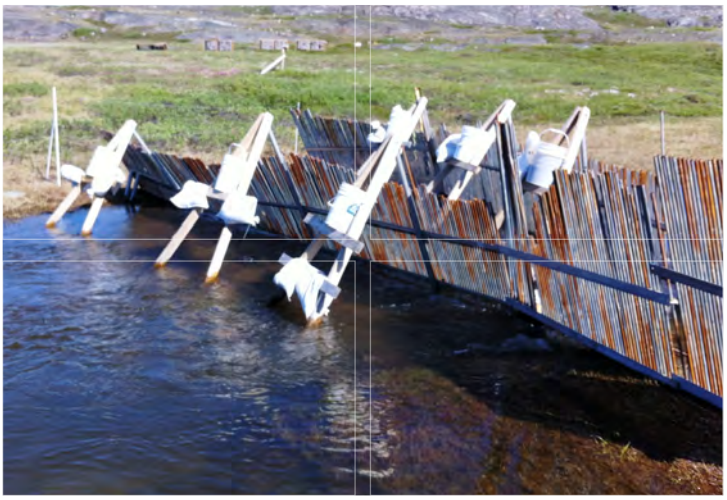
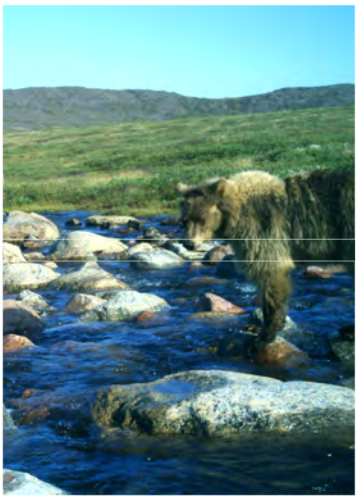
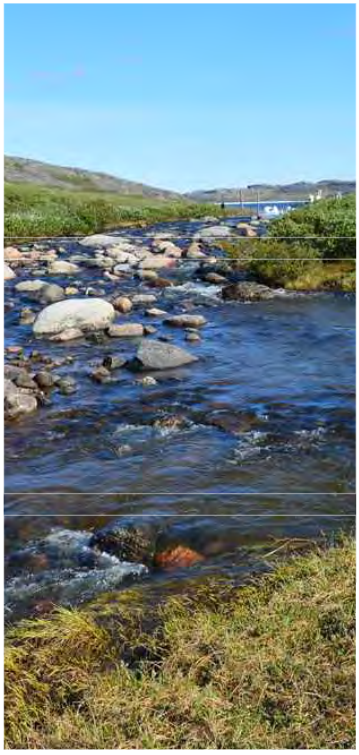
Appendix V5-6O

Doris North Project: 2014 Roberts Lake and Outflow Fish Compliance Monitoring Program Report



Prepared for:

TMAC RESOURCES

DORIS NORTH PROJECT

2014 Roberts Lake and Outflow Fish Compliance Monitoring Program

March 2015

The world's leading sustainability consultancy

ERM

TMAC Resources Inc.

DORIS NORTH PROJECT

2014 Roberts Lake and Outflow Fish Compliance Monitoring Program

March 2015

Project #0246616-0008

Citation:
ERM. 2015. *Doris North Project: 2014 Roberts Lake and Outflow Fish Compliance Monitoring Program.* Prepared for TMAC Resources Inc. by ERM Consultants Canada Ltd.: Yellowknife, Northwest Territories.

ERM
5120 49th Street, Suite 201
Yellowknife, NT
Canada X1A 1P8
T: (867) 920-2090
F: (867) 920-2015

EXECUTIVE SUMMARY

The Doris North Project (the Project) is located on the Hope Bay Belt, an 80 by 20 km property on the south shore of Melville Sound in Nunavut. The property consists of a greenstone belt (the Hope Bay Belt) that contains three main gold deposits. The Doris and Madrid deposits are located in the northern portion of the belt, and the Boston deposit is at the southern end. The Project is located on the southern shore of Melville Sound. The nearest communities are Cambridge Bay (Iqaluktuttiaq; 125 km northeast) Umingmaktok (75 km southwest), and Bathurst Inlet (Kingaok; 160 km southwest of the property).

TMAC Resources Inc. (TMAC) acquired the Hope Bay Belt Project from Newmont Corporation in March 2013. The acquisition included exploration and mineral rights over the Hope Bay Belt, including the Doris North Project and its permits, licences and authorizations for development received by previous owners. In late 2012, prior to the sale, the Project was placed into care and maintenance, and was seasonally closed during the winter of 2012/2013. TMAC re-opened the Doris North Camp in March of 2013 for the purposes of conducting site water management and environmental compliance programs and to support exploration activities that have continued through 2014. The Project remains in care and maintenance at this time.

Tail Lake was added to Schedule 2 of the Metal Mining Effluent Regulations, SOR/2002-222 on June 19, 2008 pursuant to SOR/2008- 216. A condition of this amendment was that a compensation plan be developed to ensure that no net losses of fish habitat occur. The No Net Loss Plan and its updates (NNLP; Golder 2007; Rescan 2010a, 2010b) proposed the following compensation strategies:

1. Increase the productive capacity of Roberts Lake by improving access of fish, primarily Arctic Char (*Salvelinus alpinus*), to critical overwintering habitat by creating a channel through the Roberts Lake Outflow boulder garden (completed in September 2012; Rescan 2012b);
2. Increase the quantity and quality of rearing habitat for juvenile Arctic Char in Stream E09, a tributary to Roberts Lake, by creating additional pool habitat (completed in July 2012; Rescan 2012b); and
3. Increase the quantity and quality of rearing habitat available to juvenile Lake Trout (*Salvelinus namaycush*) in Windy Lake by installing four rock compensation shoals (completed in April 2011; Rescan 2011).

A separate DFO Fisheries Authorization (NU-02-0117.3) was approved on January 19, 2011, to prescribe compensation requirements for the loss of Tail Lake Outflow through the following strategy:

1. Increase the quantity and quality of rearing habitat available to juvenile Lake Trout (*Salvelinus namaycush*) in Windy Lake by installing two rock compensation shoals (completed in April 2011; Rescan 2011).

Two monitoring programs evaluate the efficacy of habitat compensation. The Roberts Lake and Outflow Fish Compliance Monitoring Program measures:

- survival of adult Arctic Char migrating through the enhanced boulder garden;

- the structural integrity of enhanced channels constructed in 2012;
- the quantification of juvenile Arctic Char densities at Stream E09 enhancement site and at reference sites; and
- the structural stability and vegetation recovery at the enhancement site in Stream E09.

The Windy Lake Shoal Compliance Monitoring Program reviews the success of compensation shoals constructed in 2011 by measuring:

- fish habitat value;
- fish community;
- primary and secondary production; and
- structural stability.

This report presents the results of the 2014 Roberts Lake and Outflow Fish Compliance Monitoring Program (the Program), which constitutes the second year of monitoring following the construction of compensatory habitat in Stream E09 and enhancements at the Roberts Lake Outflow boulder garden.

For the first time in five years of sampling (pre- and post-construction sampling), one juvenile Arctic Char was captured in the enhanced section of Stream E09 (E09-US). Although the densities of fish in Stream E09 differed from those found in the reference site in Stream E14, the presence of fish in Site E09-US indicates the enhanced stream is functioning as intended, as rearing habitat for Arctic Char.

Visual inspection of the enhancement pools in Stream E09 in 2014 confirmed that the pools remain stable and exhibit no signs of infilling or erosion. Transplanted instream and riparian vegetation is surviving well and the combined surface area of the pools exceeds the area required by designs in the NNLP.

Safety concerns raised in 2012 prompted a change to the methods used to track migrating char in 2013 and onward. In 2013, the trap capture approach for counting fish was replaced with the Vaki Riverwatcher system, which allows fish passage through a fish fence to be monitored remotely. Survival of anadromous Arctic Char returning through the boulder garden at Roberts Lake Outflow was 94% in 2014, whereas the average for all pre-enhancement years was 62%. Survival in 2014 was similar to 2013 (survival was 93% despite 2013 being an exceptionally low flow year; conditions which would have limited Arctic Char returns in pre-enhancement years). These results suggest that survival following enhancement has improved and that survival is no longer limited by flow levels in the creek.

Additionally, wildlife camera monitoring indicated that predator activity at the boulder garden was lower in 2014 than in 2012 or 2013. Decreased stranding caused by channel modification may have caused wildlife to focus their foraging efforts elsewhere, contributing to overall survival rates observed. The enhancement appears stable and is functioning as it was intended.

ACKNOWLEDGEMENTS

This report was prepared for TMAC Resources Inc. by ERM. Data collection was conducted by Fraser Ross (B.Sc., R.P.Bio.) and Matt Arnegard (Ph.D.). Field assistance was provided by Leonard Wingnek, Colin Kuneluk, Sarah Warnock, Andy Topilak and Ikey Evalik. The report was prepared and written by Fraser Ross and technically reviewed by Kerry Marchinko (Ph.D., R.P.Bio.). The compliance program was coordinated by Cassie Chow (B.E.Sc., EIT) and managed by April Hayward (Ph.D.). Marc Wen (M.Sc., R.P.Bio.) was the Partner in Charge.

Field-related logistics support was provided by TMAC, Great Slave Helicopters, Braden Burry Expediting, and Nuna Logistics.

DORIS NORTH PROJECT

2014 Roberts Lake and Outflow Fish Compliance Monitoring Program

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF PLATES

LIST OF APPENDICES

GLOSSARY AND ABBREVIATIONS

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

BACI	Before After/Control Impact
CI	Confidence Interval, typically set at 95%
DFO	Fisheries and Oceans Canada
ERM	ERM Consultants Canada Ltd.
FDR	False Discovery Rate
FL	Fork Length
FSA	Fisheries Stock Assessment methods package for R data analysis software.
MMER	Metal Mining Effluent Regulations
n	Sample Size
N	Population size
NNLP	No Net Loss Plan
SD	Standard Deviation of the mean
SE	Standard Error of the mean
TIA	Tailings Impoundment Area
TMAC	TMAC Resources Inc.

1. INTRODUCTION

The Doris North Project (the Project) is located on the Hope Bay Belt, an 80 by 20 km property on the south shore of Melville Sound in Nunavut (Figure 1-1). The property consists of a greenstone belt (the Hope Bay Belt) that contains three main gold deposits. The Doris and Madrid deposits are located in the northern portion of the belt, and the Boston deposit is at the southern end. The Project is located on the southern shore of Melville Sound. The nearest communities are Cambridge Bay (Iqaluktuttiaq; 125 km northeast) Umingmaktok (75 km southwest), and Bathurst Inlet (Kingaok; 160 km southwest of the property).

TMAC Resources Inc. (TMAC) acquired the Hope Bay Belt Project from Newmont Corporation in March 2013. The acquisition included exploration and mineral rights over the Hope Bay Belt, including the Doris North Project and its permits, licences and authorizations for development received by previous owners. In late 2012, prior to the sale, the Project was placed into care and maintenance, and was seasonally closed during the winter of 2012/2013. TMAC re-opened the Doris North Camp in March of 2013 for the purposes of conducting site water management and environmental compliance programs and to support exploration activities that have continued through 2014. The project remains in care and maintenance at this time.

Tail Lake was added to Schedule 2 of the Metal Mining Effluent Regulations, SOR/2002-222 on June 19, 2008 pursuant to SOR/2008- 216. A condition of this amendment was that a compensation plan be developed to ensure that no net losses of fish habitat occur. The No Net Loss Plan and its updates (NNLP; Golder 2007; Rescan 2010a, 2010b) proposed the following compensation strategies:

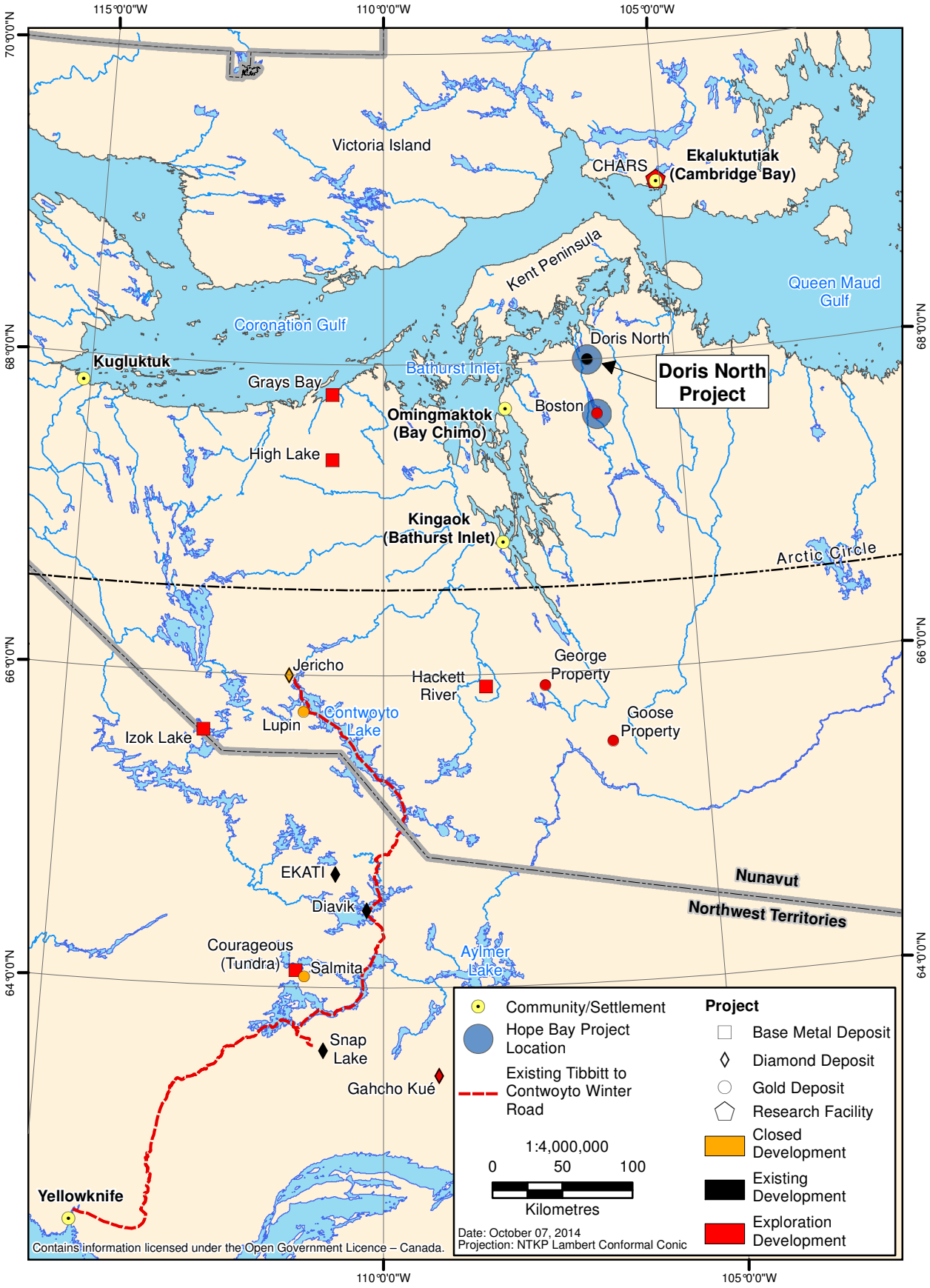
1. Increase the productive capacity of Roberts Lake by improving access of fish, primarily Arctic Char (*Salvelinus alpinus*), to critical overwintering habitat by creating a channel through the Roberts Lake Outflow boulder garden (completed in September 2012; Rescan 2012b);
2. Increase the quantity and quality of rearing habitat for juvenile Arctic Char in Stream E09, a tributary to Roberts Lake, by creating additional pool habitat (completed in July 2012; Rescan 2012b); and
3. Increase the quantity and quality of rearing habitat available to juvenile Lake Trout (*Salvelinus namaycush*) in Windy Lake by installing four rock compensation shoals (completed in April 2011; Rescan 2011).

A separate DFO Fisheries Authorization (NU-02-0117.3) was approved on January 19, 2011, to prescribe compensation requirements for the loss of Tail Lake Outflow through the following strategy:

1. Increase the quantity and quality of rearing habitat available to juvenile Lake Trout (*Salvelinus namaycush*) in Windy Lake by installing two rock compensation shoals (completed in April 2011; Rescan 2011).

Figure 1-1

Doris North Project Location



Two monitoring programs evaluate the efficacy of habitat compensation. The Roberts Lake and Outflow Fish Compliance Monitoring Program measures:

- survival of adult Arctic Char migrating through the enhanced boulder garden;
- the structural integrity of enhanced channels constructed in 2012;
- the quantification of juvenile Arctic Char densities at Stream E09 enhancement site and at reference sites; and
- the structural stability and vegetation recovery at the enhancement site in Stream E09.

The Windy Lake Shoal Compliance Monitoring Program reviews the success of compensation shoals constructed in 2011 by measuring:

- fish habitat value;
- fish community;
- primary and secondary production; and
- structural stability.

This report presents the results of the 2014 Roberts Lake and Outflow Fish Compliance Monitoring Program (the Program), which constitutes the second year of monitoring following the construction of compensatory habitat in Stream E09 and enhancements at the Roberts Lake Outflow boulder garden.

2. 2014 MONITORING PROGRAM OBJECTIVES

The objective of the 2014 Program was to fulfil requirements for monitoring the Roberts Lake and Outflow fish compensation projects. More specifically, the 2014 Program was designed to evaluate changes in the productive capacity of Arctic Char in the Roberts Lake system following the completion of two enhancement projects in 2012. The following specific tasks were set out to meet the overall objective of the monitoring program:

1. quantify juvenile Arctic Char densities at the Stream E09 enhancement site and at reference sites by electrofishing;
2. assess the structural stability and vegetation recovery at the Stream E09 enhancement;
3. quantify adult Arctic Char survival through the enhanced boulder garden at the outflow of Roberts Lake during upstream migration using two infra-red fish counting fences; and
4. assess the structural integrity of the boulder garden enhancement channels constructed in 2012 in Roberts Lake Outflow.

3. METHODS

3.1 ROBERTS LAKE TRIBUTARY FISH MONITORING PROGRAM

3.1.1 Study Design and Project History

Baseline sampling determined that most tributaries to Roberts Lake do not support juvenile Arctic Char due to low summer discharge and the presence of barriers to fish passage (Golder 2007). Stream E09 was identified as the best candidate for enhancement as it has adequate baseline flow throughout the summer and is used by rearing juvenile Arctic Char in low density. In 2012, two pools were constructed upstream in Stream E09 to provide additional juvenile Arctic Char rearing habitat, following the specifications of the NNLP (Golder 2007). To evaluate the successful use of the enhancement site (Site E09-US) by rearing Arctic Char, two reference sites (Sites E09-Mid and E09-DS) were selected downstream within Stream E09 and an additional reference site was selected in Stream E14 (Site E14; Table 3.1-1; Figure 3.1-1).

Table 3.1-1. Roberts Lake Tributary Fish Sampling Locations, Doris North Project, 2014

			UTM		
Tributary	Site	Site Type	Zone	Easting	Northing
E09	DS	Reference	13 W	441103	7559606
E09	Mid	Reference	13 W	441074	7559535
E09	US	Enhancement	13 W	440905	7559406
E14	E14	Reference	13 W	436380	7559560

Notes:
DS = downstream; Mid = middle reach; US = upstream.

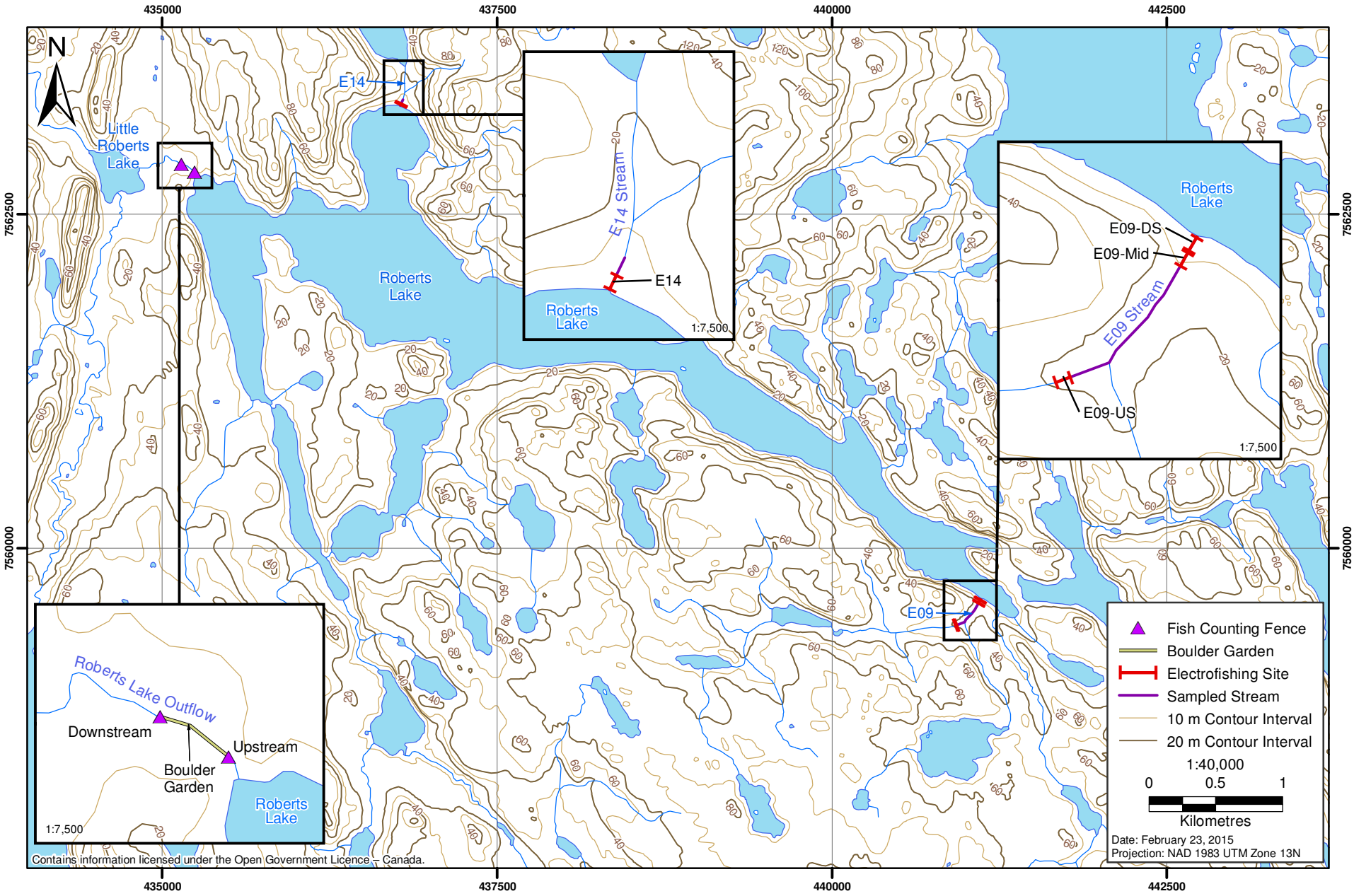
The key measure of success, as outlined in the NNLP (Golder 2007), is to demonstrate that the enhanced pools support "greater densities" of rearing juvenile Arctic Char than adjacent natural sections of stream. This report compares the first two years of post-enhancement monitoring data (2013 and 2014) to baseline data collected from 2011 to 2012.

3.1.2 Fish Community

Monitoring of post-enhancement density of juvenile Arctic Char involved sampling the fish community at enhancement and reference sites three times during 2014 (Appendices 3.1-1 to 3.1-3). Each site was marked in 2010 with metal poles and flagging tape so that the same section of creek would be sampled each year (Figure 3.1-1). Block nets (4 mm mesh size) were erected at the upstream and downstream boundaries of the site, perpendicular to the water flow. Block nets were stretched across the stream channel and rocks were hand-placed to secure the bottom of the net to the streambed. Once the net was secured along the stream channel, the ends were secured using ropes.

Figure 3.1-1

Sampling Locations for the Roberts Lake and Outflow Compliance Monitoring Program, Doris North Project, 2014



Three-pass depletion electrofishing was conducted following Johnson et al. (2007). Backpack electrofishing was conducted at each site by one crew leader using a Smith-Root LR-24 and one dip netter. Anode ring diameter was 28 cm and dip net diameter was 21 cm with 3.2 mm mesh. A systematic sweep sampling approach was conducted at each site, in which the entire wetted width was sampled from the downstream to the upstream site boundary (Stanfield 2005). Electrofishing effort was not pre-determined due to differences in site configuration. However, electrofisher voltage (V), duty cycle (%) and frequency (Hz) settings were consistent among sites. All fish captured were placed immediately in a holding tank for species identification, enumeration, and biological processing; and then released back into the site once all passes were complete.

During the second and third pass events, the same method and approximate level of effort were applied to minimize differences in the probability of detection (capture). Block nets were then removed.

The sampling program was designed so that the assumptions of the closed model removal assessment were met (Johnson et al. 2007). The assumptions were as follows:

- emigration and immigration by fish during the sampling period was negligible;
- all fish within a specified sample group were equally vulnerable to capture during a pass;
- vulnerability to capture of fish in a specified sample group remained constant for each pass (e.g., fish do not become more wary of capture); and
- collection effort and conditions which affect collection efficiency, such as water clarity, remained constant.

3.1.3 Fish Biology

All captured fish were identified, where possible, to species and given a unique sample number. Fork Length (FL) was measured to the nearest 1 mm with a measuring board and weight was measured to the nearest 0.1 g using an electronic scale. Where wounds, tag numbers, or fin clips were noted, this information was recorded for each captured fish (Appendix 3.1-2).

3.1.4 Stream E09 Enhancement Stability Assessment

The design of the enhancement of Roberts Lake tributary Stream E09 called for the creation of pools of at least 4 m² (Golder 2007). The survey completed following construction found that the upstream pool was 5 m² and the downstream pool was 6.7 m², providing a total of 11.7 m² of new habitat. This particular section of Stream E09 is a non-alluvial channel and the presence of natural pools in the same reach suggests that the enhancement pools are unlikely to be subject to infilling (Golder 2007).

The structural stability of each enhancement pool was assessed to determine whether erosion or infilling had occurred. Site photographs were taken and visual signs of erosion were noted if present. Signs of recovery or failure of transplanted vegetation plugs were recorded. The dimensions of each pool were measured using a tape measure and these dimensions were compared to those recorded immediately following construction.

3.1.5 Data Analysis

Population Density in E09 and E14

Population density and 95% confidence intervals (CI) of juvenile Arctic Char in the enhanced section of Stream E09 was estimated from three-pass electrofishing counts using the Carle and Strub method employed using the removal function in the Fisheries Stock Assessment methods (FSA) package available in R 3.0.2 (Carl and Strub 1978, R Core Team 2013). The Carle and Strub method uses maximum likelihood to evaluate density during removal studies and was developed for use when catch data is poor or counts are low, as seen in the Roberts Lake tributary system. A chi-square test was used to test the underlying assumption of the method that capture probability (i.e. catch rate in each successive pass) was equivalent for all passes at each sampling event.

Changes in the population density of juvenile Arctic Char in the enhanced section of Stream E09 were evaluated graphically in two ways: (1) examination of the density estimate and associated 95% CI for each sampling event from each sampling year; and (2) examination of the annual mean density estimate and standard error in each sampling year. The presence of many zeros within a dataset overinflates the error estimate when using conventional linear modeling, preventing robust conclusions from being drawn based on parametric analyses. Thus, due to the presence of zero catches within the dataset, visual examination of the trends in the density estimates and associated error, rather than formal statistical analyses, were used to examine changes in Arctic Char densities at Stream E09 sites through time and compared to the reference stream (E14).

The annual mean population density and standard error were calculated using the three estimates of density made each year of sampling from 2011 through 2014. Although sampling was conducted in 2010, the data was not included in the analyses as the dates of sampling events did not sufficiently overlap with the sampling dates of the monitoring program carried out between 2011 and 2014. Population density often showed a decline through the summer season, preventing meaningful comparisons between 2010 and successive years. In addition, the counts of individuals identified as Arctic Char and Lake Trout were pooled together as a total char count due to the difficulty of reliably distinguishing juveniles of these species, particularly when they are less than 70 mm fork length (FL). Thus, the reported densities represent all char species, both Arctic Char and Lake Trout.

3.1.6 Quality Assurance and Control

Data sheets were reviewed at the end of each field day to ensure that they were complete and data were collected properly. Field notes were transcribed onto electronic spreadsheets, and then checked visually against the field forms and any errors corrected.

3.2 ROBERTS LAKE OUTFLOW FISH MONITORING PROGRAM

3.2.1 Study Design

Anadromous Arctic Char cannot overwinter in Arctic marine environments (Swanson et al. 2010) and must migrate to appropriately deep freshwater winter habitat before freeze-up each year. Roberts Lake is the only lake in the watershed that provides critical overwintering habitat for

anadromous Arctic Char (Swanson et al. 2010). Doris Lake is upstream of a 4 m high impassable waterfall (Golder 2007) and Little Roberts Lake is too small and shallow (approximately 4 m deep) to provide substantial overwintering habitat (ERM Rescan 2014a).

To reach Roberts Lake, upstream migrants must pass through a boulder garden at the lake outflow. Prior to enhancement, movement through this section of the stream was challenging for fish, particularly during periods of low discharge when flow became braided and shallow. The period of lowest discharge in Roberts Creek typically occurs during August and September (ERM Rescan 2014b), concurrent with upstream migrations of anadromous Arctic Char when, historically, a large fraction (21% to 68% in baseline years) of the population perished each year from stranding and predation (Golder 2007).

The NNLP requires a fish passageway through the boulder garden to provide better access for migrants to Roberts Lake (Golder 2007). It was predicted that increased survival of returning adults would lead to an increase in the spawning population and, over time, increase the productive capacity of the lake. According to the 2007 design, the efficacy of the enhancement was to be measured by monitoring the outmigration of Arctic Char smolts in spring before and after enhancement. In 2012, DFO approved a revision to the sampling program so that it focused on monitoring the success of returning adults (G. Williston [DFO] pers. comm. to M. McGurk [Hope Bay Mining Ltd.]). A history outlining differences in the sampling programs among years and the rationale for these changes is provided in Section 3.2.2.

