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## **Columbia River Project Water Use Plan**

**Kinbasket and Arrow Recreation Management Plan**

**Boat Ramp Use Study**

**Implementation Year 8**

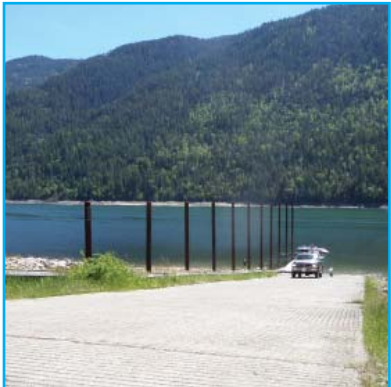
**Reference: CLBMON-14**

*Progress Report Year 8*

**Study Period: 2017**

**LEES + Associates  
509 - 318 Homer Street  
Vancouver, BC V6B 2V2  
(604) 899-3806**

**July 22, 2019**

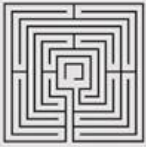


# CLBMON-14 Boat Ramp Use Study

Progress Report (Implementation Year 8)  
Study Period: 2017  
July, 2018

Prepared by:  
LEES+Associates  
509-318 Homer St  
Vancouver, BC

Submitted to:  
BC Hydro



# **CLBMON 14 Boat Ramp Use Study**

## **Year 8 Progress Report Study Period: 2017**

**July 22, 2019**

**Submitted to:**

**BC Hydro  
Burnaby, BC**

**Prepared By:**

**LEES + Associates  
Vancouver, BC**

Contact Information

LEES + Associates  
509-318 Homer St.  
Vancouver, BC  
V6B 2V2

T: 604-899-3806

F: 604-899-3805

[elees@elac.ca](mailto:elees@elac.ca)

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**Table 1.** CLBMON 14 STATUS of OBJECTIVES, MANAGEMENT QUESTIONS and HYPOTHESES after Year 8

Objectives	Management Questions	Management Hypotheses	Year 8 (2017) Status
<p>The objective of this study is to monitor trends in public use of boat ramp facilities where access improvements have been made as part of the Columbia River WUP, and assess the effectiveness of these projects in providing benefits to recreational interests in the area.</p>	<p>1) Does public use of boat ramps increase on Kinbasket and Arrow Lakes reservoirs after installation and upgrading of the WUP boat ramp facilities?</p>	<p>H<sub>1</sub>: The volume of public use of existing boat ramps where improvements have been undertaken increases over time following implementation of the Water Use Plan.</p>	<p>Results show changes in volume of public use where improvements have been undertaken is mixed. Some sites experienced an increase in volume of public use while other site saw a decrease or no change in volume. Expecting more data in 2018.</p>
	<p>2) If there is an increasing use of new or improved facilities, is it due to existing users visiting more often or new users being attracted to the area?</p>	<p>H<sub>2</sub>: The volume of public use of new boat ramps increases with the availability of new access opportunities. H<sub>2A</sub>: The volume of public use of new boat ramps does not reduce the usage of nearby existing boat ramps negatively. H<sub>2B</sub>: The volume of public use increases due to new users being attracted.</p>	<p>Results to date suggest that the volume of reported use of new or improved facilities does not reduce the usage of nearby existing boat ramps, or result in an increase in new users. Expecting more data in 2018.</p>
	<p>3) Does user satisfaction increase with improvements made to the existing boat ramps and construction of the new boat ramps?</p>	<p>H<sub>3</sub>: User satisfaction of the new and upgraded boat ramps is greater than that experienced by users of the older facilities.</p>	<p>Results to date show a significant increase in user satisfaction following improvements to existing boat ramps and parking lot conditions. Expecting more data in 2018.</p>
	<p>4) Is there a need for installation of additional facilities to satisfy the needs of boat users on Kinbasket Reservoir and Arrow Lakes Reservoir?</p>	<p>H<sub>4</sub>: There are no changes in the socio-demographic or trip behavior characteristics of users of boat ramps on Kinbasket and Arrow Lakes reservoirs.</p>	<p>Results to date suggest there are no changes in the socio-demographic characteristics of users of boat ramps on Kinbasket and Arrow Lakes reservoirs. Results suggest that boat ramp improvements have satisfied the majority of boat users' needs. Expecting more data in 2018.</p>

## Acknowledgments

We would like to thank the following people for their contributions to this project.

### Study Team

Erik Lees, LEES+Associates

Dr. Howie Harshaw, University of Alberta

Heidi Redman, LEES+Associates

Stewart Denny, LEES+Associates

Ali Canning, LEES+Associates

### Field Crew

Jody Ashdown, South Slocan, BC

Gary Krestinsky, Revelstoke, BC

Kathy Smith, Nakusp, BC

Dan Reibin, Nelson, BC

### BC Hydro Personnel

Darin Nishi, Burnaby, BC

Phil Bradshaw, Burnaby, BC

Jennifer Walker-Larsen, Revelstoke, BC

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## 1. Executive Summary

During the Columbia River Water Use Planning (WUP) process, the Consultative Committee recognized an opportunity to improve access for water-based recreation on the Arrow Lakes and Kinbasket Reservoirs through physical improvements to existing boat ramps and the construction of new ramps (BC Hydro 2007). Since that time, BC Hydro has completed boat ramp facility construction or improvements at ten locations – eight locations on the Arrow Lakes Reservoir and two on Kinbasket Reservoir. The CLBMON 14 Boat Ramp Use Study was ordered by the Comptroller of Water Rights to monitor use levels and user satisfaction at the boat launch improvement sites to inform future operational decisions.

Information gained through this monitoring program will assist future decision making around the effectiveness of the boat launch works and their maintenance, the value of implementing additional physical works to improve access to the reservoirs, and any potential unintended impacts associated with improved boat access.

To address the management questions and supporting hypotheses specific parameters were measured through a combination of monitoring (traffic count and observational data collection) and interviews (on-site surveys). The study has a 10 year horizon (2010 to 2019), with sampling occurring in Years 1 to 4 inclusive (years 2010-2013), and in Years 7 to 10 (years 2016-2019). Year 8 (2017) included a full program of vehicle counts, with intercept surveys administered at three boat launch sites.

Results to date suggest changes in daily visitor volume are mixed following boat ramp improvements. Improvements did not result in reduced usage of nearby existing boat ramps, or an increase in new users, or a change in the type of user group. Visitor satisfaction was the factor most affected post-constructions, suggesting these projects have been effective in providing benefits to recreational interests in the area. Year 8 (2017) was the second sampling year after all ramps were fully constructed. More robust conclusions may be made after more visitors have been able to use the improved sites in sampling Years 9 (2018) and 10 (2019).

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The status of CLBMON 14 after Year 8 (2017) with respect to the management questions and management hypotheses is summarized in Table 1.

**Table 1.** CLBMON 14 STATUS of OBJECTIVES, MANAGEMENT QUESTIONS and HYPOTHESES after Year 8

Objectives	Management Questions	Management Hypotheses	Year 8 (2017) Status
The objective of this study is to monitor trends in public use of boat ramp facilities where access improvements have been made as part of the Columbia River WUP, and assess the effectiveness of these projects in providing benefits to recreational interests in the area.	1) Does public use of boat ramps increase on Kinbasket and Arrow Lakes reservoirs after installation and upgrading of the WUP boat ramp facilities?	H <sub>1</sub> : The volume of public use of existing boat ramps where improvements have been undertaken increases over time following implementation of the Water Use Plan.	Results show changes in volume of public use where improvements have been undertaken is mixed. Some sites experienced an increase in volume of public use while other site saw a decrease or no change in volume. Expecting more data in 2018.
	2) If there is an increasing use of new or improved facilities, is it due to existing users visiting more often or new users being attracted to the area?	H <sub>2</sub> : The volume of public use of new boat ramps increases with the availability of new access opportunities. H <sub>2A</sub> : The volume of public use of new boat ramps does not reduce the usage of nearby existing boat ramps negatively. H <sub>2B</sub> : The volume of public use increases due to new users being attracted.	Results to date suggest that the volume of reported use of new or improved facilities does not reduce the usage of nearby existing boat ramps, or result in an increase in new users. Expecting more data in 2018.
	3) Does user satisfaction increase with improvements made to the existing boat ramps and construction of the new boat ramps?	H <sub>3</sub> : User satisfaction of the new and upgraded boat ramps is greater than that experienced by users of the older facilities.	Results to date show a significant increase in user satisfaction following improvements to existing boat ramps and parking lot conditions. Expecting more data in 2018.
	4) Is there a need for installation of additional facilities to satisfy the needs of boat users on Kinbasket Reservoir and Arrow Lakes Reservoir?	H <sub>4</sub> : There are no changes in the socio-demographic or trip behavior characteristics of users of boat ramps on Kinbasket and Arrow Lakes reservoirs.	Results to date suggest there are no changes in the socio-demographic characteristics of users of boat ramps on Kinbasket and Arrow Lakes reservoirs. Results suggest that boat ramp improvements have satisfied the majority of boat users needs. Expecting more data in 2018.



## 2. Introduction

### 2.1 Background

During the Columbia River Water Use planning (WUP) process, the Consultative Committee (CC) recognized an opportunity to improve access for water-based recreation on the Arrow Lakes and Kinbasket Reservoirs through physical improvements to existing boat ramps and the construction of new ramps (BC Hydro 2007). Since that time, BC Hydro has completed boat ramp facility improvements<sup>1</sup> at ten locations – eight locations on the Arrow Lakes Reservoir and two locations on Kinbasket Reservoir (see Tables 3, 4).

While the CC recognized the value of these projects, they also highlighted a need for a public use measurement study to monitor use levels and user satisfaction at the boat launch improvement sites to inform future operational decisions. CLBMON 14 Boat Ramp Use Study was ordered by the Comptroller of Water Rights as one of a series of monitoring programs that fulfills BC Hydro's obligations under the Columbia River Water Use Plan<sup>2</sup>.

CLBMON 14 is a 10-year study that assesses the effectiveness of the boat ramp facility improvements that have been made as part of the Columbia River WUP, by monitoring the ten sites where access improvements have been made. Information gained through this monitoring program will assist future decision making about the effectiveness of the boat launch works and their maintenance, the value of implementing additional physical works to improve access to the reservoirs, and any potential unintended impacts associated with improved boat access. This progress report summarizes the results from Year 8 (2017).

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<sup>1</sup> Recreational boat access improvements may include ramp extensions, breakwaters, debris booms, docking floats, parking and other site changes.

<sup>2</sup> Concurrent to Years 1-4 of CLBMON 14, BC Hydro conducted the Arrow Lakes Recreational Demand Study (CLBMON 41). Due to significant overlaps, the two studies were combined into one delivery model; however, data collection for CLBMON 41 concluded in 2013.

## 2.2 Management Questions and Objectives

The key management questions addressed by this study are:

- MQ1: Does public use of boat ramps increase on Kinbasket and Arrow Lakes reservoirs after installation and upgrading of the WUP boat ramp facilities?
- MQ2: If there is an increasing use of new or improved facilities, is it due to existing users visiting more often or new users being attracted to the area?
- MQ3: Does user satisfaction increase with improvements made to the existing boat ramps and construction of the new boat ramps?
- MQ4: Is there a need for installation of additional facilities to satisfy the needs of boat users on Kinbasket Reservoir and Arrow Lakes Reservoir?

The main objective of the study is to monitor trends in public use of boat ramp facilities where access improvements have been made as part of the Columbia River WUP, and assess the effectiveness of these projects in providing benefits to recreational interests in the area.

## 2.3 Management Hypotheses

Four primary management hypotheses frame this monitoring program:

“The first hypothesis is associated with evaluating whether increasing the usability of the existing ramps over a wider range of reservoir water elevations results in increased public use relative to pre-WUP conditions, at times when water levels are low. Testing of this hypothesis is informed directly by observed trends in usage obtained through ongoing monitoring of these sites.

H<sub>1</sub>: The volume of public use of existing boat ramps where improvements have been undertaken increases over time following implementation of the Water Use Plan.

The second hypothesis is associated with determining whether construction of new ramp facilities results in increased access to the reservoir, or a shift in use away from existing boat ramps because of accessibility to the area (i.e., proximity to the boat ramp) or safer launch conditions. Testing of this hypothesis is informed both directly through use data collected during the monitoring, as well as through survey questionnaires related to user characteristics and level of user satisfaction.

H<sub>2</sub>: The volume of public use of new boat ramps increases with the availability of new access opportunities.

H<sub>2A</sub>: The volume of public use of new boat ramps does not reduce the usage of nearby existing boat ramps negatively.

H<sub>2B</sub>: The volume of public use increases due to new users being attracted.

A third hypothesis addresses possible changes to the recreation experience offered to the users of the boat ramps. The simplest indicator of a quality recreation experience is user satisfaction, which is investigated as part of the survey questionnaires. Satisfaction analysis also considers related information that is collected during the monitoring study. Other changes to the users, such as socio-demographic characteristics or reservoir recreation behaviour related variables, are also used as indicators.

H<sub>3</sub>: User satisfaction of the new and upgraded boat ramps is greater than that experienced by users of the older facilities.

Finally, satisfaction alone does not provide any insights about changes to user group characteristics. Therefore, it is important to monitor if user characteristics change over time.

H<sub>4</sub>: There are no changes in the socio-demographic or trip behavior characteristics of users of boat ramps on Kinbasket and Arrow Lakes reservoirs.”

(Terms of Reference, BC Hydro, 2009 p.6)

One of the key issues with the CLBMON 14 management questions and management hypotheses is the timing of improvements at each of the boat launch ramps. Ramp locations that were improved early in the study period do not have much, if any, pre-improvement data against which the post-improvement data can be compared. Conversely, ramps that were improved later in the study period will have less post-improvement data. This will mean that hypotheses *H<sub>2B</sub>*, *H<sub>3</sub>* and *H<sub>4</sub>* may not be uniformly tested over every boat launch/ramp location.

### 3. Methods

To address the management questions and supporting hypotheses, specific parameters were measured through a combination of monitoring (traffic counters, spots counts and observational data collection) and interviews (on-site intercept and online surveys). This study has a 10 year horizon, with sampling occurring in spring, summer, and fall seasons (Terms of Reference, BC Hydro 2009, p.9). In order to meet scheduling and budget criteria, (gained through integration with CLBMON 41), sampling has occurred in Years 1 to 4 inclusive, and Years 7 to 10 (Table 2). 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 daylight hours). At the end of each sampling year, the data have been summarized in report format.

**Table 2.** Activities and reporting by monitoring year.

Year	CLBMON 14	Activities	Annual Report
2010	Year 1	<ul style="list-style-type: none"> <li>• Survey development</li> <li>• First field season (surveys and vehicle counters at all sites)</li> </ul>	Progress Report
2011	Year 2	<ul style="list-style-type: none"> <li>• Full field season</li> <li>• Two new sites added</li> </ul>	Progress Report
2012	Year 3	<ul style="list-style-type: none"> <li>• Full field season</li> <li>• All sites sampled</li> </ul>	Progress Report
2013	Year 4	<ul style="list-style-type: none"> <li>• Full field season</li> <li>• All sites sampled</li> </ul>	Mid-Term Report
2014	Year 5	<ul style="list-style-type: none"> <li>• No sampling</li> </ul>	-
2015	Year 6	<ul style="list-style-type: none"> <li>• No sampling</li> </ul>	-
2016	Year 7	<ul style="list-style-type: none"> <li>• Vehicle counters at all sites</li> <li>• No surveys</li> </ul>	Progress Report
2017	Year 8	<ul style="list-style-type: none"> <li>• Vehicle counters at all sites</li> <li>• Surveys at three sites</li> </ul>	Progress Report
2018	Year 9	<ul style="list-style-type: none"> <li>• Vehicle counters at all sites</li> <li>• No surveys</li> </ul>	Progress Report
2019	Year 10	<ul style="list-style-type: none"> <li>• Full field season</li> <li>• All sites to be sampled</li> </ul>	Final Comprehensive Report

This report provides a summary of Year 8 results. A comprehensive report will be prepared at the conclusion of the study. The final report will include a detailed summary of the study findings as they relate to the management questions and hypotheses.

