



January 2015

BERNARD HARBOUR PROJECT

Arctic Char Run Baseline Report - 2014 Results

Submitted to:
Sabina Gold & Silver Corp.

#202-930 West First Street
North Vancouver, BC
V7P 3N4

REPORT



Report Number: 14-1373-0004





Table of Contents

1.0 INTRODUCTION.....	1
1.1 Background and Scope	1
1.2 Study Area	4
2.0 METHODS	5
2.1 Fish Capture and Sampling	5
2.1.1 Fyke Net Trap	5
2.1.2 Index Gill Nets and Angling.....	6
2.1.3 Individual Fish Measurements	6
2.2 Habitat Assessments	6
2.2.1 Nulahugyuk Creek.....	6
2.2.1.1 Water Temperature and Velocity Measurements.....	7
2.2.2 Hingittok Lake	8
2.3 Movement Assessments.....	8
2.3.1 PIT Tagging	9
2.3.2 Floy Tagging	9
2.3.3 RFID Antennae Array Configuration.....	9
2.3.4 Mortality Surveys.....	10
2.3.5 Statistical Analyses	11
2.3.6 Low-Flow Channels.....	11
3.0 RESULTS	12
3.1 Fish Capture and Sampling	12
3.1.1 Nulahugyuk Creek.....	12
3.1.2 Hingittok Lake	13
3.2 Habitat Assessments	15
3.2.1 Nulahugyuk Creek.....	15
3.2.1.1 Water Temperature and Velocity	15
3.2.2 Hingittok Lake	17
3.3 Movement Assessments.....	17



BERNARD HARBOUR ARCTIC CHAR

3.3.1	Migration Success.....	18
3.3.2	Movement Rates.....	22
3.3.3	Low-flow channels.....	24
3.3.3.1	2012 Low-Flow Channel Projects	24
3.3.3.2	Potential Project Locations	24
4.0	SUMMARY AND CONCLUSIONS	25
5.0	ACKNOWLEDGMENTS	27
6.0	REFERENCES.....	29

TABLES

Table 1:	Description of Stream and Pond Sections Assessed in Nulahugyuk Creek, July 10 to 14, 2014	6
Table 2:	Water Temperature and Velocity Measurement Locations, Nulahugyuk Cree, 2014	7
Table 3:	Location of Radio Frequency Identification Antennae-Reader Arrays, Nulahugyuk Creek, 2014.....	8
Table 4:	Summary of Arctic Char by Size Class Captured in Fyke Nets on Nulahugyuk Creek, June 16 to July 17, 2014	12
Table 5:	Approximate Lake Area and Volume for Various Depth Intervals in Hingittok Lake, July 10 to 14, 2014.....	17
Table 6:	Location of Radio Frequency Identification (RFID) Arrays and Detection Information.....	19
Table 7:	Parameter Metrics for Binary Logistic Regression.....	20
Table 8:	Summary of Velocity Data from 2012 Project Locations 1 to 5, July 16, 2014	24
Table 9:	Summary of Potential Locations for Fish Passage Enhancement Projects	24

FIGURES

Figure 1:	Location of Baseline Program Bernard Harbour, 2014.....	2
Figure 2:	Schematic Showing Two-Way Fyke Net Trap Configuration at Nulahugyuk Creek	5
Figure 3:	Schematic of Paired (A) and Single (B) RFID Antenna Array Configurations.....	10
Figure 4:	Length-Frequency Distribution of Arctic char Captured in the Fyke Net Trap.	13
Figure 5:	Bathymetry and Gill Net Locations for Hingittok Lake, July 8 to 11, 2014	14
Figure 6:	Fish Species Composition in Hingittok Lake, 2014.....	15
Figure 7:	Daily Mean Temperature (°C) Recorded at Nulahugyuk Creek from June 10, 2014 to July 17, 2014. Maximum and Minimum Daily Values Indicated by Upper and Lower Dotted Lines Respectively. Warm Water Temperatures (>17°C) Delineated by the Dashed Line.	16
Figure 8:	Stream Discharge (m ³ /s) and Staff Gauge Depth (cm) Recorded at Nulahugyuk Creek Between June 13, 2014 and July 15, 2014.....	16
Figure 9:	Daily Captures of Migratory Char in Nulahugyuk Creek, 2014. D/S = downstream travelling fish and U/S = upstream travelling fish	18



BERNARD HARBOUR ARCTIC CHAR

Figure 10: Proportion of Successful Migrants Plotted Against Passive Integrated Transponder Tag Implantation Date.....	19
Figure 11: Proportion of Tagged char Observed at RFID Arrays on Nulahugyuk Creek from June 25, 2014 to July 6, 2014, and June 7, 2014 to July 17, 2014, Corrected for Array Detectability.....	20
Figure 12: Results of Binary Logistic Regression Plotting the Probability of Migration Success Against Stream Discharge (x), Holding Char Body Weight Constant at 4.18 kg.....	21
Figure 13: Results of Binary Logistic Regression Plotting the Probability of Migration Success Against Char Body Weight (y) Holding Four Day Mean Stream Discharge Constant at 1.76 m ³ /s	21
Figure 14: Mean Migration Time $\pm$ Standard Error Plotted Against Passive Integrated Transponder Tag Implantation Date. Migratory Time Could Not Be Determined After 6-Jul (dotted line) Due to a Lack of Successful Migrants	22
Figure 15: Mean Travel Time (h) of Char Between RFID Arrays on Nulahugyuk Creek From June 25, 2014 to July 6, 2014, and June 7, 2014 to July 17, 2014	23
Figure 16: Average Movement Speed (m/h) $\pm$ Standard Error of Char Traveling Through Nulahugyuk Creek. Sections Not Significantly Different From Each Other Represented By The Same Letter	23

APPENDICES

APPENDIX A

Project Photos

APPENDIX B

Habitat Classification System

APPENDIX C

Habitat Map of Nulahugyuk Creek (July 10 to 14, 2014)

APPENDIX D

Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014

APPENDIX E

Fish Catch Data for Hingittok Lake, July 8 to 14, 2014

APPENDIX F

Summary of Fate of PIT Tagged Arctic Char on Nulahugyuk Creek

APPENDIX G

Potential Habitat Enhancement Project Locations



1.0 INTRODUCTION

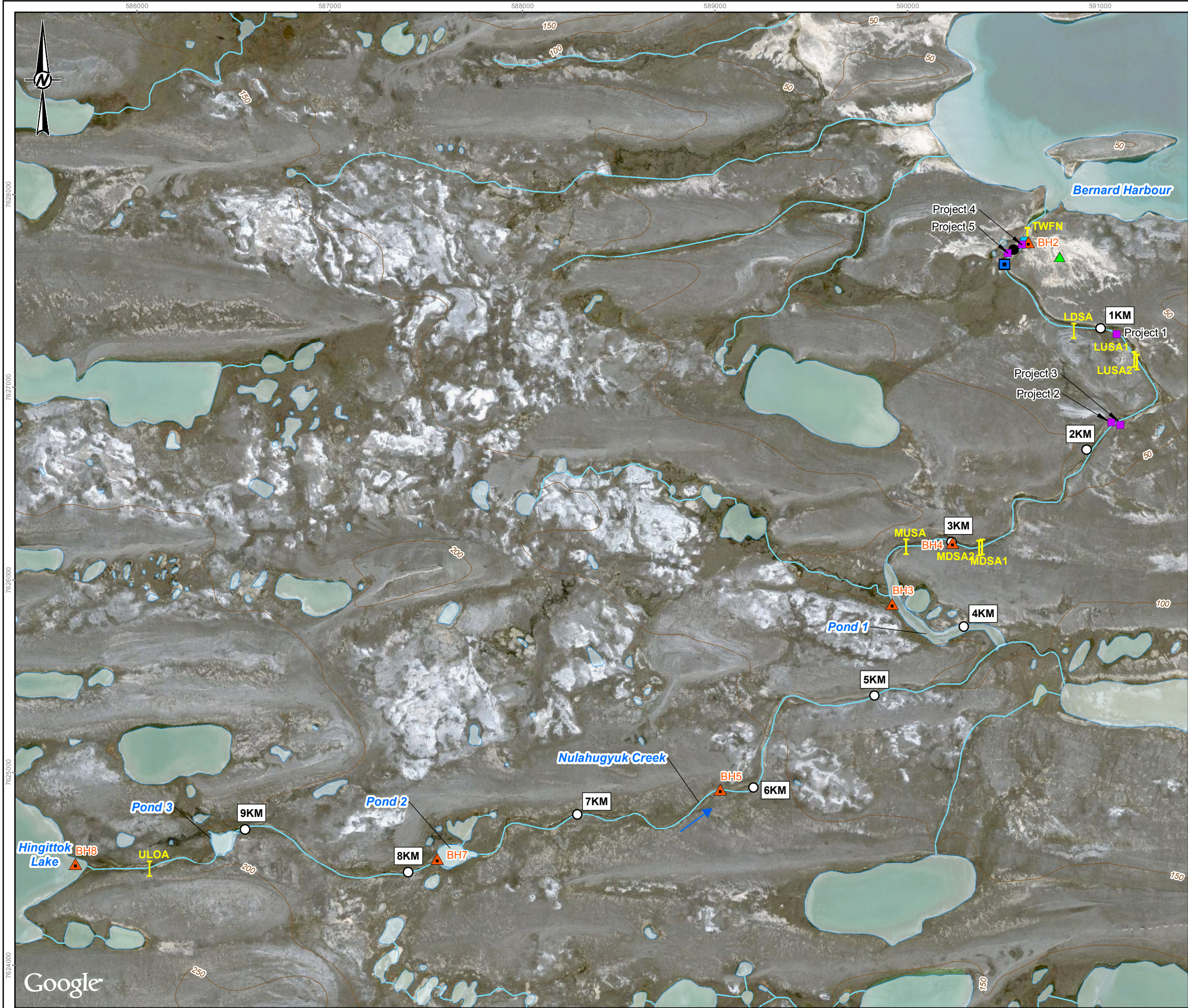
1.1 Background and Scope

The Hingittok Lake-Nulahugyuk Creek (HLNC) system at Nulahugyuk (Bernard Harbour), Nunavut (Figure 1) was once the site of a traditional domestic fishery for Arctic Char (*Salvelinus alpinus*; char). Records from the Canadian Arctic Expedition indicate that HLNC supported a large migration of anadromous char in the early 1900s (Jenness and Jenness 1991). Local knowledge, however, suggests that the number of migrating char has declined markedly over the past 30 to 40 years.

In response to local concerns, members of the Kugluktuk Hunters and Trappers Organization (HTO), and Golder Associates Ltd. (Golder) biologists, performed a preliminary assessment of the size and timing of the char run, and habitat conditions for fish passage during 2004 and 2005 (ANL and Golder 2005; Golder and ANL 2007), and again in 2012 (Golder 2013). Although the previous work reflected only a short window (i.e., less than 2 weeks) within an assumed longer migratory window per study year, the results suggested a decline in the size of the char run. In addition, the timing of the upstream char migration appeared to have shifted to earlier in the summer. It was hypothesized that the char run was affected by lower flows and poor channel conditions in mid to late summer when char generally undertake a return migration from the sea.

During the earlier investigations (ANL and Golder 2005; Golder and ANL 2007; Golder 2013) site-specific blockages (e.g., channel crossover locations) at several sites which appeared problematic for migrating adult char were identified. Upstream movements by char were particularly restricted during low discharge periods. As a possible corrective measure, it was proposed that low-flow channels (i.e., unobstructed flow paths with sufficient depths within the larger channel) be constructed to facilitate fish passage during low discharge periods in a season (e.g., late July to extend the migration window). The low-flow channels would be particularly beneficial during drier than normal years.

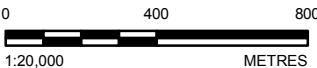
In 2012, a stream enhancement and community stewardship project aimed at understanding and enhancing the use of the HLNC system by char was successfully undertaken. Five low-flow channels were constructed with guidance from local Traditional Knowledge to assess the feasibility of applying this approach on a wider scale to increase fish production at HLNC (Figure 1). The project occurred through collaboration between local partners (i.e., students and residents of Kugluktuk, Nunavut, the Kugluktuk HTO, and the Nunavut Department of Environment), the University of Alberta, and Golder Associates Ltd. (Golder 2013).



LEGEND

- ELEVATION CONTOUR
- WATERCOURSE
- WATERBODY
- CAMP
- CHANNEL MANIPULATION PROJECT 2012
- FYKE NET
- KILOMETRE MARKER
- STAFF GAUGE
- TEMPERATURE LOGGER
- WATER VELOCITY STATION
- PIT TAG ARRAY

- LDSA - LOWER DOWNSTREAM ARRAY
- MUSA - MIDDLE UPSTREAM ARRAY
- ULOA - UPPER LAKE OUTLET ARRAY
- LUSA1 - LOWER UPSTREAM ARRAY 1
- LUSA2 - LOWER UPSTREAM ARRAY 2
- MDSA1 - MIDDLE DOWNSTREAM ARRAY 1
- MDSA2 - MIDDLE DOWNSTREAM ARRAY 2
- TWFN - TWO WAY FYKE NET (ARRAY)



NOTES

1. THE LOW-FLOW CHANNELS (CHANNEL MANIPULATION PROJECTS) WERE CONSTRUCTED IN 2012 (GOLDER 2013)
2. FOR TEMPERATURE LOGGERS LABELS, BH=BERNARD HARBOUR

REFERENCE

GOOGLE EARTH IMAGERY: © 2014 DIGITAL GLOBE
CANVEC BASE DATA: © DEPARTMENT OF NATURAL RESOURCES CANADA, 2012. ALL RIGHTS RESERVED.
NAD 83 UTM ZONE 11N

CLIENT

SABINA GOLD & SILVER CORP.

PROJECT

BERNARD HARBOUR PROJECT

TITLE

LOCATION OF BASELINE PROGRAM
BERNARD HARBOUR, 2014

CONSULTANT



YYYY-MM-DD	2015-01-26
PREPARED	LMR
DESIGN	KD
REVIEW	JPO
APPROVED	CES

PROJECT No.
14-1373-0004

PHASE
2200

Rev.
F

FIGURE
1



BERNARD HARBOUR ARCTIC CHAR

In 2014, Golder was contracted by Sabina Gold & Silver Corp. (Sabina) to design and undertake a comprehensive study of the migratory char population at HLNC. The focus of the work was to provide rigorous baseline data in support of a potential Offsetting Plan for Sabina's Back River Project (DFO 2013). The baseline information would provide a reference for future quantification of the potential benefits of using "low-flow channel" methods. Specifically, the 2014 field study was designed to address four general objectives:

- 1) Monitor the timing and size of the annual migratory char run in Nulahugyuk Creek using two-way fyke net traps installed for the duration of the migration period; data was collected for the three migratory phases, including:
 - a. the downstream (seaward) outmigration of adults (assumed to be spawners from the previous fall), which were predicted to be the first migratory fish captured in the trap during the spring freshet;
 - b. the adult upstream (lakebound) migration (consisting of char that would spawn in the year following the sampling year); and
 - c. the downstream (seaward) outmigration of juveniles, which were assumed to be 4 or 5 years old and migrating later in the summer as occurred in 2012 (Golder 2013).
- 2) Monitor rates of movement and successful upstream passage to Hingittok Lake using Passive Integrated Transponder (PIT) tag methods (e.g., Puffer et al. 2014); the movement data complement data on the size and timing of the run by providing a direct measurement of the effects of migrations conditions on char in the creek for the study year under examination.
- 3) Assess the feasibility of using low-flow channels to improve upstream passage for fish; this objective is a direct follow-up of work initiated in 2012 and includes:
 - a. Assessments of the structural integrity and performance of low-flow channels previously constructed; and
 - b. Scoping-level assessments of the number of problem locations and total length of the creek where low-flow channels could be constructed to effectively increase fish production.
- 4) Assess fish habitat and the relative abundance of fish species in Hingittok Lake using standard inventory methods to gain some understanding of the carrying capacity of the lake for Arctic Char as it relates to enhancement efforts being made to improve fish access in the creek.

In addition to the objectives outlined above, the 2014 work was intended to complement and integrate objectives of the HTO. This was to be achieved by incorporating students, organizations, and community members and by designing a study that fosters education, stewardship and community involvement in conservation initiatives. Past studies (e.g., Stern et al. 2008) have demonstrated a lasting positive change in environmental attitude, action, and knowledge following environmental education programs, such as the one implemented at Bernard Harbour.



1.2 Study Area

The HLNC drainage is located approximately 100 kilometres (km) directly north of the hamlet of Kugluktuk, Nunavut, along the south coast of Dolphin and Union Strait (Figure 1). The project site is about 4.5 hours (h) travel time by boat from the community. Nulahugyuk Creek, the outflow from Hingittok Lake (882 hectares [ha] in size), flows north for approximately 10 km before entering the sea at 68°44'52"N, 114°45'27"W, approximately 5 km south east of the abandoned DEW-Line site at Bernard Harbour. The contributing basin area at the mouth of creek is approximately 125 square kilometres (km²) in area, and may be characterized by limited groundwater derived flows punctuated by precipitation-driven peak flows. It is expected that most of the precipitation falls as rain during the open water season. Based on 1981 to 2010 Canadian climate normal station data for Kugluktuk, mean total precipitation is approximately 247 millimetres (mm), of which 144 mm falls during June, July, August, and September (see <http://climate.weather.gc.ca>). Daily maximum temperatures, on average, are above zero for June through September, peaking in July at 15.6 degrees Celsius (°C), and below zero for the remaining months of the year.



2.0 METHODS

The field study began on June 13, 2014 and was strategically planned to allow the field team to capture the first char moving through the HLNC system once the ice had melted enough to allow passage for fish. The commencement date was selected based on data collected during 2012 (Golder 2013), anecdotal information from the Canadian Arctic Expedition in 1916 (Jenness and Jenness 1991), as well as information from Kugluktuk residents. Field personnel remained on site until July 17. The field crew comprised fisheries biologists and technicians from Golder (Ryan Popowich, Davin Swift, Kent Nuspl, and Ashley Eckford), camp monitors and assistants from the Kugluktuk HTO (Larry Adjun, Jonathon Niptanatiak, Johnny Nivingalok, and Adrian Kadlack) and a graduate student from the University of Alberta who volunteered to assist with field work (Matthew Gilbert).

2.1 Fish Capture and Sampling

2.1.1 Fyke Net Trap

Fish were captured in Nulahugyuk Creek using a two-way fyke net trap installed on June 16, operating continuously until July 17, 2014 (Figure 2; Appendix A, Photos 1 to 3). The fyke net was installed 0.3 km upstream from the mouth of the creek in a shallow run area (an R3 class habitat as defined in Appendix B, with a mean width of about 18 metres (m). The wings of the fyke net were installed across the creek such that all fish moving upstream or downstream would be directed into the 1.8 m by 1.9 m opening. Once they had entered the trap they were directed through a series of five funnels with openings ranging between 0.85 m by 0.85 m at the widest end and 0.19 m by 0.29 m at the narrow end. Captured char were directed for a total distance of about 6.4 m prior entering a holding basket at the base of the net (Appendix A, Photos 4 to 6). The trap was checked several times daily and fish were removed and processed accordingly. The frequency of checks increased with water temperature and capture success to reduce crowding and potential stress to fish.

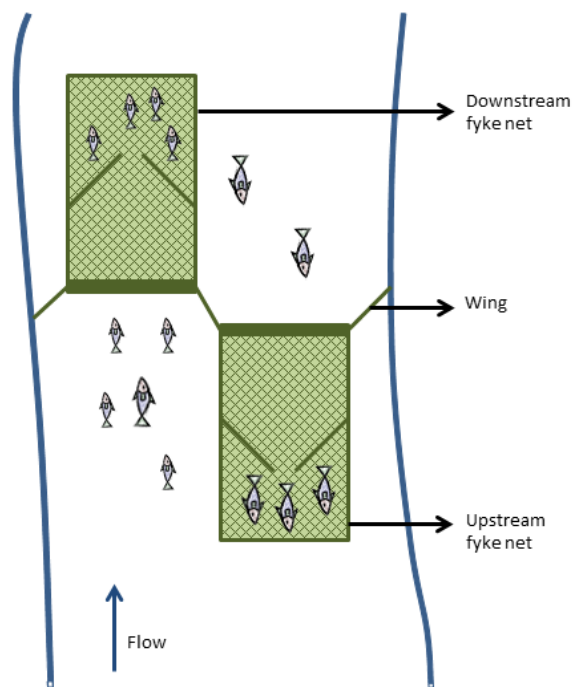


Figure 2: Schematic Showing Two-Way Fyke Net Trap Configuration at Nulahugyuk Creek



BERNARD HARBOUR ARCTIC CHAR

2.1.2 Index Gill Nets and Angling

Twenty nine gill net sets (short-duration sets) and two angling events were used to provide information on fish species composition and abundance in Hingittok Lake. Gill net mesh size and configuration were based on Broad Scale Monitoring (BSM) techniques for North American (NA1) and Ontario small mesh (ON2) gill nets (Sandstrom et. al. 2013). A series of bottom-set gill nets were deployed over four days in July 2014 (July 8, 11, 13, and 14). Large mesh nets were 49.6 m by 1.8 m (89.3 square metres [m²]) with eight mesh sizes (38, 51, 64, 76, 89, 102, 114, 127 mm stretched measure) per gang. Small mesh nets were 25.0 m by 1.8 m (45 m²) with 5 mesh sizes (13, 19, 25, 32, 38 mm stretched measure) per gang. Each set consisted of either two large (NA1) or two small (ON2) gangs joined for a double-gang configuration. The nets were checked frequently (maximum soak time was approximately four hours) to minimize mortalities. Angling at Hingittok Lake was also performed on July 11 and 13, 2014 using a variety of unbaited, spoon-type lures.

2.1.3 Individual Fish Measurements

Fish captured at the two-way fyke net trap were enumerated, identified to species, and released on the side of the trap that corresponded to their direction of travel. Most fish were weighed (grams [g]) and measured (fork length [FL] [mm]), and a small number of representative individuals were photographed. To minimize stress during periods of warm water temperatures (>17°C), a small number of fish were enumerated but not processed at the fyke net trap (i.e., were allowed to pass without measurement). When possible, otoliths (the calcified structure from the inner ear) were removed from observed mortalities (e.g., from stranding at upstream locations), folded in parafilm, and stored in a labelled coin envelope for age analysis at a later date. Fish captured from Hingittok Lake using gill nets were also enumerated, identified to species, weighed (g) and measured (fork length) then released back into Hingittok Lake. Char smaller than 300 mm were classified as 'juveniles', fish between 300 and 550 mm were classified as 'immature' (or sub-adults), and fish larger than 550 mm were classified as adults (Appendix A, Photos 7 to 11) (Golder 2013).

2.2 Habitat Assessments

2.2.1 Nulahugyuk Creek

About 9.6 km of Nulahugyuk Creek habitat was assessed from July 10 to 14, 2014. It was broken into four stream sections bounded by Hingittok Lake (upstream) and Bernard Harbour (downstream) and divided by three ponds (Pond 1, Pond 2 and Pond 3) along the length of the creek (Table 1; Figure 1).

Table 1: Description of Stream and Pond Sections Assessed in Nulahugyuk Creek, July 10 to 14, 2014

Section	Length (km)	Upstream Bound (UTM)	Downstream Bound (UTM)
Stream Section 1 (outlet of Pond 1 to the mouth of Bernard Harbour)	3.5	589901 E 7626102 N	590739 E 7627908 N
Pond 1	1.1	590309 E 7625468 N	589901 E 7626102 N
Stream Section 2 (outlet of Pond 2 to inlet of Pond 1)	3.4	587763 E 7624574 N	590309 E 7625468 N
Pond 2	0.2	587548 E 7624547 N	587763 E 7624574 N
Stream Section 3 (outlet of Pond 3 to inlet of Pond 2)	0.7	586459 E 7624644 N	587548 E 7624547 N
Pond 3	0.2	586399 E 7624568 N	586459 E 7624644 N
Stream Section 4 (outlet of Hingittok Lake to inlet of Pond 3)	0.5	585742 E 7624519 N	586399 E 7624568 N

Notes:

km = kilometres; UTM = Universal Transverse Mercator



BERNARD HARBOUR ARCTIC CHAR

Major habitat types within the sections were described in accordance with the classification system outlined in O'Neil and Hildebrand (1986). Barriers at all problem locations along the entire length of the creek were identified and described late in the program when flow levels had decreased (Appendix G). To prepare for future remedial works global positioning system (GPS) coordinates were obtained for each problem location, and each problem location was rated according to level of adult char upstream impassibility.

2.2.1.1 Water Temperature and Velocity Measurements

A water velocity measurement station with staff gauge was established approximately 0.5 km upstream from the mouth of Nulahugyuk Creek (Table 2). Water velocities were measured at 0.75 m intervals along a transect set perpendicular to flow of water at the station. Each point velocity was measured at 0.6 times the depth from the creek bed, which is representative of the mean velocity at that vertical profile. Velocity was measured using a direct read-out SwofferTM Model 2100 velocity meter and top-setting wading rod. Stream flows were measured 22 times between June 13 and July 15; the staff gauge was read an additional 28 times between June 13 and July 16. Discharge was then calculated based on the point measurements of velocity, depth, and creek width.

Water temperatures were measured at 0.25 h intervals at six locations (BH2 to 5, BH7 and 8) along Nulahugyuk Creek using Onset® HOBO Water Temperature Pro V2 Data Loggers (Figure 1; Table 2). The loggers collected data every 15 minutes and ran continuously for the duration of the field study.

Table 2: Water Temperature and Velocity Measurement Locations, Nulahugyuk Cree, 2014

Site	Location (UTM), zone 11W		Distance Upstream from Nulahugyuk Creek Mouth (km)
	Easting	Northing	
Water velocity measurement station	590504	7627637	0.50
Staff gauge	590551	7627716	0.40
BH2	590627	7627754	0.33
BH3	589922	7625874	3.70
BH4	590234	7626192	3.12
BH5	589029	7624910	6.26
BH7	587558	7624550	7.96
BH8	585681	7624524	10.03

Note:

Onset® HOBO Water Temperature Pro V2 Data Logger BH1 could not be recovered to download the temperature data and BH6 recorded air temperature during the 2014 study period, therefore; BH1 and BH6 are not included in these results.

UTM = Universal Transverse Mercator; km = kilometre; BH = Bernard Harbour.



2.2.2 Hingittok Lake

Bathymetry at Hingittok Lake was determined while gill nets were in place as part of the lake fish inventory. Bathymetry transects were completed from July 8 to July 11, 2014 using a Garmin GPSMAP 298 sounder (Garmin, Olathe, KS) coupled with a Global Positioning System (GPS). Transect layout consisted of longitudinal transects in a north/south orientation along the lake, bisected by lateral transects across the width of the lake. Longitudinal and lateral transects were approximately equally spaced to provide as much coverage of the lake as possible. Although limited data was collected in the two northwest arms of the lake, these areas were relatively shallow based on a reconnaissance survey (i.e., less than 6 m; Appendix A, Photo 12). Data were stored in the boat-mounted sonar/GPS and downloaded onto a computer as 'gpx' file. Bathymetry data (i.e., depth and GPS position) were then transcribed onto a 1-m bathymetric contour map using ArcGIS (ArcMap™ v9.3.1, 2009) 'topo to raster' tool (3D Analyst v. 9.3). Erroneous points were screened out by eliminating any unrealistic depths with the visual aid of georeferenced aerial imagery provided by Google Earth. The volume of Hingittok Lake was calculated using Global Mapper (Version 14.0.2).

2.3 Movement Assessments

Upstream movements of Arctic Char were monitored using implanted PIT tags and Radio Frequency Identification (RFID) antenna-reader arrays installed at strategic locations on the creek (Table 3; Figure 1) (e.g., Puffer et al. 2014). PIT tag methods are ideal for monitoring movements of fish in shallow streams such as Nulahugyuk Creek (i.e., constricted environments) and because of the low cost of the tags, a high number of individuals can be tracked to reliably describe movements. PIT tags are also ideal for long-term studies since they contain no battery and have indefinite life spans.

Table 3: Location of Radio Frequency Identification Antennae-Reader Arrays, Nulahugyuk Creek, 2014

Array	Location (UTM)		Distance Upstream from Nulahugyuk Creek Mouth (km) ^(a)
	Easting	Northing	
Two Way Fyke Net (TWFN)	590623	7627809	0.30
Lower Downstream Array (LDSA)	590865	7627313	0.75
Lower Upstream Array 1 (LUSA1)	591178	7627164	1.14
Lower Upstream Array 2 (LUSA2)	591192	7627151	1.16
Middle Downstream Array 1 (MDSA1)	590387	7626190	2.73
Middle Downstream Array 2 (MDSA2)	590372	7626185	2.75
Middle Upstream Array (MUSA)	589992	7626191	3.15
Upper Lake Outlet Array (ULOA)	586065	7624520	9.43

Note:

^(a) Distances upstream were measured from the mouth of Nulahugyuk Creek; UTM = Universal Transverse Mercator
UTM = Universal Transverse Mercator; km = kilometre.



2.3.1 PIT Tagging

Upon capture, char were transferred by dip net from the upstream fyke net to a large container filled with fresh water, and transported to an instream holding pool using an all-terrain vehicle (ATV) and tub trailer. Char were then transferred from the holding pool to a foam surgical bed set in a large container filled with fresh creek water. The char were placed ventral side facing up and a PIT tag needle was used to implant a uniquely coded half duplex (HDX) PIT tag (23 mm length, 3.7 mm diameter, 0.6 g weight) in the char's abdomen. The needle penetrated the fish's belly skin between the posterior tip of the pectoral fin and the anterior point of the pelvic girdle, 1 to 2 mm lateral from the mid-ventral line. The bevel of the needle was oriented toward the ventral surface to minimize the chance of contact with internal organs. The angle of the needle upon insertion was approximately 45°. PIT tag injectors were disinfected between implantations using ethyl alcohol (ethanol) diluted with water to a final concentration of 70% to 80% ethanol. Once the PIT tag was implanted, the char were transferred to an in-stream recovery pool. A block net was set at the downstream end of the pool to prevent fish from entering fast moving water that may push them downstream. The upstream end of the recovery pool was not blocked and fish were free to move out of the recovery pool at will.

2.3.2 Floy Tagging

A Floy tag program was also initiated where a subset of adult char moving downstream from Hingittok Lake was implanted with Floy to allow identification of char captured by local community members as individuals originating from HLNC. The tags were implanted through the dorsal surface of the char lateral to the dorsal fin. The tags were orange and had identification numbers ranging from 0001 and 1882. A total of 475 adult char captured moving downstream were implanted with Floy tags.

Resulting data from recaptures by domestic and recreational anglers, as well as future research teams, will be collected over time through tag return programs initiated by Sabina and the Kugluktuk HTO. This program will contribute valuable information on char movements and possibly the location of overwintering sites. However, the analysis of the return information is beyond the scope of this report.

2.3.3 RFID Antennae Array Configuration

Seven PIT tag antennae-reader arrays were installed strategically in relation to the location of the 2012 low-flow channel project areas and reference sections. An array was also installed near the outlet of Hingittok Lake (Table 3; Figure 1). The arrays were configured using either a single antennae (Lower Downstream Array [LDSA], Middle Upstream Array [MUSA], Upper Lake Outlet Array [ULOA]) or paired antennas (i.e., Lower Upstream Array 1 [LUSA1], Lower Upstream Array 2 [LUSA2] and Middle Downstream Array 1 [MDSA1], Middle Downstream Array 2 [MDSA2]), each of which was constructed from bound T90 cable (Figure 3; Appendix A, Photo 13).

Boulder spurs or weirs were constructed to prevent fish from moving around the arrays and to direct fish through the arrays. Antennas were oriented vertically to increase PIT tag reception range. The bottom of the antenna loop was embedded in the creek substrate and the top of the loop was suspended approximately 5 centimetres (cm) above the water surface. This configuration ensured that char passed through the loop perpendicular to the antenna field. Antennas were connected to individual tuner boxes located creek-side, with twinax cable extending from the tuner boxes to a multi antenna HDX-PIT tag reader box. The arrays were powered by deep-cycle 130 ampere marine batteries which were kept continually charged using solar panels.



BERNARD HARBOUR ARCTIC CHAR

Detection probabilities (p) were generated for individual antennae by assigning binary detection values for individual char based on whether they were detected (1) or not (0) at a given array. Detection probabilities were calculated for each array based on the mean detection value. Zero values above the furthest upstream detection were excluded from the detectability calculations because these fish were assumed to have been removed from the system. Therefore, detection values for each array were based only on data where detection occurred, or was known to occur further upstream. Detectability for the UOLA array was based on the mean detectability of the downstream arrays, with the exception of MUSA where a technical malfunction reduced detectability at that site.

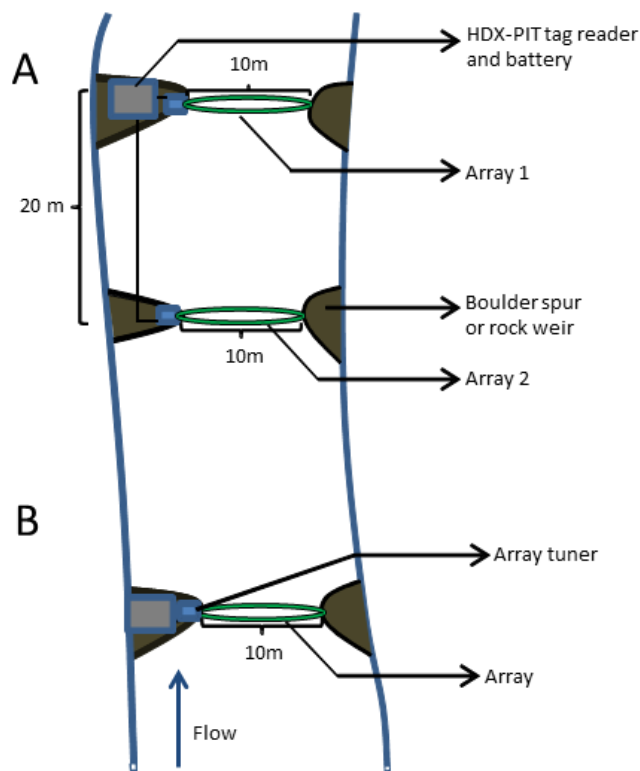


Figure 3: Schematic of Paired (A) and Single (B) RFID Antenna Array Configurations

2.3.4 Mortality Surveys

Mortality data was collected opportunistically as incidental observations, for example, during habitat assessments or while travelling to PIT reader locations. When there was an opportunity field crew members visually surveyed the creek for dead char and when located, carcass information was documented using a hand-held GPS, photographs, and field notes. Carcasses were scanned with a hand-held PIT tag reader and visually assessed for a Floy tag.



2.3.5 Statistical Analyses

Binary logistic regressions were used to explore relationships between upstream migration success (fish detected [1], or not detected [0] at the lake outlet) and environmental and biological parameters including migration date, stream discharge (daily and 4-day mean), water temperature (daily and 4-day mean), length, weight and condition factor. Various models were compared based on their Akaike Information Criterion (AIC) score, with lower values identifying models better representing the data analyzed, and Receiver Operating Characteristic (ROC), with higher values indicating greater sensitivity and specificity of the model.

Char movement speed (metres per hour [m/h]) was compared between arrays using analysis of variance (ANOVA). Movement speed was square root transformed to meet assumptions of normality. The significance level, alpha (α), was defined *a priori* as $\alpha = 0.05$. Normality was assessed graphically by examining the distribution of residuals using normal probability plots (Zar 1999). All analyses were conducted using Systat 13 (Systat Software, San Jose, CA).

2.3.6 Low-Flow Channels

The integrity of previously completed low-flow channels was visually assessed and photographed during low discharge conditions (July 18, 2014). Supporting information on channel width, velocity and depth within the assumed thalweg (deepest area of channel) was collected every 2 m for the length of each project. Mean values and standard deviations of channel characteristics are reported.



3.0 RESULTS

3.1 Fish Capture and Sampling

3.1.1 Nulahugyuk Creek

The fyke net was in place for a total of 35 days, 16 hours and 17 minutes beginning the evening of June 12, 2014 (18:15) and ending July 17, 2014 (10:32). Char catch-per-unit-effort (CPUE) for the upstream fyke net was 0.388 fish/hour, while CPUE for the downstream fyke net was 1.168 fish/hour. The combined CPUE for upstream and downstream fyke nets was 1.556 fish per hour. Three Ninespine Stickleback were also captured but not included in CPUE calculations.

A total of 1,332 char were captured from Nulahugyuk Creek. Of the char captured, 332 were adults moving upstream (Appendix A, Photos 10 to 11); 478 were adults moving downstream (Appendix A, Photos 8 and 9); one was immature, and 521 were juveniles (Appendix D, Table D1). Maximum daily upstream CPUE for adults was 1.167 fish/hour on July 4, 2014; whereas maximum downstream CPUE for adults was 3.167 fish/hour on June 24, 2014; and maximum daily juvenile CPUE (migrating downstream) was 4.417 fish/hour on July 11, 2014.

Char length and weight measurements and condition factor for the three migratory groups and one immature individual are summarized and described in Table 4 and Figure 4 (not every individual was measured). The largest captured char was 887 mm in length with a weight of 6,645 g. Adult char moving upstream had the highest average condition factor ($\pm$ standard deviation [SD]) of the three migratory groups ($K_{us} = 1.09 [\pm 0.1]$); whereas, downstream-moving juveniles had lowest average condition factor ($K_{juv} = 0.81 [\pm 0.1]$). Adult char moving downstream had an average condition factor of 0.84 (± 0.1). Adult char moving downstream from Hingittok Lake were approximately 27% lighter in weight than char moving upstream from the ocean. It was noted by the field crew that although none appeared obviously ripe for spawning, many char moving upstream were developing spawning colours had better condition (visual judgment of weight to length ratio) than adults moving downstream.

Table 4: Summary of Arctic Char by Size Class Captured in Fyke Nets on Nulahugyuk Creek, June 16 to July 17, 2014

Migratory Group	Number of Char	Length Range (mm)	Mean Length (mm) $\pm$ SD	Weight Range (g)	Mean Weight (g) $\pm$ SD	Mean Condition Factor $\pm$ SD
Adults moving upstream	329	602 to 887	728.8 $\pm$ 53.9 (<i>n</i> = 328)	2,250 to 7,545	4,271.2 $\pm$ 991.3 (<i>n</i> = 329)	1.09 $\pm$ 0.1
Adults moving downstream	476	509 to 859	717.0 $\pm$ 54.3 (<i>n</i> = 475)	1,545 to 5,080	3,134.6 $\pm$ 747.6 (<i>n</i> = 473)	0.84 $\pm$ 0.1
Immature fish moving downstream	1	305	-	243	-	0.86
Juveniles moving downstream	521	145 to 261	192.5 $\pm$ 19.1 (<i>n</i> = 347)	25 to 140	60.3 $\pm$ 18.2 (<i>n</i> = 313)	0.81 $\pm$ 0.1

Note:

mm = millimetres; $\pm$ = plus or minus; SD = standard deviation; g = grams; *n* = number of fish; - = no data



BERNARD HARBOUR ARCTIC CHAR

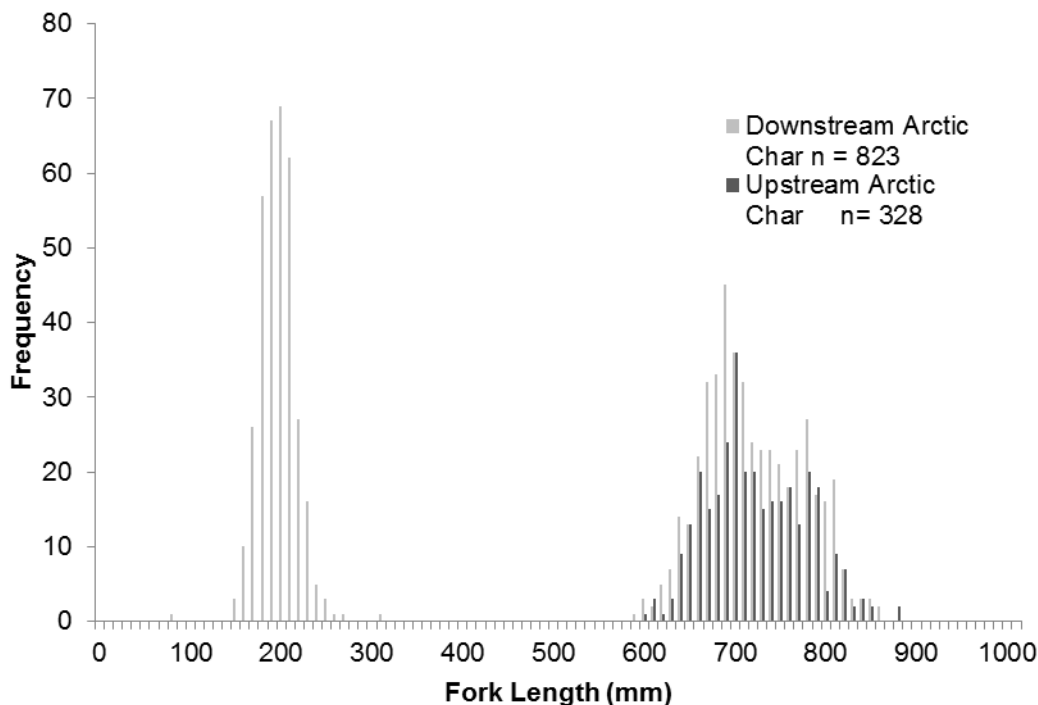
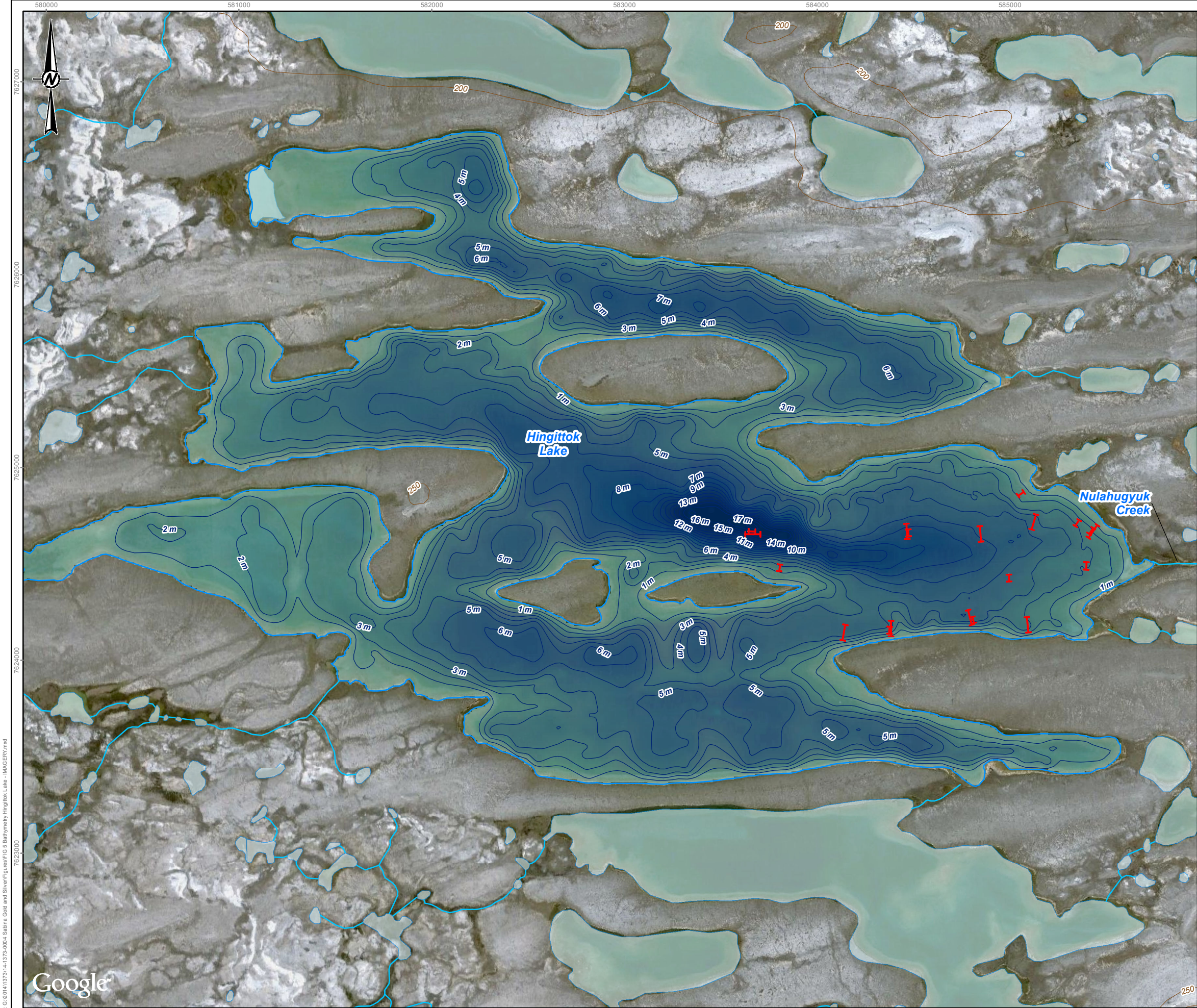


Figure 4: Length-Frequency Distribution of Arctic char Captured in the Fyke Net Trap.

3.1.2 Hingittok Lake

Twenty-nine short-duration gill net sets were deployed for a total of approximately 65 hours in Hingittok Lake (Figure 5; Appendix E, Table E1). Gill netting efforts in Hingittok Lake captured a total of 54 fish including 36 Lake Trout (*Salvelinus namaycush*; Appendix A, Photo 14), 10 Arctic Char (*Salvelinus alpinus alpinus*), 7 Cisco (*Coregonus artedii*; Appendix A, Photo 15), and 1 Ninespine Stickleback (*Pungitius pungitius*; Appendix E, Table E1). Of the 10 char captured, 7 were adults and 3 were juveniles. Mean CPUE for large mesh nets was 2.16 fish/hour/100 m; approximately twice that of small mesh nets which was 1.07 fish/hour/100 m (Appendix E, Table E2). It is noteworthy that two of the captured char were PIT tagged in 2014.

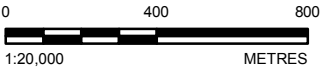
A total of 2.5 hours, mid to late afternoon, were spent angling by two crew members in the lake, resulting in the capture of eight Lake Trout (CPUE of 1.5 fish/angler hour; Appendix E, Table E1). Overall, Lake Trout was the dominant species captured from Hingittok Lake (based on gill netting and angling combined), contributing 71% to the total catch (Figure 6).



LEGEND

- ELEVATION CONTOUR
- WATERCOURSE
- WATERBODY
- GILL NET
- BATHYMETRIC CONTOUR (1 METRE INTERVAL)

DEPTH (METRES)



REFERENCE

GOOGLE EARTH IMAGERY: © 2014 DIGITAL GLOBE
CANVEC BASE DATA: © DEPARTMENT OF NATURAL RESOURCES CANADA, 2012. ALL RIGHTS RESERVED.
NAD 83 UTM ZONE 11N

CLIENT

SABINA GOLD & SILVER CORP.

PROJECT

BERNARD HARBOUR PROJECT

TITLE

**BATHYMETRY AND GILL NET LOCATIONS IN HINGITTOK LAKE,
JULY 8 TO 13, 2014**

CONSULTANT



YYYY-MM-DD	2015-01-26
PREPARED	LMR
DESIGN	KD
REVIEW	JPO
APPROVED	CES

PROJECT No.
14-1373-0004

PHASE
2200

Rev.
D

FIGURE
5

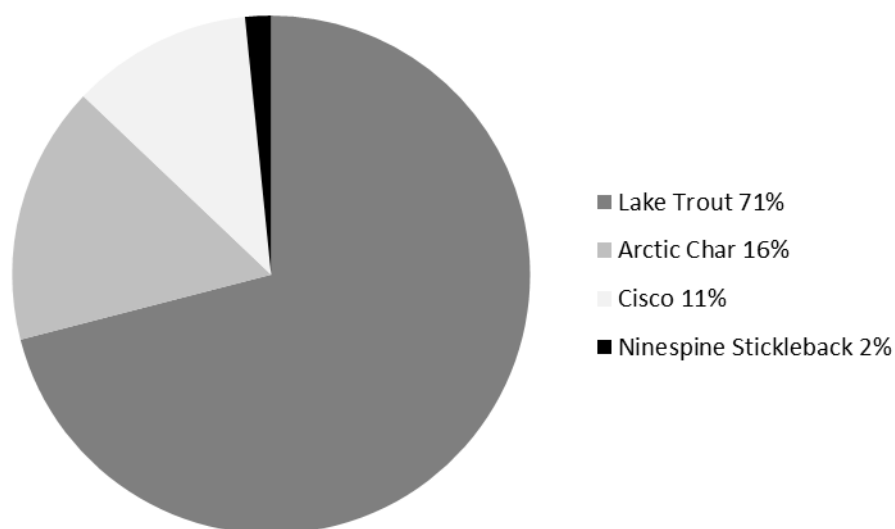


Figure 6: Fish Species Composition in Hingittok Lake, 2014

3.2 Habitat Assessments

3.2.1 Nulahugyuk Creek

A habitat survey was completed on 9.5 km of Nulahugyuk Creek between July 10 and July 14, (Appendix B; Appendix C). Nulahugyuk Creek transitions from faster moving riffles near its confluence with the sea to runs and pools near Hingittok Lake. Although about 82% of the lower section of the creek to the first pond was riffle habitat (Appendix A, Photo 16), char were observed using the vertical and undercut banks, slower moving sections and small pools as resting areas in the lower section of the creek (Appendix A, Photos 17 and 18). The creek transitioned from riffle (44%) to run (53%) between the first and second ponds. It was largely R3 run (>90%) from the second pond to the outlet of Hingittok Lake (Appendix A, Photos 19 and 20; Appendix B; Appendix C). Substrate was predominantly cobble (usually >60%) and boulder (~5 to 19%) and gravel (~5 to 13%) with small amounts of sand and silt, for the most part in ponds and large pools. The maximum depth in most stream reaches (excluding the three ponds on the creek) was less than 0.75 m, indicating that Nulahugyuk Creek does not provide overwinter habitat, as it freezes to the bottom in most areas. The habitat characteristics observed in July 2014 indicate little cover for large fish with only small patches of intermittent (or discontinuous) cover provided by boulder and undercut banks.