The current monitoring program uses two metrics to assess the effectiveness of habitat enhancement in Roberts Lake Outflow (i.e., successful migration and adult returns; Table 3.2-1). The successful migration metric is evaluated by comparing survival probabilities for adult Arctic Char migrating upstream before and after enhancement to determine whether the constructed channels improve survival through the boulder garden. Survival percentage is determined by enumerating fish both downstream and upstream of the boulder garden on an annual basis (Figure 3.1-1). The adult returns metric is evaluated by comparing total abundance of adult migrants among years to determine whether the enhancements increase the overall anadromous population of Arctic Char.

Table 3.2-1. Roberts Lake Outflow Productivity Capacity Metrics, Doris North Project, 2014

Tier	Metric	Measurement	Predicted Biological Response	Biological Assumptions
Primary	Successful Migration	Calculate survival (%) of adults migrating between the lower and upper boulder garden fences.	The enhanced channel may lead to an immediate increase in survival of fish moving through the boulder garden. This is a direct measure of success of the enhancement.	100% trap capture or sampling efficiencies at both fish fences (or partial but equivalent efficiencies at both fences).
Secondary	Adult Returns	Calculate abundance of Arctic Char migrating through the upper boulder garden fence.	Over time, a decrease in boulder garden mortality may lead to an increase in the total number of fish returning each year. This effect may be non-detectable or slight immediately after the enhancement. The magnitude of the effect may begin growing at a faster rate when the earliest post-enhancement smolts recruited into the population undertake their first outmigration and return to Roberts Lake (four or more years post-hatching).	Roberts Lake is not at productive capacity for smolt production. Constant annual marine survival of adults. Constant smoltification percentage of char population. Sampling period covers the entire migration period or a comparable portion among years.

The second metric for assessing the habitat enhancement's efficacy — adult returns — is expected to rise slowly during the first few years post-enhancement. Any increase in Arctic Char abundance during this initial period would only arise from the expected increase in adult survival rate while ascending the boulder garden. Generally, Arctic Char smolts are four to nine years old when they make their first seaward migration (Scott and Crossman 1973; Radtke et al., 1996; Gulseth and Nilssen, 2001). In the Roberts Lake watershed, first-time Arctic Char outmigrants range in age from three to six years (mean = four years; Swanson 2010). Thus, spring 2013 was the earliest possible season in which post-enhancement juveniles could have been recruited into the Roberts Lake Arctic Char population from adult spawning. Though the earliest that any of these fish would be ready to undertake their first outmigration to the ocean is Spring 2016, a surge in the number of post-enhancement Arctic Char returning to Roberts Lake is not expected for an additional two to three years. Consequently, a formal evaluation of a change in abundance of returning Arctic Char will begin in 2017 or 2018; until that time, successful migration will be the key metric used to measure the success of the boulder garden enhancement.

The habitat enhancement to the boulder garden in Roberts Lake Outflow was completed in the fall of 2012, following the conclusion of pre-enhancement data collection for that year (Rescan 2012b). This report presents the results from the second year of post-enhancement monitoring of successful migration of Arctic Char survival.

3.2.2 Program History

Fish fences have operated at the Roberts Lake Outflow boulder garden for eleven years, between 2002 and 2014. The number of fences, methods used and locations of fences have changed throughout the development of the monitoring program. Table 3.2-2 summarizes the dates, locations and direction of capture of fish fences installed from 2002 to 2014.

In 2002, the upstream migration of adult Arctic Char was monitored using one fish fence upstream of the boulder garden. The objective was to enumerate the upstream migration of returning Arctic Char into Roberts Lake in August and early September.

The fence was relocated downstream of the boulder garden in 2003, and a modified fyke net was installed immediately above the boulder garden. The fyke net was installed so that it functioned in the same manner as the fish fence; there was a central trap and two wings that stretched from the trap to each shore, blocking the full width of the channel. This change was made so that survival through the boulder garden could be determined, along with the total number of fish entering Roberts Lake.

In 2004 and 2005 two fish fences were installed each year; one upstream and one downstream of the boulder garden. Again, the purpose was to assess survival through the boulder garden, along with the total number of fish entering Roberts Lake.

In 2006 the program was amended so that data collection would meet the objectives of the draft NNLP. Monitoring of adult Arctic Char migrating into Roberts Lake during the low-discharge period of August and early September was abandoned. Monitoring focused on the abundance of char smolts migrating out of Roberts Lake to the sea during the high-discharge period of late June and early July. One fence was installed downstream of the boulder garden that caught downstream migrants. This sampling program was repeated in 2007, and no fish fences were installed in 2008 or 2009.

Table 3.2-2. Summary of Sampling at Roberts Lake Outflow, Doris North Project, 2002 to 2014

Year	Operation Dates	Fence Type	Fish Fence Location Relative to Boulder Garden (A/B)	Capture Direction (D/U)	Data Source
2002	Aug 16 - Aug 30	Manual Trap	A	U	RL&L/ Golder (2003a)
2003	Aug 7 - Sept 8	Manual Trap	A/B	U	RL&L/ Golder (2003b)
2004	Aug 9 - Sept 8	Manual Trap	A/B	U	Golder (2005)
2005	Aug 4 - Sept 12	Manual Trap	A/B	U	Golder (2006)
2006	June 19 – July 22	Manual Trap	B	D	Golder (2008a)
2007	June 28 – July 26	Manual Trap	B	D	Golder (2008b)
2010	June 29 - Aug 22	Manual Trap	A/B	D/U	Rescan (2011)
2011	July 14 - Aug 9	Manual Trap	B	D/U	Rescan (2012c)
2012	June 29 - Aug 30	Manual Trap	A/B	D/U	Rescan (2013)
2013	July 17 – Sep 7	Automated Counter	A/B	D/U	ERM Rescan (2014c)
2014	July 12 – Sep 6	Automated Counter	A/B	D/U	This report

Notes:
A = fish fence above (i.e., upstream of) boulder garden; B = fish fence below (i.e., downstream of) boulder garden; U = fish migrating upstream; D = fish migrating downstream.
Grey highlight indicates years that were used for survival estimates as the data were comparable to 2014 data.

In 2010, the program was amended so that fish fences were installed both upstream and downstream of the boulder garden and so that upstream and downstream migrating fish were captured at each fence. The fences were installed at the end of June to catch the downstream migration of smolts and the plan was to operate the fences until mid-September, when the upstream adult migration occurs. However, persistent grizzly bear (*Ursus arctos horribilis*) activity in the boulder garden and associated safety resulted in the termination of the fence program on August 22, 2010.

The sampling approach was changed in 2011, following the bear encounters that occurred toward the end of the 2010 field season. One fence was installed downstream of the boulder garden in Roberts Lake Outflow during the freshet period to monitor smolt outmigration, following the approach proposed in the NNLP. The program was scheduled to end before the main upstream return of adult char to minimize conflict with bears. However, 2011 was the highest freshet flow year on record for Roberts Lake Outflow. The conditions delayed fence installation by several weeks causing the majority of outmigrants to be missed.

Further modifications to the program were proposed prior to the 2012 field season due to the low number of smolts captured 2011. A letter sent from HBML to DFO dated June 2, 2012 requested that the program be shifted back to monitoring only adult survival for the following scientific, human safety, and practical reasons. Smolt outmigration peaks during spring freshet, yet installing and maintaining a fish fence during that time of year is logistically difficult and potentially dangerous. In addition, smolt enumeration only serves as an indirect measure of the effectiveness of the habitat

enhancement, since smolt abundance is strongly influenced by other factors, including population dynamics, marine survival, and lake carrying capacity. Returning adult individuals are in the life stage that is most likely to benefit directly from the habitat enhancement to Roberts Lake Outflow, as their passage through the boulder garden is most likely to be restricted during periods of low discharge.

In 2012, both smolt outmigration and adult upstream migration were monitored. Wildlife encounters were frequent during the latter portion of the monitoring program, when field crews had to be evacuated from site by helicopter on several occasions. Consequently, additional modifications to the methods were made prior to the 2013 field season.

In 2013, the trap capture approach for counting fish was replaced with the Vaki Riverwatcher system, which allows fish passage through a fish fence to be monitored remotely. The system automatically monitors the movements of individual fish through a fish passing chute using infra-red scanners and a high-resolution video camera to identify the species, length, and direction of travel for each passing individual. In contrast, the earlier trap count method required biologists to make daily onsite counts of fish that were entrapped in holding cages as they attempted to traverse one of the fish fences. Aside from the hardware that is specific to either method, fish fence design and construction has been held constant since 2010. This consistency helps minimize the between-fence and among-year variation in detection probability that could arise from sources other than methods of fish enumeration, especially given the complete enumeration approach being used to monitoring anadromous Arctic Char for extended periods of time. These modifications to the monitoring program were approved by DFO prior to the 2013 field season (G. Williston [DFO] pers. comm. to A. Holzapfel [Hope Bay Mining Ltd.]).

Because a rapid transition in fish counting methods was needed to minimize encounters between humans and potentially dangerous wildlife, there were no years in which the two counting methods were used simultaneously. Thus, it was not possible to compare fish detection probabilities between the two sampling methods. Based on other studies, however, it is known that fish detection probability for the trap capture approach may be strongly dependent on efficiencies of the traps used for this purpose, which can, in turn, vary according to flow rate, time of day, size of individuals, and species of fish (Roni, 2005). According to the available data, Vaki Riverwatcher systems have detection probabilities that are slightly less than detection probabilities obtained by trap counts (Pyper et al., 2006; Baumgartner et al., 2012). The most accurate fish counts from the Riverwatcher system seem to be produced at low densities of migrating fish (Baumgartner et al., 2012), such as the densities of anadromous Arctic Char observed in Roberts Lake Outflow over the past several years (e.g., Rescan, 2011, 2012b, 2013). Changes in fish enumeration methods due to wildlife safety concerns are not expected to affect the validity of the assessment of the habitat enhancement's efficacy with respect to the key metric for success, successful migration, which can be made by comparing percentage survival before and after the enhancement. Enumeration methods were the same at the downstream and upstream fish fences in any given year in which data were collected on percentage survival, which largely normalizes the data across the slight to moderate differences in detection probability between methods.

Similarly, changes in fish enumeration methods through time are not expected to affect the validity of the assessment of the habitat enhancement's efficacy with respect to adult returns because the

post-enhancement enumeration method tends to underestimate fish counts relative to the pre-enhancement method (trap counts), while the boulder garden enhancement is expected to eventually increase the abundance of anadromous Arctic Char in Roberts Lake relative to the pre-enhancement period. Thus, a finding of a significant increase in post-enhancement Arctic Char abundance would serve as evidence of a successful habitat enhancement.

3.2.3 Successful Migration of Arctic Char

Arctic Char Enumeration

Successful migration of Arctic Char traversing the boulder garden at Roberts Lake Outflow was monitored in 2014 using two Vaki Riverwatchers, one installed upstream and one installed downstream of this potential barrier to fish migration (Table 3.2-3). The Riverwatcher system consists of an infra-red scanner, a high-resolution camera, and an ultra-violet lighting system powered by four 120 W solar panels and 12 6 V deep cycle batteries (Plate 3.2-1). As a fish swims through the Riverwatcher, the infra-red scanner calculates total length and direction of travel. When the scanner is triggered, the video camera is activated and captures a video that is used at a later date for species identification and quality control. The fish counters began operating on July 12 and were uninstalled on September 6; the underwater lights allow the system to operate 24 hours a day. Between July 23 and August 4 (21% of the sample period) the underwater video camera was accidentally disabled by field crews so no videos were recorded; however, the scanner remained in operation and silhouettes were generated so each fish record was able to be validated. This occurred prior to the main migration in mid to late August. Additional measures will be implemented in 2015 to prevent this from recurring.

Plate 3.2-1. Solar panels providing power to the Vaki Riverwatcher downstream of the boulder garden, July 12, 2014.

Table 3.2-3. Roberts Lake Outflow Fish Counting Fence Locations, Doris North Project, 2014

Fish Fence	UTM		
	Zone	Easting	Northing
Lower	13 W	435142	7562877
Upper	13 W	435225	7562806

Each fish counter was installed in the centre of the channel and the infra-red scanner was orientated perpendicular to the direction of flow. Four wings (two on each side) were constructed between each Riverwatcher and the stream banks so that fish could not pass through undetected (Plate 3.2-2). Two wings were installed on each side to prevent fish passage if one wing failed. The wings consisted of aluminum frames with removable conduit rods (1.8 cm diameter) spaced 1.3 cm apart, and were reinforced with galvanized mesh hardware cloth and sand bags. Wooden "A" frames supported the panels and were held in position with large weighted buckets. An electric fence was constructed around the perimeter of the work area to prevent damage from bears.

Plate 3.2-2. Fish fence upstream of the boulder garden on July 12, 2014.

The scanner and video recorder simultaneously logged the date, time, direction, and fish length for each passing fish and paired these data with a video recording to be used for species identification (Appendix 3.2-1). Data and videos were saved on computers located on site in weather-proof containers next to the stream. In addition, the Riverwatchers continuously logged water temperature throughout the sampling period.

Field crews made site visits every five to seven days throughout the monitoring period to verify that the scanner and computer were operational. Crews downloaded data, checked the battery status, cleaned the scanner and underwater video tunnel, checked and cleaned the fence wings, and made notes of wildlife activity in the area.

Identification of Adult Arctic Char

Arctic Char smolts (first-time migrants to seawater) are generally classified as individuals 150 to 250 mm in length (Scott and Crossman 1973; Johnson 1980), but in the Roberts Lake watershed, Arctic Char smolts can grow as large as 350 mm prior to their first ocean migration (Swanson 2010; Golder 2008b). In this study, fish larger than 350 mm were classified as adults and were identified from the video recordings. Species was not assigned to fish smaller than 350 mm, because taxonomic identification from video was either inconclusive or impossible.

Predator Activity

Predator activity at the boulder garden has been monitored since 2012 using motion sensing cameras (Rescan 2013). In 2014, three motion sensing wildlife cameras (Bushnell Trail Sentry) were installed from July 10 to September 12 to quantify the frequency of predator visits (Appendix 3.2-2).

Stream Hydrology

A hydrometric station has been used to track discharge in Roberts Lake Outflow since 2003 (ERM Rescan 2014b). The 2014 station consisted of a pressure transducer paired with a data logger (model 0-5 psi vented Aquistar PT-2X Smart Sensor® [Instrumentation Northwest Inc.]). The transducer continuously sampled water level and these data were recorded by the data logger at 10 minute intervals. Full details of the hydrology monitoring program including data processing methods are described in ERM Rescan (2014b).

3.2.4 Enhancement Stability Assessment

Visual stability assessments were completed on July 12 and September 7, 2014. The same personnel that completed construction in 2012 inspected each channel, looking for signs of infilling or erosion. Representative photographs were taken of each channel to document the structural integrity.

Section 4.1.2 of the NNLP specifies the creation of a clear flow path 12 to 15 m in length through the "stranding zone" in the middle of the boulder garden in Roberts Lake Outflow. In place of a single channel, four channels were built with a total length of 69 m between September 3 and 10, 2012 (Rescan 2012a). The three additional channels provide alternative routes for fish if the structural integrity of any one channel was to deteriorate over time.

3.2.5 Data Analysis

Boulder Garden Successful Migration

Successful migration (percent survival, %) of adult fish moving upstream through the boulder garden was calculated for each year in which both an upstream and a downstream fence were in operation (Table 3.2-1).

Fish that passed the lower fence toward the end of the program may have had inadequate time to reach the upper fence before sampling ended. A portion of these fish would have survived but would have been classified as mortalities if they had not passed the upper fence at the end of the sampling period (causing an overestimation of mortality).

To accommodate for the travel time between fences, an appropriate end date for the lower fence was calculated. This was established by calculating the total number of days required for 95% of fish to pass between the fences across all pre-enhancement years. This value equaled seven days. This means that 95% of fish successfully passed upstream from one fence to the other within seven days and that fish not passing through within seven days suffered mortality. This approach assumes that 5% of the mortalities may have successfully migrated through the boulder garden after seven days and is analogous to a 5% error rate (or alpha 0.05).

The same seven day window was used to calculate the start date for the upstream fence. If simultaneous start dates were used for both fences, fish between the fences at the start would only be counted at the upstream fence, causing an overestimation of survival.

Survival rates from baseline years were recalculated following these methods, which generally resulted in a slight increase in survival (less than 5%) estimates for most baseline years. As an example, if fences were installed July 1 and removed September 1, then the enumeration interval for the downstream fence would be July 1 to August 26, whereas the enumeration interval for the upstream fence would be July 7 to September 1.

Successful migration (%) through the boulder garden was calculated using the equation:

*Successful Migration = net number of fish caught in the upstream fence / net number of fish caught in the lower fence * 100%*

In baseline years, the net number of fish caught at both fences was calculated by direct enumeration of individually tagged fish passing upstream in each fence. Thus, an individual was counted moving upstream once, even if it was observed to pass upstream and downstream at a single fence multiple times. Beginning in 2013 an extra step in this calculation was required, because individual fish were not tagged, resulting in an inability to track individuals moving two or more times (upstream and downstream) through a single fence. To account for this, the net number of fish in both fences was calculated by subtracting the number of char moving downstream from the number moving upstream separately for each fence. Subsequent calculation of successful migration was completed in the same manner as baseline years.

Species Identification and Enumeration

Underwater video was used to determine the species of each fish recorded by the Vaki Riverwatcher. Silhouettes generated for each record were reviewed using the Winari software to determine whether the scanner was triggered by a fish or if it was a false trigger (Plate 3.2-3). Where the silhouette was unclear, the corresponding video recording was reviewed to confirm whether a fish had triggered the scanner. A subsample of 20% of all fish records (previously confirmed from silhouettes) was reviewed to determine the ratio of species in the sample. To ensure an even distribution of samples were selected from throughout the sample period, approximately 20% of videos from each day were reviewed. Videos were selected from within any day using the random number generator "runif" function in R. As the Riverwatcher uses both white lights and infra-red lights to illuminate passing fish, data were able to be collected 24 hours a day so no diurnal bias is introduced.

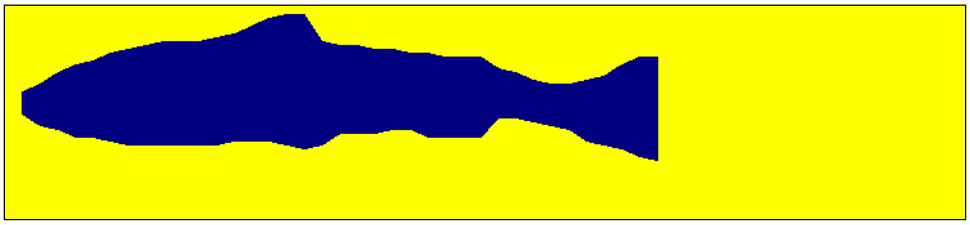


Plate 3.2-3. Silhouette of a fish swimming upstream on July 24, 2014.

Following video review, species was assigned and unusual marks or behavioural observations were noted (Plates 3.2-4 and 3.2-5).

Plate 3.2-4. An adult Arctic Char swims upstream through the Vaki Riverwatcher located upstream of the boulder garden on July 15, 2014.

Plate 3.2-5. A Lake Trout swims upstream on July 16, 2014.

Predator Activity Review

Photos from three motion sensing wildlife cameras were reviewed to determine the occurrence of predator activity. Data were entered to a Microsoft Excel spreadsheet documenting the date and time of occurrence of bear and wolf activity. Where time overlapped between the three cameras, predator activity was documented as a singular occurrence. Similarly, in instances where more than one predator was observed in a group (i.e. mother and cubs), they were documented as singular observation.

Discharge Calculations

Rating curves were established for Roberts Lake Outflow hydrologic station so that water level data could be converted into a continuous discharge time series (i.e., a hydrograph). Rating curves are hydraulic functions expressed as a parabolic equation of the form:

$$Q = C\,(h - a)^{b}$$

where Q is the discharge (m^3/s), C and b are regression coefficients, h is the stage (water level in m), and a is the stage at zero flow (datum correction in m). Data and discharge calculations are presented in ERM Rescan (2014b).

Statistical Analysis

The post-enhancement survival rate (2014) was compared to baseline survival rate (pooled among years) and then to each baseline year separately (2003, 2004, 2005, 2010, and 2012) using the χ^2 squared test for independence. For comparisons to each baseline year, each test was carried out

using a fixed significance level of $\alpha = 0.05$, but was then adjusted to account for the increase in error rate caused by multiple testing using the False Discovery Rate (FDR; Whitlock and Schluter 2009).

Beta regression was used to examine the relationship between Arctic Char survival through the boulder garden and flow (mean discharge during the sampling period) for pre-enhancement years. This analysis departs from that used in 2014 (which used linear regression) because the dependent variable (survival) is a proportion bounded by the unit interval (0,1). Beta regression was developed as a maximum likelihood fitting method to model the association of a continuous, proportional dependent variable to one or more independent variables using the beta distribution (Ferrari and Cribari-Neto 2004). This analysis was conducted using the betareg function within the "betareg" package in R.

SigmaPlot 12.0 software and R 3.0.2 (R Core Team 2013) were used for statistical analyses. For all statistical analysis, significance was accepted at $\alpha = 0.05$, except where multiple testing was performed as indicated above.

3.2.6 Quality Assurance and Control

Following the initial assessment of underwater videos, a second fish biologist randomly selected and reviewed 20% of the videos to check the accuracy of species identification. Differences in assigned species accounted for less than 1% of entries.

4. RESULTS AND DISCUSSION

4.1 ROBERTS LAKE TRIBUTARY FISH MONITORING PROGRAM

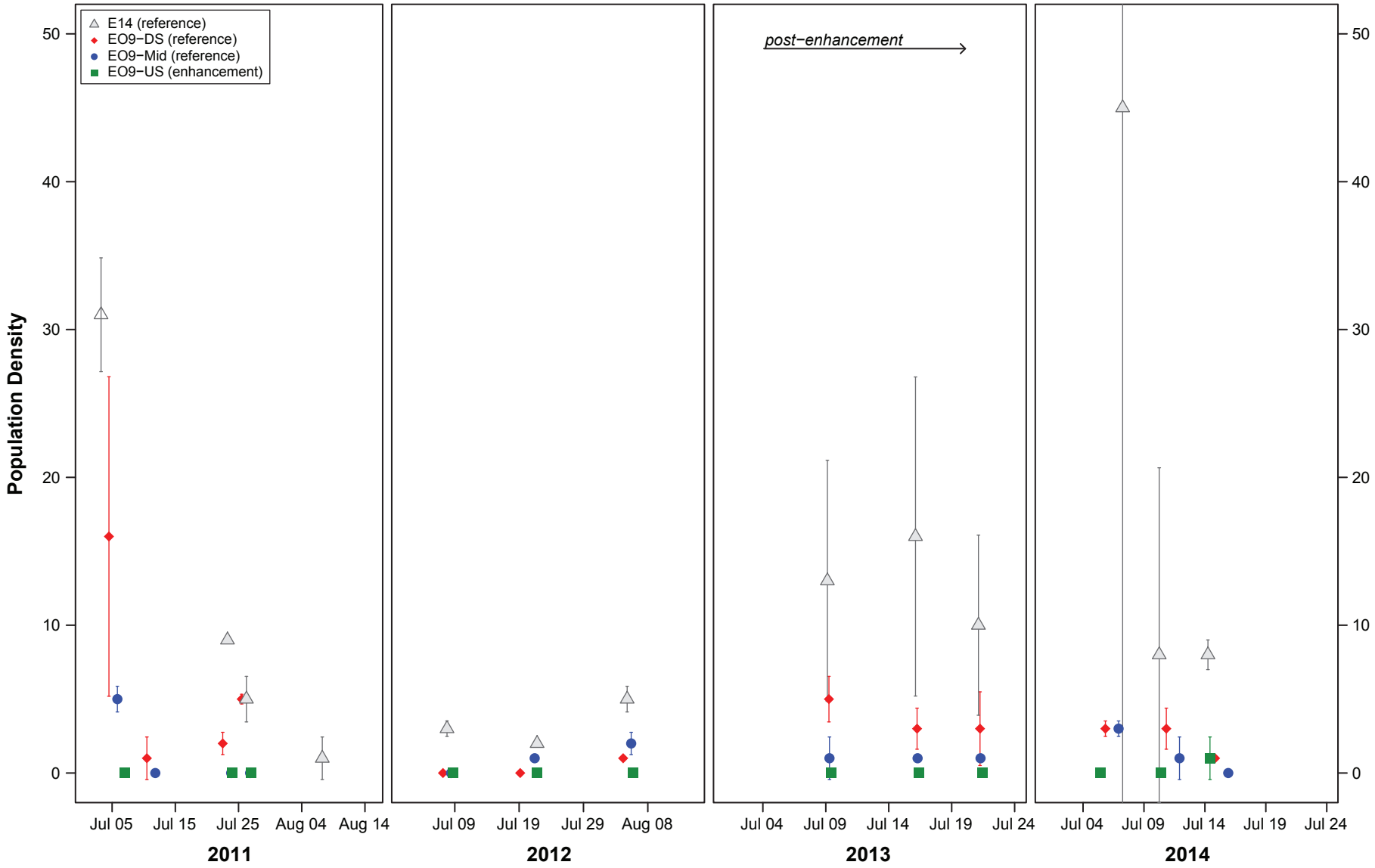
4.1.1 Comparing Trends between Reference and Enhanced Sites within Stream E09

The population density of juvenile char (Arctic Char and Lake Trout) in stream E09 shows similar trends (with some fluctuation) through all sampling years (Figure 4.1-1). Overall, the reference site nearest to Roberts Lake (E09-DS) supports the highest densities within the stream when examining each sampling event (range 0 to 16) and the annual average (range 0.33 to 6; Figures 1 and 2; Appendix 3.1-1). The mid-reach reference site on E09 (E09-Mid) supported intermediate densities (density per sampling event ranged 0 to 5; annual mean ranged 1 to 1.33), followed by the enhancement site (E09-US) with zero density (2011 to 2013), and low density in 2014 (density per sampling event ranged 0 to 1; annual mean was 0.33). 2014 was the first year that a juvenile Arctic Char (one individual) was captured at the enhancement site (E09-US; Plate 4.1-1).

Plate 4.1-1. Juvenile Arctic Char captured in the E09-US enhancement ponds, 15 July 2014.

Figure 4.1-1

Daily Population Density Estimates of Juvenile Char (Arctic Char and Lake Trout) at Enhancement and Reference Sites, 2011 to 2014



Note: Error bars represent 95% CI.

4.1.2 Comparing Trends between Reference Stream E14 and Enhanced Stream E09

The density of juvenile char at the reference stream E14 was consistently higher than densities observed at all sites at E09 in 2014, similar to the trends observed in all previous monitoring years (Figures 4.1-1 and 4.1-2). Density estimates at Stream E14 ranged from 1 to 45 per sampling event and from 3.34 to 20.34 annually. By comparing baseline (pre-enhancement 2011-2012) data from Stream E14 and Stream E09 reference site E09-DS (both sites located near the junction of Roberts Lake and the respective tributary) it appears that Stream E14 naturally supports higher densities of juvenile char than Stream E09. Indeed, Stream E14 is very near the migratory access point to Roberts Lake (Roberts Lake Outflow), located over 4 km closer than Stream E09, and so it may be accessed more readily by char in Roberts Lake. Moreover, by comparing baseline (2011-2012) to post-enhancement years (2013-2014; Figures 4.1-1 and 4.1-2), it appears that densities in E14 have increased, whereas densities in E09 have remained more consistent through time. Though only two years of post-enhancement data are available, this trend indicates that E14 is recruiting higher densities of juvenile char than during baseline years, possibly as a result of the increased survival through the boulder garden.

4.1.3 Enhancement Stability Assessment

The two juvenile Arctic Char rearing pools in Stream E09 were similar in size in 2014 as to when they were constructed in 2012 (Table 4.1-1; Plate 4.1-2). They currently have a total area of 11.5 m², exceeding the requirements of the approved design by 3.5 m² (Golder 2007). There were no signs of structural instabilities; no infilling or erosion was observed (Plate 4.1-2). Transplanted and riparian vegetation has recovered well; no dead or dying plants were observed.