This methods section is presented under the following headings:

- Sampling Sites;
- Traffic Data Collection;
- Survey Delivery and Design;

### **3.1 Sampling Sites**

The sampling sites in this study (see Tables 3, 4 and Figures 1, 2) include the ten sites that were approved by the Comptroller of Water Rights for access improvement work, such as the construction of new boat ramps and improvements to existing ramps, as well as two control sites. Burton Historical Park<sup>3</sup> was used as a control site on the Arrow Lakes Reservoir. Esplanade Bay was used as a control site on the Kinbasket Reservoir in Years 2 through 4; however, Esplanade Bay was found to be a low-use site with limited value as a control site, and measurement of traffic counts was discontinued at this site after Year 4. No environmental monitoring or interviews were conducted at the control sites. Nixon Creek was not included as a sample site as roads were inaccessible during the sampling period. The status of improvements and ramp elevations at sampling sites used in this study is summarized in Tables 3 and 4 (Monitoring Program and Physical Works Annual Report: BC Hydro 2017).

Year 8 (2017) included a full program of vehicle counters at following locations: Syringa, Anderson Point, Edgewood, Fauquier, McDonald Creek, Burton Historical Park,

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<sup>3</sup> The town of Burton has two boat launches: Burton Historical Park and Burton South. Burton Historical Park is a Provincial Park and Burton South is the brand new location where BC Hydro built the WUP boat launch.

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Burton South, Nakusp, Shelter Bay, Valemount Marina and Bush Harbour. On-site intercept surveys and observational data collection was carried out at three sites: Nakusp, Syringa and Shelter Bay.

**Table 3.** Locations and status of boat ramp improvements on Arrow Lakes Reservoir.

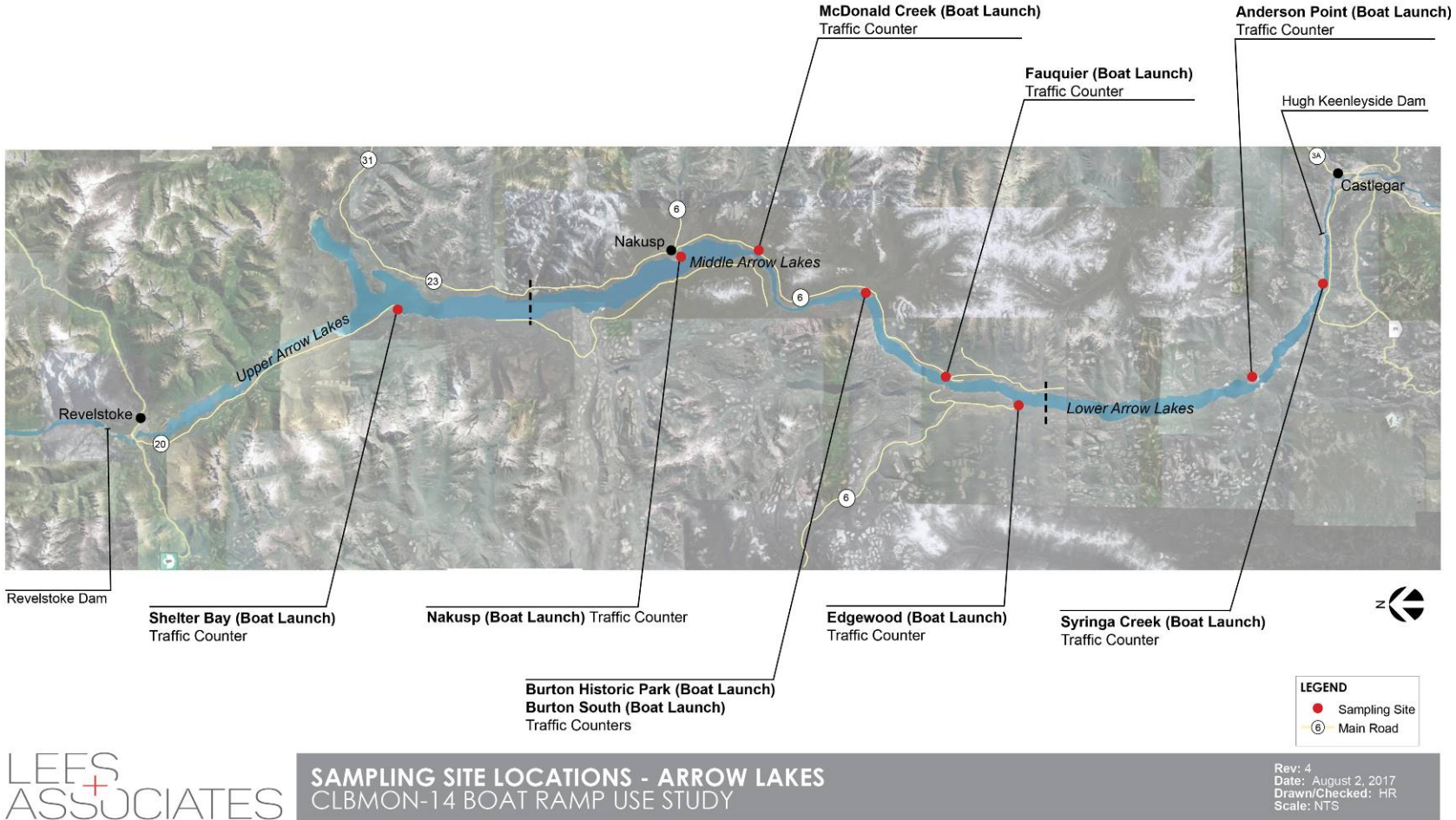
CLBMON 14 Study Site	Boat Ramp	Year Completed	Elevation of ramp toe (m)	Lowest water level where ramp is still operational (m)	Comments
<b>Arrow Lakes Reservoir</b>					
√	Nakusp	2016	420.50	421.50	Construction began in 2013, completed February 2016.
√	McDonald Creek	2015	426.00	427.00	Construction in 2014 and 2015.
√	Burton Historical Park	Control site	n/a	n/a	n/a
√	Burton South <sup>†</sup>	2015	425.40	426.40	Construction occurred between 2010 and 2015.
√	Fauquier	2011	424.66	425.66	Construction in 2010 and 2011. Some adjustments to the breakwater in 2015.
√	Edgewood	2015	425.76	426.76	Construction occurred between 2013 and 2015.
√	Anderson Point	2015	425.00	426.00	Construction began in 2013, completed in 2015.
√	Shelter Bay	2016	422.86	423.86	Construction began in 2015, completed April 2016.
√	Syringa	2015	421.87	422.87	Construction in 2015.

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**Table 4.** Location and status of boat ramp improvements on Kinbasket Reservoir.

CLBMON 14 Study Site	Boat Ramp	Year Completed	Elevation of ramp toe (m)	Lowest operational water level (m)	Comments
<b>Kinbasket Reservoir</b>					
√	Valemount Marina	2013 (Except walkway)	727.59	728.59	Majority of construction completed in 2011. Further ramp extension in 2013. Boarding floats (walkway) replacement completed in 2016.
√	Bush Harbour	2013	724.60	725.60	Construction occurred between 2011 and May 2013.
√	Esplanade Bay <sup>†</sup>	Used as a control site in Years 2 to 4	n/a	n/a	n/a
-	Nixon Creek	n/a	n/a	n/a	Not included in study. NB: While Nixon was identified as a potential ramp for improvement, it was not possible to guarantee the Forest Service Road would remain open throughout the recreation season. Therefore, this site was eliminated from consideration.

Figure 1. Sampling locations map – Arrow Lakes Reservoir.

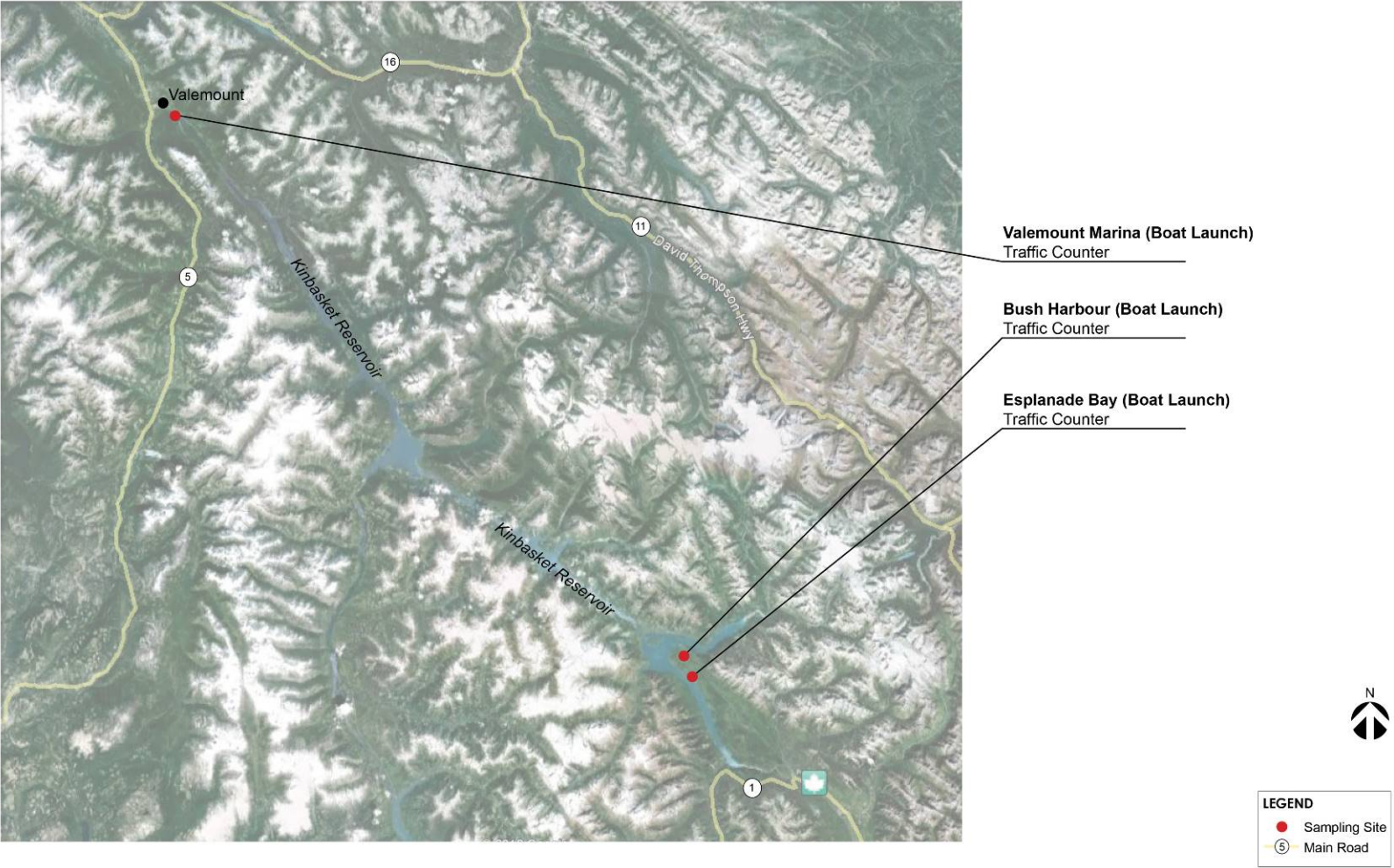


LEES  
 ASSOCIATES

**SAMPLING SITE LOCATIONS - ARROW LAKES**  
 CLBMON-14 BOAT RAMP USE STUDY



Figure 2. Sampling locations map – Kinbasket Reservoir.



## 3.2 Traffic Data Collection

Vehicle counters are a reliable tool for monitoring public recreation use and have been found to be very useful in identifying use trends and patterns to better manage public access (Terms of Reference, BC Hydro 2009, p.8). 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.

Vehicle counters were configured and installed at each sampling location as per the manufacturer's specifications to monitor the number of vehicles using the ramp facilities. Vehicle counters remained in place year-round to collect vehicle counts in Years 1-4, inclusive. Vehicle counters were re-installed in Year 7 of the study, once all planned boat ramp improvements were completed.

Annual vehicle counts were collected and automatically compiled by the TRAFx DataNet system for each full calendar year. This was 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 vehicle count calculations can be found in Appendix A. Vehicle counter results are presented in Section 4.

### 3.2.1 Arrow Lakes Reservoir Vehicle Counters

Vehicle counters were installed at boat access sites at Nakusp, McDonald Creek, Burton Historical Park, Burton South, Fauquier, Syringa, Shelter Bay, Edgewood and Anderson Point.

Counter sensitivity and delay settings were configured to most accurately record traffic at each site, in order to achieve a level of accuracy that would permit conclusive answers to the management questions. Thresholds were adjusted to the least sensitive setting that would still pick up a vehicle passing through but not smaller or more distant metal objects; there is a 17 second delay between counts on single lane ramps and 15 second delay on double lane ramps to reduce multiple counts of same vehicle.

Settings were monitored and adjusted during the first year of study (2010) and inspected three times each study year to ensure counters were configured to most accurately record traffic at each site. In 2013, Nakusp counter settings were adjusted to accommodate placement of the counter in the middle of the new cement ramp. Other than at Nakusp, the counter sensitivity and delay settings remain

unchanged since Year 2 (2011). Traffic counter settings used at Arrow Lakes sites are included in Appendix A.

### 3.2.2 Kinbasket Reservoir Vehicle Counters

Vehicle counters were installed at the Bush Harbour and Valemount Marina boat ramps. Vehicle counter sensitivity and delay settings used at Kinbasket Reservoir sites are included in Appendix A. The counter sensitivity and delay settings at Kinbasket sites have remained unchanged since Year 2 (2011).

## 3.3 Observational Data Collection

Field 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 boat ramp usage, such as weather and reservoir conditions (i.e., precipitation, wind, waves, percent cloud cover, and air temperature). Observational data were assessed using standardized forms and definitions developed for this purpose (see Appendix E).

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

Observation	Description
Number of people seen	<ul style="list-style-type: none"> <li>Provides an overall sense of the level of activity that day; recording the number of people approached provides basis for calculating response rate for the on-site survey.</li> <li>Party size was recorded where possible to compare with established BC Parks statistics†.</li> </ul>
Gender and age range	<ul style="list-style-type: none"> <li>Total male and female</li> <li>Age range (1-10, 11-15, 16-20, 21-30, 31-40, 41-50, 51-60, 61-70, 71+)</li> </ul>
Activities	<ul style="list-style-type: none"> <li>Type of recreational activity observed</li> </ul>
Number of cars in parking lot (and origin)	<ul style="list-style-type: none"> <li>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 at the beginning and end of each shift in conjunction with the surveys to minimize double counting.</li> </ul>
Site photography	<ul style="list-style-type: none"> <li>Photographic records of sample sites to capture site conditions.</li> <li>Taken from same vantage point to facilitate comparison between years.</li> </ul>
Weather*	<ul style="list-style-type: none"> <li>General descriptions to supplement individual measurements.</li> </ul>
Presence of waves*	<ul style="list-style-type: none"> <li>Wave height and formation.</li> </ul>

Wind*	• Wind direction and an estimate of speed (Beaufort Scale).
Percent cloud cover*	• An assessment of the amount of sky/sun obscured by clouds.
Air temperature*	• Recorded in Celsius.
Water temperature*	• Recorded in Celsius.

† 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.

\* Environmental data collected was each field day at 13h00.

### 3.4 Sampling Design

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

#### 3.4.1 Arrow Lakes Reservoir Sampling Strategy

Sampling on the Arrow Lakes Reservoir in Year 8 (2017) was conducted at three CLBMON 14 boat ramp sites: Nakusp, Syringa and Shelter Bay. These three sites were selected as they are the highest use sites and provide a cross-section of the Lower, Middle and Upper Arrow Lakes. Survey days at the sample sites were randomly selected as per Gregoire & Buhyoff (1999). The random sample was stratified by three factors: (1) season (the number of sample days in each season is proportional to the number of days in that season); (2) type of day (*i.e.*, weekends, week days, holidays); and (3) the time of day that sampling occurs (*i.e.*, morning or afternoon). Over the course of the sampling horizon, this approach provides a representative sample of visitors to boat ramp sites on the Arrow Lakes Reservoir.

