

**Peace Project Water Use Plan**

**Williston Recreation Use**

**Reference: GMSMON-20**

**BC Hydro Williston Reservoir Recreation Use Monitoring  
Program, Data Report Year 3 (2011)**

**Study Period: May – October 2011**

**Synergy Applied Ecology**

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# BC HYDRO WILLISTON RESERVOIR RECREATION USE MONITORING PROGRAM, DATA REPORT YEAR 3 (2011)

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## ABSTRACT

BC Hydro is planning new boat launches and improvements to existing boat launches at several recreation sites along the Williston Reservoir. A 10-year reservoir recreation use monitoring program was initiated in 2009 to assess use of the boat launch sites before and after improvements. This is an interim report presenting the results of Year 3 (2011) monitoring at 6 recreation sites, including Elizabeth Creek and Dunlevy in the Peace Reach, and Finlay Bay (76 Mile), Six Mile Bay, Cut Thumb Bay (38 Mile), and Alexander Mackenzie Landing in the Parsnip Reach. Boat launch facilities vary among sites and no improvements to launch structures were made in Year 3 (2011). Vehicle counters and remote cameras were used concurrently to evaluate site use. Total use by site estimated from photo corrected counter data varied from 272 visits at Finlay Bay to 1097 visits at Alexander Mackenzie Landing between May 17 and October 31 2011. The proportion of photo-validated site users that brought boats varied from 18.7% at Alexander Mackenzie Landing to 55.8% at Elizabeth Creek. Overall, there is good correspondence in the results with sites monitored in Year 1 (2009) and Year 2 (2010), suggesting consistent use annually.



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## INTRODUCTION

BC Hydro is planning the construction of new boat launches or improvements to existing boat launches at several recreation sites along the Williston Reservoir to facilitate improved boater access when reservoir water levels are low. To allocate future efforts relative to this objective appropriately, a 10-year site use monitoring program has been implemented to assess seasonal use of boat launches before and after improvements (BC Hydro 2008). Results of the monitoring program are expected to address 2 primary management questions:

Does recreational use of the Williston Reservoir boat launches increase after boat access is improved?  
What is the frequency of use of newly constructed boat launches? Specifically, does seasonal use change with improved access to new areas of the reservoir, and improved access during low reservoir levels?

Six recreation sites scheduled for improvements were monitored in Year 3 (2011) and include 5 sites with existing boat launches and 1 site with no constructed boat launch. Remote vehicle counters installed at the access to each recreation site or boat launch provided an estimate of site-specific, temporal use patterns. However, inferences derived from vehicle counter data alone are limited in scope and may over estimate use, and relying on a single unit or technology for remote data collection has inherent risks. To account for these limitations motion-sensitive cameras were also used. Photo-validated site use records increase confidence in the estimates resulting from counter data and provide insight to the following:

- The proportion of recreation site users with boats
- The duration of each site user's visit
- The number of repeat users at each site

Year 1 (2009) and Year 2 (2010) results were reported by Cubberley and Hengeveld (2010, 2011). This is an interim report presenting the results of the third year of the recreation use monitoring program.

## METHODS

### Study area

#### *Williston Reservoir*

The Williston Reservoir is the largest man-made, freshwater, hydroelectric reservoir in British Columbia with an area of 1,779 km<sup>2</sup> and a shoreline perimeter of 1,700 km (Figure 1). The reservoir offers considerable recreational fishing and wildlife viewing opportunities as boaters can access remote, undeveloped areas of the watershed with relative ease. The maximum licensed water level is 672 m asl and a minimum level of 640 m asl, with the lowest water levels typically reached in April annually before spring snow melt.



Figure 1. The Williston Reservoir and surrounding watershed boundary in northern British Columbia. The W.A.C. Bennett and Peace Canyon generation stations are on the Peace River adjacent to the community of Hudson's Hope.

Six recreation sites that provide boater access to the Williston Reservoir were selected for monitoring (BC Hydro 2008). Year 3 monitoring added Alexander Mackenzie Landing and removed the Strandberg site. Two of these sites, Elizabeth Creek and Dunlevy are in the Peace Reach, while the other four sites, Finlay Bay (76 Mile), Six Mile Bay, Cut Thumb Bay (38 Mile), and Alexander Mackenzie Landing are in the Parsnip Reach (Figure 2). Boat launch conditions vary among sites and no improvements were made in 2009 – 2011 to any of the sites monitored (Table 1).