3.2.1.1 Water Temperature and Velocity

The water temperatures in Nulahugyuk Creek increased steadily as the season progressed with mean daily temperatures rising from 2.7°C on June 14 to 12.3°C on July 17 (Figure 7). The warmest temperatures occurred during the latter half of the study period exceeding 17°C at the downstream site (BH2) for 24.3 hours. Diurnal variation in water temperature was evident with a mean difference of 8.8°C between daily minimum and maximum values. A temperature gradient was also observed between the upstream and downstream sites (BH2 and BH7; Figure 1) with a consistent mean difference of 2.4°C across the sampling period, indicating a rate of change of 0.3°C/km downstream.



BERNARD HARBOUR ARCTIC CHAR

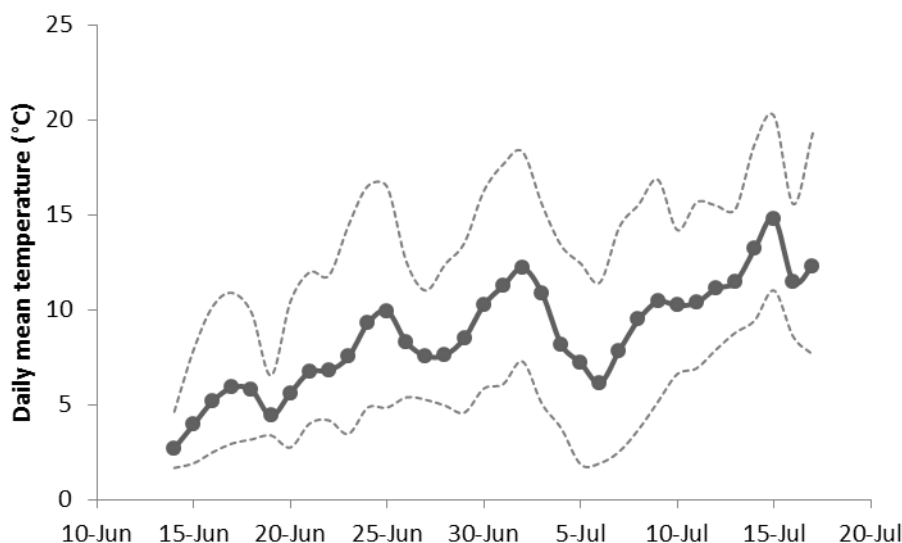


Figure 7: Daily Mean Temperature (°C) Recorded at Nulahugyuk Creek from June 10, 2014 to July 17, 2014. Maximum and Minimum Daily Values Indicated by Upper and Lower Dotted Lines Respectively. Warm Water Temperatures (>17°C) Delineated by the Dashed Line.

Creek discharge declined over the study period ranging from a high of 6.0 cubic metres per second (m^3/s) on June 15 to a low of 0.5 m^3/s on July 15 (Figure 8). Discharge was strongly correlated with water depth at the staff gauge ($r = 0.97$). A 5.5 m^3/s decline in discharge corresponded to a 28.5 cm decrease in water depth over that period.

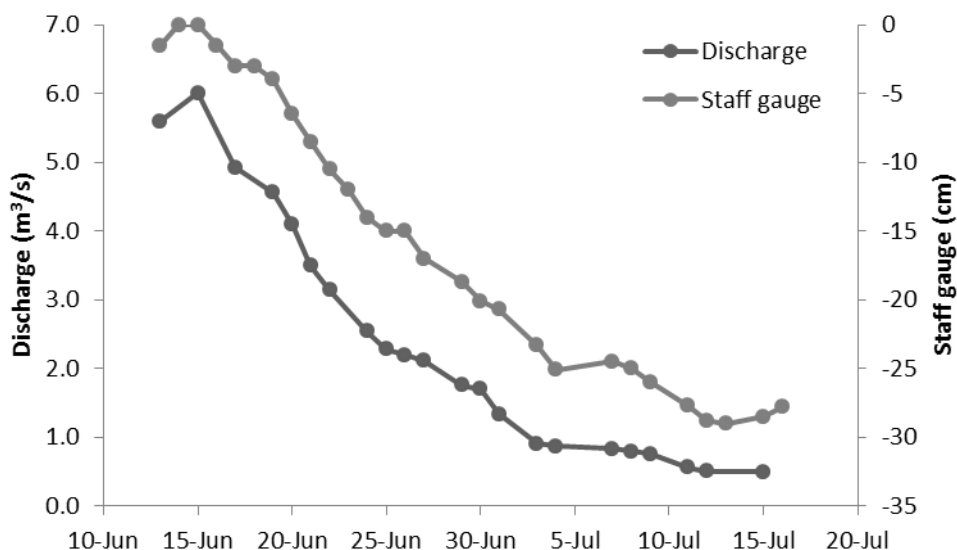


Figure 8: Stream Discharge (m^3/s) and Staff Gauge Depth (cm) Recorded at Nulahugyuk Creek Between June 13, 2014 and July 15, 2014



3.2.2 Hingittok Lake

Based on 1:50,000 CanVec data, Hingittok Lake is 982.3 ha in area and features numerous peninsulas and bays around three large islands in the centre of the lake (Figure 5). Shoreline length (38,085 m including islands) was extensive relative to the size of the lake and the shoreline development factor (the ratio of a lake's perimeter to surface area that provides a measure of irregularity of shoreline) was approximately 12.3. The higher the ratio, the more irregular the shoreline is, and thus, more shoreline habitat is potentially available (a perfect circle would have a shoreline development factor of 1). The bathymetry data derived a lake volume of 30,553,274 m³ (Table 5). The maximum depth was approximately 18 m and mean depth was 3.7 m (Table 5; Figure 5).

Table 5: Approximate Lake Area and Volume for Various Depth Intervals in Hingittok Lake, July 10 to 14, 2014

Depth (m)	Volume (m ³)	Area (ha)	Depth (m)	Volume (m ³)	Area (ha)
>0	30553274	982.25	>10	553638	14.69
>2	15767454	607.66	>12	308168	10.19
>4	6214620	352.37	>14	138401	6.89
>6	2002020	95.61	>16	32068	3.67
>8	964592	28.86	>18	335	0.16

Note:

m = metres; m³ = cubic metres, ha = hectares; > = greater than.

3.3 Movement Assessments

The first char captured was moving downstream on June 16 (Figure 9). Three distinct groups of migratory char were described including adults moving downstream after overwintering in Hingittok Lake ($n = 478$), adults moving upstream ($n = 332$) to overwinter, potentially spawning first, and juveniles¹ moving downstream from Hingittok Lake ($n = 522$). Downstream movement by adults was largely completed by July 4 (Figure 9). Upstream movement attempts by adults began on June 25 and continued through to the completion of the field study. Downstream movement by juveniles began on June 25 and also continued to the completion of the field study. Migration successes were quantified for adult char migrating upstream from the ocean to Hingittok Lake (see below – Migration Success).

¹For simplicity, one individual classed as "immature" based on length (300 to 550 mm) was included in juvenile group (300 mm or less) and was 305 mm long.

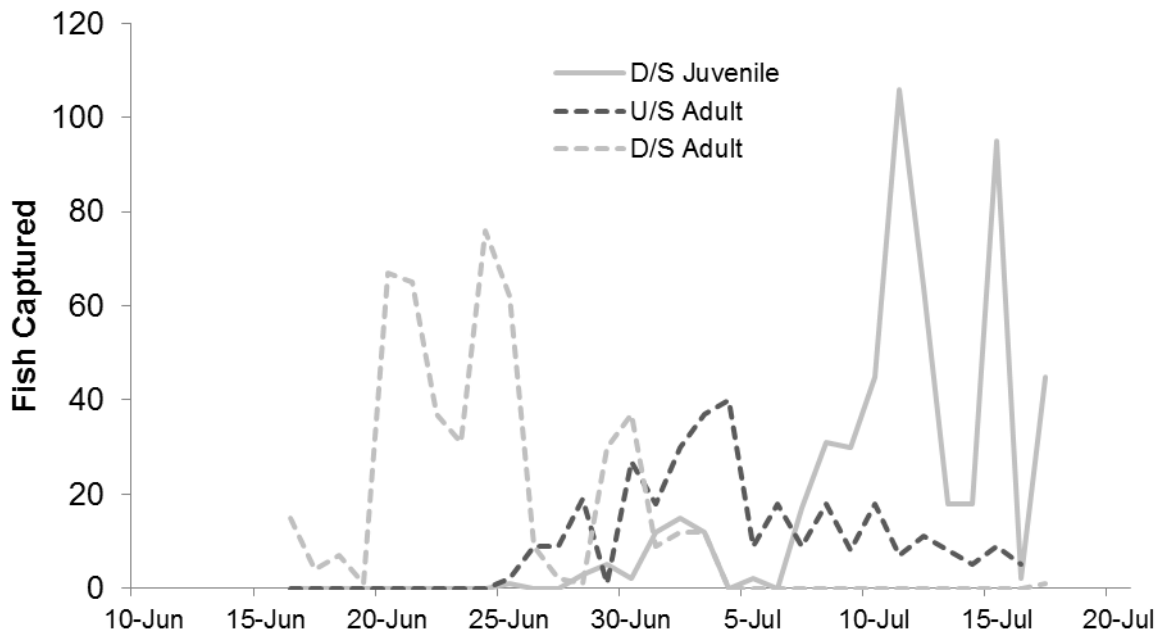


Figure 9: Daily Captures of Migratory Char in Nulahugyuk Creek, 2014. D/S = downstream travelling fish and U/S = upstream travelling fish

3.3.1 Migration Success

A total of 315 upstream migrating adult char were implanted with PIT tags with identification numbers ranging between 228000152003 and 228000152325. Selected char for PIT tag monitoring were a representative sample of the population moving upstream, and characterized by an average length ($\pm$ SD) of 726.8 ($\pm$ 52.4) mm, weight of 4229.8 ($\pm$ 949.8) g and condition factor of 1.09 ($\pm$ 0.1) (Appendix D, Table D1).

A high degree of detectability was obtained at most antennae-reader arrays (Table 6). The only exception was MUSA which suffered from a series of technical issues including a malfunctioning battery from July 8 to July 9, and suboptimal tuning prior to July 11, resulting in reduced detectability.

Of the 315 char tagged, 103 were detected at the ULOA indicating the completion of a successful upstream movement from the sea. Adjusted for array detectability, this equated to 110 tagged fish, or a success rate of 34.9% between June 25 and July 17, 2014 (Table 6). Although migratory success was relatively high early on in the study (93%), it declined rapidly over time with none of the fish tagged after July 6 detected at the ULOA (Figure 10). This indicates that a threshold was reached and stream conditions became impassable for char after this date. Any remaining fish either perished, likely from exhaustion, predation, or stranding, or remained in the deep pools located in the upper reaches of the creek (average depth exceeding 1.0 m and maximum depth exceeding 3 m, Appendix B and C). Incidental mortalities observed for tagged fish are presented in Appendix F, Table F1.



BERNARD HARBOUR ARCTIC CHAR

Table 6: Location of Radio Frequency Identification (RFID) Arrays and Detection Information

Array	Location (UTM)		Distance Upstream from Nulahugyuk Creek Mouth (km) ^(a)	Detection Probability	Detected Total	Corrected Total
	Easting	Northing				
TWFN	590623	7627809	0.30	1.00	315	315
LDSA	590865	7627313	0.75	0.90	263	293
LUSA1	591178	7627164	1.14	0.93	261	280
LUSA2	591192	7627151	1.16	0.91	255	279
MDSA1	590387	7626190	2.73	0.97	205	212
MDSA2	590372	7626185	2.75	0.96	202	211
MUSA	589992	7626191	3.15	0.59	94	158
ULOA	586065	7624520	9.43	0.93	103	110

Note:

^(a) Distances upstream were measured from the mouth of Nulahugyuk Creek.

TWFN = two way fyke net; LDSA = Lower Downstream Array; LUSA1 = Lower Upstream Array 1; LUSA2 = Lower Upstream Array 2; MDSA1 = Middle Downstream Array 1; MDSA2 = Middle Downstream Array 2; MUSA = Middle Upstream Array; ULOA = Upper Lake Outlet Array; UTM = Universal Transverse Mercator

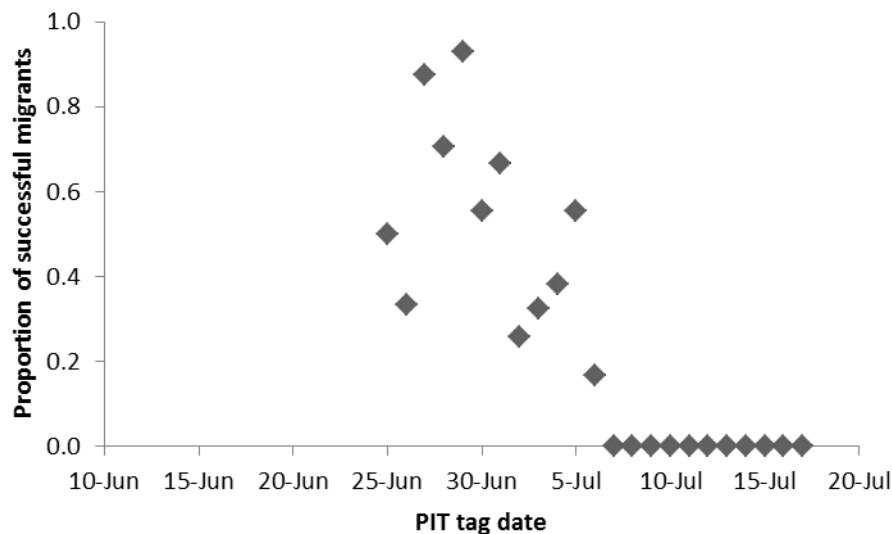


Figure 10: Proportion of Successful Migrants Plotted Against Passive Integrated Transponder Tag Implantation Date

The number of char observed among the RFID arrays declined sequentially as the fish moved upstream. Prior to July 6, a considerable reduction in detected char occurred over a 0.35 km reach between MDSA2 (2.75 km) and MUSA (3.15 km) with a 24% reduction in individuals occurring in this area (Figure 11). After July 6, a 50% reduction in the number of char detected occurred over a 1.57 km reach between LUDS2 (1.16 km) and MDSA1 (2.73 km), with no fish detected after MUSA (>3.15 km).



BERNARD HARBOUR ARCTIC CHAR

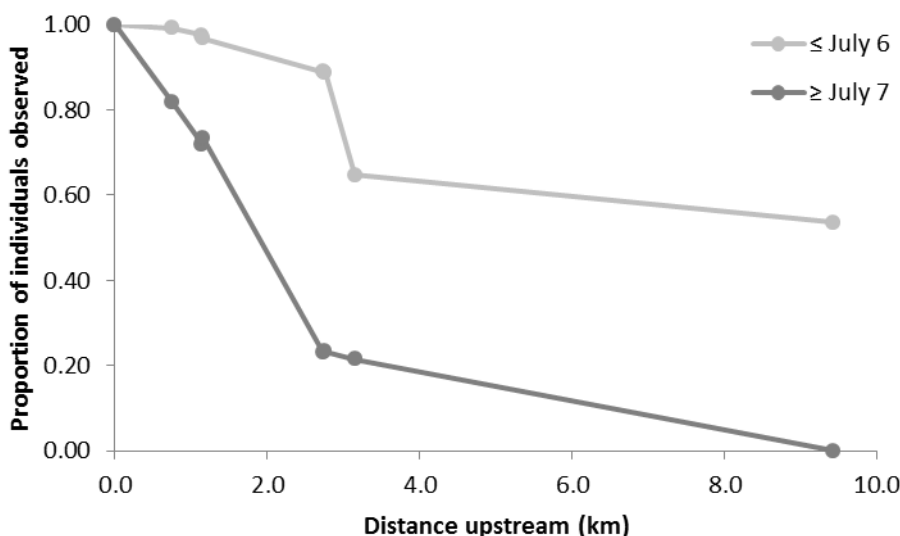


Figure 11: Proportion of Tagged char Observed at RFID Arrays on Nulahugyuk Creek from June 25, 2014 to July 6, 2014, and June 7, 2014 to July 17, 2014, Corrected for Array Detectability

Using a binary logistic regression, the primary factors influencing migratory success were determined to be four day mean discharge and char weight. This relationship was expressed using the formula:

$$P = \frac{e^{-8.398 + 15.714x - 4.612x^2 - 0.77y}}{1 + e^{-8.398 + 15.714x - 4.612x^2 - 0.77y}}$$

where P was the probability of success, x was the four day mean stream discharge (m^3/s), and y was the char weight in kilograms. Model fit was significant ($p < 0.001$) with an ROC value of 0.84. Parameter estimates are presented in Table 7. The output of the formula was presented graphically in Figures 12 and 13. With respect to the four-day mean discharge, the probability of migration success ranged from a high of 85% at $1.5 \text{ m}^3/\text{s}$, declining to a low of 0% at $0.5 \text{ m}^3/\text{s}$, when fish weight was held constant at 4.18 kilograms (kg) (Figure 12). Regarding fish weight, the probability of migratory success ranged from a high of 95% for fish that weigh 2.5 kg to a low of 31% in fish that weigh 7.5 kg when discharge was held constant at $1.76 \text{ m}^3/\text{s}$ (Figure 13).

Table 7: Parameter Metrics for Binary Logistic Regression

Parameter	Estimate	Standard Error	Z	p-Value	95% Confidence Interval	
					Lower	Upper
Constant	-8.398	2.417	-3.48	0.001	-13.134	-3.661
Four day mean discharge (x)	15.714	4.134	3.8	<0.001	7.612	23.815
Four day mean discharge ² (x^2)	-4.612	1.643	-2.81	0.005	-7.831	-1.392
Weight (kg) (y)	-0.77	0.192	-4.02	<0.001	-1.146	-0.395

Note:

z = z score; p-Value = probability value; % = percent; < = less than; kg = kilograms.



BERNARD HARBOUR ARCTIC CHAR

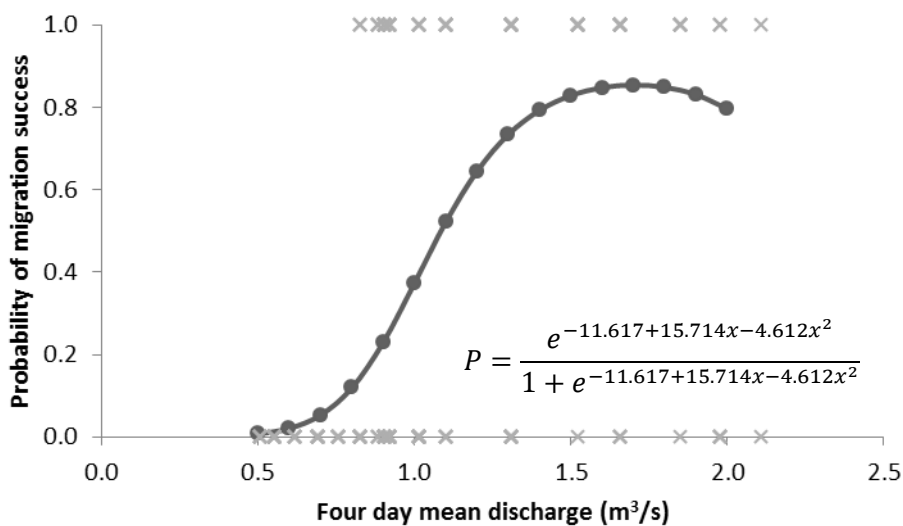


Figure 12: Results of Binary Logistic Regression Plotting the Probability of Migration Success Against Stream Discharge (x), Holding Char Body Weight Constant at 4.18 kg

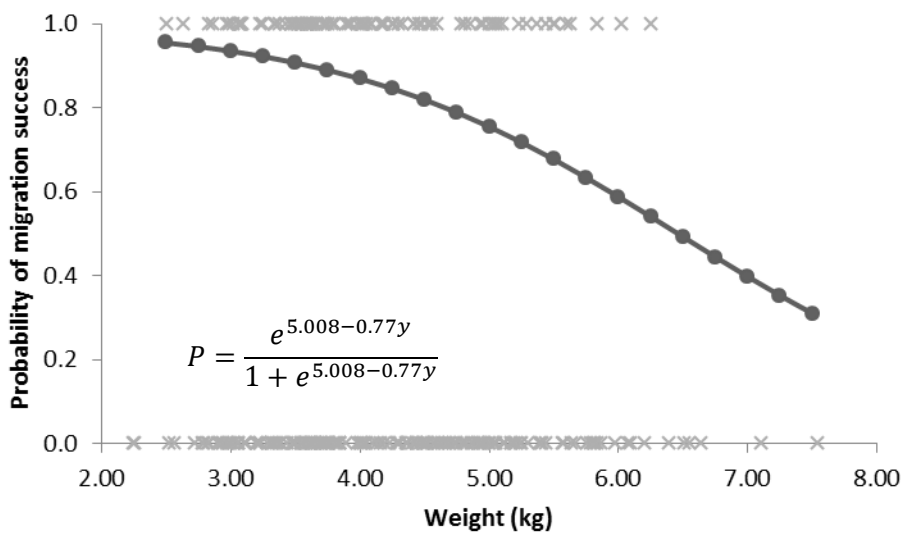


Figure 13: Results of Binary Logistic Regression Plotting the Probability of Migration Success Against Char Body Weight (y) Holding Four Day Mean Stream Discharge Constant at 1.76 m³/s



3.3.2 Movement Rates

Migration time between the farthest downstream array and the farthest upstream array (distance of 8.68 km) varied among fish and throughout the study period with a mean migration time ($\pm$ standard error) of 108.3 h ($\pm$ 4.7) (Figure 14). The fastest fish completed the migration in 34.2 h, and the slowest in 239.0 h. The migration time was generally faster from June 25 to June 30 (79.3 h [$\pm$ 5.4]) than from June 30 to July 6 (123 h [$\pm$ 5.8]). Migration time could not be determined after July 6 as none of the tagged fish successfully reached the ULOA; however, travel time between the downstream arrays decreased after July 6 indicating char were traveling at a greater speed (Figure 15).

Char travel speed also varied among creek sections throughout the study period (Figure 16). The highest upstream migration speeds occurred in the shorter array sections where water was shallow and without resting areas and where fish were more exposed (e.g., Sections 0.8 to 1.1 km [LDSA to LUSA1], 1.1 to 1.2 km [LUSA1 to LUSA2], and 2.7 to 2.8 km [MDSA1 to MDSA2]; Figure 1; Figure 16; Appendix C).

The slowest upstream migration speed was recorded in the section of the creek immediately upstream of the fyke net where the recovery pool was located (0.3 to 0.8 km [TWFN to LDSA]; Figure 1; Figure 14). There were also undercut banks in this section of the creek, which provided small pools and cover for refugia.

The next slowest migration speeds were recorded in three sections (1.2 to 2.7 km [LUSA2 to MDSA1], 2.8 to 3.2 km [MDSA2 to MUSA] and 3.2 to 9.4 km [MUSA to ULOA]; Figure 1; Figure 16). The MUSA to ULOA section was the longest section, was largely classified as run habitat (Appendix A, Photos 19 and 20) but also contained three ponds (Appendix C; Figure 1).

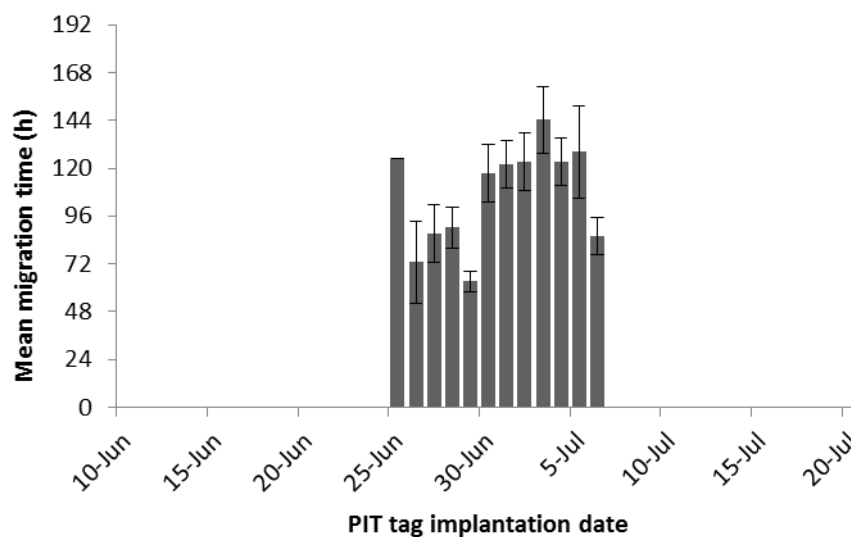


Figure 14: Mean Migration Time $\pm$ Standard Error Plotted Against Passive Integrated Transponder Tag Implantation Date. Migratory Time Could Not Be Determined After 6-Jul (dotted line) Due to a Lack of Successful Migrants



BERNARD HARBOUR ARCTIC CHAR

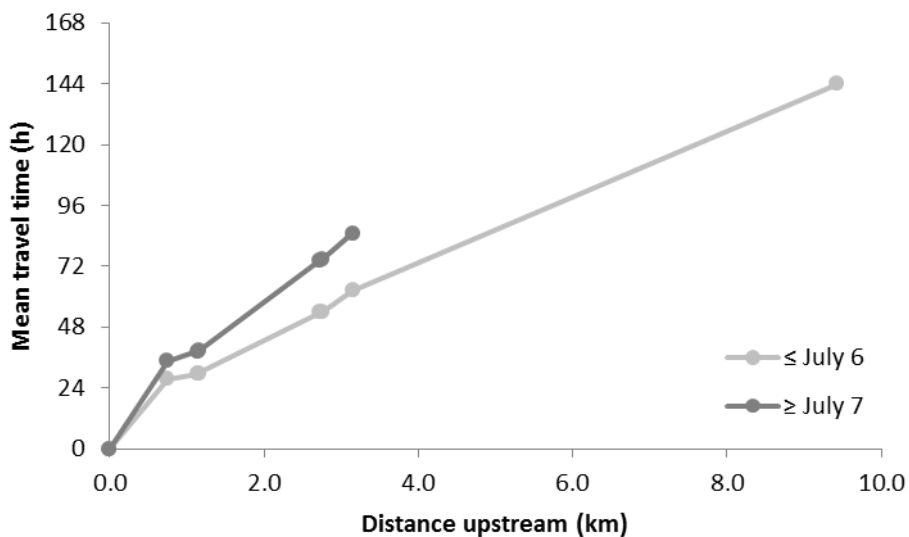


Figure 15: Mean Travel Time (h) of Char Between RFID Arrays on Nulahugyuk Creek From June 25, 2014 to July 6, 2014, and June 7, 2014 to July 17, 2014

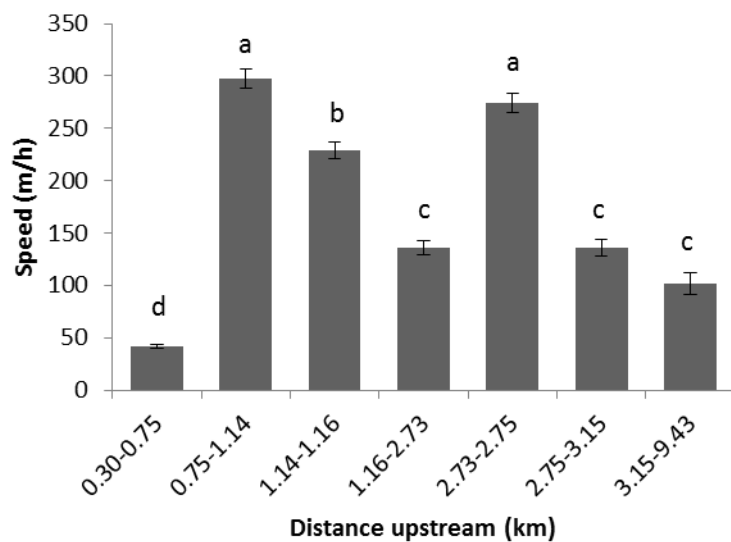


Figure 16: Average Movement Speed (m/h) ± Standard Error of Char Traveling Through Nulahugyuk Creek. Sections Not Significantly Different From Each Other Represented By The Same Letter



BERNARD HARBOUR ARCTIC CHAR

3.3.3 Low-flow channels

3.3.3.1 2012 Low-Flow Channel Projects

The integrity of previously completed low-flow channels were visually assessed and photographed during low discharge conditions (July 18, 2014; Appendix A, Photos 21 to 25). Supporting information on channel width, velocity and depth was collected every 2 m for each Project (Table 8). The low flow channels constructed in 2012 were intact in 2014 and would provide char with a migratory path where potential barriers existed in low flow conditions previously (Golder 2013).

Table 8: Summary of Velocity Data from 2012 Project Locations 1 to 5, July 16, 2014

Station	Average Wetted Width $\pm$ SD (m)	Average Depth $\pm$ SD (m)	Average Velocity $\pm$ SD (m/s)
P1	2.34 $\pm$ 1.49	0.13 $\pm$ 0.03	0.69 $\pm$ 0.26
P2	2.48 $\pm$ 0.94	0.17 $\pm$ 0.04	0.47 $\pm$ 0.22
P3	2.37 $\pm$ 0.73	0.22 $\pm$ 0.03	0.72 $\pm$ 0.36
P4	2.42 $\pm$ 0.45	0.17 $\pm$ 0.06	0.65 $\pm$ 0.21
P5	1.96 $\pm$ 0.62	0.19 $\pm$ 0.10	0.65 $\pm$ 0.24

Note:

$\pm$ = plus or minus; SD = standard deviation; m=metre; m/s=metres per second; P=project

3.3.3.2 Potential Project Locations

Problem locations (locations where char movement may be impeded by lack of depth, boulder barriers, etc.) were identified in 2014 and detailed in Appendix G. These locations are where fishery productivity, characterized by Arctic Char production (i.e., available biomass for harvesting), may benefit from enhancement projects (Table 9).

Table 9: Summary of Potential Locations for Fish Passage Enhancement Projects

Site Name	Approximate Distance Upstream of Bernard Harbour (km)	Easting (UTM)	Northing (UTM)	Estimated Length (m)	Priority for Enhancement
Site 1	1.3	591279	7627006	30	High
Site 2	1.3	591263	7627032	20	Medium
Site 3	1.5	591200	7626876	30	Low to Medium
Site 4	1.6	591165	7626842	60	Medium
Site 5	2.0	590836	7626544	20	High
Site 6	2.0	590876	7626563	20	Medium
Site 7	2.4	590556	7626395	50	High
Site 8	2.9	590214	7626213	10	Low to Medium
Site 9	4.8	589969	7625431	20	Low to Medium
Site 10	5.7	589244	7625128	40	Low
Site 11	7.8	587549	7624548	15	Low

Note:

km = kilometres; UTM = Universal Transverse Mercator; m = metre



4.0 SUMMARY AND CONCLUSIONS

The number of char ($n = 1,332$) captured at the fyke trap in Nulahugyuk Creek in 2014 was much lower than in 2012 ($n = 7,236$), especially with regard to juveniles which declined from 6,803 to 522. Possible explanations include differential recruitment success resulting in variable year-class strengths, inter-year environmental differences, or changes in the timing of movements, among others.

There is a small window for adult char migration in HLNC and the first adult char captured were those migrating downstream (June 16 to July 4; about 20 days). The migration of the second adult group (adults moving upstream towards Hingittok Lake) began June 25 and peaked around July 5. Although adults were still captured attempting to migrate upstream near the end of the study, PIT data indicated that adults attempting migration after July 7 would be unsuccessful. In contrast to adult migrations, the window for the juvenile downstream migration is likely longer, due to their smaller size allowing them to migrate through shallow water. Juvenile char were first captured migrating downstream on June 25, peaked around July 11 and (likely) continued past the end of the 2014 study on July 17.

The primary factors affecting char migration success at Nulahugyuk Creek in 2014 were discharge and fish weight. Discharge was strongly correlated with water depth, and as depth declined over time, new impediments to fish passage were created until fish passage was no longer possible. Larger fish were less likely to overcome these impediments to fish passage, presumably due to an increased probability of stranding and predation. Unfortunately larger fish are generally the most productive in a spawning population (Jeuthe et al. 2013), producing greater numbers of more viable offspring, and loss of these individuals could have significant effects on recruitment potential.

A significant barrier to fish passage was created on July 7, 2014 as stream discharge declined to approximately $0.8 \text{ m}^3/\text{s}$ and water depths declined by 25 cm at the staff gauge. Afterward, fish passage was no longer possible; indicating a brief and discrete window of opportunity exists for the char migration at Nulahugyuk Creek. Between the time fish were initially detected moving upstream (June 25) and passage was no longer possible (July 7), the migration window in 2014 was 13 days. While some of the unsuccessful migrants may have taken temporary shelter in upstream pools eventually retreating to the sea, the majority of the remaining char likely perished through stranding, exhaustion or predation, with only four fish successfully exiting the system by July 17, 2014.

The low-flow channels constructed in 2012 were intact and assumed functional in 2014 and based on the data collected, further enhancement efforts at Nulahugyuk Creek would optimally focus on the 11 problem locations (i.e., Sites 1 to 11) identified within various sections of the creek. For example, in order to augment the current cohort of successful migrants traveling upstream (i.e., those fish traveling upstream while passage remains possible), effort should focus on impediments near Site 8 and the 2.8 to 3.2 km section where losses (i.e., failed movements of PIT tagged fish) were observed in 2014. This approach would have the advantage of focusing restoration efforts over a relatively discrete (approximately 0.4 km) section of Nulahugyuk Creek. Remediation efforts could potentially increase the migration success rate by 44%, or almost 50 individuals for this section alone (based on preliminary analyses not shown). A complementary approach would be to focus on extending the current migration window (i.e., delay the point in time where fish passage is no longer possible) by removing impediments occurring when flows are low, for example, between 1.2 and 2.7 km (including Sites 1 to 7) and after 3.2 km (above MUSA; including Sites 9 to 11). As none of the 12 fish observed at MUSA after July 6, 2014 were detected at the ULOA (Hingittok Lake), it is possible that a significant barrier occurred upstream of this



BERNARD HARBOUR ARCTIC CHAR

array when flows were low (e.g., Site 9) or that char health was compromised because of downstream migration conditions, precluding a continued successful migration.

It is expected that the char that successfully reach Hingittok Lake overwinter and then spawn during the fall of the next year, migrating downstream to Bernard Harbour the following spring. Both Hingittok Lake and its connectivity with Bernard Harbour through Nulahugyuk Creek is critical to the local char population, and possibly to the larger fishery in the Coppermine River region. The maximum depth of Hingittok Lake is over 18 m deep, providing overwinter habitat, and there are at least two prey species (Cisco and Ninespine Stickleback) available to adult Arctic Char. Importantly, shoreline length is extensive relative to the size of the lake potentially providing an abundance of shoal habitat for spawning.



5.0 ACKNOWLEDGMENTS

Golder would like to first thank and acknowledge the community of Kugluktuk and the staff at the Hunters and Trappers Organization for their continued support for the project. This project was successful because of their efforts, in particular the support provided by Barb Adjun and David Nivingalok. Golder would also like to acknowledge Matt Gilbert at the University of Alberta for his continued enthusiasm and assistance with field work.



6.0 REFERENCES

- DFO (Fisheries and Oceans Canada). 2013. Fisheries Protection Policy Statement. Ottawa, ON, Canada. ISBN 978-1-100-22885-3.
- ANL (Angoniatiit Niovikvia Ltd.) and Golder (Golder Associates Ltd.), 2005. Restoration of an Arctic char fishery near Bernard Harbour, Nunavut (Phase1, Site Inspection/Design Planning). Report Prepared for Department of Fisheries and Oceans, Yellowknife NT. 19 p + plates and app.
- Golder (Golder Associates Ltd.) and ANL (Angoniatiit Niovikvia Ltd.). 2007. Restoration of an Arctic char fishery near Bernard Harbour, Nunavut, phase 1a – site inspection and design planning. Submitted to Fish Habitat Compensation Fund, Department of Fisheries and Oceans, Yellowknife, Northwest Territories. Golder Project #04-1373-019: 33 p. + app.
- Golder (Golder Associates Ltd.). 2013. 2012 Field Report: Stream Restoration and Community Stewardship of Arctic Char at Nulahugyuk (Bernard Harbour). Submitted to Environment Canada. Golder Project #10-1373-0075: 23 p. + app.
- Jenness, D., and Jenness, S.E.. 1991. Arctic Odyssey: The Diary of Diamond Jenness, Ethnologist with the Canadian Arctic Expedition in Northern Alaska and Canada, 1913-1916. Canadian Museum of Civilization.
- Jeuthe H, Brannas E, and Nilsson J. 2013. Effects of egg size, maternal age and temperature on egg, viability of farmed Arctic charr. *Aquaculture* 408-409: 70-77.
- O'Neil, J. and Hildebrand, L. 1986. *Fishery resources upstream of the Oldman River Dam*. Prepared for Alberta Environment, Planning Division. R.L. & L. Report No. 181: 131 p. + 7 appendices.
- Puffer, M., Berg, O. K., Huusko, A., Vehanen, T., Forseth, T., and Einum, S. 2014. Seasonal effects of hydropeaking on growth, energetics, and movement of juvenile Atlantic Salmon (*Salmo salar*). *River Research and Applications* *in print*.
- Sandstrom, S, Rawsonm M., and Lester, N. 2013. Manual of Instructions for Broad-scale Fish Community Monitoring; using North American (NA1) and Ontario Small Mesh (ON2) Gillnets. Ontario Ministry of Natural Resources. Peterborough, Ontario. Version 2013.2 35 p. + appendices.
- Stern, M. J., Powell, R. B., and Ardoin, N. M. (2008). What difference does it make? Assessing outcomes from participation in a residential environmental education program. *Reports & Research* 39: 31–43.
- Zar JH, 1999. Biostatistical Analysis. Prentice Hall, New Jersey, 663 pp.



APPENDIX A

Project Photos



APPENDIX A

Project Photos



Photo 1: Upstream and Downstream Fyke Nets Deployed in Nulahugyuk Creek, June 29, 2014



Photo 2: Upstream and Downstream Fyke Nets Deployed in Nulahugyuk Creek, July 14, 2014



APPENDIX A

Project Photos



Photo 3: Fyke net trap set up on Nulahugyuk Creek, June 14, 2014



Photo 4: Fyke Net Throat Including Dimensions



APPENDIX A

Project Photos

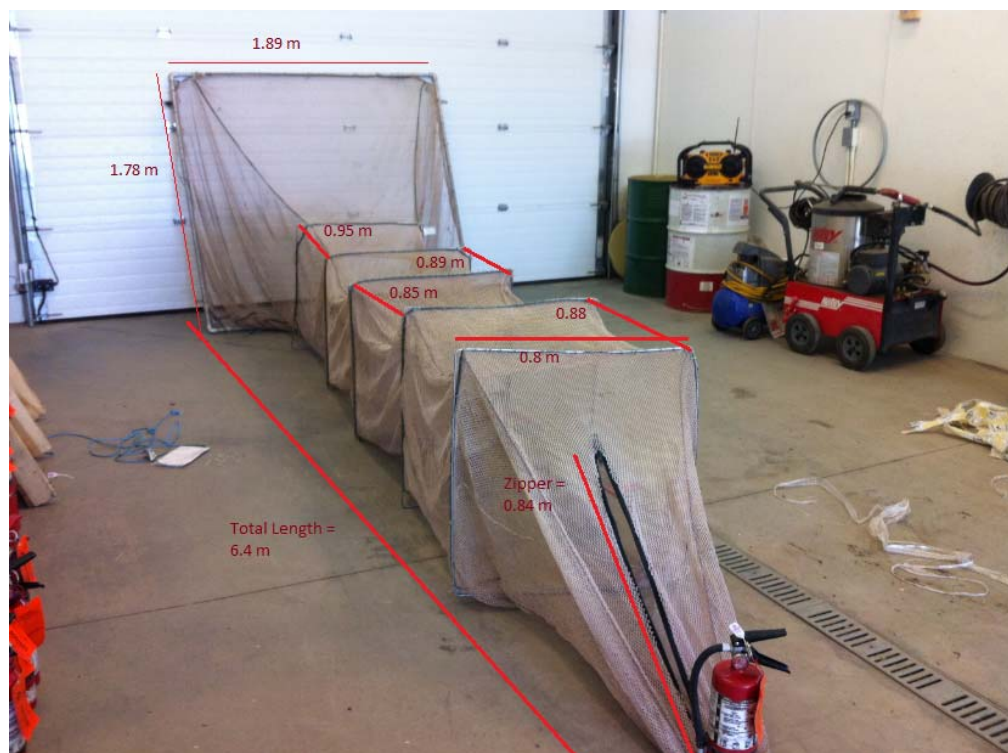


Photo 5: Fyke Net Throat and Funnel External Dimensions



Photo 6: Fyke Net Internal Funnel Dimension



APPENDIX A

Project Photos



Photo 7: Juvenile Arctic Char from Hingittok Lake, July 13, 2014



Photo 8: Adult Arctic Char Migrating Downstream Nulahugyuk Creek, June 16, 2014



APPENDIX A

Project Photos



Photo 9: Adult Arctic Char Migrating Downstream Nulahugyuk Creek, June 18, 2014



Photo 10: Adult Arctic Char Migrating Upstream Nulahugyuk Creek, June 30, 2014



APPENDIX A

Project Photos



Photo 11: Adult Arctic Char Migrating Upstream, July 5, 2014



Photo 12: View of ice edge at Hingittok Lake near outlet into Nulahugyuk Creek, June 13, 2014



APPENDIX A

Project Photos



Photo 13: Lower Upstream Array 1, June 21, 2014



Photo 14: Lake Trout from Hingittok Lake, July 13, 2014



APPENDIX A

Project Photos



Photo 15: Cisco Captured from Hingittok Lake, July 14, 2014



Photo 16: Nulahugyuk Creek, June 23, 2014



APPENDIX A

Project Photos



Photo 17: Nulahugyuk Creek approximately 250 m upstream of MDSA2, June 23, 2014



Photo 18: Nulahugyuk Creek approximately 250 m upstream of MDSA2, June 23, 2014



APPENDIX A

Project Photos



Photo 19: Nulahugyuk Creek between Pond 2 and Pond 3, July 10, 2014



Photo 20: Nulahugyuk Creek between Pond 2 and Pond 3, July 10, 2014



APPENDIX A

Project Photos

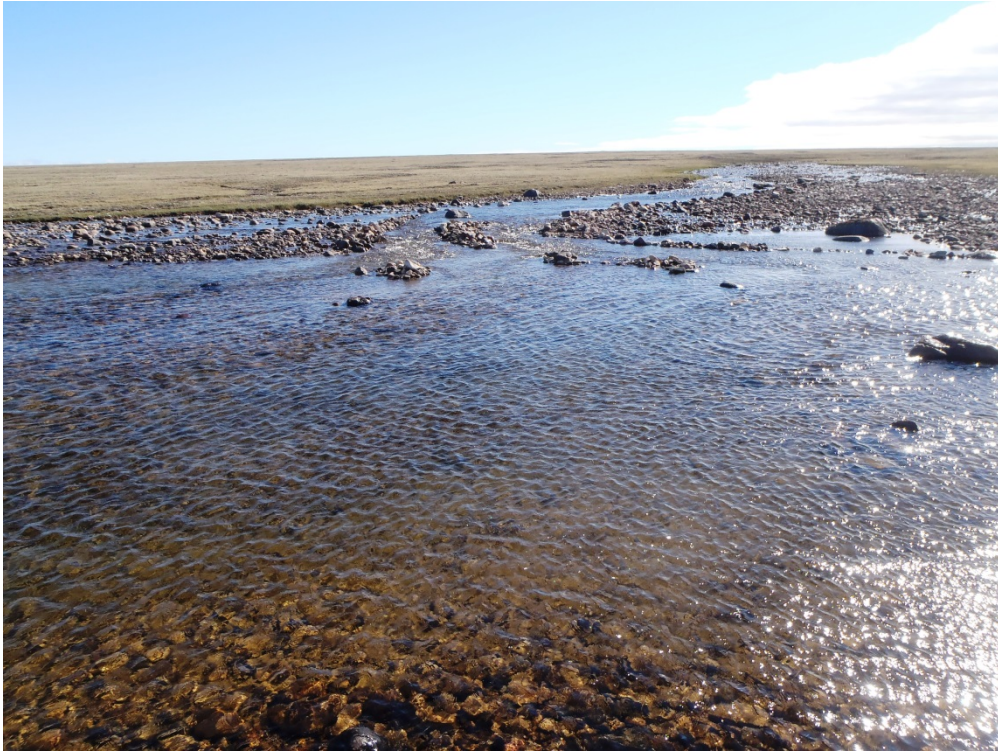


Photo 21: 2012 Low-Flow Project 2, Looking Upstream, July 18, 2014



Photo 22: 2012 Low-Flow Project 2, Looking Upstream, July 18, 2014



APPENDIX A

Project Photos



Photo 23: 2012 Low-Flow Project 2, Looking Downstream, July 18, 2014



Photo 24: 2012 Low-Flow Project 3, Looking Upstream, July 18, 2014



APPENDIX A

Project Photos



Photo 25: 2012 Low-Flow Project 3, Looking Downstream, July 18, 2014



Photo 26: View of Golder Aquatic Biologist and Kugluktuk student measuring water velocity in Nulahugyuk Creek, June 2014



APPENDIX B

Habitat Classification System



STREAM HABITAT CLASSIFICATION SYSTEM

(Modified from O'Neil and Hildebrand 1986)

Riffle - Portion of channel with increased velocity relative to Run and Pool habitat types; broken water surface due to effects of submerged or exposed bed materials; relatively shallow (less than 0.25 m) during moderate to low flow periods.

Riffle (RF) - Typical riffle habitat type; limited submerged or overhead cover for juveniles and adult life stages; coarse substrate

Riffle-Boulder Garden (RF/BG) - Riffle habitat type with significant occurrence of large boulders; availability of significant instream cover for juveniles (to lesser extent adults) at moderate to high flow events.

Rapids (RA) - Portion of channel with highest velocity relative to other habitat types. Deeper than Riffle (ranging from 0.25 m to 0.5 m); often formed by channel constriction. Substrate extremely coarse; dominated by large cobble and boulder material. Instream cover provided in pocket eddies (P3) and associated with cobble/boulder substrate.

Run - Portion of channel characterized by moderate to high current velocity relative to Pool and Flat habitat; water surface largely unbroken. Deeper than Riffle habitat type.

Run Class 1 (R1) - Highest quality Run habitat type. Maximum depth exceeding 1.5 m; average depth 1.0 m. High instream cover at all flow conditions (submerged boulders/bedrock fractures, depth). Generally of deep-slow type (to lesser extent deep-fast) and situated proximal to upstream food production area (i.e., RF, R3).

Run Class 2 (R2) - Moderate quality Run habitat type. Maximum depth reaching or exceeding 1.0 m, generally exceeding 0.75 m. High instream cover during all but low flow events (baseflow). Generally of either deep-fast type or moderately deep-slow type.

Run Class 2 / Boulder Garden (R2/BG) - Moderate quality Run habitat type; presence of large boulders in channel; high instream cover (boulder, bedrock fractures, turbulence) at all but low-flow events (baseflow). Depth characteristics similar to R2; however, required maximum depth lower due to cover afforded by boulders.

Run Class 3 (R3) - Lowest quality Run habitat type. Maximum depth of 0.75 m, but averaging <0.50 m. Low instream cover at all but high flow events.

Run Class 3 / Boulder Garden (R3/BG) - Similar to R3 in depth and velocity characteristics; presence of large boulders in channel offers improved instream cover during moderate and high flow events.



APPENDIX B

Habitat Classification System

Flat - Area of channel characterized by low current velocities (relative to RF and Run cover types); near-laminar (i.e., non-turbulent) flow character. Depositional area featuring predominantly sand/silt substrate. Differentiated from Pool habitat type on basis of high channel uniformity and lack of direct riffle/run association. More depositional in nature than R3 habitat (sand/silt substrate, lower food production, low cover).

Flat Class 1 (F1) - High quality Flat habitat type. Maximum depth exceeding 1.5 m; average depth 1.0 m or greater.

Flat Class 2 (F2) - Moderate quality Flat habitat type. Maximum depth exceeding 1.0 m; generally exceeding 0.75 m.

Flat Class 3 (F3) - Low quality Flat habitat type. Maximum depth of 0.75 m, averaging less than 0.50 m.

Pool - Discrete portion of channel featuring increased depth and reduced velocity (downstream oriented) relative to Riffle and Run habitat types; formed by channel scour.

Pool Class 1 (P1) - Highest quality Pool habitat type. Maximum depth exceeding 1.5 m; average depth 1.0 m or greater; high instream cover at all flow-conditions (submerged boulder, bedrock fractures, depth, bank irregularities). Generally featuring high Riffle and/or Run association (i.e., food input). Often intergrades with deep-slow type of R1.

Pool Class 2 (P2) - Moderate quality Pool habitat type. Maximum depth reaching or exceeding 1.0 m, generally exceeding 0.75 m. High instream cover at all but low flow events (baseflow).

Pool Class 3 (P3) - Low quality pool habitat type. Maximum depth of 0.75 m, averaging <0.50 m. Low instream cover at all but high flow events. Includes small pocket eddy type habitat.