Data collection for Year 8 (2017) commenced Friday April 28, 2017 and finished Tuesday October 24, 2017 (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 1:00 pm to 7:00 pm in summer; and 8:30 am to 2:30 pm or 10:30 am to 4:30 pm<sup>4</sup> in spring and fall).

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<sup>4</sup> 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 was designed to be delivered in two formats over the course of the project: (1) an on-site survey, administered to visitors at sample sites; and (2) an online survey, administered to regional residents to capture a broader range of attitudes and opinions about boat ramp use (or non-use) on the Arrow Lakes and Kinbasket Reservoirs. Due to low volume of responses (n = 0 to n = 37 responses per study year), the online survey was taken offline at the end of the fall 2013 sampling period and discontinued.

#### *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 were 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. The majority of respondents completed the questionnaires on-site; 30 respondents chose to mail in their survey using a self-addressed stamped envelope provided by field staff. 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. 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 and recreational access points on the Arrow Lakes and Kinbasket Reservoirs. Contact information for the project team was provided in the event that anyone had questions or concerns about the project.

### **3.6 Survey Design**

Questions that specifically address the usage of boat ramp facilities were added to the visitor questionnaire already in use for the Arrow Reservoir Recreational Demand Study (CLBMON 41). By combining questions onto one questionnaire the need for multiple interviews and the potential for survey fatigue were minimized.

The Visitor Survey questionnaire 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 would 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 and boat ramp use on the Kinbasket and Arrow Lakes Reservoirs be identified.

The first version of the questionnaire already included two questions in Section 5 relating to satisfaction with boat ramp facilities and parking lot conditions at the sites. Prior to the beginning of the Boat Ramp Use Study, drafts of the additional survey questions specific to boat ramp use were circulated in order to promote discussion around question ordering, question wording, answer options, and/or question instructions. Reviewers included the LEES+Associates team, the BC Hydro team, and members of the *Collaborative for Advanced Landscape Planning* at the *University of British Columbia*. The final version of the questionnaire included four additional questions pertaining specifically to boat ramp usage, in Section 6. The other sections remained the same. The questionnaire 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 Kinbasket and Arrow Lakes Reservoirs. A distinct version of the questionnaire was used for Kinbasket sampling and Arrow Lakes sampling to avoid confusion about which lake users were being asked about (Appendix D – Visitor Survey).

The survey questions in Sections 5 and 6 permitted the isolation of variables to characterize boat ramp use on the Kinbasket and Arrow Lakes Reservoirs. 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). These measurement protocols follow standard practices and are appropriate for a project of this type.

The questionnaire included three sections with questions related to boat ramp usage:

Section 5: Arrow Lakes / Kinbasket Reservoir Outdoor Recreation Management.

Section 6: Arrow Lakes / Kinbasket Reservoir Outdoor Recreation Experiences.

Section 7: Demographics.

A detailed rationale for the data captured by each of these questions follows. Figure illustrations are taken from the Arrow Lakes version of the questionnaire.

*3.6.1 Section 5: Arrow Lakes Reservoir / Kinbasket Reservoir Outdoor Recreation Management.*

This section has two parts. The first part of this section (Figure 3) includes questions that ask how respondents feel about existing boat ramps and parking lot conditions on the Arrow Lakes and Kinbasket Reservoirs. Questions 3 and 4 provides an assessment of visitor satisfaction with these facilities, which is used to test H<sub>3</sub>.

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 3.** Section 5 questions, part 1.

*3.6.2 Section 6: Arrow Lakes Reservoir / Kinbasket Reservoir Outdoor Recreation Experiences.*

This section has three parts which ask about respondents' recreation experiences on the reservoir. The second part includes 4 questions related to respondents' experience while using boat ramp facilities (Figure 4). Question 3 address H<sub>2</sub> by asking about which boat ramp facilities people usually use on the Arrow Lakes and Kinbasket Reservoirs. Question 5 asks about what visitors liked and disliked about the boat ramp facilities they used on Kinbasket Reservoir and Arrow Lakes Reservoir to address MQ<sub>2</sub>.

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?

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**Figure 4.** Section 6, part 2, questions pertaining to boat ramp use.

*Section 7: Demographics.*

Section 7 (Figure 5) collects basic information about respondents' demographic characteristics. These questions provide information about user group socio-demographic characteristics, which addresses H<sub>4</sub>.

What year were you born in? 19 ____	What community do you live in? _____
Gender: <input type="checkbox"/> Male <input type="checkbox"/> 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?	

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**Figure 5.** Section 7 questions.

Data collection took advantage of the different elements of the study (*i.e.*, traffic counters and questionnaire-elicited data). Table 6 illustrates the links between the management questions and specific data or questionnaire subsection.



**Table 6.** Relationship of Management Questions to Specific Monitoring Parameters

<b>Management Question</b>	<b>Management Hypothesis</b>	<b>Mode of Measurement</b>
1) Does public use of boat ramps increase on Kinbasket and Arrow Lakes reservoirs after installation and upgrading of the WUP boat ramp facilities?	H <sub>1</sub> : The volume of public use of existing boat ramps where improvements have been undertaken increases over time following implementation of the Water Use Plan.	Traffic Counter Data
2) If there is an increasing use of new or improved facilities, is it due to existing users visiting more often or new users being attracted to the area?	H <sub>2</sub> : The volume of public use of new boat ramps increases with the availability of new access opportunities.  H <sub>2A</sub> : The volume of public use of new boat ramps does not reduce the usage of nearby existing boat ramps negatively.  H <sub>2B</sub> : The volume of public use increases due to new users being attracted.	Traffic Counter Data  Section 6, question 2
3) Does user satisfaction increase with improvements made to the existing boat ramps and construction of the new boat ramps?	H <sub>3</sub> : User satisfaction of the new and upgraded boat ramps is greater than that experienced by users of the older facilities.	Section 5, questions 3 and 4
4) Is there a need for installation of additional facilities to satisfy the needs of boat users on Kinbasket Reservoir and Arrow Lakes Reservoir?	H <sub>4</sub> : There are no changes in the socio-demographic or trip behavior characteristics of users of boat ramps on Kinbasket and Arrow Lakes.	Section 6, question 5  Section 7, questions 1 and 3

## 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 between the two datasets such that each cell (each answer to a question) was verified using the Identify Duplicate Cases function of 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.

## 4. Results

### 4.1 Survey Results

A total of 742 visitors were encountered at sample sites on the Arrow Lakes between April 28 and October 24, 2017. Field staff asked 375 visitors to participate in the survey; 258 completed questionnaires were returned, which represents an overall response rate of 74.8% (Table 7).

**Table 7.** Visitor encounters and survey response rates.

Season	# Visitors Encountered	# Visitors Asked to Participate	# Previously Completed <sup>†</sup>	# Completed Questionnaires	Response Rate
Spring	251	95	0	65	68.4%
Summer	565	214	15	143	71.9%
Fall	177	66	15	50	98.0%
<b>TOTAL</b>	<b>993</b>	<b>375</b>	<b>30</b>	<b>258</b>	<b>74.8%</b>

<sup>†</sup> People who have previously completed the survey in this sampling year. These visitors are subtracted from the number of visitors asked to participate, in order to calculate response rate.

A summary of Year 8 (2017) on-site survey results is included in Appendix F.

### 4.2 Traffic Results – Kinbasket Reservoir

Below is a summary of adjusted traffic counts for the Year 8 (2017) period as collected and automatically compiled by the TRAFx DataNet system (Table 8).

The table presents traffic counts adjusted to best reflect actual use. This means TRAFx Datanet applies the average daily traffic count to 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. The application of average daily traffic counts is described further in Appendix A.

The "A = adjustment applied" referred to in the legend means that traffic counts are multiplied by 0.5. "D = divide by 2 applied" referred to in the legend means that traffic counts are also divided by 2. This divides the total traffic counts by 4, to account for the fact that one boater will cross the counter 4 times

for one boat trip, twice when launching and twice again when picking up. Further explanation regarding traffic counter settings and how annual traffic counts are calculated is included in Appendix A.

In Year 8 (2017) counters were in place at all Kinbasket sample sites from January 1 through December 31.

**Table 8.** Kinbasket Lake - Traffic Summary 2017 (Adjusted).

Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ADT†	ADT† x365	Days with data
Bush Harbour ADF	0	0	0	9*	120	150	251	201	156*	95*	17	9	2.762	1,008	361
Valemount ADF	0	0	1	6*	35	25	65	51	35*	4*	0*	1	0.630	230	351

Notes:

ADT† = Average Daily Traffic

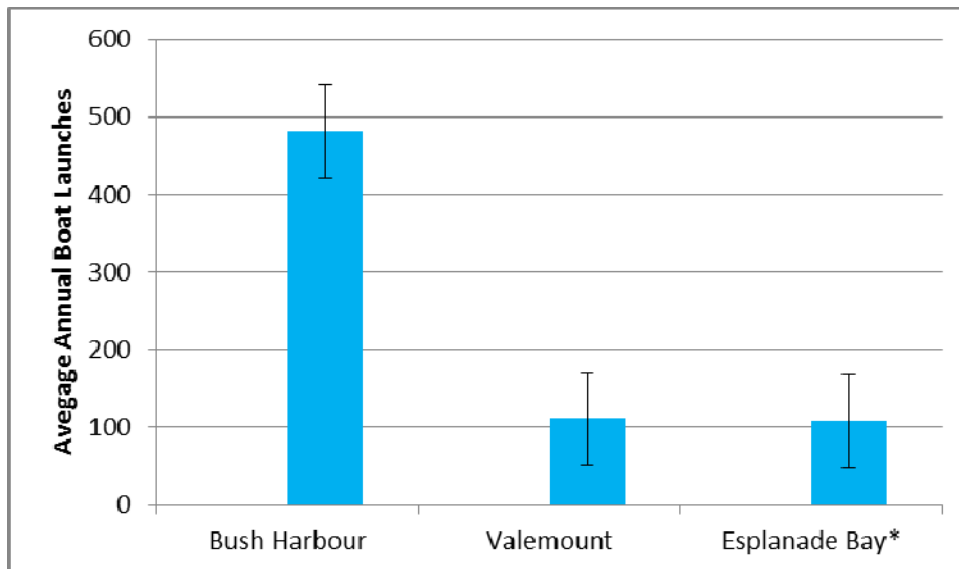
\* = based on that month's ADT

<sup>A</sup> = adjustment applied    <sup>D</sup> = divide by 2 applied    <sup>F</sup> = filtering applied

The following presents a summary of vehicle counts for Years 1 to 4, and Years 7 to 8 (Table 9, Figures 6, 7).

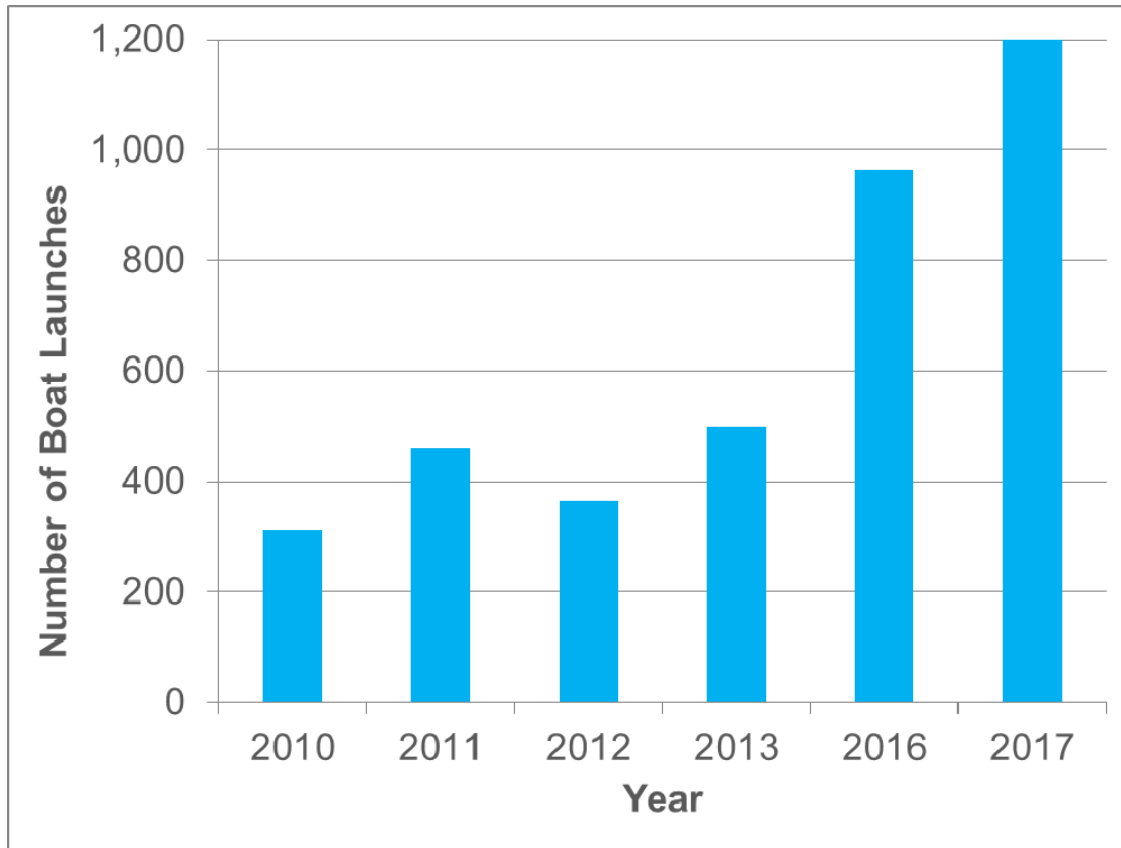
**Table 9.** Kinbasket Reservoir Boat Launches – Annual Traffic Summary (Adjusted)

Year	Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Annual Total
2010	Bush Harbour	--	--	--	--	--	--	--	86	37	38	6	0	167	313
	Valemount	0	0	0	12	6	13	61	28	23	3	0	0	146	
2011	Bush Harbour	0	0	0	0	39	43	102	82	60	33	4	0	363	600
	Esplanade Bay	--	--	--	--	6	8	27	67	26	6	0	0	140	
	Valemount	0	0	2	0	3	40	30	12	10	0	0	0	97	
2012	Bush Harbour	0	0	0	0	40	61	98	80	2	1	0	0	294	469
	Esplanade Bay	0	0	0	0	7	7	31	67	9	1	0	0	105	
	Valemount	1	0	0	0	1	25	10	20	10	2	0	0	70	
2013	Bush Harbour	0	0	0	0	39	52	83	99	84	25	10	0	392	580
	Esplanade Bay	0	0	0	0	6	8	22	32	8	6	0	0	82	
	Valemount	0	0	0	2	4	33	26	27	14	0	0	0	106	
2016	Bush Harbour	-	-	-	-	111	129	171	191	114	74	45	2	837	962
	Valemount	-	-	-	-	15	26	38	31	13	0	2	0	125	
2017	Bush Harbour	0	0	0	9	120	150	251	201	156	95	17	9	1,008	1,231
	Valemount	0	0	1	6	35	25	65	51	35	4	0	1	223	



\*Esplanade Bay counts were 2011 – 2013 only

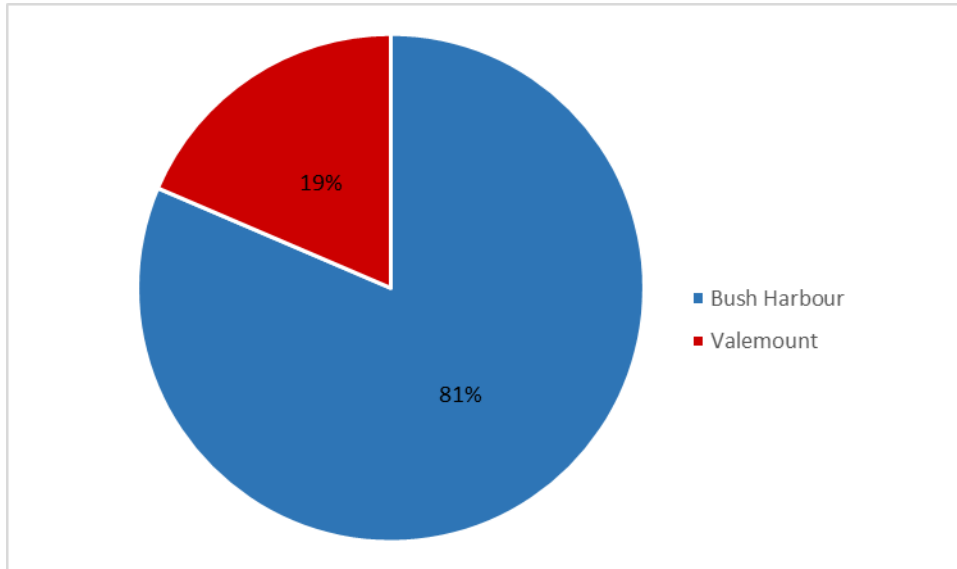
**Figure 6.** Kinbasket Boat Launches – Average Annual Total by Site (2010-2013, 2016-2017)



**Figure 7.** Kinbasket Reservoir – Total Number of Boat Launches by Year (2010-2013, 2016-2017)

Over the five full years of data collection (2011-2013 and 2016-2017) the average annual boat launch use on WUP built boat launches on Kinbasket Reservoir was 704 launches per year. Year 1 (2010) was a partial year as Bush Harbour was not available to the public until August. There was a marked reduction in boat launch use in 2012 compared with the preceding and following years. This may have been due to it being an excessively high water year with a resulting increase in floating debris and reduction in accessible beach area. Year 8 (2017) saw the highest use with a total of 1,231 launches. Year 7 (2016) was the first full sampling year post-improvements, with boat ramp construction at both Bush Harbour and Valemount reaching completion in 2013.