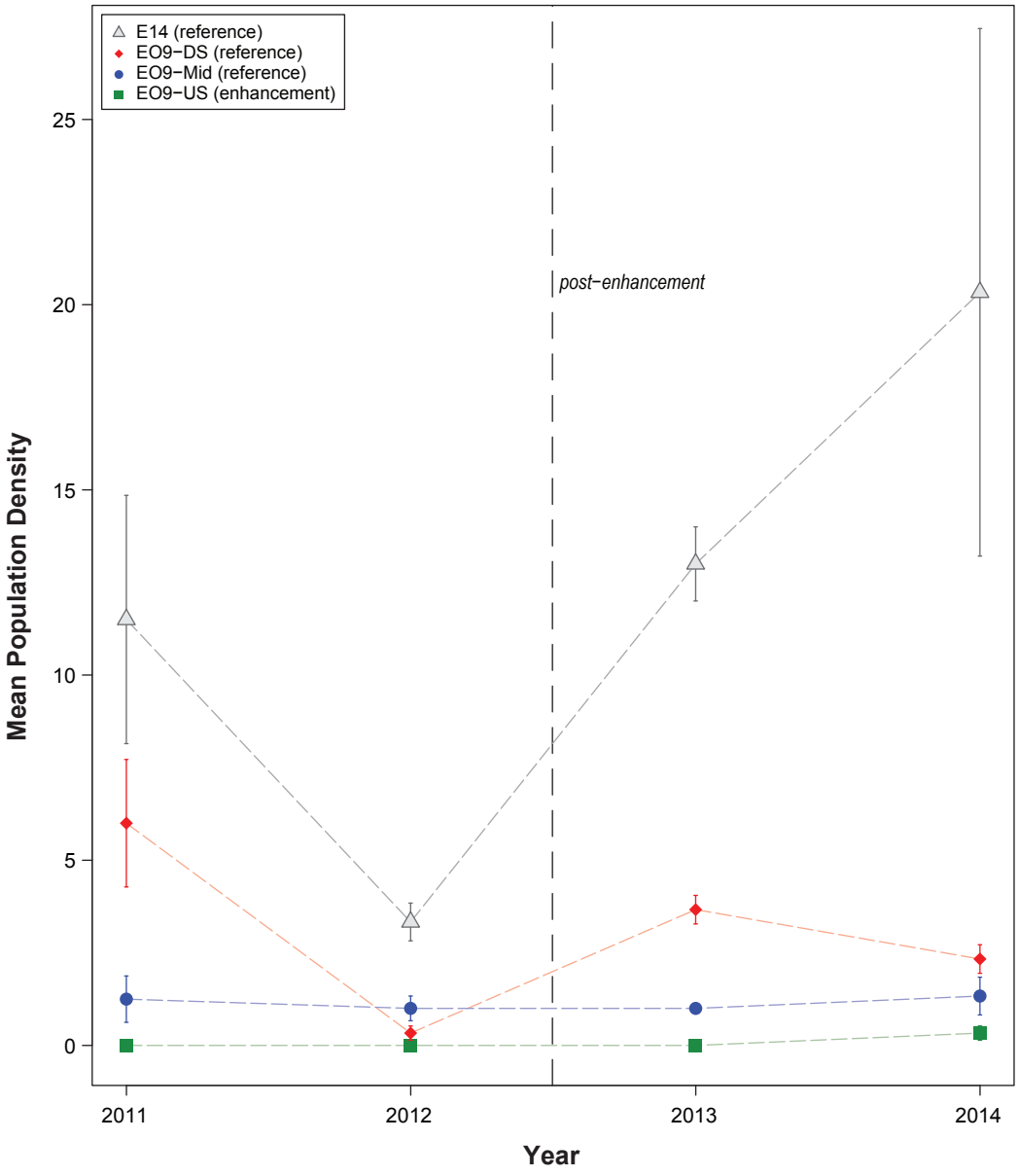
Table 4.1-1. Dimensions of Stream E09 Enhancement Pools in 2012 and 2013

Year	Upstream Pool Area (m²)	Mean Upstream Pool Depth (mm)	Downstream Pool Area (m²)	Mean Upstream Pool Depth (mm)	Total Pool Area (m²)
2012	5	190	6.7	180	11.7
2013	4.6	220	6.9	200	11.5
2014	4.9	211	6.6	197	11.5

The channel area was poorly defined and consisted of dense vegetation and braided flow prior to enhancement. In 2012, a small channel was created upstream and downstream of the pools to connect them to the nearest naturally occurring pools. The new channel remained stable and should provide improved connectivity in this reach.

Figure 4.1-2

Mean Annual Population Density Estimates of Juvenile Char (Arctic Char and Lake Trout) at Enhancement and Reference Sites in Stream E09, 2011 to 2014



Note: Error bars represent standard error.

Plate 4.1-2. Upstream juvenile Arctic Char enhancement pool, Stream E09, 11 July 2014.

4.1.4 Summary

In summary, 2014 was the first year in which a juvenile Arctic Char has been captured utilizing the enhancement site in Stream E09 (E09-US). Although the densities of fish in Stream E09 differ from the reference site in Stream E14, the presence of fish in Site E09-US indicates the enhanced stream is functioning as rearing habitat for Arctic Char. Comparisons between Stream E09 and Stream E14 suggest that Stream E14 continues to support higher densities of juvenile Arctic Char and the removal of the boulder garden from Roberts Lake Outflow may yield greater positive effects on juvenile densities in Stream E14 than in Stream E09. This is possibly due to the close proximity of Stream E14 to the migratory route to Roberts Bay feeding grounds and differences in stream morphology and habitat between Stream E14 and Stream E09.

The E09 enhancement pools and associated channels were in good condition. The total area of potential habitat provided by the pools exceeded requirements set out in the NNLP (Golder 2007) and vegetation had recovered well.

4.2 ROBERTS LAKE OUTFLOW FISH MONITORING PROGRAM

4.2.1 2014 Arctic Char Monitoring

A sum of 1,519 records of fish movement (including multiple movements by any one individual) were identified in underwater video recordings from two infra-red fish counting fences at Roberts Lake Outflow in 2014. Appendix 3.2-1 lists species, date, direction of migration, and total length for all fish records.

The number of Arctic Char migrating upstream per day at the fish fence downstream of the boulder garden ranged between 0 and 22, while the range was from 0 to 26 at the upstream fence (Figure 4.2-1). The run was trimodal; the first mode began on July 23 and lasted about three days. This peak occurred immediately following an increase in discharge in the creek, and so may have been caused by fish responding to improved flow conditions. The second, and dominant, mode occurred between August 3 and 20, containing 61% of the run. The third mode occurred between August 24 and 29, and was the smallest of the three peaks (Figure 4.2-1).

4.2.2 Pre- and Post-enhancement Survival

Successful migration through the boulder garden in 2014 was 94%: significantly greater when compared to combined survival prior to enhancement ($\chi^2_{(1,5)} = 6.26$, $P = 0.01$). In addition, combined survival from both years of post-enhancement monitoring was significantly greater than combined survival prior to enhancement ($\chi^2_{(1,5)} = 6.06$, $P = 0.01$). A total of 219 of 233 Arctic Char successfully migrated through the boulder garden in 2014 (Table 4.2-1). The remaining 14 fish (6%) were unaccounted for, possibly dying as a result of stranding in the boulder garden or predation.

Table 4.2-1. Summary of Successful Migration of Arctic Char Passing Upstream through Roberts Lake Outflow, Doris North Project, 2003 to 2014

Year	Sampling Period	Mean Flow (m^3/s)	Total Fish	Successful Fish	Unsuccessful Fish	Successful Migration (%)
Pre-enhancement						
2003	August 7 - August 30	0.67	286	221	65	77
2004	August 9 - September 2	0.15	106	34	72	32
2005	August 4 - September 12	0.57	110	52	58	47
2010	June 30 - August 17	1.32	47	37	10	79
2012	July 30 - August 23	0.74	144	83	61	58
Average	**2003 to 2012**	**0.69**	**139**	**85**	**53**	**62**
Post-enhancement						
2013	July 18 – September 6	0.29	226	211	15	93
2014	July 12 – September 6	0.97	233	219	14	94
Average	**2013 to 2014**	**0.63**	**230**	**215**	**15**	**93**

Successful migration in 2014 was greater than in any year of baseline sampling (Table 4.2-1). To further examine which particular pre-enhancement years were significantly lower in survival than 2014, each pre-enhancement year was tested against survival in 2014 separately. These comparisons showed that the key metric for measuring enhancement success, successful migration, was significantly greater in 2014 than three of the five years of pre-enhancement data (greater than 2012, 2005, and 2004; Table 4.2-2), though survival in 2014 was always higher than pre-enhancement years. Similar results were observed when successful migration in 2013 was compared to pre-enhancement years (ERM Rescan 2014c).

Figure 4.2-1

Water Temperature, Discharge and Number of Arctic Char per Day in Roberts Lake Outflow, Doris North Project, 2014

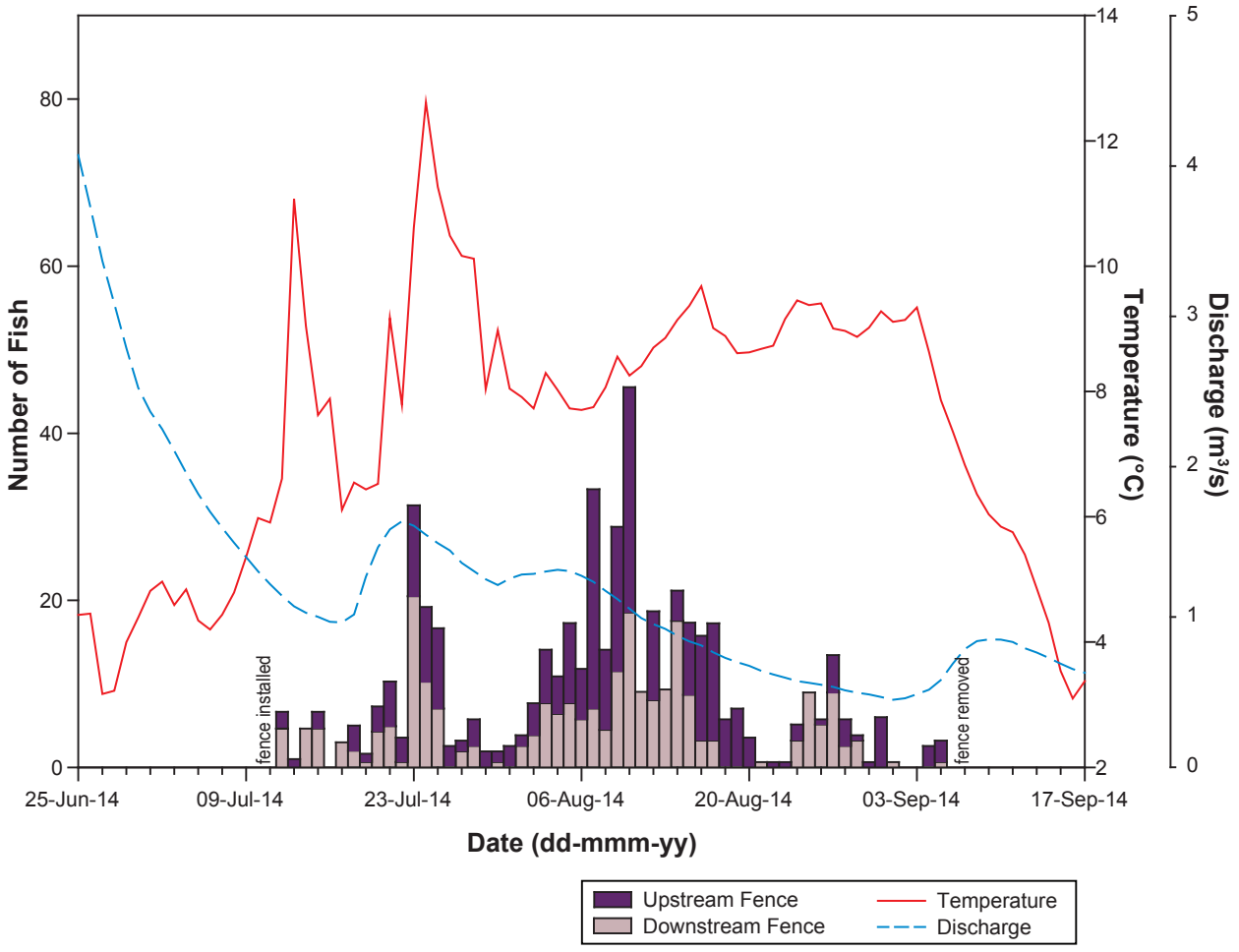


Table 4.2-2. Comparisons of Post-enhancement Survival to Each Pre-enhancement Year for Arctic Char in Roberts Lake Outflow, Doris North Project, 2003 to 2014

Comparison (2014 vs.)	$\chi 2$	Degrees of Freedom	FDR Adjusted P Value
2003	2.08	1	0.19
2004	24.53	1	<0.001
2005	12.28	1	0.001
2010	0.39	1	0.53
2012	8.17	1	<0.01

Note:
P values were adjusted using the False Discovery Rate to account for multiple comparisons (Whitlock and Schluter 2009).

Variability in yearly successful migration was high in pre-enhancement years, ranging from 32% to 79% (Table 4.2-1; Note: these percentages only reflect survival during the sampling interval, and not the entire run for that year, as outlined in Section 3.2). Combined pre-enhancement survival was 62%, with a total of 693 adult Arctic Char passing the fence downstream of the boulder garden and 427 upstream over 216 days of sampling in five years. Since enhancement, survival has been similar in each of the two years of monitoring; survival was 93% in 2013 and 94% in 2014. A total of 430 out of 459 Arctic Char successfully traversed the boulder garden in 106 days of sampling over two years.

The numbers of Arctic Char migrating into Roberts Lake in each year are shown by date along with temperature and discharge in Figures 4.2-2 to 4.2-5. From these figures it appears that the main upstream migration period occurs during the latter half of August, though timing is somewhat variable among years. Annual discharge peaks each year in June, when melting snow and ice create a spring freshet. Discharge typically declines monotonically following freshet and when the Arctic Char migration peaks in late August discharge is at or close to its lowest level of the year.

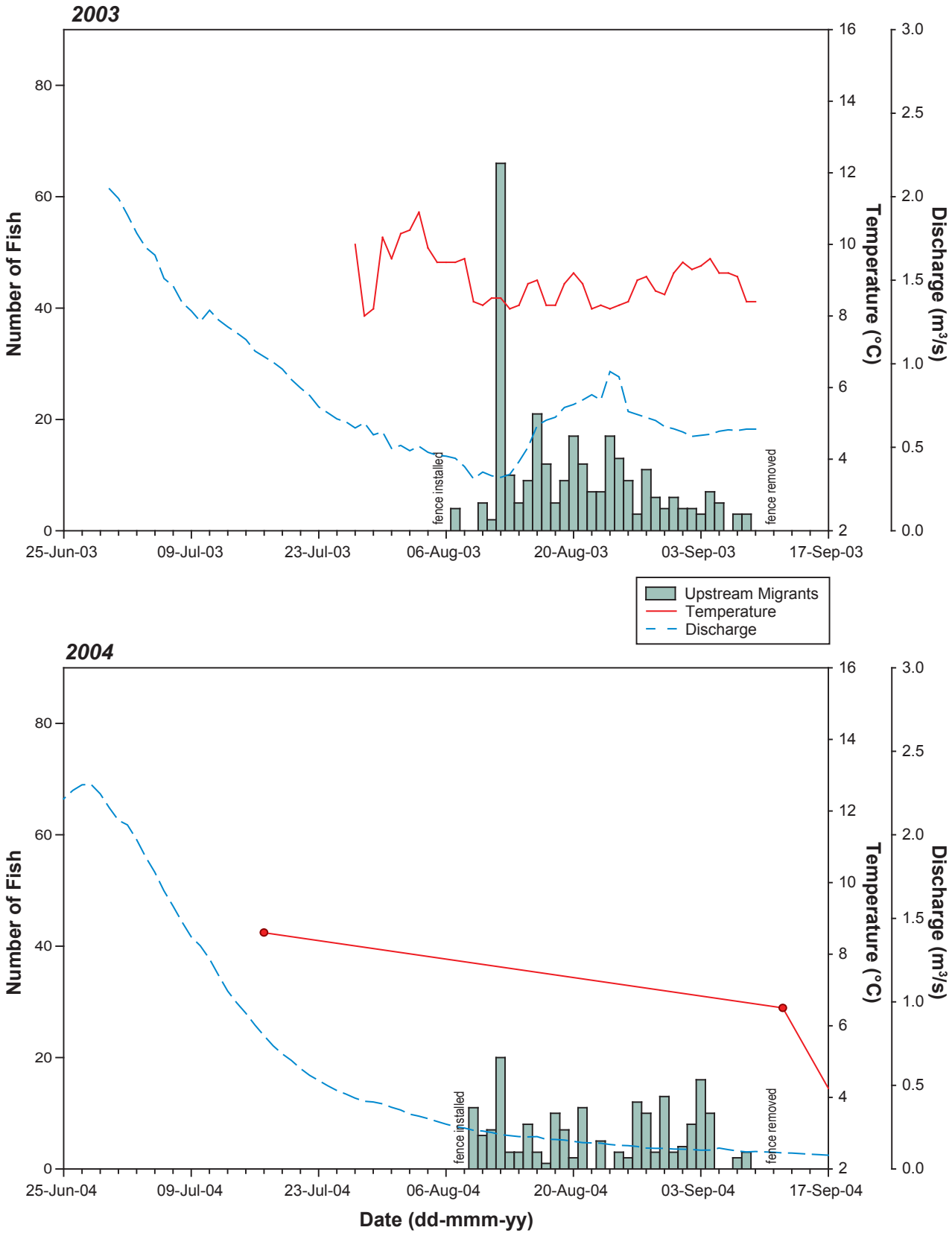
Although flow is not strongly associated with daily migration, the mean annual flow rate showed a significant relationship with survival through the boulder garden in pre-enhancement years ($Z_{(slope)} = 3.21$, $P = 0.001$, $R^2 = 0.703$). Pre-enhancement years with low mean annual flow had lower survival rates of Arctic Char through the boulder garden (Figure 4.2-6). Survival was higher than expected in 2003, a pattern that was likely caused by an unusual increase in discharge during the peak of the migration in late August (Figure 4.2-2). This peak was not observed in any other pre-enhancement year.

Successful migration in 2014 was higher than expected based on flow conditions during baseline sampling, falling outside the 95% confidence limits of the regression of survival on discharge (Figure 4.2-6). The survival on mean discharge regression model predicted a survival rate of 71% based on 2014 flow conditions. The observed rate of 94% was 23 percentage points greater (a 32% increase) than the predicted rate. Both years of post-enhancement data have shown a similar trend.

Similar rates of survival were observed in both post-enhancement years despite a large difference in average flow conditions. These early results are suggestive that the survival of Arctic Char through the boulder garden is now less dependent on stream discharge than in baseline years.

Figure 4.2-2

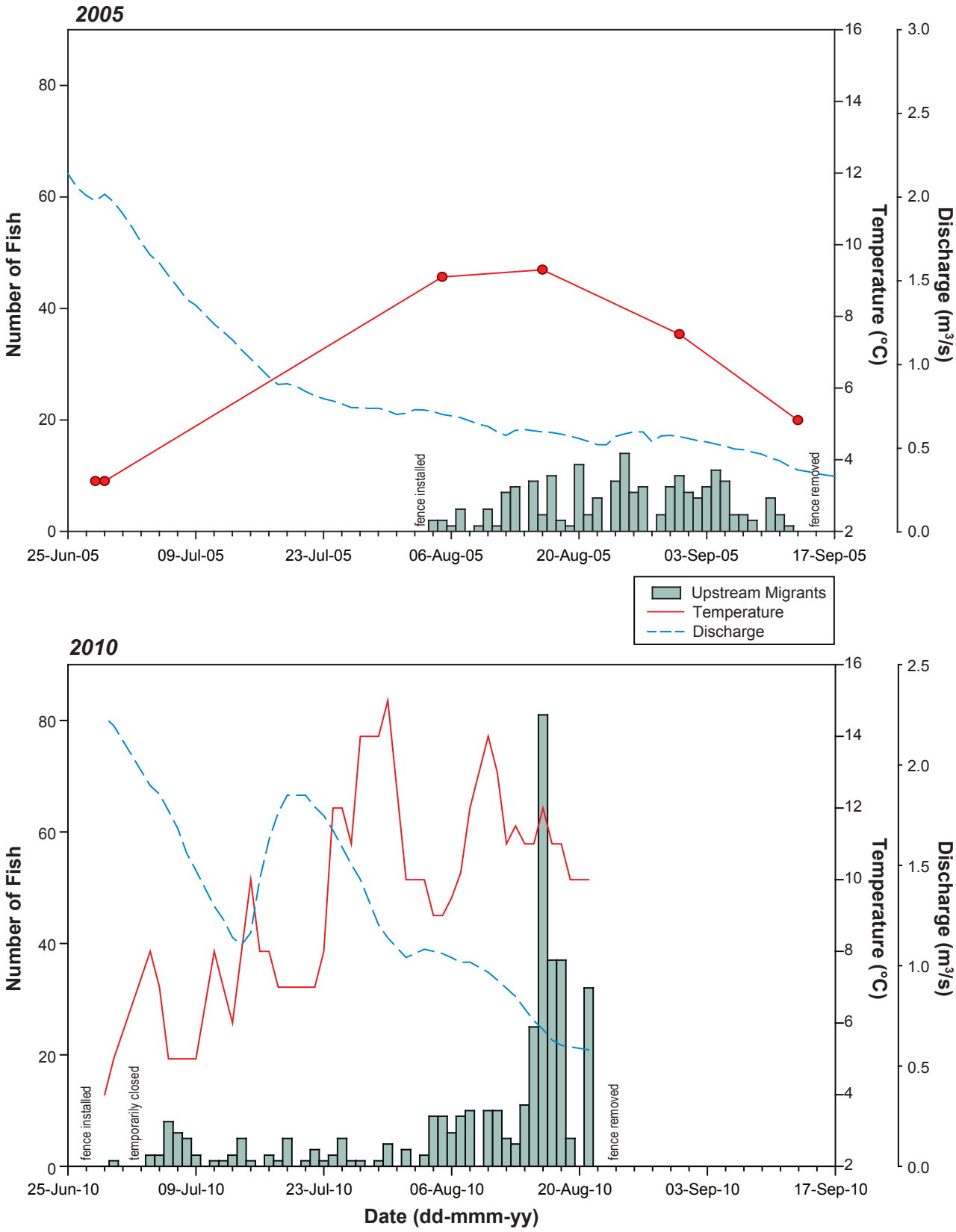
Water Temperature, Discharge, and Number of Arctic Char Migrating Upstream to Roberts Lake, Doris North Project, 2003 and 2004



Notes: Dots indicate measured values and the associated line is the assumed missing data. This was used when daily values were not available

Figure 4.2-3

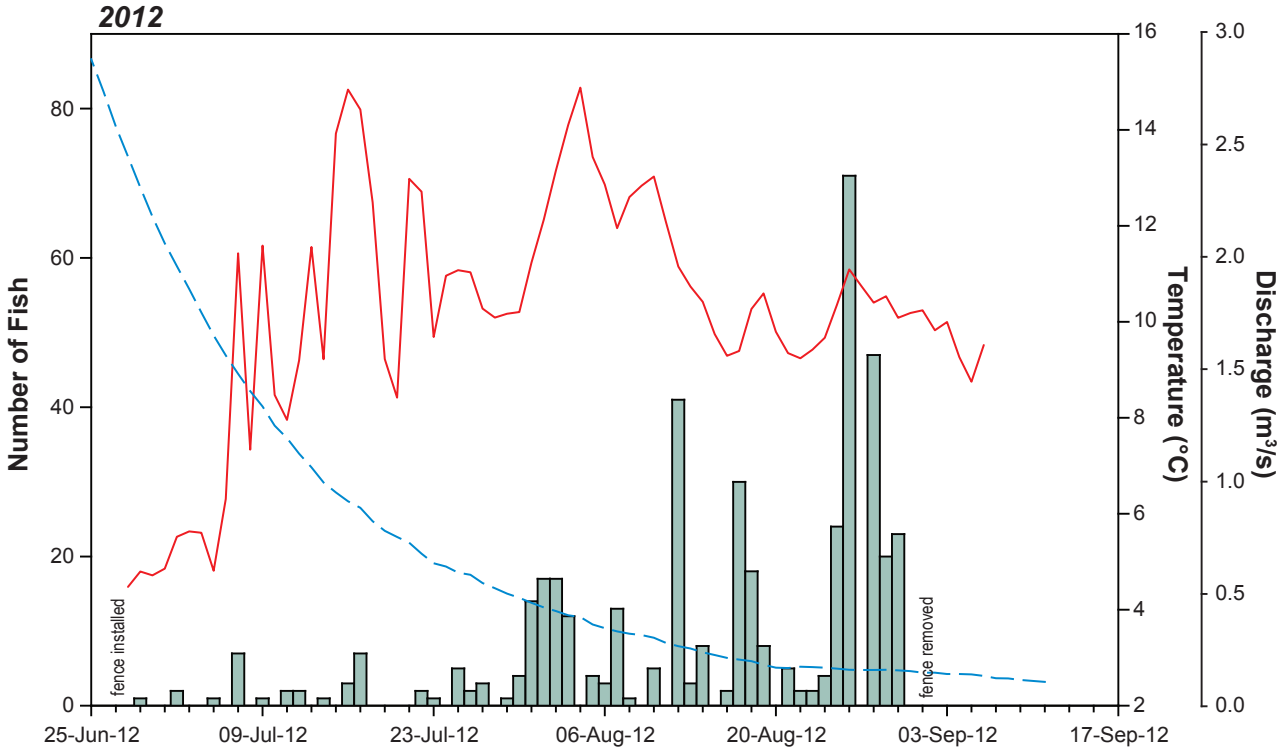
Water Temperature, Discharge, and Number of Arctic Char Migrating Upstream to Roberts Lake, Doris North Project, 2005 and 2010



Notes: Dots indicate measured values and the associated line is the assumed missing data. This was used when daily values were not available.

Figure 4.2-4

Water Temperature, Discharge, and Number of Arctic Char Migrating Upstream to Roberts Lake, Doris North Project, 2012 and 2013



Notes: Fence not checked August 4, 21, and 27, 2012.

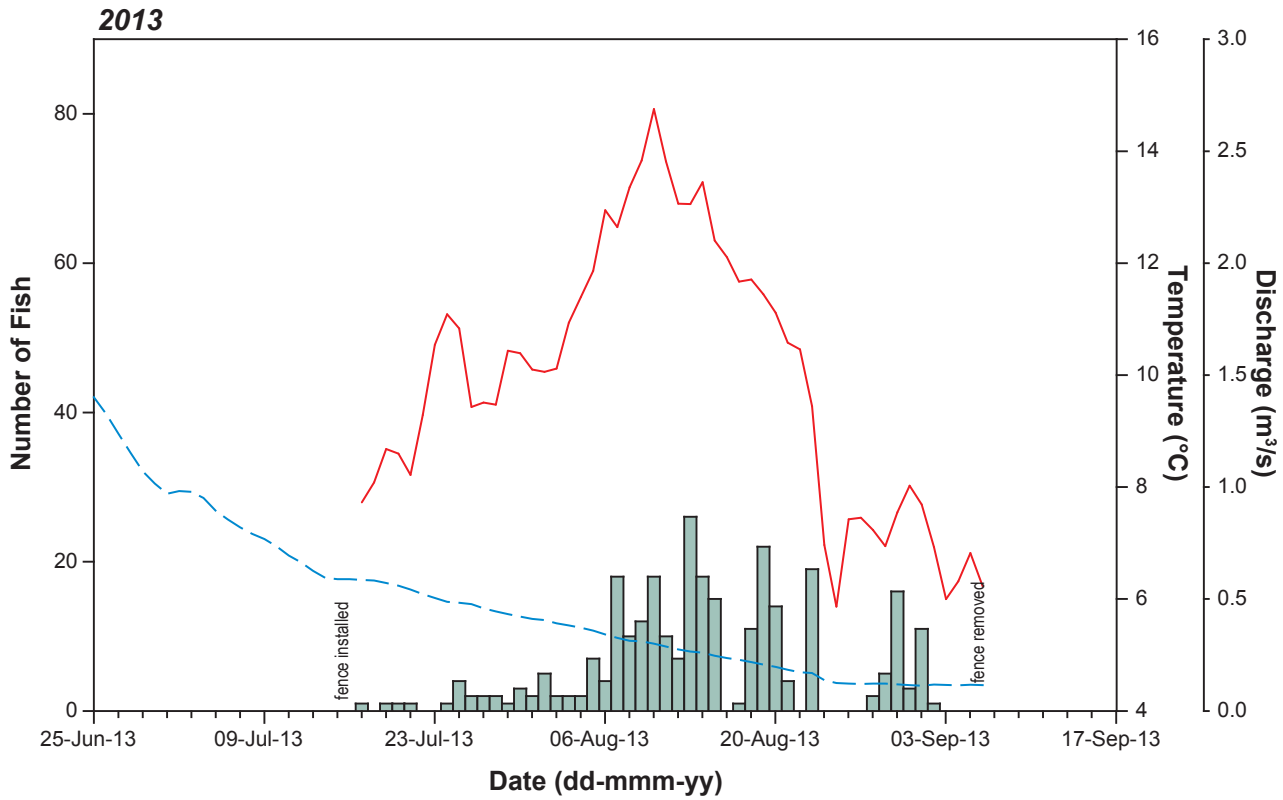


Figure 4.2-5

Water Temperature, Discharge, and Number of Arctic Char Migrating Upstream to Roberts Lake, Doris North Project, 2014