Table 1. Status of Williston Reservoir recreational sites selected for monitoring in 2010 and 2011.

| Site          | Description  | Year 2 (2010)     | Year 3 (2011)     |
|---------------|--|-------------------|-------------------|
| Cut Thumb     | No formal boat launch  | Monitoring Yr2    | Monitoring Yr3    |
| Six Mile Bay  | Constructed gravel boat launch suitable for high water levels (late season) only   | Monitoring Yr2    | Monitoring Yr3    |
| Finlay Bay    | Constructed gravel boat launch suitable for high water levels (late season) only   | Monitoring Yr2    | Monitoring Yr3    |
| Strandberg    | No formal boat launch  | Monitoring Yr2    | Not monitored Yr3 |
| Elizabeth Cr  | Constructed concrete boat launch suitable for all water levels                     | Monitoring Yr2    | Monitoring Yr3    |
| Dunlevy       | Constructed concrete boat launch suitable for high water levels (late season) only | Monitoring Yr2    | Monitoring Yr3    |
| Mack. Landing | Constructed concrete boat launch suitable for high water levels (late season) only | Not monitored Yr2 | Monitoring Yr3    |

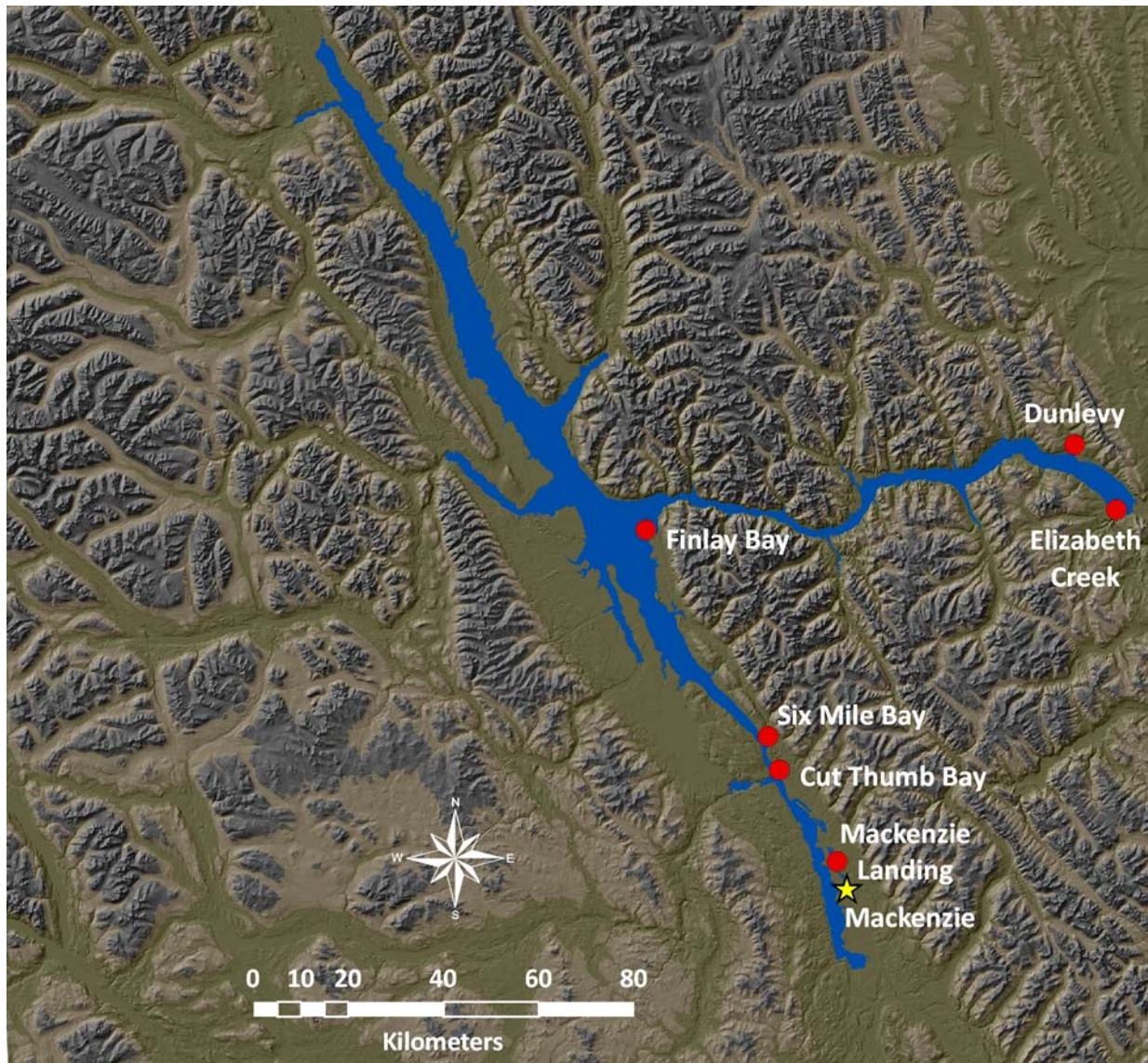


Figure 2. Williston Reservoir recreation sites monitored in Year 3 (2011).

### *Recreation Site Descriptions*

Cut Thumb Bay recreation site is located approximately 35-40 minutes driving time from Mackenzie. Access is via the Parsnip West Forest Service Road (FSR), a well-maintained, radio-assisted gravel road, turning west between the 33 and 34 km markers onto a 4 km long gravel road. The site consists of 9 camp stalls with picnic tables and 3 outhouses. During low reservoir elevation there is a large gravel bar where users can park, camp, and launch boats (Appendix A). The narrow road that leads to the gravel bar becomes the boat launch at highest water elevation. The reservoir water elevation dictates how much room users have to launch boats at this site.