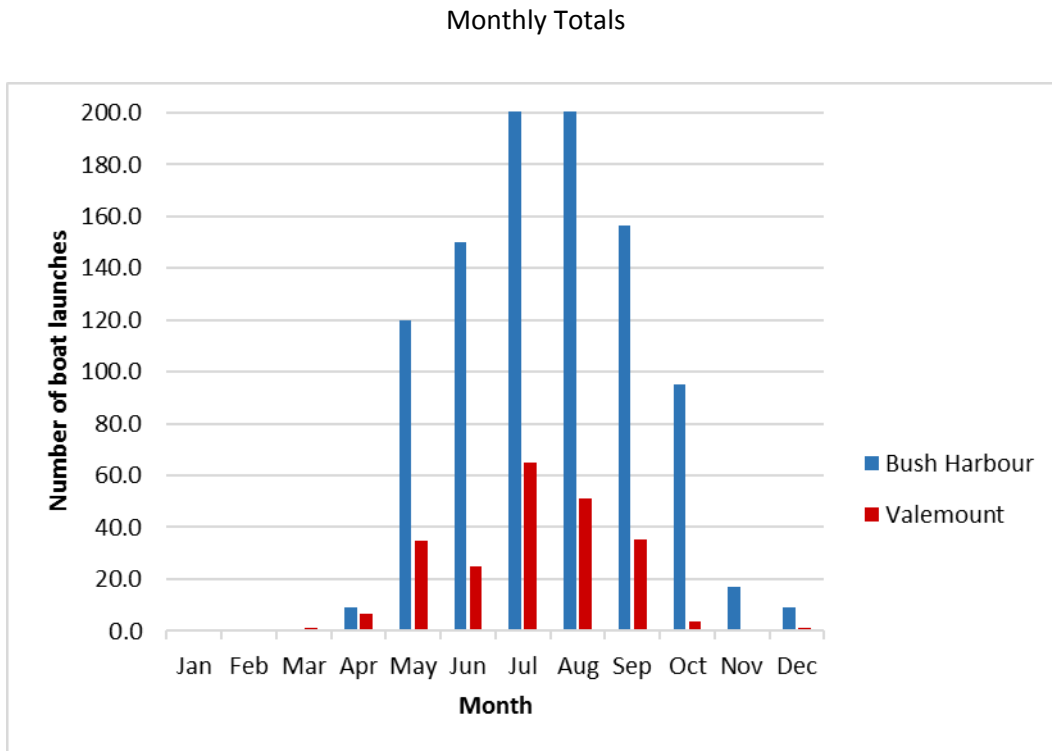
### Kinbasket Reservoir – Traffic by Site



**Figure 8.** Kinbasket Reservoir - Traffic by Site (2017).

The percentage of overall use by site in Year 8 (2017) showed that Bush Harbour generated 81% of the recorded (adjusted) boat launch use on Kinbasket Reservoir, while Valemount produced 19%. However, the actual amount of boating use at Valemount may be higher than shown due to the onsite marina and nearby recreation sites and Trails BC campgrounds where people can moor their boat rather than removing it each time they use it.

### Kinbasket Reservoir – Traffic by Months of the Year

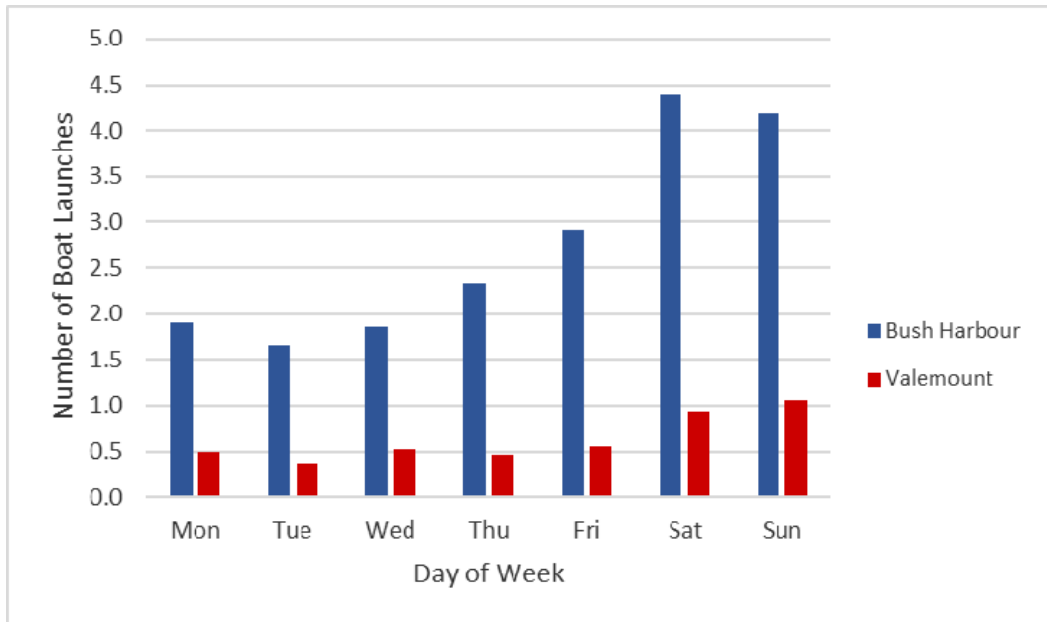


**Figure 9.** Kinbasket Reservoir - Traffic by Months of the Year (2017).

According to adjusted figures, in Year 8 (2017) the heaviest boat launch use occurred in July and August in Bush Harbour and in July in Valemount. As each of these sites is snow bound for five or six months, virtually all recorded activity occurs during the late spring, summer and early fall. A few recorded uses in winter were likely an anomaly where a snowmobile may have been recorded using the boat ramp to access the frozen lake.



### Kinbasket Reservoir – Traffic by Days of the Week



**Figure 10.** Kinbasket Reservoir – Traffic by Days of the Week, Daily average over the year (2017).

As expected, most recorded use occurred on the weekends. At Bush Harbour approximately 45% of use was attributed to Saturdays and Sundays. Saturdays got the heaviest use overall. At Bush Harbour, Thursdays and Fridays saw the most week day use. At Valemount, Fridays saw more use than other week days. Because boats are kept at the Valemount Marina and there are several Forest Service campgrounds close by there may be more boating activity (i.e., total “boater/days” on the reservoir), than the recorded traffic indicates.

### 4.3 Traffic Results – Arrow Lakes Reservoir

Below is a summary of adjusted traffic counts for the Year 8 (2017) period as collected and automatically compiled by the TRAFx DataNet system (Table 10). The table presents traffic counts adjusted to best reflect actual use as described in Appendix A. In Year 8 (2017), counters remained in place at all sample sites from January 1 through December 31. The Edgewood counter experienced a malfunction over the winter. Therefore, no counts are shown for Edgewood for November and December 2017.

**Table 10.** Arrow Lakes - Traffic Summary 2017 (Adjusted).

Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ADT†	ADT† x365	Days with data
Anderson Point <sup>ADF</sup>	5	18	14	23*	43	60	75	55	43	34*	20	12	<b>1.102</b>	<b>402</b>	<b>361</b>
Burton Historical Park <sup>ADF</sup>	1	0	1	8*	11	47	125	147	60	11*	5	1	<b>1.153</b>	<b>421</b>	<b>360</b>
Burton South <sup>ADF</sup>	9	0	9	19*	41	31	94	101	50*	21	12	5	<b>1.075</b>	<b>392</b>	<b>361</b>
Edgewood <sup>ADF</sup>	43	13	29	67*	41	51	80	107	38	24*	--	--	<b>1.646</b>	<b>601</b>	<b>294</b>
Fauquier <sup>ADF</sup>	1	0	4	12*	14	11	5	9	14*	4*	0*	2	<b>0.221</b>	<b>81</b>	<b>321</b>
McDonald Cr <sup>ADF</sup>	3	1	0	23	47	55	135	135	53	29*	12	11	<b>1.383</b>	<b>505</b>	<b>363</b>
Nakusp <sup>ADF</sup>	159	88	112	149*	207	278	462	433	198	126	63	70	<b>6.433</b>	<b>2,348</b>	<b>363</b>
Shelter Bay <sup>ADF</sup>	0	6	31	135	143	77	110	171	153	96	51	39	<b>2.773</b>	<b>1,012</b>	<b>365</b>
Syringa Cr. <sup>ADF</sup>	31	31	111	155	281	370	889	710	310	136*	78	51	<b>8.661</b>	<b>3,161</b>	<b>363</b>

Notes:

ADT† = Average Daily Traffic

\* = based on that month's ADT

<sup>A</sup> = adjustment applied    <sup>D</sup> = divide by 2 applied    <sup>F</sup> = filtering applied

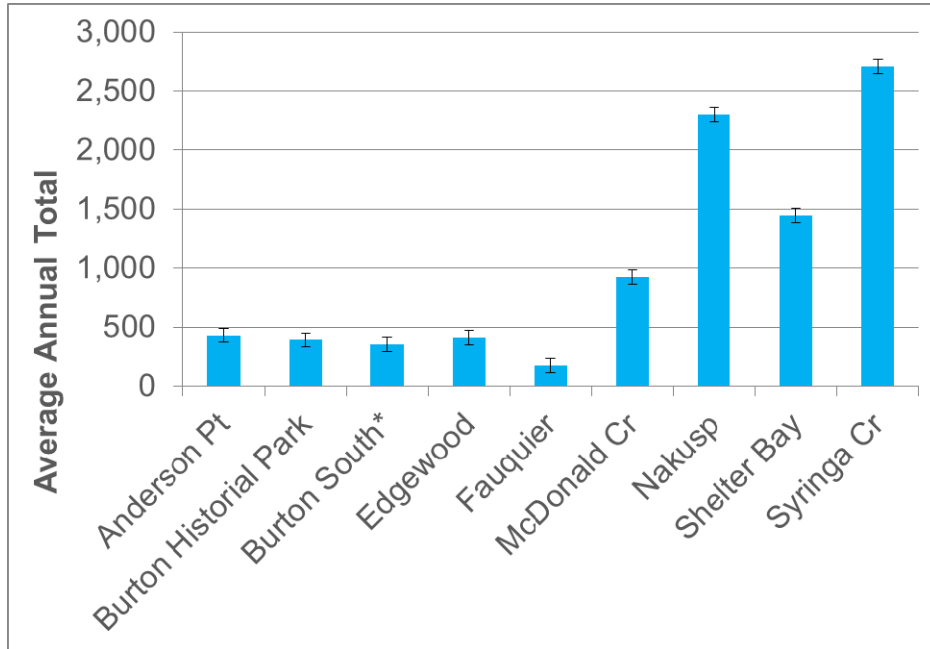
-- = no counts collected for this month



The following summarizes vehicle counts for Years 1-4, and Years 7-8 (Table 11, Figures 11, 12).

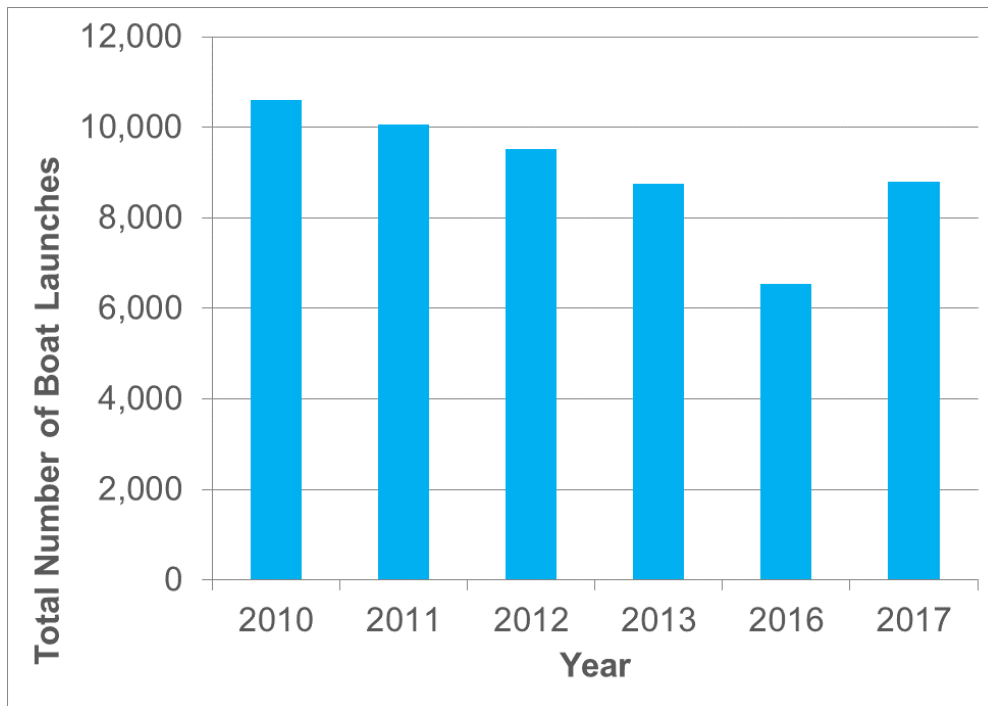
**Table 11.** Arrow Lakes Reservoir – Annual Traffic Summary (Adjusted)