Impoundment - Pools formed behind dams; tend to accumulate sediment/organic debris more than scour pools; may have cover associated with damming structure.

Impoundment Class 1 (IP1) - Maximum depth exceeding 1.5 m; average depth 1.0 m or greater.

Impoundment Class 2 (IP2) - Maximum depth reaching or exceeding 1.0 m, average depth generally exceeding 0.75 m.

Impoundment Class 3 (IP3) - Maximum depth of 0.75 m, averaging <0.50 m.

Backwater (BW) - Discrete, localized area of variable size, exhibiting reverse flow direction; generally produced by bank irregularities; velocities variable but generally lower than the main flow; substrate similar to adjacent channel, but with higher proportion of fines.

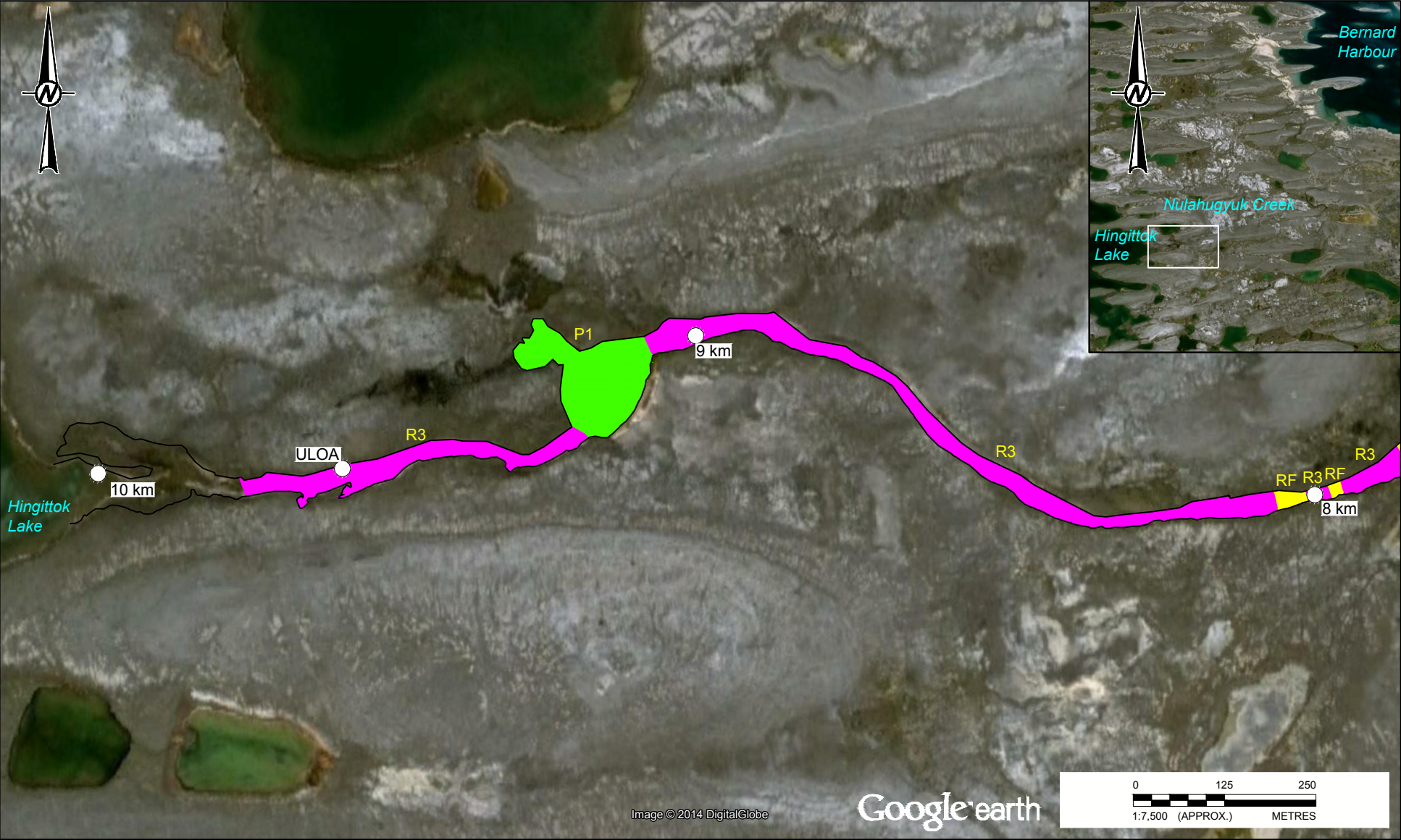
References

O'Neil, J. and L. Hildebrand. 1986. Fishery resources upstream of the Oldman River Dam. Prepared for Alberta Environment, Planning Division. R.L. & L. Report No. 181: 131 p. + 7 appendices.



APPENDIX C

Habitat Map of Nulahugyuk Creek (July 10 to 14, 2014)



LEGEND	
RA	Rapids; Very Swift, Deep, With Cover
RF	Riffle; Swift, Shallow, Turbulent
R1	Class 1 Run; Moderately Swift, Deep With Cover
R2	Class 2 Run; Moderately Swift, Moderate Depth and Cover
R3	Class 3 Run; Moderately Swift, Shallow, Limited Cover
P1	Class 1 Scour Pool; Slow, Deep
P2	Class 2 Scour Pool; Slow, Moderate Depth

REFERENCE(S)
IMAGE OBTAINED FROM GOOGLE EARTH, USED UNDER LICENSE.
IMAGERY DATE: AUGUST 21, 2006. GOOGLE EARTH IMAGE IS NOT TO SCALE.
DATUM: NAD83 PROJECTION: UTM ZONE 11.

CLIENT
SABINA GOLD AND SILVER CORP.

CONSULTANT	YYYY-MM-DD	2015-01-26
	PREPARED	AW
	DESIGN	KN
	REVIEW	JPO
	APPROVED	CES



PROJECT
BERNARD HARBOUR PROJECT -
ARCTIC CHAR RUN BASELINE STUDY

TITLE
NULAHUGYUK CREEK HABITAT AS OF JULY 10-14, 2014
- 10 km to 8 km

PROJECT No.	CONTROL	Rev.	FIGURE
1413730004	2200-RF-0001	A	C1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A 26 mm



LEGEND

- RA Rapids; Very Swift, Deep, With Cover
- RF Riffle; Swift, Shallow, Turbulent
- R1 Class 1 Run; Moderately Swift, Deep With Cover
- R2 Class 2 Run; Moderately Swift, Moderate Depth and Cover
- R3 Class 3 Run; Moderately Swift, Shallow, Limited Cover
- P1 Class 1 Scour Pool; Slow, Deep
- P2 Class 2 Scour Pool; Slow, Moderate Depth

REFERENCE(S)

IMAGE OBTAINED FROM GOOGLE EARTH, USED UNDER LICENSE.
IMAGERY DATE: AUGUST 21, 2006. GOOGLE EARTH IMAGE IS NOT TO SCALE.
DATUM: NAD83 PROJECTION: UTM ZONE 11.

CLIENT
SABINA GOLD AND SILVER CORP.

CONSULTANT



YYYY-MM-DD	2015-01-26
PREPARED	AW
DESIGN	KN
REVIEW	JPO
APPROVED	CES

PROJECT
BERNARD HARBOUR PROJECT -
ARCTIC CHAR RUN BASELINE STUDY

TITLE
**NULAHUGYUK CREEK HABITAT AS OF JULY 10-14, 2014
- 8 km to 6 km**

PROJECT No.	CONTROL	Rev.	FIGURE
1413730004	2200-RF-0002	A	C2



LEGEND	
RA	Rapids; Very Swift, Deep, With Cover
RF	Riffle; Swift, Shallow, Turbulent
R1	Class 1 Run; Moderately Swift, Deep With Cover
R2	Class 2 Run; Moderately Swift, Moderate Depth and Cover
R3	Class 3 Run; Moderately Swift, Shallow, Limited Cover
P1	Class 1 Scour Pool; Slow, Deep
P2	Class 2 Scour Pool; Slow, Moderate Depth

REFERENCE(S)	
IMAGE OBTAINED FROM GOOGLE EARTH, USED UNDER LICENSE.	
IMAGERY DATE: AUGUST 21, 2006. GOOGLE EARTH IMAGE IS NOT TO SCALE.	
DATUM: NAD83 PROJECTION: UTM ZONE 11.	

CLIENT	
SABINA GOLD AND SILVER CORP.	

CONSULTANT	

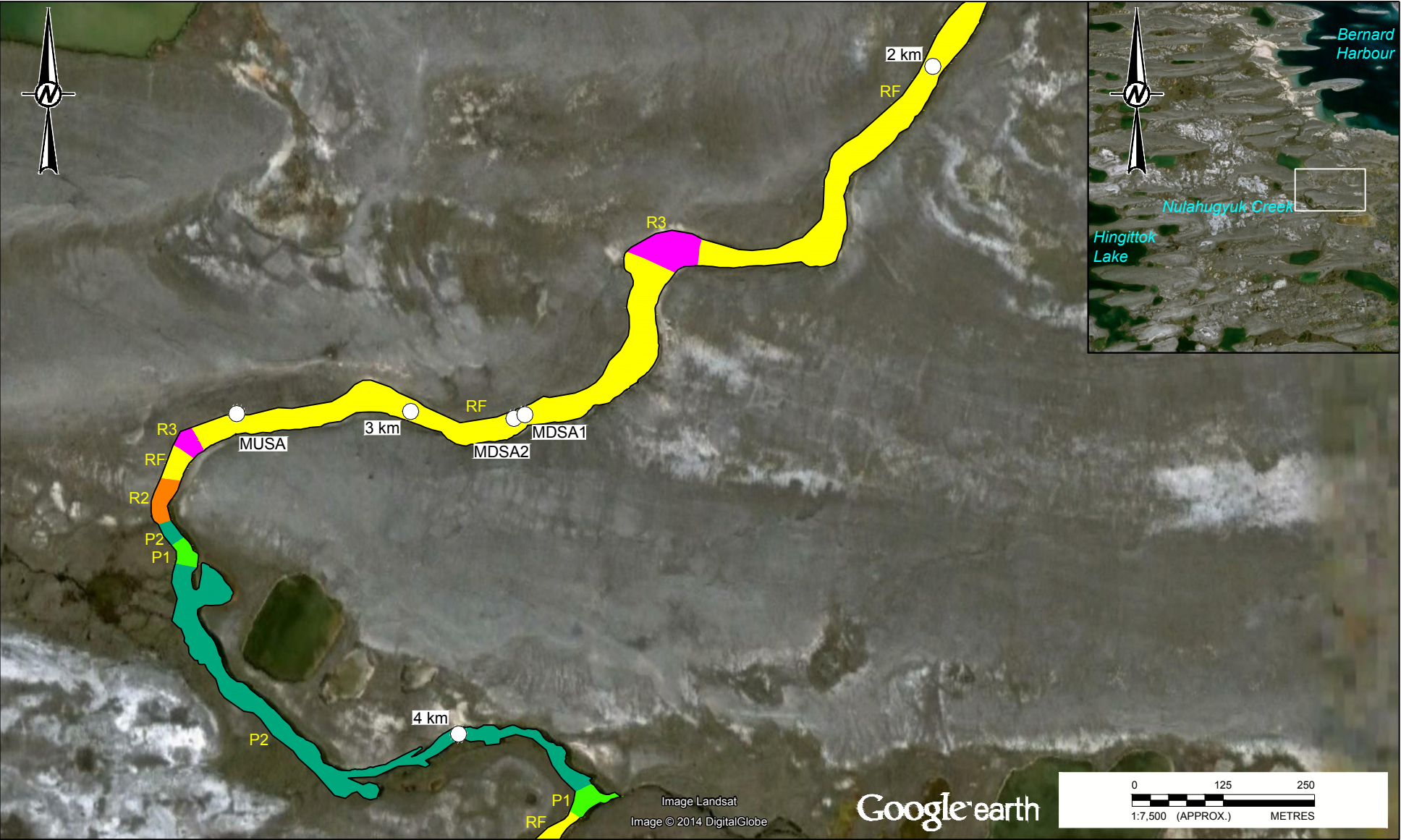
YYYY-MM-DD	2015-01-26
PREPARED	AW
DESIGN	KN
REVIEW	JPO
APPROVED	CES

PROJECT	
BERNARD HARBOUR PROJECT -	
ARCTIC CHAR RUN BASELINE STUDY	

TITLE	
NULAHUGYUK CREEK HABITAT AS OF JULY 10-14, 2014	
- 6 km to 4 km	

PROJECT No.	CONTROL	Rev.	FIGURE
1413730004	2200-RF-0003	A	C3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A



LEGEND

- RA Rapids; Very Swift, Deep, With Cover
RF Riffle; Swift, Shallow, Turbulent
- R1 Class 1 Run; Moderately Swift, Deep With Cover
R2 Class 2 Run; Moderately Swift, Moderate Depth and Cover
R3 Class 3 Run; Moderately Swift, Shallow, Limited Cover
- P1 Class 1 Scour Pool; Slow, Deep
P2 Class 2 Scour Pool; Slow, Moderate Depth

REFERENCE(S)

IMAGE OBTAINED FROM GOOGLE EARTH, USED UNDER LICENSE.
IMAGERY DATE: AUGUST 21, 2006. GOOGLE EARTH IMAGE IS NOT TO SCALE.
DATUM: NAD83 PROJECTION: UTM ZONE 11.

CLIENT
SABINA GOLD AND SILVER CORP.

CONSULTANT



YYYY-MM-DD	2015-01-26
PREPARED	AW
DESIGN	KN
REVIEW	JPO
APPROVED	CES

PROJECT
BERNARD HARBOUR PROJECT -
ARCTIC CHAR RUN BASELINE STUDY

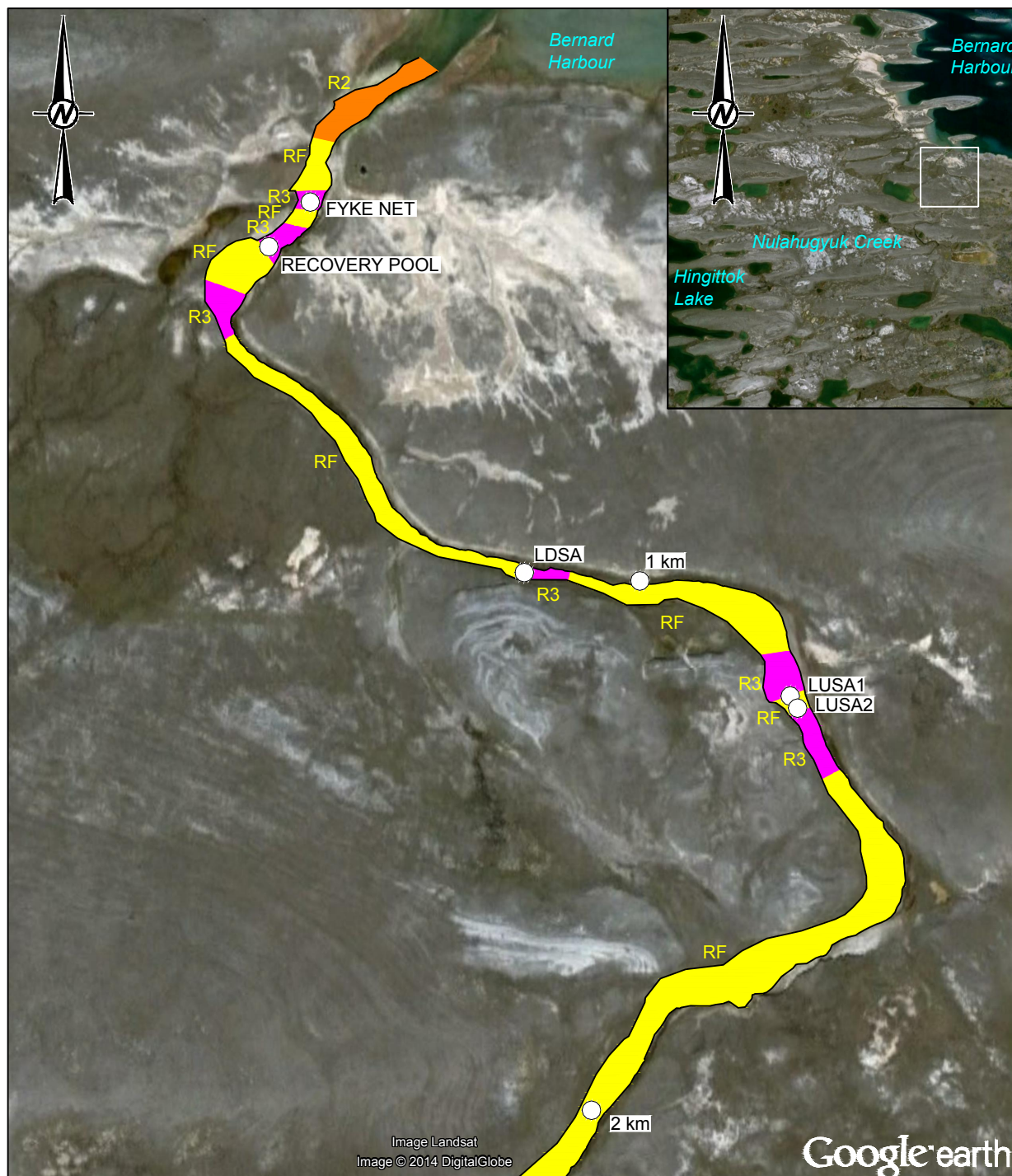
TITLE
**NULAHUGYUK CREEK HABITAT AS OF JULY 10-14, 2014
- 4 km to 2 km**

PROJECT No.
1413730004

CONTROL
2200-RF-0004

Rev.
A

FIGURE
C4

**LEGEND**

- RA Rapids; Very Swift, Deep, With Cover
 RF Riffle; Swift, Shallow, Turbulent
 R1 Class 1 Run; Moderately Swift, Deep With Cover
 R2 Class 2 Run; Moderately Swift, Moderate Depth and Cover
 R3 Class 3 Run; Moderately Swift, Shallow, Limited Cover
 P1 Class 1 Scour Pool; Slow, Deep
 P2 Class 2 Scour Pool; Slow, Moderate Depth

REFERENCE(S)

IMAGE OBTAINED FROM GOOGLE EARTH, USED UNDER LICENSE.
 IMAGERY DATE: APRIL 9, 2013. GOOGLE EARTH IMAGE IS NOT TO SCALE.
 DATUM: NAD83 PROJECTION: UTM ZONE 11.

**CLIENT**

SABINA GOLD AND SILVER CORP.

PROJECT

BERNARD HARBOUR PROJECT -
 ARCTIC CHAR RUN BASELINE STUDY

TITLE

**NULAHUGYUK CREEK HABITAT AS OF JULY 10-14, 2014
 - 2 km to 1 km**

CONSULTANT

YYYY-MM-DD 2015-01-26

PREPARED AW

DESIGN KN

REVIEW JPO

APPROVED CES

PROJECT No.
1413730004

CONTROL
2200-RF-0005

Rev.
A

FIGURE
C5



APPENDIX D

Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk
Creek, June 16 to July 17, 2014



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
1	-	0051	N	ARCH	16-Jun-14	11:48	1	D	770	3,750	0.82
2	-	0052	N	ARCH	16-Jun-14	13:27	1	D	800	3,725	0.73
3	-	0053	N	ARCH	16-Jun-14	13:27	1	D	792	4,555	0.92
4	-	0054	N	ARCH	16-Jun-14	13:36	1	D	855	4,110	0.66
5	-	0055	N	ARCH	16-Jun-14	17:22	1	D	820	4,812	0.87
6	-	0056	N	ARCH	16-Jun-14	17:29	1	D	713	2,470	0.68
7	-	0057	N	ARCH	16-Jun-14	17:34	1	D	770	4,515	0.99
8	-	0058	N	ARCH	16-Jun-14	17:37	1	D	816	4,535	0.83
9	-	0059	N	ARCH	16-Jun-14	17:40	1	D	618	2,150	0.91
10	-	0060	N	ARCH	16-Jun-14	17:53	1	D	668	2,530	0.85
11	-	0061	N	ARCH	16-Jun-14	17:54	1	D	754	4,050	0.94
12	-	0062	N	ARCH	16-Jun-14	17:56	1	D	757	3,650	0.84
13	-	0063	N	ARCH	16-Jun-14	18:00	1	D	755	3,125	0.73
14	-	0064	N	ARCH	16-Jun-14	18:02	1	D	736	3,195	0.80
15	-	0065	N	ARCH	16-Jun-14	18:05	1	D	688	3,155	0.97
16	-	0066	N	ARCH	17-Jun-14	21:36	1	D	676	2,415	0.78
17	-	0067	N	ARCH	17-Jun-14	21:30	1	D	839	4,650	0.79
18	-	0068	N	ARCH	17-Jun-14	21:33	1	D	793	4,010	0.80
19	-	0069	N	ARCH	17-Jun-14	21:34	1	D	720	3,300	0.88
20	-	0070	N	ARCH	18-Jun-14	21:26	1	D	776	4,710	1.01
21	-	0071	N	ARCH	18-Jun-14	21:29	1	D	792	3,900	0.79
22	-	0073	N	ARCH	18-Jun-14	21:31	1	D	735	3,625	0.91
23	-	0074	N	ARCH	18-Jun-14	21:33	1	D	727	3,735	0.97
24	-	0075	N	ARCH	18-Jun-14	21:34	1	D	636	2,438	0.95
25	-	0076	N	ARCH	18-Jun-14	21:37	1	D	800	4,705	0.92
26	-	0077	N	ARCH	18-Jun-14	21:39	1	D	802	4,585	0.89
27	-	0078	N	ARCH	19-Jun-14	20:45	1	D	667	2,860	0.96
28	-	0079	N	ARCH	20-Jun-14	10:45	1	D	686	2,140	0.66
29	-	0080	N	ARCH	20-Jun-14	10:47	1	D	600	1,805	0.84
30	-	0081	N	ARCH	20-Jun-14	10:51	1	D	787	3,870	0.79
31	-	0082	N	ARCH	20-Jun-14	10:53	1	D	631	2,100	0.84
32	-	0083	N	ARCH	20-Jun-14	10:55	1	D	803	4,475	0.86



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
33	-	0084	N	ARCH	20-Jun-14	10:57	1	D	781	3,860	0.81
34	-	0085	N	ARCH	20-Jun-14	11:00	1	D	699	3,795	1.11
35	-	0086	N	ARCH	20-Jun-14	11:05	1	D	732	3,690	0.94
36	-	0087	N	ARCH	20-Jun-14	11:07	1	D	660	2,460	0.86
37	-	0088	N	ARCH	20-Jun-14	11:10	1	D	767	3,760	0.83
38	-	0089	N	ARCH	20-Jun-14	11:12	1	D	793	4,195	0.84
39	-	0090	N	ARCH	20-Jun-14	20:55	1	D	742	3,840	0.94
40	-	0091	N	ARCH	20-Jun-14	20:57	1	D	686	2,580	0.80
41	-	0092	N	ARCH	20-Jun-14	20:59	1	D	808	4,465	0.85
42	-	0093	N	ARCH	20-Jun-14	21:01	1	D	732	2,305	0.59
43	-	0094	N	ARCH	20-Jun-14	21:03	1	D	745	3,645	0.88
44	-	0095	N	ARCH	20-Jun-14	21:04	1	D	705	2,360	0.67
45	-	0096	N	ARCH	20-Jun-14	21:06	1	D	689	2,790	0.85
46	-	0097	N	ARCH	20-Jun-14	21:06	1	D	768	4,275	0.94
47	-	0098	N	ARCH	20-Jun-14	21:07	1	D	685	2,910	0.91
48	-	0099	N	ARCH	20-Jun-14	21:10	1	D	684	2,840	0.89
49	-	0100	N	ARCH	20-Jun-14	21:10	1	D	749	4,275	1.02
50	-	0001	N	ARCH	20-Jun-14	21:13	1	D	735	3,760	0.95
51	-	0002	N	ARCH	20-Jun-14	21:14	1	D	786	4,365	0.90
52	-	0003	N	ARCH	20-Jun-14	21:17	1	D	772	3,445	0.75
53	-	0004	N	ARCH	20-Jun-14	21:18	1	D	664	2,250	0.77
54	-	0005	N	ARCH	20-Jun-14	21:20	1	D	748	3,740	0.89
55	-	0006	N	ARCH	20-Jun-14	21:22	1	D	786	4,285	0.88
56	-	0007	N	ARCH	20-Jun-14	21:23	1	D	690	2,655	0.81
57	-	0008	N	ARCH	20-Jun-14	21:25	1	D	796	3,025	0.60
58	-	0009	N	ARCH	20-Jun-14	21:26	1	D	725	3,220	0.84
59	-	0010	N	ARCH	20-Jun-14	21:27	1	D	636	1,930	0.75
60	-	0011	N	ARCH	20-Jun-14	21:28	1	D	755	3,640	0.85
61	-	0012	N	ARCH	20-Jun-14	21:31	1	D	694	2,780	0.83
62	-	0013	N	ARCH	20-Jun-14	21:33	1	D	741	4,020	0.99
63	-	0014	N	ARCH	20-Jun-14	21:34	1	D	730	3,465	0.89
64	-	0015	N	ARCH	20-Jun-14	21:36	1	D	674	2,420	0.79



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
65	-	0016	N	ARCH	20-Jun-14	21:37	1	D	762	4,050	0.92
66	-	0017	N	ARCH	20-Jun-14	21:37	1	D	770	4,380	0.96
67	-	0018	N	ARCH	20-Jun-14	21:40	1	D	725	3,435	0.90
68	-	0019	N	ARCH	20-Jun-14	21:42	1	D	679	2,705	0.86
69	-	0020	N	ARCH	20-Jun-14	21:43	1	D	753	3,470	0.81
70	-	0021	N	ARCH	20-Jun-14	21:43	1	D	726	3,340	0.87
71	-	0022	N	ARCH	20-Jun-14	21:44	1	D	625	3,290	1.35
72	-	0023	N	ARCH	20-Jun-14	21:47	1	D	715	3,425	0.94
73	-	0024	N	ARCH	20-Jun-14	21:49	1	D	640	2,155	0.82
74	-	0025	N	ARCH	20-Jun-14	21:50	1	D	639	2,495	0.96
75	-	0026	N	ARCH	20-Jun-14	21:53	1	D	645	2,310	0.86
76	-	0027	N	ARCH	20-Jun-14	21:53	1	D	710	3,100	0.87
77	-	0028	N	ARCH	20-Jun-14	21:55	1	D	859	5,005	0.79
78	-	0029	N	ARCH	20-Jun-14	21:59	1	D	773	4,065	0.88
79	-	0030	N	ARCH	20-Jun-14	22:00	1	D	755	3,885	0.90
80	-	0031	N	ARCH	20-Jun-14	22:01	1	D	688	2,655	0.82
81	-	0032	N	ARCH	20-Jun-14	22:15	1	D	762	3,840	0.87
82	-	0033	N	ARCH	20-Jun-14	22:17	1	D	698	2,915	0.86
83	-	0034	N	ARCH	20-Jun-14	22:17	1	D	675	2,840	0.92
84	-	0035	N	ARCH	20-Jun-14	22:20	1	D	684	2,995	0.94
85	-	0036	N	ARCH	20-Jun-14	22:22	1	D	780	4,020	0.85
86	-	0037	N	ARCH	20-Jun-14	22:24	1	D	829	4,705	0.83
87	-	0038	N	ARCH	20-Jun-14	22:26	1	D	776	4,065	0.87
88	-	0039	N	ARCH	20-Jun-14	22:27	1	D	665	2,285	0.78
89	-	0040	N	ARCH	20-Jun-14	22:29	1	D	738	3,235	0.80
90	-	0041	N	ARCH	20-Jun-14	22:32	1	D	725	3,380	0.89
91	-	0042	N	ARCH	20-Jun-14	22:33	1	D	765	4,205	0.94
92	-	0043	N	ARCH	20-Jun-14	22:34	1	D	763	4,205	0.95
93	-	0044	N	ARCH	20-Jun-14	22:35	1	D	623	1,935	0.80
94	-	0045	N	ARCH	20-Jun-14	22:36	1	D	689	2,825	0.86
95	-	0046	N	ARCH	21-Jun-14	11:46	1	D	772	3,785	0.82
96	-	0047	N	ARCH	21-Jun-14	11:48	1	D	713	3,395	0.94



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
97	-	0048	N	ARCH	21-Jun-14	11:50	1	D	739	3,540	0.88
98	-	0049	N	ARCH	21-Jun-14	11:52	1	D	822	4,680	0.84
99	-	0101	N	ARCH	21-Jun-14	11:53	1	D	733	3,280	0.83
100	-	0102	N	ARCH	21-Jun-14	11:55	1	D	779	3,970	0.84
101	-	0103	N	ARCH	21-Jun-14	11:57	1	D	699	2,410	0.71
102	-	0104	N	ARCH	21-Jun-14	11:57	1	D	736	3,540	0.89
103	-	0105	N	ARCH	21-Jun-14	11:58	1	D	678	2,485	0.80
104	-	-	N	ARCH	21-Jun-14	12:02	1	D	726	-	-
105	-	0106	N	ARCH	21-Jun-14	12:04	1	D	785	4,240	0.88
106	-	0107	N	ARCH	21-Jun-14	12:07	1	D	641	2,335	0.89
107	-	0108	N	ARCH	21-Jun-14	12:09	1	D	775	4,330	0.93
108	-	0109	N	ARCH	21-Jun-14	12:10	1	D	791	4,150	0.84
109	-	0110	N	ARCH	21-Jun-14	12:11	1	D	697	2,625	0.78
110	-	0111	N	ARCH	21-Jun-14	12:27	1	D	764	4,320	0.97
111	-	0112	N	ARCH	21-Jun-14	12:29	1	D	603	1,620	0.74
112	-	0113	N	ARCH	21-Jun-14	12:31	1	D	743	3,745	0.91
113	-	0114	N	ARCH	21-Jun-14	12:33	1	D	768	3,890	0.86
114	-	0115	N	ARCH	21-Jun-14	12:35	1	D	685	2,635	0.82
115	-	0116	N	ARCH	21-Jun-14	12:37	1	D	739	2,985	0.74
116	-	0117	N	ARCH	21-Jun-14	17:22	1	D	762	3,315	0.75
117	-	0118	N	ARCH	21-Jun-14	17:25	1	D	840	4,670	0.79
118	-	0119	N	ARCH	21-Jun-14	12:28	1	D	789	3,995	0.81
119	-	0201	N	ARCH	21-Jun-14	17:30	1	D	761	4,035	0.92
120	-	0202	N	ARCH	21-Jun-14	17:38	1	D	764	3,485	0.78
121	-	0203	N	ARCH	21-Jun-14	17:39	1	D	805	4,670	0.90
122	-	0204	N	ARCH	21-Jun-14	17:41	1	D	669	2,645	0.88
123	-	0205	N	ARCH	21-Jun-14	17:43	1	D	806	3,675	0.70
124	-	0206	N	ARCH	21-Jun-14	17:45	1	D	813	4,890	0.91
125	-	0207	N	ARCH	21-Jun-14	17:47	1	D	738	3,170	0.79
126	-	0208	N	ARCH	21-Jun-14	17:48	1	D	699	2,295	0.67
127	-	0209	N	ARCH	21-Jun-14	17:51	1	D	696	2,970	0.88



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
128	-	0210	N	ARCH	21-Jun-14	17:52	1	D	730	2,990	0.77
129	-	0211	N	ARCH	21-Jun-14	17:54	1	D	668	2,585	0.87
130	-	0212	N	ARCH	21-Jun-14	17:56	1	D	755	4,010	0.93
131	-	0213	N	ARCH	21-Jun-14	17:57	1	D	804	3,565	0.69
132	-	0214	N	ARCH	21-Jun-14	18:00	1	D	684	2,855	0.89
133	-	0215	N	ARCH	21-Jun-14	18:01	1	D	786	3,800	0.78
134	-	0216	N	ARCH	21-Jun-14	18:02	1	D	689	2,925	0.89
135	-	0217	N	ARCH	21-Jun-14	18:04	1	D	746	3,900	0.94
136	-	0218	N	ARCH	21-Jun-14	18:05	1	D	676	3,030	0.98
137	-	0219	N	ARCH	21-Jun-14	18:08	1	D	710	2,915	0.81
138	-	0220	N	ARCH	21-Jun-14	18:10	1	D	703	3,265	0.94
139	-	0221	N	ARCH	21-Jun-14	18:19	1	D	772	3,910	0.85
140	-	0222	N	ARCH	21-Jun-14	18:20	1	D	739	3,930	0.97
141	-	0223	N	ARCH	21-Jun-14	18:21	1	D	845	4,760	0.79
142	-	0224	N	ARCH	21-Jun-14	18:25	1	D	683	2,625	0.82
143	-	0225	N	ARCH	21-Jun-14	18:25	1	D	811	4,205	0.79
144	-	0226	N	ARCH	21-Jun-14	18:27	1	D	675	2,595	0.84
145	-	0227	N	ARCH	21-Jun-14	18:29	1	D	701	3,260	0.95
146	-	0228	N	ARCH	21-Jun-14	18:31	1	D	791	4,435	0.90
147	-	0229	N	ARCH	21-Jun-14	18:33	1	D	750	3,555	0.84
148	-	0230	N	ARCH	21-Jun-14	18:35	1	D	741	3,110	0.76
149	-	0231	N	ARCH	21-Jun-14	18:36	1	D	730	3,145	0.81
150	-	0232	N	ARCH	21-Jun-14	18:40	1	D	715	3,270	0.89
151	-	0233	N	ARCH	21-Jun-14	18:42	1	D	749	3,775	0.90
152	-	0234	N	ARCH	21-Jun-14	18:43	1	D	700	2,800	0.82
153	-	0235	N	ARCH	21-Jun-14	18:45	1	D	641	2,300	0.87
154	-	A4528	Y	ARCH	21-Jun-14	21:14	1	D	772	3,990	0.87
155	-	0236	N	ARCH	21-Jun-14	21:16	1	D	755	4,030	0.94
156	-	0237	N	ARCH	21-Jun-14	21:18	1	D	750	3,945	0.94
157	-	0238	N	ARCH	21-Jun-14	21:18	1	D	641	2,380	0.90
158	-	0239	N	ARCH	21-Jun-14	21:19	1	D	729	3,575	0.92



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
159	-	0240	N	ARCH	21-Jun-14	21:28	1	D	755	3,580	0.83
160	-	0241	N	ARCH	22-Jun-14	10:46	1	D	761	3,470	0.79
161	-	0242	N	ARCH	22-Jun-14	10:48	1	D	692	2,550	0.77
162	-	0243	N	ARCH	22-Jun-14	10:49	1	D	740	3,680	0.91
163	-	0244	N	ARCH	22-Jun-14	10:51	1	D	803	4,495	0.87
164	-	0245	N	ARCH	22-Jun-14	10:53	1	D	651	2,285	0.83
165	-	0246	N	ARCH	22-Jun-14	10:53	1	D	683	2,770	0.87
166	-	0247	N	ARCH	22-Jun-14	10:56	1	D	684	2,730	0.85
167	-	0248	N	ARCH	22-Jun-14	10:57	1	D	746	3,310	0.80
168	-	0249	N	ARCH	22-Jun-14	10:58	1	D	636	2,185	0.85
169	-	0250	N	ARCH	22-Jun-14	11:00	1	D	734	3,485	0.88
170	-	0251	N	ARCH	22-Jun-14	11:02	1	D	665	2,400	0.82
171	-	0252	N	ARCH	22-Jun-14	11:03	1	D	648	2,035	0.75
172	-	0253	N	ARCH	22-Jun-14	11:05	1	D	776	3,875	0.83
173	-	0254	N	ARCH	22-Jun-14	11:06	1	D	805	4,460	0.85
174	-	0255	N	ARCH	22-Jun-14	17:15	1	D	794	2,865	0.57
175	-	-	N	ARCH	22-Jun-14	17:15	1	D	-	-	-
176	-	0256	N	ARCH	22-Jun-14	17:35	1	D	793	4,275	0.86
177	-	0257	N	ARCH	22-Jun-14	17:37	1	D	706	2,945	0.84
178	-	0258	N	ARCH	22-Jun-14	17:38	1	D	779	4,120	0.87
179	-	0259	N	ARCH	22-Jun-14	17:42	1	D	775	4,015	0.86
180	-	0260	N	ARCH	22-Jun-14	17:43	1	D	672	2,590	0.85
181	-	0261	N	ARCH	22-Jun-14	18:01	1	D	809	4,425	0.84
182	-	0262	N	ARCH	22-Jun-14	18:02	1	D	749	3,600	0.86
183	-	0263	N	ARCH	22-Jun-14	18:03	1	D	712	3,070	0.85
184	-	0264	N	ARCH	22-Jun-14	18:04	1	D	780	4,895	1.03
185	-	0265	N	ARCH	22-Jun-14	18:07	1	D	775	3,855	0.83
186	-	0266	N	ARCH	22-Jun-14	18:09	1	D	759	3,950	0.90
187	-	0267	N	ARCH	22-Jun-14	18:12	1	D	721	3,260	0.87
188	-	0268	N	ARCH	22-Jun-14	18:12	1	D	727	3,185	0.83
189	-	0269	N	ARCH	22-Jun-14	18:13	1	D	660	2,655	0.92



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
190	-	0270	N	ARCH	22-Jun-14	18:14	1	D	700	3,065	0.89
191	-	0271	N	ARCH	22-Jun-14	18:16	1	D	722	3,275	0.87
192	-	0272	N	ARCH	22-Jun-14	18:17	1	D	735	3,140	0.79
193	-	0273	N	ARCH	22-Jun-14	18:18	1	D	657	2,410	0.85
194	-	0274	N	ARCH	22-Jun-14	21:46	1	D	763	3,665	0.83
195	-	0275	N	ARCH	22-Jun-14	21:49	1	D	774	4,075	0.88
196	-	0276	N	ARCH	22-Jun-14	21:53	1	D	677	2,530	0.82
197	-	0277	N	ARCH	23-Jun-14	20:10	1	D	762	3,350	0.76
198	-	0278	N	ARCH	23-Jun-14	20:11	1	D	674	2,200	0.72
199	-	0279	N	ARCH	23-Jun-14	20:12	1	D	753	4,025	0.94
200	-	0280	N	ARCH	23-Jun-14	20:13	1	D	730	3,365	0.87
201	-	0281	N	ARCH	23-Jun-14	20:14	1	D	685	2,350	0.73
202	-	0282	N	ARCH	23-Jun-14	20:16	1	D	741	3,175	0.78
203	-	0283	N	ARCH	23-Jun-14	20:16	1	D	704	3,315	0.95
204	-	0284	N	ARCH	23-Jun-14	20:17	1	D	776	3,950	0.85
205	-	0285	N	ARCH	23-Jun-14	20:18	1	D	719	2,750	0.74
206	-	0286	Y	ARCH	23-Jun-14	20:20	1	D	652	2,245	0.81
207	-	0287	N	ARCH	23-Jun-14	20:23	1	D	750	3,980	0.94
208	-	0288	N	ARCH	23-Jun-14	20:24	1	D	659	2,515	0.88
209	-	0289	N	ARCH	23-Jun-14	20:25	1	D	772	3,865	0.84
210	-	0290	N	ARCH	23-Jun-14	20:27	1	D	787	2,835	0.58
211	-	0291	N	ARCH	23-Jun-14	20:30	1	D	772	3,735	0.81
212	-	0292	N	ARCH	23-Jun-14	20:32	1	D	765	3,560	0.80
213	-	-	N	ARCH	23-Jun-14	20:33	1	D	-	-	-
214	-	0294	N	ARCH	23-Jun-14	20:33	1	D	732	3,330	0.85
215	-	0295	N	ARCH	23-Jun-14	20:34	1	D	675	2,795	0.91
216	-	0296	N	ARCH	23-Jun-14	20:35	1	D	710	2,990	0.84
217	-	0297	N	ARCH	23-Jun-14	20:36	1	D	701	2,995	0.87
218	-	0298	N	ARCH	23-Jun-14	20:44	1	D	645	2,395	0.89
219	-	0299	N	ARCH	23-Jun-14	20:44	1	D	665	2,685	0.91
220	-	0300	N	ARCH	23-Jun-14	20:46	1	D	691	2,845	0.86



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
221	-	0451	N	ARCH	23-Jun-14	20:47	1	D	691	3,220	0.98
222	-	0452	N	ARCH	23-Jun-14	20:55	1	D	726	2,920	0.76
223	-	0453	N	ARCH	23-Jun-14	20:56	1	D	672	2,780	0.92
224	-	0454	N	ARCH	23-Jun-14	20:58	1	D	764	3,940	0.88
225	-	0455	N	ARCH	23-Jun-14	20:58	1	D	715	3,005	0.82
226	-	0456	N	ARCH	23-Jun-14	20:58	1	D	690	2,730	0.83
227	-	0457	N	ARCH	23-Jun-14	21:00	1	D	693	2,815	0.85
228	-	0458	N	ARCH	24-Jun-14	11:08	1	D	845	4,795	0.79
229	-	0459	N	ARCH	24-Jun-14	11:10	1	D	686	2,615	0.81
230	-	0460	N	ARCH	24-Jun-14	11:11	1	D	658	2,245	0.79
231	-	0461	N	ARCH	24-Jun-14	11:13	1	D	698	2,890	0.85
232	-	0462	N	ARCH	24-Jun-14	11:14	1	D	778	3,675	0.78
233	-	0463	N	ARCH	24-Jun-14	11:15	1	D	713	2,770	0.76
234	-	0464	N	ARCH	24-Jun-14	11:17	1	D	708	2,800	0.79
235	-	0465	N	ARCH	24-Jun-14	11:19	1	D	819	4,610	0.84
236	-	0466	N	ARCH	24-Jun-14	11:21	1	D	655	2,540	0.90
237	-	0467	N	ARCH	24-Jun-14	11:23	1	D	644	2,185	0.82
238	-	0468	N	ARCH	24-Jun-14	11:24	1	D	750	3,585	0.85
239	-	0469	N	ARCH	24-Jun-14	11:25	1	D	706	2,945	0.84
240	-	0470	N	ARCH	24-Jun-14	11:28	1	D	671	2,725	0.90
241	-	0471	N	ARCH	24-Jun-14	11:29	1	D	688	2,655	0.82
242	-	0472	N	ARCH	24-Jun-14	11:30	1	D	684	2,830	0.88
243	-	0473	N	ARCH	24-Jun-14	11:33	1	D	772	3,775	0.82
244	-	0474	N	ARCH	24-Jun-14	11:34	1	D	820	4,315	0.78
245	-	0475	N	ARCH	24-Jun-14	11:36	1	D	682	2,665	0.84
246	-	0476	N	ARCH	24-Jun-14	11:39	1	D	715	3,030	0.83
247	-	0477	N	ARCH	24-Jun-14	11:40	1	D	805	4,500	0.86
248	-	0478	N	ARCH	24-Jun-14	11:42	1	D	785	4,135	0.85
249	-	0479	N	ARCH	24-Jun-14	11:43	1	D	710	2,835	0.79
250	-	0480	N	ARCH	24-Jun-14	11:46	1	D	724	3,180	0.84
251	-	0481	N	ARCH	24-Jun-14	11:47	1	D	708	2,700	0.76



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
252	-	0482	N	ARCH	24-Jun-14	11:49	1	D	762	2,405	0.54
253	-	0483	N	ARCH	24-Jun-14	11:50	1	D	670	2,490	0.83
254	-	0484	N	ARCH	24-Jun-14	11:52	1	D	826	5,080	0.90
255	-	0485	N	ARCH	24-Jun-14	11:55	1	D	797	4,400	0.87
256	-	0486	N	ARCH	24-Jun-14	11:57	1	D	788	4,130	0.84
257	-	0487	N	ARCH	24-Jun-14	11:58	1	D	653	2,525	0.91
258	-	0488	N	ARCH	24-Jun-14	12:02	1	D	695	2,765	0.82
259	-	0489	N	ARCH	24-Jun-14	12:03	1	D	777	4,170	0.89
260	-	0490	N	ARCH	24-Jun-14	12:28	1	D	787	4,110	0.84
261	-	0491	N	ARCH	24-Jun-14	12:29	1	D	765	3,935	0.88
262	-	0492	N	ARCH	24-Jun-14	12:30	1	D	715	-	-
263	-	0493	N	ARCH	24-Jun-14	12:33	1	D	770	3,510	0.77
264	-	0494	N	ARCH	24-Jun-14	12:35	1	D	685	2,940	0.91
265	-	0495	N	ARCH	24-Jun-14	12:37	1	D	621	2,050	0.86
266	-	0496	N	ARCH	24-Jun-14	12:41	1	D	800	4,385	0.86
267	-	0497	N	ARCH	24-Jun-14	12:42	1	D	715	2,895	0.79
268	-	0498	N	ARCH	24-Jun-14	12:44	1	D	689	2,670	0.82
269	-	0499	N	ARCH	24-Jun-14	12:45	1	D	678	2,575	0.83
270	-	0500	Y	ARCH	24-Jun-14	12:47	1	D	635	1,545	0.60
271	-	-	N	ARCH	24-Jun-14	18:05	1	D	715	2,855	0.78
272	-	-	N	ARCH	24-Jun-14	18:25	1	D	668	2,585	0.87
273	-	-	N	ARCH	24-Jun-14	20:16	1	D	624	1,885	0.78
274	-	0501	N	ARCH	24-Jun-14	22:39	1	D	750	3,475	0.82
275	-	0502	N	ARCH	24-Jun-14	22:41	1	D	703	2,965	0.85
276	-	0503	N	ARCH	24-Jun-14	22:42	1	D	803	4,390	0.85
277	-	0504	N	ARCH	24-Jun-14	22:42	1	D	733	3,305	0.84
278	-	0505	N	ARCH	24-Jun-14	22:44	1	D	715	3,155	0.86
279	-	0506	N	ARCH	24-Jun-14	22:46	1	D	838	4,685	0.80
280	-	0507	N	ARCH	24-Jun-14	22:47	1	D	704	2,685	0.77
281	-	0508	N	ARCH	24-Jun-14	22:57	1	D	656	2,255	0.80
282	-	0509	N	ARCH	24-Jun-14	22:58	1	D	650	2,035	0.74



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
283	-	0510	N	ARCH	24-Jun-14	22:59	1	D	632	2,090	0.83
284	-	0511	N	ARCH	24-Jun-14	23:01	1	D	620	2,150	0.90
285	-	0512	N	ARCH	24-Jun-14	23:04	1	D	604	1,970	0.89
286	-	0513	N	ARCH	24-Jun-14	23:05	1	D	697	2,695	0.80
287	-	0514	N	ARCH	24-Jun-14	23:06	1	D	677	2,520	0.81
288	-	0515	N	ARCH	24-Jun-14	23:07	1	D	675	2,795	0.91
289	-	0516	N	ARCH	24-Jun-14	23:08	1	D	659	2,340	0.82
290	-	0517	N	ARCH	24-Jun-14	23:17	1	D	684	2,355	0.74
291	-	0518	N	ARCH	24-Jun-14	23:19	1	D	706	3,025	0.86
292	-	0519	N	ARCH	24-Jun-14	23:20	1	D	738	3,045	0.76
293	-	0520	N	ARCH	24-Jun-14	23:22	1	D	680	2,850	0.91
294	-	A4749	Y	ARCH	24-Jun-14	23:24	1	D	720	2,780	0.74
295	-	0521	N	ARCH	24-Jun-14	23:26	1	D	734	3,050	0.77
296	-	0522	N	ARCH	24-Jun-14	23:26	1	D	616	2,130	0.91
297	-	0523	N	ARCH	24-Jun-14	23:29	1	D	714	2,905	0.80
298	-	0524	N	ARCH	24-Jun-14	23:30	1	D	654	2,315	0.83
299	-	0525	N	ARCH	24-Jun-14	23:32	1	D	754	3,450	0.80
300	-	0526	N	ARCH	24-Jun-14	23:33	1	D	724	3,075	0.81
301	-	0527	N	ARCH	24-Jun-14	23:35	1	D	721	3,385	0.90
302	-	0528	N	ARCH	24-Jun-14	23:36	1	D	642	2,080	0.79
303	-	0529	N	ARCH	24-Jun-14	23:40	1	D	772	2,475	0.54
304	-	-	N	ARCH	25-Jun-14	11:40	1	D	730	2,935	0.75
305	-	-	N	ARCH	25-Jun-14	12:00	1	D	791	3,585	0.72
306	-	0530	N	ARCH	25-Jun-14	13:23	1	D	698	2,825	0.83
307	-	0531	N	ARCH	25-Jun-14	13:24	1	D	774	3,740	0.81
308	-	0532	N	ARCH	25-Jun-14	13:24	1	D	716	3,265	0.89
309	-	0533	N	ARCH	25-Jun-14	13:25	1	D	683	2,650	0.83
310	-	0534	N	ARCH	25-Jun-14	13:29	1	D	706	2,065	0.59
311	-	0535	N	ARCH	25-Jun-14	13:30	1	D	707	3,120	0.88
312	-	0536	N	ARCH	25-Jun-14	13:31	1	D	674	2,440	0.80
313	-	0537	N	ARCH	25-Jun-14	13:31	1	D	689	2,720	0.83