Six Mile Bay recreation site is located approximately 45-50 minutes driving time from Mackenzie. Access is via the Parsnip West FSR, turning west at the 41 km marker onto an approximately 1 km long, dirt access road. There is one camping spot at high water, located right beside the top of the boat launch, with one outhouse available. At low reservoir elevation, an open, sandy area provides additional parking or camping space. Access to this sand bar is via the dirt road that also serves as the boat launch (Appendix A). At low water elevation, it may be difficult to launch boats as there is a steep drop off to the water and the sandy substrate may cause vehicles to become stuck. If the one camp spot is taken at high water elevation, it constrains the amount of room that visitors have to maneuver, and may deter use of the launch and limit parking.

Finlay Bay recreation site is located approximately 1.5-2 hours driving time from Mackenzie. Access is via the Parsnip West FSR. At the 96 km marker, the Parsnip terminates and there is a turn off onto a 1 km long, narrow (approx. 4 m wide) gravel road leading to the recreation site. The site is user maintained and consists of 11 camp stalls with picnic tables and 3 outhouses. There is also a large open field area where many users prefer to camp and where boat trailers are parked. The boat launch is a short gravel road that is approximately 4 m wide (Appendix A). There are remnants of old slabs of concrete and pieces of rebar laying off to the side, indicating that a concrete launch once existed. At low reservoir elevation, vehicles must drive over rocks and sand to reach the water. This site is popular with ATV riders, especially at low water elevation.

Elizabeth Creek recreation site is located approximately 20 minutes driving time from Hudson's Hope. Access is via paved Highway 29, turning right (north) approximately 300 m after crossing the crest of the WAC Bennett Dam. The site is intended for day-use, as there are no defined camp stalls and no outhouses. There is a modest gravel parking lot with sufficient area for large vehicles. The boat launch is approximately 6 m wide, constructed of concrete and in good condition (Appendix A). The boat launch has been constructed to allow for access to the reservoir of all sizes of boats at both low and high water elevation. Elizabeth Creek is the designated control site for this project and will not be improved.

Dunlevy recreation site is located approximately 40 minutes driving time from Hudson's Hope. Access is via Highway 29, turning north on 12 Mile Road and following this well-maintained gravel road to the site. There is a large open area for parking with 2 outhouses nearby. Although the site is intended as a day use site, there is evidence that the site is used for overnight camping. The boat launch is not usable during low reservoir elevation due to a steep sandy drop-off (Appendix A). As well, the launch is in disrepair, as the concrete slabs on one side of the launch have collapsed due to shoreline erosion, rendering only one side (3 m wide) of the launch usable. This site is part of Butler Ridge Provincial Park.

Alexander Mackenzie Landing recreation site is located approximately 10 minutes driving time from Mackenzie. Access is via the Parsnip West FSR for approximately 7 km with several signs that lead users to the site from Highway 39. The site is well-maintained and designated for day use with a picnic area, cooking shelter and amphitheater. There is a modest area for parking with 2 outhouses on site. Immediately adjacent to the day use site is the BC Hydro Alexander Mackenzie Landing campsite which contains 10 camp stalls suitable for all RV's. A maintained foot path joins the two sites. The boat launch

is approximately 6 m wide, constructed of concrete and in good condition (Appendix A). Users launch directly from the concrete slab at high reservoir elevation, but must travel further down foreshore area on a rudimentary, gravel road to access the reservoir at low elevation.

## Data collection

### *General approach*

Data collection was accomplished using remote vehicle counters and motion-sensitive remote cameras synchronized by date and time. While the counters provide baseline data for monitoring trends in site use, the primary purpose of camera data is to estimate percentage of visitors bringing boats to each site. Because access and boat launch layouts differed among sites, we placed the monitoring equipment along the access roads into each site, except at Elizabeth Creek and Mackenzie Landing, in order to keep data capture consistent between sites and among years. At Elizabeth Creek and Mackenzie Landing, remote monitoring equipment was installed directly adjacent to the constructed, concrete boat launch. Equipment was concealed to reduce the likelihood of changes in site user behavior reacting to the presence of monitoring equipment, and to lower the probability of theft or vandalism. No personal user information was collected as this was not relevant to our analysis. Vehicle counters and cameras were downloaded in the field approximately every 6 weeks and then re-deployed. All captured data was screened after download in the field to alert the field crew of potential problems, monitor battery voltage, and ensure data was transferred and secured without error. Upon return to the office each day, field data was imported to a secure project directory supported by a redundant, back up protocol. Results are reported as total monthly frequencies of use per site for mid-May through October.

### *Vehicle counters*

We installed Generation III (G3) vehicle counters manufactured by TRAFx Research Ltd., Canmore Alberta, pre-programmed to VEH-4d mode. The counters employ magnetometers that are capable of operating in temperature ranges of -40°C to 50°C with an expected battery life of approximately 7-14 months and enough storage to accommodate up to 14,000 data records. All counters were deployed with the same settings as Year 1 and 2 to ensure consistency in data interpretations among sites (Table 2). Counters were buried in waterproof, moisture controlled cases roadside at each site as per manufacturer's specifications, such that it would detect vehicle traffic traveling in both directions.