Year	Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total	Grand Total
<b>2010</b>	Anderson Point	--	--	--	32	49	99	97	96	55	43	20	14	<b>505</b>	10,608
	Burton	0	3	2	8	32	83	106	123	15	19	9	2	<b>402</b>	
	Burton South	--	--	--	--	--	--	--	--	--	--	--	--	<b>0</b>	
	Edgewood	96	100	136	64	61	88	174	103	26	34	21	15	<b>918</b>	
	Fauquier	3	17	18	12	35	--	--	--	3	0	0	0	<b>88</b>	
	McDonald Cr	4	19	16	32	124	--	300	215	87	37	12	2	<b>848</b>	
	Nakusp	152	162	170	192	247	330	748	529	161	185	90	150	<b>3,116</b>	
	Shelter Bay	0	41	100	89	165	85	142	148	118	179	31	0	<b>1,098</b>	
	Syringa Cr	106	130	181	164	307	565	997	738	175	174	64	32	<b>3,633</b>	
<b>2011</b>	Anderson Point	12	12	12	21	42	61	104	86	60	56	30	4	<b>500</b>	10,065
	Burton	0	9	2	11	32	72	121	144	56	6	2	2	<b>457</b>	
	Burton South	--	--	--	--	--	--	--	8	22	5	0	1	<b>36</b>	
	Edgewood	12	10	42	51	66	68	140	123	53	29	7	11	<b>612</b>	
	Fauquier	2	0	0	4	2	3	3	2	3	0	0	0	<b>19</b>	
	McDonald Cr	0	0	0	36	33	55	101	148	52	3	0	7	<b>435</b>	
	Nakusp	183	114	125	198	202	318	643	724	266	165	90	161	<b>3,189</b>	
	Shelter Bay	0	0	22	102	171	119	116	174	174	129	24	17	<b>1,048</b>	
	Syringa Cr	44	77	97	147	241	495	1,066	1,004	381	112	54	51	<b>3,769</b>	
<b>2012</b>	Anderson Point	12	13	32	49	64	63	71	92	90	50	25	9	<b>570</b>	9,518
	Burton	1	0	0	1	13	44	101	128	30	6	2	0	<b>326</b>	
	Burton South	0	0	2	8	4	13	8	37	24	5	0	3	<b>104</b>	
	Edgewood	14	12	33	52	50	52	68	126	76	35	16	4	<b>538</b>	
	Fauquier	0	0	2	2	4	7	0	4	0	2	0	0	<b>21</b>	
	McDonald Cr	2	0	0	11	37	47	70	110	57	13	2	3	<b>352</b>	
	Nakusp	171	112	209	213	231	225	524	697	320	224	132	135	<b>3,193</b>	
	Shelter Bay	4	0	7	88	181	70	87	205	223	132	39	8	<b>1,044</b>	
	Syringa Cr	48	46	87	144	239	266	873	1,008	341	149	87	82	<b>3,370</b>	
<b>2013</b>	Anderson Point	--	--	--	--	40	49	76	72	26	25	12	9	<b>309</b>	8,755
	Burton	0	0	0	5	27	26	106	132	28	5	0	1	<b>330</b>	
	Burton South	0	79	70	14	23	24	72	54	12	2	3	2	<b>355</b>	
	Edgewood	10	44	--	--	60	32	60	85	31	25	28	17	<b>392</b>	
	Fauquier	0	2	3	0	3	1	4	11	4	2	2	1	<b>33</b>	
	McDonald Cr	4	0	31	29	43	73	145	164	52	10	10	5	<b>566</b>	
	Nakusp	175	15	--	--	115	257	530	487	242	192	114	149	<b>2,276</b>	
	Shelter Bay	1	8	107	95	202	116	133	168	152	120	51	9	<b>1,162</b>	
	Syringa Cr	80	118	147	174	275	459	916	724	229	109	46	55	<b>3,332</b>	
<b>2016</b>	Anderson Point	--	--	--	--	42	49	70	61	25	18	17	11	<b>293</b>	6,536
	Burton	--	--	--	--	34	41	160	168	5	0	3	0	<b>411</b>	
	Burton South	--	--	--	--	31	60	80	89	29	14	11	4	<b>318</b>	
	Edgewood	--	--	--	--	47	28	87	100	25	16	19	14	<b>336</b>	
	Fauquier	--	--	--	--	2	3	18	8	0	0	2	2	<b>35</b>	
	McDonald Cr	--	--	--	--	42	60	140	185	46	52	23	4	<b>552</b>	
	Nakusp	--	--	--	--	154	258	396	411	153	129	113	90	<b>1,704</b>	
	Shelter Bay	--	--	--	--	127	62	103	194	129	98	45	12	<b>770</b>	
	Syringa Cr	--	--	--	--	246	351	617	573	147	74	71	38	<b>2,117</b>	
<b>2017</b>	Anderson Point	5	18	14	23	43	60	75	55	43	34	20	12	<b>402</b>	8,794
	Burton	1	0	1	8	11	47	125	147	60	11	5	1	<b>417</b>	
	Burton South	9	0	9	19	41	31	94	101	50	21	12	5	<b>392</b>	
	Edgewood	43	13	29	67	41	51	80	107	38	24	--	--	<b>493</b>	
	Fauquier	1	0	4	12	14	11	5	9	14	4	0	2	<b>76</b>	
	McDonald Cr	3	1	0	23	47	55	135	135	53	29	12	11	<b>504</b>	
	Nakusp	159	88	112	149	207	278	462	433	198	126	63	70	<b>2,345</b>	
	Shelter Bay	0	6	31	135	143	77	110	171	153	96	51	39	<b>1,012</b>	
	Syringa Cr	31	31	111	155	281	370	889	710	310	136	78	51	<b>3,153</b>	



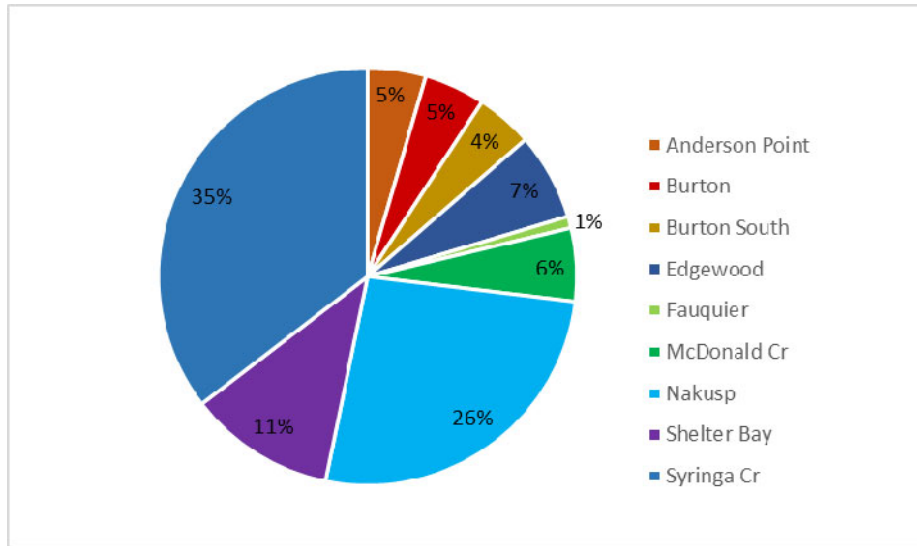
\* Burton South counts began in 2011

**Figure 11.** Arrow Lakes Boat Launches – Average Annual Total by Site (2010-2013, 2016-2017)



**Figure 12.** Arrow Lakes – Total Number of Boat Launches by Year (2010-2013, 2016-2017)

### Arrow Lakes Reservoir – Traffic by Site



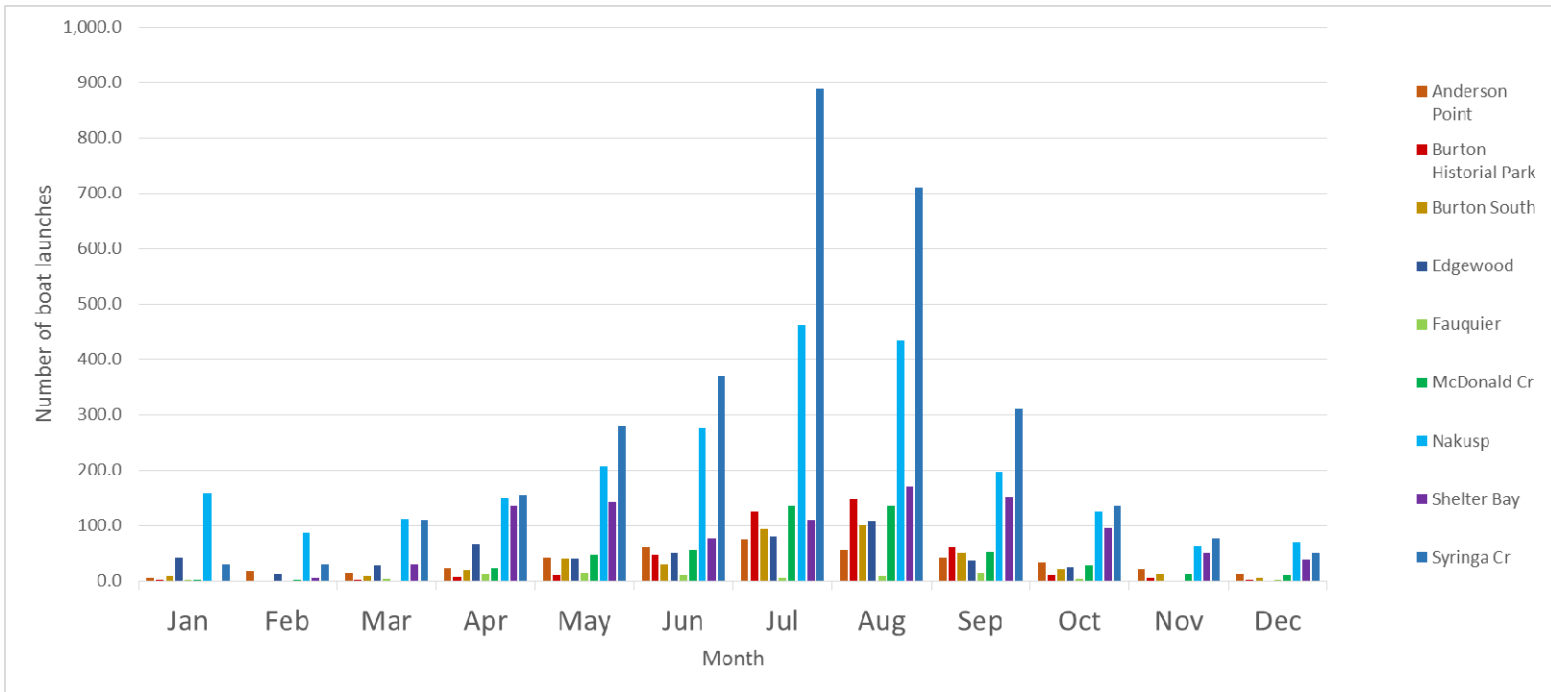
**Figure 13.** Arrow Lakes Reservoir - Traffic by Site (2017).

The percentage of overall use by site in Year 8 (2017) showed that the Syringa Creek Boat Launch and Nakusp were the most active boat launch locations and constituted approximately 60% of the daily recorded traffic at the selected boat launch locations on the Arrow Lakes in this study<sup>5</sup>. Fauquier Boat Launch generated only about 1% of total boat launch traffic. The Fauquier counter was monitored during this period and is functioning normally.

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<sup>5</sup> This percentage is for the locations used in this study only and does not represent the overall percentage of boat launch use on the Arrow Lakes.

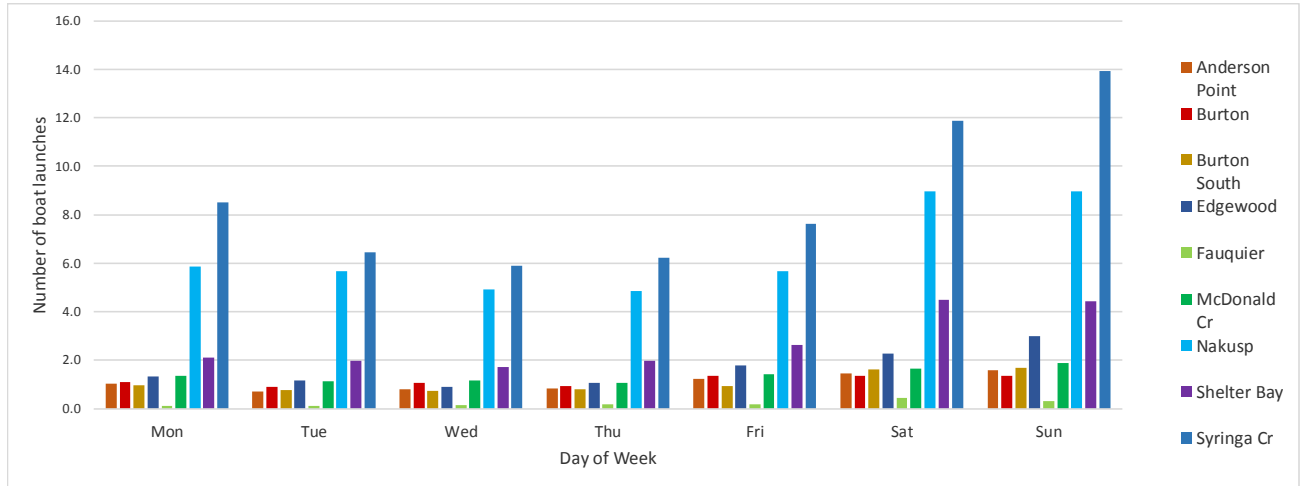
### Arrow Lakes Reservoir – Traffic by Months of the Year Monthly Totals



**Figure 14.** Arrow Lakes Reservoir - Traffic by Months of the Year (2017).

Use patterns are as expected with increasing activity in the summer months with most locations peaking in July or August, then tapering off in the fall. Nakusp generates significant use throughout the winter months and exceeds use at Syringa Creek for eight months of the year. Nakusp and Syringa received more relative use in winter months than at other locations. It may be that boats normally kept in the marina are not left there over winter thus need to be launched each time a person wants to use them, or that these are the best months for catching fish in that area of the Arrow Lakes.

### Arrow Lakes Reservoir – Traffic by Days of the Week



**Figure 15.** Arrow Lakes Reservoir – Traffic by Days of the Week, Daily average over the year (2017).

Boat launches at all sample sites had an expected relationship of greater weekend than weekday use, *i.e.*, Saturdays and Sundays received about 1.5 – 2.0 times as much traffic as weekdays. After the weekend, Mondays and Fridays received the greatest use.



## 5. Discussion

### 5.1 Management Question 1

*MQ 1. Does public use of boat ramps increase on Kinbasket and Arrow Lakes reservoirs after installation and upgrading of the WUP boat ramp facilities?*

The impact of boat ramp improvements on volume of public use at sites on Kinbasket Reservoir and Arrow Lakes Reservoir was mixed. Total vehicle counts across study sites suggest that the total number of visitors in the Kinbasket has risen since 2011 (600 visitors) to reach 962 visitors in 2016 and 1,231 visitors in 2017. In the Arrow, the total number of visitors decreased from 10,065 visitors in 2010, to 6,536 in 2016 to 8,794 visitors in 2017. Study Year 10 will include a comprehensive comparison of volume between years including a comparison of mean pre-construction and post-construction visitation at all improved boat ramp sites.

### 5.2 Management Question 2

*MQ2. If there is an increasing use of new or improved facilities, is it due to existing users visiting more often or new users being attracted to the area?*

Results to date suggest the volume of public use of new or improved boat ramps does not reduce the usage of nearby existing boat ramps. Expecting more data in 2019.

### 5.3 Management Question 3

*MQ3. Does user satisfaction increase with improvements made to the existing boat ramps and construction of the new boat ramps?*

Results to date suggest visitor satisfaction with boat ramp facilities and with parking lot conditions has increased following improvements made to the existing facilities. This suggests that the improvements made were effective in addressing visitor expectations. Expecting more data in 2019.

### 5.4 Management Question 4

*MQ4. Is there a need for installation of additional facilities to satisfy the needs of boat users on Kinbasket Reservoir and Arrow Lakes Reservoir?*

Results to date show support for Management Hypothesis #4: there are no changes in the socio-demographic or trip behavior characteristics of users of boat ramps on Kinbasket Reservoir and Arrow Lakes Reservoir LEES+Associates (2015). This suggests the improved boat launches are attracting the same demographic of user, rather than a demographic that is more satisfied in general or has different recreation behaviours LEES+Associates (2015). We are expecting more data through on-site survey results in Year 10 (2019).

## 6. Limitations and Opportunities for Further Study

A variety of unexpected situations have arisen during the study that affected measurement of use, particularly with regard to construction periods and high water curtailment of vehicle counts. Construction exclusion dates (*i.e.*, starts and finishes) represented best estimates based on information provided to the study team by BC Hydro, Columbia Power Corporation and on-site observations by project field staff. There is some uncertainty as to exact dates of construction activity that impacted the use of the boat ramps (either construction vehicle traffic increasing counts or construction activity not allowing public access to ramp). For example, there was likely a fair amount of construction activity on either side of the official McDonald Creek construction period that affected traffic counts. In some cases construction took place in the water (pile driving) and did not impede the use of the ramp but support vehicles would have been counted.