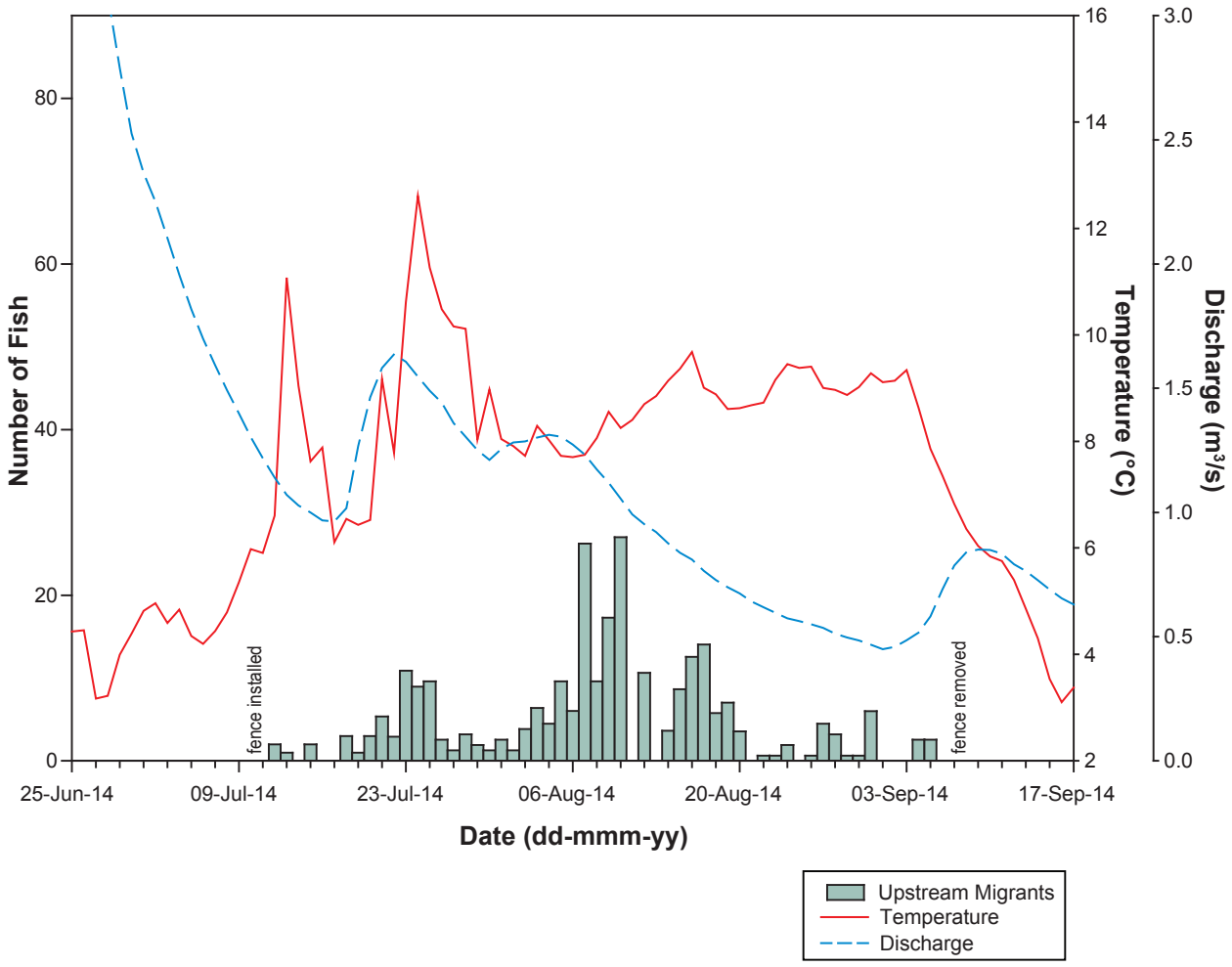
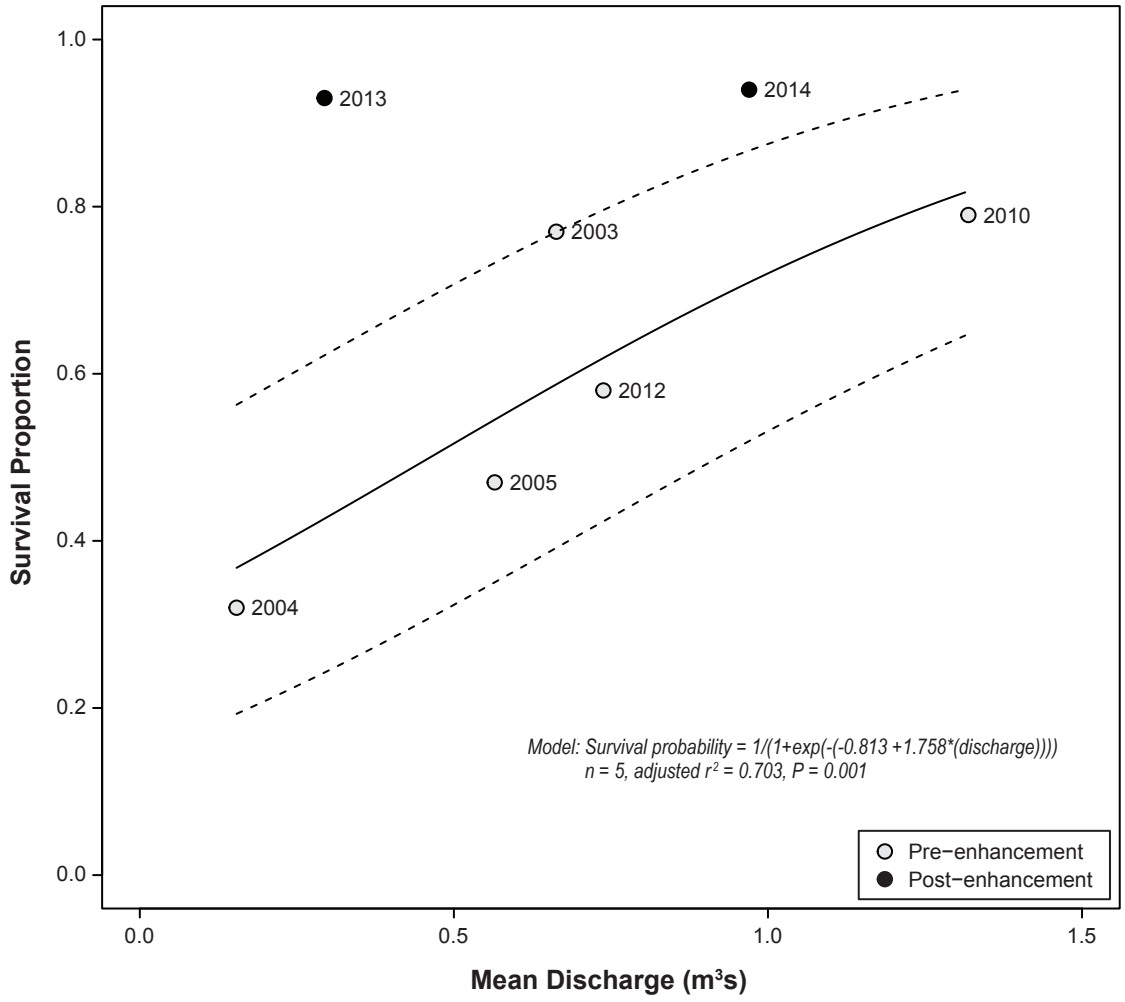


Figure 4.2-6

Relationship between Discharge and Adult Arctic Char Survival in Pre and Post-enhancement Years



Notes: Dotted lines represent 95% CI.
Solid line represents beta regression model.

4.2.3 Wildlife

The remote cameras revealed that wolves visited the site 17 times on 15 different days over the 64 day period when the remote cameras operated (Table 4.2-3). During the same time period, bears visited 21 times on 16 different days (Appendix 3.2-2). Plates 4.2-1 and 4.2-2 show a grizzly bear and a wolf (*Canis lupus*), respectively, searching for fish in the boulder garden.

Table 4.2-3. Comparison of Predatory Activity to Each Year in Roberts Lake Outflow, Doris North Project, 2012 to 2014

Year	Operation Dates	Total Operating Days	Total Cameras Installed	Total Bears Observed	Number of Bears per Week	Total Wolves Observed	Number of Wolves per Week	Total Predators Observed	Number of Predators per Week
2012	Aug 15 - Sep 8	24	3	17	5.0	45	13.1	67.0	19.5
2013	July 18 - Sep 19	63	3	23	2.6	72	8.0	97.6	10.8
2014	July 10 - Sep 12	64	3	21	2.3	17	1.9	40.3	4.4

Plate 4.2-1. Grizzly bear fishing at the upstream end of the boulder garden, August 13, 2014.

Predator activity at the boulder garden was lower in 2014 than in 2013 and 2012. There has been a decreasing trend in predatory activity from 19.5 predator visitors per week in 2012 to 10.8 in 2013 and then to only 4.4 predator visits per week in 2014. The percentage of days grizzly bears were documented at the site by wildlife cameras fell from 46% in 2012 to 30% in 2013 and then to 25% in

2014. Wolf presence showed similar trends, falling from 75% of days in 2012 and 54% in 2013 to 23% in 2014. The enhancement channels have reduced stranding at the boulder garden in both years of post-enhancement monitoring; this decline may have caused wildlife to focus their foraging efforts elsewhere.

Plate 4.2-2. A wolf searches for fish in the boulder garden, August 14, 2014.

Wildlife interactions were lower in 2014 and 2013 than in previous years as the automation of fish monitoring greatly reduced the hours crews spent at site. In 2014, the field crew could not visit the site on one occasion as a bear was in the general vicinity. The animal was observed from the air and the helicopter returned the crew to camp without landing. In 2012 field crews had to visit the site daily to service the manual traps; in that year, field crews observed grizzly bears on 16 different days at or immediately around the boulder garden (Rescan 2013), and they had to be evacuated from site by helicopter on almost every occasion.

4.2.4 Enhancement Stability Assessment

The 2014 assessment of the enhancement channels found them to be structurally stable; no signs of infilling or erosion were observed in any of the channels. Each channel was inspected and no obstacles to fish movement were observed, even during lower flow conditions in September.

The enhancement of the boulder garden will likely remain structurally stable over time as substrate is large, the degree of embeddedness is high, and there are very few large boulders downstream. The channels were designed so that the surrounding areas remain stable after construction, and boulders that were removed from the channel were relocated to a more stable location so that they are unlikely to move back into the channel during future freshets.

In 2012, field crews observed adult Arctic Char easily passing through the boulder garden after the channels were constructed. Survival through the boulder garden in 2013 was far higher than any baseline year despite extremely low discharge conditions and survival in 2014 was the highest on record. The visual inspection found that the channels appear stable and show no signs of erosion or infilling. These factors indicate that the channels are functioning as intended, and they have not deteriorated since construction.

4.2.5 Summary

Two years of post-enhancement monitoring indicate that the new channels have resulted in a marked increase in successful migration through the boulder garden. Survival of Arctic Char was 94% in 2014 and 93% in 2013; the average for all pre-enhancement years was 62%. Similar rates of successful migration were observed in both post-enhancement years despite a large difference in flow conditions, indicating that Arctic Char survival through Roberts Lake Outflow is now less dependent on stream discharge than in baseline years.

No signs of structural degradation were observed since the channels were constructed, and the total length of channel exceeds the amount required by the NNLP (Golder 2007).

5. SUMMARY

The objective of the Roberts Lake and Outflow Fish Compliance Monitoring Program is to evaluate whether the enhancements to Roberts Lake Outflow boulder garden and Stream E09 have increased the productive capacity of anadromous Arctic Char in the watershed. The increase in productive capacity is intended to offset for the losses (and therefore achieve no net loss) of fish habitat in Tail Lake. The assessments conducted in 2014, and described herein, fulfill the requirements to monitor during the second year following enhancement. These requirements were laid out in the Fisheries Authorization for the Project (NU-02-0117.3) and in the Project's No Net Loss Plan and its updates (Golder 2007; Rescan 2010a, 2010b).

5.1 ROBERTS LAKE TRIBUTARY FISH MONITORING PROGRAM

Stream E09 was selected for habitat enhancement as adequate baseline flow is present throughout the summer and was already used by rearing juvenile Arctic Char in low density. In 2012, two pools were constructed to provide additional rearing habitat for juvenile Arctic Char.

Visual inspection of the enhancement pools in 2014 confirmed that they were stable and exhibited no signs of infilling or erosion. Instream and riparian vegetation appears to be recovering well from enhancement activities completed in 2012. The combined surface area of the pools was 11.5 m^2, exceeding the NNLP requirements by 3.5 m^2.

For the first time in five years of sampling, juvenile Arctic Char (a single specimen) was captured in the enhanced section of Stream E09 (E09-US). Although the densities of fish in Stream E09 were less than the reference stream E14, the presence of fish in Site E09-US indicates the enhanced stream is functioning as rearing habitat for Arctic Char.

Comparisons between Stream E09 and Stream E14 suggest that Stream E14 continues to support higher densities of juvenile Arctic Char and the removal of the boulder garden from Roberts Lake Outflow may yield greater positive effects on juvenile densities in Stream E14 than in Stream E09. This may be related to the close proximity of Stream E14 to the migratory route to Roberts Bay feeding grounds and differences in stream morphology and habitat between Stream E14 and Stream E09.

5.2 ROBERTS LAKE OUTFLOW FISH MONITORING PROGRAM

Channels constructed in the Roberts Lake Outflow boulder garden in 2012 were designed to improve successful migration of anadromous Arctic Char migrating to critical overwintering habitat in Roberts Lake, particularly during periods of low discharge. Field crews observed an immediate improvement in the ability of fish to pass through the boulder garden following the completion of the channels in 2012. No signs of structural degradation were observed in 2013 or in 2014. There are currently 69 m of functioning channels in the boulder garden, 4.5 times more than the 12 to 15 m required by the NNLP.

Two years of post-enhancement monitoring indicate that the channels increased successful migration, the key metric for enhancement success, through the Roberts Lake Outflow boulder garden. Survival of Arctic Char was 94% in 2014 and 93% in 2013; the average for all pre-enhancement years was 62%. Similar rates of survival were observed in both post-enhancement years despite a large difference in flow conditions. These early results suggest that post-enhancement survival is less dependent on stream discharge through the boulder garden than in baseline years.

This report presents the results of the second year of post-enhancement monitoring; the early results indicate that the enhancement is functioning as it was intended and it is likely to increase the number of Arctic Char returning to overwinter and spawn in Roberts Lake.

Predator activity at the boulder garden was lower in 2014 than in previous years; lower activity indicates that predation pressure (and therefore mortality) was lower for migrating fish. The percentage of days grizzly bears were at the site fell from 46% in 2012 to less than 30% in 2013 and 25% in 2014. Wolf presence showed steeper declines, falling from 75% of days in 2012 to 54% in 2013 and then to 23% in 2014. Decreased stranding caused by the enhancement channels at the boulder garden in 2013 and 2014 may have caused wildlife to focus their foraging efforts elsewhere. In addition, human-wildlife interactions decreased from 16 in 2012 to two in 2013 and to one in 2014.

REFERENCES

Definitions of the acronyms and abbreviations used in this reference list can be found in the Glossary and Abbreviations section.

1985. *Fisheries Act*, RSC 1985. C. F-14.

Baumgartner, L. J., M. Bettanin, J. McPherson, M. Jones, B. Zampatti, and K. Beyer. 2012. Influence of Turbidity and Passage Rate on the Efficiency of an Infrared Counter. *J. Appl. Ichthyol.* 28: 531–536.

Carle, F. L. and M. R. Strub. 1978. A new method for estimating population size from removal data. Biometrics 34:621-630.

ERM. 2014. *Doris North Project: 2014 Windy Lake Shoal Compliance Monitoring Program.* Prepared for TMAC Resources Inc. by ERM Consultants Canada Ltd.: Yellowknife, Northwest Territories.

ERM Rescan. 2014a. *Doris North Project: 2013 Aquatic Effects Monitoring Program Report*. Prepared for TMAC Resources Inc. by ERM Rescan: Yellowknife, NT.

ERM Rescan. 2014b. *Doris North Project: 2013 Hydrology Compliance Monitoring Report*. Prepared for TMAC Resources Inc. by ERM Rescan: Yellowknife, NT.

ERM Rescan. 2014c. *Doris North Project: 2013 Roberts Lake and Outflow Fish Compliance Monitoring Report*. Prepared for TMAC Resources Inc. by ERM Rescan: Yellowknife, NT.

Ferrari, S.L.P., and F. Cribari-Neto. 2004. Beta Regression for Modeling Rates and Proportions. *Journal of Applied Statistics*, 31(7), 799–815.

Golder. 2005. *Doris North Project Aquatic Studies 2004*. Prepared for Miramar Hope Bay Ltd. by Golder Associates Ltd.: Edmonton, AB.

Golder. 2006. *Doris North Project Aquatic Studies 2005*. Prepared for Miramar Hope Bay Ltd. by Golder Associates Ltd.: Edmonton, AB.

Golder. 2007. *Doris North Project No Net Loss Plan, Revision 6, 2007*. Prepared for Miramar Hope Bay Ltd. by Golder Associates Ltd.: Edmonton, AB.

Golder. 2008a. *Doris North Project Aquatic Studies 2006*. Prepared for Miramar Hope Bay Ltd. by Golder Associates Ltd.: Edmonton, AB.

Golder. 2008b. *Doris North Project Aquatic Studies 2007*. Prepared for Miramar Hope Bay Ltd. by Golder Associates Ltd.: Edmonton, AB.

Gulseth, O. A., and K. J. Nilssen. 2001. Life-History Traits of Charr, *Salvelinus alpinus*, from a High Arctic Watercourse on Svalbard. *Arctic* 54: 1-11.

Johnson, L. 1980. The Arctic charr, *Salvelinus alpinus*. In Charrs, Salmonid Fishes of the Genus *Salvelinus*. In: Balon, E.K. (Ed). W. Junk, The Hague, Netherlands. 87 pp.

Johnson, D. H., B. M. Shrier, J. S. O'Neal, J. A. Knutzen, X. Augerot, T. A. O'Neil, and T. N. Persons. 2007. *Salmonid Field Protocols Handbook: Techniques for Assessing Status and Trends in Salmon and Trout Populations*. Bethesda, MD: American Fisheries Society.

Pyper, B., J. B. Lando, and C. Justice. 2006. Analyses of Weir Counts and Spawning Surveys of Adult Chinook Salmon in the Stanislaus River. Prepared by Cramer Fish Sciences: Gresham, OR.

R Core Team. 2013. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing.

Radtke, R., M. Svenning, D. Malone, A. Klementsen, J. Ruzicka, and D. Fey. 1996. Migrations in an extreme northern population of Arctic charr *Salvelinus alpinus*: insights from otolith microchemistry. *Mar. Ecol. Prog. Ser.* 136: 13-23.

Rescan. 2010a. *Hope Bay Belt Project: Updates to the Doris North No Net Loss Plan for Tail Lake*. Prepared for Hope Bay Mining Ltd. by Rescan Environmental Services Ltd.: Vancouver, BC.

Rescan. 2010b. *Hope Bay Belt Project: Updates to the Doris North No Net Loss Plan for Tail Outflow*. Prepared for Hope Bay Mining Ltd. by Rescan Environmental Services Ltd.: Vancouver, BC.

Rescan. 2011. *Hope Bay Belt Project: 2010 Freshwater Fish and Fish Habitat Baseline Report*. Prepared for Hope Bay Mining Ltd. by Rescan Environmental Services Ltd.: Vancouver, BC.

Rescan. 2012a. *Doris North Gold Mine Project: 2011 Tail Lake Fish-out Report*. Prepared for Hope Bay Mining Ltd. by Rescan Environmental Services Ltd.: Vancouver, BC.

Rescan. 2012b. *Doris North Gold Mine Project: Roberts Outflow and E09 Fish Habitat Enhancement Report*. Prepared for Hope Bay Mining Ltd. by Rescan Environmental Services Ltd.: Vancouver, BC.

Rescan. 2012c. *Doris North Gold Mine Project: Doris Mine Site Fisheries Authorization Monitoring Report 2011.* Prepared for Hope Bay Mining Ltd. by Rescan Environmental Services Ltd.: Vancouver, BC.

Rescan. 2013. *Doris North Gold Mine Project: 2012 Roberts Lake and Outflow Fish Monitoring Report*. Prepared for Hope Bay Mining Ltd. by Rescan Environmental Services Ltd.: Vancouver, BC.

RL&L / Golder. 2003a. *Doris North Project Aquatic Studies 2002*. Prepared for Miramar Hope Bay Ltd. by RL&L Environmental Services Ltd. and Golder Associates Ltd.: Edmonton, AB.

RL&L / Golder. 2003b. *Doris North Project Aquatic Studies 2003*. Prepared for Miramar Hope Bay Ltd. by RL&L Environmental Services Ltd. and Golder Associates Ltd.: Edmonton, AB.

Roni, P. 2005. Monitoring stream and watershed restoration. American Fisheries Society: Bethesda, MD.

Scott, W. B., and E. J. Crossman. 1973. *Freshwater Fishes of Canada*. Oakville, ON: Galt House Publications Ltd.

Stanfield, L.W. 2005. *Ontario Stream Assessment Protocol*. Aquatic Research and Development Section, Ontario Ministry of Natural Resources: Picton, ON.

Swanson, H. K., K. A. Kidd, J. A. Babaluk, R. J. Wastle, P. P Yang, N. M. Halden, and, J. D. Reist. 2010. Anadromy in in Arctic Populations of Lake Trout (*Salvelinus namaycush*): Otolith Microchemistry, Stable Isotopes, and Comparison with Arctic Char (*Salvelinus alpinus*). *Canadian Journal of Fisheries and Aquatic Sciences* 67: 842-853.

Whitlock, M.C., and Schluter, D. 2009. *The Analysis of Biological Data*. Greenwood Village, CO: Roberts and Company Publishers.

Personal Communications

Williston, G. 2012a. Habitat Management Biologist, Fisheries and Oceans Canada, Prescott, ON. Personal Communication to M. McGurk, Hope Bay Mining Ltd.: August 27, 2012.

Williston, G. 2012b. Habitat Management Biologist, Fisheries and Oceans Canada, Prescott, ON. Personal Communication to A. Holzapfel, Hope Bay Mining Ltd: December 5, 2012.

Appendix 3.1-1

Catch and Effort Data from Electrofishing in Tributaries of Roberts Lake, Doris North Project, 2010 to 2014

Appendix 3.1-1. Catch and Effort Data from Electrofishing in Tributaries of Roberts Lake, Doris North Project, 2010 to 2014

Year	Date	Site	Pass	Effort (s)	Species	Catch Total
2010	8/6/2010	E09-MS	1	551	AC	1
2010	8/6/2010	E09-MS	2	513	AC	1
2010	8/6/2010	E09-MS	3	491	-	0
2010	8/26/2010	E09-MS	1	459	-	0
2010	8/26/2010	E09-MS	2	324	-	0
2010	7/14/2010	E09-DS	1	270	AC	1
2010	7/14/2010	E09-DS	1	270	LT	1
2010	7/14/2010	E09-DS	2	363	AC	2
2010	7/14/2010	E09-DS	3	359	AC	2
2010	7/28/2010	E09-DS	1	341	AC	3
2010	7/28/2010	E09-DS	2	300	AC	3
2010	7/28/2010	E09-DS	2	300	LT	1
2010	7/28/2010	E09-DS	3	108	-	0
2010	8/26/2010	E09-DS	1	373	AC	2
2010	8/26/2010	E09-DS	2	369	-	0
2010	9/9/2010	E09-DS	1	577	AC	1
2010	9/9/2010	E09-DS	2	492	AC	1
2010	9/9/2010	E09-DS	3	487	-	0
2010	8/26/2010	E09-US	1	205	-	0
2010	8/26/2010	E09-US	2	207	-	0
2010	9/9/2010	E09-US	1	430	-	0
2010	9/9/2010	E09-US	2	427	-	0
2010	9/9/2010	E09-US	3	501	-	0
2010	7/13/2010	E14	1	748	AC	32
2010	7/13/2010	E14	2	627	AC	26
2010	7/13/2010	E14	3	567	AC	13
2010	8/5/2010	E14	1	477	AC	4
2010	8/5/2010	E14	1	477	LT	1
2010	8/5/2010	E14	2	542	AC	3
2010	8/5/2010	E14	2	542	NSB	1
2010	8/5/2010	E14	3	450	-	0
2010	8/26/2010	E14	1	295	AC	2
2010	8/26/2010	E14	2	275	AC	2
2010	8/26/2010	E14	3	389	-	0
2010	8/12/2010	E14	1	382	AC	4
2010	8/12/2010	E14	2	342	AC	3
2010	8/12/2010	E14	3	360	NSB	1
2010	9/9/2010	E14	1	421	AC	5
2010	9/9/2010	E14	2	419	AC	5
2010	9/9/2010	E14	3	468	-	0
2011	7/5/2011	E09-DS	1	371	AC	4
2011	7/5/2011	E09-DS	2	306	AC	3
2011	7/5/2011	E09-DS	3	339	AC	4
2011	7/5/2011	E09-DS	3	339	NSB	1
2011	7/5/2011	E09-DS	4	302	AC	2
2011	7/5/2011	E09-DS	4	302	NSB	1
2011	7/11/2011	E09-DS	1	116	-	0
2011	7/11/2011	E09-DS	2	100	AC	1
2011	7/11/2011	E09-DS	3	105	-	0
2011	7/23/2011	E09-DS	1	92	LT	1
2011	7/23/2011	E09-DS	2	254	AC	1
2011	7/23/2011	E09-DS	3	203	-	0
2011	7/26/2011	E09-DS	1	237	AC	4
2011	7/26/2011	E09-DS	2	213	LT	1
2011	7/26/2011	E09-DS	3	242	-	0

Notes:

AC = Arctic Char, LT = Lake Trout, NSB = Ninespine Stickleback.

Appendix 3.1-1. Catch and Effort Data from Electrofishing in Tributaries of Roberts Lake, Doris North Project, 2010 to 2014

Year	Date	Site	Pass	Effort (s)	Species	Catch Total
2011	7/5/2011	E09-MS	1	323	AC	3
2011	7/5/2011	E09-MS	2	306	AC	2
2011	7/5/2011	E09-MS	3	302	-	0
2011	7/11/2011	E09-MS	1	76	-	0
2011	7/11/2011	E09-MS	2	69	-	0
2011	7/23/2011	E09-MS	1	215	-	0
2011	7/23/2011	E09-MS	2	194	-	0
2011	7/23/2011	E09-MS	3	232	-	0
2011	7/26/2011	E09-MS	1	178	-	0
2011	7/26/2011	E09-MS	2	218	-	0
2011	7/26/2011	E09-MS	3	208	-	0
2011	7/6/2011	E09-US	1	361	-	0
2011	7/6/2011	E09-US	2	368	-	0
2011	7/23/2011	E09-US	1	157	-	0
2011	7/23/2011	E09-US	2	213	-	0
2011	7/23/2011	E09-US	3	195	-	0
2011	7/26/2011	E09-US	1	161	-	0
2011	7/26/2011	E09-US	2	180	-	0
2011	7/26/2011	E09-US	3	210	-	0
2011	7/4/2011	E14	1	555	AC	14
2011	7/4/2011	E14	1	555	NSB	3
2011	7/4/2011	E14	2	476	AC	10
2011	7/4/2011	E14	3	400	AC	4
2011	7/4/2011	E14	3	400	NSB	3
2011	7/4/2011	E14	4	315	AC	2
2011	7/24/2011	E14	1	326	AC	8
2011	7/24/2011	E14	1	326	NSB	4
2011	7/24/2011	E14	2	328	AC	1
2011	7/24/2011	E14	2	328	NSB	2
2011	7/24/2011	E14	3	355	NSB	1
2011	7/27/2011	E14	1	276	AC	3
2011	7/27/2011	E14	1	276	NSB	4
2011	7/27/2011	E14	2	345	AC	1
2011	7/27/2011	E14	3	229	AC	1
2011	8/8/2011	E14	1	196	-	0
2011	8/8/2011	E14	2	156	AC	1
2011	8/8/2011	E14	2	156	NSB	2
2011	8/8/2011	E14	3	151	-	0
2012	7/8/2012	E09 - DS	1	322	-	0
2012	7/8/2012	E09 - DS	2	298	-	0
2012	7/8/2012	E09 - DS	3	310	-	0
2012	7/20/2012	E09 - DS	1	215	-	0
2012	7/20/2012	E09 - DS	2	209	-	0
2012	7/20/2012	E09 - DS	3	210	-	0
2012	8/5/2012	E09 - DS	1	200	AC	1
2012	8/5/2012	E09 - DS	2	354	-	0
2012	7/8/2012	E09 - M	1	288	-	0
2012	7/8/2012	E09 - M	2	394	-	0
2012	7/8/2012	E09 - M	3	355	-	0
2012	7/21/2012	E09 - M	1	196	AC	1
2012	7/21/2012	E09 - M	2	215	-	0
2012	7/21/2012	E09 - M	3	189	-	0
2012	8/5/2012	E09 - M	1	357	AC	1
2012	8/5/2012	E09 - M	2	428	AC	1
2012	8/5/2012	E09 - M	3	364	-	0

Notes:

AC = Arctic Char, LT = Lake Trout, NSB = Ninespine Stickleback.

Appendix 3.1-1. Catch and Effort Data from Electrofishing in Tributaries of Roberts Lake, Doris North Project, 2010 to 2014

Year	Date	Site	Pass	Effort (s)	Species	Catch Total
2012	7/8/2012	E09 - US	1	281	-	0
2012	7/8/2012	E09 - US	2	274	-	0
2012	7/8/2012	E09 - US	3	252	-	0
2012	7/21/2012	E09 - US	1	188	-	0
2012	7/21/2012	E09 - US	2	192	-	0
2012	7/21/2012	E09 - US	3	179	-	0
2012	8/5/2012	E09 - US	1	177	-	0
2012	8/5/2012	E09 - US	2	131	-	0
2012	7/8/2012	E14	1	287	AC	2
2012	7/8/2012	E14	2	253	AC	1
2012	7/8/2012	E14	3	277	-	0
2012	7/22/2012	E14	1	198	LT	2
2012	7/22/2012	E14	2	205	-	0
2012	7/22/2012	E14	3	189	-	0
2012	8/5/2012	E14	1	508	AC	3
2012	8/5/2012	E14	1	508	NSB	2
2012	8/5/2012	E14	2	494	AC	2
2012	8/5/2012	E14	3	373	NSB	1
2013	7/10/2013	E09 - DS	1	301	AC	3
2013	7/10/2013	E09 - DS	2	288	AC	1
2013	7/10/2013	E09 - DS	2	288	NSB	1
2013	7/10/2013	E09 - DS	3	331	AC	1
2013	7/17/2013	E09 - DS	1	220	AC	2
2013	7/17/2013	E09 - DS	1	220	NSB	1
2013	7/17/2013	E09 - DS	2	224	-	0
2013	7/17/2013	E09 - DS	3	218	AC	1
2013	7/17/2013	E09 - DS	3	218	NSB	1
2013	7/22/2013	E09 - DS	1	223	AC	1
2013	7/22/2013	E09 - DS	2	248	AC	1
2013	7/22/2013	E09 - DS	3	275	AC	1
2013	7/22/2013	E09 - DS	3	275	NSB	1
2013	7/10/2013	E09 - M	1	308	-	0
2013	7/10/2013	E09 - M	2	274	AC	1
2013	7/10/2013	E09 - M	3	299	-	0
2013	7/17/2013	E09 - M	1	233	AC	1
2013	7/17/2013	E09 - M	2	199	-	0
2013	7/17/2013	E09 - M	3	218	-	0
2013	7/22/2013	E09 - M	1	249	AC	1
2013	7/22/2013	E09 - M	2	220	-	0
2013	7/22/2013	E09 - M	3	246	-	0
2013	7/10/2013	E09 - US	1	258	-	0
2013	7/10/2013	E09 - US	2	216	-	0
2013	7/10/2013	E09 - US	3	255	-	0
2013	7/17/2013	E09 - US	1	295	-	0
2013	7/17/2013	E09 - US	2	239	-	0
2013	7/17/2013	E09 - US	3	230	-	0
2013	7/22/2013	E09 - US	1	360	-	0
2013	7/22/2013	E09 - US	2	309	-	0
2013	7/22/2013	E09 - US	3	333	-	0
2013	7/10/2013	E14	1	324	AC	4
2013	7/10/2013	E14	1	324	NSB	2
2013	7/10/2013	E14	2	411	AC	3
2013	7/10/2013	E14	2	411	LT	2
2013	7/10/2013	E14	3	388	AC	2
2013	7/17/2013	E14	1	303	AC	4

Notes:
AC = Arctic Char, LT = Lake Trout, NSB = Ninespine Stickleback.