Table 2. Vehicle counter settings for monitoring Year 3 (2011). Settings are the same as previous years.

| Parameter | Setting |
|-----------|---------|
| Period    | 000     |
| Delay     | 024     |
| Threshold | 012     |
| Rate      | Slow    |

### *Remote cameras*

We installed ScoutGuard SG550 digital cameras that incorporate a passive infra-red motion sensor. The cameras operate with either 4 or 8 'AA' batteries or an external 6V DC power source. Eight batteries were used in each camera in order to prolong the battery life (approximately 80 days). All photos were stored on 2GB SD memory cards, allowing for over 2000 photos at 3MP resolution. The cameras operate in temperatures ranging from -20°C to 60°C and humidity of 5-90%. All cameras were programmed with the same settings (Table 3), lightly concealed and installed in areas where the risk of detection was minimal and where the photo contained both the counter location and the largest field of view possible. Since Year 2 (2010), cameras were installed in steel lock boxes to address data loss due to equipment theft in Year 1 (2009). In the event camera set-ups were discovered, lock boxes were labeled with a brief project description and a phone number to allow users to contact SAE project staff if they had any questions or concerns.

Table 3. Remote camera settings for monitoring Year 3 (2011). Settings are the same as Year 2 (2010).

| Parameter            | Setting |
|----------------------|---------|
| Mode                 | Camera  |
| No. photos per event | 1       |
| Photo quality (MP)   | 3       |
| Delay (sec.)         | 0       |
| Sensitivity          | High    |
| Time stamp           | On      |
| Timer                | Off     |

## Data analyses

Vehicle counter and remote camera data cross-referenced by event date and time stamps were imported to an MS Access database. We used the equipment manufacturer's specifications as a guide to devise a protocol for identifying and removing duplicate events, which can occur when a vehicle travels slowly past the counter or parks near the counter. A series of counter events within 10 seconds of each other were deemed redundant to the first event of the series unless a second photo-validated event was logged during this interval. For events that could be photo-validated, 'false' events such as maintenance vehicles, ATVs and cyclists detected by the counter were excluded from the total count data unless they were using the boat ramp (i.e. RCMP, BC Hydro).

Counter data were validated by photo interpretation to determine arrival and departure times of individual vehicles with and without boats and the direction of the vehicle (arriving at the site or departing). Assigning unique vehicle IDs also allowed for an estimate of the minimum number of users who visited each site between mid-May and October, the proportion of site users with boats, the duration of stay, and whether they were a repeat visitor. In some instances we observed multiple counter events by the same vehicle(s) coming and going throughout the day(s), but only one photo of the vehicle either initially arriving or its final departure. So that these orphaned data could be included in our estimates, database code routines were written to calculate the minimum duration of stay under these conditions. As a result, the mean site stay is slightly underestimated.

Year 3 (2011) estimates built on the knowledge gained from Year 2 (2010) manual index counts. Manual counts found blank photos were triggered by a valid user event, and that the high speed of the vehicle caused the image to be blank. Given that counter units function at nearly 100% reliability while photo success varies among sites, we used the total proportion of photos, including blank photos, associated with counter events at each site as a correction factor. We used this correction factor to adjust the number of total unique photo validated users to estimate site use at each location.

Because reservoir water elevation affects the effort required to launch boats at each site, we used simple regression to examine trends in the amount of daily use by boaters throughout the monitoring period, as the reservoir elevation rises. We filtered site data to include only site visits longer than 1/2 hour in duration. This excluded boaters that traveled to the site but opted not to launch. Because site visit duration calculations were limited to boat visits with an arrival and exit photo, complete records at Finlay Bay were small. As a result, Finlay Bay included all boat visits recorded, regardless of site duration.

## RESULTS

Total use by site estimated from photo-verified counter data varied from 272 visits at Finlay Bay to 1097 visits at Mackenzie Landing between May 17 and October 31 2011 (Figure 3). A large multi-year construction project at the W.A.C Bennett Dam commenced and required those wishing to use the Elizabeth Creek boat launch to be escorted by a pilot vehicle. Over 4100 events were logged by construction traffic using the boat launch during the Year 3 (2011) monitoring period. These data were

excluded but construction activities influenced our site use estimate as unmarked construction vehicles were treated as unique visitors. Despite construction, the number of site users was similar to previous years. To avoid construction delays, several boaters chose to launch at Dunlevy as reservoir elevation increased, which received an increase in visitors than the previous year.

Travel to monitoring sites was difficult in Year 3 (2011). A rain-soaked spring prompted reservoir elevation to rise quickly and caused local flooding, which led to several washouts and road closures on Highway 97 between the Mackenzie Junction and Chetwynd and the Parsnip West FSR. Repairs to Highway 97 were still ongoing at the end of October and traffic was limited to single lane alternating traffic led by a pilot vehicle. As well, the short access road to Mackenzie Landing washed out in early May due to snowmelt runoff, but was temporarily repaired until permanent site construction was completed in late July. Although heavy equipment was working, access to the launch and picnic area remained open to the public.