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
314	-	0538	N	ARCH	25-Jun-14	13:49	1	D	787	3,940	0.81
315	-	0539	N	ARCH	25-Jun-14	13:50	1	D	805	4,420	0.85
316	-	0540	N	ARCH	25-Jun-14	13:52	1	D	802	4,070	0.79
317	-	0541	N	ARCH	25-Jun-14	13:54	1	D	774	3,775	0.81
318	-	0542	N	ARCH	25-Jun-14	13:57	1	D	687	2,615	0.81
319	-	0543	N	ARCH	25-Jun-14	13:58	1	D	655	2,155	0.77
320	-	0544	N	ARCH	25-Jun-14	13:59	1	D	709	2,970	0.83
321	-	0545	N	ARCH	25-Jun-14	14:00	1	D	708	2,785	0.78
322	-	0546	N	ARCH	25-Jun-14	14:02	1	D	710	3,050	0.85
323	-	0547	N	ARCH	25-Jun-14	14:03	1	D	756	3,375	0.78
324	-	0548	N	ARCH	25-Jun-14	14:07	1	D	683	2,700	0.85
325	-	0549	N	ARCH	25-Jun-14	14:09	1	D	793	2,620	0.53
326	-	0550	N	ARCH	25-Jun-14	14:10	1	D	640	2,110	0.80
327	-	0851	N	ARCH	25-Jun-14	14:15	1	D	688	2,940	0.90
328	52004	-	N	ARCH	25-Jun-14	14:27	1	U	805	5,225	1.00
329	52003	-	N	ARCH	25-Jun-14	14:34	1	U	780	4,065	0.86
330	-	0852	N	ARCH	25-Jun-14	22:35	1	D	698	2,540	0.75
331	-	0853	N	ARCH	25-Jun-14	22:37	1	D	754	3,535	0.82
332	-	0854	N	ARCH	25-Jun-14	22:37	1	D	804	4,055	0.78
333	-	0855	N	ARCH	25-Jun-14	22:40	1	D	685	2,510	0.78
334	-	0856	N	ARCH	25-Jun-14	22:41	1	D	746	3,560	0.86
335	-	0857	N	ARCH	25-Jun-14	22:42	1	D	750	3,475	0.82
336	-	0858	N	ARCH	25-Jun-14	22:43	1	D	665	2,320	0.79
337	-	0859	N	ARCH	25-Jun-14	22:45	1	D	681	2,460	0.78
338	-	0860	N	ARCH	25-Jun-14	22:47	1	D	689	2,390	0.73
339	-	0861	N	ARCH	25-Jun-14	22:49	1	D	660	2,255	0.78
340	-	0862	N	ARCH	25-Jun-14	22:50	1	D	617	1,805	0.77
341	-	0863	N	ARCH	25-Jun-14	22:52	1	D	662	2,320	0.80
342	-	0864	N	ARCH	25-Jun-14	22:53	1	D	687	2,745	0.85
343	-	0865	N	ARCH	25-Jun-14	22:54	1	D	685	2,580	0.80
344	-	0866	N	ARCH	25-Jun-14	22:55	1	D	803	3,780	0.73



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
345	-	0867	N	ARCH	25-Jun-14	22:56	1	D	804	4,085	0.79
346	-	0868	N	ARCH	25-Jun-14	22:57	1	D	815	3,190	0.59
347	-	0869	N	ARCH	25-Jun-14	22:59	1	D	724	3,130	0.82
348	-	0870	N	ARCH	25-Jun-14	23:00	1	D	700	2,930	0.85
349	-	0871	N	ARCH	25-Jun-14	23:02	1	D	634	1,955	0.77
350	-	0872	N	ARCH	25-Jun-14	23:02	1	D	698	2,875	0.85
351	-	0873	N	ARCH	25-Jun-14	23:04	1	D	703	2,700	0.78
352	-	0874	N	ARCH	25-Jun-14	23:05	1	D	689	2,860	0.87
353	-	0875	N	ARCH	25-Jun-14	23:06	1	D	669	2,320	0.77
354	-	0876	N	ARCH	25-Jun-14	23:07	1	D	672	2,335	0.77
355	-	0877	N	ARCH	25-Jun-14	23:08	1	D	687	2,650	0.82
356	-	0878	N	ARCH	25-Jun-14	23:09	1	D	684	2,500	0.78
357	-	0879	N	ARCH	25-Jun-14	23:11	1	D	664	2,210	0.75
358	no tag	0883	Y	ARCH	25-Jun-14	23:11	1	D	743	3,490	0.85
359	-	0880	N	ARCH	25-Jun-14	23:13	1	D	732	3,670	0.94
360	-	0881	N	ARCH	25-Jun-14	23:14	1	D	643	2,595	0.98
361	-	01882	N	ARCH	25-Jun-14	23:15	1	D	630	2,060	0.82
362	-	0884	N	ARCH	25-Jun-14	23:23	1	D	660	2,150	0.75
363	-	0885	N	ARCH	25-Jun-14	23:24	1	D	679	2,730	0.87
364	-	0886	N	ARCH	25-Jun-14	23:25	1	D	774	4,030	0.87
365	-	0887	N	ARCH	25-Jun-14	23:26	1	D	715	3,055	0.84
366	-	0888	N	ARCH	25-Jun-14	23:27	1	D	696	3,785	1.12
367	-	0889	N	ARCH	25-Jun-14	23:28	1	D	649	2,345	0.86
368	-	-	N	ARCH	25-Jun-14	23:31	1	D	203	67	0.80
369	-	0890	N	ARCH	26-Jun-14	10:20	1	D	670	2,875	0.96
370	52007	-	N	ARCH	26-Jun-14	10:42	1	U	776	4,685	1.00
371	-	0891	N	ARCH	26-Jun-14	20:40	1	D	841	4,680	0.79
372	-	0892	N	ARCH	26-Jun-14	20:42	1	D	691	2,975	0.90
373	-	0893	N	ARCH	26-Jun-14	20:44	1	D	709	3,150	0.88
374	-	0894	N	ARCH	26-Jun-14	20:45	1	D	661	2,685	0.93
375	-	0895	N	ARCH	26-Jun-14	20:46	1	D	702	2,720	0.79



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
376	-	0897	N	ARCH	26-Jun-14	20:48	1	D	661	2,510	0.87
377	-	0896	N	ARCH	26-Jun-14	20:51	1	D	703	3,265	0.94
378	-	0898	N	ARCH	26-Jun-14	20:53	1	D	670	2,630	0.87
379	52011	-	N	ARCH	26-Jun-14	21:26	1	U	761	4,720	1.07
380	52006	-	N	ARCH	26-Jun-14	21:29	1	U	812	5,825	1.09
381	52012	-	N	ARCH	26-Jun-14	21:33	1	U	858	6,555	1.04
382	52008	-	N	ARCH	26-Jun-14	21:38	1	U	763	4,150	0.93
383	52015	-	N	ARCH	26-Jun-14	21:42	1	U	810	6,450	1.21
384	52009	-	N	ARCH	26-Jun-14	21:44	1	U	774	5,765	1.24
385	52016	-	N	ARCH	26-Jun-14	21:47	1	U	756	4,750	1.10
386	52014	-	N	ARCH	26-Jun-14	21:50	1	U	664	3,350	1.14
387	-	0899	N	ARCH	27-Jun-14	10:41	1	D	646	2,295	0.85
388	-	0900	N	ARCH	27-Jun-14	10:43	1	D	599	1,845	0.86
389	52019	-	N	ARCH	27-Jun-14	11:17	1	U	790	4,935	1.00
390	52018	-	N	ARCH	27-Jun-14	11:19	1	U	786	5,375	1.11
391	52022	-	N	ARCH	27-Jun-14	11:23	1	U	700	4,010	1.17
392	52020	-	N	ARCH	27-Jun-14	11:25	1	U	765	4,025	0.90
393	52017	-	N	ARCH	27-Jun-14	11:28	1	U	753	4,855	1.14
394	52025	-	N	ARCH	27-Jun-14	11:32	1	U	713	3,895	1.07
395	-	0951	N	ARCH	27-Jun-14	17:28	1	U	695	3,930	1.17
396	52023	-	N	ARCH	27-Jun-14	17:40	1	U	799	5,250	1.03
397	52010	-	N	ARCH	27-Jun-14	17:44	1	U	730	4,260	1.10
398	52033	-	N	ARCH	28-Jun-14	9:06	1	U	746	4,190	1.01
399	52039	-	N	ARCH	28-Jun-14	9:08	1	U	729	3,425	0.88
400	52034	-	N	ARCH	28-Jun-14	9:10	1	U	795	5,515	1.10
401	52046	-	N	ARCH	28-Jun-14	9:13	1	U	753	5,445	1.28
402	52036	-	N	ARCH	28-Jun-14	9:16	1	U	769	4,605	1.01
403	-	-	- ^(c)	ARCH	28-Jun-14	9:14	1	U	-	-	-
404	52044	-	N	ARCH	28-Jun-14	9:18	1	U	740	4,595	1.13
405	52024	-	N	ARCH	28-Jun-14	9:21	1	U	678	3,480	1.12



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
406	52031	-	N	ARCH	28-Jun-14	9:23	1	U	787	4,970	1.02
407	52038	-	N	ARCH	28-Jun-14	9:25	1	U	784	5,175	1.07
408	-	-	- ^(c)	ARCH	28-Jun-14	9:27	1	U	-	-	-
409	-	0952	N	ARCH	28-Jun-14	9:35	1	D	705	3,425	0.98
410	52043	-	N	ARCH	28-Jun-14	0:37	1	U	776	4,805	1.03
411	52029	-	N	ARCH	28-Jun-14	0:42	1	U	764	4,440	1.00
412	52032	-	N	ARCH	28-Jun-14	0:47	1	U	706	3,350	0.95
413	52040	-	N	ARCH	28-Jun-14	0:50	1	U	699	3,670	1.07
414	52030	-	N	ARCH	28-Jun-14	0:56	1	U	785	5,595	1.16
415	52027	-	N	ARCH	28-Jun-14	0:59	1	U	780	4,555	0.96
416	52042	-	N	ARCH	28-Jun-14	1:00	1	U	817	5,835	1.07
417	52037	-	N	ARCH	28-Jun-14	1:02	1	U	796	5,295	1.05
418	-	-	N	ARCH	28-Jun-14	1:15	1	D	198	58	0.75
419	-	-	N	ARCH	28-Jun-14	1:16	1	D	200	71	0.89
420	-	-	N	ARCH	28-Jun-14	1:17	1	D	192	54	0.76
421	-	0953	N	ARCH	29-Jun-14	1:27	1	D	746	3,285	0.79
422	-	0954	N	ARCH	29-Jun-14	1:30	1	D	614	1,990	0.86
423	-	0955	N	ARCH	29-Jun-14	12:24	1	D	700	3,175	0.93
424	-	0956	N	ARCH	29-Jun-14	12:28	1	D	670	2,975	0.99
425	-	0957	N	ARCH	29-Jun-14	12:31	1	D	670	2,570	0.85
426	-	0958	N	ARCH	29-Jun-14	12:34	1	D	700	2,850	0.83
427	-	-	N	ARCH	29-Jun-14	12:38	1	D	204	67	0.79
428	-	0959	N	ARCH	29-Jun-14	20:45	1	D	786	3,120	0.64
429	-	0960	N	ARCH	29-Jun-14	20:48	1	D	695	2,725	0.81
430	-	0961	N	ARCH	29-Jun-14	20:51	1	D	713	2,970	0.82
431	-	0962	N	ARCH	29-Jun-14	20:54	1	D	691	2,315	0.70
432	-	0963	N	ARCH	29-Jun-14	20:57	1	D	692	2,925	0.88
433	-	0964	N	ARCH	29-Jun-14	21:00	1	D	728	3,230	0.84
434	-	0965	N	ARCH	29-Jun-14	21:03	1	D	715	3,125	0.85
435	-	0966	N	ARCH	29-Jun-14	21:06	1	D	655	2,245	0.80



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
436	-	-	N	ARCH	29-Jun-14	21:09	1	D	217	81	0.79
437	-	0967	N	ARCH	29-Jun-14	21:12	1	D	680	2,820	0.90
438	-	0968	N	ARCH	29-Jun-14	21:15	1	D	635	2,085	0.81
439	-	0969	N	ARCH	29-Jun-14	21:18	1	D	716	3,115	0.85
440	-	0970	N	ARCH	29-Jun-14	21:21	1	D	675	2,525	0.82
441	-	0971	N	ARCH	29-Jun-14	21:24	1	D	703	2,685	0.77
442	-	0972	N	ARCH	29-Jun-14	21:27	1	D	680	2,880	0.92
443	-	0973	N	ARCH	29-Jun-14	21:30	1	D	700	2,740	0.80
444	-	0974	N	ARCH	29-Jun-14	21:33	1	D	665	2,305	0.78
445	-	0975	N	ARCH	29-Jun-14	21:36	1	D	595	1,795	0.85
446	-	0976	N	ARCH	29-Jun-14	21:39	1	D	680	1,870	0.59
447	-	0977	N	ARCH	29-Jun-14	21:42	1	D	655	2,410	0.86
448	-	0978	N	ARCH	29-Jun-14	21:45	1	D	664	2,850	0.97
449	-	-	N	ARCH	29-Jun-14	21:48	1	D	212	81	0.85
450	-	0979	N	ARCH	29-Jun-14	21:51	1	D	680	2,735	0.87
451	-	0980	N	ARCH	29-Jun-14	21:54	1	D	705	3,125	0.89
452	-	0981	N	ARCH	29-Jun-14	21:57	1	D	660	2,580	0.90
453	-	0982	N	ARCH	29-Jun-14	22:00	1	D	644	1,740	0.65
454	-	-	N	ARCH	29-Jun-14	22:03	1	D	186	46	0.71
455	-	-	N	ARCH	29-Jun-14	22:06	1	D	198	61	0.79
456	52041	-	N	ARCH	29-Jun-14	22:47	1	U	704	3,595	1.03
457	52047	-	N	ARCH	29-Jun-14	22:49	1	U	715	4,460	1.22
458	52035	-	N	ARCH	29-Jun-14	22:52	1	U	724	3,785	1.00
459	52026	-	N	ARCH	29-Jun-14	22:54	1	U	686	3,670	1.14
460	52028	-	N	ARCH	29-Jun-14	22:56	1	U	758	5,100	1.17
461	52013	-	N	ARCH	29-Jun-14	22:58	1	U	787	5,070	1.04
462	52021	-	N	ARCH	29-Jun-14	23:00	1	U	660	3,470	1.21
463	52045	-	N	ARCH	29-Jun-14	23:02	1	U	768	4,955	1.09
464	52063	-	N	ARCH	29-Jun-14	23:06	1	U	715	3,755	1.03
465	52068	-	N	ARCH	29-Jun-14	23:09	1	U	748	4,670	1.12
466	-	-	N	ARCH	29-Jun-14	23:11	1	U	785	4,070	0.84



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
467	52056	-	N	ARCH	29-Jun-14	23:13	1	U	674	4,050	1.32
468	52065	-	N	ARCH	29-Jun-14	23:16	1	U	785	5,235	1.08
469	52060	-	N	ARCH	29-Jun-14	23:18	1	U	684	3,250	1.02
470	52070	-	N	ARCH	29-Jun-14	23:21	1	U	704	4,085	1.17
471	52099	-	N	ARCH	30-Jun-14	12:42	1	U	826	6,395	1.13
472	52096	-	N	ARCH	30-Jun-14	12:45	1	U	744	4,090	0.99
473	52100	-	N	ARCH	30-Jun-14	12:47	1	U	644	3,060	1.15
474	52074	-	N	ARCH	30-Jun-14	12:49	1	U	816	6,250	1.15
475	52094	-	N	ARCH	30-Jun-14	12:51	1	U	768	5,665	1.25
476	52086	-	N	ARCH	30-Jun-14	12:55	1	U	721	4,485	1.20
477	52050	-	N	ARCH	30-Jun-14	12:57	1	U	794	4,960	0.99
478	52055	-	N	ARCH	30-Jun-14	12:59	1	U	682	3,550	1.12
479	52104	-	N	ARCH	30-Jun-14	13:01	1	U	727	3,615	0.94
480	52054	-	N	ARCH	30-Jun-14	13:03	1	U	769	5,760	1.27
481	52093	-	N	ARCH	30-Jun-14	13:06	1	U	732	4,990	1.27
482	52089	-	N	ARCH	30-Jun-14	13:09	1	U	843	7,110	1.19
483	52066	-	N	ARCH	30-Jun-14	13:10	1	U	650	3,075	1.12
484	52092	-	N	ARCH	30-Jun-14	13:14	1	U	767	4,640	1.03
485	52049	-	N	ARCH	30-Jun-14	13:17	1	U	686	3,595	1.11
486	52105	-	N	ARCH	30-Jun-14	13:19	1	U	666	3,340	1.13
487	52083	-	N	ARCH	30-Jun-14	13:22	1	U	813	6,550	1.22
488	52051	-	N	ARCH	30-Jun-14	13:24	1	U	784	5,440	1.13
489	52084	-	N	ARCH	30-Jun-14	13:26	1	U	664	3,235	1.11
490	52058	-	N	ARCH	30-Jun-14	13:28	1	U	765	4,420	0.99
491	52077	-	N	ARCH	30-Jun-14	13:31	1	U	726	4,480	1.17
492	52073	-	N	ARCH	30-Jun-14	13:34	1	U	694	4,305	1.29
493	52057	-	N	ARCH	30-Jun-14	13:36	1	U	736	4,250	1.07
494	52059	-	N	ARCH	30-Jun-14	13:39	1	U	701	3,810	1.11
495	52095	-	Y	ARCH	30-Jun-14	13:41	1	U	695	3,620	1.08
496	-	0983	N	ARCH	30-Jun-14	14:28	1	D	790	3,790	0.77
497	-	0984	N	ARCH	30-Jun-14	14:30	1	D	788	3,930	0.80



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
498	-	0985	N	ARCH	30-Jun-14	14:32	1	D	654	2,285	0.82
499	-	0986	N	ARCH	30-Jun-14	14:33	1	D	664	2,435	0.83
500	-	0987	N	ARCH	30-Jun-14	14:35	1	D	698	2,755	0.81
501	-	0988	N	ARCH	30-Jun-14	14:37	1	D	680	2,765	0.88
502	-	-	N	ARCH	30-Jun-14	14:38	1	D	217	85	0.83
503	-	-	N	ARCH	30-Jun-14	14:25	1	D	-	-	-
504	-	0989	N	ARCH	30-Jun-14	14:42	1	D	802	3,555	0.69
505	-	0991	N	ARCH	30-Jun-14	14:44	1	D	674	2,560	0.84
506	-	0992	N	ARCH	30-Jun-14	14:46	1	D	665	2,305	0.78
507	-	0993	N	ARCH	30-Jun-14	14:48	1	D	666	3,585	1.21
508	-	0994	N	ARCH	30-Jun-14	14:54	1	D	703	3,020	0.87
509	-	0995	N	ARCH	30-Jun-14	14:55	1	D	790	4,250	0.86
510	-	0996	N	ARCH	30-Jun-14	14:57	1	D	737	3,405	0.85
511	-	0997	N	ARCH	30-Jun-14	15:00	1	D	590	1,720	0.84
512	-	0998	N	ARCH	30-Jun-14	15:01	1	D	665	2,400	0.82
513	-	0999	N	ARCH	30-Jun-14	15:05	1	D	805	3,550	0.68
514	-	1000	N	ARCH	30-Jun-14	15:06	1	D	684	2,460	0.77
515	-	1001	N	ARCH	30-Jun-14	15:08	1	D	704	2,955	0.85
516	-	1002	N	ARCH	30-Jun-14	15:09	1	D	693	2,705	0.81
517	-	1003	N	ARCH	30-Jun-14	15:19	1	D	772	3,615	0.79
518	-	1004	N	ARCH	30-Jun-14	15:21	1	D	684	2,460	0.77
519	-	1005	N	ARCH	30-Jun-14	15:22	1	D	728	3,465	0.90
520	-	1006	N	ARCH	30-Jun-14	15:23	1	D	734	3,150	0.80
521	-	1007	N	ARCH	30-Jun-14	15:28	1	D	704	3,485	1.00
522	-	1008	N	ARCH	30-Jun-14	15:30	1	D	661	2,555	0.88
523	-	1009	N	ARCH	30-Jun-14	15:31	1	D	697	2,550	0.75
524	-	1010	N	ARCH	30-Jun-14	15:33	1	D	672	2,350	0.77
525	-	1011	N	ARCH	30-Jun-14	15:35	1	D	781	3,875	0.81
526	-	1012	N	ARCH	30-Jun-14	15:36	1	D	640	3,530	1.35
527	-	1013	N	ARCH	30-Jun-14	15:38	1	D	664	2,465	0.84
528	-	1014	N	ARCH	30-Jun-14	15:41	1	D	796	4,550	0.90



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
529	-	1015	N	ARCH	30-Jun-14	15:43	1	D	809	4,415	0.83
530	-	1016	N	ARCH	30-Jun-14	15:46	1	D	639	2,240	0.86
531	-	1017	N	ARCH	30-Jun-14	15:47	1	D	680	2,700	0.86
532	-	1018	N	ARCH	30-Jun-14	15:50	1	D	766	3,980	0.89
533	-	1019	N	ARCH	30-Jun-14	15:51	1	D	714	3,050	0.84
534	-	1020	N	ARCH	30-Jun-14	15:33	1	D	674	2,560	0.84
535	52102	-	N	ARCH	30-Jun-14	22:23	1	U	763	5,000	1.13
536	52069	-	N	ARCH	30-Jun-14	22:27	1	U	662	2,995	1.03
537	52091	-	N	ARCH	1-Jul-14	11:55	1	U	772	4,420	0.96
538	52080	-	N	ARCH	1-Jul-14	11:58	1	U	684	3,725	1.16
539	52053	-	N	ARCH	1-Jul-14	12:00	1	U	750	5,125	1.21
540	52072	-	N	ARCH	1-Jul-14	12:03	1	U	736	4,490	1.13
541	52081	-	N	ARCH	1-Jul-14	12:05	1	U	733	4,160	1.06
542	52062	-	N	ARCH	1-Jul-14	12:07	1	U	725	4,185	1.10
543	52076	-	N	ARCH	1-Jul-14	12:09	1	U	744	4,015	0.97
544	52048	-	N	ARCH	1-Jul-14	12:12	1	U	784	5,395	1.12
545	52097	-	N	ARCH	1-Jul-14	12:14	1	U	696	3,630	1.08
546	52064	-	N	ARCH	1-Jul-14	12:17	1	U	763	3,815	0.86
547	52085	-	N	ARCH	1-Jul-14	12:19	1	U	881	7,545	1.10
548	52075	-	N	ARCH	1-Jul-14	12:21	1	U	770	5,055	1.11
549	52071	-	N	ARCH	1-Jul-14	12:24	1	U	705	3,810	1.09
550	52101	-	N	ARCH	1-Jul-14	12:31	1	U	706	3,985	1.13
551	52103	-	N	ARCH	1-Jul-14	12:32	1	U	770	5,030	1.10
552	52078	-	N	ARCH	1-Jul-14	12:36	1	U	739	5,005	1.24
553	52067	-	N	ARCH	1-Jul-14	12:38	1	U	760	4,335	0.99
554	52061	-	N	ARCH	1-Jul-14	12:42	1	U	707	3,545	1.00
555	-	1022	N	ARCH	1-Jul-14	13:01	1	D	685	2,355	0.73
556	-	1023	N	ARCH	1-Jul-14	13:03	1	D	738	3,260	0.81
557	-	-	N	ARCH	1-Jul-14	13:04	1	D	213	91	0.94
558	-	-	N	ARCH	1-Jul-14	13:05	1	D	199	67	0.85
559	-	-	N	ARCH	1-Jul-14	13:06	1	D	193	70	0.97



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
560	-	-	N	ARCH	1-Jul-14	13:07	1	D	205	80	0.93
561	-	-	N	ARCH	1-Jul-14	13:07	1	D	196	60	0.80
562	-	-	N	ARCH	1-Jul-14	13:08	1	D	190	52	0.76
563	-	1024	N	ARCH	1-Jul-14	13:11	1	D	756	3,770	0.87
564	-	1025	N	ARCH	1-Jul-14	13:12	1	D	692	2,980	0.90
565	-	1026	N	ARCH	1-Jul-14	13:14	1	D	656	2,170	0.77
566	-	-	N	ARCH	1-Jul-14	13:16	1	D	-	-	-
567	-	-	N	ARCH	1-Jul-14	13:17	1	D	190	58	0.85
568	-	-	N	ARCH	1-Jul-14	13:18	1	D	202	74	0.90
569	-	1027	N	ARCH	1-Jul-14	13:19	1	D	638	2,075	0.80
570	-	1028	N	ARCH	1-Jul-14	13:27	1	D	693	2,890	0.87
571	-	1029	N	ARCH	1-Jul-14	13:29	1	D	681	2,665	0.84
572	-	1030	N	ARCH	1-Jul-14	13:30	1	D	664	2,205	0.75
573	-	-	N	ARCH	1-Jul-14	13:32	1	D	248	122	0.80
574	-	-	N	ARCH	1-Jul-14	20:25	1	D	177	46	0.83
575	-	-	N	ARCH	1-Jul-14	20:27	1	D	200	61	0.76
576	-	1031	N	ARCH	2-Jul-14	11:21	1	D	754	3,990	0.93
577	-	1032	N	ARCH	2-Jul-14	11:24	1	D	724	3,020	0.80
578	-	1033	N	ARCH	2-Jul-14	11:28	1	D	751	3,665	0.87
579	-	-	N	ARCH	2-Jul-14	11:30	1	D	180	43	0.74
580	-	-	N	ARCH	2-Jul-14	11:32	1	D	213	83	0.86
581	-	-	N	ARCH	2-Jul-14	11:32	1	D	187	51	0.78
582	-	1034	N	ARCH	2-Jul-14	11:36	1	D	769	3,605	0.79
583	-	1035	N	ARCH	2-Jul-14	11:40	1	D	684	2,455	0.77
584	-	1036	N	ARCH	2-Jul-14	11:43	1	D	673	2,365	0.78
585	-	-	N	ARCH	2-Jul-14	11:47	1	D	169	-	-
586	-	-	N	ARCH	2-Jul-14	11:48	1	D	216	76	0.75
587	52116	-	N	ARCH	2-Jul-14	12:40	1	U	659	3,230	1.13
588	52090	-	N	ARCH	2-Jul-14	12:42	1	U	743	4,165	1.02
589	52134	-	N	ARCH	2-Jul-14	12:46	1	U	743	4,750	1.16
590	52098	-	N	ARCH	2-Jul-14	12:48	1	U	668	3,085	1.03



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
591	52133	-	N	ARCH	2-Jul-14	12:49	1	U	822	5,980	1.08
592	52117	-	N	ARCH	2-Jul-14	12:54	1	U	794	5,870	1.17
593	52114	-	N	ARCH	2-Jul-14	12:56	1	U	751	4,920	1.16
594	52107	-	N	ARCH	2-Jul-14	12:58	1	U	674	3,355	1.10
595	52079	-	N	ARCH	2-Jul-14	13:00	1	U	765	4,520	1.01
596	52113	-	N	ARCH	2-Jul-14	13:02	1	U	794	5,115	1.02
597	52111	-	N	ARCH	2-Jul-14	13:05	1	U	702	3,335	0.96
598	52126	-	N	ARCH	2-Jul-14	13:07	1	U	711	3,930	1.09
599	52123	-	N	ARCH	2-Jul-14	13:11	1	U	698	3,630	1.07
600	52120	-	N	ARCH	2-Jul-14	13:12	1	U	702	3,985	1.15
601	52110	-	N	ARCH	2-Jul-14	13:13	1	U	689	3,590	1.10
602	52119	-	N	ARCH	2-Jul-14	13:17	1	U	675	3,315	1.08
603	52128	-	N	ARCH	2-Jul-14	13:19	1	U	728	3,625	0.94
604	52139	-	N	ARCH	2-Jul-14	13:21	1	U	704	3,645	1.04
605	52108	-	N	ARCH	2-Jul-14	13:23	1	U	698	3,585	1.05
606	52127	-	N	ARCH	2-Jul-14	13:26	1	U	655	2,725	0.97
607	52052	-	N	ARCH	2-Jul-14	13:28	1	U	-	4,310	-
608	52121	-	N	ARCH	2-Jul-14	13:32	1	U	632	2,860	1.13
609	52118	-	N	ARCH	2-Jul-14	13:34	1	U	763	4,525	1.02
610	52115	-	N	ARCH	2-Jul-14	13:37	1	U	697	3,670	1.08
611	52130	-	N	ARCH	2-Jul-14	13:39	1	U	723	4,495	1.19
612	52129	-	N	ARCH	2-Jul-14	13:41	1	U	645	2,905	1.08
613	52131	-	N	ARCH	2-Jul-14	13:43	1	U	652	3,115	1.12
614	52136	-	N	ARCH	2-Jul-14	14:01	1	U	735	4,050	1.02
615	52112	-	N	ARCH	2-Jul-14	23:05	1	U	706	3,670	1.04
616	52137	-	N	ARCH	2-Jul-14	23:08	1	U	664	3,125	1.07
617	52109	-	N	ARCH	2-Jul-14	23:20	1	U	666	3,090	1.05
618	-	1037	N	ARCH	2-Jul-14	23:39	1	D	676	2,740	0.89
619	-	1038	N	ARCH	2-Jul-14	23:41	1	D	701	2,800	0.81
620	-	-	N	ARCH	2-Jul-14	23:43	1	D	-	-	-
621	-	-	N	ARCH	2-Jul-14	23:45	1	D	211	78	0.83



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
622	-	-	N	ARCH	2-Jul-14	23:46	1	D	181	44	0.74
623	-	-	N	ARCH	2-Jul-14	23:47	1	D	186	50	0.78
624	-	-	N	ARCH	2-Jul-14	23:48	1	D	199	64	0.81
625	-	-	N	ARCH	2-Jul-14	23:48	1	D	168	42	0.89
626	-	-	N	ARCH	2-Jul-14	23:49	1	D	167	37	0.79
627	-	-	N	ARCH	2-Jul-14	23:49	1	D	197	60	0.78
628	-	1039	N	ARCH	2-Jul-14	23:52	1	D	697	2,415	0.71
629	-	1040	N	ARCH	2-Jul-14	23:54	1	D	685	2,600	0.81
630	-	1041	N	ARCH	2-Jul-14	23:56	1	D	660	2,210	0.77
631	-	-	N	ARCH	2-Jul-14	23:59	1	D	177	46	0.83
632	-	-	N	ARCH	2-Jul-14	23:59	1	D	197	57	0.75
633	-	-	N	ARCH	2-Jul-14	23:59	1	D	185	46	0.73
634	-	-	N	ARCH	3-Jul-14	0:00	1	D	168	37	0.78
635	-	-	N	ARCH	3-Jul-14	0:00	1	D	173	40	0.77
636	-	-	N	ARCH	3-Jul-14	0:01	1	D	223	97	0.87
637	-	-	N	ARCH	3-Jul-14	0:02	1	D	196	67	0.89
638	-	-	N	ARCH	3-Jul-14	0:02	1	D	226	94	0.81
639	-	-	N	ARCH	3-Jul-14	0:03	1	D	188	47	0.71
640	-	-	N	NNST	3-Jul-14	0:04	1	D	74		
641	-	1042	N	ARCH	3-Jul-14	11:36	1	D	685	2,640	0.82
642	-	1043	N	ARCH	3-Jul-14	11:38	1	D	664	2,315	0.79
643	-	-	N	ARCH	3-Jul-14	11:40	1	D	200	60	0.75
644	-	-	N	ARCH	3-Jul-14	11:40	1	D	170	37	0.75
645	-	1044	N	ARCH	3-Jul-14	11:44	1	D	664	2,395	0.82
646	-	-	N	ARCH	3-Jul-14	11:47	1	D	195	59	0.80
647	-	1045	N	ARCH	3-Jul-14	11:49	1	D	760	4,065	0.93
648	-	1046	N	ARCH	3-Jul-14	11:51	1	D	655	2,140	0.76
649	-	1047	N	ARCH	3-Jul-14	11:54	1	D	628	2,160	0.87
650	-	1048	N	ARCH	3-Jul-14	11:55	1	D	674	3,385	1.11
651	-	1049	N	ARCH	3-Jul-14	11:57	1	D	630	2,040	0.82
652	-	-	N	ARCH	3-Jul-14	11:58	1	D	305	243	0.86



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
653	52149	-	N	ARCH	3-Jul-14	12:49	1	U	665	3,065	1.04
654	52177	-	N	ARCH	3-Jul-14	12:51	1	U	685	3,485	1.08
655	52174	-	N	ARCH	3-Jul-14	12:53	1	U	641	2,990	1.14
656	52156	-	N	ARCH	3-Jul-14	12:56	1	U	779	4,410	0.93
657	52124	-	N	ARCH	3-Jul-14	12:58	1	U	732	3,650	0.93
658	-	-	N	ARCH	3-Jul-14	13:00	1	U	670	2,930	0.97
659	52167	-	N	ARCH	3-Jul-14	13:00	1	U	707	3,915	1.11
660	52157	-	N	ARCH	3-Jul-14	13:02	1	U	718	3,740	1.01
661	52160	-	N	ARCH	3-Jul-14	13:05	1	U	653	3,110	1.12
662	52169	-	N	ARCH	3-Jul-14	13:06	1	U	720	3,495	0.94
663	52159	-	N	ARCH	3-Jul-14	13:09	1	U	700	3,695	1.08
664	52145	-	N	ARCH	3-Jul-14	13:11	1	U	705	3,595	1.03
665	52138	-	N	ARCH	3-Jul-14	13:13	1	U	714	4,030	1.11
666	52106	-	N	ARCH	3-Jul-14	13:15	1	U	779	5,190	1.10
667	-	1050	N	ARCH	3-Jul-14	13:17	1	U	825	6,790	1.21
668	52143	-	N	ARCH	3-Jul-14	13:19	1	U	800	5,625	1.10
669	52168	-	N	ARCH	3-Jul-14	13:49	1	U	675	2,975	0.97
670	52162	-	N	ARCH	3-Jul-14	13:51	1	U	789	4,915	1.00
671	52173	-	N	ARCH	3-Jul-14	13:53	1	U	777	5,030	1.07
672	52122	-	N	ARCH	3-Jul-14	13:56	1	U	737	4,495	1.12
673	52164	-	N	ARCH	3-Jul-14	13:59	1	U	702	3,560	1.03
674	52180	-	N	ARCH	3-Jul-14	14:01	1	U	698	3,840	1.13
675	52142	-	N	ARCH	3-Jul-14	14:03	1	U	691	3,325	1.01
676	52176	-	N	ARCH	3-Jul-14	14:06	1	U	811	6,100	1.14
677	52154	-	N	ARCH	3-Jul-14	14:08	1	U	691	3,375	1.02
678	52125	-	N	ARCH	3-Jul-14	14:11	1	U	830	4,935	0.86
679	52140	-	N	ARCH	3-Jul-14	14:13	1	U	736	3,750	0.94
680	52148	-	N	ARCH	3-Jul-14	14:15	1	U	708	4,370	1.23
681	-	-	- ^(c)	ARCH	3-Jul-14	14:18	1	U	-	-	-
682	52132	-	N	ARCH	3-Jul-14	23:23	1	U	695	3,590	1.07



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
683	52147	-	N	ARCH	3-Jul-14	23:26	1	U	816	6,030	1.11
684	52152	-	N	ARCH	3-Jul-14	23:28	1	U	661	3,025	1.05
685	52151	-	N	ARCH	3-Jul-14	23:29	1	U	832	5,505	0.96
686	52135	-	N	ARCH	3-Jul-14	23:32	1	U	811	5,815	1.09
687	52144	-	N	ARCH	3-Jul-14	23:34	1	U	804	5,805	1.12
688	52170	-	N	ARCH	3-Jul-14	23:35	1	U	704	3,705	1.06
689	52163	-	N	ARCH	3-Jul-14	23:37	1	U	663	3,005	1.03
690	-	-	N	ARCH	3-Jul-14	23:53	1	D	223	87	0.78
691	-	1051	N	ARCH	3-Jul-14	23:55	1	D	699	2,790	0.82
692	-	1052	N	ARCH	3-Jul-14	23:57	1	D	665	2,380	0.81
693	-	1053	N	ARCH	3-Jul-14	23:58	1	D	718	3,040	0.82
694	-	1054	N	ARCH	3-Jul-14	23:59	1	D	713	3,075	0.85
695	52209	-	N	ARCH	4-Jul-14	12:38	1	U	708	3,715	1.05
696	52216	-	N	ARCH	4-Jul-14	12:40	1	U	643	2,640	0.99
697	52205	-	N	ARCH	4-Jul-14	12:42	1	U	725	5,215	1.37
698	52188	-	N	ARCH	4-Jul-14	12:44	1	U	696	3,525	1.05
699	-	1055	N	ARCH	4-Jul-14	12:46	1	U	827	6,590	1.17
700	52225	-	N	ARCH	4-Jul-14	12:47	1	U	750	4,575	1.08
701	52161	-	N	ARCH	4-Jul-14	12:50	1	U	707	3,840	1.09
702	52202	-	N	ARCH	4-Jul-14	12:52	1	U	654	3,075	1.10
703	52155	-	N	ARCH	4-Jul-14	12:53	1	U	719	4,260	1.15
704	52150	-	N	ARCH	4-Jul-14	12:55	1	U	755	4,540	1.05
705	52141	-	N	ARCH	4-Jul-14	12:56	1	U	752	3,740	0.88
706	52193	-	N	ARCH	4-Jul-14	12:58	1	U	682	3,500	1.10
707	52214	-	Y	ARCH	4-Jul-14	13:01	1	U	786	4,925	1.01
708	-	1056	N	ARCH	4-Jul-14	13:04	1	U	849	6,650	1.09
709	52186	-	N	ARCH	4-Jul-14	13:07	1	U	786	4,635	0.95
710	52208	-	N	ARCH	4-Jul-14	13:09	1	U	699	3,725	1.09
711	52172	-	N	ARCH	4-Jul-14	13:10	1	U	696	3,525	1.05
712	52217	-	N	ARCH	4-Jul-14	13:12	1	U	749	4,525	1.08
713	-	1057	N	ARCH	4-Jul-14	13:16	1	U	775	5,695	1.22



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
714	52184	-	N	ARCH	4-Jul-14	13:18	1	U	701	4,000	1.16
715	52165	-	N	ARCH	4-Jul-14	13:19	1	U	712	3,625	1.00
716	-	1058	N	ARCH	4-Jul-14	13:21	1	U	846	6,930	1.14
717	-	1060	N	ARCH	4-Jul-14	13:23	1	U	830	6,165	1.08
718	-	1061	N	ARCH	4-Jul-14	13:25	1	U	793	5,540	1.11
719	52207	-	N	ARCH	4-Jul-14	13:27	1	U	765	4,360	0.97
720	52182	-	N	ARCH	4-Jul-14	13:29	1	U	692	3,475	1.05
721	52210	-	N	ARCH	4-Jul-14	20:34	1	U	717	3,795	1.03
722	52204	-	N	ARCH	4-Jul-14	20:36	1	U	755	5,400	1.25
723	52201	-	N	ARCH	4-Jul-14	20:39	1	U	706	4,015	1.14
724	52197	-	N	ARCH	4-Jul-14	20:41	1	U	791	5,570	1.13
725	52222	-	N	ARCH	4-Jul-14	20:43	1	U	615	2,510	1.08
726	52221	-	N	ARCH	4-Jul-14	20:45	1	U	727	3,465	0.90
727	52206	-	N	ARCH	4-Jul-14	20:47	1	U	646	2,780	1.03
728	52224	-	N	ARCH	4-Jul-14	10:41	1	U	796	5,055	1.00
729	52183	-	N	ARCH	4-Jul-14	10:44	1	U	707	4,305	1.22
730	52195	-	N	ARCH	4-Jul-14	10:45	1	U	695	4,370	1.30
731	52192	-	N	ARCH	4-Jul-14	10:47	1	U	669	2,835	0.95
732	52203	-	N	ARCH	4-Jul-14	10:49	1	U	704	3,845	1.10
733	52226	-	N	ARCH	4-Jul-14	10:51	1	U	684	3,390	1.06
734	52200	-	N	ARCH	4-Jul-14	10:53	1	U	709	3,845	1.08
735	52185	-	N	ARCH	5-Jul-14	23:58	1	U	703	4,020	1.16
736	52218	-	N	ARCH	5-Jul-14	0:00	1	U	694	4,815	1.44
737	52146	-	N	ARCH	5-Jul-14	0:02	1	U	664	3,375	1.15
738	52219	-	N	ARCH	5-Jul-14	0:05	1	U	781	4,830	1.01
739	52220	-	N	ARCH	5-Jul-14	0:07	1	U	678	3,080	0.99
740	52198	-	N	ARCH	5-Jul-14	0:09	1	U	718	4,030	1.09
741	52178	-	N	ARCH	5-Jul-14	0:11	1	U	644	2,790	1.04
742	52191	-	N	ARCH	5-Jul-14	0:12	1	U	794	4,890	0.98
743	52175	-	N	ARCH	5-Jul-14	0:14	1	U	639	2,820	1.08
744	-	-	N	ARCH	5-Jul-14	0:32	1	D	178	44	0.78



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
745	-	-	N	ARCH	5-Jul-14	0:34	1	D	224	86	0.77
746	52223	-	N	ARCH	6-Jul-14	12:25	1	U	700	3,610	1.05
747	52187	-	N	ARCH	6-Jul-14	12:27	1	U	755	5,305	1.23
748	52199	-	N	ARCH	6-Jul-14	12:30	1	U	726	4,175	1.09
749	52211	-	N	ARCH	6-Jul-14	12:32	1	U	807	4,790	0.91
750	52153	-	N	ARCH	6-Jul-14	12:35	1	U	852	6,200	1.00
751	52189	-	N	ARCH	6-Jul-14	12:37	1	U	674	3,440	1.12
752	52166	-	N	ARCH	6-Jul-14	12:42	1	U	793	6,080	1.22
753	52196	-	N	ARCH	6-Jul-14	12:44	1	U	817	5,785	1.06
754	52213	-	N	ARCH	6-Jul-14	12:47	1	U	732	4,790	1.22
755	52181	-	N	ARCH	6-Jul-14	12:50	1	U	714	4,130	1.13
756	52171	-	N	ARCH	6-Jul-14	12:51	1	U	731	4,695	1.20
757	52215	-	N	ARCH	6-Jul-14	12:53	1	U	887	6,645	0.95
758	52194	-	N	ARCH	6-Jul-14	12:56	1	U	780	5,245	1.11
759	52190	-	N	ARCH	6-Jul-14	12:58	1	U	741	4,605	1.13
760	52288	-	N	ARCH	6-Jul-14	12:23	1	U	789	4,470	0.91
761	52258	-	N	ARCH	6-Jul-14	12:25	1	U	678	3,505	1.12
762	52243	-	N	ARCH	6-Jul-14	12:27	1	U	691	3,660	1.11
763	52277	-	N	ARCH	6-Jul-14	12:29	1	U	661	3,020	1.05
764	52233	-	N	ARCH	7-Jul-14	12:32	1	U	678	3,655	1.17
765	52250	-	N	ARCH	7-Jul-14	12:34	1	U	719	3,765	1.01
766	52229	-	N	ARCH	7-Jul-14	12:35	1	U	659	2,975	1.04
767	52289	-	N	ARCH	7-Jul-14	12:37	1	U	671	3,290	1.09
768	52290	-	N	ARCH	7-Jul-14	12:38	1	U	665	3,315	1.13
769	52232	-	N	ARCH	7-Jul-14	12:40	1	U	797	5,170	1.02
770	52254	-	N	ARCH	7-Jul-14	12:42	1	U	661	3,550	1.23
771	52249	-	N	ARCH	7-Jul-14	12:44	1	U	655	3,230	1.15
772	52283	-	N	ARCH	7-Jul-14	12:46	1	U	703	4,190	1.21
773	-	-	N	ARCH	7-Jul-14	12:59	1	D	218	92	0.89
774	-	-	N	ARCH	7-Jul-14	12:59	1	D	173	42	0.81
775	-	-	N	ARCH	7-Jul-14	21:39	1	D	215	78	0.78



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
776	-	-	N	ARCH	7-Jul-14	21:40	1	D	200	63	0.79
777	-	-	N	ARCH	7-Jul-14	21:40	1	D	205	71	0.82
778	-	-	N	ARCH	7-Jul-14	21:40	1	D	191	62	0.89
779	-	-	N	ARCH	7-Jul-14	21:41	1	D	211	77	0.82
780	-	-	N	ARCH	7-Jul-14	21:41	1	D	202	78	0.95
781	-	-	N	ARCH	7-Jul-14	21:42	1	D	169	51	1.06
782	-	-	N	ARCH	7-Jul-14	21:42	1	D	195	66	0.89
783	-	-	N	ARCH	7-Jul-14	21:42	1	D	183	50	0.82
784	-	-	N	ARCH	7-Jul-14	21:43	1	D	176	43	0.79
785	-	-	N	ARCH	7-Jul-14	21:44	1	D	184	52	0.83
786	-	-	N	ARCH	7-Jul-14	21:45	1	D	199	62	0.79
787	-	-	N	ARCH	7-Jul-14	21:45	1	D	200	61	0.76
788	-	-	N	ARCH	7-Jul-14	21:46	1	D	149	27	0.82
789	-	-	N	ARCH	7-Jul-14	21:46	1	D	145	25	0.82
790	-	-	N	ARCH	8-Jul-14	10:53	1	D	221	91	0.84
791	-	-	N	ARCH	8-Jul-14	10:53	1	D	190	64	0.93
792	-	-	N	ARCH	8-Jul-14	10:54	1	D	190	51	0.74
793	-	-	N	ARCH	8-Jul-14	10:55	1	D	206	67	0.77
794	52268	-	N	ARCH	8-Jul-14	11:22	1	U	714	4,010	1.10
795	52212	-	N	ARCH	8-Jul-14	11:23	1	U	665	3,235	1.10
796	52259	-	N	ARCH	8-Jul-14	11:25	1	U	684	3,560	1.11
797	52252	-	N	ARCH	8-Jul-14	11:27	1	U	704	3,820	1.09
798	52239	-	N	ARCH	8-Jul-14	11:28	1	U	683	3,660	1.15
799	52179	-	N	ARCH	8-Jul-14	11:29	1	U	612	2,255	0.98
800	52242	-	N	ARCH	8-Jul-14	11:31	1	U	705	3,590	1.02
801	52282	-	N	ARCH	8-Jul-14	11:32	1	U	646	2,985	1.11
802	52231	-	N	ARCH	8-Jul-14	11:33	1	U	782	4,690	0.98
803	52276	-	Y	ARCH	8-Jul-14	11:35	1	U	787	6,510	1.34
804	52262	-	N	ARCH	8-Jul-14	11:37	1	U	710	4,100	1.15
805	52280	-	N	ARCH	8-Jul-14	11:39	1	U	676	2,940	0.95
806	52237	-	N	ARCH	8-Jul-14	11:41	1	U	659	3,215	1.12



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
807	52260	-	N	ARCH	8-Jul-14	11:43	1	U	703	3,545	1.02
808	52272	-	N	ARCH	8-Jul-14	11:44	1	U	602	2,250	1.03
809	-	-	N	NNST	8-Jul-14	22:23	1	D	-	-	-
810	-	-	N	ARCH	8-Jul-14	22:34	1	D	-	-	-
811	-	-	N	ARCH	8-Jul-14	22:26	1	D	204	70	0.82
812	-	-	N	ARCH	8-Jul-14	22:27	1	D	204	71	0.84
813	-	-	N	ARCH	8-Jul-14	22:28	1	D	191	62	0.89
814	-	-	N	ARCH	8-Jul-14	22:29	1	D	163	40	0.92
815	-	-	N	ARCH	8-Jul-14	22:29	1	D	189	57	0.84
816	-	-	N	ARCH	8-Jul-14	22:30	1	D	230	89	0.73
817	-	-	N	ARCH	8-Jul-14	22:31	1	D	205	74	0.86
818	-	-	N	ARCH	8-Jul-14	22:31	1	D	216	96	0.95
819	-	-	N	ARCH	8-Jul-14	22:32	1	D	194	65	0.89
820	-	-	N	ARCH	8-Jul-14	22:32	1	D	195	66	0.89
821	-	-	N	ARCH	8-Jul-14	22:33	1	D	208	84	0.93
822	-	-	N	ARCH	8-Jul-14	22:33	1	D	193	61	0.85
823	-	-	N	ARCH	8-Jul-14	22:34	1	D	177	53	0.96
824	-	-	N	ARCH	8-Jul-14	22:34	1	D	205	71	0.82
825	-	-	N	ARCH	8-Jul-14	22:35	1	D	190	65	0.95
826	-	-	N	ARCH	8-Jul-14	22:35	1	D	187	54	0.83
827	-	-	N	ARCH	8-Jul-14	22:36	1	D	184	53	0.85
828	-	-	N	ARCH	8-Jul-14	22:37	1	D	165	41	0.91
829	-	-	N	ARCH	8-Jul-14	22:37	1	D	173	41	0.79
830	-	-	N	ARCH	8-Jul-14	22:38	1	D	201	64	0.79
831	-	-	N	ARCH	8-Jul-14	23:39	1	D	162	42	0.99
832	-	-	N	ARCH	8-Jul-14	23:39	1	D	186	60	0.93
833	-	-	N	ARCH	8-Jul-14	23:39	1	D	168	38	0.80
834	-	-	N	ARCH	8-Jul-14	23:40	1	D	194	55	0.75
835	-	-	N	ARCH	8-Jul-14	23:40	1	D	185	51	0.81
836	-	-	N	ARCH	8-Jul-14	23:41	1	D	193	60	0.83
837	52236	-	N	ARCH	8-Jul-14	23:53	1	U	719	4,440	1.19