Appendix 3.1-1. Catch and Effort Data from Electrofishing in Tributaries of Roberts Lake, Doris North Project, 2010 to 2014

Year	Date	Site	Pass	Effort (s)	Species	Catch Total
2013	7/17/2013	E14	1	303	LT	1
2013	7/17/2013	E14	2	412	AC	5
2013	7/17/2013	E14	3	435	AC	3
2013	7/17/2013	E14	3	435	NSB	1
2013	7/22/2013	E14	1	426	AC	4
2013	7/22/2013	E14	2	371	AC	2
2013	7/22/2013	E14	3	388	AC	2
2013	7/22/2013	E14	3	388	LT	1
2014	7/6/2014	E09 - DS	1	326	AC	1
2014	7/6/2014	E09 - DS	1	326	LT	1
2014	7/6/2014	E09 - DS	2	181	LT	1
2014	7/6/2014	E09 - DS	3	280	-	0
2014	7/11/2014	E09 - DS	1	249	AC	1
2014	7/11/2014	E09 - DS	2	242	AC	1
2014	7/11/2014	E09 - DS	2	242	LT	1
2014	7/11/2014	E09 - DS	3	290	-	0
2014	7/6/2014	E09 - MID	1	336	AC	2
2014	7/6/2014	E09 - MID	2	222	AC	1
2014	7/6/2014	E09 - MID	3	201	-	0
2014	7/6/2014	E09 - US	1	239	-	0
2014	7/6/2014	E09 - US	2	209	-	0
2014	7/6/2014	E09 - US	3	182	-	0
2014	7/15/2014	E09-DS	1	234	AC	1
2014	7/15/2014	E09-DS	2	275	-	0
2014	7/15/2014	E09-DS	3	308	-	0
2014	7/11/2014	E09-MID	1	277	-	0
2014	7/11/2014	E09-MID	2	310	AC	1
2014	7/11/2014	E09-MID	3	269	-	0
2014	7/15/2014	E09-MID	1	264	-	0
2014	7/15/2014	E09-MID	2	273	-	0
2014	7/15/2014	E09-MID	3	311	-	0
2014	7/11/2014	E09-US	1	170	-	0
2014	7/11/2014	E09-US	2	270	-	0
2014	7/11/2014	E09-US	3	209	-	0
2014	7/15/2014	E09-US	1	236	-	0
2014	7/15/2014	E09-US	2	277	AC	1
2014	7/15/2014	E09-US	3	317	-	0
2014	7/8/2014	E14	1	376	AC	7
2014	7/8/2014	E14	1	376	LT	2
2014	7/8/2014	E14	2	345	AC	5
2014	7/8/2014	E14	2	345	LT	2
2014	7/8/2014	E14	3	288	AC	7
2014	7/8/2014	E14	3	288	LT	2
2014	7/11/2014	E14	1	317	-	0
2014	7/11/2014	E14	2	333	AC	4
2014	7/11/2014	E14	2	333	LT	1
2014	7/11/2014	E14	3	315	AC	1
2014	7/11/2014	E14	3	315	NSB	1
2014	7/15/2014	E14	1	DNR	AC	4
2014	7/15/2014	E14	1	DNR	LT	2
2014	7/15/2014	E14	2	334	AC	1
2014	7/15/2014	E14	3	306	AC	1

Notes:

AC = Arctic Char, LT = Lake Trout, NSB = Ninespine Stickleback.

Appendix 3.1-2

Biological Data from Electrofishing in Roberts Lake Tributaries, Doris North Project, 2014

Appendix 3.1-2. Biological Data from Electrofishing in Roberts Lake Tributaries, Doris North Project, 2014

Date	Site	Pass	Species Code	Fork Length (mm)	Weight (g)	Comments
6-Jul-14	E09-DS	1	AC	117	17.9	
6-Jul-14	E09-DS	1	LT	310	-	
6-Jul-14	E09-DS	2	LT	77	2.9	
6-Jul-14	E09-MID	1	AC	114	11.0	
6-Jul-14	E09-MID	1	AC	153	32.9	
6-Jul-14	E09-MID	2	AC	116	13.8	
8-Jul-14	E14	1	LT	255	160.0	Fish had been previously captured- fin clipped.
8-Jul-14	E14	1	AC	119	14.5	
8-Jul-14	E14	1	AC	110	10.9	
8-Jul-14	E14	1	AC	75	4.2	
8-Jul-14	E14	1	AC	74	4.3	
8-Jul-14	E14	1	AC	109	10.0	
8-Jul-14	E14	1	AC	116	13.7	
8-Jul-14	E14	1	AC	78	3.9	
8-Jul-14	E14	1	LT	72	4.0	
8-Jul-14	E14	2	LT	76	3.0	
8-Jul-14	E14	2	AC	80	4.3	
8-Jul-14	E14	2	AC	116	13.9	
8-Jul-14	E14	2	AC	83	4.3	
8-Jul-14	E14	2	AC	129	16.0	
8-Jul-14	E14	2	AC	65	2.5	
8-Jul-14	E14	2	LT	71	2.7	
8-Jul-14	E14	3	AC	102	7.8	
8-Jul-14	E14	3	AC	81	4.4	
8-Jul-14	E14	3	LT	72	3.2	
8-Jul-14	E14	3	LT	86	5.3	
8-Jul-14	E14	3	AC	111	12.0	
8-Jul-14	E14	3	AC	75	3.6	
8-Jul-14	E14	3	AC	80	4.7	
8-Jul-14	E14	3	AC	86	5.5	
8-Jul-14	E14	3	AC	73	3.1	
11-Jul-14	E09-DS	1	AC	74	3.1	
11-Jul-14	E09-DS	2	LT	85	5.6	
11-Jul-14	E09-DS	2	AC	75	3.9	
11-Jul-14	E09-MID	2	AC	116	14.2	
11-Jul-14	E14	2	LT	245	164.0	
11-Jul-14	E14	2	AC	125	15.1	
11-Jul-14	E14	2	AC	74	3.2	
11-Jul-14	E14	2	AC	78	3.7	
11-Jul-14	E14	2	AC	72	2.7	
11-Jul-14	E14	3	NSB	59	2.1	
11-Jul-14	E14	3	AC	74	3.3	
15-Jul-14	E09-DS	1	AC	73	3.0	
15-Jul-14	E09-US	2	AC	32	0.4	
15-Jul-14	E14	1	LT	78	4.2	
15-Jul-14	E14	1	AC	68	3.1	
15-Jul-14	E14	1	AC	73	2.8	
15-Jul-14	E14	1	AC	111	13	
15-Jul-14	E14	1	LT	72	3.2	
15-Jul-14	E14	1	AC	108	10	
15-Jul-14	E14	2	AC	87	5.1	
15-Jul-14	E14	3	AC	32	0.5	

Notes:

Species Code: AC = Arctic Char, NSB = Ninespine Stickleback, LT = Lake Trout.

Dashes indicate not applicable.

Appendix 3.1-3

Summary Statistics for Depletion Estimation of Population Density in Roberts Lake Tributaries

Appendix 3.1-3. Summary Statistics for Depletion Estimation of Population Density in Roberts Lake Tributaries

Site	Date	Population Density	2.5% CI	97.5% CI	Probability of Capture	Chi-Square	P-value	Annual Mean (SE)
E09-DS	7/5/2011	16	5.19	26.81	0.310	0.235	0.889	6 (2.29)
	7/11/2011	1	-0.44	2.44	0.500	2.750	0.097	
	7/23/2011	2	1.25	2.75	0.667	0.778	0.378	
	7/26/2011	5	4.67	5.33	0.833	0.141	0.707	
	7/8/2012	0	-	-	-	-	-	0.33 (0.19)
	7/20/2012	0	-	-	-	-	-	
	8/5/2012	1	1	1	1.000	-	-	
	7/10/2013	5	3.46	6.54	0.625	0.030	0.862	3.66 (0.38)
	7/17/2013	3	1.61	4.39	0.600	0.742	0.389	
	7/22/2013	3	0.51	5.49	0.500	0.250	0.617	
	7/6/2014	3	2.48	3.52	0.750	0.368	0.544	2.333 (0.38)
	7/11/2014	3	1.61	4.39	0.600	2.631	0.105	
	7/15/2014	1	1	1	1.000	-	-	
E09-MID	7/5/2011	5	4.13	5.87	0.714	1.032	0.310	1.25 (0.83)
	7/11/2011	0	-	-	-	-	-	
	7/23/2011	0	-	-	-	-	-	
	7/26/2011	0	-	-	-	-	-	
	7/8/2012	0	-	-	-	-	-	1 (0.33)
	7/21/2012	1	1	1	1.000	-	-	
	8/5/2012	2	1.25	2.75	0.667	0.778	0.378	
	7/10/2013	1	-0.44	2.44	0.500	2.750	0.097	1 (0)
	7/17/2013	1	1	1	1.000	-	-	
	7/22/2013	1	1	1	1.000	-	-	
	7/6/2014	3	2.48	3.52	0.750	0.368	0.544	1.33 (0.51)
	7/11/2014	1	-0.44	2.44	0.500	2.750	0.097	
	7/15/2014	0	-	-	-	-	-	
E09-US	7/6/2011	0	-	-	-	-	-	0 (0)
	7/23/2011	0	-	-	-	-	-	
	7/26/2011	0	-	-	-	-	-	
	7/8/2012	0	-	-	-	-	-	0 (0)
	7/21/2012	0	-	-	-	-	-	
	8/5/2012	0	-	-	-	-	-	
	7/10/2013	0	-	-	-	-	-	0 (0)
	7/17/2013	0	-	-	-	-	-	
	7/22/2013	0	-	-	-	-	-	
	7/6/2014	0	-	-	-	-	-	0.33 (0.19)
	7/11/2014	0	-	-	-	-	-	
	7/15/2014	1	-0.44	2.44	0.500	2.750	0.097	
E14	7/4/2011	31	27.15	34.85	0.517	0.918	0.632	11.5 (4.47)
	7/24/2011	9	8.81	9.19	0.900	0.046	0.831	
	7/27/2011	5	3.46	6.54	0.625	0.030	0.862	
	8/8/2011	1	-0.44	2.44	0.500	2.750	0.097	
	7/8/2012	3	2.48	3.52	0.750	0.368	0.544	3.33 (0.51)
	7/22/2012	2	2	2	1.000	-	-	
	8/5/2012	5	4.13	5.87	0.714	1.032	0.310	
	7/10/2013	13	4.85	21.15	0.423	1.461	0.227	13 (1)
	7/17/2013	16	5.21	26.79	0.394	0.634	0.426	
	7/22/2013	10	3.91	16.09	0.450	0.147	0.702	
	7/8/2014	45	-13.61	103.61	0.227	0.250	0.617	20.33 (7.12)
	7/11/2014	8	-4.65	20.65	0.316	8.718	0.003	
	7/15/2014	8	7	9	0.727	0.223	0.637	

Appendix 3.2-1

Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Appendix 3.2-1. Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Date	Time (24 hr clock)	Fence Location (U/D)	Fish Direction	Species	Fork Length (mm)
12-Jul-14	17:15	D	Upstream	Arctic Char	820
12-Jul-14	17:26	U	Downstream	Lake Trout	790
12-Jul-14	19:45	D	Upstream	Arctic Char	570
12-Jul-14	19:46	D	Upstream	Not identified	780
12-Jul-14	20:12	U	Upstream	Lake Trout	790
12-Jul-14	22:39	U	Downstream	Lake Trout	600
12-Jul-14	23:25	D	Upstream	Arctic Char	850
12-Jul-14	23:25	D	Downstream	Not identified	560
12-Jul-14	23:25	D	Upstream	Not identified	690
12-Jul-14	23:33	D	Upstream	Arctic Char	700
12-Jul-14	23:42	U	Upstream	Arctic Char	770
12-Jul-14	23:42	U	Upstream	Arctic Char	850
13-Jul-14	1:37	D	Downstream	Arctic Char	360
13-Jul-14	5:09	D	Upstream	Arctic Char	730
13-Jul-14	11:57	D	Downstream	Arctic Char	380
13-Jul-14	16:46	U	Upstream	Lake Trout	840
13-Jul-14	17:58	D	Upstream	Arctic Char	850
13-Jul-14	18:05	U	Downstream	Lake Trout	440
13-Jul-14	18:17	U	Upstream	Arctic Char	890
13-Jul-14	18:28	D	Downstream	Arctic Char	360
13-Jul-14	18:42	D	Downstream	Not identified	490
13-Jul-14	21:33	D	Upstream	Not identified	400
14-Jul-14	1:47	U	Downstream	Lake Trout	600
14-Jul-14	5:05	D	Upstream	Not identified	790
14-Jul-14	5:49	D	Upstream	Arctic Char	730
14-Jul-14	5:54	D	Upstream	Arctic Char	610
14-Jul-14	6:00	D	Upstream	Arctic Char	660
14-Jul-14	6:12	D	Upstream	Arctic Char	730
14-Jul-14	6:25	U	Upstream	Lake Trout	660
14-Jul-14	6:26	U	Upstream	Arctic Char	870
14-Jul-14	7:08	U	Upstream	Lake Trout	790
14-Jul-14	7:15	U	Downstream	Lake Trout	680
14-Jul-14	7:20	U	Upstream	Lake Trout	820
14-Jul-14	7:43	U	Upstream	Lake Trout	930
14-Jul-14	8:27	U	Upstream	Lake Trout	720
14-Jul-14	12:00	U	Downstream	Arctic Char	640
14-Jul-14	12:28	U	Upstream	Arctic Char	870
14-Jul-14	12:48	U	Downstream	Arctic Char	870
14-Jul-14	13:03	U	Upstream	Arctic Char	880
14-Jul-14	13:23	U	Downstream	Arctic Char	840
14-Jul-14	13:27	D	Upstream	Arctic Char	1,150
14-Jul-14	13:28	U	Upstream	Arctic Char	850
14-Jul-14	13:30	U	Downstream	Arctic Char	840
14-Jul-14	13:34	U	Upstream	Arctic Char	850
14-Jul-14	13:57	U	Downstream	Arctic Char	840
14-Jul-14	15:34	U	Downstream	Arctic Char	820
14-Jul-14	16:10	D	Downstream	Arctic Char	760
15-Jul-14	0:43	U	Upstream	Arctic Char	1,140
15-Jul-14	2:07	D	Downstream	Arctic Char	600
15-Jul-14	2:07	D	Upstream	Not identified	490
15-Jul-14	2:07	D	Downstream	Not identified	600
15-Jul-14	5:07	U	Upstream	Lake Trout	710
15-Jul-14	7:35	U	Upstream	Arctic Char	1,170
15-Jul-14	7:47	U	Downstream	Arctic Char	700
15-Jul-14	11:05	U	Upstream	Lake Trout	580
15-Jul-14	12:44	U	Downstream	Lake Trout	570

Notes:

Fence Location: D = Downstream of boulder garden, U = Upstream of boulder garden.

Dashes indicate not applicable.

Appendix 3.2-1. Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Date	Time (24 hr clock)	Fence Location (U/D)	Fish Direction	Species	Fork Length (mm)
15-Jul-14	14:58	U	Downstream	Lake Trout	480
15-Jul-14	17:54	D	Downstream	Not identified	1,030
15-Jul-14	19:05	D	Upstream	Arctic Char	1,020
15-Jul-14	19:21	D	Upstream	Arctic Char	730
15-Jul-14	19:54	U	Upstream	Lake Trout	830
15-Jul-14	20:02	D	Upstream	Arctic Char	790
15-Jul-14	20:09	D	Upstream	Arctic Char	610
15-Jul-14	20:13	D	Upstream	Not identified	630
15-Jul-14	20:18	U	Upstream	Arctic Char	850
15-Jul-14	20:33	U	Downstream	Lake Trout	560
15-Jul-14	21:04	U	Upstream	Lake Trout	680
15-Jul-14	22:02	U	Upstream	Lake Trout	600
15-Jul-14	23:57	D	Upstream	Arctic Char	760
16-Jul-14	5:38	U	Downstream	Lake Trout	610
16-Jul-14	6:24	U	Upstream	Lake Trout	630
16-Jul-14	13:24	U	Upstream	Lake Trout	570
16-Jul-14	17:17	D	Upstream	Lake Trout	980
16-Jul-14	21:06	U	Downstream	Lake Trout	360
16-Jul-14	22:18	D	Downstream	Lake Trout	580
17-Jul-14	5:58	D	Upstream	Lake Trout	760
17-Jul-14	6:27	U	Upstream	Lake Trout	810
17-Jul-14	7:05	U	Upstream	Lake Trout	580
17-Jul-14	8:26	D	Upstream	Arctic Char	1,170
17-Jul-14	15:33	U	Upstream	Lake Trout	580
17-Jul-14	16:00	D	Upstream	Arctic Char	730
17-Jul-14	16:29	U	Upstream	Lake Trout	790
17-Jul-14	16:46	D	Upstream	Arctic Char	1,000
17-Jul-14	17:41	U	Upstream	Lake Trout	1,090
18-Jul-14	3:19	U	Upstream	Arctic Char	1,110
18-Jul-14	9:44	D	Upstream	Not identified	780
18-Jul-14	10:53	D	Upstream	Arctic Char	690
18-Jul-14	11:31	U	Upstream	Lake Trout	820
18-Jul-14	18:22	D	Upstream	Arctic Char	870
18-Jul-14	18:43	U	Upstream	Arctic Char	880
18-Jul-14	23:20	U	Upstream	Arctic Char	390
19-Jul-14	2:26	D	Upstream	Not identified	760
19-Jul-14	2:26	D	Downstream	Not identified	720
19-Jul-14	4:35	D	Downstream	Arctic Char	720
19-Jul-14	4:40	D	Downstream	Arctic Char	580
19-Jul-14	4:40	D	Upstream	Not identified	750
19-Jul-14	4:50	D	Upstream	Arctic Char	690
19-Jul-14	5:32	U	Upstream	Arctic Char	830
19-Jul-14	8:28	D	Upstream	Not identified	790
19-Jul-14	8:39	U	Upstream	Arctic Char	900
19-Jul-14	16:40	D	Upstream	Lake Trout	670
19-Jul-14	18:27	D	Upstream	Arctic Char	750
19-Jul-14	19:00	U	Upstream	Arctic Char	820
19-Jul-14	19:12	U	Downstream	Arctic Char	660
19-Jul-14	19:28	D	Downstream	Lake Trout	590
19-Jul-14	19:31	D	Downstream	Lake Trout	630
19-Jul-14	22:00	U	Downstream	Arctic Char	610
19-Jul-14	23:10	D	Downstream	Not identified	600
19-Jul-14	23:10	D	Upstream	Lake Trout	780
19-Jul-14	23:15	U	Downstream	Lake Trout	880
20-Jul-14	0:11	D	Downstream	Not identified	640
20-Jul-14	0:57	D	Upstream	Not identified	420

Notes:

Fence Location: D = Downstream of boulder garden, U = Upstream of boulder garden.

Dashes indicate not applicable.

Appendix 3.2-1. Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Date	Time (24 hr clock)	Fence Location (U/D)	Fish Direction	Species	Fork Length (mm)
20-Jul-14	0:57	D	Downstream	Not identified	400
20-Jul-14	2:43	U	Upstream	Lake Trout	410
20-Jul-14	5:38	D	Upstream	Not identified	970
20-Jul-14	5:39	D	Downstream	Not identified	750
20-Jul-14	5:39	D	Upstream	Not identified	900
20-Jul-14	5:39	D	Upstream	Lake Trout	740
20-Jul-14	5:42	D	Upstream	Arctic Char	970
20-Jul-14	6:08	U	Upstream	Arctic Char	750
20-Jul-14	6:10	U	Upstream	Arctic Char	1,030
20-Jul-14	10:04	D	Upstream	Arctic Char	810
20-Jul-14	10:34	U	Upstream	Arctic Char	900
20-Jul-14	11:35	U	Downstream	Arctic Char	790
20-Jul-14	13:20	D	Downstream	Not identified	390
20-Jul-14	20:42	D	Upstream	Lake Trout	750
20-Jul-14	21:41	D	Upstream	Arctic Char	780
20-Jul-14	22:05	U	Upstream	Lake Trout	820
20-Jul-14	22:09	D	Downstream	Not identified	820
20-Jul-14	22:20	D	Downstream	Lake Trout	790
20-Jul-14	22:32	D	Upstream	Lake Trout	750
20-Jul-14	23:08	U	Upstream	Arctic Char	810
21-Jul-14	0:19	U	Downstream	Not identified	460
21-Jul-14	1:03	D	Upstream	Lake Trout	710
21-Jul-14	3:05	D	Upstream	Lake Trout	710
21-Jul-14	3:43	D	Downstream	Lake Trout	540
21-Jul-14	3:54	D	Upstream	Lake Trout	680
21-Jul-14	4:12	U	Upstream	Arctic Char	770
21-Jul-14	4:16	D	Downstream	Not identified	640
21-Jul-14	4:16	D	Upstream	Lake Trout	780
21-Jul-14	5:47	U	Upstream	Arctic Char	880
21-Jul-14	8:57	D	Upstream	Lake Trout	660
21-Jul-14	9:07	D	Upstream	Lake Trout	780
21-Jul-14	10:15	U	Upstream	Lake Trout	700
21-Jul-14	11:19	U	Upstream	Lake Trout	790
21-Jul-14	13:02	D	Upstream	Not identified	520
21-Jul-14	14:28	D	Upstream	Lake Trout	730
21-Jul-14	14:29	D	Downstream	Not identified	580
21-Jul-14	14:39	U	Upstream	Lake Trout	720
21-Jul-14	14:46	D	Upstream	Lake Trout	690
21-Jul-14	15:40	D	Upstream	Not identified	610
21-Jul-14	16:09	D	Upstream	Not identified	670
21-Jul-14	16:36	D	Upstream	Not identified	740
21-Jul-14	16:56	U	Downstream	Not identified	580
21-Jul-14	17:07	U	Upstream	Lake Trout	700
21-Jul-14	17:27	D	Upstream	Lake Trout	610
21-Jul-14	17:28	D	Upstream	Not identified	610
21-Jul-14	17:34	D	Upstream	Lake Trout	770
21-Jul-14	17:57	U	Upstream	Lake Trout	770
21-Jul-14	18:37	U	Upstream	Lake Trout	650
21-Jul-14	18:55	D	Upstream	Arctic Char	600
21-Jul-14	19:12	D	Upstream	Arctic Char	660
21-Jul-14	19:20	D	Upstream	Arctic Char	600
21-Jul-14	19:20	D	Upstream	Not identified	570
21-Jul-14	19:32	D	Downstream	Not identified	570
21-Jul-14	19:32	D	Upstream	Not identified	750
21-Jul-14	19:37	D	Upstream	Not identified	490
21-Jul-14	19:46	D	Downstream	Lake Trout	470

Notes:

Fence Location: D = Downstream of boulder garden, U = Upstream of boulder garden.

Dashes indicate not applicable.

Appendix 3.2-1. Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Date	Time (24 hr clock)	Fence Location (U/D)	Fish Direction	Species	Fork Length (mm)
21-Jul-14	20:05	D	Upstream	Not identified	600
21-Jul-14	20:05	D	Upstream	Not identified	670
21-Jul-14	20:05	D	Upstream	Not identified	750
21-Jul-14	20:28	U	Downstream	Lake Trout	690
21-Jul-14	20:44	U	Upstream	Arctic Char	640
21-Jul-14	21:08	U	Upstream	Arctic Char	790
21-Jul-14	21:16	U	Upstream	Arctic Char	730
21-Jul-14	21:19	U	Downstream	Lake Trout	550
21-Jul-14	21:33	D	Upstream	Not identified	610
21-Jul-14	21:34	D	Upstream	Not identified	690
21-Jul-14	21:35	D	Downstream	Lake Trout	640
21-Jul-14	21:49	D	Upstream	Not identified	690
21-Jul-14	21:51	U	Upstream	Arctic Char	820
21-Jul-14	21:51	D	Downstream	Lake Trout	440
21-Jul-14	22:10	D	Upstream	Not identified	700
21-Jul-14	22:25	U	Downstream	Lake Trout	420
21-Jul-14	22:31	D	Upstream	Lake Trout	630
21-Jul-14	22:56	D	Upstream	Not identified	550
21-Jul-14	23:01	D	Upstream	Lake Trout	600
21-Jul-14	23:19	D	Upstream	Not identified	670
21-Jul-14	23:19	D	Downstream	Not identified	560
21-Jul-14	23:40	D	Upstream	Lake Trout	610
21-Jul-14	23:43	D	Upstream	Not identified	540
22-Jul-14	0:08	D	Upstream	Not identified	540
22-Jul-14	0:29	D	Downstream	Lake Trout	710
22-Jul-14	4:40	D	Upstream	Lake Trout	960
22-Jul-14	4:59	U	Downstream	Not identified	490
22-Jul-14	5:17	U	Upstream	Lake Trout	780
22-Jul-14	5:33	U	Upstream	Lake Trout	730
22-Jul-14	7:38	U	Upstream	Arctic Char	1,090
22-Jul-14	11:32	U	Downstream	Lake Trout	480
22-Jul-14	14:53	D	Upstream	Not identified	990
22-Jul-14	15:50	D	Upstream	Not identified	550
22-Jul-14	17:06	D	Upstream	Not identified	640
22-Jul-14	17:15	D	Downstream	Not identified	360
22-Jul-14	18:14	U	Upstream	Not identified	670
22-Jul-14	18:18	U	Upstream	Not identified	630
22-Jul-14	18:24	U	Upstream	Not identified	630
22-Jul-14	18:55	D	Upstream	Not identified	1,000
22-Jul-14	20:17	U	Upstream	Not identified	1,100
22-Jul-14	21:55	U	Downstream	Not identified	690
22-Jul-14	22:07	D	Downstream	Not identified	460
22-Jul-14	23:00	U	Upstream	Not identified	620
22-Jul-14	23:22	D	Downstream	Not identified	540
23-Jul-14	4:38	D	Downstream	Not identified	410
23-Jul-14	4:42	D	Upstream	Not identified	670
23-Jul-14	4:55	D	Upstream	Not identified	850
23-Jul-14	5:20	U	Upstream	Not identified	700
23-Jul-14	6:08	D	Upstream	Not identified	650
23-Jul-14	6:27	D	Upstream	Not identified	1,000
23-Jul-14	6:41	D	Upstream	Not identified	750
23-Jul-14	6:43	D	Upstream	Not identified	660
23-Jul-14	7:01	D	Upstream	Not identified	750
23-Jul-14	7:03	U	Upstream	Not identified	800
23-Jul-14	7:21	D	Upstream	Not identified	830
23-Jul-14	7:37	U	Upstream	Not identified	910

Notes:

Fence Location: D = Downstream of boulder garden, U = Upstream of boulder garden.

Dashes indicate not applicable.

Appendix 3.2-1. Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Date	Time (24 hr clock)	Fence Location (U/D)	Fish Direction	Species	Fork Length (mm)
23-Jul-14	8:15	D	Upstream	Not identified	750
23-Jul-14	8:25	D	Upstream	Not identified	690
23-Jul-14	8:37	U	Upstream	Not identified	840
23-Jul-14	9:09	U	Upstream	Not identified	730
23-Jul-14	9:45	U	Upstream	Not identified	880
23-Jul-14	10:03	D	Upstream	Not identified	570
23-Jul-14	10:26	D	Upstream	Not identified	620
23-Jul-14	10:44	D	Upstream	Not identified	600
23-Jul-14	10:44	D	Upstream	Not identified	670
23-Jul-14	11:11	D	Upstream	Not identified	780
23-Jul-14	11:13	D	Upstream	Not identified	550
23-Jul-14	11:50	U	Upstream	Not identified	700
23-Jul-14	12:36	D	Upstream	Not identified	550
23-Jul-14	13:24	U	Upstream	Not identified	710
23-Jul-14	13:44	U	Upstream	Not identified	660
23-Jul-14	13:55	D	Upstream	Not identified	750
23-Jul-14	14:24	U	Upstream	Not identified	790
23-Jul-14	14:57	U	Upstream	Not identified	720
23-Jul-14	15:02	D	Upstream	Not identified	570
23-Jul-14	15:46	D	Upstream	Not identified	750
23-Jul-14	16:02	U	Upstream	Not identified	660
23-Jul-14	16:10	D	Upstream	Not identified	700
23-Jul-14	16:17	D	Upstream	Not identified	670
23-Jul-14	17:05	D	Downstream	Not identified	370
23-Jul-14	17:49	D	Upstream	Not identified	630
23-Jul-14	18:01	U	Upstream	Not identified	790
23-Jul-14	18:24	D	Upstream	Not identified	660
23-Jul-14	18:50	D	Upstream	Not identified	550
23-Jul-14	18:51	D	Downstream	Not identified	450
23-Jul-14	19:11	D	Upstream	Not identified	550
23-Jul-14	19:15	D	Downstream	Not identified	390
23-Jul-14	19:20	D	Upstream	Not identified	740
23-Jul-14	19:27	U	Upstream	Not identified	670
23-Jul-14	20:02	D	Upstream	Not identified	750
23-Jul-14	20:10	D	Upstream	Not identified	550
23-Jul-14	20:11	D	Downstream	Not identified	400
23-Jul-14	20:18	D	Upstream	Not identified	480
23-Jul-14	20:28	D	Upstream	Not identified	570
23-Jul-14	20:34	D	Downstream	Not identified	410
23-Jul-14	20:34	D	Upstream	Not identified	520
23-Jul-14	20:40	D	Upstream	Not identified	520
23-Jul-14	20:53	D	Upstream	Not identified	540
23-Jul-14	21:16	D	Upstream	Not identified	770
23-Jul-14	21:30	U	Upstream	Not identified	730
23-Jul-14	21:45	D	Upstream	Not identified	630
23-Jul-14	22:19	U	Upstream	Not identified	760
23-Jul-14	23:11	D	Upstream	Not identified	750
23-Jul-14	23:22	D	Upstream	Not identified	900
23-Jul-14	23:31	U	Upstream	Not identified	760
24-Jul-14	0:29	D	Upstream	Not identified	630
24-Jul-14	0:32	U	Upstream	Not identified	670
24-Jul-14	0:43	U	Upstream	Not identified	640
24-Jul-14	0:43	U	Upstream	Not identified	1,010
24-Jul-14	0:53	U	Downstream	Not identified	570
24-Jul-14	0:53	U	Upstream	Not identified	600
24-Jul-14	1:13	D	Upstream	Not identified	660

Notes:

Fence Location: D = Downstream of boulder garden, U = Upstream of boulder garden.