Extended, favourable weather in late summer and fall likely influenced site use in Year 3 (2011). As a result user visits increased at all sites monitored in Year 2 (2010). Due to their condition, low spring reservoir elevation likely hindered boat launching operations at Six Mile Bay and Dunlevy more than at other sites during May –mid-July. Conversely, launching at Cut Thumb was hindered at high reservoir elevation due to the mobilization of woody debris which blocked the boat launch area. This may have led to the increase in visitors at Six Mile due to its proximity (<10 km) to Cut Thumb.

Space limitations arising from high reservoir elevation are deterring boaters from using the Six Mile Bay launch. High reservoir elevation limits parking and movement of vehicles if the one campsite is occupied. Vehicles with boats and RVs, unable to turn around, were observed backing out of the site the entire length of the access road to leave after learning the site was occupied.

### *Vehicle counters*

Vehicle counters were deployed at all sites May 17-18, 2011 and operated continuously at Cut Thumb, Six Mile, Finlay Bay and Mackenzie Landing until the end of the monitoring period, October 31 2011 (168 days). Counters at Dunlevy and Elizabeth Ck. were removed Oct. 22, 2011 (158 days). A total of 20,952 new counter event data were added to the site use database. After we implemented data handling routines 13,468 event data were used to estimate monthly site use (Table 4).

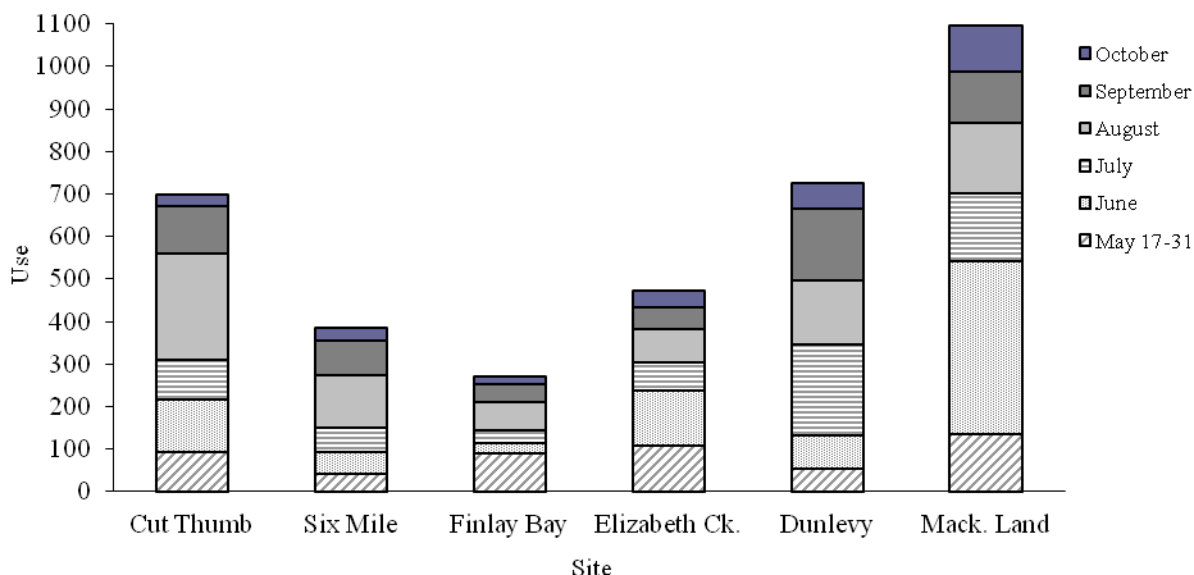


Figure 3. Monthly use by site estimated from photo-validated counter data corrected using photo success between May 17 and October 31 2011.

Table 4. Total use by site estimated for monitoring Year 1 (2009), Year 2 (2010), and Year 3 (2011). Parentheses indicate percent of total visits among sites.

| Site                         | 2009 <sup>1</sup> | 2010 <sup>1</sup> | 2011        |
|------------------------------|-------------------|-------------------|-------------|
| Cut Thumb Bay                | 793 (26.3)        | 796 (30.0)        | 699 (27.3)  |
| Six Mile Bay                 | 458 (15.2)        | 391 (14.7)        | 386 (15.1)  |
| Finlay Bay                   | 250 (8.3)         | 259 (9.8)         | 272 (10.6)  |
| Strandberg                   | 61 (2.0)          | 66 (2.5)          | No data     |
| Elizabeth Creek <sup>2</sup> | 511 (16.9)        | 525 (19.8)        | 473 (18.5)  |
| Dunlevy                      | 947 (31.4)        | 617 (23.3)        | 727 (28.4)  |
| Mackenzie Landing            | No data           | No data           | 1097 (42.9) |
| Total visits                 | 3,018             | 2,653             | 2,557       |

<sup>1</sup>Monitoring periods: June 1 – October 31 2009, June 16 – October 31 2010 and May 17 – October 31 2011