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
838	52269	-	N	ARCH	8-Jul-14	23:55	1	U	727	4,290	1.12
839	52274	-	N	ARCH	8-Jul-14	23:57	1	U	679	3,745	1.20
840	52248	-	N	ARCH	9-Jul-14	11:04	1	U	708	3,700	1.04
841	52285	-	N	ARCH	9-Jul-14	11:06	1	U	739	4745	1.18
842	52275	-	N	ARCH	9-Jul-14	11:07	1	U	753	5,110	1.20
843	52253	-	N	ARCH	9-Jul-14	11:09	1	U	651	2,830	1.03
844	52287	-	N	ARCH	9-Jul-14	11:11	1	U	690	3,485	1.06
845	52238	-	N	ARCH	9-Jul-14	11:14	1	U	706	3,700	1.05
846	-	-	N	ARCH	9-Jul-14	11:20	1	D	189	60	0.89
847	-	-	N	ARCH	9-Jul-14	11:21	1	D	175	46	0.86
848	-	-	N	ARCH	9-Jul-14	11:21	1	D	187	47	0.72
849	-	-	N	ARCH	9-Jul-14	11:21	1	D	193	53	0.74
850	-	-	N	ARCH	9-Jul-14	11:22	1	D	204	64	0.75
851	-	-	N	ARCH	9-Jul-14	11:23	1	D	204	62	0.73
852	-	-	N	ARCH	9-Jul-14	11:24	1	D	186	53	0.82
853	-	-	N	ARCH	9-Jul-14	11:25	1	D	193	55	0.77
854	-	-	N	ARCH	9-Jul-14	11:26	1	D	217	82	0.80
855	-	-	N	ARCH	9-Jul-14	11:27	1	D	184	51	0.82
856	-	-	N	ARCH	9-Jul-14	11:28	1	D	195	62	0.84
857	-	-	N	ARCH	9-Jul-14	11:29	1	D	185	44	0.69
858	-	-	N	ARCH	9-Jul-14	11:29	1	D	194	57	0.78
859	-	-	N	ARCH	9-Jul-14	11:32	1	D	198	72	0.93
860	-	-	N	ARCH	9-Jul-14	11:32	1	D	212	81	0.85
861	-	-	N	ARCH	9-Jul-14	11:33	1	D	215	89	0.90
862	-	-	N	ARCH	9-Jul-14	11:33	1	D	195	60	0.81
863	-	-	N	ARCH	9-Jul-14	11:34	1	D	192	52	0.73
864	-	-	N	ARCH	9-Jul-14	11:34	1	D	214	71	0.72
865	-	-	N	ARCH	9-Jul-14	11:35	1	D	188	54	0.81
866	52294	-	N	ARCH	9-Jul-14	21:20	1	U	684	3,615	1.13
867	52261	-	N	ARCH	9-Jul-14	21:23	1	U	714	4,035	1.11
868	-	-	N	ARCH	9-Jul-14	21:37	1	D	-	-	-



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
869	-	-	N	ARCH	9-Jul-14	21:37	1	D	199	60	0.76
870	-	-	N	ARCH	9-Jul-14	21:37	1	D	185	51	0.81
871	-	-	N	ARCH	9-Jul-14	21:38	1	D	224	88	0.78
872	-	-	N	ARCH	9-Jul-14	21:38	1	D	177	49	0.88
873	-	-	N	ARCH	9-Jul-14	21:39	1	D	234	108	0.84
874	-	-	N	ARCH	9-Jul-14	21:39	1	D	197	71	0.93
875	-	-	N	ARCH	9-Jul-14	21:39	1	D	183	51	0.83
876	-	-	N	ARCH	9-Jul-14	21:40	1	D	188	54	0.81
877	-	-	N	ARCH	9-Jul-14	21:40	1	D	208	61	0.68
878	-	-	N	NNST	9-Jul-14	21:35	1	D	-	-	-
879	52270	-	N	ARCH	10-Jul-14	11:08	1	U	664	3,610	1.23
880	52247	-	N	ARCH	10-Jul-14	11:11	1	U	660	3,200	1.11
881	52291	-	N	ARCH	10-Jul-14	11:13	1	U	721	4,435	1.18
882	52299	-	N	ARCH	10-Jul-14	11:14	1	U	665	3,050	1.04
883	52281	-	N	ARCH	10-Jul-14	11:16	1	U	747	4,510	1.08
884	52297	-	N	ARCH	10-Jul-14	11:18	1	U	822	5,640	1.02
885	52284	-	N	ARCH	10-Jul-14	11:19	1	U	705	3,545	1.01
886	52228	-	N	ARCH	10-Jul-14	11:21	1	U	681	3,495	1.11
887	52278	-	N	ARCH	10-Jul-14	11:23	1	U	681	3,680	1.17
888	52279	-	N	ARCH	10-Jul-14	11:24	1	U	806	5,840	1.12
889	52265	-	N	ARCH	10-Jul-14	11:26	1	U	700	4,230	1.23
890	52241	-	N	ARCH	10-Jul-14	11:28	1	U	676	3,065	0.99
891	52266	-	N	ARCH	10-Jul-14	11:29	1	U	726	3,895	1.02
892	52246	-	N	ARCH	10-Jul-14	11:31	1	U	637	2,920	1.13
893	52286	-	N	ARCH	10-Jul-14	11:33	1	U	721	4,290	1.14
894	52264	-	N	ARCH	10-Jul-14	11:35	1	U	786	5,580	1.15
895	52240	-	N	ARCH	10-Jul-14	12:16	1	U	674	2,940	0.96
896	52251	-	N	ARCH	10-Jul-14	12:17	1	U	734	4,865	1.23
897	-	-	N	ARCH	10-Jul-14	11:44	1	D	204	64	0.75
898	-	-	N	ARCH	10-Jul-14	11:44	1	D	198	60	0.77
899	-	-	N	ARCH	10-Jul-14	11:45	1	D	185	49	0.77



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
900	-	-	N	ARCH	10-Jul-14	11:46	1	D	197	68	0.89
901	-	-	N	ARCH	10-Jul-14	11:46	1	D	197	58	0.76
902	-	-	N	ARCH	10-Jul-14	11:47	1	D	206	64	0.73
903	-	-	N	ARCH	10-Jul-14	11:48	1	D	212	62	0.65
904	-	-	N	ARCH	10-Jul-14	11:48	1	D	212	63	0.66
905	-	-	N	ARCH	10-Jul-14	11:49	1	D	169	32	0.66
906	-	-	N	ARCH	10-Jul-14	11:50	1	D	187	63	0.96
907	-	-	N	ARCH	10-Jul-14	11:51	1	D	195	42	0.57
908	-	-	N	ARCH	10-Jul-14	11:51	1	D	180	43	0.74
909	-	-	N	ARCH	10-Jul-14	11:52	1	D	169	43	0.89
910	-	-	N	ARCH	10-Jul-14	11:53	1	D	171	43	0.86
911	-	-	N	ARCH	10-Jul-14	11:54	1	D	208	78	0.87
912	-	-	N	ARCH	10-Jul-14	11:55	1	D	196	63	0.84
913	-	-	N	ARCH	10-Jul-14	11:55	1	D	193	66	0.92
914	-	-	N	ARCH	10-Jul-14	11:56	1	D	228	94	0.79
915	-	-	N	ARCH	10-Jul-14	11:56	1	D	178	47	0.83
916	-	-	N	ARCH	10-Jul-14	11:57	1	D	204	64	0.75
917	-	-	N	ARCH	10-Jul-14	13:00	1	D	204	60	0.71
918	-	-	N	ARCH	10-Jul-14	13:00	1	D	173	33	0.64
919	-	-	N	ARCH	10-Jul-14	22:30	1	D	248	115	0.75
920	-	-	N	ARCH	10-Jul-14	22:38	1	D	224	89	0.79
921	-	-	N	ARCH	10-Jul-14	22:38	1	D	222	86	0.79
922	-	-	N	ARCH	10-Jul-14	22:39	1	D	204	64	0.75
923	-	-	N	ARCH	10-Jul-14	22:40	1	D	202	61	0.74
924	-	-	N	ARCH	10-Jul-14	22:40	1	D	223	95	0.86
925	-	-	N	ARCH	10-Jul-14	22:41	1	D	207	71	0.80
926	-	-	N	ARCH	10-Jul-14	22:42	1	D	173	38	0.73
927	-	-	N	ARCH	10-Jul-14	22:42	1	D	219	84	0.80
928	-	-	N	ARCH	10-Jul-14	22:43	1	D	168	39	0.82
929	-	-	N	ARCH	10-Jul-14	22:43	1	D	200	60	0.75
930	-	-	N	ARCH	10-Jul-14	22:44	1	D	208	71	0.79



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
931	-	-	N	ARCH	10-Jul-14	22:45	1	D	176	42	0.77
932	-	-	N	ARCH	10-Jul-14	22:46	1	D	210	71	0.77
933	-	-	N	ARCH	10-Jul-14	22:46	1	D	195	51	0.69
934	-	-	N	ARCH	10-Jul-14	22:46	1	D	196	61	0.81
935	-	-	N	ARCH	10-Jul-14	22:47	1	D	211	58	0.62
936	-	-	N	ARCH	10-Jul-14	22:47	1	D	166	33	0.72
937	-	-	N	ARCH	10-Jul-14	22:47	1	D	179	47	0.82
938	-	-	N	ARCH	10-Jul-14	22:48	1	D	196	56	0.74
939	-	-	N	ARCH	10-Jul-14	22:48	1	D	193	60	0.83
940	-	-	N	ARCH	10-Jul-14	22:49	1	D	185	51	0.81
941	-	-	N	ARCH	10-Jul-14	22:49	1	D	180	42	0.72
942	-	-	N	ARCH	11-Jul-14	22:50	1	D	248	115	0.75
- (a)	-	-	N	ARCH	11-Jul-14	22:50	30	D	-	-	-
943	52234	-	N	ARCH	11-Jul-14	12:31	1	U	759	4,940	1.13
944	52244	-	N	ARCH	11-Jul-14	12:33	1	U	748	4,725	1.13
945	52273	-	N	ARCH	11-Jul-14	12:34	1	U	783	5,040	1.05
946	52257	-	N	ARCH	11-Jul-14	12:36	1	U	626	2,530	1.03
947	52235	-	N	ARCH	11-Jul-14	12:38	1	U	616	2,570	1.10
948	52263	-	N	ARCH	11-Jul-14	12:39	1	U	745	4,565	1.10
949	52230	-	N	ARCH	11-Jul-14	23:28	1	U	800	5,415	1.06
950	-	-	N	ARCH	11-Jul-14	23:41	1	D	182	51	0.85
951	-	-	N	ARCH	11-Jul-14	23:42	1	D	212	83	0.87
952	-	-	N	ARCH	11-Jul-14	23:42	1	D	176	46	0.84
953	-	-	N	ARCH	11-Jul-14	23:43	1	D	198	73	0.94
954	-	-	N	ARCH	11-Jul-14	23:44	1	D	174	43	0.82
955	-	-	N	ARCH	11-Jul-14	23:44	1	D	203	70	0.84
956	-	-	N	ARCH	11-Jul-14	23:45	1	D	170	39	0.79
957	-	-	N	ARCH	11-Jul-14	23:46	1	D	232	104	0.83
958	-	-	N	ARCH	11-Jul-14	23:46	1	D	176	42	0.77
959	-	-	N	ARCH	11-Jul-14	23:47	1	D	209	87	0.95



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
960	-	-	N	ARCH	11-Jul-14	23:48	1	D	173	52	1.00
961	-	-	N	ARCH	11-Jul-14	23:48	1	D	236	112	0.85
962	-	-	N	ARCH	11-Jul-14	23:49	1	D	195	66	0.89
963	-	-	N	ARCH	11-Jul-14	23:50	1	D	165	33	0.73
964	-	-	N	ARCH	11-Jul-14	23:51	1	D	188	50	0.75
965	-	-	N	ARCH	11-Jul-14	23:52	1	D	224	91	0.81
966	-	-	N	ARCH	11-Jul-14	23:52	1	D	186	52	0.81
967	-	-	N	ARCH	11-Jul-14	23:53	1	D	187	54	0.83
968	-	-	N	ARCH	11-Jul-14	23:53	1	D	169	40	0.83
969	-	-	N	ARCH	11-Jul-14	23:54	1	D	176	50	0.92
970	-	-	N	ARCH	11-Jul-14	23:54	1	D	179	47	0.82
- (a)	-	-	N	ARCH	11-Jul-14	23:54	54	D	-	-	-
971	52296	-	N	ARCH	12-Jul-14	12:42	1	U	747	4,390	1.05
972	52298	-	N	ARCH	12-Jul-14	12:44	1	U	754	4,845	1.13
973	52255	-	N	ARCH	12-Jul-14	12:46	1	U	711	3,515	0.98
974	-	-	N	ARCH	12-Jul-14	13:05	1	D	198	59	0.76
975	-	-	N	ARCH	12-Jul-14	13:05	1	D	182	41	0.68
976	-	-	N	ARCH	12-Jul-14	13:06	1	D	196	52	0.69
977	-	-	N	ARCH	12-Jul-14	13:07	1	D	185	50	0.79
978	-	-	N	ARCH	12-Jul-14	13:07	1	D	184	48	0.77
979	-	-	N	ARCH	12-Jul-14	13:08	1	D	191	60	0.86
980	-	-	N	ARCH	12-Jul-14	13:08	1	D	185	61	0.96
981	-	-	N	ARCH	12-Jul-14	13:09	1	D	197	56	0.73
982	-	-	N	ARCH	12-Jul-14	13:10	1	D	189	44	0.65
983	-	-	N	ARCH	12-Jul-14	13:12	1	D	193	60	0.83
984	-	-	N	ARCH	12-Jul-14	13:13	1	D	196	57	0.76
985	-	-	N	ARCH	12-Jul-14	13:14	1	D	208	65	0.72
986	-	-	N	ARCH	12-Jul-14	13:14	1	D	172	42	0.83
987	-	-	N	ARCH	12-Jul-14	13:14	1	D	213	77	0.80
988	-	-	N	ARCH	12-Jul-14	13:15	1	D	165	37	0.82



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
989	-	-	N	ARCH	12-Jul-14	13:16	1	D	212	81	0.85
990	-	-	N	ARCH	12-Jul-14	13:17	1	D	168	35	0.74
991	-	-	N	ARCH	12-Jul-14	13:18	1	D	198	61	0.79
992	-	-	N	ARCH	12-Jul-14	13:19	1	D	199	60	0.76
993	-	-	N	ARCH	12-Jul-14	13:20	1	D	192	49	0.69
994	-	-	N	ARCH	12-Jul-14	13:20	1	D	172	40	0.79
995	-	-	N	ARCH	12-Jul-14	13:21	1	D	188	53	0.80
996	-	-	N	ARCH	12-Jul-14	13:22	1	D	173	40	0.77
997	-	-	N	ARCH	12-Jul-14	13:22	1	D	185	48	0.76
- (a)	-	-	N	ARCH	12-Jul-14	13:25	20	D	-	-	-
998	52256	-	N	ARCH	12-Jul-14	22:05	1	U	659	3,020	1.06
999	52254	-	N	ARCH	12-Jul-14	22:06	1	U	769	5,820	1.28
1000	52271	-	N	ARCH	12-Jul-14	22:08	1	U	759	5,100	1.17
1001	52293	-	N	ARCH	12-Jul-14	22:10	1	U	742	4,670	1.14
1002	52295	-	N	ARCH	12-Jul-14	22:11	1	U	721	3,760	1.00
1003	52267	-	N	ARCH	12-Jul-14	22:13	1	U	687	3,420	1.05
1004	52292	-	N	ARCH	12-Jul-14	22:14	1	U	711	3,935	1.09
1005	52309	-	N	ARCH	12-Jul-14	22:16	1	U	652	3,240	1.17
- (a)	-	-	N	ARCH	12-Jul-14	22:00	10	D	-	-	-
1006	-	-	N	ARCH	12-Jul-14	22:35	1	D	206	71	0.81
1007	-	-	N	ARCH	12-Jul-14	22:36	1	D	208	77	0.86
1008	-	-	N	ARCH	12-Jul-14	22:36	1	D	181	42	0.71
1009	-	-	N	ARCH	12-Jul-14	22:37	1	D	188	58	0.87
1010	-	-	N	ARCH	12-Jul-14	22:37	1	D	183	50	0.82
1011	-	-	N	ARCH	12-Jul-14	22:38	1	D	235	106	0.82
1012	-	-	N	ARCH	12-Jul-14	22:38	1	D	153	30	0.84
1013	-	-	N	ARCH	12-Jul-14	22:40	1	D	225	72	0.63
1014	-	-	N	ARCH	12-Jul-14	22:40	1	D	206	65	0.74
1015	-	-	N	ARCH	12-Jul-14	22:41	1	D	208	67	0.74
1016	52312	-	N	ARCH	13-Jul-14	11:43	1	U	793	5,925	1.19



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
1017	-	-	N	ARCH	13-Jul-14	12:10	1	D	175	40	0.75
1018	-	-	N	ARCH	13-Jul-14	12:10	1	D	208	75	0.83
1019	-	-	N	ARCH	13-Jul-14	12:11	1	D	192	57	0.81
1020	-	-	N	ARCH	13-Jul-14	12:12	1	D	158	33	0.84
1021	-	-	N	ARCH	13-Jul-14	12:14	1	D	163	31	0.72
1022	52311	-	N	ARCH	13-Jul-14	23:33	1	U	754	4,025	0.94
1023	52304	-	N	ARCH	13-Jul-14	23:35	1	U	721	4,625	1.23
1024	52321	-	N	ARCH	13-Jul-14	23:37	1	U	798	5,470	1.08
1025	52315	-	N	ARCH	13-Jul-14	23:40	1	U	706	3,840	1.09
1026	52323	-	N	ARCH	13-Jul-14	23:41	1	U	753	4,795	1.12
1027	52324	-	N	ARCH	13-Jul-14	23:43	1	U	817	5,860	1.07
1028	52301	-	N	ARCH	13-Jul-14	23:45	1	U	699	3,290	0.96
1029	-	-	N	ARCH	13-Jul-14	23:54	1	D	207	73	0.82
1030	-	-	N	ARCH	13-Jul-14	23:54	1	D	198	68	0.88
1031	-	-	N	ARCH	13-Jul-14	23:55	1	D	186	53	0.82
1032	-	-	N	ARCH	13-Jul-14	23:55	1	D	177	50	0.90
1033	-	-	N	ARCH	13-Jul-14	23:56	1	D	210	78	0.84
1034	-	-	N	ARCH	13-Jul-14	23:57	1	D	178	50	0.89
1035	-	-	N	ARCH	13-Jul-14	23:57	1	D	200	63	0.79
1036	-	-	N	ARCH	13-Jul-14	23:58	1	D	234	96	0.75
1037	-	-	N	ARCH	13-Jul-14	23:58	1	D	203	63	0.75
1038	-	-	N	ARCH	13-Jul-14	23:58	1	D	214	86	0.88
1039	-	-	N	ARCH	13-Jul-14	23:59	1	D	198	57	0.73
1040	-	-	N	ARCH	13-Jul-14	23:59	1	D	172	40	0.79
1041	-	-	N	ARCH	14-Jul-14	0:01	1	D	194	68	0.93
1042	-	-	N	ARCH	14-Jul-14	0:02	1	D	176	43	0.79
1043	-	-	N	ARCH	14-Jul-14	0:03	1	D	204	65	0.77
1044	-	-	N	ARCH	14-Jul-14	0:03	1	D	177	43	0.78
1045	-	-	N	ARCH	14-Jul-14	0:04	1	D	218	81	0.78
1046	-	-	N	ARCH	14-Jul-14	0:04	1	D	181	44	0.74
1047	-	-	N	ARCH	14-Jul-14	0:05	1	D	177	47	0.85



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
1048	-	-	N	ARCH	14-Jul-14	0:30	1	D	203	68	0.81
1049	-	-	N	ARCH	14-Jul-14	0:31	1	D	207	73	0.82
1050	-	-	N	ARCH	14-Jul-14	11:36	1	D	186	51	0.79
1051	-	-	N	ARCH	14-Jul-14	11:37	1	D	149	29	0.88
1052	-	-	N	ARCH	14-Jul-14	11:38	1	D	209	75	0.82
1053	-	-	N	ARCH	14-Jul-14	11:39	1	D	216	78	0.77
1054	-	-	N	ARCH	14-Jul-14	11:39	1	D	177	34	0.61
1055	-	-	N	ARCH	14-Jul-14	11:40	1	D	186	49	0.76
1056	-	-	N	ARCH	14-Jul-14	11:40	1	D	173	39	0.75
1057	-	-	N	ARCH	14-Jul-14	11:40	1	D	172	45	0.88
1058	-	-	N	ARCH	15-Jul-14	0:20	1	D	181	44	0.74
1059	-	-	N	ARCH	15-Jul-14	0:20	1	D	204	63	0.74
1060	-	-	N	ARCH	15-Jul-14	0:21	1	D	186	51	0.79
1061	-	-	N	ARCH	15-Jul-14	0:23	1	D	176	50	0.92
1062	-	-	N	ARCH	15-Jul-14	0:24	1	D	202	71	0.86
1063	-	-	N	ARCH	15-Jul-14	0:24	1	D	261	140	0.79
1064	-	-	N	ARCH	15-Jul-14	0:24	1	D	214	78	0.80
1065	-	-	N	ARCH	15-Jul-14	0:25	1	D	183	55	0.90
1066	-	-	N	ARCH	15-Jul-14	0:25	1	D	193	56	0.78
1067	-	-	N	ARCH	15-Jul-14	0:25	1	D	206	67	0.77
1068	-	-	N	ARCH	15-Jul-14	0:26	1	D	210	81	0.87
1069	-	-	N	ARCH	15-Jul-14	0:26	1	D	210	76	0.82
1070	-	-	N	ARCH	15-Jul-14	0:27	1	D	191	58	0.83
1071	-	-	N	ARCH	15-Jul-14	0:27	1	D	152	32	0.91
1072	-	-	N	ARCH	15-Jul-14	0:28	1	D	175	42	0.78
1073	-	-	N	ARCH	15-Jul-14	0:28	1	D	230	96	0.79
1074	-	-	N	ARCH	15-Jul-14	0:29	1	D	184	47	0.75
1075	-	-	N	ARCH	15-Jul-14	0:30	1	D	171	40	0.80
1076	-	-	N	ARCH	15-Jul-14	0:30	1	D	194	66	0.90
1077	-	-	N	ARCH	15-Jul-14	0:31	1	D	205	67	0.78



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
- (a)	-	-	N	ARCH	15-Jul-14	0:32	23	D	-	-	-
1078	52318	-	N	ARCH	15-Jul-14	12:05	1	U	776	4,910	1.05
1079	52303	-	N	ARCH	15-Jul-14	12:08	1	U	728	4,475	1.16
1080	52300	-	N	ARCH	15-Jul-14	12:10	1	U	690	3,715	1.13
1081	52317	-	N	ARCH	15-Jul-14	12:11	1	U	737	4,030	1.01
1082	-	-	N	ARCH	15-Jul-14	12:24	1	D	173	49	0.95
1083	-	-	N	ARCH	15-Jul-14	12:24	1	D	154	36	0.99
1084	-	-	N	ARCH	15-Jul-14	12:25	1	D	226	100	0.87
1085	-	-	N	ARCH	15-Jul-14	12:25	1	D	206	63	0.72
1086	-	-	N	ARCH	15-Jul-14	12:26	1	D	207	67	0.76
1087	-	-	N	ARCH	15-Jul-14	12:27	1	D	189	56	0.83
1088	-	-	N	ARCH	15-Jul-14	12:28	1	D	201	75	0.92
1089	-	-	N	ARCH	15-Jul-14	12:28	1	D	177	42	0.76
1090	-	-	N	ARCH	15-Jul-14	12:29	1	D	184	64	1.03
1091	-	-	N	ARCH	15-Jul-14	12:29	1	D	203	74	0.88
1092	-	-	N	ARCH	15-Jul-14	12:36	1	D	153	-	-
1093	-	-	N	ARCH	15-Jul-14	12:36	1	D	203	-	-
1094	-	-	N	ARCH	15-Jul-14	12:37	1	D	151	-	-
1095	-	-	N	ARCH	15-Jul-14	12:37	1	D	151	-	-
1096	-	-	N	ARCH	15-Jul-14	12:38	1	D	169	-	-
1097	-	-	N	ARCH	15-Jul-14	12:38	1	D	182	-	-
1098	-	-	N	ARCH	15-Jul-14	12:39	1	D	175	-	-
1099	-	-	N	ARCH	15-Jul-14	12:39	1	D	155	-	-
1100	-	-	N	ARCH	15-Jul-14	12:40	1	D	195	-	-
1101	-	-	N	ARCH	15-Jul-14	12:40	1	D	161	-	-
1102	-	-	N	ARCH	15-Jul-14	17:22	1	D	181	47	0.79
1103	-	-	N	ARCH	15-Jul-14	17:30	1	D	251	115	0.73
1104	-	-	N	ARCH	15-Jul-14	17:45	1	D	188	47	0.71
1105	52308	-	N	ARCH	15-Jul-14	21:20	1	U	702	3,915	1.13
1106	-	-	N	ARCH	15-Jul-14	21:32	1	D	154	25	0.68



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
1107	-	-	N	ARCH	15-Jul-14	21:32	1	D	167	41	0.88
1108	-	-	N	ARCH	15-Jul-14	21:32	1	D	177	46	0.83
1109	-	-	N	ARCH	15-Jul-14	21:33	1	D	175	40	0.75
1110	-	-	N	ARCH	15-Jul-14	21:33	1	D	188	52	0.78
1111	-	-	N	ARCH	15-Jul-14	21:34	1	D	198	65	0.84
1112	-	-	N	ARCH	15-Jul-14	21:35	1	D	176	49	0.90
- (a)	-	-	N	ARCH	15-Jul-14	22:00	21	D	-	-	-
1113	52319	-	N	ARCH	16-Jul-14	10:48	1	U	715	4,075	1.11
1114	52302	-	N	ARCH	16-Jul-14	10:49	1	U	722	4,270	1.13
1115	52325	-	N	ARCH	16-Jul-14	10:51	1	U	644	2,965	1.11
1116	52305	-	N	ARCH	16-Jul-14	10:43	1	U	742	4,370	1.07
1117	52313	-	N	ARCH	16-Jul-14	10:54	1	U	718	3,880	1.05
1118	52322	-	N	ARCH	16-Jul-14	10:55	1	U	790	5,840	1.18
1119	52316	-	N	ARCH	16-Jul-14	10:57	1	U	794	5,570	1.11
1120	52306	-	N	ARCH	16-Jul-14	10:59	1	U	796	5,370	1.06
1121	52310	-	N	ARCH	16-Jul-14	11:01	1	U	704	4,300	1.23
1122	-	-	N	ARCH	16-Jul-14	15:30	1	D	197	56	0.73
1123	-	-	N	ARCH	13-Jul-14	15:30	1	D	201	64	0.79
1124	-	-	N	ARCH	14-Jul-14	15:30	1	D	181	47	0.79
1125	-	-	N	ARCH	15-Jul-14	15:30	1	D	186	44	0.68
1126	-	-	N	ARCH	16-Jul-14	15:30	1	D	166	38	0.83
1127	52307	-	N	ARCH	17-Jul-14	0:14	1	U	710	4,485	1.25
1128	-	1062	N	ARCH	17-Jul-14	0:24	1	D	700	2,605	0.76
1129	-	-	N	ARCH	17-Jul-14	0:28	1	D	189	59	0.87
1130	-	-	N	ARCH	17-Jul-14	0:29	1	D	184	53	0.85
1131	-	-	N	ARCH	17-Jul-14	0:30	1	D	175	45	0.84
1132	-	-	N	ARCH	17-Jul-14	0:30	1	D	215	83	0.84
1133	-	-	N	ARCH	17-Jul-14	0:30	1	D	174	43	0.82
1134	-	-	N	ARCH	17-Jul-14	0:31	1	D	201	62	0.76
1135	-	-	N	ARCH	17-Jul-14	0:33	1	D	165	37	0.82



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
1136	-	-	N	ARCH	17-Jul-14	0:34	1	D	203	71	0.85
1137	-	-	N	ARCH	17-Jul-14	0:35	1	D	190	52	0.76
1138	-	-	N	ARCH	17-Jul-14	0:35	1	D	204	73	0.86
1139	-	-	N	ARCH	17-Jul-14	0:37	1	D	189	-	-
1140	-	-	N	ARCH	17-Jul-14	0:37	1	D	204	-	-
1141	-	-	N	ARCH	17-Jul-14	0:38	1	D	192	-	-
1142	-	-	N	ARCH	17-Jul-14	0:38	1	D	186	-	-
1143	-	-	N	ARCH	17-Jul-14	0:38	1	D	171	-	-
1144	-	-	N	ARCH	17-Jul-14	0:39	1	D	165	-	-
1145	-	-	N	ARCH	17-Jul-14	0:39	1	D	183	-	-
1146	-	-	N	ARCH	17-Jul-14	0:39	1	D	194	-	-
1147	-	-	N	ARCH	17-Jul-14	0:39	1	D	204	-	-
1148	-	-	N	ARCH	17-Jul-14	0:40	1	D	205	-	-
1149	-	-	N	ARCH	17-Jul-14	0:40	1	D	203	-	-
1150	-	-	N	ARCH	17-Jul-14	0:40	1	D	209	-	-
- (a)	-	-	N	ARCH	17-Jul-14	0:41	12	D	-	-	-
1151	-	-	N	ARCH	17-Jul-14	10:11	1	U	779	5,620	-
1152	-	-	N	ARCH	17-Jul-14	10:13	1	U	668	3,140	-
1153	-	-	N	ARCH	17-Jul-14	10:14	1	U	831	5,340	-
1154	-	-	N	ARCH	17-Jul-14	10:16	1	U	672	3,430	-
1155	-	-	N	ARCH	17-Jul-14	10:30	1	D	171	-	-
1156	-	-	N	ARCH	17-Jul-14	10:30	1	D	175	-	-
1157	-	-	N	ARCH	17-Jul-14	10:31	1	D	185	-	-
1158	-	-	N	ARCH	17-Jul-14	10:31	1	D	222	-	-
1159	-	-	N	ARCH	17-Jul-14	10:31	1	D	178	-	-
1160	-	-	N	ARCH	17-Jul-14	10:31	1	D	173	-	-



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D1: Fish Catch Data for Two-Way Fyke Net on Lower Nulahugyuk Creek, June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	Floy Tag#	Recap	Species	Date Captured	Time Captured	Number of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
1161	-	-	N	ARCH	17-Jul-14	10:31	1	D	207	-	-
1162	-	-	N	ARCH	17-Jul-14	10:32	1	D	157	-	-
1163	-	-	N	ARCH	17-Jul-14	10:32	1	D	174	-	-
1164	-	-	N	ARCH	17-Jul-14	10:32	1	D	176	-	-
1165	-	-	N	ARCH	17-Jul-14	10:32	1	D	172	-	-

Note:

Table excludes efforts or net hauls where no fish were captured.

- (a) No fish ID number was assigned to fish that were enumerated only (not weighed or measured for length). The number of fish are indicated in the "Number of Fish" column.
- (b) All PIT tag identification numbers began with the same 7 digits (2280001), not displayed in this table.
- (c) Fish escaped or was not examined for re-capture.

ID = identification; # = number; PIT tag = Passive Integrated Transponder tag; - = no data; Recap. = Has this individual been captured before?; N = No; Y = Yes, these individuals were captured prior to 2014 (evidence of previous fin clip or FLOY tag).; ARCH = Arctic Char; D = downstream; U = upstream; mm = millimetres; g = grams; k = condition factor ($k = [\text{weight}/\text{length}^3] \times 100000$).



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D2: Summary of Recaptured Fish - June 16 to July 17, 2014

Fish ID#	PIT Tag# ^(b)	FLOY Tag#	Species	Recapture Date	Recapture Time	Initial Catch Date	Fish Direction
62	-	0013	ARCH	21-Jun	18:24	20-Jun	D
89	-	0040	ARCH	22-Jun	21:44	20-Jun	D
165	-	0247	ARCH	22-Jun	17:15	22-Jun	-
69	-	0020	ARCH	22-Jun	17:30	20-Jun	D
63	-	0014	ARCH	23-Jun	20:14	20-Jun	D
61	-	0012	ARCH	23-Jun	20:09	20-Jun	D
89	-	0040	ARCH	23-Jun	20:28	20-Jun	D
53	-	0004	ARCH	23-Jun	20:28	20-Jun	D
64	-	0015	ARCH	24-Jun	11:13	20-Jun	D
83	-	0034	ARCH	24-Jun	11:32	20-Jun	D
79	-	0030	ARCH	24-Jun	11:32	20-Jun	D
24	-	0075	ARCH	24-Jun	12:01	18-Jun	D
50	-	0001	ARCH	24-Jun	22:49	20-Jun	D
47	-	0098	ARCH	24-Jun	23:03	20-Jun	D
74	-	0025	ARCH	24-Jun	23:07	20-Jun	D
255	-	0487	ARCH	24-Jun	23:40	24-Jun	U
267	-	0499	ARCH	25-Jun	23:50	24-Jun	U
N/A ^(a)	-	-	ARCH	25-Jun	13:20	-	U
87	-	0038	ARCH	25-Jun	13:21	20-Jun	D
137	-	0220	ARCH	25-Jun	13:28	21-Jun	D
280	-	0512	ARCH	25-Jun	14:19	24-Jun	U
74	-	0025	ARCH	25-Jun	14:19	20-Jun	U
297	-	0528	ARCH	25-Jun	14:19	24-Jun	U
270	-	0502	ARCH	25-Jun	14:19	24-Jun	U
292	-	0523	ARCH	25-Jun	14:19	24-Jun	U
281	-	0513	ARCH	25-Jun	14:19	24-Jun	U
267	-	0499	ARCH	25-Jun	14:19	24-Jun	U



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D2: Summary of Recaptured Fish - June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	FLOY Tag#	Species	Recapture Date	Recapture Time	Initial Catch Date	Fish Direction
291	-	0522	ARCH	25-Jun	14:19	24-Jun	U
284	-	0516	ARCH	25-Jun	14:19	24-Jun	U
231	-	0463	ARCH	25-Jun	14:19	24-Jun	U
133	-	0216	ARCH	25-Jun	22:37	21-Jun	D
59	-	0010	ARCH	25-Jun	22:45	20-Jun	D
61	-	0012	ARCH	25-Jun	23:06	20-Jun	D
313	-	0543	ARCH	25-Jun	23:34	25-Jun	U
307	-	0537	ARCH	25-Jun	23:34	25-Jun	U
310	-	0540	ARCH	25-Jun	23:34	25-Jun	U
344	-	0872	ARCH	26-Jun	10:25	25-Jun	U
342	-	0870	ARCH	26-Jun	10:25	25-Jun	U
343	-	0871	ARCH	26-Jun	10:26	25-Jun	U
74	-	0025	ARCH	26-Jun	10:26	20-Jun	U
334	-	0862	ARCH	26-Jun	10:26	25-Jun	U
335	-	0863	ARCH	26-Jun	10:26	25-Jun	U
341	-	0869	ARCH	26-Jun	10:26	25-Jun	U
339	-	0867	ARCH	26-Jun	10:26	25-Jun	U
71	-	0022	ARCH	26-Jun	20:29	20-Jun	D
344	-	0872	ARCH	26-Jun	21:04	25-Jun	D
379	52016	-	ARCH	27-Jun	10:45	26-Jun	D
71	-	0022	ARCH	27-Jun	11:00	20-Jun	U
366	-	0892	ARCH	27-Jun	11:01	26-Jun	U
418	-	0956	ARCH	29-Jun	12:48	29-Jun	U
418	-	0956	ARCH	29-Jun	15:05	29-Jun	U
429	-	0966	ARCH	30-Jun	12:15	29-Jun	U
131	-	0214	ARCH	30-Jun	15:04	21-Jun	D
471	52050	-	ARCH	30-Jun	21:35	30-Jun	D



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D2: Summary of Recaptured Fish - June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	FLOY Tag#	Species	Recapture Date	Recapture Time	Initial Catch Date	Fish Direction
503	-	0995	ARCH	30-Jun	22:00	30-Jun	U
524	-	1016	ARCH	30-Jun	22:05	30-Jun	U
525	-	1017	ARCH	30-Jun	22:10	30-Jun	U
N/A ^(a)	-	1021 (new)	ARCH	30-Jun	22:13	N/A	U
525	-	1017	ARCH	1-Jul	11:30	30-Jun	U
504	-	996	ARCH	1-Jul	11:30	30-Jun	U
470	52086	-	ARCH	1-Jul	13:21	30-Jun	D
68	-	0019	ARCH	1-Jul	13:25	20-Jun	D
549	-	1022	ARCH	1-Jul	20:30	1-Jul	U
541	52085	-	ARCH	2-Jul	17:00	1-Jul	D
578	-	1036	ARCH	2-Jul	23:15	2-Jul	U
601	52052	-	ARCH	3-Jul	11:42	2-Jul	D
600	52127	-	ARCH	3-Jul	11:45	2-Jul	D
578	-	1036	ARCH	3-Jul	12:21	2-Jul	U
596	52119	-	ARCH	3-Jul	12:47	2-Jul	U
643	-	1047	ARCH	3-Jul	23:12	3-Jul	U
643	-	1047	ARCH	4-Jul	12:10	3-Jul	-
684	-	1051	ARCH	4-Jul	12:20	3-Jul	-
596	52119	-	ARCH	4-Jul	13:39	3-Jul	D
643	-	1047	ARCH	4-Jul	20:20	2-Jul	U
726	52226	-	ARCH	5-Jul	0:28	3-Jul	D
653	52157	-	ARCH	5-Jul	0:30	4-Jul	D
723	52195	-	ARCH	7-Jul	12:57	3-Jul	D
658	52138	-	ARCH	7-Jul	13:07	4-Jul	D
723	52195	-	ARCH	8-Jul	10:47	3-Jul	D
641	-	1045	ARCH	8-Jul	11:20	4-Jul	D
644	-	1048	ARCH	10-Jul	10:54	3-Jul	U



APPENDIX D

Fish Catch Data for the Two-Way Fyke Net

Table D2: Summary of Recaptured Fish - June 16 to July 17, 2014 (continued)

Fish ID#	PIT Tag# ^(b)	FLOY Tag#	Species	Recapture Date	Recapture Time	Initial Catch Date	Fish Direction
800	52260	-	ARCH	11-Jul	23:41	8-Jul	D
934	52244	-	ARCH	11-Jul	23:44	11-Jul	D
879	52228	-	ARCH	12-Jul	13:00	10-Jul	D
789	52259	-	ARCH	12-Jul	22:34	8-Jul	D
934	52244	-	ARCH	14-Jul	0:14	11-Jul	D
889	52251	-	ARCH	14-Jul	0:16	10-Jul	D
789	52259	-	ARCH	15-Jul	12:42	8-Jul	D
641	-	1045	ARCH	16-Jul	10:40	3-Jul	U
797	52262	-	ARCH	16-Jul	11:05	8-Jul	D
934	52244	-	ARCH	17-Jul	0:04	11-Jul	D
1067	52303	-	ARCH	17-Jul	0:20	15-Jul	D

Note:

^(a) Fish was recognized as 2014 re-capture but individual identification was not possible because of missing floy tag or escaped fish.

^(b) = All PIT tag identification numbers began with the same 7 digits (2280001), not displayed in this table.

ID = identification; # = number; PIT tag = Passive Integrated Transponder tag; - = no data; N/A = not applicable; ARCH = Arctic Char; D = downstream; U = upstream.



APPENDIX E

Fish Catch Data for Hingittok Lake, July 8 to 14, 2014



APPENDIX E

Fish Catch Data for Hingittok Lake, 2014

Table E1: Index Gill Net Locations in Hingittok Lake, July 8 to 13, 2014

Set Number	Set Date	Set Time	Lift Time	Soak Time (hours)	Start Location (UTM)	
					Easting	Northing
1	8-Jul-14	16:11	18:10	1.98	585437	7624686
2	8-Jul-14	16:48	17:50	1.03	585129	7624734
3	8-Jul-14	18:10	20:10	2.00	585437	7624686
4	8-Jul-14	17:50	18:45	0.92	585129	7624734
5	8-Jul-14	18:50	19:50	1.00	585437	7624686
1	11-Jul-14	15:10	17:10	2.00	584803	7624182
2	11-Jul-14	15:19	17:30	2.18	585397	7624469
3	11-Jul-14	15:25	17:35	2.17	585357	7624720
4	11-Jul-14	16:02	18:20	2.30	584470	7624630
5	11-Jul-14	17:10	19:05	1.92	584803	7624182
6	11-Jul-14	17:30	19:30	2.00	585397	7624469
7	11-Jul-14	17:35	19:35	2.00	585357	7624720
8	11-Jul-14	18:20	20:20	2.00	584470	7624630
9	11-Jul-14	19:05	21:05	2.00	584803	7624182
1	13-Jul-14	14:07	17:10	3.05	583801	7624457
2	13-Jul-14	14:15	17:41	3.43	583676	7624653
3	13-Jul-14	14:25	17:52	3.45	584374	7624134
4	13-Jul-14	14:30	18:10	3.67	584133	7624101
5	13-Jul-14	17:22	20:40	3.30	583807	7624493
6	13-Jul-14	18:06	20:50	2.73	583663	7624663
7	13-Jul-14	20:40	21:15	0.58	584384	7624155
8	13-Jul-14	20:48	21:45	0.95	584134	7624125
1	14-Jul-14	13:45	17:00	3.25	584847	7624654
2	14-Jul-14	13:50	17:15	3.42	585063	7624866
3	14-Jul-14	14:30	18:00	3.50	585096	7624149
4	14-Jul-14	14:35	17:25	2.83	584998	7624407
5	14-Jul-14	17:00	19:10	2.17	584847	7624654
6	14-Jul-14	17:15	18:55	1.67	585063	7624866
7	14-Jul-14	17:25	18:45	1.33	584998	7624407

Note:

UTM = Universal Transverse Mercator



APPENDIX E

Fish Catch Data for Hingittok Lake, 2014

Table E2: Fish Catch Data for Hingittok Lake, July 8 to July 14, 2014

Fish ID#	Method	Run/Set #	Date	Set Time	Pull Time	Mesh Size	Species	Length (mm)	Weight (g)	Condition Factor (k)	PIT tag# ^(a)	Recap
1	AN	N/A	11-Jul	16:15	N/A	N/A	LKTR	563	1,970	1.10	-	N
2	AN	N/A	11-Jul	16:39	N/A	N/A	LKTR	767	5,155	1.14	-	N
3	GN	1	14-Jul	13:45	17:00	L	LKTR	203	91.3	1.09	-	N
4	GN	1	14-Jul	13:45	17:00	L	LKTR	502	1,200	0.95	-	N
5	GN	1	14-Jul	13:45	17:00	L	LKTR	519	1,700	1.22	-	N
6	GN	1	14-Jul	13:45	17:00	L	LKTR	540	1,700	1.08	-	N
7	GN	4	14-Jul	14:35	17:25	S	CISC	112	12.8	0.91	-	N
8	GN	4	14-Jul	14:35	17:25	S	CISC	133	24	1.02	-	N
9	GN	4	14-Jul	14:35	17:25	S	CISC	128	19.8	0.94	-	N
10	GN	4	14-Jul	14:35	17:25	S	CISC	123	18.2	0.98	-	N
11	GN	3	14-Jul	14:30	18:00	L	LKTR	521	1,900	1.34	-	N
12	GN	3	14-Jul	14:30	18:00	L	LKTR	94	-	-	-	N
13	GN	4	8-Jul	17:50	18:45	L	LKTR	283	245	1.08	-	N
14	GN	4	8-Jul	17:50	18:45	L	LKTR	464	1,165	1.17	-	N
15	GN	1	11-Jul	15:10	17:10	L	ARCH	610	1,695	0.75	-	N
16	GN	1	11-Jul	15:10	17:10	L	ARCH	675	2,895	0.94	-	N
17	GN	2	11-Jul	15:19	17:30	S	LKTR	320	350	1.07	-	N
18	GN	2	11-Jul	15:19	17:30	S	CISC	92	-	-	-	N
19	GN	2	11-Jul	15:19	17:30	S	CISC	115	-	-	-	N
20	GN	2	11-Jul	15:19	17:30	S	CISC	108	-	-	-	N
21	GN	4	11-Jul	16:02	18:20	L	LKTR	565	2,205	1.22	-	N
22	GN	5	11-Jul	17:10	19:05	L	ARCH	690	2,430	0.74	-	N
23	GN	5	11-Jul	17:10	19:05	L	ARCH	721	2,980	0.80	-	N
24	GN	5	11-Jul	17:10	19:05	L	LKTR	539	1,945	1.24	-	N
25	GN	5	11-Jul	17:10	19:05	L	LKTR	540	1,915	1.22	-	N
26	GN	6	11-Jul	17:30	19:30	S	LKTR	488	1,600	1.38	-	N
27	GN	8	11-Jul	18:20	20:20	S	LKTR	523	1,730	1.21	-	N
28	GN	9	11-Jul	19:05	21:05	S	ARCH	-	5,025	-	52037	Y
29	GN	9	11-Jul	19:05	21:05	S	ARCH	660	2,560	0.89	-	N
30	GN	9	11-Jul	19:05	21:05	S	LKTR	539	1,880	1.20	-	N
31	GN	1	13-Jul	14:07	17:10	S	LKTR	63	1.9	0.76	-	N
32	GN	1	13-Jul	14:07	17:10	S	NNST	59	1.6	0.78	-	N



APPENDIX E

Fish Catch Data for Hingittok Lake, 2014

Table E2: Fish Catch Data for Hingittok Lake, July 8 to July 14, 2014 (continued)

Fish ID#	Method	Run/Set #	Date	Set Time	Pull Time	Mesh Size	Species	Length (mm)	Weight (g)	Condition Factor (k)	PIT tag ^{u(a)}	Recap
33	GN	2	13-Jul	14:15	17:41	L	ARCH	-	-	-	52034	Y
34	GN	2	13-Jul	14:15	17:41	L	LKTR	680	2,995	0.95	-	N
35	GN	2	13-Jul	14:15	17:41	L	LKTR	265	175	0.94	-	N
36	GN	2	13-Jul	14:15	17:41	L	LKTR	601	2,560	1.18	-	N
37	GN	2	13-Jul	14:15	17:41	L	LKTR	620	2,350	0.99	-	N
38	GN	2	13-Jul	14:15	17:41	L	LKTR	241	140	1.00	-	N
39	GN	4	13-Jul	14:30	18:10	L	LKTR	252	1,925	12.03	-	N
40	GN	4	13-Jul	14:30	18:10	L	LKTR	615	2,780	1.20	-	N
41	GN	4	13-Jul	14:30	18:10	L	LKTR	514	1,915	1.41	-	N
42	GN	4	13-Jul	14:30	18:10	L	LKTR	542	2,095	1.32	-	N
43	GN	3	13-Jul	14:25	17:52	S	ARCH	67	2.7	0.90	-	N
44	GN	3	13-Jul	14:25	17:52	S	ARCH	58	2	1.03	-	N
45	GN	3	13-Jul	14:25	17:52	S	ARCH	73	2.8	0.72	-	N
46	AN	N/A	13-Jul	14:25	17:52	N/A	LKTR	499	-	-	-	N
47	AN	N/A	13-Jul	14:25	17:52	N/A	LKTR	-	-	-	-	N
48	AN	N/A	13-Jul	14:25	17:52	N/A	LKTR	-	-	-	-	N
49	GN	6	13-Jul	18:06	20:50	S	LKTR	532	2,015	1.34	-	N
50	GN	6	13-Jul	18:06	20:50	S	LKTR	140	21.7	0.79	-	N
51	GN	5	13-Jul	17:22	20:40	S	-	-	-	-	-	N
52	GN	7	13-Jul	20:40	21:15	L	LKTR	664	2,945	1.01	-	N
53	GN	7	13-Jul	20:40	21:15	L	LKTR	694	3,390	1.01	-	N
54	GN	7	13-Jul	20:40	21:15	L	LKTR	286	275	1.18	-	N
55	GN	7	13-Jul	20:40	21:15	L	LKTR	274	220	1.07	-	N
56	GN	7	13-Jul	20:40	21:15	L	LKTR	347	420	1.01	-	N
57	GN	7	13-Jul	20:40	21:15	L	LKTR	296	290	1.12	-	N
58	GN	7	13-Jul	20:40	21:15	L	LKTR	309	300	1.02	-	N
59	GN	7	13-Jul	20:40	21:15	L	LKTR	679	2,965	0.95	-	N
60	GN	8	13-Jul	20:48	21:45	L	LKTR	698	3,800	1.12	-	N



APPENDIX E

Fish Catch Data for Hingittok Lake, 2014

Table E2: Fish Catch Data for Hingittok Lake, July 8 to July 14, 2014 (continued)

Fish ID#	Method	Run/Set #	Date	Set Time	Pull Time	Mesh Size	Species	Length (mm)	Weight (g)	Condition Factor (k)	PIT tag# ^(a)	Recap
61	AN	N/A	13-Jul	15:15	N/A	N/A	LKTR	695	-	-	-	N
62	AN	N/A	13-Jul	15:30	N/A	N/A	LKTR	546	-	-	-	N
63	AN	N/A	13-Jul	15:40	N/A	N/A	LKTR	510	-	-	-	-

Note:

Table excludes efforts or net hauls where no fish were captured.

No fish with floy tags were captured in Hingittok Lake, data not shown.

^(a) All PIT tag identification numbers began with the same 7 digits (2280001), not displayed in this table.

ID = identification; # = number; AN = angling; GN = gill net; N/A = not applicable; L = large mesh; S= small mesh; LKTR = Lake Trout; CISC = Cisco; ARCH = Arctic Char; NNST = Ninespine Stickleback; mm = millimetre; g = gram; - = no data; PIT tag = Passive Integrated Transponder tag; Recap. = Has this individual been captured before?; N = No; Y = Yes, these individuals were captured prior to 2014 (evidence of previous fin clip or FLOY tag).



