + Associates at (604) 899-3806.

Q1

The questions in this section ask about the recreation activities that you do **ON THE WATER** or **ON THE SHORE** of the Arrow Lakes.

Indicate **ALL** of the activities that you do **ON THE WATER** or **ON THE SHORE** of the Arrow Lakes.

- | | | | |
|---|---|--|---|
| <input type="checkbox"/> Fishing | <input type="checkbox"/> Beach activities | <input type="checkbox"/> Hunting | <input type="checkbox"/> Mushroom picking |
| <input type="checkbox"/> Boating (motor cruising) | <input type="checkbox"/> Nature study | <input type="checkbox"/> Scenic viewing | <input type="checkbox"/> Berry picking |
| <input type="checkbox"/> Canoeing/kayaking | <input type="checkbox"/> Bird watching | <input type="checkbox"/> Picnicking | <input type="checkbox"/> Drawing/painting/photography |
| <input type="checkbox"/> Swimming | <input type="checkbox"/> Wildlife viewing | <input type="checkbox"/> Camping | <input type="checkbox"/> Cross-country skiing |
| <input type="checkbox"/> Waterskiing | <input type="checkbox"/> Horseback riding | <input type="checkbox"/> Walking/hiking | <input type="checkbox"/> Snowmobiling |
| <input type="checkbox"/> Wind surfing | <input type="checkbox"/> ATV/Trail bike/4 × 4 | <input type="checkbox"/> Mountain biking | <input type="checkbox"/> Other: _____ |

On average, how many **DAYS PER SEASON** do you visit the Arrow Lakes?

Spring: _____ days/season Summer: _____ days/season

Fall: _____ days/season Winter: _____ days/season

What recreation activities did you do **TODAY** on the water or on the shore of the Arrow Lakes?

Are you participating in this activity today as a paying customer of a commercial recreation or tourism operator/guide?

Yes No **Please elaborate:**

OFFICE
USE ONLY

Tracking #

Sample Date (yyyy-mm-dd)

Sample Location

Surveyor Initials

Version: March 29, 2010

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Q2

The following questions ask about the **ONE** outdoor recreation activity that is **MOST IMPORTANT** to you. Refer to this activity when answering all of the questions in this section.

Of all of the activities that you do on the water or on the shore of the Arrow Lakes, which one is the **MOST IMPORTANT**? *Identify only one activity.*

My most important recreation activity is: _____

How many years have you done this activity? _____ years.

On a scale of 1 to 5, with 1 being **BEGINNER** and 5 being **EXPERT**, how skilled are you at this activity?

Beginner (1) (2) (3) (4) (5) Expert

On a scale of 1 to 5, with 1 being **NOT IMPORTANT AT ALL** and 5 being **VERY IMPORTANT**, how important is this activity to your lifestyle?

Not important at all (1) (2) (3) (4) (5) Very important

Who do you usually do this recreation activity with? Check only one.

Alone Family Friends Clubs People from work Other: _____

On average, how many DAYS PER SEASON do you do this activity?

Spring: _____ days/season Summer: _____ days/season

Fall: _____ days/season Winter: _____ days/season

Q3

The following questions ask about some of the **EXPERIENCES** that you may have had while visiting the Arrow Lakes for recreation activities.

Consider how many people you are comfortable seeing while you are visiting the Arrow Lakes and complete the following statement:

It is OK to have as many as _____ encounters per day.

OR

It doesn't matter to me how many people I see.

For each season below, indicate on a scale of 1-9 how crowded you have felt while visiting the Arrow Lakes.

Spring: (1) (2) (3) (4) (5) (6) (7) (8) (9)
Not at all crowded Somewhat crowded Moderately crowded Extremely crowded

Summer: (1) (2) (3) (4) (5) (6) (7) (8) (9)
Not at all crowded Somewhat crowded Moderately crowded Extremely crowded

Fall: (1) (2) (3) (4) (5) (6) (7) (8) (9)
Not at all crowded Somewhat crowded Moderately crowded Extremely crowded

Winter: (1) (2) (3) (4) (5) (6) (7) (8) (9)
Not at all crowded Somewhat crowded Moderately crowded Extremely crowded

Have you ever experienced any conflicts with other people or recreation activities while you were visiting the Arrow Lakes?

Yes No **Please elaborate:**

Q4

The questions below ask about your **USE** and **FAMILIARITY** with the Arrow Lakes.

From the list below, indicate why you come to the Arrow Lakes. *Check all that apply.*

- To learn about reservoirs
- To discover new things
- To learn more about nature
- To view the scenery
- To be close to nature
- To think about my personal values
- To get exercise
- To give my mind a rest
- To have a change from my daily routine
- To be with friends
- To be with family
- Other _____

The Arrow Lakes serves many purposes. In your opinion, *what are the 3 most important management goals for the Arrow Lakes?* Place a 1, 2, or 3 beside your choices (with 1 being the most important management goal).

Rank

- _____ Provide local employment
- _____ Safety for reservoir users
- _____ Provide recreation opportunities
- _____ Flood control
- _____ Electricity generation
- _____ Provide habitat for aquatic species
- _____ Other _____

Q5

The questions below ask about **HOW YOU FEEL** about the management of recreation on the Arrow Lakes.

The management of the Arrow Lakes seeks to balance many tasks. Please indicate your satisfaction with management activities.

Never
Rarely
Sometimes
Frequently
Always
Don't know

On the whole, are you satisfied with water levels on the Arrow Lakes? 1 2 3 4 5

On the whole, do you have satisfying experiences on the water or on the shore of the Arrow Lakes? 1 2 3 4 5

On the whole, are you satisfied with the condition of the boat ramp facilities at this site? 1 2 3 4 5

On the whole, are you satisfied with the parking lot conditions at this site? 1 2 3 4 5

On the whole, are you satisfied with the management of the Arrow Lakes? 1 2 3 4 5

Compared to the water levels that you experienced today, how might different water levels affect your use of the Arrow Lakes for recreation activities?

I will come back
I will go somewhere else
Not sure

If the water level is the **same** as today...

If the water level is **higher** than today...

If the water level is **lower** than today...

Please elaborate:

Q6 The following questions ask about YOUR RECREATION EXPERIENCES on the Arrow Lakes.

How long have you been coming to the Arrow Lakes for recreation activities? _____ years.

Based on your experience today, will you come back to the Arrow Lakes for recreation activities?

Yes No Please elaborate:

Which boat ramp facility do you usually use on the Arrow Lakes?

Why did you come to this boat ramp facility today?

What did you LIKE MOST about the boat ramp facility that you visited today?

What did you LIKE LEAST about the boat ramp facility that you visited today?

How did you first hear about recreation opportunities and activities near and on the Arrow Lakes?
Check all that apply.

- | | | |
|--|--|---|
| <input type="checkbox"/> Tourism information booth | <input type="checkbox"/> Family | <input type="checkbox"/> BC Hydro web site |
| <input type="checkbox"/> Tourism information brochures | <input type="checkbox"/> Friends | <input type="checkbox"/> BC Hydro facility (e.g., Revelstoke Dam) |
| <input type="checkbox"/> Tourism operators | <input type="checkbox"/> BC Parks | <input type="checkbox"/> BC Hydro bill |
| <input type="checkbox"/> Private marinas | <input type="checkbox"/> BC Forest Service | <input type="checkbox"/> Other: _____ |

Q7 These questions below ask about you. We use this information only to assist us in compiling the survey results.

What year were you born in? 19 _____ What community do you live in? _____

Gender: Male Female How long have you lived in your community? _____ years

Please list any outdoor recreation clubs or organizations that you belong to.

Do you have any additional comments about recreation on the water or on the shore of the Arrow Lakes

APPENDIX C – SAMPLING SCHEDULE 2012

Arrow Lakes Summer 2012 Sampling Schedule

Day	Date	Lower Arrow Lake		Middle Arrow Lake		Upper Arrow Lake	
Monday	June 18	Syringa Creek Park Day Use	PM	Edgewood Community Park	PM	Eagle Bay	AM
Thursday	June 21	Syringa Creek Park Boat Launch	PM	Fauquier Community Park Boat Launch	AM	Shelter Bay	AM
Saturday	June 23	Syringa Creek Park Day Use	AM	Burton Historic Park	AM	Shelter Bay	AM
Wednesday	June 27	Syringa Creek Park Day Use	AM	Nakusp Beach	PM	Revelstoke Boat Launch	PM
Monday	July 2	Syringa Creek Park Boat Launch	AM	Edgewood Community Park	AM	Shelter Bay	AM
Thursday	July 5	Anderson Point	PM	Fauquier Community Park Boat Launch	AM	Revelstoke Boat Launch	AM
Sunday	July 15	Anderson Point	AM	Nakusp Boat Launch	PM	Shelter Bay	AM
Saturday	July 21	Syringa Creek Park Boat Launch	AM	MacDonald Creek Provincial Park	PM	Revelstoke Boat Launch	PM
Sunday	July 29	Anderson Point	PM	Burton Historic Park	PM	Revelstoke Boat Launch	AM
Sunday	August 5	Syringa Creek Park Day Use	AM	Nakusp Beach	PM	Eagle Bay	PM
Monday	August 6	Syringa Creek Park Boat Launch	PM	Burton Historic Park	AM	Eagle Bay	PM
Saturday	September 1	Syringa Creek Park Day Use	AM	MacDonald Creek Provincial Park	PM	Eagle Bay	AM
Sunday	September 2	Syringa Creek Park Boat Launch	PM	Nakusp Boat Launch	AM	Revelstoke Boat Launch	PM
Saturday	September 8	Syringa Creek Park Boat Launch	PM	Nakusp Beach	AM	Eagle Bay	PM
Monday	September 10	Anderson Point	AM	MacDonald Creek Provincial Park	PM	Shelter Bay	PM
Friday	September 21	Syringa Creek Park Day Use	PM	Edgewood Community Park	PM	Revelstoke Boat Launch	PM
Thursday	September 27	Anderson Point	AM	Nakusp Boat Launch	AM	Shelter Bay	PM
Friday	September 28	Anderson Point	PM	Fauquier Community Park Boat Launch	AM	Eagle Bay	AM

Summer sampling hours

AM: 8:00 am to 2:00 pm

PM: 1:00 pm to 7:00 pm

Arrow Lakes Fall 2012 Sampling Schedule

Day	Date	Lower Arrow Lake		Middle Arrow Lake		Upper Arrow Lake	
Wednesday	October 3	Syringa Creek Park Boat Launch	PM	Nakusp Beach	PM	Revelstoke Boat Launch	AM
Monday	October 8	Anderson Point	PM	Edgewood Community Park	PM	Shelter Bay	PM
Saturday	October 13	Syringa Creek Park Boat Launch	AM	Nakusp Boat Launch	AM	Eagle Bay	PM
Sunday	October 21	Anderson Point	PM	Fauquier Community Park Boat Launch	PM	Revelstoke Boat Launch	AM
Monday	October 29	Syringa Creek Park Day Use	AM	MacDonald Creek Provincial Park	AM	Shelter Bay	PM

Fall sampling hours

AM: 8:30 am to 2:30 pm

PM: 10:30 am to 4:30 pm

APPENDIX D – COMPLETED QUESTIONNAIRES BY SAMPLE DATE 2012

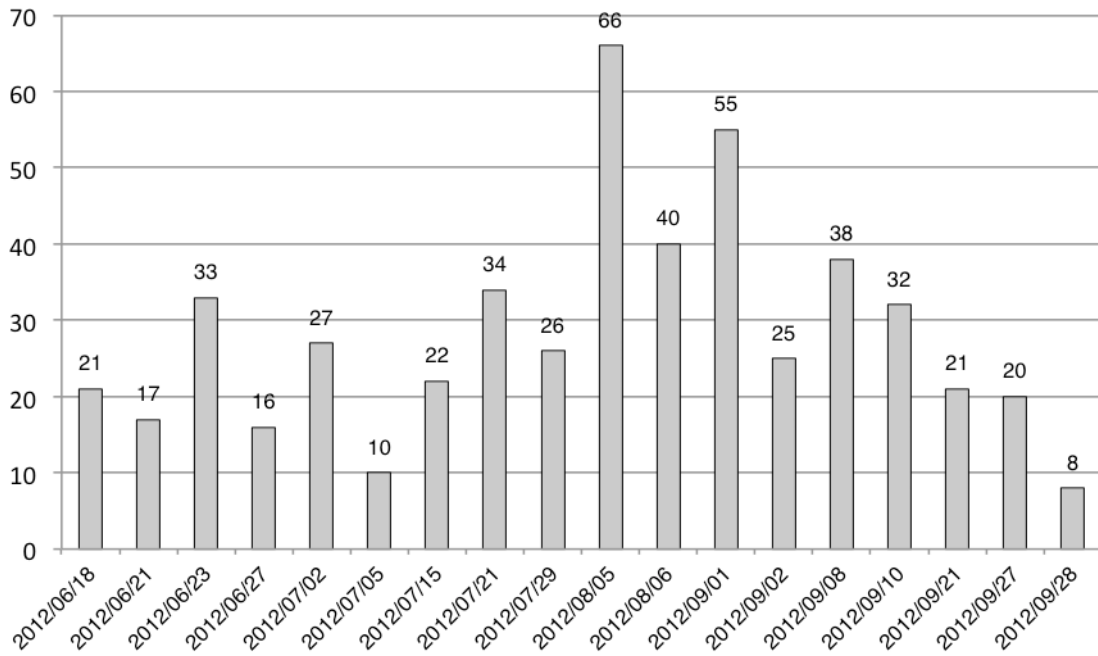


Figure 18. Completed summer questionnaires by sample date, June - September (n = 511).

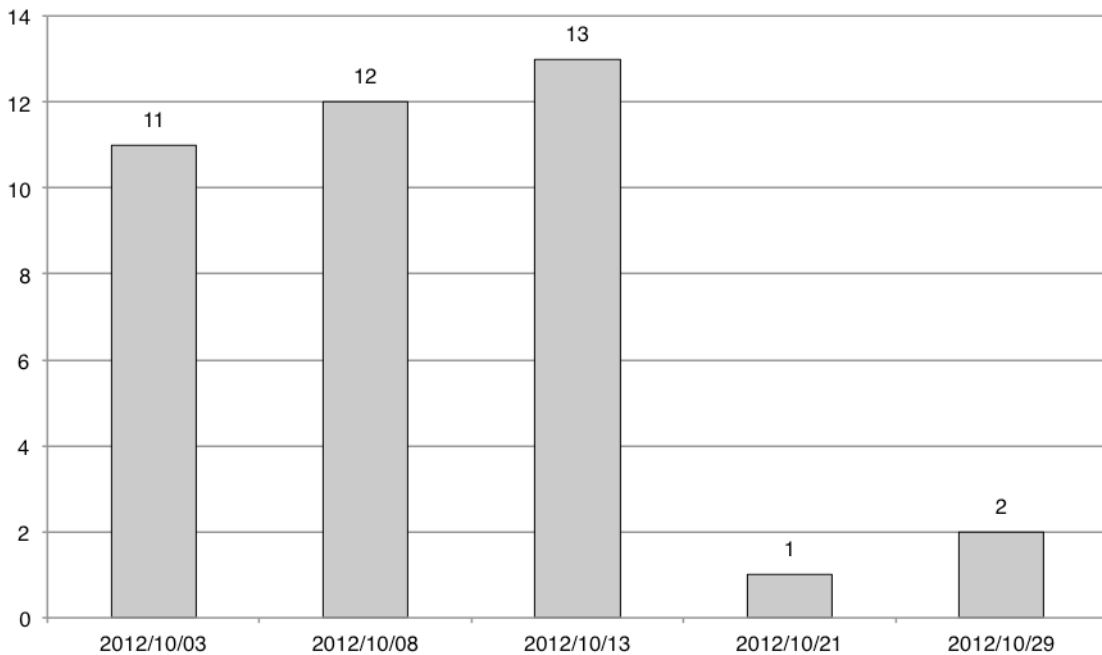


Figure 19. Completed fall questionnaires by sample date, October (n = 39).

APPENDIX E – SURVEY RESULTS

The following tables summarize responses to each survey question for each year (2009-2012).

Question 1: Recreation Activities Done on the Water or on the Shore of the Arrow Lakes¹².

Table 16. Indicate all of the activities that you do on the water or onshore of the Arrow Lakes.

Activity	2009 (n = 127)	2010 (n = 624)	2011 (n = 678)	2012 (n = 549)
ATV/Trail bike/4 x 4	15.7%	29.3%	21.5%	20.6%
Beach activities	61.4%	71.2%	71.4%	68.1%
Berry picking	27.6%	30.4%	23.9%	25.1%
Bird watching	32.3%	37.3%	35.0%	31.3%
Boating (motor cruising)	60.6%	62.3%	55.0%	48.8%
Camping	66.1%	70.2%	71.8%	72.3%
Canoeing/kayaking	27.6%	32.2%	29.4%	33.0%
Cross-country skiing	7.9%	8.7%	7.2%	6.0%
Drawing/painting/photography	14.2%	21.2%	19.8%	16.9%
Fishing	72.4%	73.1%	68.3%	66.7%
Horseback riding	4.7%	4.5%	2.7%	1.6%
Hunting	10.2%	18.1%	11.1%	11.7%
Mountain biking	15.0%	20.2%	20.2%	16.8%
Mushroom picking	19.7%	24.0%	16.8%	18.6%
Nature study	19.7%	24.2%	24.8%	22.0%
Picnicking	52.0%	59.0%	58.0%	53.0%
Scenic viewing	65.4%	62.3%	64.5%	60.1%
Snowmobiling	7.9%	13.8%	8.3%	7.5%
Swimming	62.2%	77.1%	78.9%	72.3%
Walking/hiking	63.8%	72.6%	72.0%	66.3%
Waterskiing	17.3%	21.8%	16.5%	15.1%
Wildlife viewing	47.2%	47.0%	45.0%	42.1%
Wind surfing	1.6%	3.4%	1.3%	0.9%
Other	6.3%	8.7%	7.2%	7.8%

¹² Where there are statistically significant differences between responses for sample years, they have been noted.