<sup>2</sup>Elizabeth Creek: 2009 estimate adjusted as per method used for 2010 estimate

### *Remote cameras*

Remote cameras operated continuously at Cut Thumb, Six Mile, and Finlay Bay for the duration of the monitoring period, May 17 – October 31 2011 (168 days). High volumes of construction traffic filled the camera storage capacity at Elizabeth Creek, rendering it inoperable in late August just before the Labour Day long weekend. The camera at Mackenzie Landing was removed July 12-22, 2011 while conducting site improvements related to the road washout (B. Webster, pers. comm). The camera was redeployed in a different location upon completion because the original location was altered. Most cameras have been discovered by site users; however, no phone queries, theft or vandalism occurred during the Year 3 (2011) monitoring period.

A total of 18,707 photos were collected with 9,981 corresponding to vehicle counter events. The proportion of photo-validated site users that brought boats varied from 18.7% at Mackenzie Landing to 55.8% at Elizabeth Creek (Figure 4, Table 5). Mean photo success was 64% and ranged from 32% at Finlay Bay to 99% at Elizabeth Creek. Boaters visited all sites throughout the monitoring period (Table 6). On average, visitors with boats stayed longer than 8 hours at all sites (Table 7). The number of easily recognized repeat visitors per site ranged from 11 (Finlay Bay) to 141 (Mackenzie Landing; Table 8). Cameras were removed at the end of season but camera lock boxes were left on site to facilitate re-deployment of monitoring equipment next spring.

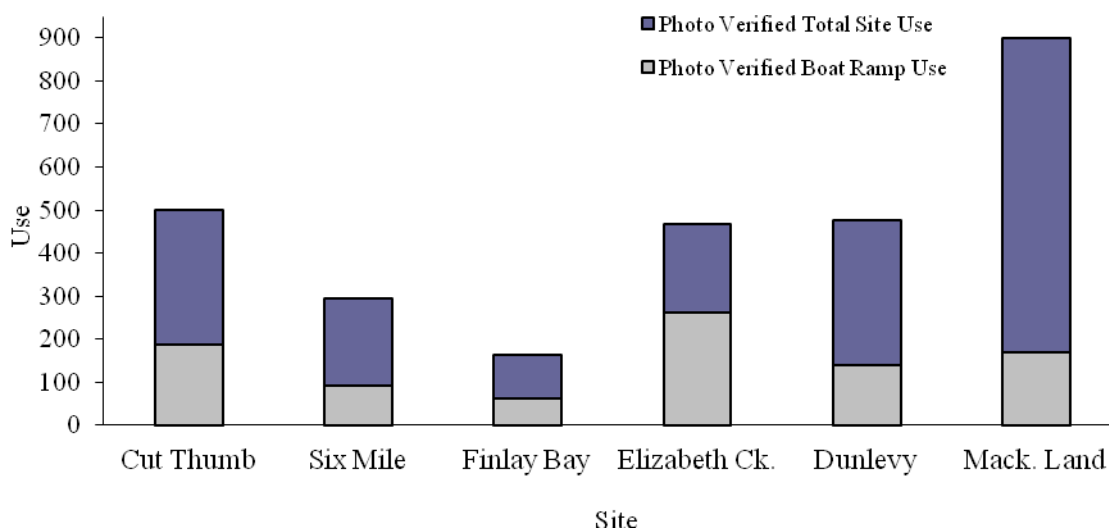


Figure 4. Proportion of photo-validated vehicles bringing boats to the recreation sites between May 17 and October 31 2011.

Table 5. Proportion (%) of photo-validated vehicles bringing boats to recreation sites during the Year 1 (2009), Year 2 (2010), and Year 3 (2011) monitoring periods. Parentheses indicate total number of photo-verified site users.

| Site              | 2009       | 2010       | 2011       |
|-------------------|------------|------------|------------|
| Cut Thumb Bay     | 41.5 (378) | 46.2 (383) | 37.7 (499) |
| Six Mile Bay      | 39.2 (125) | 28.4 (218) | 31.5 (295) |
| Finlay Bay        | 31.1 (61)  | 28.7 (188) | 37.7(162)  |
| Strandberg        | 0 (5)      | 57.1 (7)   | No data    |
| Elizabeth Creek   | No data    | 56.8 (472) | 55.8 (468) |
| Dunlevy           | 32.5 (166) | 21.0 (443) | 29.5 (475) |
| Mackenzie Landing | No data    | No data    | 18.7 (899) |

Monitoring periods: June 1 – October 31 2009 (camera data were incomplete; no camera data was collected at Elizabeth Creek boat launch and the number of camera monitoring days was not consistent among sites), June 16 – October 31 2010, and May 17 - October 31, 2011.