APPENDIX E

Fish Catch Data for Hingittok Lake, 2014

Table E3: Catch Per Unit Effort (CPUE) for Gill Net Effort in Hingittok Lake, July 8 to July 14, 2014

Set Number	Set Date/Time		Lift Date / Time		Soak Time (h)	Number of Fish Captured					Net type	Total CPUE (fish/net unit)
						LKTR	ARCH	CISC	NNST	Total	-	
1	8-Jul-14	16:11	8-Jul-14	18:10	1.98	-	-	-	-	0	S	0.00
2	8-Jul-14	16:48	8-Jul-14	17:50	1.03	-	-	-	-	0	L	0.00
3	8-Jul-14	18:10	8-Jul-14	20:10	2.00	-	-	-	-	0	S	0.00
4	8-Jul-14	17:50	8-Jul-14	18:45	0.92	2	-	-	-	2	L	2.44
5	8-Jul-14	18:50	8-Jul-14	19:50	1.00	-	-	-	-	0	L	0.00
1	11-Jul-14	15:10	11-Jul-14	17:10	2.00	-	2	-	-	2	L	1.12
2	11-Jul-14	15:19	11-Jul-14	17:30	2.18	1	-	3	-	4	S	4.07
3	11-Jul-14	15:25	11-Jul-14	17:35	2.17	-	-	-	-	0	S	0.00
4	11-Jul-14	16:02	11-Jul-14	18:20	2.30	1	-	-	-	1	L	0.49
5	11-Jul-14	17:10	11-Jul-14	19:05	1.92	2	2	-	-	4	L	2.34
6	11-Jul-14	17:30	11-Jul-14	19:30	2.00	1	-	-	-	1	S	1.11
7	11-Jul-14	17:35	11-Jul-14	19:35	2.00	-	-	-	-	0	S	0.00
8	11-Jul-14	18:20	11-Jul-14	20:20	2.00	1	-	-	-	1	S	1.11
9	11-Jul-14	19:05	11-Jul-14	21:05	2.00	1	2	-	-	3	S	3.33
1	13-Jul-14	14:07	13-Jul-14	17:10	3.05	1	-	-	1	1	S	0.73
2	13-Jul-14	14:15	13-Jul-14	17:41	3.43	5	1	-	-	6	L	1.96
3	13-Jul-14	14:25	13-Jul-14	17:52	3.45	-	3	-	-	3	S	1.93
4	13-Jul-14	14:30	13-Jul-14	18:10	3.67	4	-	-	-	4	L	1.22
5	13-Jul-14	17:22	13-Jul-14	20:40	3.30	-	-	-	-	0	S	0.00
6	13-Jul-14	18:06	13-Jul-14	20:50	2.73	2	-	-	-	2	S	1.63
7	13-Jul-14	20:40	13-Jul-14	21:15	0.58	8	-	-	-	8	L	15.36
8	13-Jul-14	20:48	13-Jul-14	21:45	0.95	1	-	-	-	1	L	1.18
1	14-Jul-14	13:45	14-Jul-14	17:00	3.25	4	-	-	-	4	L	1.38
2	14-Jul-14	13:50	14-Jul-14	17:15	3.42	-	-	-	-	0	S	0.00
3	14-Jul-14	14:30	14-Jul-14	18:00	3.50	2	-	-	-	2	L	0.64
4	14-Jul-14	14:35	14-Jul-14	17:25	2.83	-	-	4	-	4	S	3.14
5	14-Jul-14	17:00	14-Jul-14	19:10	2.17	-	-	-	-	0	L	0.00
6	14-Jul-14	17:15	14-Jul-14	18:55	1.67	-	-	-	-	0	S	0.00
7	14-Jul-14	17:25	14-Jul-14	18:45	1.33	-	-	-	-	0	S	0.00

Note:

h = hour; - = no data; LKTR = Lake Trout; ARCH = Arctic Char; CISC = Cisco; NNST = Ninespine Stickleback; S= small mesh; L = large mesh; CPUE = catch per unit effort.



APPENDIX F

Summary of Fate of PIT Tagged Arctic Char on Nulahugyuk Creek



APPENDIX F

Summary of Fate of PIT Tagged Arctic Char in Nulahugyuk Creek

Table F1: Location and Supporting Information for Arctic Char Mortalities Observed on Nulahugyuk Creek Between June 25 and July 17, 2014

Fish ID	PIT tag ^(a)	Discovery Date	Upstream Distance (km)	UTM (11W)		Mortality Cause	Length (mm)	Weight (g)	Condition Factor	Sex
				Easting	Northing					
487	52083	1-Jul	1.70	591264	7626896	Natural	813	6,550	1.219	M
480	52054	2-Jul	2.76	590546	7626273	Natural	769	5,760	1.267	M
547	52085	2-Jul	1.98	590962	7626806	Natural	881	7,545	1.103	M
476	52086	12-Jul	0.40	590551	7627716	Euthanized	721	4,485	1.197	F
886	52228	15-Jul	0.40	590551	7627716	Euthanized	684	3,300	1.031	F
665	52138	15-Jul	0.40	590551	7627716	Euthanized	686	3,630	1.124	F
709	52186	5-Jul	1.39	591210	7627156	Natural	786	4,635	0.955	M
552	52078	5-Jul	2.37	590824	7626432	Natural	739	5,005	1.240	-
728	52224	6-Jul	1.78	591198	7626846	Natural	796	5,055	1.002	M
593	52114	10-Jul	4.59	590338	7625500	Natural	751	4,920	1.162	-
884	52297	15-Jul	0.33	590620	7627738	Natural	822	5,640	1.015	-
1118	52322	17-Jul	1.91	591078	7626793	Natural	-	-	-	-

Note:

^(a) All PIT tag identification numbers began with the same 7 digits (2280001), not displayed in this table.

Condition Factor = $(\text{weight}/\text{length}^3) \times 100000$.

ID = identification; PIT tag = Passive Integrated Transponder tag; Jul = July; km = kilometre; UTM = Universal Transverse Mercator; mm = millimetres; g = grams; M = male; F = female; - = no data.



APPENDIX G

Potential Habitat Enhancement Project Locations

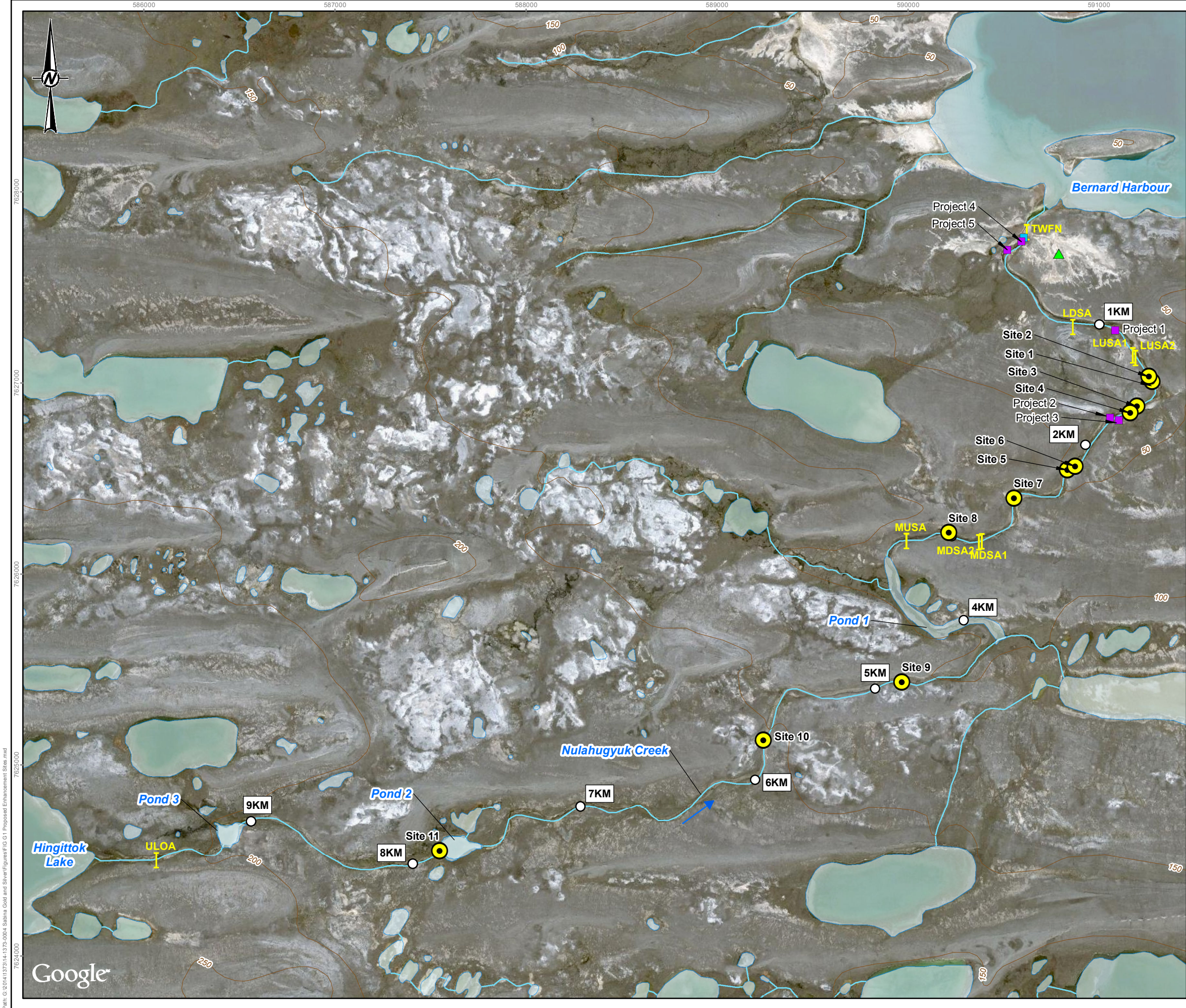


1.0 INTRODUCTION

A reconnaissance survey of Hingittok Creek was completed on July 16, 2014 to identify problem locations (those with the potential to negatively affect the upstream migration of Arctic Char) where stream enhancement activities may be beneficial to char migration. Effects may range from a failed attempt to access the spawning lake, and physiological stress or mortality from exposure due to stranding, all of which may lead to reductions in fish production. Eleven problem sites or sections of the creek were identified and rated as being either high, medium or low priority for future enhancement efforts (using the low-flow channel method). Ratings were based on a qualitative assessment of habitat conditions observed in 2012 (Golder 2013) and 2014. A follow-up survey of habitat conditions will be completed prior to constructing the low-flow channels, at which time the list of priority enhancement sites will be finalized.

High priority sections are those where fish stranding and partial barriers to movement may be common during average-to below average conditions through most of the upstream migration period. High priority areas are characterized by dispersed flows and boulder fields that impede upstream movements and may directly expose fish to terrestrial predators, such as gulls, because of the relatively low water levels in the sections. High-priority sections are also characterized by significant barriers to movement during average to below-average flow conditions during the later stages of migration. Medium-priority sections may be difficult for fish to pass during peak periods of migration under below average flow conditions and may also present a high potential for stranding and partial blockage of movements during the later stages of migration when water levels decline. Low priority sections are likely passable through most of the upstream migration period during average flow conditions, but likely present the potential for stranding and stressful conditions during below-average flow conditions and towards the later stages of migration as water levels decline in summer.

The eleven proposed enhancement sites are described in the tables below (Tables G1 to G11; Figure G1). At least four medium-to-high priority sites were identified within a sharp bend in the lower section of the creek, starting 1.3 kilometres (km) from the mouth of Nulahugyuk Creek and for an upstream distance of approximately 400 m. Many strandings and mortalities were observed along this section during 2012 and 2014. Most of the identified problem or pinch point locations (i.e., proposed enhancement sites) are within the lower 3 km of the creek, which is consistent with previous habitat assessments of the creek (Golder 2007). Surveys for mortalities were typically limited to the lower 3 km of Nulahugyuk Creek.



LEGEND

- ELEVATION CONTOUR
- WATERCOURSE
- WATERBODY
- CAMP
- CHANNEL MANIPULATION PROJECT 2012
- FYKE NET
- KILOMETRE MARKER
- PROPOSED ENHANCEMENT SITE
- PIT TAG ARRAY

LDSA - LOWER DOWNSTREAM ARRAY
MUSA - MIDDLE UPSTREAM ARRAY
ULOA - UPPER LAKE OUTLET ARRAY
LUSA1 - LOWER UPSTREAM ARRAY 1
LUSA2 - LOWER UPSTREAM ARRAY 2
MDSA1 - MIDDLE DOWNSTREAM ARRAY 1
MDSA2 - MIDDLE DOWNSTREAM ARRAY 2
TWFN - TWO WAY FYKE NET (ARRAY)

KEY MAP

NOTES

1. THE LOW-FLOW CHANNELS (CHANNEL MANIPULATION PROJECTS) WERE CONSTRUCTED IN 2012 (GOLDER 2013)

REFERENCE

GOOGLE EARTH IMAGERY: © 2014 DIGITAL GLOBE
CANVEC BASE DATA: © DEPARTMENT OF NATURAL RESOURCES CANADA, 2012. ALL RIGHTS RESERVED.
NAD 83 UTM ZONE 11N

CLIENT

SABINA GOLD & SILVER CORP.

PROJECT

BERNARD HARBOUR PROJECT

TITLE

LOCATIONS OF PROPOSED ENHANCEMENT SITES ON NULAHUGYUK CREEK

CONSULTANT	YYYY-MM-DD	2015-01-26
	PREPARED	LMR
	DESIGN	KD
	REVIEW	JPO
	APPROVED	CES

PROJECT No.
14-1373-0004

PHASE
2200

Rev.
F

FIGURE
G1



APPENDIX G

Proposed Enhancement Sites 2014

Table G1: Proposed Enhancement Site – Low-Flow Channel Site 1

Priority for Enhancement	High	Notes: - Proposed low-flow channels for Site 1, 2 and 3 are within a sharp bend in the creek where flows are dispersed. - Recommended that the HTO connects the thalwegs where broken, and blocks shallow sections that trap fish during upstream movements. - Recommended that is blocked to channel fish up the centre or LDB (otherwise fish strand further upstream near at the bend in the river). - Two, parallel low-flow channels may be required. - Level of effort for this site may be similar to, or require more effort than Project 5 in 2012. - Three mortalities observed between Site 1 and 2 in 2014.
Fish Stranding Observed?	Yes for 2012 and 2014	
Approximate Minimum Length	30 m plus long weir	
Approximate Distance From Mouth	1.3 km	
Easting	591279	
Northing	7627006	



Photo 1a: Looking towards the RDB at potential Site 1.



Photo 1b: Looking downstream towards potential Site 1 along the RDB where the weir should be placed.

Note:

m = metres; km = kilometres; HTO = Kugluktuk Hunters and Trappers Organization ; LDB = left downstream bank; RDB = right downstream bank.



APPENDIX G

Proposed Enhancement Sites 2014

Table G2: Proposed Enhancement Site - Low-Flow Channel Site 2

Priority	Medium	Notes: ■ This site is downstream of Site 1 and is similar in habitat conditions to Site 1. ■ A follow-up investigation is needed to determine if both Site 1 and Site 2 should be enhanced or if Site 1 is sufficient for improving passage at the location. ■ Recommended that the HTO connects the thalwegs where broken, and blocks shallow sections that trap fish during upstream movements. ■ This site may require two parallel low-flow channels. ■ The level of effort for this location may be similar to Project 1 from 2012. ■ Three mortalities observed between Site 1 and 2 in 2014.
Fish Stranding Observed?	Yes to 2012 and 2014	
Approximate Minimum Length	20 m	
Approximate Distance From Mouth	1.3 km	
Easting	591263	
Northing	7627032	



Photo 2a: Looking upstream towards potential Site 2 (photo taken from RDB).



Photo 2b: Looking upstream towards potential Site 2 showing opening on LDB where fish should be directed.

Note:

m = metres; km = kilometres; HTO = Kugluktuk Hunters and Trappers Organization ; RDB = right downstream bank; LDB = left downstream bank.



APPENDIX G

Proposed Enhancement Sites 2014

Table G3: Proposed Enhancement Site - Low-Flow Channel Site 3

Priority	Low To Medium	Notes: ■ Located upstream of Site 1. ■ Recommended that the HTO construct a long weir or multiple shorter weirs to direct fish to upstream pools and thalwegs on the LDB (below existing Projects 2 and 3 that were constructed in 2012). ■ A low-channel may be required (in addition to the weir) for a distance of about 30 m to facilitate passage along the LDB.
Fish Stranding Observed?	Yes for 2012 and 2014	
Approximate Minimum Length	30 m plus long weir	
Approximate Distance From Mouth	1.5 km	
Easting	591200	
Northing	7626876	



Photo 3a: Looking upstream towards potential Site 3 on the RDB



Photo 3b: Looking downstream towards potential Site 3 showing opening on LDB.

Note:

m = metres; km = kilometres; HTO = Kugluktuk Hunters and Trappers Organization ; LDB = left downstream bank; RDB = right downstream bank.



APPENDIX G

Proposed Enhancement Sites 2014

Table G4: Proposed Enhancement Site - Low-Flow Channel Site 4

Priority	Medium	Notes: ■ Recommended the HTO create a 60 m channel to direct fish from the right downstream bank, up the center and towards the LDB. ■ This channel would connect deep water sections (e.g., thalwegs, small pools) below Project 2 and 3 (from 2012) to downstream sections. ■ The centre of the creek (from Site 4 to Site 3) appears to be relatively deep and may provide adequate habitat for fish passage.
Fish Stranding Observed?	Yes (2012 and 2014)	
Approximate Minimum Length	60 m	
Approximate Distance From Mouth	1.6 km	
Easting	591165	
Northing	7626842	



Photo 4a: Looking upstream towards potential Site 4 on the RDB.



Photo 4b: Looking upstream towards potential Site 4 showing opening on LDB (channel should pass through centre of creek).

Note:

m = metres; km = kilometres; HTO = Kugluktuk Hunters and Trappers Organization ; LDB = left downstream bank; RDB = right downstream bank.



APPENDIX G

Proposed Enhancement Sites 2014

Table G5: Proposed Enhancement Site - Low-Flow Channel Site 5

Priority	High	Notes: ■ Recommend the HTO constructs a low-flow channel to direct fish up the middle of the creek to pool on the right downstream bank. ■ Efforts should also restrict access to shallow sections (using weirs) to assist fish with upstream navigation. ■ This low-flow channel project may be extended where needed to connect adjacent refugia (e.g., thalwegs, small pools). ■ This site may be similar to Project 3 from 2012. ■ Two mortalities observed 60 m upstream in 2014.
Fish Stranding Observed?	Yes for 2012 and 2014	
Approximate Length	20 m	
Approximate Distance From Mouth	2.0 km	
Easting	590836	
Northing	7626544	



Photo 5a: Looking upstream towards the potential project at Site 5 on the RDB (channel should go through centre of creek).



Photo 5b: Looking downstream from edge of boulder garden towards the potential project at Site 5 on the centre/left downstream bank.

Note:

m = metres; km = kilometres; HTO = Kugluktuk Hunters and Trappers Organization ; RDB = right downstream bank.



APPENDIX G

Proposed Enhancement Sites 2014

Table G6: Proposed Enhancement Site - Low-Flow Channel Site 6

Priority	Medium	Notes: ■ Located immediately downstream of Site 5. ■ Recommend a low-flow channel and weir to direct fish up the middle of the creek and to the LDB where water is deeper. ■ If fish continue to navigate up the RDB there is potential for fish to strand at upstream locations. ■ An alternative to Site 6 may be a long weir constructed at a downstream location to direct fish to the LDB (requires a follow-up investigation). ■ Two mortalities observed 100 m upstream in 2014.
Fish Stranding Observed?	Yes for 2012 and 2014	
Approximate Minimum Length	20 m	
Approximate Distance From Mouth	2.0 km	
Easting	590876	
Northing	7626563	



Photo 6a: Looking upstream towards Site 6 (channel should go from bottom left to top right in photo).



Photo 6b: Looking downstream towards the potential project at Site 6.

Note:

m = metres; km = kilometres; LDB = left downstream bank; RDB = right downstream bank.



APPENDIX G

Proposed Enhancement Sites 2014

Table G7: Proposed Enhancement Site - Low-Flow Channel Site 7

Priority	High	Notes: ■ Identified as an area with many obstacles for fish passage. ■ Located upstream of a large pool and within a sharp bend in the meander of the creek. ■ The location needs substantial enhancement, and may require two parallel low-flow channels. ■ Recommend building weirs to navigate fish towards the LDB or the center of creek (where there may be a small thalweg) because the right downstream bank has high potential for blocking and stranding fish. ■ One mortality observed 100 m upstream.
Fish Stranding Observed?	Yes (2014)	
Approximate Minimum Length	50 m	
Approximate Distance From Mouth	2.4 km	
Easting	590556	
Northing	7626395	



Photo 7a: Looking upstream towards the potential project at Site 7.



Photo 7b: Looking downstream towards the potential project at Site 7.

Note:

m = metres; km = kilometres; LDB = left downstream bank.



APPENDIX G

Proposed Enhancement Sites 2014

Table G8: Proposed Enhancement Site - Low-Flow Channel Site 8

Priority	Low to Medium	Notes: ■ The channel should connect the RDB thalweg and small holding pools to the LDB thalweg and small holding pools. ■ If fish continue up the RDB there is potential to for fish to become stranded; a rock weir should be constructed to direct fish to the LDB. ■ Site may require two parallel low-flow channels. ■ This site is similar to the pre-construction section for 2012 Project 3.
Fish Stranding Observed?	Yes (2012)	
Approximate Minimum Length	10 m	
Approximate Distance From Mouth	2.9 km	
Easting	590214	
Northing	7626213	



Photo 8a: Looking upstream towards the potential project at Site 8.



Photo 8b: Looking downstream towards the potential project at Site 8.

Note:

m = metres; km = kilometres; RDB = right downstream bank; LDB = left downstream bank.



APPENDIX G

Proposed Enhancement Sites 2014

Table G9: Proposed Enhancement Site - Low-Flow Channel Site 9

Priority	Low to Medium	Notes: ■ The channel should connect the RDB thalweg and related small holding pools to the LDB thalweg and related small holding pools. ■ If fish continue up the RDB there is potential to for fish to become stranded; a rock weir should be constructed to direct fish to the LDB. ■ Site may require two parallel low-flow channels. ■ This site is similar to pre-construction conditions at 2012 Project 3. ■ Site is approximately 600 m above the lowermost pond on the creek. ■ Minimal time was spent in this section of the creek in 2014.
Fish Stranding Observed?	None	
Approximate Minimum Length	20 m	
Approximate Distance From Mouth	4.8 km	
Easting	589969	
Northing	7625431	



Photo 9a: Looking upstream towards potential project at Site 9.



Photo 9b: Looking downstream towards potential project at Site 9.

Note:

m = metres; km = kilometres; RDB = right downstream bank; LDB = left downstream bank.



APPENDIX G

Proposed Enhancement Sites 2014

Table G10 Proposed Enhancement Site - Low-Flow Channel Site 10

Priority	Low	Notes: - Low-flow channels should connect the LDB thalweg to the RDB thalweg. - Fish travelling up the LDB have potential to become stranded; a rock weir should be constructed to direct fish to the RDB. - The RDB currently provides a better (i.e., non-obstructed) route for fish passage. - Minimal time was spent in this section of the creek in 2014.
Fish Stranding Observed?	None	
Approximate Minimum Length	40 m	
Approximate Distance From Mouth	5.7 km	
Easting	589244	
Northing	7625128	



Photo 10a: Looking upstream towards Site 10 (channel should go from bottom right to top left in photo).



Photo 10b: Looking downstream towards potential project at Site 10.

Note:

m = metres; km = kilometres; LDB = left downstream bank; RDB = right downstream bank.



APPENDIX G

Proposed Enhancement Sites 2014

Table G11: Proposed Enhancement Site - Low-Flow Channel Site 11

Priority	Low	Notes: ■ Potential low-flow channel to be located at the inlet of a large pond (i.e., second pond from mouth). ■ During existing low flows, fish that travel up the LDB may become stranded. ■ A rock weir may be required to direct fish from the LDB to deeper/unobstructed stream sections near the RDB; proper placement of weir may preclude the need for a low-flow channel. ■ Site located approximately 2 km downstream of Hingittok Lake. ■ Minimal time was spent in this section of the creek in 2014.
Fish Stranding Observed?	None	
Approximate Minimum Length	15 m	
Approximate Distance From Mouth	7.8 km	
Easting	587549	
Northing	7624548	



Photo 11a: Looking downstream towards proposed project at Site 11.



Photo 11b: Looking upstream towards proposed project at Site 11.

Note:

m = metres; km = kilometres; LDB = left downstream bank; RDB = right downstream bank.

As a global, employee-owned organisation with over 50 years of experience, Golder Associates is driven by our purpose to engineer earth's development while preserving earth's integrity. We deliver solutions that help our clients achieve their sustainable development goals by providing a wide range of independent consulting, design and construction services in our specialist areas of earth, environment and energy.

For more information, visit golder.com

Africa	+ 27 11 254 4800
Asia	+ 86 21 6258 5522
Australasia	+ 61 3 8862 3500
Europe	+ 44 1628 851851
North America	+ 1 800 275 3281
South America	+ 56 2 2616 2000

solutions@golder.com
www.golder.com

Golder Associates Ltd.
16820 107 Avenue
Edmonton, Alberta, T5P 4C3
Canada
T: +1 (780) 483 3499



2015 Report

DATE 14 August 2015**PROJECT No.** 1419666.3000**TO** Matthew Pickard
Sabina Gold & Silver Corp.**CC** Max Brownhill, Jason Prno**FROM** Cam Stevens and Ashley Eckford**EMAIL** cestevens@golder.com**COMMUNITY-BASED MONITORING AT BERNARD HARBOUR, NUNAVUT, JULY 2015**

The purpose of this memo is to provide Sabina Gold and Silver Corp. (Sabina) with a summary of the Nulahugyuk Creek assessment and community engagement program that took place during 19 to 25 July 2015 (with the crew arriving at Bernard Harbour on the evening of 21 July, returning to Kugluktuk on the morning of 25 July). The purpose of the program was to monitor flow conditions in Nulahugyuk Creek, evaluate the integrity of previously completed channels, and to engage the local community involvement with student participation from the Kugluktuk Hunters and Trappers Organization (HTO).

The status of the previously constructed 2012 'Projects' (i.e., low-flow channels) were assessed (velocities, widths, and depths), and compared to measurements made at similar, unaltered sections of the creek. A subset of the proposed enhancement projects identified in 2014 (i.e., stream sections identified as being most problematic for fish passage) were re-evaluated to provide supplemental information for strategic planning for low-flow channel remediation in 2016. Additional problem locations were identified in Nulahugyuk Creek during the site visit as potential low-flow channel (i.e., enhancement) project locations for 2016.

Daily monitoring of creek discharge was also performed to collect supplemental baseline data for the Back River Offsetting Plan. All field work was supervised by a Golder fisheries technician (Ashley Eckford) and was assisted by students from the HTO (names provided further below). Stream remediation training was also provided to the students. A small rock weir was constructed at a problem location to direct Arctic char away from a shallow section of the creek. This memo includes a brief summary of the status of the 2012 low-flow channels, proposed enhancement sites for the future, a discussion regarding health and safety, and a labour summary at the end. Any information collected during this program not included in this memo will be considered in the baseline description of the Bernard Harbour Offsetting Option for the Back River Offsetting Plan.

2012 Low-Flow Channel Projects

The previously completed low-flow channel projects (1 to 5) were assessed on 22 July 2015 (for example, see Project 1 and 5 in Figure 1 and 2, respectively). The integrity of 2012 projects was visually assessed. Higher spring flows and ice scouring may alter the stream channels, however, there was very little indication of any movement of channel substrates. All low-flow channel projects were in excellent condition and deemed to be functioning for fish passage as designed. The only signs of movement were at Project 1, where three small boulders had moved into the channel. The boulders were measured, photographed, and then repositioned to the side of the channel. It was determined that all projects would be passable by an upstream migrating char, even at the current low water level.





Figure 1: View of Nulahugyuk Creek Looking Upstream at Low-Flow Channel Project 1, 22 July 2015



Figure 2: View of Nulahugyuk Creek Looking Upstream at Low-Flow Channel Project 5, 22 July 2015

Width, depth, and velocities were collected at 2-m intervals for each Project, beginning at the downstream location and ending at the upstream location of the low-flow channel. A representative non-remediated section of

the creek near each Project location was also measured for width, depth, and velocity in the thalweg, providing a reference of the flow conditions in the area where each channel has been remediated. It is important to note that the areas around low-flow channel Projects 2 and 3 were dry. The only areas with sustained flows for fish passage at these Project locations were within the low-flow channels.

Proposed Low-Flow Channel Projects

During the 2014 baseline study, 11 locations in Nulahugyuk Creek between the mouth of the creek and Hingittok Lake were identified as problem areas; these were locations in the creek deemed difficult for adult char to navigate while migrating upstream, resulting in possible strandings and mortalities. On 23 and 24 July 2015, the crew re-assessed eight of the problem locations in the lower three kilometres (km) of the creek. As done in 2014, each location was assessed for the likelihood of stranding fish and being a barrier for upstream passage. The only change being that this year the assessment was done collaboratively with the HTO students. The HTO students also helped with determining where the low-flow channels and weirs should be constructed to improve passage by considering substrate of the location, natural thalwegs in the area, and current patterns in flow. During this assessment, four additional problem locations were identified, all within the lower three km of the creek (Table 1). For each location assessed in 2015, the field crew created detailed maps and took photographs, waypoints and GPS tracks to aid in planning and remediation works in 2016.

Table 1: Proposed Enhancement Project Locations Assessed in Nulahugyuk Creek in 2015

Year Identified for Site Remediation	Site Identification	UTM NAD 83 (11W)		Distance from Mouth of Creek (km)	Priority ^a
		Easting	Northing		
2014	Site 1-14	591279	7627006	1.3	High
	Site 2-14	591263	7627032	1.3	Medium
	Site 3-14	591200	7626876	1.5	Low to Medium
	Site 4-14	591165	7626842	1.6	Medium
	Site 5-14	590836	7626544	2.0	High
	Site 6-14	590876	7626563	2.0	Medium
	Site 7-14	590556	7626395	2.4	High
	Site 8-14	590214	7626213	2.9	Low
2015	Site 1-15 ^b	590754	7627249	0.7	Low
	Site 2-15	590886	7626250	2.1	Low
	Site 3-15	590750	7626185	2.3	Low
	Site 4-15	590208	7625980	3.0	Low

^a see 2014 baseline report for additional descriptions of 2014 proposed enhancement projects and rationale for ranking priority of stream locations for remediation.

^b partially remediated on 24 July 2015 (see below).

Student-Designed Rock Weir

The HTO students assisted with the construction of an 18-m long rock weir at Site 1-15 on 24 July 2015. The objective of the weir was to re-direct upstream migrating fish from a shallow path near the right downstream bank to the deepest sections of the creek nearer to the left downstream bank. It is expected that the weir reduces the risk of fish getting stranded. To achieve this, the students re-positioned boulders in a diagonal direction, starting from the right downstream bank towards deeper, faster flowing water near the left downstream

bank (Figure 3 and 4). Based on positive feedback from the students during this exercise, constructing the rock weir gave the HTO students a better understanding of how flows can be altered to benefit the char migration.



Figure 3: HTO Students Starting Directional Weir for Migrating Char in Nulahugyuk Creek, June 24, 2015



Figure 4: Directional Weir (Students in Background) for Migrating Char in Nulahugyuk Creek, June 24, 2015

Nulahugyuk Creek Discharge

Daily discharge measurements of Nulahugyuk Creek were performed by the field crew. All measurements were made using a Swoffer velocity meter. There was a decrease in flow from the beginning of the program to the end, where a flow of 0.420 m³/s was recorded on 22 July 2015, dropping to 0.290 m³/s on 24 July 2015.

Health and Safety

The comprehensive Health and Safety plan developed for this program was successful in providing the crew with the resources required to mitigate risk and maintain communication with emergency contacts throughout the program. Daily check-ins provided office staff with project updates and to help plan logistics. The presence of a Wildlife Monitor was a critical asset to the team given the high level of bear activity observed in the area in previous years. Hazards identified during the execution of the field tasks included, but are not limited to:

- general challenges associated with remote work
- adverse weather conditions
- slips, trips, falls, and foot hazards
- bear encounters
- boat work
- communication

It is important to note a loss of process because of inclement weather. Travel from Kugluktuk to Bernard Harbour by boat was postponed the morning of 20 July 2015 until the afternoon of 21 July 2015 due to high winds (40 km/hr) and unsafe boating conditions. Other mitigations were employed to reduce risk and maintain a safe working environment for the field staff. Both structured and casual daily health and safety discussions served to maintain communication, and identify new hazards. The crew always worked together and did not leave camp without the Wildlife Monitor.

Golder Labour Summary for Field Program

One Golder staff (A. Eckford) was at Bernard Harbour from 21 to 25 July 2015. Local community assistants at Bernard Harbour included Perry Klengenberg (Wildlife Monitor), Richard Akana (Boat Operator), Mary Algona (Camp Cook), and HTO students (Dallas Harvey, Felix Anablak, Braydon Pedersen, Evan Nivingalok, and Darien Evyagotailak). Although inclement weather postponed the boat trip from Kugluktuk to Bernard Harbour on 20 July 2015, the 'weather day' was utilized for mobilization and community engagement at the HTO. Air travel days for A. Eckford included 19 July 2015 for flights to Kugluktuk and 25 July 2015 for flights to Edmonton.

Table 2: Golder Staff Field Labour Summary

	Date (2015)							
	July 19	July 20	July 21	July 22	July 23	July 24	July 25	Total
Golder Staff ^a Field Hours ^b Billed	10	8	12	12	12	10	14	78

^a does not include time for HTO Wildlife Monitor P. Klengenberg, Boat Operator R. Akana, or Camp Cook M. Algona, or HTO Students.

^b includes travel time (e.g., air travel) but does not include logistics planning, coordination, or project management.

Summary and Closure

The field program at Nulahugyuk Creek was deemed successful in meeting baseline data collection and community engagement objectives. The program was an excellent opportunity for maintaining relationships with the Kugluktuk community and the HTO. The students were actively engaged in field monitoring and general learning opportunities related to remediation of the creek.

We appreciate the opportunity to participate in this unique study and look forward to the challenges associated with the next phases of the project. Please do not hesitate to contact Cam Stevens at 780-989-7708, or cestevens@golder.com, for any questions or further details.

GOLDER ASSOCIATES LTD.



Ashley Eckford, B.Sc.
Aquatic Component Lead



Cameron Stevens, M.Sc., Ph.D.
Associate, Project Manager

AE/CES/GC/jr

2016 Report



February 2017

BERNARD HARBOUR PROJECT

Arctic Char Run Baseline Report - 2016 Results

Submitted to:

Sabina Gold & Silver Corp.

Suite 375, Two Bentall Centre

555 Burrard Street

Box 220

Vancouver, BC V7X 1M7

REPORT



Report Number: Doc 010 1545534.4000





Table of Contents

ACKNOWLEDGMENTS	1
1.0 INTRODUCTION.....	1
1.1 Introduction	1
1.2 Study Area	2
2.0 METHODS	4
2.1 Water Temperature and Velocity Measurements.....	4
2.2 Fish Capture and Sampling	5
2.2.1 Fyke Trap.....	5
2.2.2 Individual Fish Measurements	6
2.3 Fish Movements	6
2.3.1 Statistical Analyses	8
2.4 Habitat Assessments	9
2.4.1 Nulahugyuk Creek.....	9
3.0 RESULTS AND DISCUSSION	11
3.1 Environmental Variables.....	11
3.2 Fish Capture and Sampling	14
3.3 Fish Movements	16
3.3.1 Migration Success.....	18
3.3.2 Migration Retreat.....	21
3.4 Habitat Assessments	22
3.4.1 2012 Low-Flow Channel Integrity.....	23
4.0 SUMMARY.....	28
5.0 REFERENCES.....	31

TABLES

Table 2-1: Field Personnel Involved in the 2016 Bernard Harbour Study	4
Table 2-2: Water Temperature and Velocity Measurement Locations, Nulahugyuk Creek	5
Table 2-3: Locations of the Fyke Trap and Antennae Arrays, Nulahugyuk Creek.....	7



BERNARD HARBOUR ARCTIC CHAR

Table 2-4: Habitat Assessment Sections in Nulahugyuk Creek	9
Table 3-1: Lengths and Weights for Arctic Char Captured in Nulahugyuk Creek, 6 July to 25 July 2016	16
Table 3-2: Travel Time and Mean Speed of PIT-Tagged Char Migrating Upstream, 2016	18
Table 3-3: Parameter Metrics for Binary Logistic Regression of Migratory Success	19
Table 3-4: Parameter Metrics for Binary Logistic Regression of Retreat.....	21
Table 3-5: Summary of Potential Locations for Fish Passage Enhancement Projects.....	23
Table 3-6: Summary of Low-Flow Channel Data.....	24
Table 3-7: Comparison of 2016, 2014, and 2012 Low-Flow Channel Mean Depth Data	24

FIGURES

Figure 1-1: Bernard Harbour Offsetting Option, July 2016	3
Figure 3-1: Daily Mean Temperature (°C) Recorded at Nulahugyuk Creek from 8 July to 24 July 2016. Maximum and Minimum Daily Values Indicated by Upper and Lower Dotted Lines Respectively. Warm Water Temperatures (>21°C) Delineated by the Dashed Line.....	11
Figure 3-2: Monthly mean (maximum daily) temperatures reported for 2011-12, 2013-14, and 2015-16 by the Environment Canada climate station at Kugluktuk, Nunavut.....	12
Figure 3-3: Daily Stream Discharge (m ³ /s) Calculated for Nulahugyuk Creek Between 7 July and 25 July 2016	13
Figure 3-4: Monthly precipitation totals reported for 2011-12, 2013-14, and 2015-16 by the Environment Canada climate station at Kugluktuk, Nunavut	13
Figure 3-5: Length-Frequency Distribution of Arctic Char Captured in the Fyke Trap.....	16
Figure 3-6: Daily Captures of Migratory Char in Nulahugyuk Creek, 2014 (A) and 2016 (B). D/S = downstream travelling fish and U/S = upstream travelling fish.....	17
Figure 3-7: Results of Binary Logistic Regression Plotting the Probability of Migration Success against Stream Discharge (x), Holding Char Body Weight Constant at 3.90 kg.....	20
Figure 3-8: Results of Binary Logistic Regression Plotting the Probability of Migration Success against Char Body Weight (y) Holding Mean Stream Discharge Constant at 0.408 m ³ /s	20
Figure 3-9: Results of Binary Logistic Regression Plotting the Probability of Retreat against Maximum Daily Temperature in 2014.....	22
Figure 3-10: Results of Binary Logistic Regression Plotting the Probability of Retreat against Maximum Daily Temperature in 2016.....	22



BERNARD HARBOUR ARCTIC CHAR

PHOTOGRAPHS

Photo 2-1: Two-Way Fyke Net Trap at Mouth of Nulahugyuk Creek, July 2016	6
Photo 2-2: Antennae-Array Location (LDSA); Photograph Facing the Right Downstream Bank of Creek, July 2016	8
Photo 3-1: Adult Arctic Char Captured During Their Upstream Migration on 21 July 2016	14
Photo 3-2: Juvenile Arctic Char Captured During Their Downstream Migration on 12 July 2016.....	15
Photo 3-3: 2012 Project 1, Facing Downstream, 8 July 2016.....	25
Photo 3-4: 2012 Project 2, Facing Downstream, 8 July 2016.....	25
Photo 3-5: 2012 Project 3 (Upper Section), Facing Upstream, 8 July 2016.	26
Photo 3-6: 2012 Project 4, Facing Downstream, 8 July 2016.....	26
Photo 3-7: 2012 Project 5 (Top Section), Facing Downstream, 8 July 2016	27
Photo 3-8: 2012 Project 5, Showing Failed Directional Weir Near Right Downstream Bank, 15 July 2016	27
Photo 3-9: 2012 Project 5, Showing Repaired Directional Weir Near Right Downstream Bank, 15 July 2016.....	28

APPENDICES

APPENDIX A

Project Photos

APPENDIX B

Fish Catch Data for Lower Nulahugyuk Creek, 6 to 25 July 2016

APPENDIX C

Remediation Plan



ACKNOWLEDGMENTS

Funding for this study was provided by Sabina Gold & Silver Corp. (Sabina) and the successful execution of the study is credited to the community of Kugluktuk and the staff at the Kugluktuk HTO. Their hard work in the creek and on-going support of the objectives for this project are acknowledged as critical components to its successful completion. This project was also successful because of the logistical support provided by Johnny Nivingalok (HTO Manager), Larry Adjun (HTO chairperson), and John Kaiyogana (Sabina).



1.0 INTRODUCTION

1.1 Introduction

Bernard Harbour was (and continues to be) an important land use area for a number of Inuit families in the Kitikmeot region of Nunavut (Prno and Kaiyogana 2015). Based on Traditional Knowledge collected in the area (Prno and Kaiyogana 2015), recent environmental changes have had negative implications on the local Arctic Char (*Salvelinus Alpinus*) fishery (Golder 2013). This highlights the potential benefit stream restoration activities may have on the Arctic Char fishery and the Inuit that rely on the fishery for subsistence and cultural values.

In preparation of a detailed offsetting plan to be submitted with a *Fisheries Act* Authorization application for the Back River Project, Golder was contracted by Sabina Gold & Silver Corp. (Sabina) to continue baseline studies at Bernard Harbour (specifically Nulahugyuk Creek) (Figure 1-1). The 2016 scope of work provides a numerical estimate on the Arctic Char run in Nulahugyuk Creek, which will be combined with data collected in 2014 and available Traditional Knowledge (Prno and Kaiyogana 2015) to describe a reference condition for future quantification of the benefits of creek remediation efforts (Golder 2015a). The 2016 scope of work also provides baseline data on habitat conditions for directing remediation efforts on Nulahugyuk Creek (the creek).

The 2016 field program addressed five general baseline objectives at Nulahugyuk Creek (see below). All of which were conducted within the known migration window for Arctic Char (char) at Nulahugyuk Creek, and timed to overlap during low-flow conditions in early to mid-summer when fish passage barriers (e.g., boulders) are prevalent (Golder 2013, 2015a). The work objectives were as follows:

- 1) Monitor the adult char (lake-bound) migration using a two-way fyke net trap (fyke trap) during low-flow conditions; results from this objective are intended to confirm that suitable conditions for fish passage are not present during the upstream migration period;
- 2) Monitor the juvenile char (seaward) migration using a fyke trap during the peak period of outmigration early to mid-summer (Golder 2013, 2015a); results from this work objective are intended to help understand spawning and migration successes associated with the run that produced the offspring observed during the outmigration (which are assumed to be 4 to 5 year-old fish; Golder 2013);
- 3) Monitor rates of movement and successful upstream passage of adult char using Passive Integrated Transponder (PIT) tags (e.g., Puffer et al. 2015); the movement data provide a direct measurement of the effects of migrations conditions (e.g., low-flows) on char in the creek for the study year under examination and are anticipated to provide a baseline condition (when combined with 2014 data) as a measurement indicator for evaluating the benefits of future remediation efforts;
- 4) Survey creek habitat to identify and describe problem locations where low-flow channels and/or directional weirs could be constructed to effectively increase fish passage success and hence production; and
- 5) Evaluate the structural integrity and performance of previously constructed (2012) low-flow channels as part of a feasibility assessment of using low-flow channels to improve upstream passage for fish; this work objective is a direct follow-up from work initiated in 2012 (Golder 2013), and related to monitoring work completed in 2014 (Golder 2015a) and 2015 (Golder 2015b).



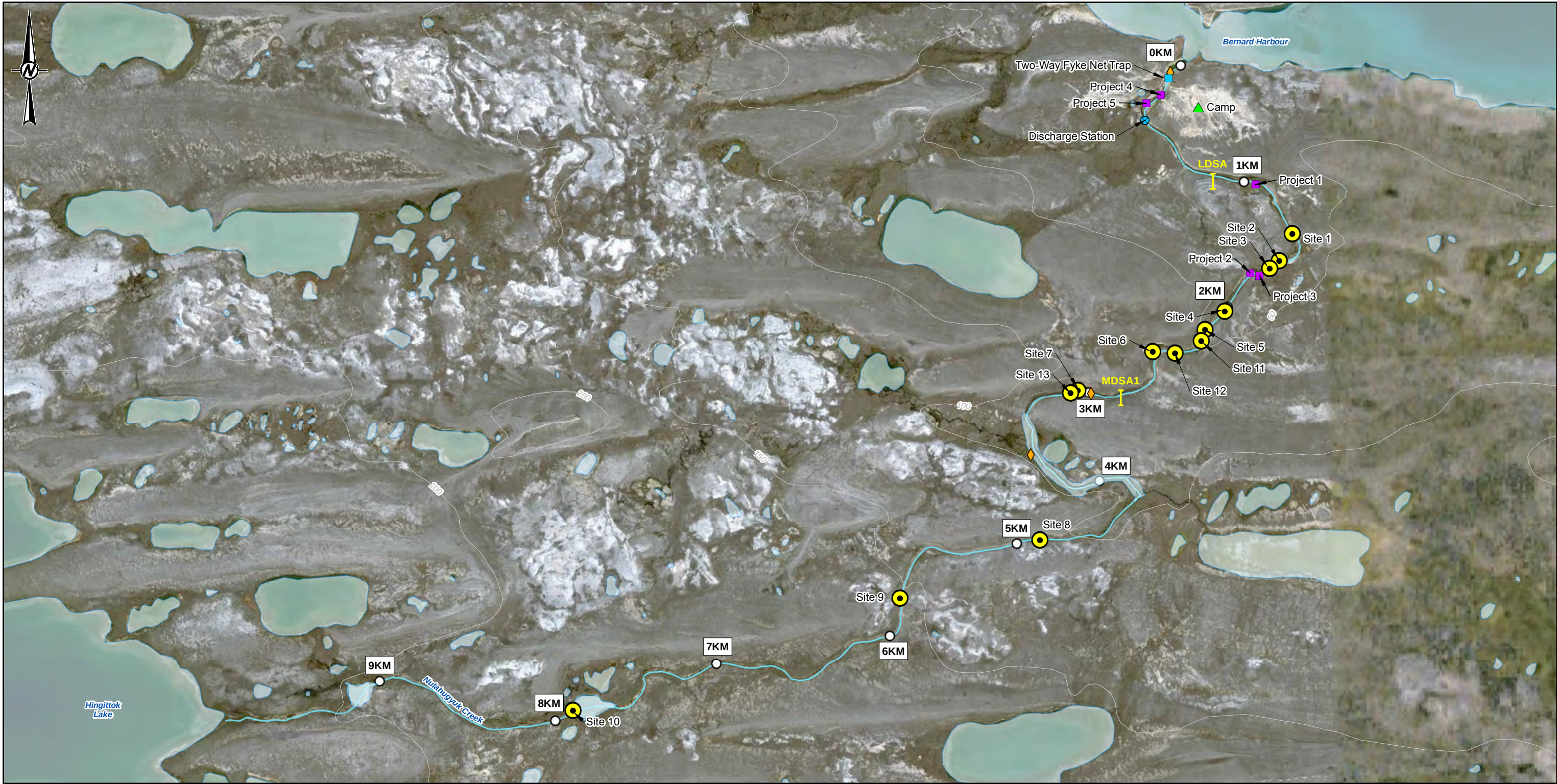
BERNARD HARBOUR ARCTIC CHAR

In addition to the objectives outlined above, the 2016 field program integrated conservation and community-capacity objectives of the Kugluktuk Hunters' and Trappers' Organization (HTO). This was achieved by incorporating local students and community members, and by designing a study that fosters education, stewardship, and community involvement in conservation initiatives. Past studies (e.g., Stern et al. 2008) have demonstrated a lasting positive change in environmental attitude, awareness, action, and knowledge following environmental education programs, such as the program being implemented at Bernard Harbour (Golder 2013, 2015a, 2015b). Local residents are supportive of the stream restoration work being proposed by the Kugluktuk HTO and Sabina, and wish to see the Bernard Harbour Arctic Char fishery returned to its previous status (Prno and Kaiyogana 2015).

1.2 Study Area

The Hingittok Lake-Nulahugyuk Creek drainage is located approximately 100 kilometres (km) directly north from the hamlet of Kugluktuk, Nunavut (the community), along the south coast of Dolphin and Union Strait (Figure 1-1). The Project site is about 4.5 hours (h) travel time by boat from Kugluktuk. Nulahugyuk Creek, the outflow from Hingittok Lake (882 hectares [ha] in area), flows north for approximately 10 km before entering the Dolphin and Union Strait at 68°44'52"N, 114°45'27"W, approximately 5 km southeast from an abandoned DEW-Line site (site PIN-C) (Appendix A; Photo A-1).

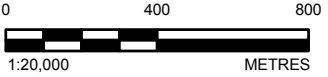
The contributing basin area at the mouth of the creek is approximately 125 square kilometres (km²) and may be characterized by limited groundwater derived flows punctuated by precipitation-driven peak flows. It is expected that most of the precipitation falls as rain during the open water season. Based on Canadian climate normal station data for Kugluktuk (1981 to 2010), mean total precipitation is approximately 247 millimetres (mm), of which 144 mm falls during June, July, August, and September (see <http://climate.weather.gc.ca>). Daily maximum temperatures, on average, are above 0 degrees Celsius (°C) for June through September, peaking in July at 15.6°C, and below 0°C for the remainder of the year.