A key limitation of the study is the timing of physical improvements at each of the boat launch ramps. Ramp locations that were improved early in the study period do not have much, if any, pre-improvement data against which the post-improvement data can be compared. Conversely, ramps that were improved later in the study period (after year 4) will not have as much post-improvement data. This will mean that hypotheses  $H_{2B}$ ,  $H_3$  and  $H_4$  may not be uniformly tested over every boat launch ramp location.

## 7. Conclusion

Results to date suggest changes in daily visitor volume are mixed following boat ramp improvements. Improvements did not result in reduced usage of nearby existing boat ramps, an increase in new users, or a change in the type of user group. Visitor satisfaction was the factor most affected post-constructions, suggesting these projects have been effective in providing benefits to recreational

interests in the area. At this time, all ramps have been fully constructed; more robust conclusions may be made in Year 10, after more visitors have been able to use the improved sites.

## 8. References

- BC Hydro (2007). Columbia River Project Water Use Plan. BC Hydro dated January 11, 2007.
- BC Hydro (2009). Columbia River Project Water Use Plan Monitoring Program Terms of Reference – CLBMON 14 Boat Ramp Use Study.
- BC Hydro (2017). Columbia River Project Water Use Plan. Monitoring Program and Physical Works Annual Report: 2017. BC Hydro dated January 31, 2017.
- LEES+Associates (2015). CLBMON-14 Boat Ramp Use Study. Mid-Term Analysis Report (Year 4) Implementation Period – 2010-2013. Vancouver, BC. BC Hydro, Water License Requirements.

## APPENDIX A – TRAFx Vehicle Counters

### *Vehicle counter settings*

Vehicle counters were configured and installed at 11 monitoring sites with boat launch facilities: nine sites on the Arrow Lakes Reservoir and two on Kinbasket Reservoir. Vehicle counters were configured and installed using the following settings (Table 12):

**Table 12.** Vehicle counter settings.

Location	Mode	Period	Delay	Threshold	Rate
<b>Arrow Lakes Reservoir</b>					
Nakusp	VEH_5d	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
Anderson Point	VEH_2s	000	120	16	S
Shelter Bay	VEH_2s	000	120	16	S
Syringa Creek	VEH_4d	000	96	16	S
<b>Kinbasket Reservoir</b>					
Bush Harbour	VEH_2s	000	120	16	S
Valemount	VEH_2s	000	120	16	S

Notes:

Mode: VEH\_2s = single lane traffic; VEH\_4d = double lane traffic with counter on side of road;

VEH\_5d=double lane traffic with counter in middle of road

Period: 000 = timestamps

Delay: 8 = 1 sec; 96 = 12 sec; 120 = 15 sec

Threshold: Range is 3-16; 16 is least sensitive

Rate: S = slow (<50 km/h)

### ***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 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 will 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 are 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.

For this study, 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 average daily traffic count (ADT) is applied to all days within a missing month. The sum of recorded and calculated counts generates the total estimate for the year.

***How are boat launch counts calculated?***

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

- Filter – a 15-17 second delay is applied (15 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. This may provide a slightly more conservative estimate than reality at Anderson Point but it is applicable for much of the year and maintains a common standard application of the methodology across all sites.
- 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).

The ADT procedure has been applied as described above for minor occurrences of missing data. However, as most boat launch locations in this study are snow bound in winter, recorded summer use has been higher and winter use has been lower than the daily average.

## APPENDIX B – Site Photos

### Kinbasket Reservoir Boat Ramp Construction – Before and After Photos



**Figure 16.** Bush Harbour at low water before



**Figure 17.** Bush Harbour high water after



**Figure 18.** Valemount before



**Figure 19.** Valemount after



**Arrow Lakes Reservoir Boat Ramp Construction – Before and After Photos**



**Figure 20.** Anderson Point before



**Figure 21.** Anderson Point after



**Figure 22.** Burton South before



**Figure 23.** Burton South after



**Figure 24.** Edgewood before



**Figure 25.** Edgewood after



**Figure 26.** Fauquier before



**Figure 27.** Fauquier after



**Figure 28.** McDonald Creek before



**Figure 29.** McDonald Creek after



**Figure 30.** Nakusp before



**Figure 31.** Nakusp after



Figure 32. Shelter Bay before



Figure 33. Shelter Bay after



Figure 34. Syringa before



Figure 35. Syringa after

## APPENDIX C – Sampling Schedule

### Year 8 (2017) Sampling Schedule

Season	Day	Date	Time
Spring	Friday	April 28, 2017	AM
	Monday	May 22, 2017	PM
Summer	Monday	June 19, 2017	AM
	Tuesday	July 11, 2017	PM
	Monday	August 7, 2017	PM
	Sunday	September 3, 2017	AM
Fall	Sunday	October 1, 2017	PM
	Tuesday	October 24, 2017	AM

Spring sampling hours	Summer sampling hours	Fall sampling hours
AM: 8:30 am to 2:30 pm PM: 10:30 am to 4:30 pm	AM: 8:00 am to 2:00 pm PM: 1:00 pm to 7:00 pm	AM: 8:30 am to 2:30 pm PM: 10:30 am to 4:30 pm

Sample days are the same for each of the three sample sites (Syringa, Nakusp, and Shelter Bay)

#### Notes

- Consistent with previous field schedules, the seasons were calculated as:
  - Spring: April 1 - Victoria Day Long Weekend
  - Summer: Victoria Day Long Weekend - September 30
  - Fall: October 1 - October 31
- Given the shortened sampling season (Spring = 2, Summer = 4, Fall = 2), the sampling of weekends and holidays has been combined for Spring and Fall.
- 2017 Holidays
  - Good Friday April 14
  - Easter Monday April 17
  - Victoria Day May 22
  - Canada Day July 1 (July 3)
  - Civic Holiday August 7 (BC Day)
  - Labour Day September 4
  - Thanksgiving October 9

## APPENDIX D – Visitor Survey

(Arrow Lakes Reservoir Version)



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### 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

Page 1 of 4

**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 E – Observational Data Forms and Definitions



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## Arrow Lakes Recreation Study Site and Survey Log

Date (dd/mm/yyyy)	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: elee@elac.bc.ca

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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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## **Observational Data Definitions**

**1 - Wind Condition Definitions**

**2 - Water Surface Condition Definitions**

**3 - Forecasting Terminology**

**4 - Sky Conditions Definitions**

**5 - Air and Water Temperature Data Collection Procedures**

**Boat Ramp Use Study  
Wind Condition  
Definitions**



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

Source: Oregon Emergency Management Net – Net Protocol

**Boat Ramp Use Study  
Water Surface Condition  
Definitions**



<b>Water Condition</b>	<b>Description</b>
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



## Boat Ramp Use Study Forecasting Terminology

Condition	Description
<b>Duration of Precipitation</b>	<ul style="list-style-type: none"> <li>Brief - short, sudden showers or periods of rain</li> <li>Intermittent - on and off intervals, not continuous</li> <li>Occasional - irregular, infrequent intervals of precipitation</li> <li>Frequent - persistent short intervals, happening regularly and often</li> <li>Periods of precipitation - rain or snow falling most of the time with breaks</li> </ul>
<b>Distribution of Precipitation, as in showers</b>	<ul style="list-style-type: none"> <li>Isolated - showers separated during a given period of time</li> <li>Few - indicated in time, not over an area</li> <li>Local - restricted to a smaller area</li> <li>Patchy - irregularly occurring in an area</li> <li>Scattered - not widespread but of greater occurrence than isolated showers</li> </ul>
<b>Precipitation Intensity</b>	<ul style="list-style-type: none"> <li>Light - each drop or small flake of precipitation can be easily seen, puddles form slowly, some water flow in gutters</li> <li>Moderate - water puddles quickly, roads and other surfaces collect water, rain streams down windows</li> <li>Heavy - numerous flakes or sheets of rain, large puddles form, flooding can occur, visibility reduced</li> </ul>
<b>Cloud Cover</b>	<ul style="list-style-type: none"> <li>Clear or sunny - free of clouds or less than one tenth cloudy</li> <li>Partly cloudy or partly sunny - three tenths to six tenths of the sky is clouded</li> <li>Mostly cloudy - the sky is predominantly clouded or seven tenths to eight tenths of the sky has clouds</li> <li>Cloudy or overcast - the sky is covered with clouds from nine tenths to a hundred percent cloud covered</li> </ul>
<b>Showers vs. Rain: A Difference of Duration and Intensity</b>	<ul style="list-style-type: none"> <li>Rain - forms from stratus clouds, more widespread over larger area, uniformly steady, less intense</li> <li>Showers - forms from cumulus clouds, more isolated, short-lived, affects a smaller area, sometimes more intense</li> </ul>
<b>Partly Cloudy vs. Partly Sunny</b>	<p>According to the <a href="http://www.noaa.gov">National Oceanic and Atmospheric Administration</a> 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#ixzz0QBMAiIT](http://weatherforecasting.suite101.com/article.cfm/meteorologist_forecasting_terms#ixzz0QBMAiIT)

**Boat Ramp Use 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](http://weatherforecasting.suite101.com/article.cfm/meteorologist_forecasting_terms)

**Boat Ramp Use 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/ga/docs/ECY\\_EAP-SOP\\_011InstantMeasureofTempinWater.pdf](http://www.ecy.wa.gov/programs/eap/ga/docs/ECY_EAP-SOP_011InstantMeasureofTempinWater.pdf))

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



## APPENDIX F – Survey Results

Note: The analyses reported here consider on-site responses from respondents at the following Year 8 (2017) Arrow Lakes Reservoir sample sites: Nakusp, Syringa and Shelter Bay.

### Question 1: Arrow Lakes Outdoor Recreation Activities

Respondents participated in a total of 24 individual outdoor recreation activities (Table 13); respondents could identify more than one activity. The five most frequently identified activities by on-site respondents (n = 258) were: swimming (68.6%), boating (67.4%), fishing (66.7%), walking/hiking (64.7%) and beach activities (63.6%).

**Table 13.** On-site responses: Indicate all of the activities that you do on the water or onshore of the Arrow Lakes (n = 258).

Activities	Frequency	%
Swimming	177	68.6%
Boating (motor cruising)	174	67.4%
Fishing	172	66.7%
Walking/hiking	167	64.7%
Beach activities	164	63.6%
Scenic viewing	163	63.2%
Camping	144	55.8%
Picnicking	139	53.9%
Wildlife viewing	106	41.1%
Canoeing/kayaking	94	36.4%
Bird watching	91	35.3%
Berry picking	73	28.3%
ATV/Trail bike/4 x 4	63	24.4%
Mushroom picking	60	23.3%
Nature study	57	22.1%
Drawing/painting/photography	50	19.4%
Waterskiing	47	18.2%
Mountain biking	41	15.9%
Hunting	29	11.2%
Cross-country skiing	28	10.9%
Snowmobiling	19	7.4%
Other	18	7.0%
Horseback riding	4	1.6%
Wind surfing	4	1.6%

Respondents reported visiting the Arrow lakes in all four seasons (Table 14). Annual visits by on-site respondents averaged 74.3 days (SD = 78.730) per year.

**Table 14.** On average, how many days per season do you visit the Arrow Lakes?

Season	n	Minimum	Maximum	Mean	SD
Spring	186	0	90	15.6	19.216
Summer	215	0	90	19.8	18.001
Fall	176	0	90	15.5	18.448
Winter	135	0	90	13.1	20.183
Annual	132	0	360	74.3	78.730

Respondents participated in a total of 18 outdoor recreation activities on the day that they completed their questionnaire (Table 15). Boating was the most frequently identified activity by on-site respondents (31.4%).

**Table 15.** What recreation activities did you do today on the water or onshore of the Arrow Lakes? (n = 177<sup>†</sup>).

Today's Recreation Activities	Frequency	%
Boating (motor cruising)	81	31.4%
Fishing	80	31.0%
Walking/hiking	78	30.2%
Swimming	45	17.4%
Beach activities	39	15.1%
Scenic viewing	34	13.2%
Picnicking	24	9.3%
Camping	19	7.4%
Canoeing/kayaking	13	5.0%
Waterskiing	13	5.0%
Bird watching	11	4.3%
Drawing/painting/photography	8	3.1%
Wildlife watching	8	3.1%
Mountain biking	6	2.3%
Other	6	2.3%
Dog walking	5	1.9%
Hunting	1	0.4%
Windsurfing	1	0.4%

<sup>†</sup> Respondents typically identified more than one activity.

The majority of on-site respondents (n = 246; 94.3%) reported that they were not paying customers of a commercial recreation or tourism operator/guide.

**Question 2: Important Outdoor Recreation Activities**

Respondents identified a total of 18 outdoor recreation activities that they considered to be most important (Table 16). Of the 240 on-site respondents that provided responses, fishing was identified most frequently (35.0%), followed by boating (23.3%) and walking/hiking (14.2%).

**Table 16.** On-site responses: Of all of the activities that you do on the water or onshore of the Arrow Lakes, which one is the most important†? (n = 240).

Activity	Frequency	%
Fishing	84	35.0%
Boating (motor cruising)	56	23.3%
Walking/hiking	34	14.2%
Swimming	32	13.3%
Canoeing/kayaking	19	7.9%
Camping	16	6.7%
Scenic viewing	10	4.2%
Beach activities	6	2.5%
Dog walking	5	2.1%
Waterskiing	5	2.1%
Picnicking	4	1.7%
ATV/Trail bike/ 4 x 4	3	1.3%
Mountain biking	3	1.3%
Bird watching	2	0.8%
Hunting	2	0.8%
Drawing/painting/photography	1	0.4%
Mushroom picking	1	0.4%
Other	1	0.4%

† Some respondents identified more than one activity.

On-site respondents (n = 240) reported that they had participated in their most important activity for an average of 23.4 years (SD = 18.566).

On-site respondents (n = 243) indicated that they were generally skilled at the activity that was most important to them; the mean skill level for respondents' most important activity was 3.8 (SD = 0.995) on a scale of 1 to 5.

Respondents indicated that the activity that was most important to them was also important to their lifestyle; the mean lifestyle importance was 4.1 (SD = 0.836) on a scale of 1 to 5.

Family and friends were the most frequently identified people that on-site respondents participated in their most important outdoor recreation activity with (Table 17).

**Table 17.** Who do you usually do this recreation activity with? (n = 194)

Response	Frequency	%
Family	105	54.1%
Friends	42	21.6%
Alone	24	12.4%
Other	21	10.8%
Clubs	1	0.5%
People from work	1	0.5%

Respondents reported participating in their most important outdoor recreation activity in all four seasons (Table 18).

**Table 18.** On average, how many days per season do you participate in this activity?

Season	n	Minimum	Maximum	Mean	SD
Spring	172	0	90	15.4	18.714
Summer	217	0	90	20.8	17.898
Fall	168	0	90	15.4	18.369
Winter	122	0	90	11.8	19.195
Annual	116	0	360	72.4	77.905

**Question 3: Arrow Lake Outdoor Recreation Experiences**

On-site respondents (n = 69) indicated that an average of 29.07 (SD = 120.987) encounters with other people was acceptable while visiting the Arrow Lakes. In terms of respondents who indicated no crowding threshold, 187 (72.5%) reported that it did not matter how many people that they saw while visiting the Arrow Lakes. Respondents indicated that they generally did not feel crowded while visiting the Arrow Lakes, except in the summer, when respondents on average reported feeling somewhat crowded. (Table 19). Crowding was experienced most frequently in the summer months and least frequently in the winter months.

**Table 19.** For each season below, indicate on a scale of 1 - 9 how crowded you have felt while visiting the Arrow Lakes.

Season	n	Minimum	Maximum	Mean	SD
Spring	212	1	7	1.8	0.079
Summer	236	1	9	3.4	0.140
Fall	211	1	8	2.0	0.090
Winter	187	0	6	1.4	0.065

Just more than one in ten on-site respondents (11.9%) reported that they had experienced conflicts with other people or recreation activities while they were visiting the Arrow Lakes. Space was provided for people to elaborate on whether or not they had experienced conflicts while visiting the Arrow Lakes; 18 respondents elaborated on the conflicts that they had experienced, which generally dealt with issues of respect (Table 20).