Table 17. On average, how many days per month do you visit the Arrow Lakes in each season?

Season	Year	n	Mean	95% CI	SD
Spring ^a	2009	123	7.0	± 1.5	8.746
	2010	444	11.5	± 1.0	10.319
	2011	678	10.0	± 0.9	11.592
	2012	486	6.9	± 0.9	9.884
Summer ^b	2009	124	10.8	± 1.8	10.374
	2010	494	17.2	± 1.0	10.773
	2011	678	16.4	± 0.8	11.163
	2012	486	13.1	± 0.9	10.357
Fall ^c	2009	123	8.2	± 1.5	8.639
	2010	443	11.3	± 1.0	10.405
	2011	678	10.0	± 0.9	11.535
	2012	486	7.3	± 0.9	9.898
Winter ^d	2009	123	4.0	± 1.3	7.413
	2010	381	7.5	± 1.0	10.122
	2011	678	7.3	± 0.9	11.615
	2012	486	4.0	± 0.8	8.802
Average number of days per year					
Annual ^e	2009	123	90.0	± 16.6	94.094
	2010	370	151.6	± 11.3	111.279
	2011	678	131.1	± 9.6	127.427
	2012	486	94.0	± 9.2	103.982

^a 2009 and 2012 had significantly lower mean participation rates than 2010 and 2011 ($F(3, 1727) = 17.818, p < .001$).

^b 2009 and 2012 had significantly lower mean participation rates than 2010 and 2011 ($F(3, 1778) = 21.333, p < .001$).

^c 2009 and 2012 had significantly lower mean participation rates than 2010; 2012 had a significantly lower mean participation rate than 2011 ($F(3, 1726) = 12.260, p < .001$).

^d 2009, 2011, and 2012 had significantly lower mean participation rates than 2010; 2009 and 2012 had significantly lower mean participation rates than 2011 ($F(3, 1664) = 13.965, p < .001$).

^e 2009 and 2012 had significantly lower mean participation rates than 2010 and 2011 ($F(3, 1653) = 22.318, p < .001$).

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Table 18. What recreation activities did you do today on the water or onshore of the Arrow Lakes[†]?

Today's Recreation Activity	2009 (n = 127)		2010 (n = 624)		2011 (n = 678)		2012 (n = 550)	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
ATV/Trail bike/ 4 x 4	2	1.6%	14	2.2%	11	1.6%	10	1.8%
Beach activities	8	6.3%	90	14.4%	109	16.1%	106	19.3%
Berry picking	1	0.8%	1	0.2%	4	0.6%	8	1.5%
Bird watching	5	3.9%	30	4.8%	22	3.2%	19	3.5%
Boating (motor cruising)	20	15.7%	108	17.3%	115	17.0%	63	11.5%
Camping	10	7.9%	96	15.4%	96	14.2%	92	16.7%
Canoeing/kayaking	4	3.1%	16	2.6%	25	3.7%	60	10.9%
Dog walking	3	2.4%	17	2.7%	2	0.3%	21	3.8%
Drawing/painting/photography	3	2.4%	18	2.9%	23	3.4%	19	3.5%
Fishing	47	37.0%	172	27.6%	182	26.8%	119	21.6%
Horseback riding	0	–	2	0.3%	0	–	0	–
Hunting	1	0.8%	3	0.5%	0	–	1	0.2%
Mountain biking	1	0.8%	16	2.6%	22	3.2%	10	1.8%
Mushroom picking	0	–	5	0.8%	3	0.4%	3	0.5%
Nature study	0	–	7	1.1%	14	2.1%	5	0.9%
Picnicking	6	4.7%	36	5.8%	80	11.8%	36	6.5%
Scenic viewing	10	7.9%	61	9.8%	93	13.7%	63	11.5%
Swimming	12	9.4%	100	16.0%	148	21.8%	137	24.9%
Walking/hiking	26	20.5%	153	24.5%	151	22.3%	110	20.0%
Waterskiing	0	–	8	1.3%	10	1.5%	10	1.8%
Wildlife watching	7	5.5%	20	3.2%	21	3.1%	11	2.0%
Windsurfing	0	–	1	0.2%	0	–	1	0.2%
Other	3	2.4%	43	6.9%	26	3.8%	34	6.2%

[†] Some respondents identified more than one activity.

Table 19. Are you participating in this activity today as a paying customer of a commercial recreation or tourism operator/guide?

Response ^a	2009 (n = 120)		2010 (n = 584)		2011 (n = 646)		2012 (n = 515)	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
No	115	95.8%	518	88.7%	549	85.0%	426	82.7%
Yes	5	4.2%	66	11.3%	97	15.0%	89	17.3%

^a A higher proportion of 2009 respondents indicated that they were not paying customers of a commercial recreation or tourism operator or guide ($\chi^2 = 18.498$, $df = 3$, $p > 0.001$; Cramer's V = 0.100).

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Question 2: The One Recreation Activity that is Most Important to Respondents¹³.

Table 20. Of all of the activities that you do on the water or onshore of the Arrow Lakes, which one is the most important[†]?

Activity	2009 (n = 127)		2010 (n = 624)		2011 (n = 678)		2012 (n = 550)	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
ATV/Trail bike/ 4 x 4	1	0.8%	8	1.3%	6	0.9%	7	1.3%
Beach activities	8	6.3%	25	4.0%	36	5.3%	40	7.3%
Bird watching	1	0.8%	7	1.1%	3	0.4%	4	0.7%
Boating (motor cruising)	13	10.2%	136	21.8%	103	15.2%	81	14.7%
Camping	24	18.9%	79	12.7%	125	18.4%	133	24.2%
Canoeing/kayaking	4	3.1%	13	2.1%	37	5.5%	23	4.2%
Cross-country skiing	1	0.8%	0	0.0%	2	0.3%	2	0.4%
Dog walking	2	1.6%	3	0.5%	2	0.3%	4	0.7%
Drawing/painting/photography	1	0.8%	4	0.6%	4	0.6%	2	0.4%
Fishing	51	40.2%	183	29.3%	207	30.5%	145	26.4%
Horseback riding	1	0.8%	1	0.2%	1	0.1%	1	0.2%
Hunting	1	0.8%	1	0.2%	3	0.4%	5	0.9%
Mountain biking	0	0.0%	4	0.6%	4	0.6%	6	1.1%
Mushroom picking	1	0.8%	2	0.3%	1	0.1%	2	0.4%
Nature study	0	0.0%	2	0.3%	3	0.4%	1	0.2%
Picnicking	0	0.0%	6	1.0%	8	1.2%	6	1.1%
Scenic viewing	4	3.1%	15	2.4%	17	2.5%	10	1.8%
Snowmobiling	0	0.0%	1	0.2%	2	0.3%	0	0.0%
Swimming	16	12.6%	53	8.5%	107	15.8%	87	15.8%
Walking/hiking	8	6.3%	33	5.3%	53	7.8%	38	6.9%
Waterskiing	0	0.0%	5	0.8%	2	0.3%	12	2.2%
Wildlife watching	0	0.0%	1	0.2%	5	0.7%	5	0.9%
Other	2	1.6%	27	4.3%	24	3.5%	15	2.7%

[†] Some respondents identified more than one activity. The first activity that was listed was taken to be the "most important activity."

¹³ Where there are statistically significant differences between responses for sample years, they have been noted.

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Table 21. How many years have you done this activity?

Year	n	Min	Max	Mean	95% CI	SD
2009	125	0	65	22.93	± 2.7	15.648
2010	601	0	80	22.30	± 1.3	15.711
2011	631	0	70	22.72	± 1.3	16.165
2012	523	0	75	23.13	± 1.4	16.389

Table 22. On a scale of 1 to 5, with 1 being beginner and 5 being expert, how skilled are you at this activity?

Year	n	Beginner (1)	Somewhat Skilled (2)	Moderately Skilled (3)	Very Skilled (4)	Expert (5)	Mean	95% CI	SD
2009	123	2.4%	4.1%	28.5%	42.3%	22.8%	3.79	± 0.16	0.926
2010	605	2.3%	5.8%	22.0%	38.1%	31.8%	3.93	± 0.08	0.988
2011	644	1.6%	4.5%	24.5%	37.7%	31.6%	3.93	± 0.07	0.952
2012	531	1.6%	3.8%	25.8%	37.9%	31.0%	3.92	± 0.08	0.934

Table 23. On a scale of 1 to 5, with 1 being not important at all and 5 being very important, how important is this activity to your lifestyle?

Year	n	Not important at all (1)	Somewhat Important (2)	Moderately Important (3)	Mostly Important (4)	Very Important (5)	Mean	95% CI	SD
2009	122	2.5%	4.1%	14.8%	24.6%	54.1%	4.24	0.18	1.013
2010	615	1.0%	2.6%	12.8%	26.5%	57.1%	4.38	0.07	0.875
2011	650	0.6%	2.8%	15.4%	24.5%	56.7%	4.33	0.07	0.884
2012	530	0.8%	3.2%	17.4%	26.3%	52.4%	4.26	0.08	0.918

Table 24. Who do you usually do this recreation activity with?

Year	Alone	Family	Friends	Clubs	People from work	Other
2009	7.1%	41.3%	33.3%	0.8%	0.8%	16.7%
2010	6.2%	47.8%	25.0%	0.0%	0.2%	20.9%
2011	4.2%	50.7%	22.5%	0.5%	0.0%	22.2%
2012	3.5%	54.3%	21.5%	0.7%	0.4%	19.6%

Question 3: Experiences Had While Visiting the Arrow Lakes for Recreation Activities¹⁴.

Table 25. Consider how many people you are comfortable seeing while you are visiting the Arrow Lakes and complete the following statement: "It is OK to have as many as _____ encounters per day".

Year	n	Min	Max	Mean	95% CI	SD
2009 ^a	77	0	50	10.26	± 1.88	8.406
2010	577	0	100	4.77	± 1.06	12.990
2011	675	0	100	4.49	± 0.90	11.969
2012	490	0	127	3.29	± 0.97	10.916

^a 2009 had a significantly higher mean number of preferred daily encounters than all other years ($F(3, 1815) = 7.787, p < .001$). Note that after the 2009 pilot year, a review of frequencies of response confirmed inconsistencies with responses to this question. After further review of crowding literature and in consultation with BC Hydro the question was subsequently revised in 2010 to include an "It doesn't matter to me how many people I see" option.

Table 26. It doesn't matter to me how many people I see.

Year	%
2009	0.0%
2010	63.1%
2011	60.3%
2012	64.2%

¹⁴ Where there are statistically significant differences between responses for sample years, they have been noted.

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Table 27. For each season below, indicate on a scale of 1 - 9³ how crowded you have felt while visiting the Arrow Lakes.

Season	Year	n	Min	Max	Mean	95% CI	SD
Spring	2009	105	1	7	2.17	± 0.27	1.431
	2010	516	1	9	1.96	± 0.12	1.347
	2011	538	1	9	1.96	± 0.11	1.357
	2012	402	1	9	2.16	± 0.14	1.465
Summer ^a	2009	112	1	9	4.19	± 0.45	2.455
	2010	557	1	9	3.93	± 0.19	2.338
	2011	615	1	9	3.75	± 0.18	2.260
	2012	483	1	9	4.13	± 0.22	2.443
Fall ^b	2009	111	1	7	2.29	± 0.28	1.522
	2010	491	1	9	2.15	± 0.13	1.502
	2011	519	1	9	2.08	± 0.12	1.354
	2012	411	1	8	2.39	± 0.15	1.568
Winter	2009	87	1	8	1.68	± 0.24	1.126
	2010	418	1	9	1.40	± 0.09	0.933
	2011	443	1	9	1.41	± 0.09	0.967
	2012	315	1	7	1.45	± 0.09	0.856

^a The mean crowding threshold for 2011 was significantly lower than that of 2012 ($F(3, 1763) = 2.780, p < .05$).

^b The mean crowding threshold for 2011 was significantly lower than that of 2012 ($F(3, 1528) = 3.892, p < .05$).

³ 1 is least crowded, and 9 is most crowded.

Table 28. Have you ever experienced any conflicts with other people or recreation activities while you were visiting the Arrow Lakes?^a

Year	Response	Freq.	%
2009 (n = 124)	No	107	86.3%
	Yes	17	13.7%
2010 (n = 599)	No	472	78.8%
	Yes	127	21.2%
2011 (n = 651)	No	555	85.3%
	Yes	96	14.7%
2012 (n = 532)	No	443	83.3%
	Yes	89	16.7%

^a A significantly higher proportion of respondents in 2010 indicated that experienced conflict ($\chi^2 = 10.596, df = 3, p < .05$; Cramer's $V = 0.075$).

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Question 4: Use and Familiarity with the Arrow Lakes¹⁵.

Table 29. From the list below, indicate why you come to the Arrow Lakes.

Motivation	2009 (n = 127)		2010 (n = 624)		2011 (n = 678)		2012 (n = 550)	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
To learn about reservoirs	7	5.5%	29	4.7%	36	5.3%	20	3.7%
To discover new things ^a	46	36.2%	211	34.5%	253	37.3%	156	29.2%
To learn more about nature	27	21.3%	182	29.8%	205	30.2%	132	24.7%
To view the scenery	90	70.9%	455	74.5%	511	75.4%	405	75.8%
To be close to nature ^b	69	54.3%	389	63.7%	441	65.0%	338	63.3%
To think about my personal values ^c	21	16.5%	142	23.2%	199	29.4%	106	19.9%
To get exercise	57	44.9%	317	51.9%	356	52.5%	253	47.4%
To give my mind a rest	78	61.4%	376	61.5%	446	65.8%	347	65.0%
To have a change from my daily routine	68	53.5%	340	55.6%	383	56.5%	295	55.2%
To be with friends	79	62.2%	393	64.3%	394	58.1%	342	64.0%
To be with family	73	57.5%	408	66.8%	471	69.5%	366	68.5%
Other	17	13.4%	131	21.4%	118	17.4%	93	17.4%

^a A significantly lower proportion of respondents in 2012 indicated that discovering new things was their motivation for visiting the Arrow Lakes ($\chi^2 = 9.090$, $df = 3$, $p < .05$; Cramer's $V = 0.068$).

^b A significantly lower proportion of respondents in 2009 indicated that to be close to nature was their motivation for visiting the Arrow Lakes ($\chi^2 = 8.363$, $df = 3$, $p < .05$; Cramer's $V = 0.039$).

^c A significantly lower proportion of respondents in 2009, and a significantly higher proportion of respondents in 2011 indicated that thinking about their personal values was their motivation for visiting the Arrow Lakes ($\chi^2 = 19.758$, $df = 3$, $p < .001$; Cramer's $V = 0.101$).

¹⁵ Where there are statistically significant differences between responses for sample years, they have been noted.

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Table 30. The Arrow Lakes serve many purposes. In your opinion, what are the 3 most important management goals for the Arrow Lakes? Place a 1, 2, or 3 beside your choices (with 1 being the most important management goal)^a

Management Goals	Year	n	1 – Most important		2 – Second most important		3 – Third most important	
			Freq.	%	Freq.	%	Freq.	%
Provide local employment	2009	36	12	33.3%	12	33.3%	11	30.6%
	2010	208	66	31.7%	55	26.4%	82	39.4%
	2011	220	64	29.1%	72	32.7%	64	29.1%
	2012	181	67	37.0%	46	25.4%	61	33.7%
Safety for reservoir users	2009	42	18	42.9%	9	21.4%	14	33.3%
	2010	196	66	33.7%	61	31.1%	65	33.2%
	2011	224	78	34.8%	67	29.9%	63	28.1%
	2012	180	56	31.1%	57	31.7%	61	33.9%
Provide recreation opportunities	2009	95	48	50.5%	29	30.5%	17	17.9%
	2010	466	200	42.9%	155	33.3%	108	23.2%
	2011	485	203	41.9%	143	29.5%	131	27.0%
	2012	398	183	46.0%	109	27.4%	99	24.9%
Flood control	2009	48	15	31.3%	15	31.3%	18	37.5%
	2010	228	71	31.1%	86	37.7%	67	29.4%
	2011	257	80	31.1%	91	35.4%	74	28.8%
	2012	239	85	35.6%	70	29.3%	77	32.2%
Electricity generation	2009	52	25	48.1%	12	23.1%	15	28.8%
	2010	252	92	36.5%	70	27.8%	87	34.5%
	2011	309	84	27.2%	104	33.7%	106	34.3%
	2012	234	76	32.5%	80	34.2%	69	29.5%
Provide habitat for aquatic species	2009	73	37	50.7%	23	31.5%	13	17.8%
	2010	386	166	43.0%	102	26.4%	112	29.0%
	2011	399	174	43.6%	111	27.8%	106	26.6%
	2012	295	128	43.4%	87	29.5%	74	25.1%
Other	2009	6	2	33.3%	3	50.0%	1	16.7%
	2010	29	16	55.2%	6	20.7%	7	24.1%
	2011	24	16	66.7%	4	16.7%	4	16.7%
	2012	13	6	46.2%	3	23.1%	4	30.8%

^a The majority of respondents identified 'provide recreation opportunities' and 'provide habitat for aquatic species' as the most important management goal for the Arrow Lakes. A significantly lower number of respondents identified 'safety for reservoir users' and 'provide local employment' as important management goals.