LEGEND

- CAMP
- DISCHARGE STATION
- FYKE NET
- KILOMETRE MARKER
- LOW-FLOW CHANNEL PROJECT 2012
- PIT TAG ARRAY
- REMEDIAION SITE 2016
- WATER TEMPERATURE LOGGER
- ELEVATION CONTOUR

- WATERCOURSE
- WATERBODY
- LDSA - LOWER DOWNSTREAM ARRAY
- MDSA1 - MIDDLE DOWNSTREAM ARRAY 1



REFERENCE(S)
1. GOOGLE EARTH IMAGERY: © 2014 DIGITAL GLOBE
2. CANVEC BASE DATA: © DEPARTMENT OF NATURAL RESOURCES CANADA, 2012. ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 11 DATUM: NAD 83

CLIENT



CONSULTANT



YYYY-MM-DD	2016-12-19
DESIGNED	CS
PREPARED	ANK
REVIEWED	RP
APPROVED	CS

PROJECT

**BACK RIVER PROJECT
NUNAVUT, CANADA**

TITLE

BERNARD HARBOUR OFFSETTING OPTION, JULY 2016

PROJECT NO.
1545534

PHASE
4000

REV.
A

FIGURE
1-1



BERNARD HARBOUR ARCTIC CHAR

2.0 METHODS

The field program at Bernard Harbour occurred from 5 to 25 July 2016 during the later stages of the char migration when creek conditions were anticipated to be unsuitable for fish passage. Methods followed those previously used during 2012 and 2014 visits to Bernard Harbour (Golder 2013, 2015a). The field crew comprised fisheries biologists from Golder and camp monitors, assistants, and students from the Kugluktuk HTO (Table 2-1).

Table 2-1: Field Personnel Involved in the 2016 Bernard Harbour Study

Name	Role
Paul Vecsei	Golder Aquatic Biologist
Cam Davis	Golder Aquatic Biologist
Eztiaan Groenewald	Golder Aquatic Biologist
Corby Shurgot	Golder Aquatic Biologist
Johnny Nivingalok	Logistical Support
Adrian Kudlak	HTO Bear Monitor
Perry Klengenberg	HTO Bear Monitor
Cathy Anablak	HTO Field Assistant
Andrew J Atatahak	HTO Field Assistant
Evan Nivingalok	HTO Student
Antoin Nivingalok	HTO Student
Kaelan Panioyak	HTO Student
Keegen Taptuna	HTO Student
Amber Adjun	HTO Student
David Enogaloak	Camp Supervisor
Margo Nivingalok	Camp Cook/Attendant
Shirly Hatogina	Camp Cook/Attendant
Jack Himiak	Boat Captain
Shaun Klengenberg	Boat Mate
Richard Akana	Boat Captain
OJ Bernhardt	Boat Mate
Jonathan Niptanatiak	Boat Captain

2.1 Water Temperature and Velocity Measurements

A water discharge station and staff gauge was established upstream from the mouth of Nulahugyuk Creek (Figure 1-1; Table 2-2; Appendix A, Photo A-6). Water velocities were measured between the creek banks at 0.75 m intervals along a transect set up perpendicular to the flow of water. Each point velocity was measured at 0.6 times the measured depth which is representative of the mean velocity at that vertical profile. Velocity was measured using a direct read-out Swoffer™ Model 2100 velocity meter and top-setting wading rod. Velocity and water levels were measured on eight days between 7 July and 14 July 2016. Discharge was calculated based on the point measurements of velocity, depth, and creek width at the discharge station.



BERNARD HARBOUR ARCTIC CHAR

Water temperature was measured for the duration of the field program at 0.25 h intervals at three locations (TWFN, BH3, and BH4) in Nulahugyuk Creek using Onset® HOBO Water Temperature Pro V2 Data Loggers (Figure 1-1; Table 2-2).

Table 2-2: Water Temperature and Velocity Measurement Locations, Nulahugyuk Creek

Site	Location (UTM, Zone 11W)		Distance to Nulahugyuk Creek Mouth (km) ^b	Year Logger Installed	
	Easting	Northing		2014	2016
TWFN ^a	590644	7627855	0.06		√
Staff gauge	590551	7627716	0.24	√	
Discharge station	590514	7627609	0.37	√	
BH2	590627	7627754	0.19	√	
BH4	590234	7626192	2.99	√	√
BH3 (Pond 1)	589922	7625874	3.58	√	√
BH5	589029	7624910	6.16	√	
BH7 (Pond 2)	587558	7624550	7.89	√	
BH8 (Hingittok Lake)	585681	7624524	9.96	√	

^a Fyke trap positioned approximately 50 m downstream of the location used in 2014

^b Distances were based on a revised shapefile of the creek resulting in minor differences with measurements made as part of previous baseline studies

UTM=Universal Transverse Mercator; km=kilometre; BH=Bernard Harbour

2.2 Fish Capture and Sampling

2.2.1 Fyke Trap

Fish were captured in Nulahugyuk Creek using a fyke trap installed immediately upstream from the mouth of the creek. The fyke trap was installed on 6 July 2016 and operated continuously until 25 July 2016 (Photo 2-1; Appendix A Photo A-2 to A-4). The fyke trap was installed within a shallow run area and the wings of the fyke trap spanned the creek such that fish moving upstream or downstream would be directed into the 1.8 m by 1.9 m openings. Once fish had entered the trap they were directed through a series of five funnels with openings ranging between 0.85 m by 0.85 m and 0.19 m by 0.29 m. Captured fish were directed for a total distance of approximately 6.4 m prior to entering a holding basket at the base of the net. The trap was checked several times daily and fish were removed and processed according to the methods approved under the DFO Licence to Fish For Scientific Purposes (licence #S-16/17-1015-NU) and the DFO Animal Use Protocol application (protocol #FWI-ACC-2016-015). The frequency of checks increased when water temperatures and/or capture success was high to reduce crowding and potential stress to captured fish.



Photo 2-1: Fyke Trap at Mouth of Nulahugyuk Creek, July 2016

2.2.2 Individual Fish Measurements

Fish captured at the fyke trap were enumerated, identified to species, and released on the side of the trap that corresponded with their direction of travel. Most fish were weighed (grams [g]) and measured (fork length [FL] [mm]), and a small number of representative individuals were photographed. To minimize stress during periods of warm water temperatures (greater than 17°C), some fish were enumerated but not processed at the fyke trap (i.e., were allowed to pass without measurement). Char smaller than 300 mm were classified as 'juveniles', fish between 300 and 550 mm were classified as 'immature' (or sub-adults), and fish larger than 550 mm were classified as adults (Golder 2013). Body measurement data were then combined with 2014 data to update length-weight (L-W) equations for understanding population structure and patterns in growth (Guy and Brown 2007).

Field crew members visually surveyed the creek for dead char and when located, carcass information was documented using a hand-held global positioning system (GPS), photographs (photos), and field notes. Carcasses were scanned for PIT tags with a hand-held reader, visually assessed for the presence of an external (e.g., Floy) tag, and otoliths were removed for ageing.

2.3 Fish Movements

Upstream movements of char were monitored using implanted PIT tags and Radio Frequency Identification (RFID) antenna-reader arrays (the antenna arrays), consistent with other research on salmonid migrations (e.g., Puffer et al. 2015) and the previous Bernard Harbour field programs (Golder 2013, 2015a).

Upon capture, adult char were transferred by dip net from the fyke net to an immersed soft mesh net panel in shallow water. High water temperatures (greater than 17°C) in early July required constant ventilation of gills in



BERNARD HARBOUR ARCTIC CHAR

fast flowing water to minimize unnecessary stress. While immersed in the creek, char were placed ventral side facing up and a PIT tag needle was used to implant a uniquely coded half duplex (HDX) PIT tag (23 mm length, 3.7 mm diameter, 0.6 g weight) in the char's abdomen. The needle penetrated the fish's ventrum between the posterior tip of the pectoral fin and the anterior point of the pelvic girdle, 1 to 2 mm lateral from the mid-ventral line. The bevel of the needle was oriented toward the ventral surface at a 20 degrees angle to minimize the chance of contact with internal organs. PIT tag injectors were disinfected between implantations using ethyl alcohol (ethanol) diluted with water to a final concentration of 70% to 80% ethanol. Once the PIT tag was implanted, char were immediately released upstream from the fyke trap in a natural side pool that served as a recovery area. Char were then observed until swimming upstream on their own.

Antenna arrays were installed at two locations on the creek (Table 2-3; Photo 2-2; Figure 1-1; Appendix A Photo A-5), both of which were used as antenna array locations in 2014 (Lower Downstream Array [LDSA] and Middle Downstream Array 1 [MUSA1]). The LDSA location represents the assumed location at which upstream migrating char have acclimatized to warmer, freshwater conditions. Based on previous habitat assessments, the area between the two antenna arrays was expected to include the most challenging areas with respect to fish movements (Golder 2013, 2015a).

Table 2-3: Locations of the Fyke Trap and Antennae Arrays, Nulahugyuk Creek

Array	Location (UTM, Zone 11 W)		Distance from Nulahugyuk Creek Mouth (km) ^a	Year Installed	
	Easting	Northing		2014	2016
Two Way Fyke Net (TWFN) ^b	590644	7627855	0.10	√	√
Lower Downstream Array (LDSA)	590865	7627313	0.84	√	√
Lower Upstream Array 1 (LUSA1)	591178	7627164	1.23	√	
Lower Upstream Array 2 (LUSA2)	591192	7627151	1.25	√	
Middle Downstream Array 1 (MDSA1)	590387	7626190	2.83	√	√
Middle Downstream Array 2 (MDSA2)	590372	7626185	2.84	√	
Middle Upstream Array (MUSA)	589992	7626191	3.22	√	
Upper Lake Outlet Array (ULOA)	586065	7624520	9.56	√	

^a Distances upstream were measured from the mouth of Nulahugyuk Creek using collected GPS data and a revised creek shapefile in GIS, resulting in minor differences with measurements made as part of previous baseline studies

^b Fyke trap positioned approximately 50 m downstream from the location used in 2014

UTM=Universal Transverse Mercator; km=kilometre



Photo 2-2: Antenna Array Location (LDSA) with a Rock Weir Built to Direct Fish Through the Antenna Array; Photo Facing the Right Downstream Bank of the Creek, July 2016

Rock weirs were constructed to prevent fish from moving around the arrays and to direct fish through the antenna arrays (Photo 2-2). The antenna loops of the antenna arrays were oriented vertically to increase PIT tag reception range. The bottom of the antenna loop was embedded in the creek substrate and the top of the loop was suspended approximately 5 centimetres (cm) above the water surface. This configuration ensured that char passed through the loop perpendicular to the antenna field. Antenna loops were connected to individual tuner boxes and HDX-PIT tag reader boxes located on the bank. The arrays were powered by deep-cycle 130 ampere marine batteries which were continually charged using solar panels.

2.3.1 Statistical Analyses

The migratory success of char traveling upstream from the fyke trap to the upstream array (labelled MDSA1 in 2014) was assessed by comparing data collected in 2014 (Golder 2015a) with 2016 data under similar discharge conditions (less than 0.5 cubic metres per second [m^3/s]) using a binary logistic regression. Because no significant differences were observed in migratory success between 2014 and 2016 ($p = 0.452$), migratory data were pooled to develop a single baseline model describing biological and environmental factors affecting migratory success of char through the lowest 2.8 km of the creek.

Binary logistic regressions were used to explore relationships between upstream migration success (fish detected [1], or not detected [0] at the upstream array) and environmental and biological factors such as migration date, stream discharge, water temperature, length, weight, and condition factor. Various models were compared based on their Akaike Information Criterion (AIC) score, with lower values identifying models better representing the data



analyzed, and on their Receiver Operating Characteristic (ROC), with higher values indicating greater sensitivity and specificity of the model.

A complementary investigation on the effects of environmental factors on the probability of char retreating from Nulahugyuk Creek was completed after initial review of the 2016 dataset. The warmer water temperatures in early July (compared to the 2012 and 2014 field programs [Golder 2013, 2015a]) and the location of the fyke net trap, which was 50 m downstream from the 2014 location and nearer to the interface of fresh and brackish water, provided an opportunity to examine the ability of char to acclimatize as they entered the creek from the ocean. This interface may be an area for acclimatization as char attempt to enter the creek from the ocean, occasionally retreating back towards the ocean until physiologically adapted for their upstream migration. Thus, a migration retreat model was developed (as done for migration success) to identify parameters affecting the probability of char retreating from Nulahugyuk Creek and exiting the system after commencing the upstream migration (fish retreated [1], or did not retreat [0] from Nulahugyuk Creek) with respect to year (as a surrogate of trap position), migration date, stream discharge, water temperature, length, weight, and condition factor.

2.4 Habitat Assessments

2.4.1 Nulahugyuk Creek

Approximately 10 km of Nulahugyuk Creek habitat was assessed from 8 to 13 July 2016. The creek assessments were divided into four main sections bounded by Hingittok Lake (upstream) and the Dolphin and Union Strait (downstream) and included three ponds (Pond 1, Pond 2, and Pond 3) (Table 2-4; Figure 1-1). Dominant habitat types within the sections were described using Hawkins et al. (1993).

Table 2-4: Habitat Assessment Sections in Nulahugyuk Creek

Section	Start (km)	Length (km)	Upstream Bound (UTM)	Downstream Bound (UTM)
Stream Section 1 (Mouth of creek to Pond 1 outlet)	0	3.37	589901 E 7626102 N	590739 E 7627908 N
Pond 1	3.37	0.93	590309 E 7625468 N	589901 E 7626102 N
Stream Section 2 (Pond 1 inlet to Pond 2 outlet)	4.30	3.38	587763 E 7624574 N	590309 E 7625468 N
Pond 2	7.68	0.21	587548 E 7624547 N	587763 E 7624574 N
Stream Section 3 (Pond 2 inlet to Pond 3 outlet)	7.89	1.14	586459 E 7624644 N	587548 E 7624547 N
Pond 3	9.03	0.17	586399 E 7624568 N	586459 E 7624644 N
Stream Section 4 (Pond 3 inlet to Hingittok Lake outlet)	9.20	0.70	585742 E 7624519 N	586399 E 7624568 N

UTM=Universal Transverse Mercator; km=kilometres

Potential char migration barriers (problem locations) along the entire length of the creek were identified, photographed, and described during low flow conditions (i.e., less than 0.8 m³/s). Aerial photos of selected problem locations in the lower section of Nulahugyuk Creek were taken using a drone.

To prepare for future remedial works, GPS coordinates were obtained for each problem location, and each problem location was qualitatively rated according to the perceived level of impassibility for adult char moving upstream during the later stages of migration. The most impassible locations (rank '3' locations) were those where fish stranding has been previously observed and where flows are dispersed flows and boulder fields often occur at the reach-level, impeding upstream movements and exposing fish to terrestrial predators. Highest risk locations were obvious barriers to fish passage during the later stages of the upstream migration (e.g., early July), and may also



BERNARD HARBOUR ARCTIC CHAR

present a risk to fish earlier in the migration period. Rank 2 locations were those characterized by a high potential for stranding and a partial migration barrier during the later stages of migration when water levels decline. Rank 1 locations were those that may be passable during average flow conditions, but present the potential for stranding and stressful conditions during below-average flow conditions during the later stages of migration.

A detailed remediation plan was then finalized in the field, capturing the spatial extent and locations of remediation sites and included spatial (track) files of proposed low-flow channels and directional weirs (using the Esri Collector Application). The integrity of previously completed low-flow channels was also visually assessed and photographed during low flow conditions. Width, velocity, and depth measurements within the thalweg were collected every 2 m for the length of each 2012 low-flow project and any displaced substrates were identified and photographed.



3.0 RESULTS AND DISCUSSION

3.1 Environmental Variables

Daily mean water temperatures in Nulahugyuk Creek ranged from a high of 19.8°C on 12 July 2016 to a low of 7.0°C on 22 July 2016 (Figure 3-1). The warmest recorded temperatures occurred during the first half of the study period and exceeded 21°C (thermal stress barrier for salmonids [McCullough 1999]) for a combined total of 40 hours as measured at the fyke trap. Water temperatures during the 2016 sampling period were warmer than those measured in 2014 (Golder 2015a) when the highest daily mean water temperature was 7.5°C lower (i.e., only 12.3°C), and the maximum recorded water temperature remained below 21°C for the duration of the 2014 monitoring period. As observed in 2014, diurnal variation in water temperature was evident during the sampling period in 2016. The mean difference between daily minimum and maximum values during the 2016 monitoring period was 7.4°C.

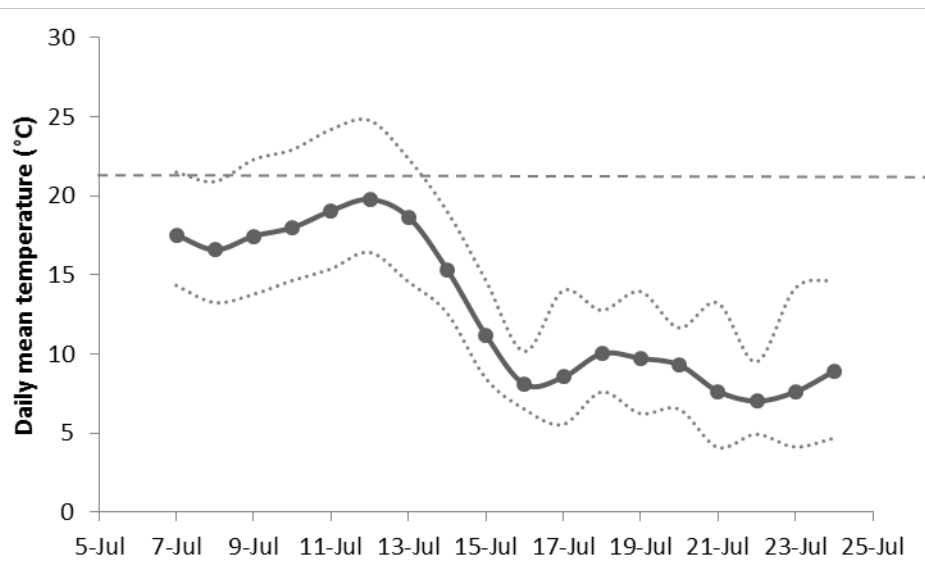


Figure 3-1: Daily Mean Temperature (°C) Recorded at Nulahugyuk Creek from 8 July to 24 July 2016. Maximum and Minimum Daily Values Indicated by Upper and Lower Dotted Lines Respectively. Warm Water Temperatures (>21°C) Delineated by the Dashed Line

Mean maximum daily air temperatures for the 2016 study year were above the 30-year normal for the months of June (by 1.8°C), July (by 1.2°C), and August (by 1.5°C) (Figure 3-2) (weather data obtained from <http://climate.weather.gc.ca>). For comparison, monthly mean maximum daily temperatures for the 2014 study year were below normal for the months of June (by 1.2°C) and August (by 1.2°C), but were above normal for July (by 0.2°C).



BERNARD HARBOUR ARCTIC CHAR

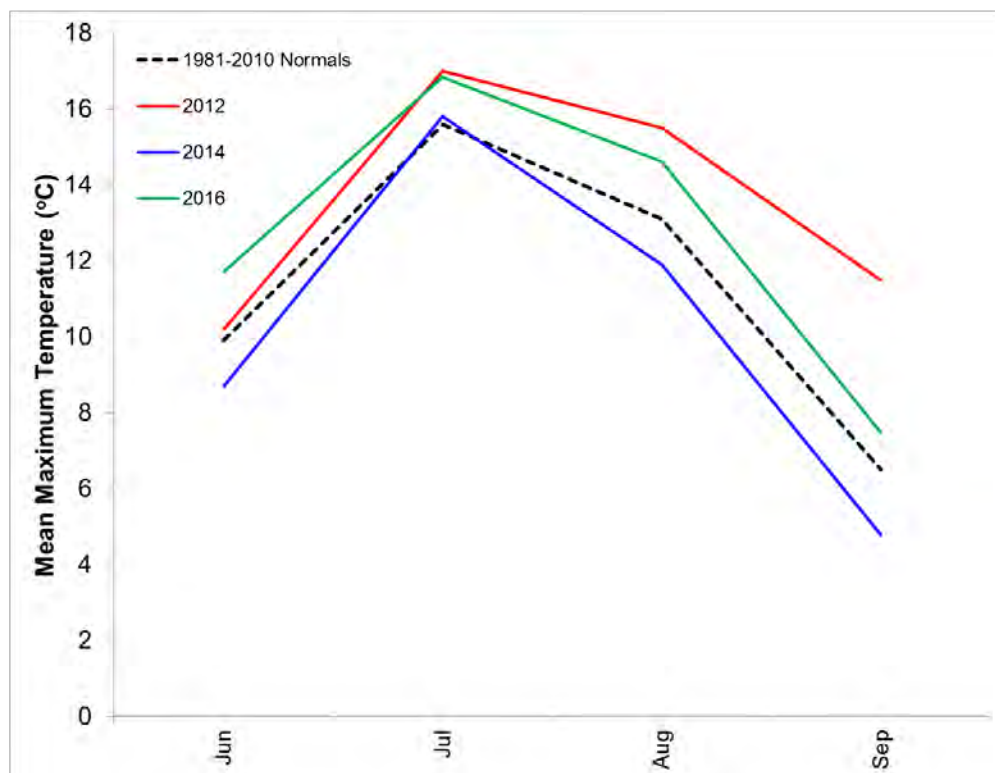


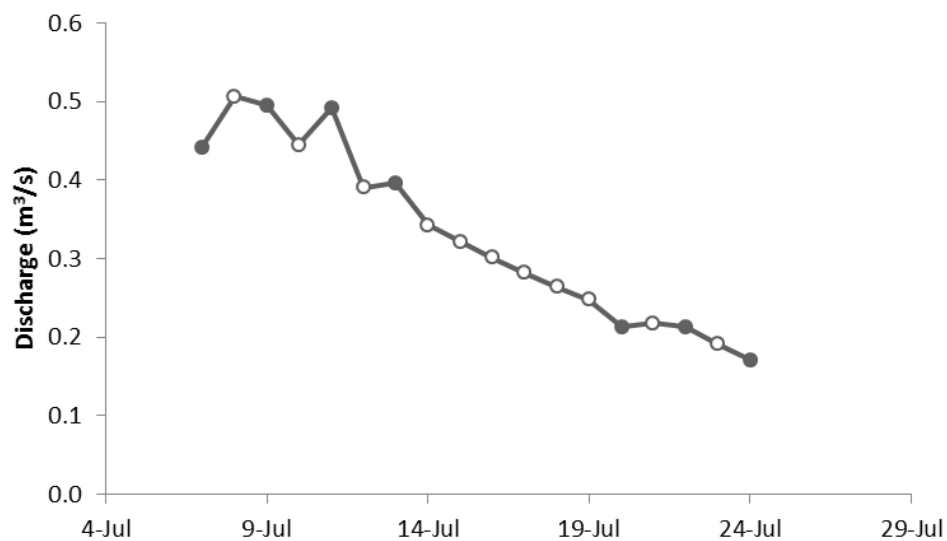
Figure 3-2: Monthly mean (maximum daily) temperatures reported for 2011-12, 2013-14, and 2015-16 by the Environment Canada climate station at Kugluktuk, Nunavut

Discharge declined over the study period ranging from a high of 0.5 m³/s on 8 July 2016 to a low of 0.2 m³/s on 25 July 2016 (Figure 3-3). For comparison, discharge during the 2014 study period started at a high of 6.0 m³/s on 15 June 2014 to a low of 0.4 m³/s on 17 July 2014 (Golder 2015a). During the 2015 field visit, creek discharge ranged from 0.4 to 0.3 m³/s from 22 July to 24 July (Golder 2015b).

Monthly precipitation totals for the 2016 study year were above the 30-year normal for the months of May (10.2 mm above normal), and June (21.1 mm above normal), but were below the 30-year normal for the month of July (6.5 mm below normal) (Figure 3-4) (weather data obtained from <http://climate.weather.gc.ca>). For comparison, monthly precipitation totals for the 2014 study year were above normal for the months of May (0.6 mm above normal), June (9 mm above normal), and July (1.7 mm above normal).



BERNARD HARBOUR ARCTIC CHAR



Note: Calculated values are indicated by open circles derived from regression formula $y = 0.5768e^{-0.065x}$

Figure 3-3: Daily Stream Discharge (m³/s) Calculated for Nulahugyuk Creek Between 7 July and 25 July 2016

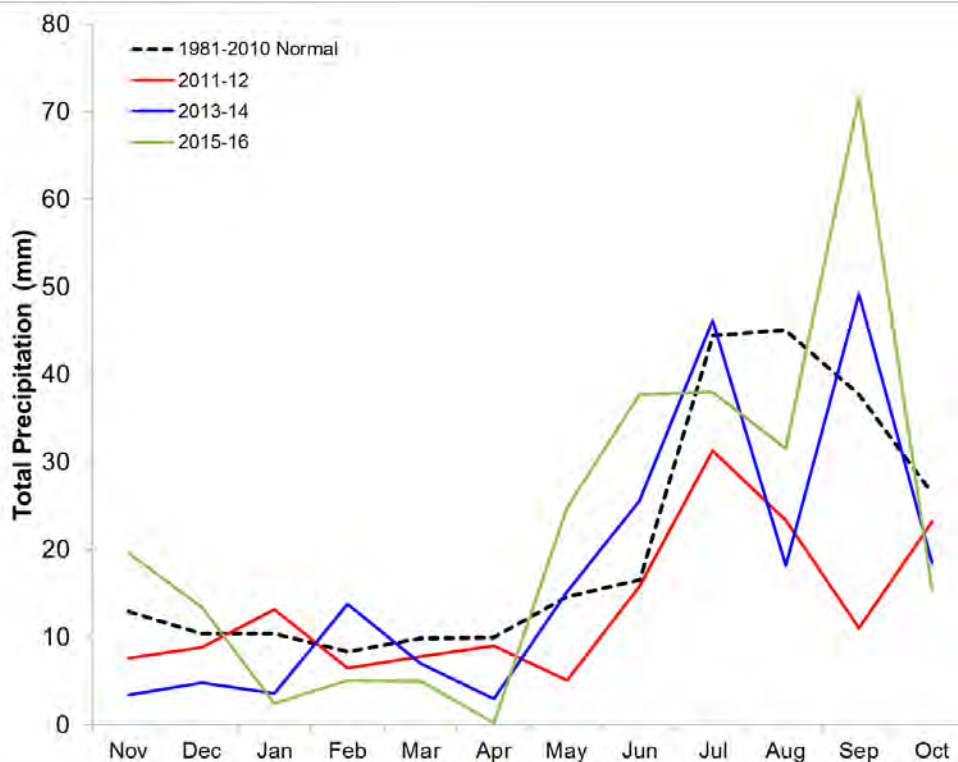


Figure 3-4: Monthly precipitation totals reported for 2011-12, 2013-14, and 2015-16 by the Environment Canada climate station at Kugluktuk, Nunavut



3.2 Fish Capture and Sampling

The fyke trap was in place for a total of 19 days, 21 hours and 40 minutes beginning the afternoon of 6 July 2016 (14:10) and ending 25 July 2016 (11:50). Five species were captured: Arctic Char, Arctic Cisco (*Coregonus autumnalis*), Arctic Cod (*Arctogadus glacialis*), Lake Trout (*Salvelinus namaycush*), and Spoonhead Sculpin (*Cottus ricei*) (non-char species shown in Appendix A, Photos A-15 through A-17). Total catch-per-unit-effort (CPUE) for the downstream opening portion of the fyke trap was 0.32 upstream migrating fish/h, while CPUE for the upstream opening portion of the fyke trap was 3.56 downstream migrating fish/h.

CPUE for char in the downstream opening portion of the fyke trap (Photo 3-1) was 0.12 fish/h, while CPUE for char in the upstream opening portion of the fyke trap (Photo 3-2) was 3.24 fish/h. Maximum daily catch of adult char in the upstream opening portion of the fyke trap was 10 fish on 9 July 2016; and maximum daily catch of juvenile char in the downstream opening portion of the fyke trap was 189 on 7 July 2016.



Photo 3-1: Adult Arctic Char Captured During Upstream Migration, 21 July 2016



BERNARD HARBOUR ARCTIC CHAR



Photo 3-2: Juvenile Arctic Char Captured During Downstream Migration, 12 July 2016

Most (86%) of the captured fish were char (1,467 juvenile captures and 55 adult captures), followed by Spoonhead Sculpin (228), Arctic Cod (10), Arctic Cisco (1), and Lake Trout (1). A portion of the catch were recaptured fish that were moving within the lower section of the creek where the fyke trap was installed. For example, the 55 captures of adult char represented 33 individual fish (60% of the catch) based on PIT tag identification. These char were lake-bound fish (Photo 3-1), first recorded in the downstream opening portion of the fyke trap as they started their upstream migration to Hingittok Lake from the ocean. Of the 1,467 captures of juvenile char, 1,452 were assumed to be of individual fish (99% of the catch) (Table 3-1). These fish were seaward bound (Photo 3-2), captured in the upstream opening portion of the fyke trap during their downstream migration to the ocean. For additional information on catch data, see Appendix B.

Char length and weight measurements are described in Table 3-1 and Figure 3-5 (not every individual was measured). The largest char was 879 mm in length with a weight of 7,350 g. Length and weight measurements for adult char were combined with those made in 2014 to provide the following length-weight relationship:

$$\log_{10} \text{Weight (g)} = -4.6039 + 2.8733 \times \log_{10} \text{Length (mm)} (R^2 = 0.87)$$



BERNARD HARBOUR ARCTIC CHAR

Table 3-1: Lengths and Weights for Arctic Char Captured in Nulahugyuk Creek, 6 July to 25 July 2016

Migratory Group	Number of Char	Length Range (mm)	Mean Length (mm) ± SD	Weight Range (g)	Mean Weight (g) ± SD	Mean Condition Factor ± SD
Juveniles moving downstream	1,452	104 to 228	157 ± 16	-	-	-
Adults moving upstream	33	560 to 879	709 ± 85	2,250 to 7,350	3,935	1.07

- =no data; the length-weight equation for 2014 juvenile fish was calculated as: $\log_{10} \text{Weight (g)} = -4.9282 + 2.9275 \times \log_{10} \text{Length (mm)}$ ($R^2 = 0.91$); n=number of fish; mm=millimetres; ± = plus or minus; SD=standard deviation; g=grams

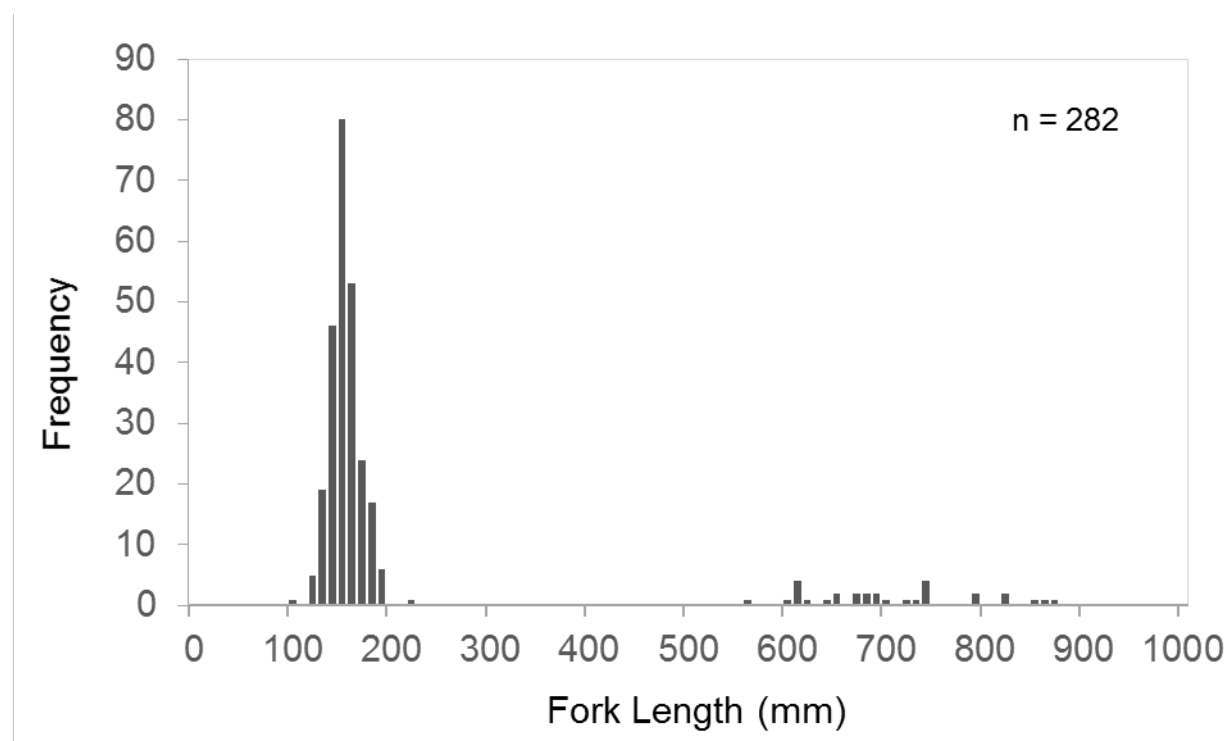


Figure 3-5: Length-Frequency Distribution of Arctic Char Captured in the Fyke Trap

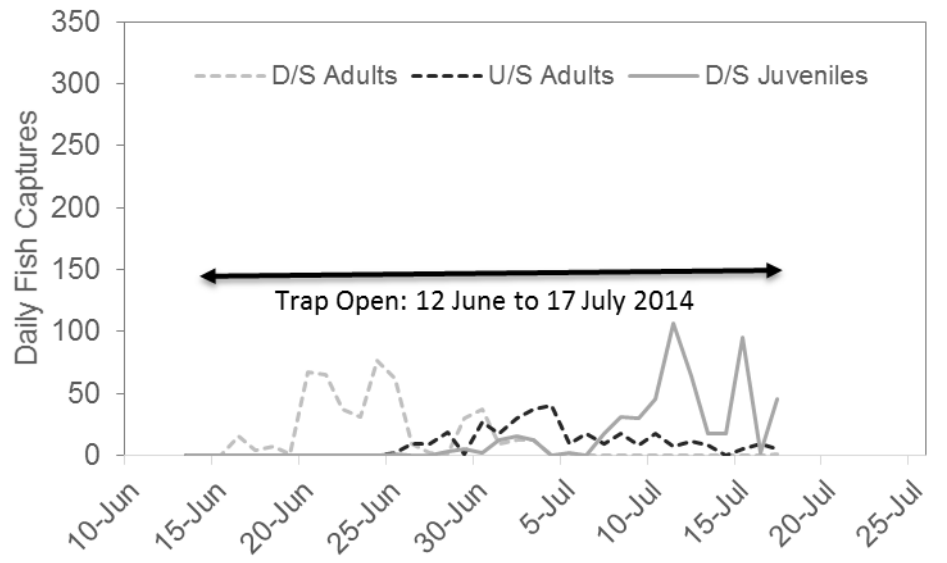
3.3 Fish Movements

Two distinct groups of migratory char were identified in July 2016, which included adults moving upstream ($n = 33$) to overwinter in Hingittok Lake, potentially spawning first, and juveniles moving downstream from Hingittok Lake to the ocean for foraging ($n = 1,452$) (Figure 3-6). Adult char migrating downstream from Hingittok Lake to the ocean were not observed in 2016. Based on the timing of migrations observed in 2014, it is expected that the downstream migration by adult char was completed 1 to 2 weeks prior to the installation of the fyke trap in 2016. The trapping period in 2016 is assumed to have captured the majority of the downstream migrating juvenile char, and any movements associated with the later stages of the upstream migration of adult char. Migration successes were quantified for adult char migrating upstream from the ocean to Hingittok Lake (see below – Migration Success).



BERNARD HARBOUR ARCTIC CHAR

A)



B)

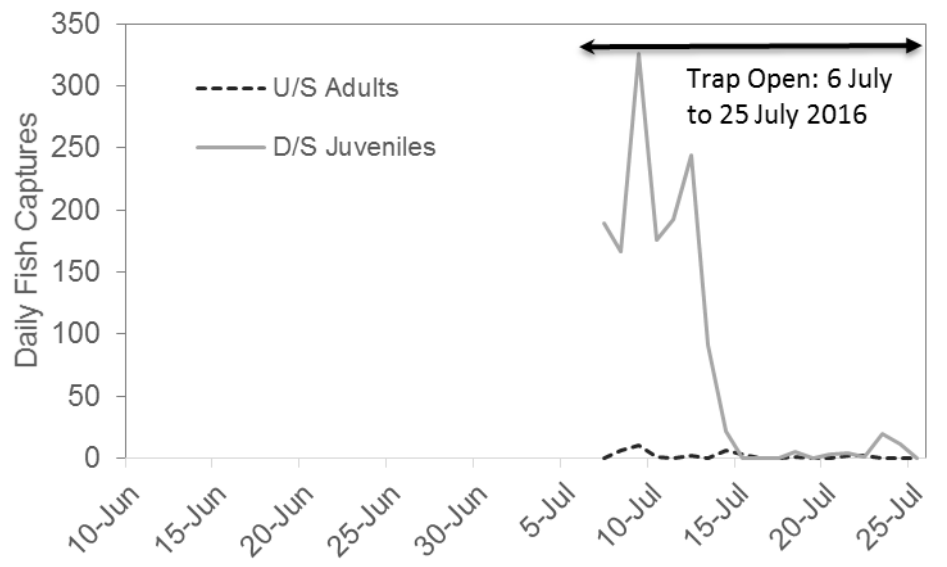


Figure 3-6: Daily Captures of Migratory Char in Nulahugyuk Creek, 2014 (A) and 2016 (B). D/S = downstream travelling fish and U/S = upstream travelling fish



BERNARD HARBOUR ARCTIC CHAR

3.3.1 Migration Success

In 2016, field data collection occurred from 8 to 24 July with discharge declining from 0.5 to 0.2 m³/s over that period. In 2014, field data collection occurred from 12 June to 17 July with discharge declining from 6.0 to an estimated 0.4 m³/s over that period (Golder 2015a). Differences in the timing of the data collection resulted in lower catch numbers in 2016 compared with 2014, however migration success results were similar when comparing sampling periods with comparable discharge (less than 0.5 m³/s) (Golder 2015a).

Of the 33 adult char captured while migrating upstream in 2016, 24 were new captures and implanted with PIT tags, 5 were recaptures previously tagged in 2014, and 4 were new captures but not tagged due to their poor health condition. The average length of upstream migrating adult char was 706 ± 16 mm, ranging from 560 to 879 mm in length and had an average mass of 3,897 ± 254 g ranging from 1,700 to 7,350 g. Of these, 14 adult char were detected at the downstream antenna array (LDSA) and three were detected at the upstream antenna array (MDSA). On average, it took char 7.7 h traveling 96 m/h (mean rate of travel) to reach LDSA, and another 24.9 h traveling 80 m/h to reach MDSA. Generally, char either moved relatively quickly to LDSA arriving at the array in less than 6.5 h, or progressed slowly taking over 11 h to complete the same journey. Travel times and speeds of individual char are presented in Table 3-2.

Table 3-2: Travel Time and Mean Speed of PIT-Tagged Char Migrating Upstream, 2016

PIT ID Number	Travel Time (h)			Mean Travel Speed (m/h)		
	TWFN-LDSA	LDSA-MDSA	TWFN-MDSA	TWFN-LDSA	LDSA-MDSA	TWFN-MDSA
228000152702	13.2			56		
228000152707	11.0			67		
228000152708	3.1	30.2	33.3	239	66	82
228000152709	3.5	19.6	23.1	211	102	118
228000152710	19.6			38		
228000152711	2.5			296		
228000152712	13.6			54		
228000152746	3.6			206		
228000152751	nd		25.1			109
228000152752	4.7			157		
228000152755	2.8			264		
228000152757	14.7			50		
228000152772	6.1			121		
228000152779	3.4			218		
228000152783	6.4			116		
Average	7.7	24.9	27.2	96	80	100

Note: 15 tagged char did not reach the LDSA and were not included in this table.

nd=not detected

Using a binary logistic regression, the primary factors influencing migratory success to MDSA in 2014 and 2016 were determined to be discharge and char weight. This relationship was expressed using the formula:

$$P = \frac{e^{-5.475+13.709x-4.282x^2-0.628y}}{1 + e^{-5.475+13.709x-4.282x^2-0.628y}}$$



BERNARD HARBOUR ARCTIC CHAR

where P was the probability of success, x was discharge (m^3/s), and y was the char mass in kilograms (kg). Model fit was significant ($p < 0.001$) with an ROC value of 0.87. Parameter estimates are presented in Table 3-3. There was no significant difference in the number of char reaching the upstream array between 2014 and 2016 under similar discharge conditions (less than $0.5 \text{ m}^3/\text{s}$; $p = 0.452$).

With respect to discharge, the probability of successfully reaching the upstream array ranged from a high of 95% at $1.6 \text{ m}^3/\text{s}$ or greater, declining to a low of 0% at $0.2 \text{ m}^3/\text{s}$, when char mass was held constant using the mean char mass of 4.20 kg. The P_{50} was $0.79 \text{ m}^3/\text{s}$. With respect to char mass, the probability of successfully reaching the upstream antenna array ranged from a high of 96% for char that had a maximum mass of 2.0 kg to a low of 38% for 7.55 kg (the maximum char mass measured), when discharge was held constant using the weighted mean discharge of $1.06 \text{ m}^3/\text{s}$. The P_{50} was calculated as 6.75 kg.

For the data collection period in 2016, the probability of char successfully reaching the upstream array ranged from a high of 11% at a maximum discharge of $0.5 \text{ m}^3/\text{s}$, declining to a low of 0% at $0.2 \text{ m}^3/\text{s}$, when char mass was held constant using the 2016 mean char mass of 3.90 kg (Figure 3-7). Regarding char mass, the probability of char successfully reaching the upstream antenna array ranged from a high of 14% for fish that had a mass of 2.0 kg to a low of 1% in fish that had a mass of 5.75 kg, when discharge was held constant using the 2016 weighted mean discharge of $0.41 \text{ m}^3/\text{s}$ (Figure 3-8).

Table 3-3: Parameter Metrics for Binary Logistic Regression of Migratory Success

Parameter	Estimate	Standard Error	Z	p-Value	95% Confidence Interval	
					Lower	Upper
Constant	-5.475	1.11	-4.9325	<0.001	-7.6506	-3.2995
Discharge (x)	13.709	1.8335	7.4766	<0.001	10.1149	17.3022
Discharge ² (x^2)	-4.282	0.67	-6.3914	<0.001	-5.595	-2.9688
Weight (kg) (y)	-0.628	0.156	-4.0293	<0.001	-0.9341	-0.3227

z=z score; p-Value=probability value; % =percent; < =less than; kg=kilograms



BERNARD HARBOUR ARCTIC CHAR

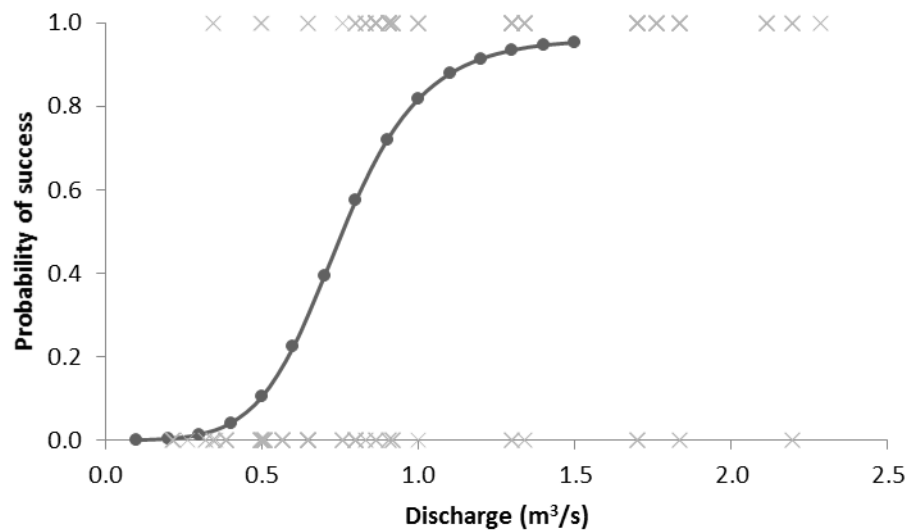


Figure 3-7: Results of Binary Logistic Regression Plotting the Probability of Migration Success against Stream Discharge (x), Holding Char Body Weight Constant at 3.90 kg

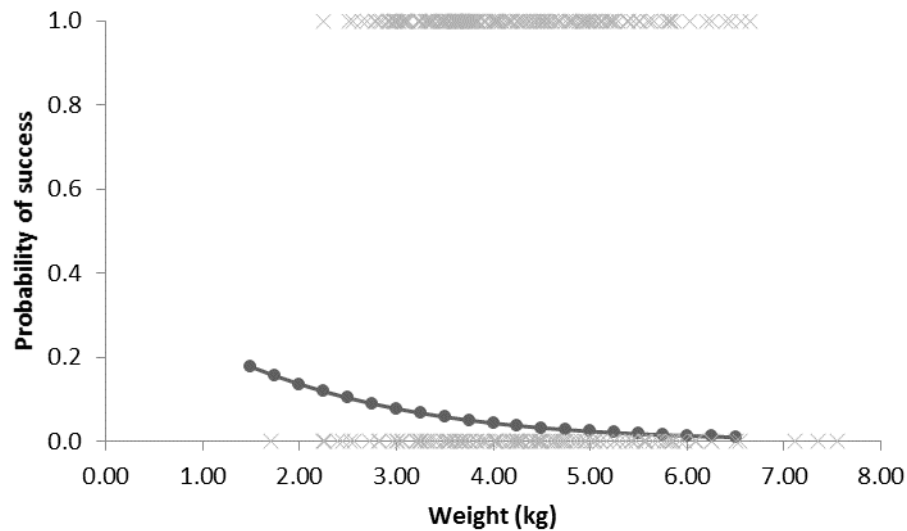


Figure 3-8: Results of Binary Logistic Regression Plotting the Probability of Migration Success against Char Body Weight (y), Holding Mean Stream Discharge Constant at 0.408 m³/s



BERNARD HARBOUR ARCTIC CHAR

3.3.2 Migration Retreat

Between 2014 and 2016, 31 tagged fish were detected retreating from Nulahugyuk Creek after initiating an upstream migration, including 18 char in 2014 (6% of tagged fish) and 13 char in 2016 (45% of tagged fish). The proportion of char retreating in 2014 under discharge conditions similar to that observed in 2016 was only 1 of 30 fish (3.3%). The unusually warm water temperatures in early July that exceeded a known thermal stress barrier for salmonids (21°C; McCullough 1999), and the new location of the fyke trap near the interface of fresh and brackish water (during high tides only) in 2016 provided an opportunity to examine the ability of char to acclimatize as they entered the creek from the ocean. Some of the char (5 of 13) in 2016 re-attempted the migration 3 to 14 days after exiting the creek on their first attempt.

Using a binary logistic regression, the primary factor influencing retreat in 2014 and 2016 was determined to be maximum daily water temperature with a significant difference observed between years (Table 3-4). There was no interaction between temperature and year ($p = 0.509$). The relationship was expressed using the formula:

$$P = \frac{e^{-5.190+0.265x_1-1.719x_2}}{1 + e^{-5.190+0.265x_1-1.719x_2}}$$

where P was the probability of success, x_1 was maximum daily temperature (°C), and x_2 was year (2016 = 0 and 2014 = 1). Model fit was significant ($p < 0.001$) with an ROC value of 0.77. Parameter estimates are presented in Table 3-4. The output of the formula is presented graphically in Figures 3-9 and 3-10.

In 2014 the probability of retreat ranged from 17% at 20.2°C (July 15, 2014) to 2% at 11.0°C (27 June 2014). The P_{50} was calculated as 26.1°C. In 2016 the probability of retreat was determined to range from 67% at 22.3°C (9 July 2016) to 6% at 9.5°C (22 July 2016). The P_{50} was calculated as 19.6°C. The effect of year (i.e., as a surrogate of trap position) suggests that adult char acclimation occurs near the mouth of the creek and that char are more committed to their migration the further upstream they swim.