**Table 20.** Have you ever experienced any conflicts with other people or recreation activities while you were visiting the Arrow Lakes (elaboration)? (n = 31)

Response
A fisherman @ Kiskanax river mouth hogged the whole area to fish.
Boat launch problems. Impatient people.
Busiest, best opportunity for conflict is holiday summer long weekends with many out of province visitors from Alberta.
But have witnessed at the boat launch.
Campers playing loud music.
Car was vandalized while at Shelter Bay.
Everyone loves the area.
First time visit.
Fisherman running more lines than regulations allow.
Its our first time.
Jet skis / loud disruptive.
Jet skis crossing into our path.
Just once in using the boat launch. Someone was a little impatient as there was quite a queue of boats waiting to get out of the water.
Lack of consideration at wharf
Man on jet ski water craft close to shore deliberately chasing 2 loons.
Not enough dock for launching. And to many non-dock/boat launch users parked where we park our trucks & trailers.
One only, I had paid for camp site at McDonald Creek park and someone else occupied it and refused to leave. Park employee took care of situation.
Only with drunken parties who abuse and litter the waterfront.
Overly crowded dock.
Parties, usually not too bad though.
Person with vicious dog. Not comfortable with people who bring a dangerous dog to a campground with lots of children playing. They brought a "beware of dog" sign, but it was of no use to a dog who can break off his chain to attack another dog on a leash. Not acceptable!
Please respect the lakes and forest.
Sailboat moorage issue with the lake level going up + down. My boat grounded 3 times.
See's poachers fishing in no legal zones and not following fishing regs.
Skiing or tubing boats have no need to crowd + cause a large wake or noises near fishing boats.
Some people are not patient at the boat launch and put each other and property in danger.
The only incidents we have had are the drivers coming into the provincial park way too fast. We need calcium on the gravel to control the dust.
Trucks or motor bikes driving fast on the flats.
Unsure at this time.
When using the boat launch at Anderson Point I have been told it belongs to Renata. The signs get ignored and people park wherever they want so it can be difficult to use the ramp.
Yes, some people with dogs off leash and jerks that don't pick up their dog's poop, we always pick up ours.

**Question 4: Use and Familiarity of Arrow Lakes**

Of the twelve motivation items presented to respondents for visiting the Arrow Lakes, viewing scenery was identified most often (Table 21).

**Table 21.** From the list below, indicate why you come to the Arrow Lakes (n = 241).

Motivation	Frequency	%
To learn about reservoirs.	13	5.4%
To discover new things.	88	36.5%
To learn about nature.	63	26.1%
To view scenery.	197	81.7%
To be close to nature.	165	68.5%
To think about my personal values.	63	26.1%
To get exercise.	140	58.1%
To give my mind a rest.	145	60.2%
To have a change from my daily routine.	124	51.5%
To be with friends.	152	63.1%
To be with family.	163	67.6%
Other.	32	13.3%

Of the six management goals that respondents ranked in terms of importance (Table 22) among On-site respondents, providing habitat for aquatic species received the most first rankings (58.4%), followed by flood control (47.0%), providing recreation opportunities (46.4%), safety for reservoir users (40.6%), providing local employment (33.7%), and electricity generation (32.8%).

**Table 22.** The Arrow Lakes serve many purposes. In your opinion, what are the 3 most important management goals for the Arrow Lakes?

Management Goal	n	Rank <sup>†</sup>		
		1	2	3
Provide local employment	80	33.7%	30.2%	29.1%
Safety for reservoir users	96	40.6%	28.7%	25.7%
Provide recreation opportunities	196	46.4%	28.6%	23.5%
Flood control	108	47.0%	17.4%	29.6%
Electricity generation	109	32.8%	26.7%	34.5%
Provide habitat for aquatic species	170	58.4%	24.9%	15.0%
Other	13	40.9%	9.1%	9.1%

<sup>†</sup> Ranks may not add up to 100% as some respondents indicated ranks greater than three.

**Question 5: Arrow Lakes Outdoor Recreation Management**

On average, respondents indicated that they were frequently satisfied with the management of the five management tasks that were presented to them (Table 23). Respondents were most satisfied with their experiences on the water or onshore of the Arrow Lakes, and least satisfied with water levels on the Arrow Lakes.

**Table 23.** The management of the Arrow Lakes seeks to balance many tasks. Please indicate your satisfaction with management activities.

Management Activity	n	Minimum	Maximum	Mean	SD
On the whole, are you satisfied with water levels on the Arrow Lakes?	219	1	5	3.15	1.005
On the whole, do you have satisfying experiences on the water or onshore of the Arrow Lakes?	229	1	5	4.21	0.795
On the whole, are you satisfied with the conditions of the boat ramps on the Arrow Lakes?	208	1	5	4.05	1.055
On the whole, are you satisfied with the parking lot conditions when you visit the Arrow Lakes?	225	1	5	4.08	1.034
On the whole, are you satisfied with the management of the Arrow Lakes?	213	1	5	3.52	1.143

The majority of on-site respondents indicated that they would continue to return to the Arrow Lakes if water levels were the same or different than those that they experienced on the day that they completed their questionnaire (Table 24). Eighty-four on-site respondents elaborated on their answers regarding water levels (Table 25).

**Table 24.** Compared to the water levels that you experienced today, how might different water levels affect your use of the Arrow Lakes for recreation activities?

Condition	n	I will come back	I will go somewhere else	Not sure
If the water level is the same as today...	229	86.0%	4.4%	9.6%
If the water level is higher than today...	226	78.3%	8.4%	13.3%
If the water level is lower than today...	225	58.2%	18.2%	23%.6



**Table 25.** Compared to the water levels that you experienced today, how might different water levels affect your use of the Arrow Lakes for recreation activities? Elaboration.

Response
<b>On-site Respondents (n = 84)</b>
1+2= on July 13/17, consistent water level.
Adaptability.
All depends of access of boat launch danger if windy.
All of the above depending on the extreme fluctuations of lake levels.
Any higher level is fine. Not great for fishing when the water is too low...not good for the fish!!
As a resident of Nakusp I have to accept what I get; but would like higher and more stable levels in summer.
Boat launch easier to use.
Can't use boat launch if no water to launch into.
Dead heads (wood).
Depends on what I want to do.
Developing property at Whistler Point.
Does not matter.
Don't care what the water level is.
Drastic water level changes effects the kokanee spawning grounds north of the reservoir.
Except July/ August if the reservoir is too low it effects summer rec and swimming- do not like mud...
Expect the water level to be adequate to have a swimming beach all summer and late spring and early fall.
Extreme low water levels at Edgewood have been a problem in the winter.
Good for all seasons!
Have never found a time i/we do not enjoy the lake.
High water levels have flooded many walking trails right now.
I can stand when the water level is so low the dock isn't even in the water.
I don't like low water.
I live close by and today the waters levels are almost the highest I have seen in 3-4 years.
I live here. [6 respondents]
I live here and I adapt to water level.
I live here most of the year.
I live here so I'll always come back however the experience & enjoyment changes w/ changing water levels- highs + lows.
I live here so will be back no matter what. I really like higher water levels.
I live here, I'm always here.
I understand what BC Hydro is doing.
I will always come back but consistency or minimizing change would be nice.
I worry about the bird life/their nests and suchlike.
I would prefer a mid-level for water for the shore birds.
I'll fish anywhere anytime.
I'm a house-boater. Boat too large to move all the time from lake to lake. Little lower for some beach access would be nice.

**Table 25 (Cont'd).**

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I'm coming back regardless of water levels, or conditions as a result.
If the water is in the trees (very high) navigation is difficult + no beach for the grandchildren. Higher mosquito population right after around noon.
Important to keep water levels as consistent as possible for sustained recreational use to prosper!
Its sad when it drops really low.
Large fluctuations in water levels has a negative impact on fish habitat and numbers.
Like to see a natural balance.
Live here.
Living here, water levels impact most activities. A better mean level would help greatly. Extreme highs and lows cost and cause damage.
Low water levels create dangerous conditions for boater and swimmers.
More stable water levels.
Must maintain better consistent levels for us + especially fish habitats.
Navigation launching far more difficult in low lake levels.
No swimming area at beach.
Not great for beach activities when water is super low- all rocks and no sand for entry into water.
Often too low.
Only 2nd time here. 0 comparison.
Part time residents so we will always use the lake regardless of the level...having said that it would be nice to see the water levels remain high for the summer season.
Sailboat moorage is a real challenge.
Stabilization must be a priority going forward. 435m would be nice for fish habitat and recreation (spawning creek access etc.).
The amount of debris on the lake is the only issue with us using the lake-and I realize that is affected by water level.
The lake should be high enough to swim in from June- end of august, for both personal activities and tourism. If water levels can't be maintained, we need a system such as at Harrison Lake where there is a swimming channel. A mud flat is not a good swimming feature.
The water level makes the holidays a lot nicer. Beautiful small town enjoy it.
There's always lots of water. I'm not concerned with where it comes up to on the shore.
Today is not important: June, July, august it needs to be at full flood.
Too much hay or grass on water as well as drift wood. I live in the area.
Very disappointing when you drive out and the water levels are low...not consistent...
Water is pretty low today.
Water level needs to be maintained for recreational use- this needs to be a management priority.
Water level needs to be stable both for recreation + ecology.
Water level won't stop me from walking, my preference would be higher levels not as much fluctuation. Let's not give the USA control of the water levels in Columbia river treaty negotiations.
We are always here.
We live in arrow lakes so will return.
We love arrow lakes thank you.
When the dock is beach you can't get out on the water. The medal wharf is horrible. No cleats harder to tie up.
When the water is too high it makes docking very dangerous as well finding camping spots difficult.

**Table 25. (Cont'd.)**

When the water levels have been lower, it's harder to get the boat out. There is never enough room on the docks.
When very high there is a lot of floating debris.
When water levels are low there is difficulty launching boat from ramp as it doesn't always reach the water and no dock. Also very difficult to come into dock with no protected waters near dock.
While I prefer the water levels to remain constant, they do not affect my choice to come.
Wish it did not get so low. Ramp is good. Marina needs repair.
With new floating dock pretty easy now.
With water levels high like today debris from the shore is deposited into the lake making boating and water sports dangerous. We have been here in summer's past where levels much lower and debris was minimal, today with this high level, like a mine field will not risk skiers or equipment (boat prop etc.).
Work requires low water levels.
Would be nice to have more beach.

**Question 6: Arrow Lakes Outdoor Recreation Experiences.**

On-site respondents reported an average of indicated that they had pursued their outdoor recreation activities on the Arrow Lakes for more than 21 years (Table 26).

**Table 26.** How long have you been coming to the Arrow Lakes for recreation activities (years)?

n	Minimum	Maximum	Mean	SD
170	0	88	21.3	16.592

Most (98.3%) on-site respondents reported that they would return to the Arrow Lakes for recreation activities based on their experience the day that they completed a questionnaire. Forty-four respondents provided comments about their experience on the day that they completed a questionnaire (Table 27).

**Table 27.** Based on your experience today, will you come back to the Arrow Lakes for recreation activities?  
Elaboration.

<b>Response</b>
<b>On-site Respondents (n = 44)</b>
As long as water stays up.
Born + live here.
Close to town.
Family here. Born here west arrow park farmer family home.
Fishing.
Fun lake for boating.
I live & recreate here.
I live here.
I live here + I like to fish.
I live here so use the lake regularly.
I live in Nakusp – the lake is a valuable asset to our community.
I love McDonald Prov Park. I love the Nakusp waterfront, walkway and covered picnic area.
If the water is higher.
It is the only boat ramp that you can launch big boats on.
Just visiting.
Kayaking has been fun but maybe more signage to indicate private property etc.
Live here. [3 respondents]
Live in Nakusp.
Lived here our whole lives.
Local. It's easy to get to except launching a boat or paddle board.
Love it here.
Love it! Peaceful.
Love this area.
Near Revelstoke – great facility for boating.
Not for boating, skiing, too much debris in water.
Resident.
Today scenic drive and exploring do this often in this area..
Until I'm too old to fish it is a great experience.
Very refreshing.
Water levels are high enough.
We are Australians passing through.
We live in Castlegar.
We live in Revelstoke, and walk our dogs along the flats frequently.
We love fishing here + will make many day trips to do so.

Respondents indicated that they usually use all of the available boat ramps on the Arrow Lakes (Table 28). The Nakusp Boat Launches and Shelter Bay received the highest reported use.

**Table 28.** Which boat ramp facility do you usually use on the Arrow Lakes? (n = 225)

<b>Boat Launch</b>	<b>Frequency</b>	<b>%</b>
Nakusp Boat Launch	71	31.6%
Shelter Bay	68	30.2%
Multiple sites	66	29.3%
Syringa Creek Park Boat Launch	7	3.1%
MacDonald Creek Provincial Park	3	1.3%
Scotties Marina	2	0.9%
Don't use boat ramps	2	0.9%
Anderson Point	1	0.4%
Edgewood Community Park	1	0.4%
Nakusp Beach	1	0.4%
Syringa Creek Park Day Use	1	0.4%
Arrow Park Ferry	1	0.4%
Galena Bay	1	0.4%

Respondents at the Nakusp Boat Launch indicated 18 different motivations for using the boat ramp facility that they did on the day that they were surveyed (Table 29). The pursuit of other recreation activities and closeness to home were the most common motivations indicated.

**Table 29.** Why did you come to the Nakusp Boat Launch facility today? (n = 101)

<b>Reason</b>	<b>Frequency</b>	<b>%</b>
Other recreation activities	24	23.8%
Close to home (local)	17	16.8%
Convenient	12	11.9%
Closest to other recreation activities	9	8.9%
Other	8	7.9%
Keep boat here	5	5.0%
To launch boat/take boat out of water	5	5.0%
Multiple	5	5.0%
Scenery	4	4.0%
Close to swimming	2	2.0%
To fish	2	2.0%
Parking	2	2.0%
Previous enjoyable experience	1	1.0%
Do not have boat	1	1.0%
Best one	1	1.0%
Only one	1	1.0%
Only one with appropriate facilities	1	1.0%
To complete survey	1	1.0%

Respondents at the Shelter Bay boat ramp facility indicated 14 different motivations for using the boat ramp facility that they did on the day that they were surveyed (Table 30). Fishing and other recreation activities were the most common motivations indicated.

**Table 30.** Why did you come to the Shelter Bay boat ramp facility today? (n = 48)

<b>Reason</b>	<b>Frequency</b>	<b>%</b>
To fish	16	33.3%
Other recreation activities	6	12.5%
Other	5	10.4%
Scenery	4	8.3%
Multiple	4	8.3%
Close to home (local)	3	6.3%
Preferred one	2	4.2%
To launch boat/take boat out of water	2	4.2%
Convenient	1	2.1%
Only one	1	2.1%
Closest to where I want to go	1	2.1%
Only one with appropriate facilities	1	2.1%
Access to Renata	1	2.1%
Closest to other recreation activities	1	2.1%

Respondents at the Syringa Creek Park Boat Launch facility indicated 16 different motivations for using the boat ramp facility that they did on the day that they were surveyed (Table 31). Convenience and launching/taking boar out of the water were the most common motivations indicated.

**Table 31.** Why did you come to the Syringa Creek Park Boat Launch facility today? (n = 45)

Reason	Frequency	%
Convenient	13	22.8%
To launch boat/take boat out of water	9	15.8%
Close to home (local)	6	10.5%
Other recreation activity	5	8.8%
Only one with appropriate facilities	4	7.0%
Closest to other recreation activities	4	7.0%
Cost (free)/Public launch	3	5.3%
Multiple	3	5.3%
To fish	2	3.5%
Other	2	3.5%
Previous enjoyable experience	1	1.8%
Best one	1	1.8%
Close to camping	1	1.8%
Scenery	1	1.8%
Water levels	1	1.8%
Access to Renata	1	1.8%



Respondents at the Nakusp Boat Launch indicated 19 elements that they liked most about the boat ramp facility that they visited on the day that they were surveyed (Table 32). That the ramp was upgraded/well-constructed was the most frequently identified element.