Table 6. Dates of the first and last photo-verified boater visits during the Year 3 monitoring period, May 17 – October 31 2011. Not all visitors photographed arriving with boats launched due to site conditions.

| Site              | First occurrence    | Last occurrence     |
|-------------------|---------------------|---------------------|
| Cut Thumb Bay     | May 20              | Oct 16              |
| Six Mile Bay      | May 20 <sup>1</sup> | Oct 7               |
| Finlay Bay        | May 20              | Oct 5               |
| Elizabeth Creek   | May 17              | Oct 18 <sup>2</sup> |
| Dunlevy           | May 20              | Oct 21 <sup>2</sup> |
| Mackenzie Landing | May 21              | Oct 31              |

<sup>1</sup>Users with larger boats are not launching and leaving the site within ½ hour.

<sup>2</sup>Monitor equipment removed October 22, 2011.



Table 7. Average duration of stay for site users identified as boaters or non-boaters in 2011. Duration is a minimum biased estimate of hours per visit based on a subset of photo-validated counter data; see text for explanation of method.

| Site              | Boaters |      |               | Non-boaters |      |               |
|-------------------|---------|------|---------------|-------------|------|---------------|
|                   | n       | mean | range         | n           | mean | range         |
| Cut Thumb Bay     | 84      | 18.4 | 0.19 – 104.0  | 71          | 17.8 | 0.09 - 119.2  |
| Six Mile Bay      | 59      | 21.7 | 0.03 – 161.6  | 100         | 6.7  | 0.02 – 119.7  |
| Finlay Bay        | 8       | 54.0 | 10.0 – 71.2   | 11          | 12.7 | 0.14 – 62.7   |
| Elizabeth Creek   | 172     | 17.9 | 0.05 – 96.4   | 128         | 0.7  | 0.001 – 20.7  |
| Dunlevy           | 35      | 20.2 | 0.02 – 259.5  | 79          | 10.8 | 0.01 – 185.7  |
| Mackenzie Landing | 128     | 8.8  | 0.005 - 216.9 | 453         | 1.8  | 0.001 - 386.9 |

Table 8. Number of easily recognized repeat visitors per site during the Year 3 monitoring period, May 17 – October 31 2011.

| Site            | Repeat visitors |
|-----------------|-----------------|
| Cut Thumb Bay   | 76              |
| Six Mile Bay    | 29              |
| Finlay Bay      | 11              |
| Elizabeth Creek | 81              |
| Dunlevy         | 43              |
| Mack. Landing   | 141             |

#### *Effects of reservoir elevation on boat launch use*

Site use by boaters appears spread throughout the monitoring period at Cut Thumb Bay, Finlay Bay, and Mackenzie Landing, regardless of reservoir elevation (Figure 5). Elizabeth Creek was the only site to show a negative trend in boater use as the reservoir elevation increased, emphasizing its value to boaters early in the season as a reliable access to the water. Six Mile Bay and Dunlevy were seldom used early in the season but increased in appeal to boaters as the reservoir elevation increased above 662 masl.