Dashes indicate not applicable.

Appendix 3.2-1. Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Date	Time (24 hr clock)	Fence Location (U/D)	Fish Direction	Species	Fork Length (mm)
24-Jul-14	1:14	U	Upstream	Not identified	640
24-Jul-14	1:16	D	Upstream	Not identified	510
24-Jul-14	1:17	D	Downstream	Not identified	580
24-Jul-14	1:36	U	Upstream	Not identified	640
24-Jul-14	1:37	D	Upstream	Not identified	510
24-Jul-14	1:40	U	Downstream	Not identified	420
24-Jul-14	1:46	U	Upstream	Not identified	720
24-Jul-14	1:49	U	Downstream	Not identified	440
24-Jul-14	2:00	D	Downstream	Not identified	490
24-Jul-14	2:24	U	Downstream	Not identified	680
24-Jul-14	4:11	U	Upstream	Not identified	810
24-Jul-14	4:35	U	Upstream	Not identified	720
24-Jul-14	5:13	D	Upstream	Not identified	600
24-Jul-14	5:42	D	Downstream	Not identified	730
24-Jul-14	6:42	D	Upstream	Not identified	660
24-Jul-14	6:49	U	Upstream	Not identified	700
24-Jul-14	6:57	D	Upstream	Not identified	670
24-Jul-14	7:10	D	Upstream	Not identified	600
24-Jul-14	7:18	D	Downstream	Not identified	600
24-Jul-14	8:08	D	Upstream	Not identified	600
24-Jul-14	8:12	U	Upstream	Not identified	640
24-Jul-14	8:43	U	Upstream	Not identified	690
24-Jul-14	9:32	U	Upstream	Not identified	760
24-Jul-14	10:35	D	Upstream	Not identified	750
24-Jul-14	11:16	D	Upstream	Not identified	600
24-Jul-14	12:44	D	Upstream	Not identified	670
24-Jul-14	12:58	U	Upstream	Not identified	660
24-Jul-14	13:15	D	Upstream	Not identified	670
24-Jul-14	16:11	D	Upstream	Not identified	610
24-Jul-14	16:14	D	Upstream	Not identified	700
24-Jul-14	16:14	D	Upstream	Not identified	1,090
24-Jul-14	16:20	U	Upstream	Not identified	620
24-Jul-14	16:25	D	Upstream	Not identified	780
24-Jul-14	16:40	D	Upstream	Not identified	630
24-Jul-14	16:57	D	Downstream	Not identified	1,000
24-Jul-14	17:27	D	Upstream	Not identified	610
24-Jul-14	17:34	D	Upstream	Not identified	540
24-Jul-14	17:54	U	Upstream	Not identified	670
24-Jul-14	18:49	U	Downstream	Not identified	510
24-Jul-14	20:29	D	Downstream	Not identified	490
24-Jul-14	20:29	D	Upstream	Not identified	670
24-Jul-14	20:41	D	Upstream	Not identified	670
24-Jul-14	20:50	D	Upstream	Not identified	750
24-Jul-14	21:33	D	Upstream	Not identified	790
24-Jul-14	21:52	D	Downstream	Not identified	450
24-Jul-14	22:17	D	Downstream	Not identified	520
24-Jul-14	22:20	U	Upstream	Not identified	730
24-Jul-14	22:30	U	Upstream	Not identified	720
24-Jul-14	22:49	U	Upstream	Not identified	820
24-Jul-14	23:23	D	Upstream	Not identified	610
24-Jul-14	23:41	D	Downstream	Not identified	540
25-Jul-14	0:49	U	Upstream	Not identified	650
25-Jul-14	2:08	D	Upstream	Not identified	940
25-Jul-14	2:26	D	Upstream	Not identified	930
25-Jul-14	2:57	U	Downstream	Not identified	430
25-Jul-14	3:05	U	Upstream	Not identified	990

Notes:

Fence Location: D = Downstream of boulder garden, U = Upstream of boulder garden.

Dashes indicate not applicable.

Appendix 3.2-1. Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Date	Time (24 hr clock)	Fence Location (U/D)	Fish Direction	Species	Fork Length (mm)
25-Jul-14	3:58	U	Upstream	Not identified	640
25-Jul-14	4:00	U	Upstream	Not identified	630
25-Jul-14	4:55	D	Upstream	Not identified	640
25-Jul-14	5:29	U	Downstream	Not identified	600
25-Jul-14	6:57	D	Downstream	Not identified	570
25-Jul-14	12:05	U	Upstream	Not identified	710
25-Jul-14	13:01	D	Upstream	Not identified	490
25-Jul-14	13:02	D	Upstream	Not identified	460
25-Jul-14	13:12	U	Upstream	Not identified	700
25-Jul-14	13:28	U	Upstream	Not identified	580
25-Jul-14	13:44	D	Upstream	Not identified	610
25-Jul-14	13:50	D	Upstream	Not identified	600
25-Jul-14	14:00	D	Upstream	Not identified	570
25-Jul-14	14:13	D	Upstream	Not identified	620
25-Jul-14	14:26	U	Upstream	Not identified	600
25-Jul-14	14:36	U	Upstream	Not identified	660
25-Jul-14	14:36	U	Upstream	Not identified	660
25-Jul-14	14:39	U	Upstream	Not identified	630
25-Jul-14	14:43	U	Upstream	Not identified	540
25-Jul-14	15:01	D	Upstream	Not identified	560
25-Jul-14	15:46	D	Upstream	Not identified	720
25-Jul-14	16:15	U	Downstream	Not identified	570
25-Jul-14	16:56	U	Upstream	Not identified	580
25-Jul-14	17:15	D	Upstream	Not identified	540
25-Jul-14	18:16	U	Upstream	Not identified	710
25-Jul-14	18:19	U	Upstream	Not identified	690
25-Jul-14	18:30	U	Upstream	Not identified	820
25-Jul-14	18:32	U	Upstream	Not identified	620
25-Jul-14	18:51	D	Downstream	Not identified	360
25-Jul-14	19:13	U	Upstream	Not identified	670
25-Jul-14	20:05	D	Upstream	Not identified	580
25-Jul-14	20:39	U	Downstream	Not identified	610
25-Jul-14	21:02	U	Upstream	Not identified	630
25-Jul-14	21:09	U	Downstream	Not identified	770
25-Jul-14	21:40	D	Downstream	Not identified	550
25-Jul-14	22:09	D	Upstream	Not identified	580
25-Jul-14	23:19	U	Upstream	Not identified	610
26-Jul-14	4:54	D	Downstream	Not identified	560
26-Jul-14	6:46	D	Upstream	Not identified	840
26-Jul-14	7:19	U	Upstream	Not identified	870
26-Jul-14	8:19	U	Upstream	Not identified	850
26-Jul-14	8:27	D	Downstream	Not identified	460
26-Jul-14	8:31	D	Upstream	Not identified	740
26-Jul-14	10:42	D	Upstream	Not identified	690
26-Jul-14	11:15	U	Upstream	Not identified	620
26-Jul-14	11:24	U	Upstream	Not identified	740
26-Jul-14	11:37	U	Upstream	Not identified	690
26-Jul-14	13:05	U	Upstream	Not identified	780
26-Jul-14	14:21	D	Upstream	Not identified	730
26-Jul-14	15:02	U	Upstream	Not identified	810
26-Jul-14	15:08	U	Upstream	Not identified	640
26-Jul-14	15:22	D	Upstream	Not identified	640
26-Jul-14	16:59	U	Downstream	Not identified	600
26-Jul-14	17:15	U	Upstream	Not identified	760
26-Jul-14	17:31	D	Downstream	Not identified	480
26-Jul-14	18:12	D	Downstream	Not identified	540

Notes:

Fence Location: D = Downstream of boulder garden, U = Upstream of boulder garden.

Dashes indicate not applicable.

Appendix 3.2-1. Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Date	Time (24 hr clock)	Fence Location (U/D)	Fish Direction	Species	Fork Length (mm)
26-Jul-14	18:19	D	Downstream	Not identified	620
26-Jul-14	19:19	U	Downstream	Not identified	570
26-Jul-14	20:18	U	Downstream	Not identified	610
26-Jul-14	20:45	D	Upstream	Not identified	450
26-Jul-14	20:54	D	Downstream	Not identified	700
26-Jul-14	21:04	D	Upstream	Not identified	480
26-Jul-14	21:09	D	Downstream	Not identified	800
26-Jul-14	21:12	D	Downstream	Not identified	480
26-Jul-14	21:48	U	Downstream	Not identified	540
26-Jul-14	23:23	U	Downstream	Not identified	660
27-Jul-14	1:56	D	Downstream	Not identified	400
27-Jul-14	5:49	D	Downstream	Not identified	790
27-Jul-14	5:54	D	Upstream	Not identified	630
27-Jul-14	5:56	D	Upstream	Not identified	1,080
27-Jul-14	6:15	D	Upstream	Not identified	730
27-Jul-14	9:03	D	Upstream	Not identified	660
27-Jul-14	9:33	D	Upstream	Not identified	960
27-Jul-14	9:45	U	Upstream	Not identified	810
27-Jul-14	11:16	U	Upstream	Not identified	970
27-Jul-14	15:48	D	Upstream	Not identified	610
27-Jul-14	16:30	U	Downstream	Not identified	970
27-Jul-14	16:31	U	Upstream	Not identified	640
27-Jul-14	16:34	D	Upstream	Not identified	700
27-Jul-14	17:12	D	Downstream	Not identified	1,030
27-Jul-14	22:44	U	Upstream	Not identified	870
27-Jul-14	23:10	D	Downstream	Not identified	770
27-Jul-14	23:15	U	Downstream	Not identified	450
27-Jul-14	23:20	D	Upstream	Not identified	390
27-Jul-14	23:52	D	Downstream	Not identified	360
28-Jul-14	0:03	D	Upstream	Not identified	450
28-Jul-14	4:24	D	Upstream	Not identified	940
28-Jul-14	4:55	D	Downstream	Not identified	610
28-Jul-14	4:55	D	Upstream	Not identified	650
28-Jul-14	5:01	U	Upstream	Not identified	970
28-Jul-14	5:12	U	Upstream	Not identified	970
28-Jul-14	5:37	D	Upstream	Not identified	650
28-Jul-14	9:33	U	Upstream	Not identified	820
28-Jul-14	10:50	D	Downstream	Not identified	450
28-Jul-14	16:06	D	Downstream	Not identified	490
28-Jul-14	17:43	D	Upstream	Not identified	700
28-Jul-14	20:31	D	Upstream	Not identified	900
28-Jul-14	21:24	U	Upstream	Not identified	810
28-Jul-14	21:24	U	Upstream	Not identified	940
28-Jul-14	22:29	D	Upstream	Not identified	670
29-Jul-14	0:33	U	Downstream	Not identified	730
29-Jul-14	2:14	U	Upstream	Not identified	670
29-Jul-14	2:14	D	Upstream	Not identified	540
29-Jul-14	5:59	U	Downstream	Not identified	450
29-Jul-14	6:13	U	Upstream	Not identified	840
29-Jul-14	7:10	D	Upstream	Not identified	620
29-Jul-14	8:04	D	Upstream	Not identified	450
29-Jul-14	15:01	D	Upstream	Not identified	690
29-Jul-14	15:13	D	Upstream	Not identified	770
29-Jul-14	15:36	U	Upstream	Not identified	720
29-Jul-14	15:38	U	Upstream	Not identified	810
29-Jul-14	21:30	U	Upstream	Not identified	510

Notes:

Fence Location: D = Downstream of boulder garden, U = Upstream of boulder garden.

Dashes indicate not applicable.

Appendix 3.2-1. Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Date	Time (24 hr clock)	Fence Location (U/D)	Fish Direction	Species	Fork Length (mm)
29-Jul-14	21:53	D	Upstream	Not identified	1,290
29-Jul-14	22:29	D	Upstream	Not identified	610
29-Jul-14	23:16	U	Downstream	Not identified	490
29-Jul-14	23:39	U	Upstream	Not identified	1,030
30-Jul-14	1:39	D	Downstream	Not identified	490
30-Jul-14	6:54	D	Downstream	Not identified	670
30-Jul-14	7:04	D	Upstream	Not identified	580
30-Jul-14	7:41	U	Upstream	Not identified	610
30-Jul-14	7:57	U	Downstream	Not identified	360
30-Jul-14	8:27	U	Upstream	Not identified	670
30-Jul-14	15:58	D	Upstream	Not identified	710
30-Jul-14	19:08	D	Upstream	Not identified	610
30-Jul-14	20:21	U	Upstream	Not identified	700
31-Jul-14	2:22	D	Downstream	Not identified	830
31-Jul-14	2:56	D	Upstream	Not identified	940
31-Jul-14	6:48	U	Upstream	Not identified	970
31-Jul-14	11:11	D	Upstream	Not identified	570
31-Jul-14	11:52	U	Upstream	Not identified	630
31-Jul-14	11:52	U	Upstream	Not identified	970
31-Jul-14	15:06	U	Upstream	Not identified	650
31-Jul-14	18:21	U	Downstream	Not identified	700
31-Jul-14	18:23	U	Upstream	Not identified	700
31-Jul-14	18:42	D	Downstream	Not identified	730
1-Aug-14	1:39	U	Downstream	Not identified	670
1-Aug-14	5:21	D	Downstream	Not identified	570
1-Aug-14	5:21	D	Upstream	Not identified	580
1-Aug-14	8:44	D	Upstream	Not identified	670
1-Aug-14	9:40	U	Upstream	Not identified	680
1-Aug-14	20:51	D	Upstream	Not identified	560
1-Aug-14	21:39	U	Upstream	Not identified	610
1-Aug-14	21:39	U	Downstream	Lake Trout	490
1-Aug-14	22:40	D	Upstream	Not identified	670
1-Aug-14	22:50	D	Upstream	Not identified	540
1-Aug-14	22:51	D	Downstream	Not identified	490
1-Aug-14	22:58	D	Upstream	Not identified	550
1-Aug-14	23:46	U	Upstream	Not identified	720
2-Aug-14	3:43	D	Upstream	Not identified	760
2-Aug-14	11:37	U	Upstream	Not identified	820
2-Aug-14	12:03	D	Upstream	Not identified	490
2-Aug-14	12:34	U	Upstream	Not identified	810
2-Aug-14	13:29	D	Upstream	Not identified	930
2-Aug-14	14:24	U	Upstream	Not identified	970
2-Aug-14	16:14	U	Upstream	Not identified	690
2-Aug-14	16:23	D	Upstream	Not identified	600
2-Aug-14	18:24	D	Upstream	Not identified	940
2-Aug-14	19:02	U	Upstream	Not identified	930
2-Aug-14	19:55	U	Upstream	Lake Trout	1,080
2-Aug-14	22:08	U	Upstream	Not identified	760
2-Aug-14	22:16	D	Upstream	Not identified	640
3-Aug-14	4:49	D	Upstream	Not identified	840
3-Aug-14	4:57	D	Upstream	Not identified	1,080
3-Aug-14	5:16	U	Upstream	Not identified	730
3-Aug-14	5:52	U	Upstream	Not identified	1,240
3-Aug-14	7:29	D	Upstream	Not identified	690
3-Aug-14	7:45	U	Upstream	Not identified	730
3-Aug-14	7:46	D	Upstream	Not identified	850

Notes:

Fence Location: D = Downstream of boulder garden, U = Upstream of boulder garden.

Dashes indicate not applicable.

Appendix 3.2-1. Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Date	Time (24 hr clock)	Fence Location (U/D)	Fish Direction	Species	Fork Length (mm)
3-Aug-14	8:03	U	Upstream	Not identified	870
3-Aug-14	9:21	U	Upstream	Not identified	750
3-Aug-14	9:53	U	Upstream	Not identified	650
3-Aug-14	12:09	D	Upstream	Not identified	570
3-Aug-14	12:33	D	Upstream	Not identified	970
3-Aug-14	16:46	D	Upstream	Not identified	940
3-Aug-14	17:03	U	Upstream	Not identified	1,000
3-Aug-14	19:52	D	Upstream	Not identified	690
3-Aug-14	19:52	D	Upstream	Not identified	850
3-Aug-14	19:52	D	Upstream	Not identified	910
3-Aug-14	20:13	D	Upstream	Not identified	990
3-Aug-14	20:13	U	Upstream	Lake Trout	670
3-Aug-14	20:17	D	Upstream	Not identified	900
3-Aug-14	20:22	U	Upstream	Not identified	1,010
3-Aug-14	20:44	U	Downstream	Not identified	850
3-Aug-14	20:44	U	Upstream	Not identified	870
3-Aug-14	20:47	U	Upstream	Not identified	980
3-Aug-14	21:15	U	Upstream	Not identified	720
3-Aug-14	21:16	U	Downstream	Not identified	530
3-Aug-14	21:42	U	Upstream	Not identified	750
4-Aug-14	3:03	U	Upstream	Not identified	890
4-Aug-14	3:08	D	Upstream	Not identified	880
4-Aug-14	3:08	D	Upstream	Not identified	940
4-Aug-14	3:29	U	Upstream	Not identified	980
4-Aug-14	5:14	D	Upstream	Not identified	700
4-Aug-14	5:29	U	Upstream	Not identified	700
4-Aug-14	5:52	D	Upstream	Not identified	870
4-Aug-14	5:52	D	Upstream	Not identified	1,020
4-Aug-14	5:57	D	Upstream	Not identified	820
4-Aug-14	6:00	D	Upstream	Not identified	1,050
4-Aug-14	6:21	U	Upstream	Not identified	910
4-Aug-14	6:37	U	Upstream	Not identified	1,040
4-Aug-14	6:58	U	Upstream	Not identified	900
4-Aug-14	6:58	D	Upstream	Not identified	990
4-Aug-14	14:48	D	Upstream	Not identified	900
4-Aug-14	18:33	U	Downstream	Not identified	440
4-Aug-14	18:35	U	Upstream	Not identified	660
4-Aug-14	19:27	D	Upstream	Not identified	690
4-Aug-14	20:47	U	Downstream	Not identified	610
4-Aug-14	21:38	U	Upstream	Not identified	940
4-Aug-14	21:48	U	Upstream	Not identified	690
5-Aug-14	1:48	U	Downstream	Not identified	820
5-Aug-14	2:45	D	Upstream	Not identified	900
5-Aug-14	2:45	D	Upstream	Not identified	930
5-Aug-14	3:11	U	Upstream	Not identified	940
5-Aug-14	3:53	U	Upstream	Lake Trout	970
5-Aug-14	3:57	U	Downstream	Lake Trout	420
5-Aug-14	4:56	D	Upstream	Lake Trout	1,020
5-Aug-14	5:45	D	Downstream	Not identified	840
5-Aug-14	7:00	D	Upstream	Not identified	970
5-Aug-14	7:02	D	Upstream	Arctic Char	970
5-Aug-14	7:11	D	Upstream	Not identified	940
5-Aug-14	7:11	D	Upstream	Not identified	1,010
5-Aug-14	7:22	U	Upstream	Not identified	990
5-Aug-14	7:36	U	Upstream	Not identified	530
5-Aug-14	7:38	U	Upstream	Not identified	960

Notes:

Fence Location: D = Downstream of boulder garden, U = Upstream of boulder garden.

Dashes indicate not applicable.

Appendix 3.2-1. Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Date	Time (24 hr clock)	Fence Location (U/D)	Fish Direction	Species	Fork Length (mm)
5-Aug-14	7:49	D	Upstream	Not identified	820
5-Aug-14	7:53	U	Upstream	Not identified	1,020
5-Aug-14	7:53	U	Upstream	Not identified	1,020
5-Aug-14	7:59	U	Upstream	Not identified	820
5-Aug-14	7:59	U	Upstream	Not identified	1,000
5-Aug-14	8:21	U	Upstream	Not identified	880
5-Aug-14	9:13	D	Downstream	Not identified	570
5-Aug-14	12:53	D	Upstream	Not identified	840
5-Aug-14	13:07	U	Upstream	Lake Trout	870
5-Aug-14	17:02	D	Downstream	Not identified	490
5-Aug-14	17:16	D	Upstream	Not identified	570
5-Aug-14	17:34	U	Upstream	Lake Trout	570
5-Aug-14	19:27	D	Upstream	Not identified	920
5-Aug-14	19:44	D	Upstream	Not identified	880
5-Aug-14	19:44	D	Upstream	Not identified	1,080
5-Aug-14	20:15	D	Upstream	Arctic Char	960
5-Aug-14	20:16	U	Upstream	Not identified	930
5-Aug-14	20:29	U	Upstream	Lake Trout	1,060
5-Aug-14	20:49	U	Upstream	Not identified	990
5-Aug-14	20:50	U	Upstream	Arctic Char	980
5-Aug-14	20:50	U	Upstream	Not identified	1,130
5-Aug-14	21:37	D	Upstream	Not identified	690
6-Aug-14	2:39	U	Upstream	Arctic Char	790
6-Aug-14	3:55	U	Downstream	Not identified	390
6-Aug-14	7:58	D	Upstream	Not identified	930
6-Aug-14	8:07	D	Upstream	Not identified	780
6-Aug-14	8:07	D	Upstream	Arctic Char	840
6-Aug-14	8:37	U	Upstream	Not identified	810
6-Aug-14	8:41	U	Upstream	Not identified	930
6-Aug-14	8:41	U	Upstream	Arctic Char	970
6-Aug-14	9:57	D	Upstream	Not identified	940
6-Aug-14	10:04	U	Upstream	Not identified	920
6-Aug-14	10:33	U	Upstream	Not identified	960
6-Aug-14	16:27	U	Downstream	Arctic Char	390
6-Aug-14	16:50	D	Upstream	Arctic Char	580
6-Aug-14	16:52	D	Upstream	Lake Trout	760
6-Aug-14	16:54	D	Downstream	Not identified	430
6-Aug-14	16:56	D	Upstream	Not identified	430
6-Aug-14	17:45	D	Upstream	Not identified	930
6-Aug-14	17:46	D	Upstream	Not identified	730
6-Aug-14	17:46	D	Upstream	Not identified	1,010
6-Aug-14	18:05	U	Upstream	Not identified	1,030
6-Aug-14	18:45	U	Upstream	Not identified	760
6-Aug-14	18:46	U	Downstream	Not identified	520
6-Aug-14	18:51	U	Upstream	Not identified	650
6-Aug-14	19:01	U	Upstream	Not identified	760
6-Aug-14	20:57	U	Upstream	Not identified	880
6-Aug-14	21:07	D	Downstream	Not identified	600
6-Aug-14	21:15	D	Upstream	Lake Trout	750
6-Aug-14	21:55	U	Upstream	Not identified	580
6-Aug-14	22:15	U	Upstream	Not identified	760
6-Aug-14	23:10	D	Upstream	Lake Trout	930
6-Aug-14		D	Downstream	Not identified	600
7-Aug-14	0:24	U	Upstream	Not identified	700
7-Aug-14	3:21	D	Upstream	Lake Trout	910
7-Aug-14	3:27	U	Upstream	Not identified	820

Notes:

Fence Location: D = Downstream of boulder garden, U = Upstream of boulder garden.

Dashes indicate not applicable.

Appendix 3.2-1. Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Date	Time (24 hr clock)	Fence Location (U/D)	Fish Direction	Species	Fork Length (mm)
7-Aug-14	3:31	U	Upstream	Not identified	1,020
7-Aug-14	3:39	D	Upstream	Not identified	1,110
7-Aug-14	4:11	U	Upstream	Not identified	1,140
7-Aug-14	4:16	U	Upstream	Lake Trout	1,080
7-Aug-14	4:19	U	Upstream	Not identified	920
7-Aug-14	4:19	U	Upstream	Not identified	990
7-Aug-14	6:31	U	Upstream	Not identified	960
7-Aug-14	7:13	D	Upstream	Not identified	450
7-Aug-14	7:23	D	Upstream	Lake Trout	1,000
7-Aug-14	7:37	D	Upstream	Arctic Char	780
7-Aug-14	8:01	U	Upstream	Not identified	1,000
7-Aug-14	8:10	U	Upstream	Lake Trout	820
7-Aug-14	9:58	D	Upstream	Not identified	780
7-Aug-14	9:58	D	Upstream	Not identified	930
7-Aug-14	10:17	D	Upstream	Not identified	1,000
7-Aug-14	10:27	U	Upstream	Not identified	810
7-Aug-14	10:27	U	Upstream	Lake Trout	850
7-Aug-14	10:33	U	Upstream	Not identified	940
7-Aug-14	10:40	U	Upstream	Not identified	820
7-Aug-14	11:32	U	Upstream	Arctic Char	720
7-Aug-14	11:40	U	Upstream	Not identified	640
7-Aug-14	12:23	U	Upstream	Not identified	690
7-Aug-14	13:34	U	Upstream	Not identified	640
7-Aug-14	14:03	U	Upstream	Not identified	850
7-Aug-14	14:23	U	Upstream	Not identified	690
7-Aug-14	14:44	U	Upstream	Arctic Char	720
7-Aug-14	15:01	U	Upstream	Not identified	730
7-Aug-14	15:59	U	Upstream	Not identified	710
7-Aug-14	16:25	U	Upstream	Not identified	730
7-Aug-14	16:25	U	Upstream	Not identified	730
7-Aug-14	16:25	U	Upstream	Not identified	1,150
7-Aug-14	16:48	U	Upstream	Not identified	720
7-Aug-14	16:48	U	Upstream	Not identified	720
7-Aug-14	18:52	D	Upstream	Not identified	960
7-Aug-14	18:57	U	Upstream	Not identified	690
7-Aug-14	18:59	U	Downstream	Lake Trout	770
7-Aug-14	19:00	D	Downstream	Lake Trout	810
7-Aug-14	19:15	U	Upstream	Not identified	900
7-Aug-14	19:25	U	Upstream	Not identified	980
7-Aug-14	19:36	U	Upstream	Not identified	630
7-Aug-14	19:36	U	Upstream	Not identified	850
7-Aug-14	19:53	D	Upstream	Not identified	1,060
7-Aug-14	20:12	U	Upstream	Not identified	1,030
7-Aug-14	20:15	D	Upstream	Not identified	660
7-Aug-14	20:16	U	Upstream	Not identified	730
7-Aug-14	20:16	U	Upstream	Not identified	850
7-Aug-14	20:16	U	Upstream	Not identified	910
7-Aug-14	20:25	U	Upstream	Not identified	700
7-Aug-14	20:26	U	Upstream	Not identified	510
7-Aug-14	20:26	U	Upstream	Not identified	720
7-Aug-14	20:33	U	Upstream	Not identified	820
7-Aug-14	20:43	U	Upstream	Not identified	870
7-Aug-14	21:19	U	Upstream	Arctic Char	910
7-Aug-14	21:32	D	Upstream	Arctic Char	940
7-Aug-14	21:44	U	Downstream	Arctic Char	440
8-Aug-14	0:16	U	Upstream	Arctic Char	750

Notes:

Fence Location: D = Downstream of boulder garden, U = Upstream of boulder garden.

Dashes indicate not applicable.

Appendix 3.2-1. Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Date	Time (24 hr clock)	Fence Location (U/D)	Fish Direction	Species	Fork Length (mm)
8-Aug-14	2:11	D	Upstream	Arctic Char	930
8-Aug-14	2:38	U	Upstream	Not identified	1,030
8-Aug-14	3:30	U	Upstream	Not identified	1,010
8-Aug-14	4:18	U	Upstream	Not identified	540
8-Aug-14	4:45	U	Upstream	Arctic Char	730
8-Aug-14	4:45	U	Upstream	Not identified	990
8-Aug-14	5:10	U	Downstream	Not identified	700
8-Aug-14	5:21	U	Downstream	Not identified	560
8-Aug-14	6:03	D	Upstream	Not identified	1,020
8-Aug-14	6:36	U	Upstream	Not identified	800
8-Aug-14	6:42	U	Upstream	Not identified	720
8-Aug-14	8:30	D	Upstream	Lake Trout	930
8-Aug-14	8:45	U	Upstream	Not identified	880
8-Aug-14	8:58	U	Upstream	Not identified	930
8-Aug-14	9:46	D	Upstream	Not identified	670
8-Aug-14	10:05	U	Upstream	Not identified	720
8-Aug-14	10:16	U	Upstream	Not identified	1,040
8-Aug-14	11:08	D	Upstream	Not identified	1,030
8-Aug-14	11:44	U	Upstream	Not identified	1,030
8-Aug-14	12:28	D	Upstream	Not identified	600
8-Aug-14	15:24	D	Upstream	Not identified	820
8-Aug-14	15:39	U	Upstream	Not identified	990
8-Aug-14	15:44	U	Upstream	Lake Trout	900
8-Aug-14	16:06	U	Upstream	Arctic Char	1,100
8-Aug-14	19:13	D	Downstream	Not identified	690
8-Aug-14	20:26	U	Upstream	Not identified	930
8-Aug-14	21:25	D	Upstream	Not identified	370
8-Aug-14	21:44	U	Upstream	Not identified	810
8-Aug-14	23:39	U	Downstream	Not identified	400
9-Aug-14	0:12	U	Downstream	Not identified	580
9-Aug-14	0:30	U	Upstream	Not identified	740
9-Aug-14	1:20	U	Upstream	Not identified	1,180
9-Aug-14	1:30	U	Downstream	Not identified	610
9-Aug-14	2:10	U	Upstream	Not identified	950
9-Aug-14	2:16	U	Downstream	Not identified	1,080
9-Aug-14	2:35	U	Upstream	Not identified	1,170
9-Aug-14	3:26	U	Upstream	Arctic Char	570
9-Aug-14	3:43	D	Downstream	Arctic Char	930
9-Aug-14	3:56	U	Upstream	Not identified	960
9-Aug-14	3:57	U	Upstream	Not identified	600
9-Aug-14	4:02	U	Upstream	Not identified	840
9-Aug-14	4:02	U	Upstream	Not identified	1,000
9-Aug-14	4:02	U	Upstream	Lake Trout	1,170
9-Aug-14	4:13	U	Downstream	Not identified	850
9-Aug-14	4:22	U	Upstream	Not identified	940
9-Aug-14	4:23	U	Upstream	Not identified	940
9-Aug-14	4:49	D	Downstream	Lake Trout	910
9-Aug-14	5:09	U	Upstream	Not identified	850
9-Aug-14	5:14	D	Upstream	Not identified	780
9-Aug-14	5:43	U	Upstream	Not identified	1,100
9-Aug-14	5:52	D	Upstream	Not identified	880
9-Aug-14	6:11	U	Downstream	Not identified	690
9-Aug-14	6:11	U	Upstream	Not identified	760
9-Aug-14	6:12	U	Upstream	Arctic Char	810
9-Aug-14	6:34	U	Upstream	Not identified	970
9-Aug-14	6:34	U	Upstream	Not identified	1,040

Notes:

Fence Location: D = Downstream of boulder garden, U = Upstream of boulder garden.