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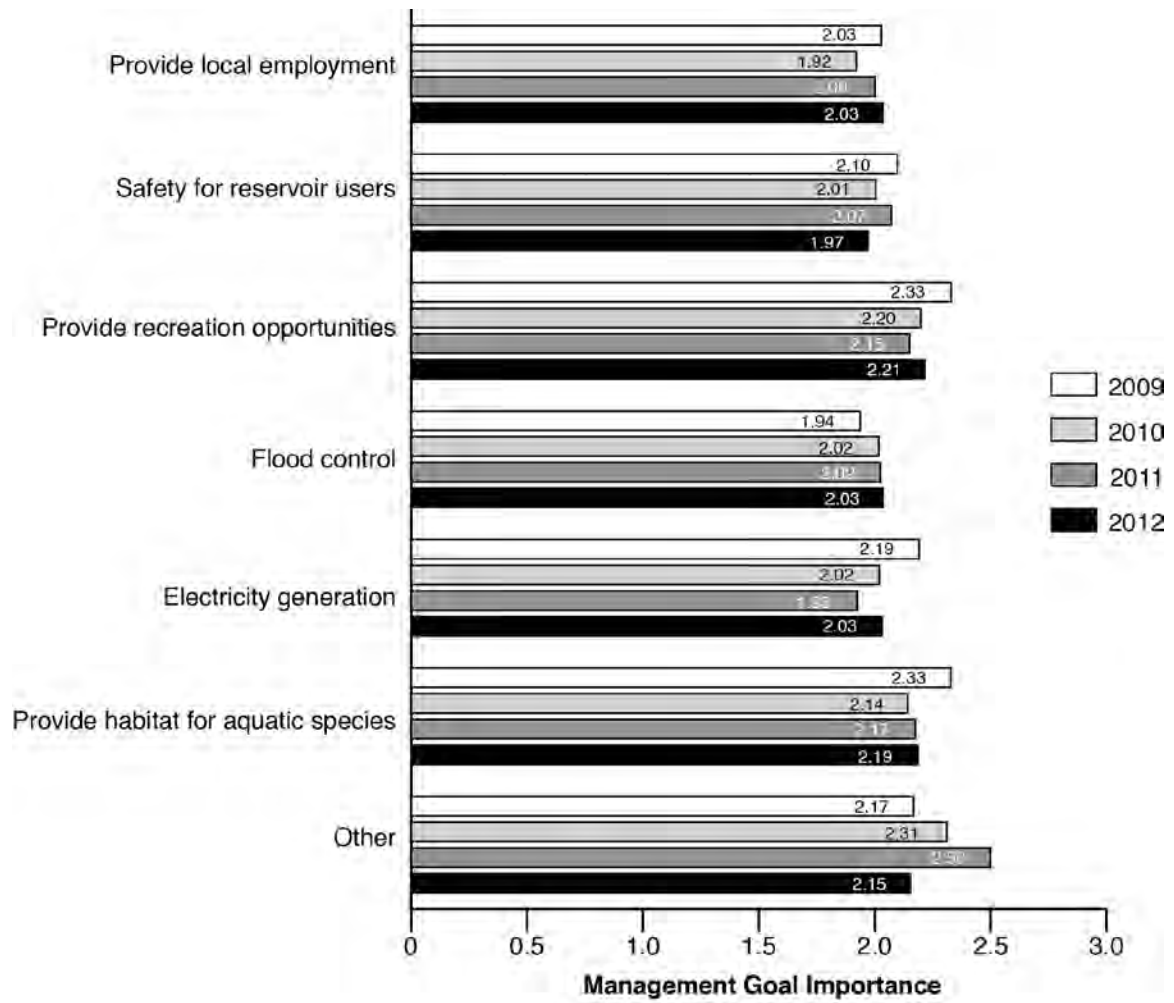


Figure 20. Standardized importance rank scores of management goals for the Arrow Lakes.

Question 5: Visitor Satisfaction with Management Activities¹⁶.

Table 31. The management of the Arrow Lakes seeks to balance many tasks. Please indicate your satisfaction with management activities.

Management Activities	Year	n	Never	Rarely	Sometimes	Frequently	Always	Mean	95% CI	SD
On the whole, are you satisfied with water levels on the Arrow Lakes? ^a	2009	115	7.8%	7.8%	48.7%	17.4%	18.3%	3.30	± 0.20	1.102
	2010	540	5.2%	15.6%	40.7%	25.7%	12.8%	3.25	± 0.09	1.034
	2011	569	2.8%	12.1%	34.6%	32.0%	18.5%	3.51	± 0.08	1.016
	2012	451	3.5%	10.2%	37.3%	33.7%	15.3%	3.47	± 0.09	0.987
On the whole, do you have satisfying experiences on the water or onshore of the Arrow Lakes? ^b	2009	115	3.5%	1.7%	15.7%	38.3%	40.9%	4.11	± 0.18	0.971
	2010	586	1.5%	1.2%	14.2%	40.1%	43.0%	4.22	± 0.07	0.843
	2011	634	0.3%	0.9%	7.7%	39.9%	51.1%	4.41	± 0.05	0.701
	2012	512	1.0%	0.8%	10.0%	42.0%	46.3%	4.32	± 0.07	0.763
On the whole, are you satisfied with the conditions of the boat ramps on the Arrow Lakes? ^c	2009	112	8.9%	14.3%	29.5%	27.7%	19.6%	3.35	± 0.22	1.206
	2010	489	21.9%	15.3%	18.6%	24.1%	20.0%	3.05	± 0.13	1.440
	2011	473	15.0%	14.0%	19.2%	20.5%	31.3%	3.39	± 0.13	1.431
	2012	393	13.2%	10.7%	19.3%	24.7%	32.1%	3.52	± 0.14	1.380
On the whole, are you satisfied with the parking lot conditions when you visit the Arrow Lakes? ^d	2009	117	3.4%	3.4%	23.1%	40.2%	29.9%	3.90	± 0.18	0.986
	2010	552	7.8%	10.1%	19.6%	27.7%	34.8%	3.72	± 0.10	1.254
	2011	612	4.1%	6.2%	12.9%	31.0%	45.8%	4.08	± 0.09	1.094
	2012	495	4.0%	6.1%	16.0%	29.7%	44.2%	4.04	± 0.10	1.099
On the whole, are you satisfied with the management of the Arrow Lakes? ^e	2009	117	4.3%	2.6%	35.9%	35.0%	22.2%	3.68	± 0.18	0.988
	2010	537	5.2%	12.3%	36.1%	26.4%	19.9%	3.44	± 0.09	1.098
	2011	560	4.5%	6.8%	28.6%	32.1%	28.0%	3.73	± 0.09	1.080
	2012	468	3.0%	5.8%	29.5%	35.5%	26.3%	3.76	± 0.09	1.002

^a The mean satisfaction with water levels on the Arrow Lakes for 2010 was significantly lower than that of 2011 and 2012 ($F(3, 1671) = 7.005, p < .001$).

^b The mean satisfaction with experiences on the water or onshore of the Arrow Lakes for 2011 was significantly higher than that of 2009 and 2010 ($F(3, 1843) = 8.200, p < .001$).

^c The mean satisfaction with boat ramps on the Arrow Lakes for 2010 was significantly lower than that of 2011 and 2012 ($F(3, 1463) = 8.923, p < .001$).

^d The mean satisfaction with parking lot conditions when the Arrow Lakes are visited for 2010 was significantly lower than that of 2011 and 2012 ($F(3, 1772) = 15.086, p < .001$).

^e The mean satisfaction with the management of the Arrow Lakes are visited for 2010 was significantly lower than that of 2011 and 2012 ($F(3, 1678) = 11.244, p < .001$).

¹⁶ Where there are statistically significant differences between responses for sample years, they have been noted.

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Table 32. Compared to the water levels that you experienced today, how might different water levels affect your use of the Arrow Lakes for recreation activities?

Statement	Year	n	I will come back	I will go somewhere else
If the water levels is the same as today... ^a	2009	98	91.8%	8.2%
	2010	487	97.1%	2.9%
	2011	557	96.1%	3.9%
	2012	447	92.2%	7.8%
If the water level is higher than today... ^b	2009	100	98.0%	2.0%
	2010	487	93.2%	6.8%
	2011	537	85.3%	14.7%
	2012	418	81.3%	18.7%
If the Water level is lower than today... ^c	2009	78	79.5%	20.5%
	2010	415	76.6%	23.4%
	2011	511	85.9%	14.1%
	2012	414	87.4%	12.6%

^a A significantly lower proportion of respondents in 2011 and 2011 indicated that they would go elsewhere if water levels were the same as they were on the day that they visited the Arrow Lakes ($\chi^2 = 15.607$, $df = 3$, $p < .05$; Cramer's V = 0.099).

^b A significantly lower proportion of respondents in 2009 and 2010 indicated that they would go elsewhere if water levels were higher than they were on the day that they visited the Arrow Lakes ($\chi^2 = 41.707$, $df = 3$, $p < .001$; Cramer's V = 0.164).

^c A significantly lower proportion of respondents in 2011 and 2012 indicated that they would go elsewhere if water levels were lower than they were on the day that they visited the Arrow Lakes ($\chi^2 = 21.689$, $df = 3$, $p < .001$; Cramer's V = 0.124).

Question 6: Recreation Experiences on the Arrow Lakes¹⁷.

Table 33. How long have you been coming to the Arrow Lakes for recreation activities (years)?

Year	n	Min	Max	Mean	95% CI	SD
2009	121	0	65	16.91	± 2.44	13.683
2010	574	0	75	19.57	± 1.25	15.288
2011	631	0	70	18.12	± 1.18	15.110
2012	506	0	85	18.63	± 1.30	14.877

Table 34. Based on your experience today, will you come back to the Arrow Lakes for recreation activities?

Year	Yes	No
2009	98.4%	1.6%
2010	99.7%	0.3%
2011	99.2%	0.8%
2012	98.1%	1.9%

¹⁷ Where there are statistically significant differences between responses for sample years, they have been noted.

Table 35. What boat ramp facility do you usually use?

Boat Ramp Location	2010 (n = 510)		2011 (n = 530)		2012 (n=430)	
	Freq.	%	Freq.	%	Freq.	%
Anderson Point	23	4.5%	12	2.3%	2	0.5%
Burton Historic Park	14	2.7%	16	3.0%	27	6.3%
Eagle Bay	15	2.9%	12	2.3%	21	4.9%
Edgewood Community Park	30	5.9%	54	10.2%	26	6.0%
Fauquier Community Park Boat Launch	17	3.3%	11	2.1%	13	3.0%
MacDonald Creek Provincial Park	10	2.0%	16	3.0%	16	3.7%
Nakusp Boat Launch	65	12.7%	63	11.9%	42	9.8%
Revelstoke Boat Launch	2	0.4%	4	0.8%	2	0.5%
Shelter Bay	41	8.0%	98	18.5%	78	18.1%
Syringa Creek Park Boat Launch	69	13.5%	15	2.8%	17	4.0%
Syringa Creek Park Day Use	0	0.0%	0	0.0%	1	0.2%
Above Revelstoke Dam	0	0.0%	2	0.4%	0	0.0%
Arrow Park Ferry	11	2.2%	2	0.4%	1	0.2%
Centennial Park	2	0.4%	3	0.6%	3	0.7%
Galena Bay	2	0.4%	1	0.2%	1	0.2%
Needles	3	0.6%	0	0.0%	1	0.2%
Renata	3	0.6%	2	0.4%	0	0.0%
Scotties Marina	11	2.2%	4	0.8%	4	0.9%
Don't use boat ramps	0	0.0%	23	4.3%	12	2.8%
Multiple sites	192	37.6%	192	36.2%	163	37.9%

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Table 36. Why did you come to this boat ramp facility today – Anderson Point & Burton Historic Park?

Response Categories	Anderson Point			Burton Historic Park		
	2010 (n = 42)	2011 (n = 21)	2012 (n = 7)	2010 (n = 24)	2011 (n = 24)	2012 (n = 36)
Previous enjoyable experience	—	—	—	—	4.2%	—
Do not have boat	—	—	—	4.2%	—	2.8%
Convenient	2.4%	—	—	12.5%	—	2.8%
Close to home (local)	7.1%	4.8%	—	12.5%	—	2.8%
Cost (free)/Public launch	—	—	—	—	—	—
Not crowded	—	—	—	—	—	—
Preferred one	—	—	14.3%	—	—	—
Best one	—	—	—	—	—	—
Only one	7.1%	4.8%	—	—	—	—
Closest to where I want to go	4.8%	—	14.3%	37.5%	50.0%	50.0%
Keep boat here	—	—	—	—	—	—
Closest to where I want to go	—	—	—	4.2%	4.2%	—
Only one with appropriate facilities	—	—	—	—	—	—
Public	—	—	—	—	—	—
Scenery	—	14.3%	—	—	4.2%	—
Close to swimming	—	—	—	—	—	—
Close to beach	—	—	—	4.2%	—	—
Other ramp(s) closed	—	—	—	—	—	—
To launch boat/take boat out of water	—	—	14.3%	4.2%	—	—
Water levels	—	—	—	4.2%	—	—
Access to Renata	28.6%	42.9%	14.3%	—	—	—
Closest to other recreation activities	11.9%	9.5%	28.6%	4.2%	—	11.1%
To complete survey	—	—	—	—	—	—
Didn't use ramp today	—	—	—	—	—	—
To fish	16.7%	9.5%	—	4.2%	—	—
Other	19.0%	14.3%	14.3%	8.3%	33.3%	30.6%
Multiple	2.4%	—	—	—	4.2%	—

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Table 37. Why did you come to this boat ramp facility today – Eagle Bay & Edgewood Community Park?

Response Categories	Eagle Bay			Edgewood Community Park		
	2010 (n = 39)	2011 (n = 20)	2012 (n = 28)	2010 (n = 38)	2011 (n = 64)	2012 (n = 27)
Previous enjoyable experience	5.1%	—	3.6%	—	—	—
Do not have boat	5.1%	—	—	—	—	—
Convenient	7.7%	—	—	10.5%	1.6%	3.7%
Close to home (local)	—	—	—	26.3%	14.1%	18.5%
Cost (free)/Public launch	—	—	—	—	—	—
Not crowded	—	5.0%	—	—	3.1%	—
Preferred one	2.6%	—	3.6%	—	3.1%	—
Best one	2.6%	—	—	—	—	—
Only one	—	—	—	—	4.7%	3.7%
Close to camping	51.3%	30.0%	46.4%	2.6%	3.1%	7.4%
Keep boat here	—	—	—	—	—	—
Closest to where I want to go	—	—	—	—	—	3.7%
Only one with appropriate facilities	—	—	—	—	—	—
Public	—	—	—	—	—	—
Scenery	—	5.0%	—	—	7.8%	18.5%
Close to swimming	—	—	—	7.9%	1.6%	—
Close to beach	—	—	—	2.6%	—	—
Other ramp(s) closed	—	—	—	—	—	—
To launch boat/take boat out of water	—	—	3.6%	5.3%	1.6%	3.7%
Water levels	—	—	—	—	—	—
Access to Renata	—	—	—	—	—	—
Closest to other recreation activities	7.7%	30.0%	7.1%	28.9%	26.6%	14.8%
To complete survey	—	—	—	—	—	—
Didn't use ramp today	5.1%	5.0%	—	—	—	—
To fish	2.6%	10.0%	7.1%	5.3%	12.5%	3.7%
Other	7.7%	10.0%	17.9%	10.5%	20.3%	14.8%
Multiple	2.6%	5.0%	10.7%	—	—	7.4%

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Table 38. Why did you come to this boat ramp facility today – Fauquier Community Boat Launch & MacDonald Creek Provincial Park?

Response Categories	Fauquier Community Park Boat Launch			MacDonald Creek Provincial Park		
	2010 (n = 33)	2011 (n = 14)	2012 (n = 13)	2010 (n = 19)	2011 (n = 19)	2012 (n = 22)
Previous enjoyable experience	—	14.3%	—	—	—	—
Do not have boat	—	—	—	—	—	—
Convenient	12.1%	14.3%	7.7%	10.5%	10.5%	4.5%
Close to home (local)	15.2%	7.1%	7.7%	10.5%	—	—
Cost (free)/Public launch	—	—	—	—	—	—
Not crowded	—	—	—	—	—	—
Preferred one	6.1%	—	—	—	—	—
Best one	—	—	—	—	—	—
Only one	—	—	—	5.3%	—	—
Close to camping	—	—	—	15.8%	52.6%	50.0%
Keep boat here	—	—	—	—	—	4.5%
Closest to where I want to go	—	—	—	—	—	—
Only one with appropriate facilities	—	14.3%	—	10.5%	—	4.5%
Public	—	—	—	—	—	—
Scenery	—	7.1%	—	—	—	—
Close to swimming	—	14.3%	—	—	—	—
Close to beach	—	—	—	—	—	—
Other ramp(s) closed	—	—	—	—	—	—
To launch boat/take boat out of water	3.0%	7.1%	15.4%	5.3%	10.5%	4.5%
Water levels	6.1%	7.1%	—	—	—	4.5%
Access to Renata	—	—	—	—	—	—
Closest to other recreation activities	6.1%	—	30.8%	21.1%	5.3%	4.5%
To complete survey	30.3%	—	7.7%	—	—	—
Didn't use ramp today	—	—	—	10.5%	—	4.5%
To fish	6.1%	7.1%	15.4%	5.3%	—	—
Other	12.1%	7.1%	15.4%	—	21.1%	13.6%
Multiple	3.0%	—	—	5.3%	—	4.5%

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Table 39. Why did you come to this boat ramp facility today – Nakusp Boat Launch & Nakusp Beach?

Response Categories	Nakusp Boat Launch			Nakusp Beach		
	2010 (n = 67)	2011 (n = 66)	2012 (n = 34)	2010 (n = 14)	2011 (n = 24)	2012 (n = 20)
Previous enjoyable experience	1.5%	1.5%	—	—	—	—
Do not have boat	—	—	—	—	—	—
Convenient	14.9%	15.2%	2.9%	28.6%	8.3%	10.0%
Close to home (local)	9.0%	16.7%	11.8%	7.1%	4.2%	10.0%
Cost (free)/Public launch	—	—	—	—	—	—
Not crowded	—	—	—	—	—	—
Preferred one	—	1.5%	2.9%	—	4.2%	—
Best one	—	1.5%	—	—	—	—
Only one	1.5%	6.1%	—	—	4.2%	—
Close to camping	—	—	—	—	—	—
Keep boat here	7.5%	3.0%	8.8%	—	—	10.0%
Closest to where I want to go	—	—	—	—	—	10.0%
Only one with appropriate facilities	—	1.5%	8.8%	—	—	—
Public	—	—	—	—	—	—
Scenery	—	3.0%	11.8%	—	4.2%	—
Close to swimming	—	—	—	—	—	5.0%
Close to beach	—	—	—	—	4.2%	20.0%
Other ramp(s) closed	—	—	—	—	—	—
To launch boat/take boat out of water	7.5%	7.6%	14.7%	—	8.3%	5.0%
Water levels	—	—	—	—	—	—
Access to Renata	—	—	—	—	—	—
Closest to other recreation activities	40.3%	12.1%	20.6%	14.3%	16.7%	15.0%
To complete survey	1.5%	—	—	—	—	—
Didn't use ramp today	—	1.5%	—	14.3%	25.0%	5.0%
To fish	6.0%	9.1%	5.9%	7.1%	4.2%	—
Other	10.4%	18.2%	11.8%	21.4%	16.7%	10.0%
Multiple	—	1.5%	—	7.1%	—	—

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Table 40. Why did you come to this boat ramp facility today – Revelstoke Boat Launch & Shelter Bay?