**Table 32.** What did you like most about the Nakusp Boat Launch facility that you visited today? (n = 88)

Reason	Frequency	Percent
Upgrade/well-constructed	18	20.5%
Other	10	11.4%
Multiple	10	11.4%
Clean/well maintained	7	8.0%
No problems/General positive comment	7	8.0%
Convenient	6	6.8%
Not crowded	6	6.8%
Access	4	4.5%
Amenities (toilets, garbage containers, etc.)	3	3.4%
Paved parking lot	3	3.4%
Didn't use today	2	2.3%
Wide ramp	2	2.3%
Easy to use	2	2.3%
Lots of space	2	2.3%
Do not like/negative comment	2	2.3%
Concrete ramp/dock	1	1.1%
Water levels	1	1.1%
Dock	1	1.1%
Parking	1	1.1%

Respondents at the Shelter Bay boat ramp facility indicated 12 elements that they liked most about the boat ramp facility that they visited on the day that they were surveyed (Table 33). That the ramp was clean and well-maintained, and that the ramp was upgraded/well-constructed were the most frequently identified element.

**Table 33.** What did you like most about the Shelter Bay boat ramp facility that you visited today? (n = 46)

Reason	Frequency	Percent
Clean/well maintained	10	21.7%
Upgrade/well-constructed	8	17.4%
No problems/General positive comment	7	15.2%
Access	5	10.9%
Multiple	5	10.9%
Dock	3	6.5%
Other	3	6.5%
Close to home	1	2.2%
Convenient	1	2.2%
Not crowded	1	2.2%
Easy to use	1	2.2%
Cost (free)	1	2.2%

Respondents at the Syringa Creek Park Boat Launch 14 elements that they liked most about the boat ramp facility that they visited on the day that they were surveyed (Table 34). Access, and that the ramp was upgraded/well-constructed were the most frequently identified elements.

**Table 34.** What did you like most about the Syringa Creek Park Boat Launch facility that you visited today? (n = 49)

Reason	Frequency	Percent
Access	10	20.4%
Upgrade/well-constructed	6	12.2%
Not crowded	5	10.2%
Wide ramp	5	10.2%
Clean/well maintained	4	8.2%
Other	4	8.2%
Convenient	3	6.1%
Paved parking lot	2	4.1%
Easy to use	2	4.1%
Cost (free)	2	4.1%
No problems/General positive comment	2	4.1%
Do not like/negative comment	2	4.1%
Dock	1	2.0%
Multiple	1	2.0%

Respondents at the Nakusp Boat Launch identified 14 elements that they liked least about the boat ramp facility that they visited on the day that they were surveyed (Table 35). Problems with parking lot was identified most frequently.

**Table 35.** What did you like least about the Nakusp Boat Launch facility that you visited today? (n = 62)

Reason	Frequency	Percent
No problems/positive comment	17	27.4%
Problems with parking lot	14	22.6%
Other	11	17.7%
Problems with dock/dock ramp	4	6.5%
Water levels	4	6.5%
Ramp angle too steep	2	3.2%
Too crowded	2	3.2%
Not well maintained/not clean	2	3.2%
Rough road	1	1.6%
Improvements needed for all components	1	1.6%
Debris	1	1.6%
No boat tie-ups	1	1.6%
Did not use today	1	1.6%
Multiple	1	1.6%

Respondents at the Shelter Bay boat ramp facility identified 10 elements that they liked least about the boat ramp facility that they visited on the day that they were surveyed (Table 36). Problems with dock/dock ramp was identified most frequently.

**Table 36.** What did you like least about the Shelter Bay boat ramp facility that you visited today? (n = 26)

Reason	Frequency	Percent
No problems/positive comment	8	30.8%
Problems with dock/dock ramp	4	15.4%
Water levels	4	15.4%
Other	3	11.5%
Ramp not long enough	2	7.7%
Problems with parking lot	1	3.8%
Too crowded	1	3.8%
Debris	1	3.8%
Not well maintained/not clean	1	3.8%
Did not use today	1	3.8%

Respondents at the Syringa Creek Park Boat Launch identified 10 elements that they liked least about the boat ramp facility that they visited on the day that they were surveyed (Table 37). Problems with dock/dock ramp was identified most frequently.

**Table 37.** What did you like least about the Syringa Creek Park Boat Launch facility that you visited today? (n = 38)

Reason	Frequency	Percent
Problems with dock/dock ramp	8	21.1%
No problems/positive comment	8	21.1%
Other	6	15.8%
Too crowded	5	13.2%
Water levels	4	10.5%
Multiple	3	7.9%
Problems with breakwater	1	2.6%
Problems with parking lot	1	2.6%
Ramp not long enough	1	2.6%
No boat tie-ups	1	2.6%

Of the eleven possibilities presented to respondents about information sources they heard first for recreation opportunities near and on the Arrow Lakes, *friends* and *family* were identified most frequently (Table 38).

**Table 38.** How did you first hear about recreation opportunities near and on the Arrow Lakes? (n = 257)

Response	Frequency	%
Friends	123	47.9%
Family	115	44.7%
Other	38	14.8%
BC Parks	26	10.1%
Tourism information booth	11	4.3%
Tourism information brochures	9	3.5%
BC Forest Service	9	3.5%
Private marinas	2	0.8%
BC Hydro web site	2	0.8%
Tourism operators	2	0.8%
BC Hydro facility (e.g., Revelstoke Dam)	1	0.4%
BC Hydro bill	1	0.4%

Sixty-two respondents indicated other ways that they first found information about recreation opportunities near and on the Arrow Lakes (Table 39). Most respondents cited that they know about the Arrow Lakes because they were local residents.

**Table 39.** How did you first hear about recreation opportunities near and on the Arrow Lakes: Comment (n = 62)

<b>Comment Category</b>	<b>Frequency</b>
Local resident	31
I grew up around here	5
Drove past	4
Real estate related	3
Discovered	2
Ferry terminal	2
Internet	2
Kootenay native	2
Signs	2
All of above	1
Always used it	1
Books	1
From a fishing magazine	1
Maps	1
Our family used this when it was first made	1
People from work	1
Selkirk college	1
Touring area	1

### **Question 7: Demographics**

On-site respondents ranged in age from 20 to 90; the average age of on-site respondents (n = 234) was 54.9 years (SD = 14.477). More than half of on-site respondents were male (55.2%).

Respondents reported living in 59 different communities (Table 40). On-site respondents had lived an average of 25.9 (n = 232; SD = 19.340) years in their communities.

**Table 40.** What community do you live in? (n = 241)

Community	Frequency	%
<b>BC Communities (n = 213)</b>		
100 Mile House	1	0.5%
Abbotsford	2	0.9%
Black Creek	1	0.5%
Blewett	1	0.5%
Castlegar	32	15.0%
Chase	1	0.5%
Cherryville	1	0.5%
Cobble Hill	1	0.5%
Coldstream	1	0.5%
Cranbrook	1	0.5%
Creston	1	0.5%
Enderby	2	0.9%
Fruitvale	5	2.3%
Genelle	1	0.5%
Grand Forks	1	0.5%
Kamloops	1	0.5%
Kelowna	6	2.8%
Kimberley	1	0.5%
Kootenay	1	0.5%
Langley	1	0.5%
Lumby	1	0.5%
Montrose	1	0.5%
Nakusp	74	34.7%
Nanaimo	1	0.5%
Nelson	2	0.9%
New Denver	1	0.5%
Okanagan	2	0.9%
Pass Creek	1	0.5%
Peachland	1	0.5%
Penticton	1	0.5%
Port Coquitlam	1	0.5%
Revelstoke	35	16.4%
Robson	3	1.4%
Rossland	1	0.5%
Salmo	2	0.9%

**Table 40. (Cont'd).**

Salmon Arm	4	1.9%
Slocan Valley	1	0.5%
South Slocan	3	1.4%
Sparwood	1	0.5%
Summerland	1	0.5%
Summit Lake	1	0.5%
Trail	7	3.3%
Vancouver	1	0.5%
Vernon	4	1.9%
Victoria	1	0.5%
Other Canadian Respondents (n = 22)		
Calgary, AB	11	50.0%
Edmonton, AB	3	13.6%
Delta, AB	1	4.5%
Linden, AB	1	4.5%
Red Deer, AB	1	4.5%
Montreal, QC	1	4.5%
Richmond Hill, ON	1	4.5%
Windsor, ON	1	4.5%
Fort Qu'Appelle SK	1	4.5%
Yellowknife, NT	1	4.5%
International Respondents (n = 6)		
Australia	3	50.0%
Czech Republic	1	16.7%
Sorrento	1	16.7%
Oregon, U.S.A.	1	16.7%

More than one-quarter of on-site respondents (n = 258; 29.5%) reported being members of outdoor recreation clubs or organizations.

Many respondents (n = 101) provided additional comments on their questionnaires; these are provided in Table 41.

**Table 41.** Additional comments (n = 101).

All good.
All good until people with not nice dog attacked our friends dog. Cleats on both sides of dock would be good and a ladder on the end of the dock for getting out of water. People speed through campsite from coming off ferry; a larger speed control sign would be good.
Appreciate the trash & washroom & picnic facilities.
BCH needs to put in a new breakwater + a new marina.
Beautiful here!
Beautiful lake, not crowded, great facilities very close to ramp.
Beautiful scenery and people. Keep it that way!
Beautiful!
Better fishing.
Better job could be done on fish management.
Boaters should not fuel up at the dock– as always, they spill fuel – must do on land. Have fun and play.
Bring back galena bay hatchery not enough trout, nowhere to spawn.
Cement pier out into the arrow lakes. Providing a (water break) break water – a place to anchor boats especially for low water levels.
Changes and improvements continue. More camp sites with spots available to locals.
Client lived in Nakusp for 1 yr on a teachers exchange at 2010.
Closing Mortan’s beach for local use, lack of camping is huge concern for family and friends. McDonald Creek camp is often booked up, when lakes are high no beach is available when low the wharfs are not useable and some areas are not accessible.
Consistency is important.
Could develop between the dock and make a nice sandy beach. Plus add a bumper on the pole side of the dock so more people can tie up their boats for overnight. Pave north side of campground. Put up a slow sign at campground/boat launch entrance.
Don't like noisy skidoos.
Enjoyed the beautiful lakeside gardens.
Even in the '80s when the dam system had been established for 15+ years, we could count on useable swimming levels. Why not now? Why is it that, even though we live right on a lake/reservoir, swimming conditions have deteriorated so badly?
For safety there should be cell phone service.
Great new dock.
Hydro should be more considerate of nesting shore birds, raising + lowering the levels only pleases below the border. Keep water levels constant (lower) persons can enjoy area better.
I am very concerned about the chemicals that are dumped into the lake that are designed to produce algae blooms. Maintaining a mid-level of water is a better way to feed the fish.
I fished the Kootenay most of my life. But prefer the calmer waters of Nakusp. The rainbows are smaller but when you don't get beat up twice a day it is much better and you only need a small boat.
I love this area and the outdoor activities that it provides.
I understand that the levels have to fluctuate but it would be great if during our summer months we could think about the BC residents and store some water so we could enjoy the lake or at least be able to use the dock.



**Table 41. (Cont'd).**

I wish the fish hatchery was still in service.

I wish the water levels would stay the same so local/private beaches would be more enjoyable-would be nice if they stayed higher.

I wish we would put more effort into fishing habitat, better water level, clean up drift logs in water, hold mills more responsible for their mess. (dangerous)

I would like to see the water level kept more stable.

If it is not broken don't try fixing it.

Increase bull trout limit.

It is great and underutilized, would be great to have remote boat in campsites along lake.

It is our favourite place to come. We enjoy the fishing and love the scenery. It is a beautiful spot!! The camp attendants are friendly and the campsite is clean.

It is such a beautiful spot to swim and feel connected to our natural world. People are so friendly + quick to offer help-the boardwalk is especially lovely-someone cares for it obviously. Thanks.

It would be nice to have more buoys to tie up to for pleasure use.

It would be nice to see less fluctuation in water levels.

Keep lake at one level.

Keep the water levels up pls.

Keep updating and maintaining! Thank you!

Keep water levels higher so fish can access creeks and spawn.

Keep water levels sufficiently high from June to Sept 30 to support recreation and fish levels.

Keeping shoreline water levels as consistent as possible is very important. As much as practical, higher levels in summer (june-sept) is very helpful for water sports, tourism.

Let's maintain stable habitat for all the local critters and creatures.

Let's take a hard line with the U.S. in negotiating the Columbia River Treaty. If they won't pay downstream benefits then they get no control over the river flow! It may take a little time but we can win this fight, as their reservoirs drop ours can still be full.

Like seeing the water high, much more appealing. Beautiful scenery.

Like water higher than what it is now and a swimming pool.

Love it!

Love the ferry.

Love the plan.

Love this high water.

Marina/boat launch requires breakwater.

Marking of the ferry lane would help us navigate.

More fish stocking would be nice.

More stable lake levels would improve all activities.

Move medal wharf to the first part on beach & extend the wharf. Thank you.

My husband and I are hoping to retire in the Nakusp area. We really like the community + people.

Nakusp dock is falling apart.

Nakusp marine needs urgent professionally engineered and constructed upgrading!!! Break waters are sinking! Boat stalls are only for small boats. Upgraded Nakusp marina could be profitable! Present marina is losing money and is practically closed for new members. I am on "waiting list" for 4 years and see no chance.

**Table 41.** (Cont'd).

Need a boat launch between Nakusp + galena bay and steady lake level 1425 ft level-fishing funds-fish hatchery for the rainbows + bull trout, kokanee-more sport fishery. Bigger fish like Kootenay.

Need a boat ramp at Blanket Creek.

Need a breakwater/ 2 docks.

Need a bridge at needles.

Need cell service.

Need more fish!!

Nice place.

Obviously, there are logistical limitations with water levels, but ensuring clean accessible beaches + boat launch amenities are key to enjoying the arrow lakes.

People drive too fast in campground.

Please a little more recreation and access, not too much though.

Please keep the water levels up during the summer season. And please keep the beaches clean.

Please keep the water levels up in the summer!

Please look at fixing the boat launch.

Please stop messing with the ecosystem in this lake and respect the Columbia River treaty pls.

Pretty awesome for the most part. Debris management in the spring could improve. Maintain higher water levels so useable docks are in the water.

Recreation facilities appear to be better maintained today as compared to 20 years ago. I hope this continues.

Signage about off season camping could be a little clearer.

Stable water level!

Steadier water level - better maintained, more mountain bike trails.

The boardwalk is new since my last visit (1982). I would encourage further efforts to develop the waterfront.

The breakwater at the Nakusp marina needs repairing and gas needs to be available on the lake at Nakusp.

The erosion control on the Arrow Lakes Reservoir has never been successful and still has not been addressed.

The fishing has noticeably deteriorated over the years we have come.

The grass floating in lake during high water. Drift wood on lake sometimes challenging. Fertilizing lake @ Galena Bay ferry improves fishing.

The levels of the lake fluctuate abruptly and go way too high and way too low. As a result, fishing is highly affected, a lot of debris, a lot of random logging debris from the past. Needs of outhouse and garbage facilities and no fuel on the lake available.

The marina needs to be rebuilt and break water please.

The rainbow population seems to be in steady decline. Stabilize the elevation so that riparian/ creek spawning habitat can be rehabilitated. Everything else follows a stable, full pool elevation (or close to it). 435m would be nice.

The reservoir exists for power generation + flood control, but it's nice to have recreational opps.

The water should stay high during recreation seasons.

There should be a survey for local residents (specifically).

**Table 41.** (Cont'd).

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Too quiet. Wonderful spot but no promotion of the potential and not enough tourism related facilities or maintenance.

Very nice.

Water could stay up longer in summer- fall!

Water levels are not steady.

We enjoy the Nakusp area, we come with family every year for 2-week summer vacation. We enjoy the community and water sports. Debris in water or lack of effect a major reason we keep coming back.

We lived in Nakusp for 25 years and used the lake often. The boat launches are fabulous! The water levels can be frustrating but doesn't deter us!

We love our walk way.

We really need a stable lake level in the summer. I drove down the columbia river on the u.s. side last summer and the river was very high (also full of milfoil weed, which made it unpleasant to swim in) we should be able to have a swimming beach all summer.

- When water is high = no shoreline = no habitat for migrating birds.
- Extremely low water = negative impacts to fish spawning + access upstream.
- Lake debris needs cleaning off of shores etc.
- Low water = no beach.
- Everyone complains that the breakwater is "broken".

Would be nice to have a boat launch on the Galena Bay site.

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