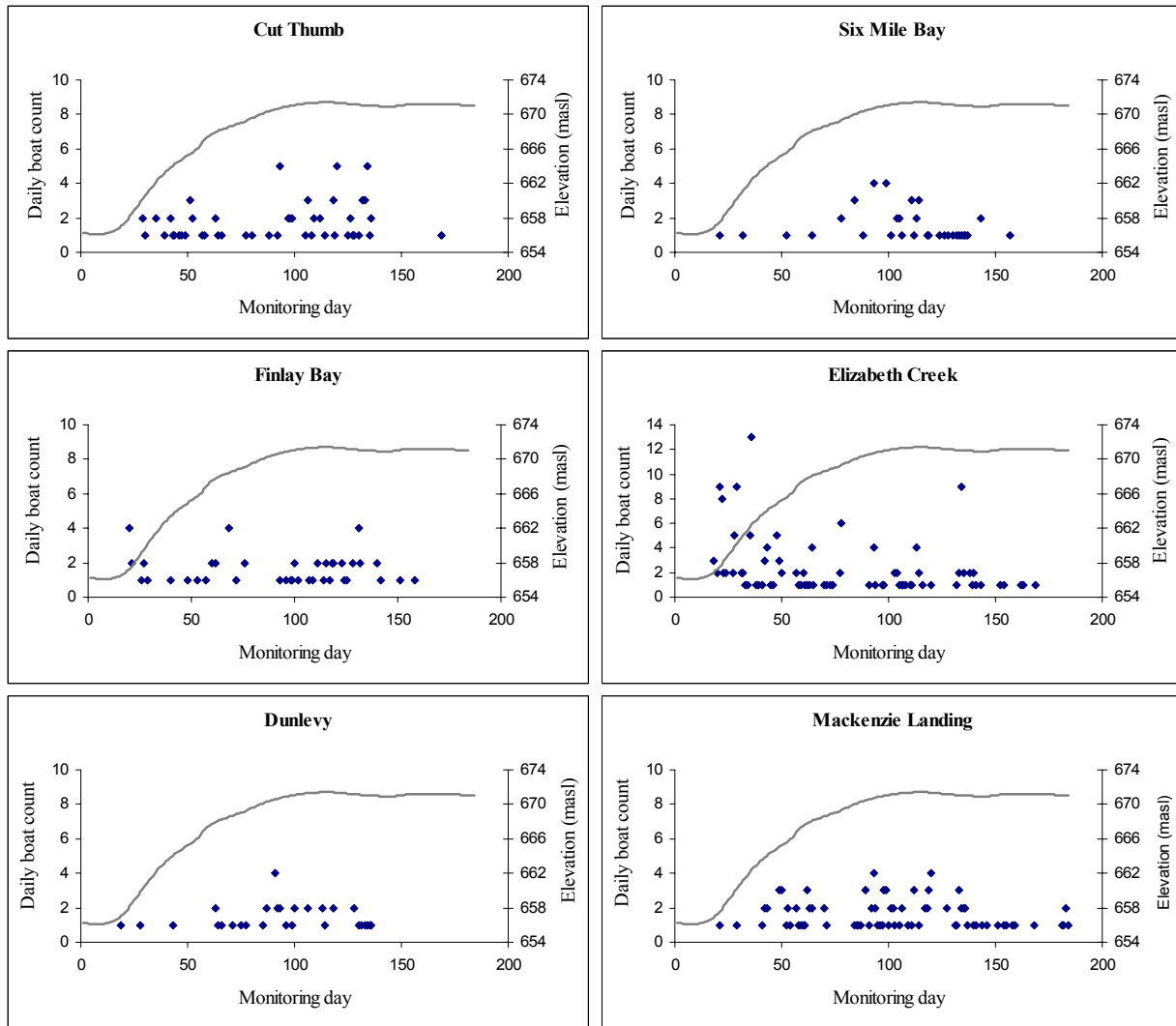


Figure 5. Daily boat use count (points) as a function of reservoir elevation (line) for each recreation site through the Year 3 (2011) monitoring period. Only boats photographed staying longer than 1/2 hour were included, except at Finlay Bay which includes all boats visiting the site in Year 3 (2011). Monitoring day 1 corresponds to May 1 while monitoring day 184 corresponds to October 31.

## DISCUSSION

Although construction and weather-related events offered challenges, data quality and quantity was exceptional in Year 3 (2011), increasing 3-fold over last year. Overall, there was good correspondence in the results for monitoring Year 1(2009) and Year 2 (2010), suggesting consistent use both within and among recreation sites. The high number of repeat visitors at Cut Thumb, Elizabeth Creek, and Mackenzie Landing likely reflect the appeal of launches closer to population centres. Patterns of use suggest locals enjoy visiting Mackenzie Landing to access the reservoir for community events with or without intending to launch boats. The expected improvements to the launch in Year 4 (2012) should be well received by the public despite the interruption by construction.

Remote counters provide the foundation of use data for analysis as manual count validation in Year 2 (2010) suggests the counters are performing as intended. As such, the vehicle counters will continue to provide a reliable method of evaluating trends in recreation site use over the long-term. Near perfect photo success at Elizabeth Creek is the result of slow moving construction vehicles on the launch and supports our Year 2 (2010) conclusions that cameras cannot respond to higher vehicle speed.

Two minor data collection challenges may be improved upon in future years. The status of current remote cameras to reliably respond to variable weather conditions are of concern for data capture. Cool, wet weather contributes to lower photo success and periods of no photos. Camera positioning may also be improved at sites where field of view and road conditions limit photo success. The cameras at Finlay Bay and Dunlevy captured a smaller proportion of vehicles triggering counter events than other sites. As such, both may be candidates to move set-up location. While vehicles only need to be captured on camera once (either at site arrival or departure) to assess the percentage of sites users bringing boats, the subset of data used to estimate minimum durations of stay is limited to vehicles with both arrival and departure photos. Better photo success will improve the overall site use estimates as well as duration of stay.

## LITERATURE CITED

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## **APPENDIX A. SITE PHOTOS**



Cut Thumb May 18 2011



Cut Thumb May 18 2011



Cut Thumb June 15 2011



Cut Thumb July 25 2011



Cut Thumb September 7 2011



Cut Thumb alternate launch September 7 2011



Six Mile Bay May 18 2011



Six Mile Bay May 18 2011



Six Mile Bay June 15 2011



Six Mile Bay June 15 2011



Six Mile Bay July 25 2011



Six Mile Bay September 7 2011



Finlay Bay May 19 2011



Finlay Bay May 19 2011



Finlay Bay June 15 2011



Finlay Bay June 15 2011



Finlay Bay July 25 2011



Finlay Bay September 7 2011



Elizabeth Creek May 17 2011



Elizabeth Creek May 17 2011



Elizabeth Creek June 14 2011



Elizabeth Creek June 14 2011



Elizabeth Creek Oct 22 2011



Elizabeth Creek October 22 2011





Dunlevy May 17 2011



Dunlevy May 17 2011



Dunlevy June 14 2011



Dunlevy July 26 2011



Dunlevy September 8 2011



Mackenzie Landing May 18 2011



Mackenzie Landing May 18 2011



Mackenzie Landing June 15 2011



Mackenzie Landing July 25 2011



Mackenzie Landing September 7 2011



Mackenzie Landing September 7 2011