Response Categories	Revelstoke Boat Launch			Shelter Bay		
	2010 (n = 8)	2011 (n = 20)	2012 (n = 8)	2010 (n = 37)	2011 (n = 36)	2012 (n = 25)
Previous enjoyable experience	—	—	—	—	—	—
Do not have boat	—	—	—	—	—	—
Convenient	12.5%	—	—	13.5%	11.1%	8.0%
Close to home (local)	12.5%	5.0%	25.0%	5.4%	2.8%	4.0%
Cost (free)/Public launch	—	—	—	—	—	—
Not crowded	—	—	—	—	2.8%	—
Preferred one	12.5%	—	—	—	—	—
Best one	—	—	—	—	—	—
Only one	—	—	—	10.8%	8.3%	—
Close to camping	—	—	—	10.8%	11.1%	28.0%
Keep boat here	—	—	—	—	—	—
Closest to where I want to go	—	—	—	—	2.8%	4.0%
Only one with appropriate facilities	—	—	—	5.4%	2.8%	4.0%
Public	—	—	—	—	—	—
Scenery	—	—	12.5%	—	—	—
Close to swimming	—	—	—	—	—	—
Close to beach	—	—	—	—	—	—
Other ramp(s) closed	—	—	—	—	—	—
To launch boat/take boat out of water	—	—	25.0%	5.4%	2.8%	4.0%
Water levels	—	5.0%	12.5%	2.7%	—	—
Access to Renata	—	—	—	—	—	4.0%
Closest to other recreation activities	—	5.0%	—	8.1%	8.3%	8.0%
To complete survey	—	—	—	—	—	—
Didn't use ramp today	—	10.0%	—	—	2.8%	—
To fish	37.5%	15.0%	12.5%	13.5%	27.8%	20.0%
Other	12.5%	50.0%	12.5%	13.5%	8.3%	8.0%
Multiple	12.5%	10.0%	—	10.8%	8.3%	8.0%

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Table 41. Why did you come to this boat ramp facility today – Syringa Creek Park Boat Launch & Syringa Creek Park Day Use?

Response Categories	Syringa Creek Park Boat Launch			Syringa Creek Park Day Use		
	2010 (n = 53)	2011 (n = 66)	2012 (n = 55)	2010 (n = 27)	2011 (n = 30)	2012 (n = 36)
Previous enjoyable experience	1.9%	1.5%	1.8%	—	—	—
Do not have boat	—	—	—	—	—	—
Convenient	7.5%	6.1%	16.4%	11.1%	3.3%	—
Close to home (local)	9.4%	4.5%	5.5%	3.7%	3.3%	—
Cost (free)/Public launch	5.7%	3.0%	1.8%	—	3.3%	8.3%
Not crowded	3.8%	1.5%	—	—	—	—
Preferred one	—	1.5%	7.3%	3.7%	3.3%	8.3%
Best one	5.7%	3.0%	—	—	—	—
Only one	7.5%	7.6%	3.6%	14.8%	3.3%	2.8%
Close to camping	9.4%	6.1%	—	7.4%	23.3%	30.6%
Keep boat here	—	—	—	7.4%	3.3%	2.8%
Closest to where I want to go	—	—	1.8%	—	—	—
Only one with appropriate facilities	3.8%	1.5%	9.1%	—	3.3%	—
Public	—	—	—	—	—	—
Scenery	—	—	1.8%	—	—	—
Close to swimming	3.8%	—	—	3.7%	—	—
Close to beach	—	3.0%	1.8%	—	—	2.8%
Other ramp(s) closed	—	—	—	—	—	—
To launch boat/take boat out of water	18.9%	10.6%	12.7%	22.2%	13.3%	16.7%
Water levels	1.9%	3.0%	—	—	—	—
Access to Renata	—	—	—	—	—	—
Closest to other recreation activities	9.4%	16.7%	12.7%	—	3.3%	2.8%
To complete survey	—	—	—	—	—	—
Didn't use ramp today	—	1.5%	3.6%	22.2%	13.3%	13.9%
To fish	3.8%	10.6%	5.5%	3.7%	6.7%	8.3%
Other	5.7%	16.7%	10.9%	—	13.3%	2.8%
Multiple	1.9%	1.5%	3.6%	—	3.3%	—

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Table 42. What do you like most about the boat ramp facility that you visited today – Anderson Point & Burton Historic Park?

Response Categories	Anderson Point			Burton Historic Park		
	2010 (n = 33)	2011 (n = 21)	2012 (n = 7)	2010 (n = 21)	2011 (n = 17)	2012 (n = 37)
Access	12.1%	9.5%	—	9.5%	5.9%	—
Close to home	3.0%	—	—	—	—	5.4%
Concrete ramp/dock	6.1%	—	—	4.8%	—	2.7%
Amenities (toilets, garbage containers, etc.)	—	—	—	—	—	—
Didn't use today	—	—	—	19.0%	—	2.7%
Clean/well maintained	—	—	28.6%	4.8%	5.9%	5.4%
Boat tip ups	3.0%	—	—	—	—	—
Paved parking lot	—	—	—	—	—	—
Convenient	—	4.8%	—	14.3%	—	2.7%
Close to campsite	—	—	—	4.8%	5.9%	2.7%
Not crowded	—	14.3%	14.3%	9.5%	5.9%	16.2%
Close to Renata	6.1%	4.8%	—	—	—	—
Water levels	3.0%	4.8%	—	—	11.8%	8.1%
Dock	—	—	—	—	5.9%	—
Wide ramp	—	—	—	—	—	2.7%
Easy to use	—	4.8%	—	4.8%	—	—
Lots of space	—	—	—	4.8%	—	2.7%
Only one	3.0%	—	—	—	—	—
Reputation	—	—	—	—	—	—
Upgrade/well constructed	—	—	—	—	5.9%	10.8%
Cost (free)	—	—	—	—	—	—
No problems/General positive comment	—	4.8%	28.6%	—	5.9%	18.9%
Close to activities	3.0%	—	—	4.8%	—	2.7%
Do not like/negative comment	36.4%	23.8%	28.6%	9.5%	5.9%	8.1%
Other	24.2%	28.6%	—	4.8%	5.9%	5.4%
Multiple	—	—	—	14.3%	35.3%	2.7%

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Table 44. What do you like most about the boat ramp facility that you visited today – Eagle Bay & Edgewood Community Park?

Response Categories	Eagle Bay			Edgewood Community Park		
	2010 (n = 28)	2011 (n = 18)	2012 (n = 21)	2010 (n = 31)	2011 (n = 59)	2012 (n = 25)
Access	7.1%	11.1%	4.8%	3.2%	8.5%	—
Close to home	—	—	—	3.2%	—	—
Concrete ramp/dock	7.1%	16.7%	14.3%	16.1%	6.8%	4.0%
Amenities (toilets, garbage containers, etc.)	—	—	—	—	—	—
Didn't use today	14.3%	—	—	6.5%	1.7%	4.0%
Clean/well maintained	3.6%	5.6%	4.8%	—	—	8.0%
Boat tip ups	—	—	—	—	—	—
Paved parking lot	—	—	—	—	1.7%	—
Convenient	—	—	—	3.2%	—	—
Close to campsite	—	5.6%	14.3%	—	—	4.0%
Not crowded	3.6%	—	4.8%	12.9%	—	4.0%
Close to Renata	—	—	—	—	—	—
Water levels	14.3%	5.6%	4.8%	3.2%	1.7%	—
Dock	—	—	—	—	—	—
Wide ramp	—	—	—	—	—	—
Easy to use	3.6%	—	4.8%	3.2%	5.1%	4.0%
Lots of space	3.6%	—	—	—	—	—
Only one	—	—	—	—	—	—
Reputation	—	—	—	—	—	—
Upgrade/well constructed	7.1%	5.6%	4.8%	—	1.7%	—
Cost (free)	—	—	—	—	—	—
No problems/General positive comment	10.7%	27.8%	19.0%	3.2%	5.1%	—
Close to activities	3.6%	—	—	—	—	—
Do not like/negative comment	10.7%	5.6%	19.0%	16.1%	28.8%	40.0%
Other	10.7%	16.7%	4.8%	19.4%	35.6%	32.0%
Multiple	—	—	—	9.7%	3.4%	—

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Table 43. What do you like most about the boat ramp facility that you visited today – Fauquier Community Park Boat Launch & MacDonald Creek Provincial Park?

Response Categories	Fauquier Community Park Boat Launch			MacDonald Creek Provincial Park		
	2010 (n = 36)	2011 (n = 14)	2012 (n = 13)	2010 (n = 17)	2011 (n = 15)	2012 (n = 20)
Access	2.8%	—	—	11.8%	13.3%	5.0%
Close to home	—	—	—	—	—	—
Concrete ramp/dock	—	—	—	—	—	10.0%
Amenities (toilets, garbage containers, etc.)	—	7.1%	—	5.9%	—	—
Didn't use today	—	—	—	5.9%	6.7%	10.0%
Clean/well maintained	8.3%	14.3%	—	5.9%	6.7%	15.0%
Boat tip ups	—	—	—	—	—	—
Paved parking lot	13.9%	—	—	—	—	—
Convenient	5.6%	—	7.7%	5.9%	—	—
Close to campsite	—	—	—	—	6.7%	—
Not crowded	11.1%	—	—	17.6%	6.7%	5.0%
Close to Renata	—	—	—	—	—	—
Water levels	—	—	—	—	—	—
Dock	—	—	—	—	—	5.0%
Wide ramp	—	—	—	—	—	—
Easy to use	5.6%	—	—	5.9%	—	—
Lots of space	—	—	—	—	—	—
Only one	—	—	—	—	—	—
Reputation	—	—	—	—	—	—
Upgrade/well constructed	5.6%	28.6%	30.8%	17.6%	40.0%	25.0%
Cost (free)	—	—	—	—	—	—
No problems/General positive comment	2.8%	7.1%	30.8%	5.9%	6.7%	20.0%
Close to activities	—	—	—	—	—	—
Do not like/negative comment	22.2%	—	—	5.9%	—	—
Other	19.4%	28.6%	23.1%	11.8%	—	5.0%
Multiple	2.8%	14.3%	7.7%	—	13.3%	—

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Table 44. What do you like most about the boat ramp facility that you visited today – Nakusp Boat Launch & Nakusp Beach?

Response Categories	Nakusp Boat Launch			Nakusp Beach		
	2010 (n = 56)	2011 (n = 62)	2012 (n = 26)	2010 (n = 12)	2011 (n = 17)	2012 (n = 20)
Access	3.6%	4.8%	—	8.3%	11.8%	—
Close to home	7.1%	4.8%	—	—	11.8%	5.0%
Concrete ramp/dock	—	—	—	—	—	—
Amenities (toilets, garbage containers, etc.)	3.6%	1.6%	7.7%	—	—	10.0%
Didn't use today	—	4.8%	3.8%	8.3%	11.8%	—
Clean/well maintained	17.9%	4.8%	11.5%	16.7%	5.9%	5.0%
Boat tip ups	—	—	—	—	—	—
Paved parking lot	1.8%	1.6%	—	—	—	—
Convenient	3.6%	6.5%	7.7%	25.0%	17.6%	5.0%
Close to campsite	—	—	—	—	—	—
Not crowded	7.1%	19.4%	15.4%	16.7%	5.9%	5.0%
Cose to Renata	—	—	—	—	—	—
Water levels	—	—	—	—	5.9%	5.0%
Dock	—	1.6%	—	—	—	—
Wide ramp	1.8%	—	7.7%	—	—	5.0%
Easy to use	1.8%	6.5%	—	8.3%	—	—
Lots of space	—	—	—	—	—	5.0%
Only one	—	—	—	—	—	—
Reputation	—	—	—	—	—	—
Upgrade/well constructed	1.8%	1.6%	3.8%	—	—	—
Cost (free)	—	—	—	—	—	5.0%
No problems/General positive comment	7.1%	12.9%	11.5%	8.3%	5.9%	5.0%
Close to activities	3.6%	—	—	—	—	5.0%
Do not like/negative comment	5.4%	3.2%	7.7%	—	5.9%	15.0%
Other	30.4%	22.6%	23.1%	8.3%	17.6%	15.0%
Multiple	3.6%	3.2%	—	—	—	10.0%

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Table 45. What do you like most about the boat ramp facility that you visited today – Revelstoke Boat Launch & Shelter Bay?

Response Categories	Revelstoke Boat Launch			Shelter Bay		
	2010 (n = 8)	2011 (n = 18)	2012 (n = 8)	2010 (n = 36)	2011 (n = 25)	2012 (n = 23)
Access	—	5.6%	25.0%	16.7%	4.0%	8.7%
Close to home	25.0%	11.1%	12.5%	2.8%	—	—
Concrete ramp/dock	12.5%	—	—	8.3%	16.0%	8.7%
Amenities (toilets, garbage containers, etc.)	—	—	—	—	—	—
Didn't use today	—	—	—	—	—	8.7%
Clean/well maintained	—	—	—	13.9%	4.0%	13.0%
Boat tip ups	—	—	—	—	—	—
Paved parking lot	—	—	—	—	8.0%	—
Convenient	—	—	12.5%	2.8%	—	—
Close to campsite	—	—	—	8.3%	—	—
Not crowded	25.0%	5.6%	—	5.6%	8.0%	8.7%
Cose to Renata	—	—	—	—	—	—
Water levels	12.5%	5.6%	25.0%	8.3%	—	13.0%
Dock	—	—	—	—	—	—
Wide ramp	—	—	—	—	—	4.3%
Easy to use	—	—	—	8.3%	8.0%	4.3%
Lots of space	—	—	—	2.8%	—	4.3%
Only one	—	—	—	—	—	—
Reputation	—	—	—	—	—	—
Upgrade/well constructed	—	—	—	8.3%	—	8.7%
Cost (free)	—	—	—	—	—	—
No problems/General positive comment	—	—	12.5%	8.3%	16.0%	8.7%
Close to activities	12.5%	—	—	—	—	—
Do not like/negative comment	—	—	12.5%	2.8%	4.0%	4.3%
Other	—	72.2%	—	—	20.0%	4.3%
Multiple	12.5%	—	—	2.8%	12.0%	—

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Table 46. What do you like most about the boat ramp facility that you visited today – Syringa Creek Park Boat Launch & Syringa Creek Park Day Use?

Response Categories	Syringa Creek Park Boat Launch			Syringa Creek Park Day Use		
	2010 (n = 48)	2011 (n = 64)	2012 (n = 47)	2010 (n = 27)	2011 (n = 28)	2012 (n = 27)
Access	8.3%	10.9%	2.1%	3.7%	3.6%	3.7%
Close to home	4.2%	3.1%	—	—	—	3.7%
Concrete ramp/dock	4.2%	1.6%	2.1%	22.2%	7.1%	3.7%
Amenities (toilets, garbage containers, etc.)	—	—	—	—	—	3.7%
Didn't use today	—	—	—	3.7%	—	7.4%
Clean/well maintained	8.3%	7.8%	10.6%	3.7%	7.1%	—
Boat tip ups	2.1%	—	—	—	—	—
Paved parking lot	—	—	2.1%	—	3.6%	3.7%
Convenient	—	—	—	7.4%	3.6%	—
Close to campsite	—	—	—	3.7%	—	11.1%
Not crowded	16.7%	12.5%	8.5%	11.1%	3.6%	7.4%
Cose to Renata	—	—	—	—	—	—
Water levels	8.3%	7.8%	2.1%	7.4%	—	—
Dock	2.1%	3.1%	12.8%	—	14.3%	3.7%
Wide ramp	2.1%	1.6%	—	—	3.6%	3.7%
Easy to use	—	1.6%	4.3%	—	—	3.7%
Lots of space	—	1.6%	6.4%	—	—	—
Only one	—	—	—	—	—	3.7%
Reputation	—	—	—	3.7%	—	—
Upgrade/well constructed	14.6%	9.4%	14.9%	7.4%	10.7%	14.8%
Cost (free)	—	1.6%	—	—	—	—
No problems/General positive comment	12.5%	6.3%	17.0%	11.1%	14.3%	11.1%
Close to activities	—	—	—	—	—	—
Do not like/negative comment	4.2%	6.3%	4.3%	—	3.6%	11.1%
Other	12.5%	18.8%	8.5%	3.7%	3.6%	3.7%
Multiple	—	6.3%	4.3%	11.1%	21.4%	—

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Table 47. What do you like least about the boat ramp facility that you visited today – Anderson Point & Burton Historic Park?