Dashes indicate not applicable.

Appendix 3.2-1. Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Date	Time (24 hr clock)	Fence Location (U/D)	Fish Direction	Species	Fork Length (mm)
9-Aug-14	10:07	U	Upstream	Not identified	1,020
9-Aug-14	12:32	D	Upstream	Not identified	980
9-Aug-14	13:25	U	Upstream	Not identified	910
9-Aug-14	15:46	U	Upstream	Not identified	1,030
9-Aug-14	15:49	U	Upstream	Lake Trout	780
9-Aug-14	16:36	D	Upstream	Not identified	730
9-Aug-14	17:24	U	Upstream	Not identified	670
9-Aug-14	17:37	D	Upstream	Not identified	640
9-Aug-14	17:37	D	Upstream	Arctic Char	780
9-Aug-14	17:37	D	Upstream	Arctic Char	930
9-Aug-14	17:48	U	Upstream	Not identified	700
9-Aug-14	17:49	D	Downstream	Not identified	720
9-Aug-14	17:50	U	Downstream	Arctic Char	670
9-Aug-14	18:20	U	Upstream	Not identified	690
9-Aug-14	18:20	U	Upstream	Not identified	820
9-Aug-14	18:20	U	Upstream	Not identified	900
9-Aug-14	18:20	D	Upstream	Lake Trout	720
9-Aug-14	18:20	D	Upstream	Not identified	820
9-Aug-14	18:29	D	Upstream	Not identified	1,050
9-Aug-14	18:38	U	Upstream	Not identified	790
9-Aug-14	18:38	U	Upstream	Not identified	1,030
9-Aug-14	19:52	D	Upstream	Not identified	760
9-Aug-14	19:52	D	Upstream	Not identified	820
9-Aug-14	19:52	D	Upstream	Arctic Char	960
9-Aug-14	20:12	U	Upstream	Not identified	1,030
9-Aug-14	20:32	U	Upstream	Not identified	840
9-Aug-14	21:12	U	Downstream	Arctic Char	870
9-Aug-14	21:21	U	Upstream	Not identified	1,170
9-Aug-14	21:56	U	Downstream	Not identified	870
9-Aug-14	22:08	U	Upstream	Not identified	1,210
9-Aug-14	22:31	D	Upstream	Arctic Char	990
9-Aug-14	22:42	D	Upstream	Arctic Char	490
9-Aug-14	22:43	U	Upstream	Arctic Char	1,000
9-Aug-14	22:53	D	Upstream	Arctic Char	490
9-Aug-14	23:07	D	Upstream	Not identified	700
9-Aug-14	23:07	D	Upstream	Not identified	900
9-Aug-14	23:09	D	Upstream	Not identified	920
9-Aug-14	23:11	D	Upstream	Not identified	670
9-Aug-14	23:11	D	Upstream	Arctic Char	760
9-Aug-14	23:12	U	Downstream	Not identified	850
9-Aug-14	23:23	U	Upstream	Not identified	820
9-Aug-14	23:23	U	Upstream	Not identified	950
10-Aug-14	3:26	U	Downstream	Not identified	420
10-Aug-14	4:43	D	Upstream	Not identified	750
10-Aug-14	5:39	D	Downstream	Arctic Char	660
10-Aug-14	5:43	D	Upstream	Not identified	1,060
10-Aug-14	5:46	D	Upstream	Arctic Char	580
10-Aug-14	5:46	D	Downstream	Not identified	750
10-Aug-14	5:48	D	Downstream	Arctic Char	1,060
10-Aug-14	5:53	D	Upstream	Not identified	670
10-Aug-14	5:53	D	Upstream	Not identified	780
10-Aug-14	5:53	D	Upstream	Not identified	900
10-Aug-14	6:00	U	Upstream	Arctic Char	600
10-Aug-14	6:01	D	Upstream	Not identified	830
10-Aug-14	6:01	D	Upstream	Not identified	860
10-Aug-14	6:22	U	Upstream	Arctic Char	820

Notes:

Fence Location: D = Downstream of boulder garden, U = Upstream of boulder garden.

Dashes indicate not applicable.

Appendix 3.2-1. Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Date	Time (24 hr clock)	Fence Location (U/D)	Fish Direction	Species	Fork Length (mm)
10-Aug-14	6:24	U	Upstream	Arctic Char	930
10-Aug-14	6:24	D	Upstream	Arctic Char	730
10-Aug-14	6:25	U	Upstream	Not identified	870
10-Aug-14	6:34	U	Upstream	Arctic Char	880
10-Aug-14	6:46	U	Upstream	Arctic Char	850
10-Aug-14	7:33	U	Upstream	Arctic Char	1,090
10-Aug-14	7:58	U	Upstream	Arctic Char	740
10-Aug-14	10:25	D	Downstream	Arctic Char	630
10-Aug-14	10:25	D	Upstream	Not identified	1,180
10-Aug-14	10:31	D	Upstream	Arctic Char	540
10-Aug-14	11:29	U	Upstream	Arctic Char	1,090
10-Aug-14	12:43	D	Upstream	Arctic Char	600
10-Aug-14	14:35	D	Upstream	Not identified	940
10-Aug-14	14:46	U	Upstream	Arctic Char	990
10-Aug-14	16:37	D	Upstream	Arctic Char	450
10-Aug-14	16:39	D	Upstream	Arctic Char	1,080
10-Aug-14	16:44	D	Upstream	Arctic Char	930
10-Aug-14	16:44	D	Upstream	Not identified	580
10-Aug-14	16:44	D	Upstream	Not identified	810
10-Aug-14	16:46	U	Upstream	Arctic Char	1,110
10-Aug-14	16:55	U	Upstream	Arctic Char	480
10-Aug-14	17:06	U	Upstream	Arctic Char	960
10-Aug-14	17:09	D	Upstream	Not identified	660
10-Aug-14	17:09	D	Upstream	Not identified	720
10-Aug-14	17:11	U	Downstream	Arctic Char	690
10-Aug-14	17:11	U	Upstream	Arctic Char	840
10-Aug-14	17:21	U	Upstream	Arctic Char	600
10-Aug-14	17:21	U	Upstream	Arctic Char	700
10-Aug-14	17:21	U	Upstream	Arctic Char	820
10-Aug-14	17:29	U	Upstream	Arctic Char	760
10-Aug-14	17:33	U	Upstream	Arctic Char	400
10-Aug-14	17:51	U	Upstream	Arctic Char	690
10-Aug-14	18:36	D	Upstream	Not identified	520
10-Aug-14	19:37	D	Downstream	Arctic Char	610
10-Aug-14	19:48	D	Upstream	Arctic Char	640
10-Aug-14	19:50	D	Upstream	Arctic Char	880
10-Aug-14	19:50	D	Upstream	Not identified	820
10-Aug-14	19:50	D	Upstream	Not identified	930
10-Aug-14	19:51	D	Upstream	Not identified	820
10-Aug-14	19:51	D	Upstream	Not identified	880
10-Aug-14	19:56	D	Upstream	Not identified	840
10-Aug-14	20:03	U	Downstream	Not identified	640
10-Aug-14	20:03	U	Upstream	Not identified	840
10-Aug-14	20:04	U	Downstream	Arctic Char	590
10-Aug-14	20:04	U	Upstream	Arctic Char	680
10-Aug-14	20:08	U	Upstream	Arctic Char	930
10-Aug-14	20:09	U	Upstream	Arctic Char	690
10-Aug-14	20:09	U	Upstream	Arctic Char	820
10-Aug-14	20:11	U	Upstream	Arctic Char	860
10-Aug-14	20:11	U	Upstream	Arctic Char	1,010
10-Aug-14	20:27	U	Upstream	Arctic Char	840
10-Aug-14	20:27	U	Upstream	Arctic Char	900
10-Aug-14	20:35	D	Upstream	Arctic Char	970
10-Aug-14	20:39	D	Upstream	Arctic Char	760
10-Aug-14	20:44	U	Upstream	Arctic Char	1,030
10-Aug-14	20:53	U	Upstream	Arctic Char	780

Notes:

Fence Location: D = Downstream of boulder garden, U = Upstream of boulder garden.

Dashes indicate not applicable.

Appendix 3.2-1. Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Date	Time (24 hr clock)	Fence Location (U/D)	Fish Direction	Species	Fork Length (mm)
10-Aug-14	21:19	D	Downstream	Arctic Char	780
10-Aug-14	22:02	D	Upstream	Arctic Char	570
11-Aug-14	3:09	D	Upstream	Not identified	990
11-Aug-14	4:10	D	Upstream	Not identified	1,000
11-Aug-14	4:24	D	Downstream	Not identified	700
11-Aug-14	4:24	D	Upstream	Not identified	810
11-Aug-14	4:30	D	Downstream	Not identified	970
11-Aug-14	4:36	U	Upstream	Arctic Char	940
11-Aug-14	5:01	U	Upstream	Lake Trout	600
11-Aug-14	7:09	D	Upstream	Arctic Char	990
11-Aug-14	7:36	U	Upstream	Arctic Char	1,020
11-Aug-14	7:50	D	Upstream	Not identified	760
11-Aug-14	7:50	D	Upstream	Not identified	790
11-Aug-14	7:50	D	Upstream	Not identified	820
11-Aug-14	7:50	D	Upstream	Not identified	1,010
11-Aug-14	8:09	U	Upstream	Arctic Char	1,040
11-Aug-14	8:10	U	Upstream	Arctic Char	850
11-Aug-14	11:25	D	Upstream	Arctic Char	870
11-Aug-14	12:13	U	Upstream	Arctic Char	910
11-Aug-14	16:46	D	Upstream	Not identified	600
11-Aug-14	16:46	D	Upstream	Not identified	670
11-Aug-14	17:33	U	Upstream	Arctic Char	610
11-Aug-14	19:07	D	Upstream	Not identified	990
11-Aug-14	19:13	U	Upstream	Arctic Char	1,010
11-Aug-14	19:14	D	Upstream	Not identified	740
11-Aug-14	19:43	U	Upstream	Arctic Char	730
11-Aug-14	21:02	D	Upstream	Not identified	750
11-Aug-14	21:30	U	Upstream	Arctic Char	780
11-Aug-14	21:38	D	Upstream	Not identified	490
11-Aug-14	22:10	U	Upstream	Arctic Char	520
11-Aug-14	23:39	D	Upstream	Not identified	740
11-Aug-14	23:55	D	Downstream	Not identified	520
12-Aug-14	0:03	D	Downstream	Not identified	460
12-Aug-14	0:07	D	Upstream	Not identified	580
12-Aug-14	0:17	U	Upstream	Arctic Char	840
12-Aug-14	1:46	D	Upstream	Not identified	780
12-Aug-14	4:42	D	Upstream	Not identified	690
12-Aug-14	4:53	D	Upstream	Not identified	700
12-Aug-14	5:21	D	Upstream	Arctic Char	730
12-Aug-14	5:37	U	Downstream	Arctic Char	430
12-Aug-14	19:40	D	Upstream	Not identified	640
12-Aug-14	21:50	D	Upstream	Not identified	600
12-Aug-14	22:15	D	Upstream	Not identified	400
12-Aug-14	22:25	D	Upstream	Not identified	460
12-Aug-14	22:25	D	Upstream	Not identified	460
12-Aug-14	22:47	U	Upstream	Arctic Char	510
12-Aug-14	22:47	U	Downstream	Not identified	430
12-Aug-14	22:49	D	Upstream	Not identified	480
12-Aug-14	22:52	U	Upstream	Arctic Char	600
12-Aug-14	22:55	U	Downstream	Not identified	530
12-Aug-14	23:11	U	Upstream	Arctic Char	490
12-Aug-14	23:51	D	Upstream	Not identified	730
13-Aug-14	0:37	D	Upstream	Not identified	930
13-Aug-14	0:39	D	Upstream	Not identified	790
13-Aug-14	0:40	D	Upstream	Not identified	790
13-Aug-14	0:41	D	Upstream	Not identified	870

Notes:

Fence Location: D = Downstream of boulder garden, U = Upstream of boulder garden.

Dashes indicate not applicable.

Appendix 3.2-1. Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Date	Time (24 hr clock)	Fence Location (U/D)	Fish Direction	Species	Fork Length (mm)
13-Aug-14	0:46	U	Upstream	Arctic Char	860
13-Aug-14	2:52	U	Upstream	Arctic Char	1,020
13-Aug-14	8:00	D	Upstream	Not identified	390
13-Aug-14	10:56	D	Upstream	Lake Trout	540
13-Aug-14	12:09	U	Upstream	Lake Trout	450
13-Aug-14	13:31	U	Upstream	Lake Trout	550
13-Aug-14	13:47	D	Upstream	Not identified	440
13-Aug-14	13:47	D	Upstream	Not identified	510
13-Aug-14	14:14	U	Upstream	Arctic Char	740
13-Aug-14	14:48	D	Upstream	Arctic Char	820
13-Aug-14	14:48	D	Upstream	Not identified	520
13-Aug-14	15:07	D	Upstream	Not identified	1,060
13-Aug-14	15:19	U	Upstream	Arctic Char	1,000
13-Aug-14	15:26	U	Upstream	Arctic Char	850
13-Aug-14	15:53	D	Upstream	Not identified	540
13-Aug-14	16:19	U	Upstream	Lake Trout	550
13-Aug-14	17:15	D	Upstream	Not identified	610
13-Aug-14	17:24	D	Upstream	Not identified	500
13-Aug-14	18:01	D	Upstream	Arctic Char	480
13-Aug-14	20:05	D	Upstream	Not identified	570
13-Aug-14	20:31	D	Upstream	Not identified	850
13-Aug-14	20:42	U	Upstream	Arctic Char	570
13-Aug-14	20:53	U	Upstream	Arctic Char	810
13-Aug-14	21:30	D	Downstream	Not identified	410
13-Aug-14	21:30	D	Upstream	Not identified	690
13-Aug-14	21:48	U	Upstream	Arctic Char	540
13-Aug-14	22:59	D	Downstream	Not identified	540
13-Aug-14	23:13	D	Downstream	Arctic Char	620
14-Aug-14	0:16	D	Upstream	Not identified	540
14-Aug-14	0:55	U	Upstream	Arctic Char	780
14-Aug-14	0:57	D	Upstream	Not identified	600
14-Aug-14	3:03	D	Upstream	Not identified	570
14-Aug-14	3:05	D	Upstream	Not identified	480
14-Aug-14	3:44	D	Upstream	Not identified	830
14-Aug-14	3:52	D	Upstream	Not identified	700
14-Aug-14	4:07	D	Downstream	Arctic Char	490
14-Aug-14	4:08	D	Downstream	Not identified	520
14-Aug-14	4:12	D	Downstream	Lake Trout	600
14-Aug-14	4:15	D	Upstream	Not identified	610
14-Aug-14	4:31	D	Upstream	Arctic Char	510
14-Aug-14	4:55	D	Downstream	Not identified	600
14-Aug-14	7:09	U	Downstream	Lake Trout	420
14-Aug-14	7:25	U	Upstream	Lake Trout	770
14-Aug-14	8:05	D	Upstream	Not identified	820
14-Aug-14	8:25	U	Upstream	Lake Trout	870
14-Aug-14	8:43	D	Upstream	Not identified	610
14-Aug-14	9:16	D	Upstream	Arctic Char	480
14-Aug-14	9:30	U	Downstream	Lake Trout	500
14-Aug-14	9:55	U	Upstream	Lake Trout	760
14-Aug-14	10:01	U	Upstream	Lake Trout	740
14-Aug-14	10:06	U	Downstream	Lake Trout	360
14-Aug-14	10:07	D	Upstream	Arctic Char	420
14-Aug-14	10:11	D	Upstream	Arctic Char	510
14-Aug-14	10:14	U	Upstream	Lake Trout	730
14-Aug-14	10:53	U	Upstream	Lake Trout	420
14-Aug-14	11:17	D	Upstream	Not identified	910

Notes:

Fence Location: D = Downstream of boulder garden, U = Upstream of boulder garden.

Dashes indicate not applicable.

Appendix 3.2-1. Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Date	Time (24 hr clock)	Fence Location (U/D)	Fish Direction	Species	Fork Length (mm)
14-Aug-14	11:38	U	Upstream	Arctic Char	950
14-Aug-14	14:28	D	Upstream	Not identified	580
14-Aug-14	14:37	D	Upstream	Not identified	570
14-Aug-14	14:44	D	Upstream	Not identified	670
14-Aug-14	15:42	D	Upstream	Not identified	540
14-Aug-14	16:05	U	Upstream	Arctic Char	600
14-Aug-14	18:17	U	Upstream	Arctic Char	1,170
14-Aug-14	19:00	D	Upstream	Arctic Char	690
14-Aug-14	19:05	U	Upstream	Arctic Char	730
14-Aug-14	19:14	D	Upstream	Not identified	720
14-Aug-14	19:14	D	Upstream	Not identified	890
14-Aug-14	19:36	D	Upstream	Arctic Char	810
14-Aug-14	19:50	U	Upstream	Arctic Char	740
14-Aug-14	19:59	U	Upstream	Arctic Char	870
14-Aug-14	19:59	D	Upstream	Not identified	520
14-Aug-14	20:19	U	Upstream	Arctic Char	1,130
14-Aug-14	20:35	D	Upstream	Arctic Char	450
14-Aug-14	20:47	D	Upstream	Not identified	490
14-Aug-14	21:33	D	Upstream	Not identified	850
14-Aug-14	21:34	U	Upstream	Not identified	550
14-Aug-14	21:39	U	Downstream	Lake Trout	440
14-Aug-14	22:14	U	Upstream	Arctic Char	910
14-Aug-14	22:15	U	Downstream	Not identified	690
14-Aug-14	22:26	U	Upstream	Arctic Char	910
14-Aug-14	23:00	D	Downstream	Not identified	550
14-Aug-14	23:22	D	Downstream	Arctic Char	480
14-Aug-14	23:22	D	Upstream	Not identified	480
14-Aug-14	23:26	D	Upstream	Not identified	1,040
14-Aug-14	23:31	D	Upstream	Arctic Char	630
15-Aug-14	0:17	U	Upstream	Not identified	450
15-Aug-14	0:27	U	Upstream	Arctic Char	730
15-Aug-14	0:27	U	Upstream	Not identified	1,090
15-Aug-14	0:41	U	Downstream	Not identified	640
15-Aug-14	0:46	U	Downstream	Not identified	580
15-Aug-14	0:46	U	Upstream	Not identified	640
15-Aug-14	1:07	U	Upstream	Arctic Char	660
15-Aug-14	1:58	U	Downstream	Not identified	660
15-Aug-14	4:12	D	Upstream	Not identified	760
15-Aug-14	4:12	D	Upstream	Not identified	1,050
15-Aug-14	4:15	D	Upstream	Not identified	580
15-Aug-14	4:15	D	Upstream	Not identified	610
15-Aug-14	4:22	U	Downstream	Arctic Char	490
15-Aug-14	4:32	U	Upstream	Arctic Char	1,030
15-Aug-14	4:45	U	Upstream	Arctic Char	790
15-Aug-14	4:48	U	Upstream	Arctic Char	580
15-Aug-14	6:25	D	Upstream	Not identified	510
15-Aug-14	6:38	U	Upstream	Lake Trout	700
15-Aug-14	9:54	D	Upstream	Not identified	940
15-Aug-14	10:43	U	Upstream	Arctic Char	1,020
15-Aug-14	11:41	U	Downstream	Lake Trout	430
15-Aug-14	13:18	D	Upstream	Not identified	640
15-Aug-14	16:12	D	Upstream	Not identified	540
15-Aug-14	17:33	U	Downstream	Lake Trout	400
15-Aug-14	17:34	U	Upstream	Lake Trout	670
15-Aug-14	18:14	U	Downstream	Lake Trout	610
15-Aug-14	18:59	D	Upstream	Not identified	420

Notes:

Fence Location: D = Downstream of boulder garden, U = Upstream of boulder garden.

Dashes indicate not applicable.

Appendix 3.2-1. Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Date	Time (24 hr clock)	Fence Location (U/D)	Fish Direction	Species	Fork Length (mm)
15-Aug-14	20:27	D	Upstream	Not identified	520
15-Aug-14	20:41	U	Upstream	Lake Trout	820
15-Aug-14	20:44	D	Upstream	Not identified	540
15-Aug-14	20:44	D	Downstream	Not identified	540
15-Aug-14	21:22	U	Upstream	Lake Trout	640
15-Aug-14	21:22	U	Upstream	Lake Trout	720
15-Aug-14	21:34	D	Upstream	Arctic Char	900
15-Aug-14	21:38	D	Upstream	Not identified	550
15-Aug-14	22:02	U	Upstream	Arctic Char	720
15-Aug-14	22:03	U	Upstream	Arctic Char	580
15-Aug-14	22:55	D	Downstream	Arctic Char	450
15-Aug-14	22:55	D	Upstream	Not identified	480
15-Aug-14	23:12	D	Upstream	Arctic Char	480
15-Aug-14	23:56	U	Upstream	Not identified	820
16-Aug-14	5:16	D	Upstream	Not identified	810
16-Aug-14	5:53	U	Upstream	Not identified	760
16-Aug-14	6:18	U	Upstream	Lake Trout	400
16-Aug-14	6:19	U	Upstream	Not identified	540
16-Aug-14	6:22	U	Downstream	Not identified	410
16-Aug-14	8:00	D	Upstream	Arctic Char	850
16-Aug-14	8:07	D	Downstream	Not identified	430
16-Aug-14	9:24	D	Upstream	Not identified	520
16-Aug-14	10:02	U	Downstream	Not identified	400
16-Aug-14	11:21	D	Downstream	Not identified	360
16-Aug-14	11:42	U	Upstream	Not identified	740
16-Aug-14	12:29	U	Upstream	Not identified	700
16-Aug-14	18:06	D	Upstream	Arctic Char	870
16-Aug-14	18:38	D	Upstream	Not identified	1,060
16-Aug-14	18:43	D	Downstream	Not identified	700
16-Aug-14	18:43	D	Upstream	Not identified	760
16-Aug-14	18:48	D	Downstream	Not identified	1,170
16-Aug-14	18:50	D	Upstream	Not identified	760
16-Aug-14	18:53	D	Upstream	Not identified	750
16-Aug-14	19:20	U	Upstream	Arctic Char	780
16-Aug-14	20:19	U	Upstream	Not identified	680
16-Aug-14	20:19	D	Upstream	Not identified	770
16-Aug-14	20:28	U	Downstream	Not identified	720
16-Aug-14	20:46	U	Upstream	Not identified	770
16-Aug-14	20:52	U	Upstream	Lake Trout	960
16-Aug-14	21:43	D	Upstream	Lake Trout	550
16-Aug-14	22:38	U	Downstream	Not identified	660
16-Aug-14	23:44	D	Downstream	Not identified	460
16-Aug-14	23:58	U	Upstream	Arctic Char	740
17-Aug-14	0:01	U	Upstream	Not identified	370
17-Aug-14	0:37	U	Upstream	Not identified	630
17-Aug-14	1:11	U	Upstream	Lake Trout	910
17-Aug-14	1:30	U	Upstream	Not identified	690
17-Aug-14	1:30	U	Downstream	Not identified	700
17-Aug-14	1:30	D	Upstream	Not identified	1,210
17-Aug-14	2:07	U	Upstream	Not identified	1,290
17-Aug-14	7:25	U	Upstream	Not identified	530
17-Aug-14	10:16	D	Upstream	Not identified	390
17-Aug-14	11:29	D	Downstream	Not identified	750
17-Aug-14	12:38	U	Downstream	Lake Trout	910
17-Aug-14	13:16	U	Upstream	Not identified	940
17-Aug-14	14:24	U	Upstream	Not identified	1,010

Notes:

Fence Location: D = Downstream of boulder garden, U = Upstream of boulder garden.

Dashes indicate not applicable.

Appendix 3.2-1. Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Date	Time (24 hr clock)	Fence Location (U/D)	Fish Direction	Species	Fork Length (mm)
17-Aug-14	16:02	D	Upstream	Not identified	910
17-Aug-14	16:41	U	Upstream	Not identified	930
17-Aug-14	16:44	D	Upstream	Not identified	570
17-Aug-14	17:06	U	Upstream	Arctic Char	620
17-Aug-14	17:14	D	Upstream	Arctic Char	490
17-Aug-14	17:52	U	Upstream	Not identified	570
17-Aug-14	17:55	U	Upstream	Arctic Char	830
17-Aug-14	17:55	D	Upstream	Not identified	490
17-Aug-14	18:22	U	Upstream	Not identified	540
17-Aug-14	22:45	U	Upstream	Not identified	630
17-Aug-14	23:10	U	Downstream	Arctic Char	580
18-Aug-14	0:56	U	Upstream	Not identified	580
18-Aug-14	2:15	D	Downstream	Lake Trout	840
18-Aug-14	3:59	D	Upstream	Arctic Char	1,000
18-Aug-14	4:55	U	Upstream	Not identified	1,050
18-Aug-14	5:39	U	Upstream	Arctic Char	830
18-Aug-14	5:48	D	Downstream	Not identified	700
18-Aug-14	5:48	D	Upstream	Not identified	810
18-Aug-14	5:49	D	Upstream	Not identified	990
18-Aug-14	6:16	U	Upstream	Not identified	780
18-Aug-14	6:35	U	Upstream	Not identified	910
18-Aug-14	11:50	U	Upstream	Not identified	570
18-Aug-14	12:09	D	Downstream	Not identified	1,110
18-Aug-14	13:28	D	Downstream	Not identified	810
18-Aug-14	14:00	D	Downstream	Not identified	660
18-Aug-14	14:15	D	Upstream	Lake Trout	640
18-Aug-14	16:14	D	Downstream	Not identified	550
18-Aug-14	16:15	D	Downstream	Not identified	720
18-Aug-14	16:19	D	Downstream	Not identified	430
18-Aug-14	17:21	D	Downstream	Arctic Char	550
18-Aug-14	17:22	D	Downstream	Not identified	730
18-Aug-14	17:50	D	Downstream	Not identified	460
18-Aug-14	17:50	D	Downstream	Not identified	630
18-Aug-14	18:18	D	Upstream	Arctic Char	520
18-Aug-14	18:22	D	Downstream	Not identified	540
18-Aug-14	20:08	D	Upstream	Not identified	780
18-Aug-14	20:25	U	Upstream	Not identified	720
18-Aug-14	22:21	U	Upstream	Not identified	600
18-Aug-14	23:50	U	Downstream	Lake Trout	390
18-Aug-14	23:50	U	Upstream	Lake Trout	460
18-Aug-14	23:51	U	Upstream	Not identified	450
19-Aug-14	1:03	U	Upstream	Not identified	820
19-Aug-14	4:14	D	Upstream	Lake Trout	360
19-Aug-14	4:29	D	Upstream	Not identified	370
19-Aug-14	4:31	U	Downstream	Arctic Char	670
19-Aug-14	4:31	U	Upstream	Not identified	770
19-Aug-14	4:33	D	Downstream	Not identified	430
19-Aug-14	4:42	U	Downstream	Not identified	710
19-Aug-14	4:48	D	Downstream	Not identified	1,120
19-Aug-14	4:49	D	Downstream	Not identified	450
19-Aug-14	4:52	U	Upstream	Not identified	520
19-Aug-14	4:55	U	Upstream	Arctic Char	710
19-Aug-14	4:57	U	Upstream	Lake Trout	780
19-Aug-14	5:13	U	Upstream	Lake Trout	1,170
19-Aug-14	5:47	D	Downstream	Not identified	400
19-Aug-14	5:48	D	Downstream	Not identified	400

Notes:

Fence Location: D = Downstream of boulder garden, U = Upstream of boulder garden.

Dashes indicate not applicable.