Response Categories	Anderson Point			Burton Historic Park		
	2010 (n = 37)	2011 (n = 19)	2012 (n = 7)	2010 (n = 19)	2011 (n = 14)	2012 (n = 21)
Problems with dock/dock ramp	10.8%	15.8%	28.6%	10.5%	7.1%	4.8%
Problems with breakwater	—	—	—	—	—	—
Rough road	2.7%	—	14.3%	—	—	—
Washrooms needed	5.4%	—	—	—	—	—
Too narrow/not wide enough	—	—	—	5.3%	—	4.8%
Not safe*	5.4%	—	—	—	—	—
Ramp angle to steep	—	—	—	—	7.1%	—
Problems with parking lot	—	—	—	—	—	—
Too high	—	—	14.3%	—	—	—
Too crowded	2.7%	21.1%	—	5.3%	—	19.0%
Rough launch	—	5.3%	—	—	—	—
Improvements needed for all components	8.1%	10.5%	—	10.5%	—	—
Ramp not long enough	2.7%	5.3%	—	—	7.1%	—
Water levels	—	5.3%	—	5.3%	14.3%	—
More parking needed	8.1%	—	—	—	—	—
Not enough room to turn around/load/unload	10.8%	10.5%	—	—	—	—
Debris	—	—	14.3%	—	—	9.5%
Needs picnic area	—	—	—	—	—	—
Docks too far from shore	2.7%	—	—	—	—	—
Not well maintained/not clean	2.7%	—	14.3%	—	14.3%	9.5%
Hard to get to	2.7%	—	—	—	—	—
Hard to use	5.4%	—	—	—	—	—
Needs barrier-free access	—	—	—	—	—	—
No boat tie-ups	2.7%	—	—	5.3%	7.1%	—
No wharf	—	—	—	—	—	—
No boat launch	13.5%	—	14.3%	—	—	—
Too sandy/muddy	—	—	—	31.6%	—	4.8%
No problems/positive comment	2.7%	—	—	15.8%	28.6%	4.8%
Did not use today	—	—	—	5.3%	—	—
Other	5.4%	5.3%	—	5.3%	7.1%	42.9%
Multiple	5.4%	21.1%	—	—	7.1%	—

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Table 48. What do you like least about the boat ramp facility that you visited today – Eagle Bay & Edgewood Community Park?

Response Categories	Eagle Bay			Edgewood Community Park		
	2010 (n = 28)	2011 (n = 14)	2012 (n = 19)	2010 (n = 28)	2011 (n = 48)	2012 (n = 25)
Problems with dock/dock ramp	10.7%	—	5.3%	25.0%	16.7%	24.0%
Problems with breakwater	—	—	—	3.6%	6.3%	8.0%
Rough road	3.6%	7.1%	10.5%	—	—	—
Washrooms needed	3.6%	7.1%	—	—	4.2%	—
Too narrow/not wide enough	3.6%	—	—	—	—	—
Not safe*	—	—	—	—	4.2%	—
Ramp angle too steep	—	—	5.3%	—	—	4.0%
Problems with parking lot	—	—	—	—	—	—
Too high	—	—	—	—	—	—
Too crowded	—	14.3%	5.3%	—	—	—
Rough launch	—	—	10.5%	—	—	—
Improvements needed for all components	—	7.1%	—	10.7%	14.6%	—
Ramp not long enough	17.9%	7.1%	—	3.6%	2.1%	4.0%
Water levels	10.7%	—	21.1%	3.6%	6.3%	—
More parking needed	—	—	—	—	—	—
Not enough room to turn around/load/unload	—	—	—	—	—	—
Debris	—	7.1%	—	—	—	4.0%
Needs picnic area	—	—	—	—	—	—
Docks too far from shore	—	—	5.3%	—	—	4.0%
Not well maintained/not clean	21.4%	7.1%	31.6%	17.9%	4.2%	—
Hard to get to	—	—	—	—	—	—
Hard to use	—	—	—	—	—	—
Needs barrier-free access	—	—	—	3.6%	—	4.0%
No boat tie-ups	—	—	—	—	—	—
No wharf	—	—	—	—	—	4.0%
No boat launch	—	—	—	—	—	12.0%
Too sandy/muddy	—	—	—	—	—	—
No problems/positive comment	14.3%	28.6%	5.3%	21.4%	10.4%	16.0%
Did not use today	7.1%	7.1%	—	3.6%	—	—
Other	7.1%	7.1%	—	7.1%	22.9%	16.0%
Multiple	—	—	—	—	8.3%	—

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Table 49. What do you like least about the boat ramp facility that you visited today – Fauquier Community Park Boat Launch & MacDonald Creek Provincial Park?

Response Categories	Fauquier Community Park Boat Launch			MacDonald Creek Provincial Park		
	2010 (n = 33)	2011 (n = 7)	2012 (n = 9)	2010 (n = 12)	2011 (n = 4)	2012 (n = 8)
Problems with dock/dock ramp	36.4%	—	—	33.3%	—	—
Problems with breakwater	—	14.3%	11.1%	—	—	—
Rough road	—	—	—	—	—	—
Washrooms needed	—	—	—	—	—	—
Too narrow/not wide enough	—	14.3%	—	—	25.0%	12.5%
Not safe*	—	—	—	—	—	—
Ramp angle too steep	3.0%	14.3%	—	—	—	—
Problems with parking lot	3.0%	—	—	—	25.0%	—
Too high	—	—	—	—	—	—
Too crowded	3.0%	—	—	8.3%	—	—
Rough launch	—	—	—	—	—	—
Improvements needed for all components	18.2%	—	—	—	—	—
Ramp not long enough	6.1%	—	—	—	—	—
Water levels	15.2%	—	11.1%	—	—	—
More parking needed	—	—	—	16.7%	—	—
Not enough room to turn around/load/unload	—	—	—	—	—	—
Debris	3.0%	—	—	—	—	—
Needs picnic area	—	—	—	—	—	—
Docks too far from shore	—	—	—	—	—	—
Not well maintained/not clean	3.0%	—	—	8.3%	—	—
Hard to get to	—	—	—	—	—	—
Hard to use	—	—	—	—	—	—
Needs barrier-free access	—	—	—	—	—	—
No boat tie-ups	—	—	—	—	—	—
No wharf	—	—	—	—	—	—
No boat launch	—	—	—	—	—	—
Too sandy/muddy	3.0%	—	—	—	—	—
No problems/positive comment	—	57.1%	55.6%	16.7%	25.0%	12.5%
Did not use today	—	—	—	—	—	—
Other	6.1%	—	22.2%	16.7%	25.0%	62.5%
Multiple	—	—	—	—	—	12.5%

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Table 50. What do you like least about the boat ramp facility that you visited today – Nakusp Boat Launch & Nakusp Beach?

Response Categories	Nakusp Boat Launch			Nakusp Beach		
	2010 (n = 42)	2011 (n = 45)	2012 (n = 20)	2010 (n = 13)	2011 (n = 16)	2012 (n = 20)
Problems with dock/dock ramp	2.4%	6.7%	35.0%	7.7%	—	20.0%
Problems with breakwater	2.4%	—	—	—	—	5.0%
Rough road	—	—	—	—	—	—
Washrooms needed	—	—	—	—	—	—
Too narrow/not wide enough	4.8%	2.2%	—	—	—	—
Not safe*	4.8%	2.2%	—	—	6.3%	15.0%
Ramp angle too steep	4.8%	2.2%	—	—	6.3%	—
Problems with parking lot	—	—	—	23.1%	—	5.0%
Too high	—	—	—	—	—	—
Too crowded	—	—	5.0%	7.7%	—	—
Rough launch	—	—	10.0%	—	—	5.0%
Improvements needed for all components	9.5%	6.7%	5.0%	15.4%	18.8%	—
Ramp not long enough	—	—	—	—	—	—
Water levels	11.9%	4.4%	—	—	—	—
More parking needed	4.8%	—	—	—	—	—
Not enough room to turn around/load/unload	2.4%	—	—	—	—	—
Debris	—	2.2%	5.0%	—	—	—
Needs picnic area	—	—	—	—	—	—
Docks too far from shore	—	—	—	—	—	—
Not well maintained/not clean	16.7%	13.3%	10.0%	7.7%	25.0%	10.0%
Hard to get to	—	—	—	—	—	—
Hard to use	—	—	—	—	—	—
Needs barrier-free access	—	—	—	—	—	—
No boat tie-ups	—	—	—	—	—	—
No wharf	—	—	—	—	—	—
No boat launch	—	—	—	—	—	—
Too sandy/muddy	—	—	—	—	—	—
No problems/positive comment	14.3%	22.2%	5.0%	30.8%	18.8%	15.0%
Did not use today	—	4.4%	5.0%	7.7%	6.3%	—
Other	16.7%	24.4%	15.0%	—	12.5%	20.0%
Multiple	4.8%	8.9%	5.0%	—	6.3%	5.0%

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Table 51. What do you like least about the boat ramp facility that you visited today – Revelstoke Boat Launch & Shelter Bay?

Response Categories	Revelstoke Boat Launch			Shelter Bay		
	2010 (n = 8)	2011 (n = 9)	2012 (n = 6)	2010 (n = 23)	2011 (n = 19)	2012 (n = 17)
Problems with dock/dock ramp	12.5%	—	—	26.1%	15.8%	5.9%
Problems with breakwater	—	—	—	21.7%	5.3%	—
Rough road	—	—	—	4.3%	—	—
Washrooms needed	—	—	—	—	5.3%	—
Too narrow/not wide enough	—	—	—	8.7%	—	5.9%
Not safe*	—	11.1%	16.7%	—	—	—
Ramp angle too steep	—	—	—	—	—	5.9%
Problems with parking lot	—	—	16.7%	—	5.3%	5.9%
Too high	12.5%	—	—	—	—	—
Too crowded	—	22.2%	—	—	—	—
Rough launch	—	—	—	—	—	—
Improvements needed for all components	12.5%	11.1%	—	8.7%	10.5%	—
Ramp not long enough	—	—	—	—	—	—
Water levels	12.5%	—	33.3%	—	—	5.9%
More parking needed	—	—	—	4.3%	15.8%	—
Not enough room to turn around/load/unload	—	—	—	—	—	—
Debris	—	—	—	4.3%	—	29.4%
Needs picnic area	—	—	—	—	—	—
Docks too far from shore	—	—	16.7%	—	—	—
Not well maintained/not clean	12.5%	11.1%	—	8.7%	5.3%	—
Hard to get to	—	—	—	—	—	—
Hard to use	—	—	—	—	—	—
Needs barrier-free access	—	—	—	—	—	—
No boat tie-ups	—	11.1%	—	8.7%	—	—
No wharf	—	—	—	—	—	—
No boat launch	—	—	—	—	—	—
Too sandy/muddy	—	—	—	—	5.3%	—
No problems/positive comment	25.0%	11.1%	16.7%	4.3%	10.5%	17.6%
Did not use today	—	—	—	—	—	—
Other	12.5%	11.1%	—	—	15.8%	11.8%
Multiple	—	11.1%	—	—	5.3%	11.8%

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Table 52. What do you like least about the boat ramp facility that you visited today – Syringa Creek Park Boat Launch & Syringa Creek Park Day Use?

Response Categories	Syringa Creek Park Boat Launch			Syringa Creek Park Day Use		
	2010 (n = 33)	2011 (n = 46)	2012 (n = 39)	2010 (n = 21)	2011 (n = 21)	2012 (n = 27)
Problems with dock/dock ramp	—	6.5%	5.1%	9.5%	—	7.4%
Problems with breakwater	15.2%	4.3%	—	28.6%	4.8%	3.7%
Rough road	—	—	—	—	—	—
Washrooms needed	—	—	—	4.8%	—	—
Too narrow/not wide enough	—	—	2.6%	—	4.8%	—
Not safe*	—	—	—	—	—	—
Ramp angle too steep	—	—	2.6%	4.8%	—	—
Problems with parking lot	3.0%	—	2.6%	—	—	22.2%
Too high	—	—	2.6%	—	—	—
Too crowded	6.1%	10.9%	12.8%	9.5%	19.0%	3.7%
Rough launch	—	—	—	—	—	—
Improvements needed for all components	3.0%	—	—	4.8%	—	—
Ramp not long enough	6.1%	10.9%	—	—	—	—
Water levels	15.2%	15.2%	12.8%	14.3%	4.8%	7.4%
More parking needed	3.0%	4.3%	2.6%	—	—	3.7%
Not enough room to turn around/load/unload	—	—	—	—	4.8%	—
Debris	—	8.7%	15.4%	9.5%	—	11.1%
Needs picnic area	—	—	—	—	—	—
Docks too far from shore	6.1%	2.2%	2.6%	—	—	3.7%
Not well maintained/not clean	6.1%	—	—	—	—	—
Hard to get to	3.0%	—	—	—	—	—
Hard to use	—	—	—	—	—	—
Needs barrier-free access	—	—	—	—	—	—
No boat tie-ups	—	—	—	—	—	3.7%
No wharf	—	—	—	—	—	—
No boat launch	—	—	—	—	—	—
Too sandy/muddy	—	—	—	—	—	—
No problems/positive comment	21.2%	10.9%	17.9%	—	14.3%	3.7%
Did not use today	—	—	2.6%	4.8%	9.5%	7.4%
Other	12.1%	15.2%	10.3%	9.5%	19.0%	14.8%
Multiple	—	10.9%	7.7%	—	19.0%	7.4%

Table 53. How did you hear about recreation opportunities and activities near and on the Arrow Lakes?

Information Source	2009 (n = 127)		2010 (n = 600)		2011 (n = 678)		2012 (n = 522)	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Tourism information booth	5	3.9%	23	3.8%	22	3.2%	17	3.3%
Family	51	40.2%	276	46.0%	273	40.3%	242	46.4%
BC Hydro web site	3	2.4%	5	0.8%	2	0.3%	4	0.8%
Tourism information brochures	6	4.7%	33	5.5%	40	5.9%	34	6.5%
Friends	78	61.4%	332	55.3%	353	52.1%	289	55.4%
BC Hydro facility (<i>e.g.</i> , Revelstoke Dam)	2	1.6	5	0.8%	3	0.0%	6	1.1%
Tourism operators	0	0.0%	5	0.8%	6	0.9%	7	1.3%
BC Parks	17	13.4%	62	10.3%	101	14.9%	87	16.7%
BC Hydro bill	1	0.1%	2	0.3%	0	0.0%	1	0.2%
Private marinas	2	1.6%	12	2.0%	10	1.5%	7	1.3%
BC Forest Service	8	6.3%	30	5.0%	32	4.7%	25	4.8%
Other	29	22.8%	161	26.8%	168	24.8%	115	22.0%

Question 7: Respondents' Demographic Characteristics¹⁸.

Table 54. Respondent age.

Year	n	Min	Max	Mean	95% CI	SD
2009	122	17	79	51.9	± 2.5	14.312
2010	606	13	109	51.4	± 1.1	13.755
2011	678	12	120	53.3	± 1.4	18.848
2012	528	14	85	52.3	± 1.2	14.243

Table 55. Respondent's gender.

2009 (n = 124)		2010 (n = 607)		2011 (n = 650)		2012 (n = 527)	
Male	Female	Male	Female	Male	Female	Male	Female
77.4%	22.6%	67.5%	32.5%	64.0%	36.0%	63.4%	36.6%

Table 56. How long have you lived in your community?

Year	n	Min	Max	95% CI	Mean	SD
2009	121	0	64	± 3.09	23.74	17.350
2010	602	0	78	± 1.43	25.76	17.953
2011	641	0	77	± 1.30	23.78	16.834
2012	517	0	73	± 1.43	25.11	16.545

¹⁸ Where there are statistically significant differences between responses for sample years, they have been noted.

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Table 57. Respondents' communities of residence: British Columbia within 80km of Arrow Lakes (i.e., local residents).

Community	2009 (n = 122)		2010 (n = 598)		2011 (n = 642)		2012 (n = 523)	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
BC RESIDENTS	79	64.8%	405	67.7%	386	60.1%	290	55.4%
Arrow Park	0	—	1	0.2%	0	—	2	0.4%
Blueberry	0	—	1	0.2%	0	—	0	—
Brilliant	0	—	0	—	3	0.5%	0	—
Broadwater	0	—	1	0.2%	0	—	0	—
Burton	1	0.8%	15	2.5%	6	0.9%	11	2.1%
Castlegar	16	13.1%	96	16.1%	88	13.7%	72	13.8%
Crescent Valley	0	—	3	0.5%	1	0.2%	1	0.2%
Deer Park	0	—	1	0.2%	1	0.2%	0	—
East Arrow Park	0	—	1	0.2%	0	—	0	—
Edgewood	15	12.3%	34	5.7%	52	8.1%	23	4.4%
Fauquier	0	—	27	4.5%	8	1.2%	12	2.3%
Fruitvale	1	0.8%	7	1.2%	9	1.4%	9	1.7%
Galena Bay	0	—	0	—	0	—	1	0.2%
Genelle	2	1.6%	11	1.8%	3	0.5%	5	1.0%
Glade	0	—	0	—	0	—	1	0.2%
Glenbank	1	0.8%	0	—	0	—	0	—
Hills	0	—	0	—	0	—	3	0.6%
Kootneys	0	—	0	—	0	—	3	0.6%
Krestova	0	—	0	—	0	—	1	0.2%
Montrose	0	—	2	0.3%	2	0.3%	1	0.2%
Nakusp	14	11.5%	74	12.4%	60	9.3%	54	10.3%
Nelson	2	1.6%	8	1.3%	20	3.1%	10	1.9%
New Denver	0	—	2	0.3%	1	0.2%	0	—
Pass Creek	1	0.8%	2	0.3%	4	0.6%	0	—
Raspberry	0	—	0	—	0	—	1	0.2%
Renata	0	—	12	2.0%	5	0.8%	2	0.4%
Revelstoke	16	13.1%	56	9.4%	62	9.7%	36	6.9%
Robson	3	2.5%	13	2.2%	13	2.0%	9	1.7%
Rossland	2	1.6%	5	0.8%	12	1.9%	11	2.1%
Salmo	1	0.8%	7	1.2%	1	0.2%	1	0.2%
Slocan Park	0	—	3	0.5%	4	0.6%	1	0.2%
Slocan Valley	0	—	1	0.2%	0	—	1	0.2%
South Slocan	0	—	1	0.2%	2	0.3%	3	0.6%
Thrums	1	0.8%	5	0.8%	1	0.2%	1	0.2%
Trail	2	1.6%	12	2.0%	26	4.0%	14	2.7%
Warfield	1	0.8%	3	0.5%	1	0.2%	1	0.2%
Ymir	0	—	1	0.2%	1	0.2%	0	—

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Table 58. Respondents' communities of residence: British Columbia greater than 80km of Arrow Lakes (*i.e.*, tourists).

Community	2009 (n = 122)		2010 (n = 598)		2011 (n = 642)		2012 (n = 523)	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
BC TOURISTS	36	29.5%	118	19.7%	148	23.1%	162	31.0%
100 Mile House	0	—	0	—	0	—	1	0.2%
Abbotsford	0	—	1	0.2%	3	0.5%	1	0.2%
Agassiz	0	—	0	—	1	0.2%	0	—
Angel Falls	0	—	1	0.2%	0	—	0	—
Armstrong	1	0.8%	8	1.3%	3	0.5%	5	1.0%
Blind Bay	0	—	0	—	1	0.2%	0	—
Burnaby	0	—	0	—	1	0.2%	0	—
Campbell River	0	—	0	—	2	0.3%	0	—
Canoe	0	—	1	0.2%	0	—	0	—
Chase	0	—	0	—	4	0.6%	0	—
Cherryville	0	—	2	0.3%	1	0.2%	2	0.4%
Chilliwack	0	—	0	—	3	0.5%	1	0.2%
Cranbrook	1	0.8%	1	0.2%	1	0.2%	6	1.1%
Crescent Bay	0	—	0	—	1	0.2%	0	—
Creston	0	—	0	—	1	0.2%	2	0.4%
Crofton	0	—	0	—	0	—	1	0.2%
Crossfield	0	—	0	—	1	0.2%	0	—
Dawson Creek	0	—	0	—	1	0.2%	1	0.2%
Delta	0	—	1	0.2%	0	—	0	—
Edson	0	—	1	0.2%	0	—	0	—
Enderby	2	1.6%	2	0.3%	2	0.3%	2	0.4%
Evans	0	—	0	—	0	—	1	0.2%
Falkland	0	—	0	—	0	—	1	0.2%
Fort St John	0	—	0	—	1	0.2%	0	—
Gibsons	0	—	0	—	2	0.3%	0	—
Golden	0	—	0	—	2	0.3%	3	0.6%
Grand Forks	0	—	0	—	4	0.6%	0	—
Hope	0	—	1	0.2%	0	—	0	—
Hudson's Hope	1	0.8%	1	0.2%	0	—	0	—
Invermere	0	—	0	—	0	—	1	0.2%
Kaleden	0	—	0	—	1	0.2%	0	—
Kamloops	2	1.6%	4	0.7%	8	1.2%	13	2.5%
Kelowna	6	4.9%	20	3.3%	24	3.7%	30	5.7%
Keremeos	0	—	1	0.2%	0	—	0	—
Kimberley	1	0.8%	1	0.2%	2	0.3%	0	—
Lantzville	0	—	0	—	0	—	1	0.2%

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Table 58 (con't). Respondents' communities of residence: British Columbia greater than 80km of Arrow Lakes (*i.e.*, tourists).

Community	2009 (n = 122)		2010 (n = 598)		2011 (n = 642)		2012 (n = 523)	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Logan Lake	0	—	1	0.2%	1	0.2%	0	—
Lower Mainland	0	—	0	—	1	0.2%	0	—
Lumby	2	1.6%	4	0.7%	3	0.5%	3	0.6%
Malakwa	0	—	1	0.2%	0	—	0	—
Maple Ridge	1	0.8%	1	0.2%	1	0.2%	1	0.2%
Mara	0	—	0	—	0	—	1	0.2%
Mayne Island	0	—	0	—	0	—	1	0.2%
Merritt	0	—	0	—	0	—	1	0.2%
Mission	0	—	2	0.3%	1	0.2%	0	—
Nanaimo	0	—	0	—	0	—	1	0.2%
New Westminster	0	—	0	—	3	0.5%	0	—
North Saanich	0	—	1	0.2%	0	—	0	—
North Vancouver	0	—	3	0.5%	2	0.3%	0	—
Okanagan	1	0.8%	6	1.0%	5	0.8%	3	0.6%
Oliver	0	—	0	—	2	0.3%	0	—
Oyama	0	—	0	—	1	0.2%	1	0.2%
Peachland	0	—	1	0.2%	1	0.2%	2	0.4%
Penticton	1	0.8%	2	0.3%	5	0.8%	5	1.0%
Pine Lake	0	—	0	—	0	—	1	0.2%
Port Coquitlam	0	—	0	—	0	—	1	0.2%
Port Moody	0	—	0	—	1	0.2%	0	—
Prince George	2	1.6%	1	0.2%	1	0.2%	0	—
Princeton	0	—	0	—	1	0.2%	1	0.2%
Pritchard	1	0.8%	0	—	0	—	0	—
Richmond	0	—	0	—	0	—	1	0.2%
Riverdale	0	—	0	—	0	—	1	0.2%
Salmon Arm	5	4.1%	14	2.3%	8	1.2%	12	2.3%
Scotch Creek	0	—	1	0.2%	0	—	0	—
Sechelt	0	—	0	—	1	0.2%	0	—
Shuswap	0	—	1	0.2%	1	0.2%	3	0.6%
Sicamous	4	3.3%	3	0.5%	2	0.3%	1	0.2%
Sidney	0	—	0	—	1	0.2%	0	—
Sorrento	0	—	1	0.2%	1	0.2%	1	0.2%
Sparwood	0	—	0	—	1	0.2%	0	—
Squamish	0	—	1	0.2%	1	0.2%	0	—

Table 58 (con't). Respondents' communities of residence: British Columbia greater than 80km of Arrow Lakes (*i.e.*, tourists).

Community	2009 (n = 122)		2010 (n = 598)		2011 (n = 642)		2012 (n = 523)	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Summerland	1	0.8%	3	0.5%	2	0.3%	2	0.4%
Summit Lake	0	—	0	—	1	0.2%	0	—
Surrey	1	0.8%	2	0.3%	3	0.5%	2	0.4%
Tappen	0	—	0	—	0	—	1	0.2%
Tarrys	0	—	0	—	2	0.3%	0	—
Tsawwassen	0	—	0	—	1	0.2%	0	—
Vancouver	0	—	6	1.0%	4	0.6%	12	2.3%
Vancouver Island	0	—	0	—	1	0.2%	0	—
Vanderhoof	0	—	0	—	1	0.2%	0	—
Vernon	2	1.6%	14	2.3%	19	3.0%	25	4.8%
Victoria	1	0.8%	2	0.3%	2	0.3%	4	0.8%
Westbank	0	—	0	—	1	0.2%	2	0.4%
Whistler	0	—	1	0.2%	0	—	0	—
Winfield	0	—	0	—	0	—	1	0.2%

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Table 59. Respondents' communities of residence: Other Canadian Provinces (*i.e.*, tourists).

Community	2009 (n = 122)		2010 (n = 598)		2011 (n = 642)		2012 (n = 523)	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Alberta	6	4.9%	58	9.7%	85	13.2%	59	11.3%
Alberta	1	0.8%	7	1.2%	4	0.6%	13	2.5%
Airdrie	0	—	4	0.7%	0	—	1	0.2%
Banff	0	—	0	—	2	0.3%	0	—
Beaumont	0	—	0	—	1	0.2%	0	—
Calgary	5	4.1%	23	3.8%	42	6.5%	25	4.8%
Canmore	0	—	4	0.7%	2	0.3%	3	0.6%
Carstairs	0	—	1	0.2%	0	—	0	—
Cochrane	0	—	1	0.2%	1	0.2%	0	—
Coldstream	0	—	2	0.3%	2	0.3%	0	—
Edmonton	0	—	7	1.2%	8	1.2%	8	1.5%
Fort Macleod	0	—	0	—	1	0.2%	0	—
Fort Sask	0	—	0	—	1	0.2%	0	—
Ft. M ^c Murray	0	—	0	—	1	0.2%	0	—
Grande Prairie	0	—	2	0.3%	3	0.5%	1	0.2%
Halcyon	0	—	0	—	2	0.3%	0	—
Innisfail	0	—	0	—	1	0.2%	0	—
Linden Alberta	0	—	0	—	1	0.2%	0	—
Millarville	0	—	0	—	0	—	1	0.2%
Millet	0	—	0	—	1	0.2%	0	—
Olds	0	—	0	—	1	0.2%	1	0.2%
Rainbow Lake	0	—	0	—	1	0.2%	0	—
Red Deer	0	—	1	0.2%	5	0.8%	2	0.4%
Rimbey	0	—	1	0.2%	1	0.2%	0	—
Sherwood Park	0	—	0	—	1	0.2%	2	0.4%
Spruce Grove	0	—	1	0.2%	0	—	0	—
Spruce View	0	—	1	0.2%	0	—	0	—
St Albert	0	—	1	0.2%	0	—	0	—
Stony Plain	0	—	0	—	1	0.2%	1	0.2%
Sundre	0	—	0	—	1	0.2%	1	0.2%
Tofield	0	—	1	0.2%	0	—	0	—
Warner	0	—	1	0.2%	0	—	0	—
Wetaskinin	0	—	0	—	1	0.2%	0	—
Estevan	0	—	0	—	0	—	1	0.2%
Prince Albert	0	—	1	0.2%	0	—	0	—
Regina	0	—	1	0.2%	0	—	0	—
MANITOBA	0	—	1	0.2%	1	0.2%	0	—
Manitoba	0	—	0	—	1	0.2%	0	—
Whiteshell	0	—	1	0.2%	0	—	0	—
ONTARIO	0	—	3	0.5%	2	0.3%	1	0.2%
Ontario	0	—	2	0.3%	1	0.2%	0	—
Ottawa	0	—	0	—	0	—	1	0.2%
Port Colborne	0	—	0	—	1	0.2%	0	—
Mississauga	0	—	1	0.2%	0	—	0	—

Table 59 (cont'd). Respondents' communities of residence: Other Canadian Provinces (*i.e.*, tourists).

Community	2009 (n = 122)		2010 (n = 598)		2011 (n = 642)		2012 (n = 523)	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Nova Scotia	0	—	1	0.2%	0	—	0	—
NEWFOUNDLAND	<i>0</i>	—	<i>1</i>	<i>0.2%</i>	<i>0</i>	—	<i>0</i>	—
St. John's	0	—	1	0.2%	0	—	0	—
YUKON	<i>0</i>	—	<i>0</i>	—	<i>1</i>	<i>0.2%</i>	<i>1</i>	<i>0.2%</i>
Yukon	0	—	0	—	0	—	1	0.2%
Whitehorse	0	—	0	—	1	0.2%	0	—

Table 60. Membership in outdoor recreation clubs or organizations.

Year	n	%
2009	127	27.6%
2010	624	23.7%
2011	678	28.3%
2012	550	21.8%

APPENDIX F – TRAFFIC COUNTER RESULTS

**CLBMON41 Arrow Reservoir Recreational Demand Study
2012 (Year 4) Progress Report**

**Arrow Lakes – Annual Traffic
Summary¹⁹**

Year	Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AADT [†]	Days with data	Totals
2009	Burton ^{ADF}									82 [*]	19 [*]	8	0	0.604	106	220 ^{**}
	Eagle Bay ^{ADF}									25 [*]	3 [*]	0 [*]	0	0.188	96	68 ^{**}
	Edgewood ^{ADF}									84 [*]	51	48	37	1.728	113	630 ^{**}
	Fauquier ^{ADF}									33 [*]	7 [*]	6	3	0.351	111	128 ^{**}
	McDonald Cr ^{ADF}									71 [*]	26	15	7	0.867	113	317 ^{**}
	Nakusp ^{ADF}									245 [*]	178	144	149	5.661	112	2,066 ^{**}
	Revelstoke ^{ADF}									114 [*]	81 [*]	32	0	1.655	110	604 ^{**}
	Shelter Bay ^{ADF}									211 [*]	142	79	9	3.377	114	1,233 ^{**}
	Syringa Cr. ^{ADF}									465 [*]	152 [*]	75 [*]	55	5.402	102	1,972 ^{**}
2010	Anderson Point ^{ADF}				32	49	99	97	96	55	43	20	14	1.836	275	670 ^{**}
	Burton ^{ADF}	0	3	2 [*]	8 [*]	32 [*]	83	106	123	15	19	9	2	1.134	351	414 ^{**}
	Eagle Bay ^{ADF}	0	0	1 [*]	1 [*]	22	2 [*]	41	25	17	2 [*]	0	0	0.316	351	115 ^{**}
	Edgewood ^{ADF}	96	100	136 [*]	64	61	88	174	103	26	34 [*]	21	15	2.524	361	921 ^{**}
	Fauquier ^{ADF}	3	17	18 [*]	12	35 [*]				3 [*]	0 [*]	0	0	0.340	244	124 ^{**}
	McDonald Cr ^{ADF}	4	19	16 [*]	32 [*]	124 [*]		300 [*]	215	87	37 [*]	12	2	2.530	328	924 ^{**}
	Nakusp ^{ADF}	152	162	170 [*]	192	247	330	748	520 [*]	161	185	90	150	8.530	362	3,114 ^{**}
	Revelstoke ^{ADF}	2	16	33 [*]	24	42	90 [*]	159	87	86	68 [*]	17	0	1.706	361	623 ^{**}
	Shelter Bay ^{ADF}	0	41	100 [*]	89	165	85 [*]	142	148	118	170 [*]	31	0	2.992	359	1,092 ^{**}
Syringa Cr. ^{ADF}	106	130	181	164	307	565	997	738	175	174 [*]	64	32	9.964	364	3,637 ^{**}	
2011	Anderson Point ^{ADF}	12	12	12	21 [*]	42	61	104	86	60	50 [*]	30 [*]	4	1.372	358	501 ^{**}
	Burton ^{ADF}	0	9	2	11 [*]	32	72	121	144 [*]	56	0 [*]	2	2	1.257	358	459 ^{**}
	Burton South ^{ADF}								35 [*]	22	5 [*]	0	1	0.283	127	103 ^{**}
	Eagle Bay ^{ADF}	0	0	0	0	9	3	23 [*]	13	11	7 [*]	1	0	0.178	349	65 ^{**}
	Edgewood ^{ADF}	12	10	42	51 [*]	66	68	140	123	53	20 [*]	7	11	1.683	360	614 ^{**}
	Fauquier ^{ADF}	2	0	0	4 [*]	2	3	3 [*]	2	3	0 [*]	0 [*]	0	0.058	313	21 ^{**}
	McDonald Cr ^{ADF}	0	0	0	36 [*]	33	55	101	148	52	3 [*]	0	7	1.217	355	444 ^{**}
	Nakusp ^{ADF}	183	114	125	198 [*]	202	318	643	724	266	165 [*]	90	161	8.752	363	3,195 ^{**}
	Revelstoke ^{ADF}	0	0	0	25 [*]	44	60	110 [*]	129	91	51 [*]	2	0	1.415	359	516 ^{**}
	Shelter Bay ^{ADF}	0	0	22	102	171	119	116	174	174	120 [*]	24	17	2.868	364	1,047 ^{**}
Syringa Cr. ^{ADF}	44	77	97	147 [*]	241	495	1,066	1,004	381	112 [*]	54	51	10.393	361	3,794 ^{**}	
2012	Anderson Point ^{ADF}	12	13	32	49	64 [*]	83 [*]	71	92	90 [*]				1.613	222	590 ^{**}
	Burton ^{ADF}	1	0	0	1	13 [*]	44	101 [*]	128 [*]	30	0 [*]			0.677	251	248 ^{**}
	Burton South ^{ADF}	0	0	2	8	4 [*]	13	8 [*]	37 [*]	24	5 [*]			0.297	249	109 ^{**}
	Eagle Bay ^{ADF}	0	0	0	2	16 [*]	4	31 [*]	2 [*]	6	1 [*]			0.120	251	44 ^{**}
	Edgewood ^{ADF}	14	12	33	52	50 [*]	52	68 [*]	126 [*]	76	35 [*]			1.510	259	553 ^{**}
	Fauquier ^{ADF}	0	0	2	2	4 [*]	7	0 [*]		0 [*]				0.076	184	28 ^{**}
	McDonald Cr ^{ADF}	2	0	0	11	37 [*]	47	70 [*]	110 [*]	57	13 [*]			0.892	259	326 ^{**}
	Nakusp ^{ADF}	171	112	209	213	231 [*]	225	524	697	320	224 [*]			9.619	302	3,521 ^{**}
	Revelstoke ^{ADF}	1	5	4	30	24 [*]	64	205 [*]	136 [*]	79	35 [*]			1.312	260	480 ^{**}
	Shelter Bay ^{ADF}	4	0	7	88	161 [*]	70	87 [*]	205 [*]	223	135 [*]			3.104	260	1,136 ^{**}
Syringa Cr. ^{ADF}	48	46	87	144	239	266	673	1,008	341	140 [*]			10.531	303	3,854 ^{**}	

[†] AADT = Annual Average Daily Traffic, the total whole day counts for the given year, divided by the number of whole days with data in that year.

* Some monthly totals are estimated when there is only partial data for the month. The values shown are calculated based on the daily average for the available data, multiplied by the number of days in that month.

** Totals in years where data is incomplete are calculated by multiplying the AADT by the number of days in that year.

A = adjustment applied, D = divide by 2 applied, F = filtering applied

¹⁹ See Appendix A for a description of how the TRAFx traffic counters work and how annual traffic counts are calculated.

2012 Traffic Results

The following table shows a complete year of traffic counts for 2012 from January 1, 2012 to December 31, 2012 at the 11 boat launches on the Arrow Lakes. Averages from previous years were applied for those complete months with missing data.

Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AADT	Days with data	Total
Anderson Point	12	13	32	49	64	63	71	92	90	50	25	9	1.140	314	417
Burton	1	0	0	1	13	44	101	128	30	6	6	1	0.545	312	199
Burton South	0	0	2	8	4	13	8	37	24	5	0	1	0.239	310	87
Eagle Bay	0	0	0	2	16	4	31	2	6	1	0	0	0.201	312	35
Edgewood	14	12	33	52	50	52	68	126	76	35	25	21	1.222	310	462
Fauquier	0	0	2	2	4	7	0	2	0	2	2	1	0.046	307	17
McDonald Creek	2	0	0	11	37	47	70	110	57	13	9	5	0.745	310	273
Nakusp	171	112	209	213	231	225	524	697	320	224	108	153	8.003	363	2929
Revelstoke Shelter Bay	1	5	4	30	24	64	205	136	79	35	17	0	1.866	321	389
	4	0	7	88	181	70	87	205	223	135	45	9	3.280	321	920
Syringa Cr.	48	46	87	144	239	266	873	1,008	341	149	65	46	9.124	363	3,217
													Total		8,946

Our calculations indicate 8,946 boat launches this year, which is a 17% decrease in use from 2011 and 23% lower than 2010. Another indication of boating use on the Arrow Lakes in 2012 comes from comparing use at Syringa Creek and Nakusp as the counters there did not get removed during the high water period and represent 68% of all the boating use. Syringa Creek was down 15% and Nakusp was down 8% in 2012. All locations recorded between 8% and 57% fewer users than last year. The greatest percentage decreases were noted at: Burton (-57%), Edgewood (-46%) and McDonald Creek (-39%). The reductions in use were likely due to the prolonged presence of floating debris that clogged some boat ramps and created boating safety hazards on the water.

2012 Operational Considerations

Year 4 (2012) produced an excessively high water year with a sustained water level of 1446 feet elevation (or about 2 feet above normal pond level of 1444') for six weeks of the summer beginning July 6th. This created a number of operational challenges to traffic data collection during the busiest boating periods. To protect the sensitive electronic traffic counters from being submerged and water damaged due to the excessive high water conditions, the counters were removed from all ramp locations except Anderson Point, Nakusp and Syringa Creek boat launches from July 6, 2012 to Aug. 15, 2012. Monthly average traffic data from past years was used for complete months with missing data. The AADT calculations were adjusted where average monthly data was added in to provide the correct number of days with data, thus avoiding over counting. However, traffic estimates for the summer months are

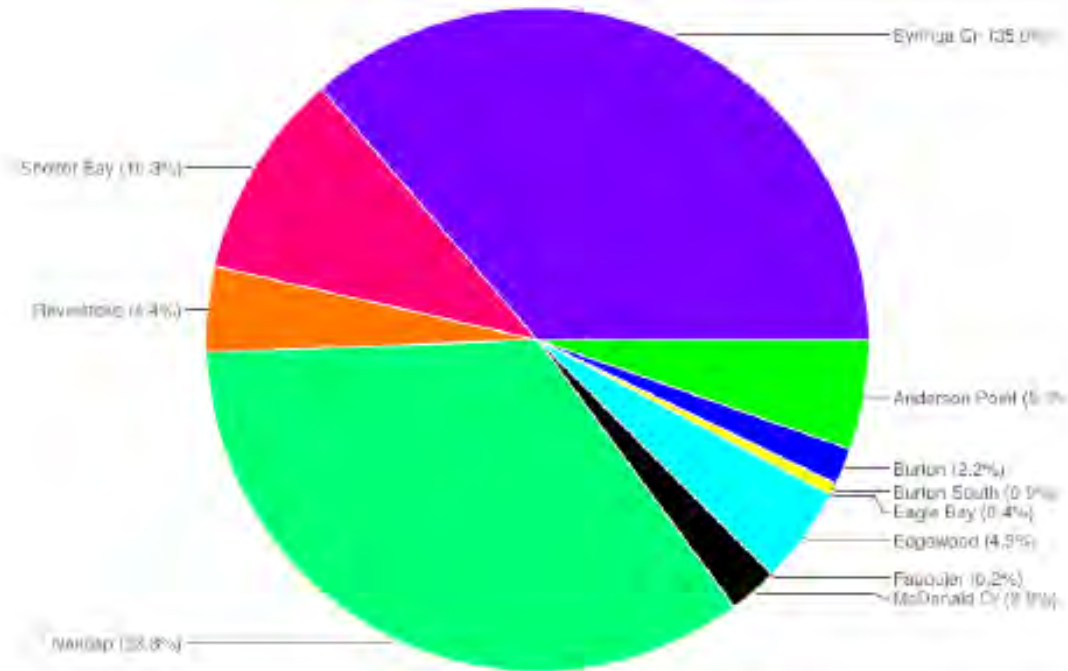
conservative as the Average Annual Daily Traffic (AADT) is lower than the actual use during the summer peak use period and higher than November and December when the ramps receive limited use. The high water resulted in a greater than normal volume of driftwood and floating debris on the lake and made access at the boat launches more difficult. This debris is likely the major cause of the reduced amount of boat use during the high water period.

The Anderson Point traffic counter was removed on May 14, 2012 in response to planned road construction activities. The planned activities were subsequently deferred and the counter was re-installed on June 12, 2012. During scheduled fall winterization on October 31, 2012 this counter was again removed due to planned road construction activities in preparation for the boat ramp construction during the following winter and spring. Upon removal the counter was found to have a faulty battery pack case and a non-functioning counter. It was immediately replaced and new batteries installed. On downloading the data it was found that the counter had stopped operating on September 9, 2012.

2012 averages applied for missing data

At all locations in this study, recorded summer use has been higher and winter use lower than the annual daily average. Thus, to more accurately present the total boat ramp use for the current year we have calculated the average November and December counts for each location from the past two years and applied them to the 2012 November and December data. As August was a prime activity month we likewise applied the average August values from past years for August 2012. We adjusted the AADT calculations to match each change.

Arrow Lakes Recreation – Site Traffic

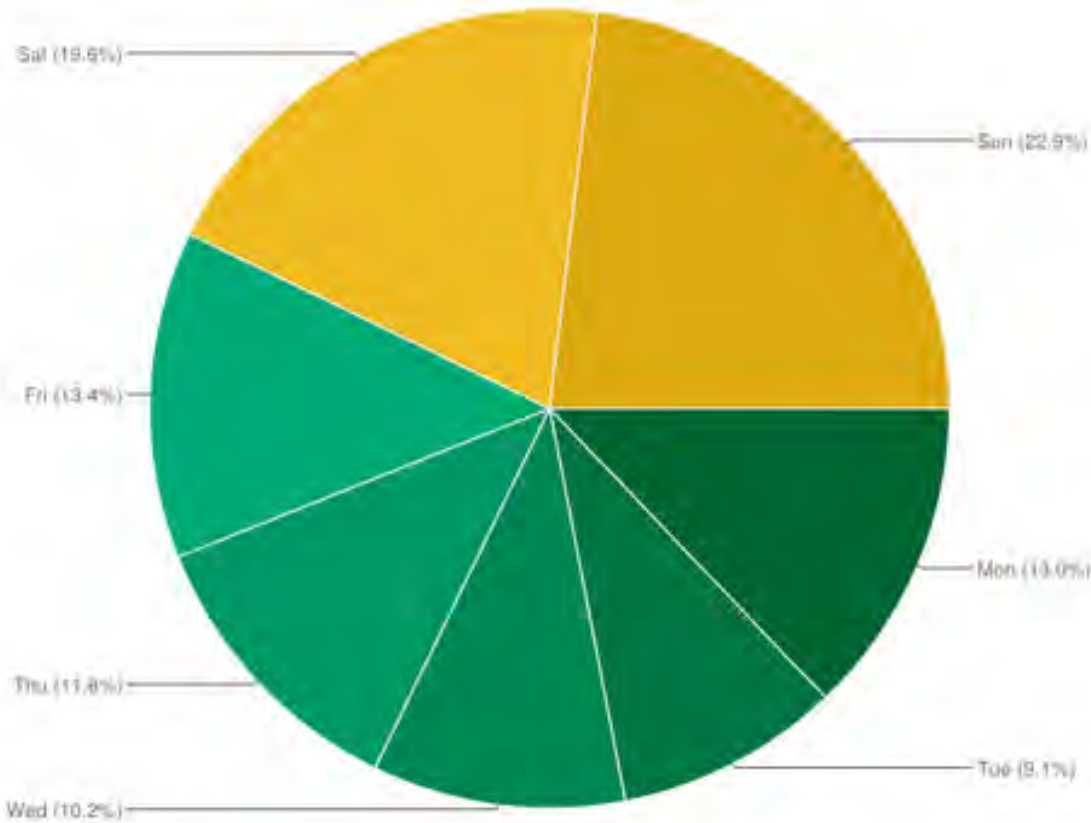


Site Name	Daily Average
Anderson Point (ADF)	1.4 (5.6%)
Burton (ADF)	0.6 (2.2%)
Burton South (ADF)	0.2 (0.9%)
Eagle Bay (ADF)	0.1 (0.4%)
Edgewood (ADF)	1.3 (4.9%)
Fauquier (ADF)	0.1 (0.2%)
McDonald Cr (ADF)	0.7 (2.8%)
Nakusp (ADF)	8.5 (33.3%)
Revelstoke (ADF)	1.1 (4.4%)
Shelter Bay (ADF)	2.6 (10.3%)
Syringa Cr. (ADF)	9.0 (35.0%)

A = adjustment applied, D = divide by 2 applied, F = filtering applied

Syringa Creek and Nakusp are the most active boat launch locations and constituted 68.3% of the recorded boat launch traffic on the Arrow Lakes in 2012.

Arrow Lakes Recreation – Traffic by Day of the Week

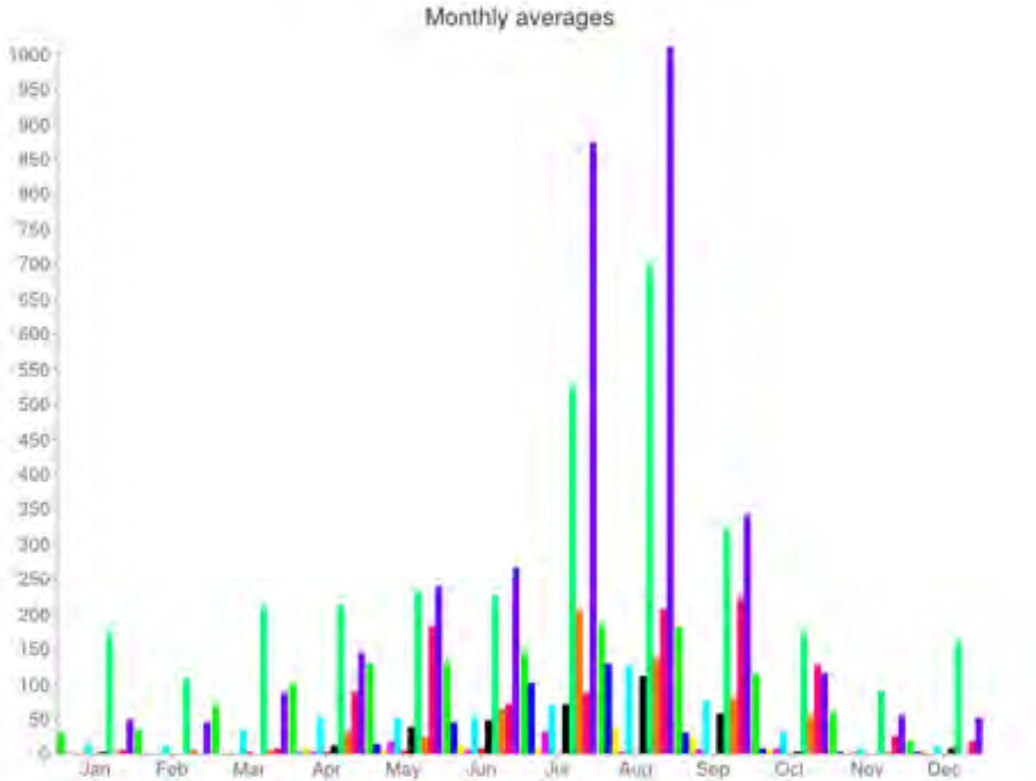


site name	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Anderson Point ^{ADF}	2.9	2.6	2.6	2.7	3.8	2.7	3.3
Burton ^{ADF}	0.4	0.3	0.5	0.7	0.6	0.8	0.6
Burton South ^{ADF}	0.3	0.2	0.1	0.2	0.2	0.2	0.5
Eagle Bay ^{ADF}	0.1	0.0	0.1	0.1	0.2	0.1	0.2
Edgewood ^{ADF}	1.1	0.7	0.8	1.2	1.4	1.8	1.8
Fauquier ^{ADF}	0.1	0.0	0.1	0.1	0.1	0.1	0.0
McDonald Cr ^{ADF}	0.5	0.6	0.5	0.6	0.7	1.0	1.2
Nakusp ^{ADF}	8.2	5.1	5.9	7.7	8.2	11.9	12.6
Revelstoke ^{ADF}	1.2	1.0	1.2	1.3	0.8	1.0	1.3
Shelter Bay ^{ADF}	1.9	1.6	1.6	1.5	2.2	4.7	4.9
Syringa Cr ^{ADF}	7.9	5.2	6.1	6.2	7.2	12.9	16.8
daily averages	2.2	1.6	1.8	2.0	2.3	3.4	3.9

^A - adjustment applied, ^D - divide by 2 applied, ^F - filtering applied

Generally, each day of a weekend receives about 1.5 - 2 times the number of recorded counts as most week days. Weekends account for approximately 43% of the weekly use. Friday counts are generally higher than other week day counts for most sites. Anderson Point continues to have higher Friday counts, possibly due to commuter traffic.

Arrow Lakes Recreation – Traffic by Month



Site Name	Average	Median	STDV (σPOP)	Min	Max
Anderson Point ^{DF}	99.0	107.3	55.1	18.0	184.0
Burton ^{ADF}	27.4	4.3	41.4	1.0	127.9
Burton South ^{ADF}	8.6	5.3	10.8	1.0	36.8
Eagle Bay ^{ADF}	5.7	2.0	8.8	1.0	31.0
Edgewood ^{ADF}	44.3	41.6	33.2	7.0	126.1
Fauquier ^{ADF}	1.3	0.0	2.1	2.0	7.0
McDonald Cr ^{ADF}	28.7	9.0	34.4	2.0	110.4
Nakusp ^{ADF}	260.1	211.0	170.4	90.0	697.0
Revelstoke ^{ADF}	50.3	26.8	61.1	1.0	204.6
Shelter Bay ^{ADF}	86.0	78.4	77.9	4.0	223.0
Syringa Cr. ^{ADF}	272.5	129.4	313.9	44.4	1,008.0

^A = adjustment applied ^D = date of 2 applied ^F = fishing codes

July and August recorded the highest traffic counts with the greatest use peaking in July or August. Syringa Creek had over 875 and 1000 launches in July and Aug while Nakusp recorded about 520 and 700 respectively in the same months. Nakusp maintained the highest counts through seven off-season months but this may be due to the fact that the boat launch access is good, right in town, is plowed regularly and it can be used at lower water levels.

APPENDIX G – SITE PHOTOS



Figure 21. Anderson Point – July 16, 2012



Figure 22. Nakusp Boat Launch - July 15, 2012



Figure 23. Shelter Bay – July 15, 2012



Figure 24. MacDonald Park - July 21, 2012



Figure 25. Syringa Creek - July 21, 2012



Figure 26. Anderson Point - July 29, 2012



Figure 27. Burton - July 29, 2012



Figure 28. Eagle Bay - August 5, 2012



Figure 29. Nakusp Beach - August 5, 2012



Figure 30. Syringa Day Use - August 5, 2012



Figure 31. Syringa Boat Launch - Aug 6, 2012

APPENDIX H – OBSERVATIONAL DATA FORMS AND DEFINITIONS

Data Forms

- Site and Survey Log
- Detailed Daily Sample Summary

Definitions

- Wind Condition Definitions
- Water Surface Condition Definitions
- Forecasting Terminology
- Sky Conditions Definitions
- Air and Water Temperature Data Collection Procedures

**CLBMON41 Arrow Reservoir Recreational Demand Study
2012 (Year 4) Progress Report**



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**Arrow Lakes Recreation Study
Site and Survey Log**

Date (dd/mm/yy)	Location	Time of env record	Sky Cond (1-14)	Wind (0-12)	Wind Dir (from)	Water Surface Cond (1-5)	Air Temp (°C)	Water Temp (°C)	# BC Plates	# Other Canada Plates	# Intn'l Plates	# Parties	Total # People visiting site	# invited to take survey	# prev taken survey this yr	# who decline taking survey	# complet ed surveys	# surveys to be mailed in	Staff Initials	Comment

#509 318 Homer Street Vancouver, BC V6B 2V2 | fax: 604 899 3805 | email: eleees@elac.bc.ca

Page ____



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Arrow Lakes Recreation Study – Detailed Daily Sample Summary

Date: _____ Sample Site: _____ Surveyor: _____ Page ____ of ____

Total # in Group	Gender	Age Range									Activities	Comments
	Total M/F	1 – 10	11 – 15	16 – 20	21 – 30	31 – 40	41 – 50	51 – 60	61 – 70	71 +		

Version: September 7, 2009

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Arrow Reservoir Recreational Demand Study
Water Surface Condition
Definitions



Water Condition	Description
1. Calm	Flat surface – some ripples, no noticeable breeze
2. Gentle	Noticeable breeze; low gentle waves
3. Small waves	Light winds – larger waves but no white caps
4. Moderate waves	Moderate winds; choppy water; white caps
5. Stormy	Strong winds; steep waves

Arrow Reservoir Recreational Demand Study Forecasting Terminology



Condition	Description
Duration of Precipitation	<ul style="list-style-type: none"> Brief - short, sudden showers or periods of rain Intermittent - on and off intervals, not continuous Occasional - irregular, infrequent intervals of precipitation Frequent - persistent short intervals, happening regularly and often Periods of precipitation - rain or snow falling most of the time with breaks
Distribution of Precipitation, as in showers	<ul style="list-style-type: none"> Isolated - showers separated during a given period of time Few - indicated in time, not over an area Local - restricted to a smaller area Patchy - irregularly occurring in an area Scattered - not widespread but of greater occurrence than isolated showers
Precipitation Intensity	<ul style="list-style-type: none"> Light - each drop or small flake of precipitation can be easily seen, puddles form slowly, some water flow in gutters Moderate - water puddles quickly, roads and other surfaces collect water, rain streams down windows Heavy - numerous flakes or sheets of rain, large puddles form, flooding can occur, visibility reduced
Cloud Cover	<ul style="list-style-type: none"> Clear or sunny - free of clouds or less than one tenth cloudy Partly cloudy or partly sunny - three tenths to six tenths of the sky is clouded Mostly cloudy - the sky is predominantly clouded or seven tenths to eight tenths of the sky has clouds Cloudy or overcast - the sky is covered with clouds from nine tenths to a hundred percent cloud covered
Showers vs. Rain: A Difference of Duration and Intensity	<ul style="list-style-type: none"> Rain - forms from stratus clouds, more widespread over larger area, uniformly steady, less intense Showers - forms from cumulus clouds, more isolated, short-lived, affects a smaller area, sometimes more intense
Partly Cloudy vs. Partly Sunny	<p>According to the National Oceanic and Atmospheric Administration there is no official difference between the two terms. One or the other may be emphasized, to help clarify the meaning of the term used.</p>