Appendix 3.2-1. Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Date	Time (24 hr clock)	Fence Location (U/D)	Fish Direction	Species	Fork Length (mm)
19-Aug-14	8:18	U	Upstream	Not identified	690
19-Aug-14	9:32	D	Upstream	Not identified	790
19-Aug-14	11:27	U	Upstream	Not identified	800
19-Aug-14	11:37	U	Upstream	Not identified	450
19-Aug-14	13:25	U	Upstream	Not identified	360
19-Aug-14	16:09	D	Upstream	Not identified	580
19-Aug-14	16:42	U	Upstream	Not identified	850
19-Aug-14	16:52	U	Upstream	Not identified	950
19-Aug-14	17:04	U	Upstream	Lake Trout	750
19-Aug-14	17:39	D	Downstream	Not identified	430
19-Aug-14	18:44	D	Upstream	Not identified	600
20-Aug-14	4:34	U	Downstream	Not identified	690
20-Aug-14	6:14	U	Downstream	Arctic Char	440
20-Aug-14	12:56	U	Upstream	Not identified	390
20-Aug-14	12:57	U	Upstream	Not identified	470
20-Aug-14	15:52	U	Upstream	Not identified	390
20-Aug-14	19:14	U	Upstream	Arctic Char	490
20-Aug-14	20:02	U	Upstream	Not identified	510
21-Aug-14	2:11	U	Downstream	Arctic Char	360
21-Aug-14	5:12	U	Upstream	Not identified	510
21-Aug-14	5:37	U	Upstream	Not identified	760
21-Aug-14	6:20	U	Downstream	Not identified	360
21-Aug-14	8:53	U	Downstream	Not identified	350
21-Aug-14	10:04	U	Downstream	Not identified	360
21-Aug-14	12:02	U	Upstream	Arctic Char	660
21-Aug-14	12:15	U	Upstream	Not identified	720
21-Aug-14	15:20	U	Downstream	Lake Trout	460
21-Aug-14	22:05	D	Upstream	Not identified	740
21-Aug-14	22:33	U	Downstream	Not identified	490
22-Aug-14	0:35	U	Upstream	Not identified	1,000
22-Aug-14	0:37	U	Upstream	Not identified	1,020
22-Aug-14	0:38	U	Downstream	Not identified	650
22-Aug-14	0:38	U	Upstream	Not identified	870
22-Aug-14	0:39	U	Upstream	Not identified	880
22-Aug-14	1:08	U	Upstream	Arctic Char	730
22-Aug-14	6:03	U	Upstream	Not identified	640
22-Aug-14	6:04	U	Downstream	Not identified	490
22-Aug-14	6:05	U	Upstream	Not identified	690
22-Aug-14	7:21	U	Upstream	Not identified	720
22-Aug-14	8:29	U	Downstream	Not identified	400
22-Aug-14	8:29	U	Upstream	Not identified	480
22-Aug-14	8:31	U	Downstream	Not identified	420
22-Aug-14	8:31	U	Upstream	Not identified	520
22-Aug-14	8:31	U	Downstream	Not identified	600
22-Aug-14	8:33	U	Downstream	Arctic Char	590
22-Aug-14	9:24	U	Downstream	Not identified	360
22-Aug-14	13:00	U	Downstream	Not identified	490
22-Aug-14	13:48	U	Upstream	Not identified	690
22-Aug-14	13:49	U	Upstream	Not identified	680
22-Aug-14	14:02	U	Downstream	Lake Trout	350
22-Aug-14	15:42	U	Downstream	Not identified	350
22-Aug-14	15:57	U	Downstream	Not identified	360
22-Aug-14	16:53	U	Upstream	Arctic Char	600
22-Aug-14	22:14	U	Downstream	Not identified	450
22-Aug-14	23:49	U	Upstream	Not identified	380
22-Aug-14	23:50	U	Downstream	Arctic Char	430

Notes:

Fence Location: D = Downstream of boulder garden, U = Upstream of boulder garden.

Dashes indicate not applicable.

Appendix 3.2-1. Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Date	Time (24 hr clock)	Fence Location (U/D)	Fish Direction	Species	Fork Length (mm)
23-Aug-14	0:30	U	Upstream	Not identified	450
23-Aug-14	0:42	U	Downstream	Not identified	520
23-Aug-14	0:56	U	Downstream	Lake Trout	490
23-Aug-14	1:18	U	Upstream	Not identified	540
23-Aug-14	1:20	U	Downstream	Not identified	480
23-Aug-14	6:21	U	Downstream	Not identified	550
23-Aug-14	13:20	U	Downstream	Not identified	400
23-Aug-14	13:25	U	Downstream	Not identified	370
23-Aug-14	13:25	U	Upstream	Not identified	720
23-Aug-14	13:31	U	Upstream	Not identified	820
23-Aug-14	15:24	U	Upstream	Lake Trout	670
23-Aug-14	17:12	U	Upstream	Not identified	660
23-Aug-14	17:43	U	Downstream	Not identified	640
23-Aug-14	18:58	U	Downstream	Not identified	550
23-Aug-14	19:01	U	Upstream	Not identified	430
23-Aug-14	19:34	U	Upstream	Not identified	690
23-Aug-14		U	Upstream	Lake Trout	370
24-Aug-14	0:49	U	Upstream	Not identified	780
24-Aug-14	5:28	U	Upstream	Not identified	680
24-Aug-14	5:39	U	Upstream	Not identified	870
24-Aug-14	6:10	U	Upstream	Not identified	660
24-Aug-14	8:15	U	Downstream	Not identified	370
24-Aug-14	10:07	U	Downstream	Lake Trout	570
24-Aug-14	10:09	U	Downstream	Lake Trout	360
24-Aug-14	12:17	U	Upstream	Lake Trout	680
24-Aug-14	12:19	U	Downstream	Not identified	370
24-Aug-14	12:23	U	Upstream	Not identified	670
24-Aug-14	12:44	U	Upstream	Arctic Char	760
24-Aug-14	13:57	U	Downstream	Not identified	360
24-Aug-14	15:09	U	Upstream	Not identified	490
24-Aug-14	15:36	U	Downstream	Not identified	490
24-Aug-14	16:13	U	Downstream	Not identified	630
24-Aug-14	16:26	U	Downstream	Not identified	560
24-Aug-14	19:10	D	Upstream	Not identified	400
24-Aug-14	19:45	U	Upstream	Not identified	420
24-Aug-14	19:45	D	Upstream	Not identified	360
24-Aug-14	19:45	D	Upstream	Arctic Char	430
24-Aug-14	19:47	D	Upstream	Not identified	450
24-Aug-14	19:50	U	Upstream	Not identified	660
24-Aug-14	22:38	D	Upstream	Not identified	520
25-Aug-14	0:02	D	Upstream	Arctic Char	470
25-Aug-14	0:02	D	Downstream	Not identified	520
25-Aug-14	0:51	U	Downstream	Not identified	370
25-Aug-14	0:54	U	Upstream	Not identified	610
25-Aug-14	1:31	U	Downstream	Not identified	490
25-Aug-14	4:07	D	Upstream	Not identified	420
25-Aug-14	4:56	D	Upstream	Not identified	420
25-Aug-14	5:00	D	Upstream	Arctic Char	450
25-Aug-14	5:08	D	Upstream	Not identified	420
25-Aug-14	5:53	D	Upstream	Not identified	490
25-Aug-14	6:07	U	Upstream	Arctic Char	740
25-Aug-14	6:26	D	Upstream	Not identified	520
25-Aug-14	6:31	U	Downstream	Not identified	450
25-Aug-14	6:39	U	Downstream	Arctic Char	660
25-Aug-14	11:56	D	Upstream	Not identified	850
25-Aug-14	14:27	U	Upstream	Not identified	870

Notes:

Fence Location: D = Downstream of boulder garden, U = Upstream of boulder garden.

Dashes indicate not applicable.

Appendix 3.2-1. Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Date	Time (24 hr clock)	Fence Location (U/D)	Fish Direction	Species	Fork Length (mm)
25-Aug-14	17:17	U	Downstream	Not identified	540
25-Aug-14	19:01	D	Upstream	Not identified	880
25-Aug-14	20:31	D	Upstream	Not identified	460
25-Aug-14	21:16	D	Upstream	Not identified	450
25-Aug-14	21:16	D	Upstream	Not identified	480
25-Aug-14	21:18	D	Downstream	Not identified	760
25-Aug-14	21:18	D	Upstream	Not identified	810
25-Aug-14	21:24	D	Upstream	Lake Trout	980
25-Aug-14	21:29	D	Upstream	Not identified	850
25-Aug-14	21:32	D	Upstream	Arctic Char	830
25-Aug-14	21:59	U	Upstream	Not identified	850
25-Aug-14	22:24	U	Downstream	Not identified	780
25-Aug-14	22:24	U	Upstream	Not identified	990
26-Aug-14	0:27	U	Upstream	Arctic Char	670
26-Aug-14	1:27	D	Upstream	Not identified	1,050
26-Aug-14	1:47	U	Downstream	Not identified	720
26-Aug-14	1:52	U	Upstream	Not identified	810
26-Aug-14	1:53	D	Downstream	Not identified	920
26-Aug-14	3:15	D	Downstream	Not identified	930
26-Aug-14	3:15	D	Upstream	Not identified	1,050
26-Aug-14	3:18	D	Upstream	Arctic Char	610
26-Aug-14	4:58	U	Downstream	Not identified	540
26-Aug-14	5:04	U	Downstream	Arctic Char	350
26-Aug-14	5:57	U	Upstream	Not identified	680
26-Aug-14	5:58	D	Upstream	Not identified	460
26-Aug-14	6:24	U	Upstream	Arctic Char	790
26-Aug-14	17:32	D	Upstream	Arctic Char	690
26-Aug-14	18:55	U	Downstream	Not identified	390
26-Aug-14	19:29	U	Downstream	Not identified	640
26-Aug-14	19:56	U	Upstream	Not identified	700
26-Aug-14	19:57	U	Upstream	Not identified	660
26-Aug-14	21:53	D	Upstream	Not identified	360
26-Aug-14	22:12	D	Upstream	Not identified	400
26-Aug-14	22:20	D	Upstream	Not identified	390
26-Aug-14	22:36	D	Upstream	Not identified	460
26-Aug-14	23:28	D	Upstream	Not identified	490
27-Aug-14	0:09	D	Downstream	Not identified	510
27-Aug-14	0:25	U	Upstream	Arctic Char	480
27-Aug-14	0:25	U	Downstream	Not identified	660
27-Aug-14	0:59	U	Downstream	Arctic Char	360
27-Aug-14	0:59	U	Upstream	Not identified	560
27-Aug-14	1:04	U	Upstream	Arctic Char	580
27-Aug-14	1:30	D	Downstream	Not identified	660
27-Aug-14	1:42	U	Downstream	Not identified	490
27-Aug-14	2:13	U	Downstream	Not identified	490
27-Aug-14	5:50	U	Upstream	Lake Trout	700
27-Aug-14	5:50	D	Upstream	Not identified	370
27-Aug-14	5:50	D	Downstream	Not identified	390
27-Aug-14	7:13	U	Upstream	Not identified	660
27-Aug-14	7:15	U	Downstream	Lake Trout	630
27-Aug-14	7:18	D	Upstream	Not identified	360
27-Aug-14	7:18	D	Upstream	Not identified	400
27-Aug-14	7:38	U	Downstream	Not identified	350
27-Aug-14	7:53	D	Upstream	Not identified	370
27-Aug-14	7:59	U	Downstream	Not identified	390
27-Aug-14	8:12	D	Upstream	Not identified	390

Notes:

Fence Location: D = Downstream of boulder garden, U = Upstream of boulder garden.

Dashes indicate not applicable.

Appendix 3.2-1. Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Date	Time (24 hr clock)	Fence Location (U/D)	Fish Direction	Species	Fork Length (mm)
27-Aug-14	8:12	D	Upstream	Not identified	400
27-Aug-14	8:17	U	Upstream	Not identified	710
27-Aug-14	8:56	U	Upstream	Not identified	690
27-Aug-14	9:52	D	Upstream	Lake Trout	830
27-Aug-14	10:30	D	Upstream	Not identified	360
27-Aug-14	10:42	U	Upstream	Not identified	880
27-Aug-14	12:04	U	Upstream	Not identified	420
27-Aug-14	16:11	D	Upstream	Arctic Char	390
27-Aug-14	16:37	D	Upstream	Not identified	400
27-Aug-14	17:20	D	Upstream	Not identified	490
27-Aug-14	18:08	U	Upstream	Not identified	550
27-Aug-14	18:28	D	Upstream	Not identified	790
27-Aug-14	18:28	D	Upstream	Not identified	940
27-Aug-14	18:56	U	Upstream	Not identified	870
27-Aug-14	18:57	U	Upstream	Not identified	1,060
27-Aug-14	19:27	U	Upstream	Not identified	390
27-Aug-14	20:00	D	Downstream	Not identified	390
27-Aug-14	20:07	D	Upstream	Not identified	400
27-Aug-14	20:07	D	Upstream	Arctic Char	450
27-Aug-14	20:27	D	Downstream	Lake Trout	520
27-Aug-14	20:27	D	Upstream	Arctic Char	670
27-Aug-14	20:32	D	Upstream	Not identified	660
27-Aug-14	20:47	U	Upstream	Not identified	490
27-Aug-14	20:48	U	Downstream	Arctic Char	370
27-Aug-14	21:17	U	Upstream	Not identified	700
27-Aug-14	23:15	D	Upstream	Not identified	390
27-Aug-14	23:15	D	Downstream	Not identified	400
27-Aug-14	23:33	D	Upstream	Not identified	370
27-Aug-14	23:35	D	Upstream	Not identified	380
28-Aug-14	13:08	U	Upstream	Not identified	700
28-Aug-14	14:49	D	Upstream	Not identified	380
28-Aug-14	15:12	D	Upstream	Not identified	360
28-Aug-14	15:13	D	Downstream	Not identified	370
28-Aug-14	15:15	D	Upstream	Not identified	450
28-Aug-14	15:17	D	Upstream	Not identified	400
28-Aug-14	15:17	D	Downstream	Not identified	400
28-Aug-14	15:26	D	Downstream	Not identified	360
28-Aug-14	15:27	D	Downstream	Not identified	350
28-Aug-14	15:35	D	Downstream	Not identified	360
28-Aug-14	15:35	D	Upstream	Not identified	390
28-Aug-14	15:35	D	Upstream	Lake Trout	420
28-Aug-14	15:37	D	Downstream	Not identified	350
28-Aug-14	15:40	U	Upstream	Not identified	390
28-Aug-14	15:40	D	Upstream	Arctic Char	380
28-Aug-14	15:40	D	Upstream	Not identified	430
28-Aug-14	15:47	U	Upstream	Not identified	420
28-Aug-14	15:47	U	Upstream	Not identified	430
28-Aug-14	16:53	U	Downstream	Not identified	430
28-Aug-14	16:53	U	Upstream	Not identified	480
28-Aug-14	16:53	U	Downstream	Arctic Char	660
28-Aug-14	17:03	U	Upstream	Not identified	480
28-Aug-14	21:08	D	Upstream	Not identified	490
28-Aug-14	21:09	D	Upstream	Not identified	360
28-Aug-14	21:30	U	Upstream	Not identified	520
29-Aug-14	2:42	U	Upstream	Arctic Char	360
29-Aug-14	5:34	U	Upstream	Arctic Char	390

Notes:

Fence Location: D = Downstream of boulder garden, U = Upstream of boulder garden.

Dashes indicate not applicable.

Appendix 3.2-1. Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Date	Time (24 hr clock)	Fence Location (U/D)	Fish Direction	Species	Fork Length (mm)
29-Aug-14	6:42	U	Upstream	Not identified	650
29-Aug-14	6:57	U	Downstream	Not identified	510
29-Aug-14	7:00	U	Upstream	Not identified	620
29-Aug-14	7:01	U	Downstream	Not identified	360
29-Aug-14	7:03	U	Upstream	Not identified	640
29-Aug-14	7:07	U	Downstream	Not identified	400
29-Aug-14	7:51	U	Downstream	Not identified	360
29-Aug-14	8:33	U	Downstream	Not identified	350
29-Aug-14	8:34	U	Upstream	Not identified	720
29-Aug-14	8:36	U	Downstream	Not identified	350
29-Aug-14	9:02	U	Downstream	Not identified	350
29-Aug-14	11:10	U	Upstream	Lake Trout	690
29-Aug-14	12:34	D	Upstream	Not identified	360
29-Aug-14	14:43	D	Upstream	Not identified	880
29-Aug-14	15:25	D	Downstream	Not identified	820
29-Aug-14	15:58	U	Downstream	Not identified	350
29-Aug-14	17:03	D	Upstream	Not identified	690
29-Aug-14	17:06	D	Upstream	Not identified	760
29-Aug-14	17:24	U	Downstream	Not identified	670
29-Aug-14	17:32	U	Upstream	Not identified	980
29-Aug-14	17:36	U	Upstream	Arctic Char	810
29-Aug-14	19:59	U	Upstream	Not identified	360
29-Aug-14	20:22	D	Upstream	Arctic Char	400
29-Aug-14	20:26	D	Upstream	Arctic Char	400
30-Aug-14	5:12	U	Downstream	Not identified	360
30-Aug-14	8:13	U	Upstream	Not identified	470
30-Aug-14	8:28	D	Downstream	Not identified	360
30-Aug-14	9:13	U	Upstream	Not identified	680
30-Aug-14	12:25	U	Downstream	Not identified	540
30-Aug-14	13:43	U	Downstream	Not identified	660
30-Aug-14	14:41	U	Upstream	Not identified	730
30-Aug-14	14:42	U	Downstream	Lake Trout	510
30-Aug-14	16:11	U	Upstream	Arctic Char	720
30-Aug-14	21:49	D	Downstream	Not identified	480
30-Aug-14	22:17	D	Downstream	Not identified	510
30-Aug-14	22:27	D	Upstream	Lake Trout	420
30-Aug-14	23:40	U	Upstream	Not identified	690
31-Aug-14	1:15	U	Downstream	Not identified	610
31-Aug-14	4:37	U	Downstream	Not identified	720
31-Aug-14	4:43	U	Downstream	Not identified	580
31-Aug-14	5:10	U	Downstream	Not identified	730
31-Aug-14	5:37	U	Upstream	Not identified	760
31-Aug-14	5:38	U	Upstream	Lake Trout	480
31-Aug-14	5:38	U	Downstream	Not identified	520
31-Aug-14	6:06	U	Downstream	Not identified	680
31-Aug-14	6:30	U	Downstream	Lake Trout	690
31-Aug-14	7:35	U	Upstream	Not identified	490
31-Aug-14	8:15	U	Upstream	Not identified	640
31-Aug-14	10:15	U	Downstream	Not identified	670
31-Aug-14	12:41	U	Downstream	Not identified	560
31-Aug-14	12:41	U	Upstream	Arctic Char	630
31-Aug-14	13:10	U	Downstream	Not identified	660
31-Aug-14	14:19	U	Downstream	Not identified	660
31-Aug-14	15:24	U	Downstream	Lake Trout	660
31-Aug-14	17:33	U	Downstream	Not identified	690
31-Aug-14	19:31	U	Downstream	Not identified	670

Notes:

Fence Location: D = Downstream of boulder garden, U = Upstream of boulder garden.

Dashes indicate not applicable.

Appendix 3.2-1. Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Date	Time (24 hr clock)	Fence Location (U/D)	Fish Direction	Species	Fork Length (mm)
1-Sep-14	0:57	D	Downstream	Not identified	620
1-Sep-14	2:42	U	Downstream	Lake Trout	580
1-Sep-14	5:00	U	Upstream	Not identified	780
1-Sep-14	6:07	U	Downstream	Not identified	660
1-Sep-14	6:20	U	Downstream	Not identified	650
1-Sep-14	6:32	U	Upstream	Lake Trout	670
1-Sep-14	8:49	U	Downstream	Not identified	660
1-Sep-14	9:36	U	Downstream	Not identified	380
1-Sep-14	9:40	U	Upstream	Not identified	720
1-Sep-14	11:35	U	Downstream	Not identified	550
1-Sep-14	12:46	U	Upstream	Lake Trout	640
1-Sep-14	12:51	U	Upstream	Not identified	700
1-Sep-14	13:01	U	Downstream	Not identified	640
1-Sep-14	13:02	U	Upstream	Not identified	730
1-Sep-14	13:05	U	Downstream	Not identified	640
1-Sep-14	16:05	U	Downstream	Not identified	390
1-Sep-14	16:08	U	Downstream	Not identified	650
1-Sep-14	16:11	U	Downstream	Not identified	650
1-Sep-14	16:13	U	Downstream	Arctic Char	660
1-Sep-14	17:32	U	Downstream	Not identified	660
1-Sep-14	17:40	U	Downstream	Not identified	640
1-Sep-14	18:34	U	Downstream	Not identified	650
1-Sep-14	18:56	U	Downstream	Not identified	670
1-Sep-14	19:42	U	Downstream	Not identified	640
1-Sep-14	20:49	U	Upstream	Arctic Char	740
1-Sep-14	21:51	U	Upstream	Not identified	530
1-Sep-14	22:15	U	Downstream	Not identified	540
1-Sep-14	22:31	U	Upstream	Not identified	600
1-Sep-14	22:34	U	Upstream	Not identified	610
1-Sep-14	22:52	U	Upstream	Not identified	370
1-Sep-14	22:52	U	Upstream	Not identified	400
1-Sep-14	22:52	U	Downstream	Not identified	400
1-Sep-14	22:52	U	Downstream	Lake Trout	450
1-Sep-14	22:52	U	Upstream	Arctic Char	610
1-Sep-14	22:53	U	Downstream	Not identified	460
1-Sep-14	22:58	U	Upstream	Not identified	390
1-Sep-14	23:24	U	Downstream	Arctic Char	360
1-Sep-14	23:24	U	Upstream	Not identified	370
1-Sep-14	23:30	U	Upstream	Not identified	380
1-Sep-14	23:35	U	Upstream	Not identified	700
2-Sep-14	5:41	U	Upstream	Not identified	410
2-Sep-14	5:41	U	Downstream	Not identified	480
2-Sep-14	5:45	U	Downstream	Arctic Char	370
2-Sep-14	5:45	U	Upstream	Not identified	550
2-Sep-14	5:53	U	Upstream	Not identified	410
2-Sep-14	5:59	U	Downstream	Not identified	380
2-Sep-14	5:59	U	Upstream	Arctic Char	570
2-Sep-14	6:02	U	Downstream	Not identified	660
2-Sep-14	6:03	U	Downstream	Not identified	350
2-Sep-14	6:04	U	Downstream	Not identified	650
2-Sep-14	6:05	U	Downstream	Not identified	380
2-Sep-14	6:07	U	Downstream	Not identified	650
2-Sep-14	6:11	U	Upstream	Arctic Char	550
2-Sep-14	6:15	U	Downstream	Not identified	640
2-Sep-14	6:24	U	Upstream	Not identified	670
2-Sep-14	6:27	U	Downstream	Not identified	640

Notes:

Fence Location: D = Downstream of boulder garden, U = Upstream of boulder garden.

Dashes indicate not applicable.

Appendix 3.2-1. Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Date	Time (24 hr clock)	Fence Location (U/D)	Fish Direction	Species	Fork Length (mm)
2-Sep-14	6:43	U	Downstream	Not identified	640
2-Sep-14	6:50	U	Downstream	Not identified	480
2-Sep-14	7:41	U	Downstream	Not identified	480
2-Sep-14	7:54	U	Downstream	Not identified	370
2-Sep-14	12:17	U	Upstream	Not identified	670
2-Sep-14	12:47	U	Upstream	Not identified	660
2-Sep-14	13:31	U	Downstream	Not identified	630
2-Sep-14	14:44	U	Upstream	Lake Trout	700
2-Sep-14	14:45	U	Downstream	Not identified	500
2-Sep-14	15:07	U	Downstream	Not identified	640
2-Sep-14	15:11	U	Downstream	Lake Trout	630
2-Sep-14	16:00	U	Upstream	Not identified	400
2-Sep-14	16:00	U	Upstream	Not identified	580
2-Sep-14	16:00	U	Downstream	Not identified	640
2-Sep-14	19:55	U	Upstream	Not identified	410
2-Sep-14	21:39	U	Upstream	Arctic Char	390
3-Sep-14	6:02	U	Downstream	Not identified	640
3-Sep-14	6:02	U	Upstream	Arctic Char	690
3-Sep-14	6:03	U	Downstream	Not identified	660
3-Sep-14	6:04	U	Downstream	Arctic Char	350
3-Sep-14	6:07	U	Downstream	Not identified	650
3-Sep-14	6:10	U	Downstream	Lake Trout	650
3-Sep-14	7:20	U	Downstream	Not identified	640
3-Sep-14	7:49	U	Downstream	Not identified	640
3-Sep-14	8:55	U	Upstream	Not identified	720
3-Sep-14	8:57	U	Downstream	Not identified	630
3-Sep-14	12:46	U	Upstream	Not identified	630
3-Sep-14	16:02	U	Upstream	Not identified	650
3-Sep-14	16:03	U	Downstream	Not identified	640
3-Sep-14	17:31	U	Upstream	Not identified	660
3-Sep-14	17:33	U	Downstream	Not identified	360
3-Sep-14	20:30	U	Upstream	Not identified	660
4-Sep-14	4:37	U	Upstream	Not identified	690
4-Sep-14	5:56	D	Downstream	Not identified	370
4-Sep-14	7:23	U	Upstream	Not identified	470
4-Sep-14	7:23	U	Upstream	Arctic Char	640
4-Sep-14	8:54	U	Upstream	Not identified	640
4-Sep-14	8:55	U	Downstream	Not identified	360
4-Sep-14	10:33	U	Upstream	Not identified	510
4-Sep-14	11:46	U	Upstream	Not identified	640
4-Sep-14	12:17	U	Downstream	Not identified	380
4-Sep-14	13:54	D	Upstream	Not identified	510
4-Sep-14	14:34	U	Downstream	Not identified	610
4-Sep-14	14:37	U	Downstream	Not identified	630
4-Sep-14	14:38	U	Upstream	Not identified	690
4-Sep-14	14:41	U	Downstream	Not identified	610
4-Sep-14	14:46	U	Downstream	Not identified	630
4-Sep-14	14:49	U	Downstream	Not identified	670
4-Sep-14	14:51	U	Upstream	Arctic Char	540
4-Sep-14	15:36	U	Upstream	Not identified	620
4-Sep-14	17:40	U	Upstream	Not identified	680
4-Sep-14	17:46	U	Downstream	Lake Trout	500
4-Sep-14	19:14	U	Upstream	Lake Trout	660
4-Sep-14	22:58	U	Upstream	Not identified	610
5-Sep-14	0:03	U	Upstream	Not identified	710
5-Sep-14	0:07	U	Upstream	Not identified	690

Notes:

Fence Location: D = Downstream of boulder garden, U = Upstream of boulder garden.

Dashes indicate not applicable.

Appendix 3.2-1. Biological Data from Fish Counting Fences in Roberts Lake Outflow, Doris North Project, 2014

Date	Time (24 hr clock)	Fence Location (U/D)	Fish Direction	Species	Fork Length (mm)
5-Sep-14	0:42	U	Upstream	Arctic Char	750
5-Sep-14	1:52	U	Upstream	Not identified	660
5-Sep-14	2:26	U	Upstream	Not identified	730
5-Sep-14	3:05	U	Upstream	Not identified	510
5-Sep-14	6:41	U	Downstream	Not identified	700
5-Sep-14	6:57	D	Upstream	Not identified	390
5-Sep-14	11:30	U	Downstream	Not identified	690
5-Sep-14	12:34	U	Upstream	Not identified	410
5-Sep-14	16:57	U	Upstream	Not identified	450
5-Sep-14	18:52	U	Downstream	Not identified	390
5-Sep-14	18:52	U	Upstream	Arctic Char	730
5-Sep-14	19:24	U	Downstream	Not identified	490
5-Sep-14	19:57	U	Downstream	Not identified	700
5-Sep-14	20:00	U	Downstream	Lake Trout	690
5-Sep-14	23:04	U	Upstream	Lake Trout	360
6-Sep-14	2:12	U	Downstream	Not identified	540
6-Sep-14	2:26	U	Downstream	Not identified	530
6-Sep-14	2:27	U	Downstream	Not identified	370
6-Sep-14	2:48	U	Upstream	Arctic Char	880
6-Sep-14	3:36	U	Downstream	Not identified	490
6-Sep-14	3:40	U	Downstream	Not identified	370
6-Sep-14	3:47	U	Upstream	Not identified	780
6-Sep-14	6:01	U	Downstream	Lake Trout	490
6-Sep-14	6:03	U	Downstream	Not identified	690
6-Sep-14	6:09	U	Downstream	Not identified	490
6-Sep-14	6:13	U	Downstream	Lake Trout	490
6-Sep-14	6:24	U	Downstream	Not identified	700
6-Sep-14	11:04	U	Downstream	Not identified	730
6-Sep-14	11:16	U	Downstream	Not identified	690
6-Sep-14	11:16	U	Upstream	Arctic Char	800
6-Sep-14	12:44	U	Downstream	Not identified	720

Notes:

Fence Location: D = Downstream of boulder garden, U = Upstream of boulder garden.

Dashes indicate not applicable.

Appendix 3.2-2

Remote Camera Wildlife Observations at the Boulder Garden, Doris North Project, 2014

Appendix 3.2-2. Remote Camera Wildlife Observations at the Boulder Garden, Doris North Project, 2014

Date	Start Time	End Time	Species	Number	Observation Type	Location	Zone	Easting	Northing
15-Jul-14	7:56	8:01	Grizzly Bear	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
15-Jul-14	11:54	11:55	Wolf	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
15-Jul-14	13:01	13:01	Grizzly Bear	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
16-Jul-14	21:22	21:22	Wolf	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
22-Jul-14	0:33	0:33	Grizzly Bear	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
26-Jul-14	22:31	22:36	Grizzly Bear	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
28-Jul-14	2:25	2:25	Grizzly Bear	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
28-Jul-14	22:46	22:46	Grizzly Bear	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
29-Jul-14	10:19	10:19	Grizzly Bear	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
29-Jul-14	18:43	18:43	Wolf	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
1-Aug-14	4:05	4:08	Grizzly Bear	2	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
1-Aug-14	22:12	22:12	Grizzly Bear	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
2-Aug-14	8:32	8:33	Grizzly Bear	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
3-Aug-14	1:22	1:22	Grizzly Bear	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
6-Aug-14	1:57	1:57	Grizzly Bear	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
6-Aug-14	2:55	2:55	Wolf	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
10-Aug-14	21:21	21:02	Wolf	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
11-Aug-14	17:33	17:33	Wolf	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
12-Aug-14	21:13	21:16	Grizzly Bear	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
12-Aug-14	21:17	21:31	Grizzly Bear	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
13-Aug-14	8:03	8:05	Grizzly Bear	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
13-Aug-14	11:13	11:16	Grizzly Bear	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
14-Aug-14	15:18	15:54	Wolf	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
15-Aug-14	15:55	15:55	Wolf	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
15-Aug-14	20:38	20:38	Wolf	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
16-Aug-14	1:15	1:15	Grizzly Bear	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
17-Aug-14	10:51	10:51	Grizzly Bear	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
17-Aug-14	20:38	20:38	Wolf	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
19-Aug-14	11:28	11:28	Wolf	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
19-Aug-14	22:51	22:52	Grizzly Bear	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
21-Aug-14	13:01	13:01	Wolf	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
21-Aug-14	20:45	20:45	Wolf	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
22-Aug-14	4:12	4:12	Grizzly Bear	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
25-Aug-14	19:04	19:04	Wolf	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
29-Aug-14	19:25	19:25	Wolf	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
31-Aug-14	8:31	8:31	Grizzly Bear	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
9-Sep-14	16:48	16:48	Wolf	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N
11-Sep-14	15:20	15:20	Wolf	1	Photo	Boulder garden	13 W	435167 m E	7562876.34 m N