Read more: http://weatherforecasting.suite101.com/article.cfm/meteorologist_forecasting_terms#ixzz0QBMaiiTT

Arrow Reservoir Recreational Demand Study
Wind Condition
Definitions



International Description	Specifications	Beaufort Number	MPH	Knots
Calm	<ul style="list-style-type: none"> • Calm, smoke rises vertically 	0	< 1	< 1
Light air	<ul style="list-style-type: none"> • Direction of wind shown by smoke drift but not by wind vanes 	1	1 - 3	1 - 3
Light Breeze	<ul style="list-style-type: none"> • Wind felt on face • Leaves rustle • Vanes moved by wind 	2	4 - 7	4 - 6
Gentle Breeze	<ul style="list-style-type: none"> • Leaves and small twigs in constant motion • Wind extends light flag 	3	8 - 12	7 - 10
Moderate	<ul style="list-style-type: none"> • Raises dust, loose paper • Small branches moved 	4	13 - 18	11 - 16
Fresh	<ul style="list-style-type: none"> • Small trees in leaf begin to sway • Crested wavelets form on inland waters 	5	19 - 24	17 - 21
Strong	<ul style="list-style-type: none"> • Large branches in motion • Whistling heard in telegraph wires • Umbrellas used with difficulty 	6	25 - 31	22 - 27
Near Gale	<ul style="list-style-type: none"> • Whole trees in motion • Inconvenience felt walking against wind 	7	32 - 38	28 - 33
Gale	<ul style="list-style-type: none"> • Breaks twigs off trees • Impedes progress 	8	39 - 46	34 - 40
Strong Gale	<ul style="list-style-type: none"> • Slight structural damage occurs 	9	47 - 54	41 - 47
Storm	<ul style="list-style-type: none"> • Trees uprooted • Considerable damage occurs 	10	55 - 63	48 - 55
Violent Storm	<ul style="list-style-type: none"> • Wide Spread Damage 	11	64 - 72	56 - 63
Hurricane	<ul style="list-style-type: none"> • Wide Spread Damage 	12	73 - 82	64 - 71

Source: Oregon Emergency Management Net – Net Protocol

Arrow Reservoir Recreational Demand Study
Sky Condition
Definitions



Sky Condition	Description
1. Clear (Sunny)	< 10% cloud cover
2. Partly Cloudy (mostly sunny)	30 - 60% cloud cover
3. Mostly Cloudy (partly sunny)	70-80 % cloud cover
4. Overcast	≥ 90% cloud cover
5. Fog	Report visibility in tenths of a kilometer (<i>e.g.</i> , 100m, 200m, etc.)
6. Trace of Rain or Snow	Not enough to measure
7. Light Rain	from stratus (layers/blanket) clouds, more widespread, steady, less intense; each drop of precipitation can be easily seen, puddles form slowly, some water flow in gutters
8. Moderate Rain	water puddles quickly, roads and other surfaces collect water, rain streams down windows
9. Heavy Rain	numerous sheets of rain, large puddles form, flooding can occur, visibility reduced
10. Showers	forms from cumulus clouds, more isolated, short-lived, affects a smaller area, sometimes more intense
11. Drizzle	Fine consistent light rain, <1mm droplet size (no wind)
12. Light Snow	Visibility is > 1 km; often very little accumulation results
13. Moderate Snow	Visibility between 400m - 1km; < 10 cm in 12 hours
14. Heavy Snow	Numerous flakes, visibility <400m; 10 cm in 12 hrs or 15 cm in 24 hrs

Source: http://weatherforecasting.suite101.com/article.cfm/meteorologist_forecasting_terms

Arrow Reservoir Recreational Demand Study Air and Water Temperature Data Collection Procedures



Field staff should take air and water temperature readings any time between 11:00 am and 2:00 pm on each survey day. First collect air temperatures then water temperatures.

Summary of procedure for air temperature readings

1. Expose the thermometer to the air yet suspended away from any other material that may affect an accurate air temperature reading. The thermometer should be sheltered from direct solar radiation and other weather related influences.
2. Allow the thermometer to equilibrate before reading.
3. Read temperature.
4. Record temperature in the field form, along with ancillary information such as site, date, and time.

Summary of procedure for near surface water temperature readings

1. Select a representative area of the water body 2m from shore and hold the thermometer directly in the water 10 cm below the surface (e.g., attach thermometer to a fishing line and pole and hang so as to have thermometer bulb about 10cm below surface).
2. Allow the immersed thermometer to equilibrate before reading (hold in water about 2 minutes).
3. Read temperature. If the thermometer is unreadable while it is immersed in the water, pull the thermometer out and check the reading quickly. Do this multiple times until an accurate reading is achieved (the lowest reading for a reading from cold water when the air is hot and still, or the highest reading if the water is warm and a wind is cooling the wet thermometer).
4. Record temperature in the field form, along with ancillary information such as site, date, and time.
5. If temperature readings are unstable (which can occur in lakes or poorly mixed streams), take multiple readings.

Suggested tips for taking the water-temperature measurements

Be careful not to break your thermometer and keep it in the shade at all times. While reading temperature, avoid warming the thermometer bulb or water sample with your hands or by the sun. Read the temperature measurements to the nearest ½ degree C.

Source: Adapted from SFU Water Studies (<http://www.educ.sfu.ca/nbcr/tempprot.html>), and Washington State Department of Ecology Environmental Assessment Program Standard Operating Procedures for Instantaneous Measurements of Temperature in Water http://www.ecy.wa.gov/programs/eap/qa/docs/ECY_EAP-SOP_011InstantMeasureofTempinWater.pdf

Note: Thermometers used in study: waterproof pocket thermometer (-30/+50c), not calibrated.

APPENDIX I – OBSERVATIONAL DATA SUMMARIES

APPENDIX J – SURVEY SITES LOCATION MAP

Upper Arrow

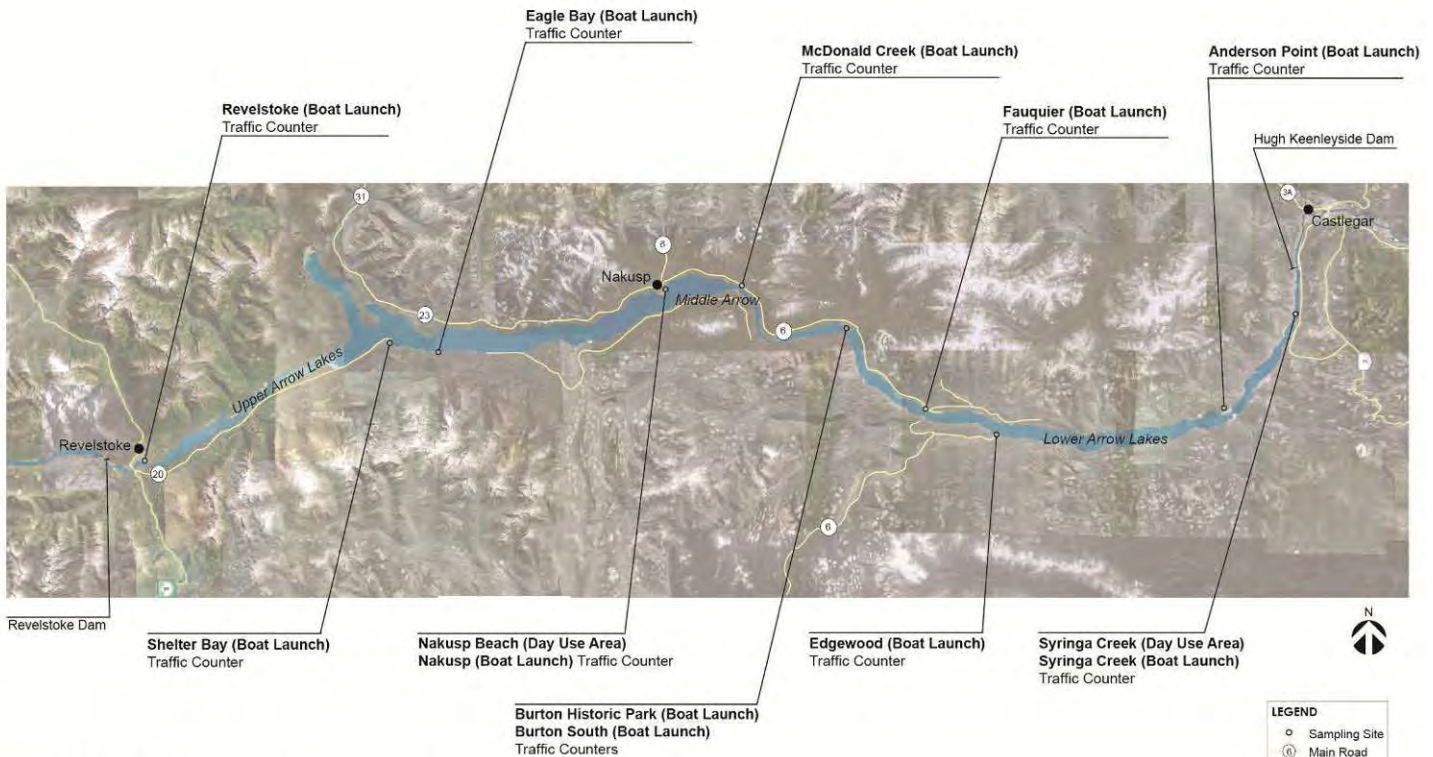
- Eagle Bay Recreation Site Boat Launch
- Shelter Bay Park Boat Launch
- Revelstoke Boat Launch

Middle Arrow

- Edgewood Park Boat Launch
- Fauquier Park Boat Launch
- Burton Historic Park Boat Launch
- Burton South Boat Launch
- McDonald Creek Park Boat Launch
- Nakusp Municipal Boat Launch
- Nakusp Beach Area

Lower Arrow

- Syringa Creek Park Boat Launch
- Syringa Creek Park Day Use Area
- Anderson Point Boat Launch



APPENDIX K – NEWS ARTICLES

- BC Hydro News Release (March 2011).
- BC Hydro online survey to understand recreational use of Arrow Lakes Reservoir and Kinbasket boat ramp use. (2011, March 31). *Revelstoke Current*.
- BC Hydro online survey studies recreational use of Arrow Lakes Reservoir. (2011, April 6). *Revelstoke Times Review*.
- BC Hydro survey seeks input on Arrow Lakes boat ramp use. (2011, April 6). *The Valley Voice*.
- BC Hydro launches revised recreation survey. (2011, April 6). *Arrow Lakes News*. |

NEWS RELEASE

Issued: **March 2011**

BC Hydro online survey to understand recreational use of Arrow Lakes Reservoir and Kinbasket boat ramp use

BC Hydro announces an improved online survey now available at www.arrow-kinbasket-recreation-survey.ca as part of studies to understand water and shore-based recreational use of Arrow Lakes Reservoir and boat ramp use of Kinbasket Reservoir.

The online survey asks questions about reservoir recreation including boat ramp use, frequency of recreational activity, location, infrastructure requirements, user demographics, and level of familiarity with Arrow and Kinbasket Lakes reservoirs.

“BC Hydro wants to better understand current recreational use of Arrow Lakes Reservoir and use of Kinbasket Reservoir boat ramps as recommended by the Columbia River Water Use Plan,” said Alan Chan-McLeod, BC Hydro’s Columbia River Water Use Plan Physical Works Lead. “This information will help guide future decision-making on recreational improvements.”

The studies are being delivered by LEES and Associates. Data on recreational use is being collected at established recreation sites on Arrow Lakes Reservoir through traffic counters, face-to-face surveys with reservoir users, and online surveys. Kinbasket boat ramp use data is being collected through face-to-face surveys, online surveys and traffic counters installed at existing boat ramps.

“Last year, traffic counters installed at established boat launch locations recorded close to 24,000 boat launches at Arrow Lakes Reservoir ramps between October 1, 2009 and September 30, 2010,” said Erik Lees from LEES and Associates., “and a total of 1,354 boat launches at Kinbasket Reservoir ramps were recorded at Kinbasket Reservoir ramps between April 9, 2010 and Sep 30, 2010.

Study staff will be at randomly selected reservoir access points from spring to fall this year to continue face-to-face surveys with reservoir users. To date a total of 641 face-to-face surveys have been completed as well as 39 responses to the pilot online survey that operated last year.

The Columbia River Water Use Plan, now in its fifth year of implementation, recommends a large number of monitoring programs and projects over 12 years to provide benefits to a variety of non-power interests along the Columbia River mainstem including recreation, fish and fish habitat, wildlife, vegetation, and heritage. The Plan calls for debris management, boat ramp improvements, and recreation demand studies on Arrow Lakes and Kinbasket reservoirs to benefit boat recreation.

BC Hydro online survey to understand recreational use of Arrow Lakes Reservoir and Kinbasket boat ramp use | Revelstoke Current

<http://www.revelstokecurrent.com/2011/03/31/bc-hydro-online-survey-to-understand-recreational-use-of-arrow-lakes-reservoir-andkinbasket-boat-ramp-use/>
April 6, 2011

Posted by editor on March 31, 2011



Harry Anderson and Dave Fitchett are two of the LEES and Associates surveyors finding out what people hope to see done with boat ramps on the Kinbasket and Arrow Lakes.
Photo courtesy of BC Hydro

BC Hydro has announced an improved online survey now available at www.arrow-kinbasket-recreationsurvey.ca as part of its studies to understand water and shore-based recreational use of Arrow Lakes Reservoir and boat ramp use of Kinbasket Reservoir.

The online survey asks questions about reservoir recreation including boat ramp use, frequency of recreational activity, location, infrastructure requirements, user demographics, and level of familiarity with Arrow and Kinbasket Lakes reservoirs.

"BC Hydro wants to better understand current recreational use of Arrow Lakes Reservoir and use of Kinbasket Reservoir boat ramps as recommended by the Columbia River Water Use Plan," Alan Chan-McLeod, Hydro's Columbia River Water Use Plan Physical Works Lead, said in a statement Thursday. "This information will help guide future decision-making on recreational improvements."

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Revelstoke Times Review - News

BC Hydro online survey studies recreational use of Arrow Lakes Reservoir

By Aaron Orlando - Revelstoke Times Review
Published: April 06, 2011 12:00 PM

BC Hydro has announced an improved online survey is now available at www.arrow-kinbasket-recreation-survey.ca as part of studies to understand water and shore-based recreational use of Arrow Lakes Reservoir and boat ramp use of Kinbasket Reservoir.

The online survey asks questions about reservoir recreation including boat ramp use, frequency of recreational activity, location, infrastructure requirements, user demographics and level of familiarity with Arrow and Kinbasket Lakes reservoirs.

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Boat ramp use data is being collected through face-to-face surveys, online surveys and traffic counters installed at existing boat ramps.

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The survey will run through until mid-2014 and results of the survey and other study activities will be made available in a recreation demand report around at the end of 2014.

Find this article at:

http://www.bclocalnews.com/kootenay_rockies/revelstoketimesreview/news/119294809.html

The Valley Voice (April 6th, 2011)
Serving every home between Edgewood,
Kaslo and South Slocan (on the Arrow Lakes)

BC Hydro survey seeks input on Arrow Lakes boat ramp use

submitted by BC Hydro

BC Hydro has recently posted an improved online survey as part of studies to understand water and shore-based recreational use of Arrow Lakes Reservoir and boat ramp use of Kinbasket Reservoir.

The online survey asks questions about reservoir recreation including boat ramp use, frequency of recreational activity, location, infrastructure requirements, user demographics, and level of familiarity with Arrow and Kinbasket Lakes reservoirs. Alan Chan-McLeod, BC Hydro's Columbia River Water Use Plan Physical Works Lead, said the information will help guide future decision-making on recreational improvements.

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"Last year, traffic counters installed at established boat launch locations recorded close to 24,000 boat launches at

Arrow Lakes Reservoir ramps between October 1, 2009 and September 30, 2010," said Erik Lees from LEES and Associates, which is conducting the study. "A total of 1,354 boat launches were recorded at Kinbasket Reservoir ramps between April 9, 2010 and September 30, 2010."

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selected Arrow Lakes and Kinbasket reservoir access points from spring to fall this year to continue face-to-face surveys with reservoir users. To date a total of 641 face-to-face surveys have been completed as well as 39 responses to the pilot online survey that operated last year.

The Columbia River Water

Use Plan, now in its fifth year of implementation, recommends a large number of monitoring programs and projects over 12 years to provide benefits to a variety of non-power interests along the Columbia River main stem, including recreation, fish and fish habitat, wildlife, vegetation, and heritage. The plan calls for debris management, boat ramp improvements, and recreation demand studies on Arrow Lakes and Kinbasket reservoirs to benefit boat recreation.

To participate visit www.arrow-kinbasket-recreation-survey.ca.

BC Hydro launches revised recreation survey

By Staff Writer - Arrow Lakes News
Published: April 06, 2011 5:00 PM
Updated: April 07, 2011 12:09 PM

BC Hydro has announced an improved online survey is now available at www.arrow-kinbasket-recreation-survey.ca as part of studies to understand water and shore-based recreational use of Arrow Lakes Reservoir and boat ramp use of Kinbasket Reservoir.

The online survey asks questions about reservoir recreation including boat ramp use, frequency of recreational activity, location, infrastructure requirements, user demographics and level of familiarity with Arrow and Kinbasket Lakes reservoirs.

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Find this article at: <http://www.arrowlakesnews.com/news/119367584.html>