Table 3-4: Parameter Metrics for Binary Logistic Regression of Retreat

Parameter	Estimate	Standard Error	Z	p-Value	95% Confidence Interval	
					Lower	Upper
Constant	-5.1902	1.8072	-2.8719	0.0041	-8.7323	-1.648
Year	-1.7191	0.5854	-2.9364	0.0033	-2.8665	-0.5716
Maximum Daily Temperature	0.2645	0.0885	2.9877	0.0028	0.091	0.4381



BERNARD HARBOUR ARCTIC CHAR

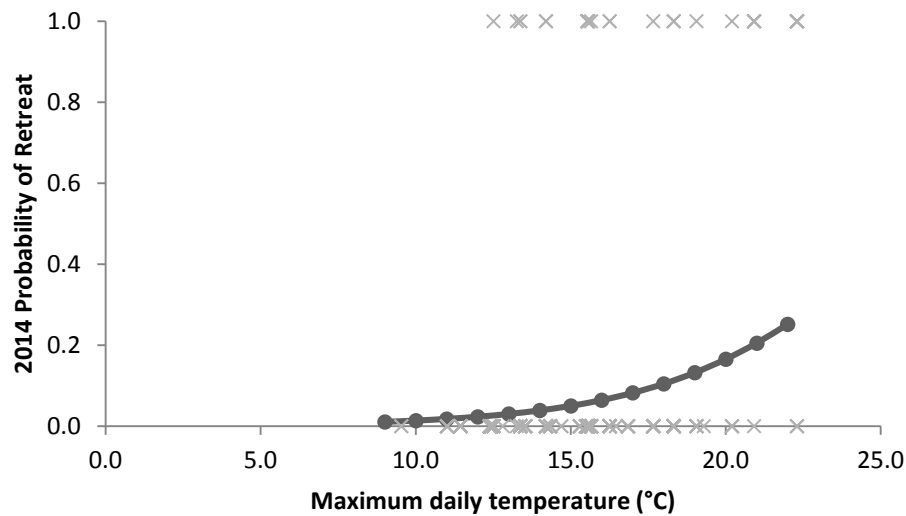


Figure 3-9: Results of Binary Logistic Regression Plotting the Probability of Retreat against Maximum Daily Temperature in 2014

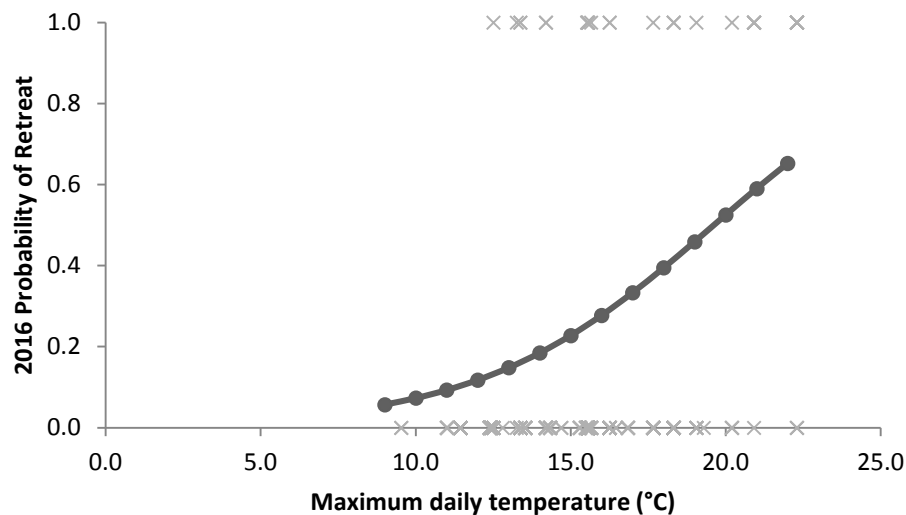


Figure 3-10: Results of Binary Logistic Regression Plotting the Probability of Retreat against Maximum Daily Temperature in 2016

3.4 Habitat Assessments

Habitat conditions were similar to that described in July 2014 (Golder 2015a). Flow characteristics of the creek (not including the pools) at the time of sampling included mean water depths = 0.23 m, mean water velocities = 0.28 m/s, and mean wetted widths = 27.8 m (n = 45 transects). The most prevalent habitat type was riffle habitat (35%) defined by a broken water surface due to effects of exposed bed materials, and by relatively shallow water during moderate to low-flow periods (typically less than 0.25 m). Riffle habitat was common in the lower 3.4 km of Nulahugyuk Creek. Shallow run habitat, defined by moderate to high current velocity relative to pool habitats, a water surface that is largely unbroken, and water depths averaging less than 0.50 m, was the second most



BERNARD HARBOUR ARCTIC CHAR

common (25%) habitat type. Rapids comprised 23% of the creek length, occurring only in creek Section 2 (between 4.2 to 6.0 km upstream from the creek mouth), and riffle/boulder garden habitat comprised 17% of the creek length. Overall substrate composition was 37% boulder, 28% cobble, 25% gravel, 7% fines, and 3% bedrock. The habitat survey indicated little cover for adult char (14% of creek area), where any cover was provided by intermittent (or discontinuous) undercut banks and large boulders; however, it is expected that the abundance of small and large boulders in the creek provides suitable cover for juvenile char (79% of creek area).

Thirteen problem locations were identified or re-evaluated during the habitat assessment and are described in detail in Appendix C. These locations are where fishery productivity, characterized by char production (i.e., available biomass for harvesting), may benefit from enhancement projects (Table 3-5).

Table 3-5: Summary of Potential Locations for Fish Passage Enhancement Projects

Site Identification	Stream Section	Approximate Distance Upstream from Creek Outlet (km)	Expected Risk of Mortality and/or Blockage Rank (Higher Ranking = Higher Risk)	Minimum Required Low-Flow Channel Length to Improve Passage (m)
Site 1 ^a	Section 1	1.40	Rank 3	41
Site 2	Section 1	1.63	Rank 2	42 ^b
Site 3	Section 1	1.69	Rank 2	34 ^c
Site 4	Section 1	2.03	Rank 2	30
Site 5	Section 1	2.15	Rank 3	22
Site 6	Section 1	2.50	Rank 3	45
Site 7	Section 1	3.05	Rank 2	14
Site 8	Section 2	4.87	Rank 1	20
Site 9	Section 2	5.76	Rank 1	40
Site 10	Section 3	7.89	Rank 1	15
Site 11 ^d	Section 1	2.22	Rank 1	38
Site 12 ^d	Section 1	2.40	Rank 1	19
Site 13 ^d	Section 1	3.10	Rank 1	15

Note: extended rock weirs are recommended for most sites, for example, to direct char migrating upstream through the low-flow channels

^a The site was initially described as two separate problem locations in 2014 but was later characterized in 2015 as one problem location requiring an extended low-flow channel (versus two separate consecutive channels)

^b Two parallel low-flow channels recommended (length represents combined length of parallel channels)

^c Problem location requires further evaluation; a directional weir may be a viable alternative for this location

^d Problem sites identified in 2015

km=kilometres; m=metre

3.4.1 2012 Low-Flow Channel Integrity

Photographs of previously constructed low-flow channels (Golder 2013) are provided in Photos 3-3 to 3-7. Supporting information on channel width, velocity, and depth for each project are summarized in Table 3-6 and Table 3-7. Mean depths of the 2012 projects have remained at approximately 0.2 m depths under low-flow conditions, which is adequate depth for adult char to successfully migrate upstream.



BERNARD HARBOUR ARCTIC CHAR

Table 3-6: Summary of Low-Flow Channel Data

Project	Wetted Width (m)		Centre Depth (m)		Velocity (m/s)	
	Mean	± SD	Mean	± SD	Mean	± SD
Project 1	1.08	0.15	0.14	0.03	0.44	0.32
Project 2	2.47	0.20	0.24	0.06	0.48	0.24
Project 3	2.67	0.55	0.17	0.06	0.36	0.19
Project 4	3.30	2.14	0.21	0.06	0.53	0.18
Project 5	2.20	0.64	0.24	0.14	0.57	0.23

± =plus or minus; SD=standard deviation; m=metre; m/s=metres per second

Table 3-7: Comparison of 2016, 2014, and 2012 Low-Flow Channel Mean Depth Data

Project	Low-Flow Channel Conditions					
	2012 ^a Depth (m)	± SD	2014 ^b Depth (m)	± SD	2016 ^c Depth (m)	± SD
Project 1	0.17	0.03	0.13	0.03	0.14	0.03
Project 2	0.24	0.04	0.17	0.04	0.24	0.06
Project 3	NA	NA	0.22	0.03	0.17	0.06
Project 4	0.20	0.04	0.17	0.06	0.21	0.06
Project 5	0.19	0.05	0.19	0.10	0.24	0.14
Mean	0.20		0.18		0.20	

^a Discharge at time of measurement approximately 0.36 m³/s

^b Discharge at time of measurement approximately 0.38 m³/s

^c Discharge at time of measurement approximately 0.51 m³/s

± =plus or minus; SD=standard deviation; m=metre; NA=not available

As concluded from the assessments performed in July 2014 and 2015 (Golder 2015a, 2015b), the low-flow channels constructed in 2012 were deemed structurally intact in 2016, and provided char with suitable depths and velocities to create an enhanced path for upstream migration. The only low-flow channel project that required minor repair was project 5 where boulders within a directional weir on the right downstream bank were displaced. The boulders were repositioned at the weir location by one field technician with less than one hour of effort (Photos 3-8 and 3-9).



BERNARD HARBOUR ARCTIC CHAR



Photo 3-3: 2012 Project 1, Facing Downstream, 8 July 2016



Photo 3-4: 2012 Project 2, Facing Downstream, 8 July 2016



BERNARD HARBOUR ARCTIC CHAR



Photo 3-5: 2012 Project 3, Facing Upstream, 8 July 2016



Photo 3-6: 2012 Project 4, Facing Downstream, 8 July 2016



BERNARD HARBOUR ARCTIC CHAR



Photo 3-7: 2012 Project 5, Facing Downstream, 8 July 2016



Photo 3-8: 2012 Project 5, Showing Failed Directional Weir Near Right Downstream Bank, 15 July 2016



Photo 3-9: 2012 Project 5, Showing Repaired Directional Weir Near Right Downstream Bank, 15 July 2016

4.0 SUMMARY

The 2016 field program provided data contributing to a better understanding of the Bernard Harbour Arctic Char migration, and a rigorous dataset for evaluating future changes in the local stock. The baseline data collection period coincided with a short period of above average water temperatures in early July that exceeded a known thermal stress barrier for salmonids. Although monitoring may have occurred during above average flow conditions at the start of the sampling period in early July based on climate data normals for the region, creek discharge at the start of the field program was below the previously identified flow threshold at which adult char can successfully migrate to Hingittok Lake (Golder 2015a).

Even under the low-flow conditions, 33 adult char were captured in the fyke trap moving upstream from the ocean to spawn in Hingittok Lake. Only three char (10.3% of tagged char) were detected at the upstream antenna array, and using 2014 and 2016 data combined, the estimated discharge at which there is a 50% probability of an adult Arctic Char reaching the upstream antenna array was $0.8 \text{ m}^3/\text{s}$. It is unlikely that any of these char were successful in reaching Hingittok Lake, in part, because of the stress incurred while navigating shallow water in the lower sections of Nulahugyuk Creek.

The fyke trap also captured 1,467 juvenile char. Although the start of the juvenile char downstream migration was not monitored in 2016, the number of juvenile captures exceeded that recorded during the extended monitoring period in 2014 when only 522 juvenile char were captured. Assuming that the age of a juvenile char migrating downstream is 4 years old, the number of captured juvenile char may reflect, in part, the number of adult Arctic Char run that successfully reached Hingittok Lake in 2012 (estimated to be 116 char; see Golder 2013).



BERNARD HARBOUR ARCTIC CHAR

Observations of creek habitat and the physical dimensions of previously constructed low-flow channels were similar to those made in 2014. The low-flow channels constructed in 2012 (Golder 2013) were deemed structurally intact, providing char with suitable depths, velocities, and an unobstructed path for migration to upstream locations. Thirteen remaining problem locations were confirmed in 2016 where low-flow channels are recommended to improve upstream passage of fish. Remediation of these problem locations are expected to benefit the production of Arctic Char stock at Bernard Harbour (i.e., increase available biomass for harvesting through increased survival, access, and recruitment).



Report Signature Page

GOLDER ASSOCIATES LTD.

Kent Nuspi
Aquatic Biologist

Cameron Stevens
Associate, Aquatic Biologist

Colin Arens
Fisheries Biologist

Ryan Popowich
Associate, Aquatic Biologist

KN/CA/CS/RP/jr

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.



5.0 REFERENCES

- Golder (Golder Associates Ltd.) 2013. 2012 Field Report: Stream Restoration and Community Stewardship of Arctic Char at Nulahugyuk (Bernard Harbour). Submitted to Environment Canada. Golder Project #10-1373-0075: 23 p. + app.
- Golder. 2015a. Back River Project: Conceptual Fish Offsetting Plan. Prepared for Sabina Gold & Silver Corp. by Golder Associates Ltd.
- Golder. 2015b. Community Based Monitoring at Bernard Harbour, Nunavut, July 2015. Memo prepared for Sabina Gold & Silver Corp.. Golder Project #1419666-3000: 6 p.
- Guy CS, Brown ML. 2007. Analysis and Interpretation of Freshwater Fisheries Data. Edited by C. S. Guy and M. L. Brown. American Fisheries Society, Bethesda, Maryland, USA.
- Hawkins CP, Kershner JL, Bison PA, Bryant MD, Decker LM, Gregory SV, McCullough DA, Overton CK, Reeves GH, Steedman RJ, Young MK. 1993. A Hierarchical Approach to Classifying Stream Habitat Features. Fisheries 18:3-12.
- McCullough DA. 1999. A Review and Synthesis of Effects of Alterations to the Water Temperature Regime on Freshwater Life Stages of Salmonids, with Species Reference to Chinook Salmon. Prepared for the U.S. Environmental Protection Agency. 291 pp.
- Prno, J. and J. Kaiyogana. 2015. Traditional Knowledge Study Report on the Arctic Char Fishery in the Nulahugyuk Creek – Hingittok Lake Area (Bernard Harbour), Nunavut. Report prepared by the Kugluktuk Hunters and Trappers Organization and Sabina Gold & Silver Corp. April 2015.
- Puffer M, Berg OK, Huusko A, Vehanen T, Forseth T, Einum, S. 2015. Seasonal Effects of Hydropeaking on Growth, Energetics, And Movement of Juvenile Atlantic Salmon (*Salmo salar*). River Research and Applications 31: 1101-1108.
- Stern MJ, Powell RB, Ardoin NM. 2008. What Difference Does It Make? Assessing outcomes from participation in a residential environmental education program. Reports & Research 39: 31–43.
- Zar JH. 1999. Biostatistical Analysis. Prentice Hall, New Jersey, 663 pp.



APPENDIX A

Project Photos



APPENDIX A

Photographs



Photo A-1: Arrival at abandoned DEW-Line site 5 km southeast from Bernard Harbour, 6 July 2016.



Photo A-2: Downstream fyke-net trap used to capture out-migrating juvenile Arctic Char, 12 July 2016.



APPENDIX A

Photographs

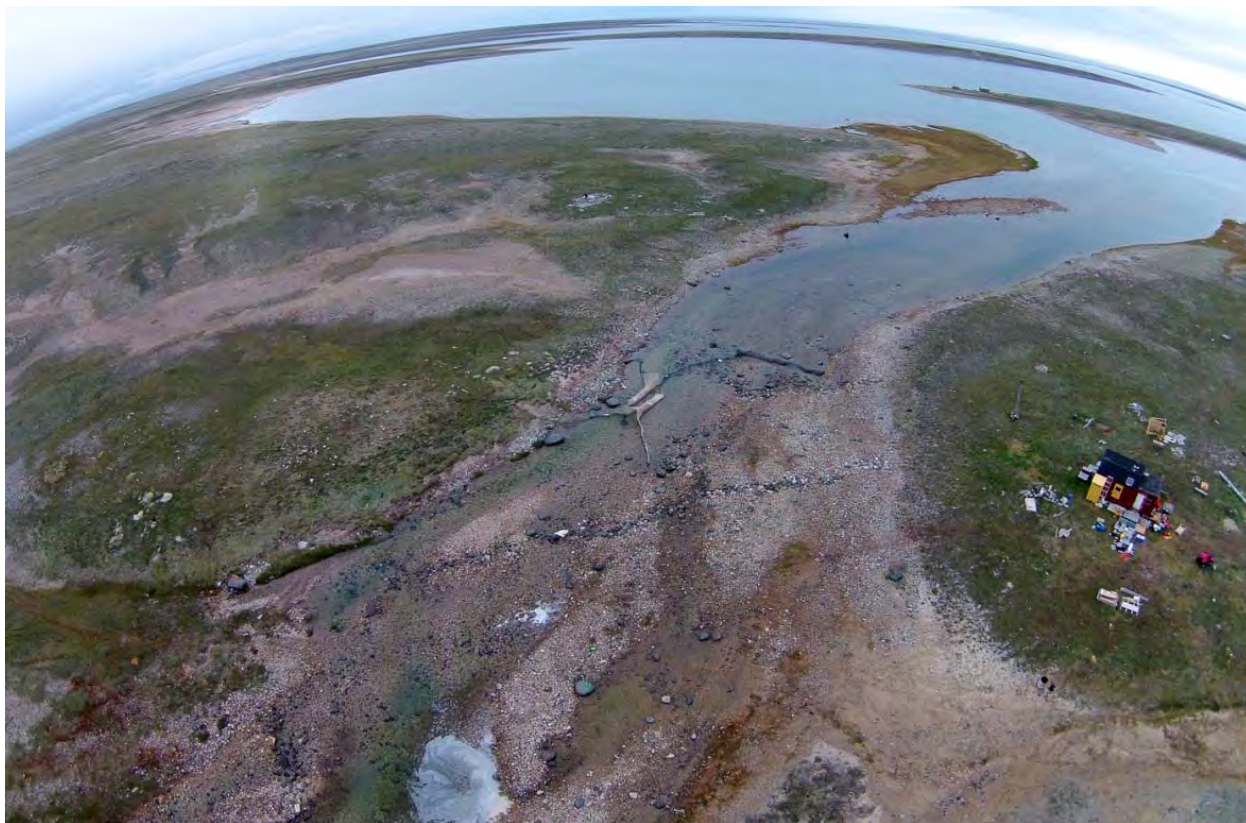


Photo A-3: Aerial view of base camp/HTO cabin and fyke trap layout at stream/estuary interface, 10 July 2016.



Photo A-4: Base camp/HTO cabin on lower Nulahugyuk Creek, Bernard Harbour, 24 July 2016.



APPENDIX A

Photographs

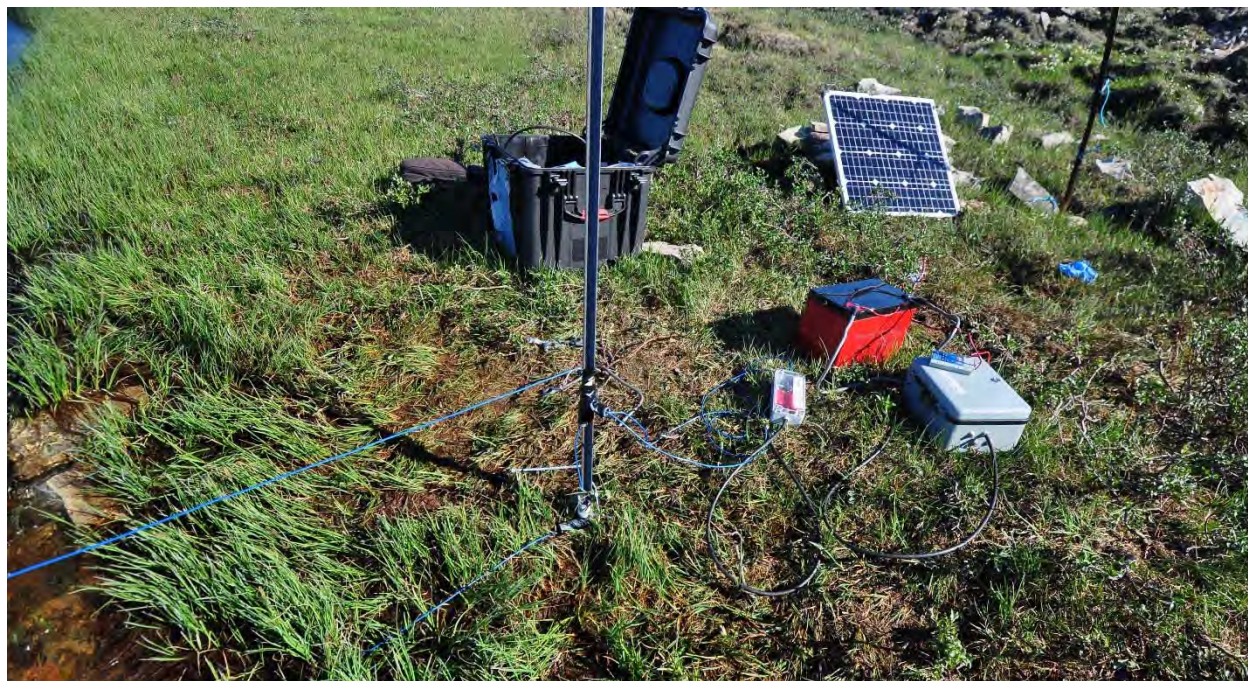


Photo A-5: Antenna array tuner and reader box, setup on the bank Nulahugyuk Creek, 10 July 2016.



Photo A-6: Aerial upstream view of Nulahugyuk Creek 0.75 km upstream from the outlet. Discharge station was at narrow bottleneck immediately upstream from the bend in the creek, 10 July 2016.



APPENDIX A

Photographs



Photo A-7: Large male Arctic Char pit tagged and being released upstream from the fyke trap, 12 July 2016.



Photo A-8: Pair of Arctic Char in lower Nulahugyuk Creek, 12 July 2016.



APPENDIX A

Photographs



Photo A-9: Migrating Arctic Char resting in shallows during warm water conditions, 8 July 2016



Photo A-10: Large pool (refugia) at km 2 on Nulahugyuk Creek, 11 July 2016.



APPENDIX A

Photographs



Photo A-11: Wide, shallow section of Nulahugyuk Creek at km 4.3, 13 July 2014.



Photo A-12: Arctic Char entering freshwater interface in estuary of Nulahugyuk Creek, 12 July 2016.



APPENDIX A

Photographs



Photo A-13: Upstream migrating Arctic Char in Project 4 area at km 0.5, 12 July 2016



Photo A-14: View of Golder Fish Biologist snorkeling to observe char following release after processing, 18 July 2016.



APPENDIX A

Photographs



Photo A-15: Spoonhead Sculpin caught and released from the fyke trap, 22 July 2016.



Photo A-16: An Arctic Cisco captured in lower Nulahugyuk Creek, 1o July 2016.



APPENDIX A

Photographs



Photo A-17: Arctic Cod in live-well prior to release, 24 July 2016.



Photo A-18: Golder biologist and an HTO student holding an Arctic Char, 24 July 2016.



APPENDIX B

Fish Catch Data for Lower Nulahugyuk Creek, 6 to 25 July 2016



APPENDIX B

Fish Catch Data for the Two-Way Fyke Net Trap

Table B1: Fish Catch Data from the Fyke Trap on Nulahugyuk Creek, 7 to 25 July 2016

Fish ID#	PIT Tag# ^b	2014 Floy Tag#	2014 Recap.? (Y/N)	Species	Date	Time	No. of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
1	-	-	N	ARCH	7-Jul-16	9:15	1	D	193	-	-
2	-	-	N	ARCH	7-Jul-16	9:15	1	D	162	-	-
3	-	-	N	ARCH	7-Jul-16	9:15	1	D	158	-	-
4	-	-	N	ARCH	7-Jul-16	9:15	1	D	156	-	-
5	-	-	N	ARCH	7-Jul-16	9:15	1	D	171	-	-
6	-	-	N	ARCH	7-Jul-16	9:15	1	D	228	-	-
7	-	-	N	ARCH	7-Jul-16	9:15	1	D	178	-	-
8	-	-	N	ARCH	7-Jul-16	9:15	1	D	139	-	-
9	-	-	N	ARCH	7-Jul-16	9:15	1	D	182	-	-
10	-	-	N	ARCH	7-Jul-16	9:15	1	D	166	-	-
11	-	-	N	ARCH	7-Jul-16	9:15	1	D	134	-	-
12	-	-	N	ARCH	7-Jul-16	9:15	1	D	159	-	-
13	-	-	N	ARCH	7-Jul-16	9:15	1	D	182	-	-
14	-	-	N	ARCH	7-Jul-16	9:15	1	D	141	-	-
15	-	-	N	ARCH	7-Jul-16	9:15	1	D	146	-	-
16	-	-	N	ARCH	7-Jul-16	9:15	1	D	177	-	-
17	-	-	N	ARCH	7-Jul-16	9:15	1	D	189	-	-
18	-	-	N	ARCH	7-Jul-16	9:15	1	D	157	-	-
19	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
20	-	-	N	ARCH	7-Jul-16	9:15	1	D	183	-	-
21	-	-	N	ARCH	7-Jul-16	9:15	1	D	168	-	-
22	-	-	N	ARCH	7-Jul-16	9:15	1	D	143	-	-
23	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
24	-	-	N	ARCH	7-Jul-16	9:15	1	D	183	-	-
25	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
26	-	-	N	ARCH	7-Jul-16	9:15	1	D	161	-	-
27	-	-	N	ARCH	7-Jul-16	9:15	1	D	166	-	-
28	-	-	N	ARCH	7-Jul-16	9:15	1	D	167	-	-
29	-	-	N	ARCH	7-Jul-16	9:15	1	D	158	-	-
30	-	-	N	ARCH	7-Jul-16	9:15	1	D	139	-	-
31	-	-	N	ARCH	7-Jul-16	9:15	1	D	136	-	-
32	-	-	N	ARCH	7-Jul-16	9:15	1	D	193	-	-
33	-	-	N	ARCH	7-Jul-16	9:15	1	D	149	-	-
34	-	-	N	ARCH	7-Jul-16	9:15	1	D	141	-	-
35	-	-	N	ARCH	7-Jul-16	9:15	1	D	154	-	-
36	-	-	N	ARCH	7-Jul-16	9:15	1	D	147	-	-
37	-	-	N	ARCH	7-Jul-16	9:15	1	D	142	-	-
38	-	-	N	ARCH	7-Jul-16	9:15	1	D	156	-	-
39	-	-	N	ARCH	7-Jul-16	9:15	1	D	177	-	-
40	-	-	N	ARCH	7-Jul-16	9:15	1	D	168	-	-
41	-	-	N	ARCH	7-Jul-16	9:15	1	D	158	-	-
42	-	-	N	ARCH	7-Jul-16	9:15	1	D	172	-	-
43	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
44	-	-	N	ARCH	7-Jul-16	9:15	1	D	166	-	-



APPENDIX B

Fish Catch Data for the Two-Way Fyke Net Trap

Table B1: Fish Catch Data from the Fyke Trap on Nulahugyuk Creek, 7 to 25 July 2016

Fish ID#	PIT Tag# ^b	2014 Floy Tag#	2014 Recap.? (Y/N)	Species	Date	Time	No. of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
45	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
46	-	-	N	ARCH	7-Jul-16	9:15	1	D	158	-	-
47	-	-	N	ARCH	7-Jul-16	9:15	1	D	161	-	-
48	-	-	N	ARCH	7-Jul-16	9:15	1	D	151	-	-
49	-	-	N	ARCH	7-Jul-16	9:15	1	D	151	-	-
50	-	-	N	ARCH	7-Jul-16	9:15	1	D	166	-	-
51	-	-	N	ARCH	7-Jul-16	9:15	1	D	121	-	-
52	-	-	N	ARCH	7-Jul-16	9:15	1	D	142	-	-
53	-	-	N	ARCH	7-Jul-16	9:15	1	D	147	-	-
54	-	-	N	ARCH	7-Jul-16	9:15	1	D	166	-	-
55	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
56	-	-	N	ARCH	7-Jul-16	9:15	1	D	198	-	-
57	-	-	N	ARCH	7-Jul-16	9:15	1	D	149	-	-
58	-	-	N	ARCH	7-Jul-16	9:15	1	D	151	-	-
59	-	-	N	ARCH	7-Jul-16	9:15	1	D	151	-	-
60	-	-	N	ARCH	7-Jul-16	9:15	1	D	166	-	-
61	-	-	N	ARCH	7-Jul-16	9:15	1	D	161	-	-
62	-	-	N	ARCH	7-Jul-16	9:15	1	D	136	-	-
63	-	-	N	ARCH	7-Jul-16	9:15	1	D	153	-	-
64	-	-	N	ARCH	7-Jul-16	9:15	1	D	148	-	-
65	-	-	N	ARCH	7-Jul-16	9:15	1	D	146	-	-
66	-	-	N	ARCH	7-Jul-16	9:15	1	D	146	-	-
67	-	-	N	ARCH	7-Jul-16	9:15	1	D	133	-	-
68	-	-	N	ARCH	7-Jul-16	9:15	1	D	175	-	-
69	-	-	N	ARCH	7-Jul-16	9:15	1	D	182	-	-
70	-	-	N	ARCH	7-Jul-16	9:15	1	D	151	-	-
71	-	-	N	ARCH	7-Jul-16	9:15	1	D	150	-	-
72	-	-	N	ARCH	7-Jul-16	9:15	1	D	150	-	-
73	-	-	N	ARCH	7-Jul-16	9:15	1	D	132	-	-
74	-	-	N	ARCH	7-Jul-16	9:15	1	D	147	-	-
75	-	-	N	ARCH	7-Jul-16	9:15	1	D	144	-	-
76	-	-	N	ARCH	7-Jul-16	9:15	1	D	163	-	-
77	-	-	N	ARCH	7-Jul-16	9:15	1	D	140	-	-
78	-	-	N	ARCH	7-Jul-16	9:15	1	D	139	-	-
79	-	-	N	ARCH	7-Jul-16	9:15	1	D	151	-	-
80	-	-	N	ARCH	7-Jul-16	9:15	1	D	165	-	-
81	-	-	N	ARCH	7-Jul-16	9:15	1	D	138	-	-
82	-	-	N	ARCH	7-Jul-16	9:15	1	D	159	-	-
83	-	-	N	ARCH	7-Jul-16	9:15	1	D	158	-	-
84	-	-	N	ARCH	7-Jul-16	9:15	1	D	142	-	-
85	-	-	N	ARCH	7-Jul-16	9:15	1	D	133	-	-
86	-	-	N	ARCH	7-Jul-16	9:15	1	D	138	-	-
87	-	-	N	ARCH	7-Jul-16	9:15	1	D	143	-	-
88	-	-	N	ARCH	7-Jul-16	9:15	1	D	128	-	-



APPENDIX B

Fish Catch Data for the Two-Way Fyke Net Trap

Table B1: Fish Catch Data from the Fyke Trap on Nulahugyuk Creek, 7 to 25 July 2016

Fish ID#	PIT Tag# ^b	2014 Floy Tag#	2014 Recap.? (Y/N)	Species	Date	Time	No. of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
89	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
90	-	-	N	ARCH	7-Jul-16	9:15	1	D	136	-	-
91	-	-	N	ARCH	7-Jul-16	9:15	1	D	143	-	-
92	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
93	-	-	N	ARCH	7-Jul-16	9:15	1	D	143	-	-
94	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
95	-	-	N	ARCH	7-Jul-16	9:15	1	D	136	-	-
96	-	-	N	ARCH	7-Jul-16	9:15	1	D	153	-	-
97	-	-	N	ARCH	7-Jul-16	9:15	1	D	148	-	-
98	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
99	-	-	N	ARCH	7-Jul-16	9:15	1	D	153	-	-
100	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
101	-	-	N	ARCH	7-Jul-16	9:15	1	D	161	-	-
102	-	-	N	ARCH	7-Jul-16	9:15	1	D	122	-	-
103	-	-	N	ARCH	7-Jul-16	9:15	1	D	160	-	-
104	-	-	N	ARCH	7-Jul-16	9:15	1	D	128	-	-
105	-	-	N	ARCH	7-Jul-16	9:15	1	D	173	-	-
106	-	-	N	ARCH	7-Jul-16	9:15	1	D	162	-	-
107	-	-	N	ARCH	7-Jul-16	9:15	1	D	142	-	-
108	-	-	N	ARCH	7-Jul-16	9:15	1	D	157	-	-
109	-	-	N	ARCH	7-Jul-16	9:15	1	D	155	-	-
110	-	-	N	ARCH	7-Jul-16	9:15	1	D	170	-	-
111	-	-	N	ARCH	7-Jul-16	9:15	1	D	130	-	-
112	-	-	N	ARCH	7-Jul-16	9:15	1	D	148	-	-
113	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
114	-	-	N	ARCH	7-Jul-16	9:15	1	D	129	-	-
115	-	-	N	ARCH	7-Jul-16	9:15	1	D	160	-	-
116	-	-	N	ARCH	7-Jul-16	9:15	1	D	143	-	-
117	-	-	N	ARCH	7-Jul-16	9:15	1	D	155	-	-
118	-	-	N	ARCH	7-Jul-16	9:15	1	D	165	-	-
119	-	-	N	ARCH	7-Jul-16	9:15	1	D	160	-	-
120	-	-	N	ARCH	7-Jul-16	9:15	1	D	150	-	-
121	-	-	N	ARCH	7-Jul-16	9:15	1	D	170	-	-
122	-	-	N	ARCH	7-Jul-16	9:15	1	D	180	-	-
123	-	-	N	ARCH	7-Jul-16	9:15	1	D	160	-	-
124	-	-	N	ARCH	7-Jul-16	9:15	1	D	158	-	-
125	-	-	N	ARCH	7-Jul-16	9:15	1	D	149	-	-
126	-	-	N	ARCH	7-Jul-16	9:15	1	D	140	-	-
127	-	-	N	ARCH	7-Jul-16	9:15	1	D	168	-	-
128	-	-	N	ARCH	7-Jul-16	9:15	1	D	190	-	-
129	-	-	N	ARCH	7-Jul-16	9:15	1	D	153	-	-
130	-	-	N	ARCH	7-Jul-16	9:15	1	D	160	-	-
131	-	-	N	ARCH	7-Jul-16	9:15	1	D	143	-	-
132	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-



APPENDIX B

Fish Catch Data for the Two-Way Fyke Net Trap

Table B1: Fish Catch Data from the Fyke Trap on Nulahugyuk Creek, 7 to 25 July 2016

Fish ID#	PIT Tag# ^b	2014 Floy Tag#	2014 Recap.? (Y/N)	Species	Date	Time	No. of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
133	-	-	N	ARCH	7-Jul-16	9:15	1	D	156	-	-
134	-	-	N	ARCH	7-Jul-16	9:15	1	D	178	-	-
135	-	-	N	ARCH	7-Jul-16	9:15	1	D	139	-	-
136	-	-	N	ARCH	7-Jul-16	9:15	1	D	151	-	-
137	-	-	N	ARCH	7-Jul-16	9:15	1	D	153	-	-
138	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
139	-	-	N	ARCH	7-Jul-16	9:15	1	D	168	-	-
140	-	-	N	ARCH	7-Jul-16	9:15	1	D	148	-	-
141	-	-	N	ARCH	7-Jul-16	9:15	1	D	140	-	-
142	-	-	N	ARCH	7-Jul-16	9:15	1	D	150	-	-
143	-	-	N	ARCH	7-Jul-16	9:15	1	D	153	-	-
144	-	-	N	ARCH	7-Jul-16	9:15	1	D	178	-	-
145	-	-	N	ARCH	7-Jul-16	9:15	1	D	140	-	-
146	-	-	N	ARCH	7-Jul-16	9:15	1	D	172	-	-
147	-	-	N	ARCH	7-Jul-16	9:15	1	D	184	-	-
148	-	-	N	ARCH	7-Jul-16	9:15	1	D	168	-	-
149	-	-	N	ARCH	7-Jul-16	9:15	1	D	155	-	-
150	-	-	N	ARCH	7-Jul-16	9:15	1	D	175	-	-
151	-	-	N	ARCH	7-Jul-16	9:15	1	D	160	-	-
152	-	-	N	ARCH	7-Jul-16	9:15	1	D	166	-	-
153	-	-	N	ARCH	7-Jul-16	9:15	1	D	198	-	-
154	-	-	Y	ARCH	7-Jul-16	9:15	1	D	182	-	-
155	-	-	N	ARCH	7-Jul-16	9:15	1	D	150	-	-
156	-	-	N	ARCH	7-Jul-16	9:15	1	D	146	-	-
157	-	-	N	ARCH	7-Jul-16	9:15	1	D	169	-	-
158	-	-	N	ARCH	7-Jul-16	9:15	1	D	182	-	-
159	-	-	N	ARCH	7-Jul-16	9:15	1	D	140	-	-
160	-	-	N	ARCH	7-Jul-16	9:15	1	D	153	-	-
161	-	-	N	ARCH	7-Jul-16	9:15	1	D	137	-	-
162	-	-	N	ARCH	7-Jul-16	9:15	1	D	151	-	-
163	-	-	N	ARCH	7-Jul-16	9:15	1	D	155	-	-
164	-	-	N	ARCH	7-Jul-16	9:15	1	D	170	-	-
165	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
166	-	-	N	ARCH	7-Jul-16	9:15	1	D	188	-	-
167	-	-	N	ARCH	7-Jul-16	9:15	1	D	180	-	-
168	-	-	N	ARCH	7-Jul-16	9:15	1	D	174	-	-
169	-	-	N	ARCH	7-Jul-16	9:15	1	D	163	-	-
170	-	-	N	ARCH	7-Jul-16	9:15	1	D	141	-	-
171	-	-	N	ARCH	7-Jul-16	9:15	1	D	150	-	-
172	-	-	N	ARCH	7-Jul-16	9:15	1	D	157	-	-
173	-	-	N	ARCH	7-Jul-16	9:15	1	D	178	-	-
174	-	-	N	ARCH	7-Jul-16	9:15	1	D	158	-	-
175	-	-	N	ARCH	7-Jul-16	9:15	1	D	180	-	-
176	-	-	N	ARCH	7-Jul-16	9:15	1	D	157	-	-



APPENDIX B

Fish Catch Data for the Two-Way Fyke Net Trap

Table B1: Fish Catch Data from the Fyke Trap on Nulahugyuk Creek, 7 to 25 July 2016

Fish ID#	PIT Tag# ^b	2014 Floy Tag#	2014 Recap.? (Y/N)	Species	Date	Time	No. of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
177	-	-	N	ARCH	7-Jul-16	9:15	1	D	175	-	-
178	-	-	N	ARCH	7-Jul-16	9:15	1	D	139	-	-
179	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
180	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
181	-	-	N	ARCH	7-Jul-16	9:15	1	D	140	-	-
182	-	-	N	ARCH	7-Jul-16	9:15	1	D	160	-	-
183	-	-	N	ARCH	7-Jul-16	9:15	1	D	156	-	-
184	-	-	N	ARCH	7-Jul-16	9:15	1	D	149	-	-
185	-	-	N	ARCH	7-Jul-16	9:15	1	D	173	-	-
186	-	-	N	ARCH	7-Jul-16	9:15	1	D	168	-	-
187	-	-	N	ARCH	7-Jul-16	9:15	1	D	141	-	-
- ^a	-	-	N	ARCH	7-Jul-16	9:15	3	D	-	-	-
188	52780	0465	Y	ARCH	8-Jul-16	9:00	1	U	823	-	-
189	52701	0468	Y	ARCH	8-Jul-16	9:20	1	U	745	5,250	1.270
190	52757	-	N	ARCH	8-Jul-16	9:40	1	U	730	4,250	1.092
191	52756	-	N	ARCH	8-Jul-16	10:00	1	U	605	2,250	1.016
192	52181	-	Y	ARCH	8-Jul-16	10:30	1	U	745	4,250	1.028
193	52755	-	N	ARCH	8-Jul-16	10:50	1	U	615	3,250	1.397
- ^a	-	-	N	ARCH	8-Jul-16	11:30	167	D	-	-	-
194	52779	0453	Y	ARCH	9-Jul-16	8:05	1	U	795	4,250	0.846
195	52777	-	N	ARCH	9-Jul-16	8:15	1	U	791	4,200	0.849
196	52778	-	N	ARCH	9-Jul-16	8:35	1	U	618	3,750	1.589
197	52754	-	N	ARCH	9-Jul-16	8:45	1	U	612	2,450	1.069
198	52753	-	N	ARCH	9-Jul-16	8:50	1	U	649	2,400	0.878
199	52752	-	N	ARCH	9-Jul-16	9:05	1	U	650	3,400	1.238
200	52751	-	N	ARCH	9-Jul-16	9:10	1	U	655	2,700	0.961
201	52749	-	N	ARCH	9-Jul-16	9:15	1	U	855	5,700	0.912
202	52748	-	N	ARCH	9-Jul-16	9:25	1	U	620	2,250	0.944
203	52185	-	Y	ARCH	9-Jul-16	9:30	1	U	691	3,250	0.985
204	-	-	N	ARCH	9-Jul-16	10:30	1	D	178	-	-
205	-	-	N	ARCH	9-Jul-16	10:30	1	D	163	-	-
206	-	-	N	ARCH	9-Jul-16	10:30	1	D	172	-	-
207	-	-	N	ARCH	9-Jul-16	10:30	1	D	155	-	-
208	-	-	N	ARCH	9-Jul-16	10:30	1	D	147	-	-
209	-	-	N	ARCH	9-Jul-16	10:30	1	D	198	-	-
210	-	-	N	ARCH	9-Jul-16	10:30	1	D	163	-	-
211	-	-	N	ARCH	9-Jul-16	10:30	1	D	166	-	-
212	-	-	N	ARCH	9-Jul-16	10:30	1	D	166	-	-
213	-	-	N	ARCH	9-Jul-16	10:30	1	D	181	-	-
214	-	-	N	ARCH	9-Jul-16	10:30	1	D	142	-	-
215	-	-	N	ARCH	9-Jul-16	10:30	1	D	149	-	-
216	-	-	N	ARCH	9-Jul-16	10:30	1	D	156	-	-
217	-	-	N	SPSC	9-Jul-16	10:30	1	D	66	-	-
218	-	-	N	ARCH	9-Jul-16	10:30	1	D	170	-	-



APPENDIX B

Fish Catch Data for the Two-Way Fyke Net Trap

Table B1: Fish Catch Data from the Fyke Trap on Nulahugyuk Creek, 7 to 25 July 2016

Fish ID#	PIT Tag# ^b	2014 Floy Tag#	2014 Recap.? (Y/N)	Species	Date	Time	No. of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
219	-	-	N	ARCH	9-Jul-16	10:30	1	D	154	-	-
220	-	-	N	ARCH	9-Jul-16	10:30	1	D	136	-	-
221	-	-	N	ARCH	9-Jul-16	10:30	1	D	153	-	-
222	-	-	N	ARCH	9-Jul-16	10:30	1	D	165	-	-
223	-	-	N	ARCH	9-Jul-16	10:30	1	D	154	-	-
224	-	-	N	ARCH	9-Jul-16	10:30	1	D	163	-	-
225	-	-	N	ARCH	9-Jul-16	10:30	1	D	157	-	-
226	-	-	N	ARCH	9-Jul-16	10:30	1	D	160	-	-
227	-	-	N	ARCH	9-Jul-16	10:30	1	D	154	-	-
228	-	-	N	ARCH	9-Jul-16	10:30	1	D	148	-	-
229	-	-	N	ARCH	9-Jul-16	10:30	1	D	167	-	-
230	-	-	N	ARCH	9-Jul-16	10:30	1	D	180	-	-
231	-	-	N	ARCH	9-Jul-16	10:30	1	D	150	-	-
232	-	-	N	ARCH	9-Jul-16	10:30	1	D	144	-	-
233	-	-	N	ARCH	9-Jul-16	10:30	1	D	153	-	-
- ^a	-	-	N	ARCH	9-Jul-16	15:00	125	D	-	-	-
234		0549	Y	ARCH	10-Jul-16	8:00	1	U	- ^c	-	-
- ^a	-	-	N	ARCH	10-Jul-16	10:30	141	D	-	-	-
- ^a	-	-	N	ARCH	10-Jul-16	16:00	35	D	-	-	-
- ^a	-	-	N	ARCH	11-Jul-16	8:30	77	D	-	-	-
- ^a	-	-	N	ARCH	11-Jul-16	14:30	67	D	-	-	-
- ^a	-	-	N	ARCH	11-Jul-16	16:45	49	D	-	-	-
235	-	-	N	ARCH	11-Jul-16	8:00	1	U	- ^c	-	-
236	-	-	N	ARCH	11-Jul-16	8:00	1	U	- ^c	-	-
237	-	-	N	ARCH	11-Jul-16	16:00	1	D	- ^c	-	-
- ^a	-	-	N	ARCH	12-Jul-16	8:00	190	D	-	-	-
- ^a	-	-	N	ARCH	12-Jul-16	16:00	54	D	-	-	-
- ^a	-	-	N	ARCH	13-Jul-16	8:00	91	D	-	-	-
238	52710		N	ARCH	14-Jul-16	6:30	1	U	826	6,250	1.109
239	52707		N	ARCH	14-Jul-16	6:45	1	U	725	4,300	1.128
240	52709		N	ARCH	14-Jul-16	6:55	1	U	615	2,550	1.096
241	52708		N	ARCH	14-Jul-16	7:10	1	U	677	3,300	1.064
242	52712		N	ARCH	14-Jul-16	7:15	1	U	679	3,000	0.958
243	52711		N	ARCH	14-Jul-16	7:30	1	U	686	3,250	1.007
- ^a	-	-	N	ARCH	14-Jul-16	7:45	22	D	-	-	-
244	52747		N	ARCH	15-Jul-16	8:30	1	U	879	7,350	1.082
245	52779	0481	Y	ARCH	15-Jul-16	8:45	1	U	749	4,250	1.011
246	52746		N	ARCH	15-Jul-16	9:00	1	U	748	4,250	1.016
247	52772		N	ARCH	18-Jul-16	17:15	1	U	690	4,250	1.294
- ^a	-	-	N	ARCH	18-Jul-16	17:15	4	U	-	-	-
248	-	-	N	ARCH	18-Jul-16	17:15	1	U	-	-	-
- ^a	-	-	N	ARCH	18-Jul-16	17:30	5	D	-	-	-
- ^a	-	-	N	SPSC	18-Jul-16	17:30	3	D	-	-	-
249	-	-	N	ARCH	19-Jul-16	17:50	1	U	157	-	-



APPENDIX B

Fish Catch Data for the Two-Way Fyke Net Trap

Table B1: Fish Catch Data from the Fyke Trap on Nulahugyuk Creek, 7 to 25 July 2016

Fish ID#	PIT Tag# ^b	2014 Floy Tag#	2014 Recap.? (Y/N)	Species	Date	Time	No. of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
250	-	-	N	SPSC	19-Jul-16	17:50	1	U	65	-	-
251	-	-	N	SPSC	19-Jul-16	17:50	1	U	75	-	-
252	-	-	N	SPSC	19-Jul-16	17:50	1	U	71	-	-
253	-	-	N	SPSC	19-Jul-16	17:50	1	U	71	-	-
254	-	-	N	SPSC	19-Jul-16	17:50	1	U	67	-	-
255	-	-	N	SPSC	19-Jul-16	17:50	1	D	79	-	-
256	-	-	N	SPSC	20-Jul-16	7:35	1	D	68	-	-
257	-	-	N	SPSC	20-Jul-16	7:35	1	D	115	-	-
258	-	-	N	SPSC	20-Jul-16	7:35	1	D	110	-	-
259	-	-	N	SPSC	20-Jul-16	7:35	1	D	69	-	-
260	-	-	N	SPSC	20-Jul-16	7:35	1	D	81	-	-
261	-	-	N	SPSC	20-Jul-16	7:35	1	D	71	-	-
262	-	-	N	SPSC	20-Jul-16	7:35	1	D	62	-	-
263	-	-	N	SPSC	20-Jul-16	7:35	1	D	59	-	-
264	-	-	N	SPSC	20-Jul-16	7:35	1	D	64	-	-
265	-	-	N	SPSC	20-Jul-16	7:35	1	D	76	-	-
266	-	-	N	SPSC	20-Jul-16	7:35	1	D	73	-	-
267	-	-	N	SPSC	20-Jul-16	7:35	1	D	71	-	-
268	-	-	N	SPSC	20-Jul-16	7:35	1	D	72	-	-
269	-	-	N	SPSC	20-Jul-16	7:35	1	D	64	-	-
270	-	-	N	SPSC	20-Jul-16	7:35	1	D	71	-	-
271	-	-	N	ARCH	20-Jul-16	7:35	1	D	197	-	-
272	-	-	N	ARCO	20-Jul-16	7:35	1	D	82	-	-
273	-	-	N	SPSC	20-Jul-16	7:50	1	U	62	-	-
274	-	-	N	SPSC	20-Jul-16	7:50	1	U	73	-	-
275	-	-	N	SPSC	20-Jul-16	7:50	1	U	68	-	-
276	-	-	N	SPSC	20-Jul-16	7:50	1	U	70	-	-
277	-	-	N	SPSC	20-Jul-16	7:50	1	U	115	-	-
278	-	-	N	SPSC	20-Jul-16	7:50	1	U	71	-	-
279	-	-	N	SPSC	20-Jul-16	7:50	1	U	71	-	-
280	-	-	N	SPSC	20-Jul-16	7:50	1	U	74	-	-
281	-	-	N	SPSC	20-Jul-16	7:50	1	U	67	-	-
282	-	-	N	SPSC	20-Jul-16	7:50	1	U	82	-	-
283	-	-	N	SPSC	20-Jul-16	7:50	1	U	75	-	-
284	-	-	N	SPSC	20-Jul-16	7:50	1	U	65	-	-
285	-	-	N	SPSC	20-Jul-16	7:50	1	U	68	-	-
286	-	-	N	SPSC	20-Jul-16	7:50	1	U	60	-	-
287	-	-	N	SPSC	20-Jul-16	7:50	1	U	64	-	-
288	-	-	N	SPSC	20-Jul-16	7:50	1	U	60	-	-
289	-	-	N	SPSC	20-Jul-16	7:50	1	U	56	-	-
290	-	-	N	SPSC	20-Jul-16	7:50	1	U	67	-	-
291	-	-	N	SPSC	20-Jul-16	7:50	1	U	64	-	-
292	-	-	N	SPSC	20-Jul-16	7:50	1	U	69	-	-
293	-	-	N	SPSC	20-Jul-16	7:50	1	U	65	-	-



APPENDIX B

Fish Catch Data for the Two-Way Fyke Net Trap

Table B1: Fish Catch Data from the Fyke Trap on Nulahugyuk Creek, 7 to 25 July 2016

Fish ID#	PIT Tag# ^b	2014 Floy Tag#	2014 Recap.? (Y/N)	Species	Date	Time	No. of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
294	-	-	N	SPSC	20-Jul-16	7:50	1	U	73	-	-
295	-	-	N	SPSC	20-Jul-16	7:50	1	U	60	-	-
296	-	-	N	SPSC	20-Jul-16	7:50	1	U	71	-	-
297	-	-	N	SPSC	20-Jul-16	7:50	1	U	66	-	-
298	-	-	N	SPSC	20-Jul-16	7:50	1	U	65	-	-
299	-	-	N	SPSC	20-Jul-16	7:50	1	U	71	-	-
300	-	-	N	SPSC	20-Jul-16	7:50	1	U	54	-	-
301	-	-	N	SPSC	20-Jul-16	7:50	1	U	55	-	-
302	-	-	N	SPSC	20-Jul-16	7:50	1	U	59	-	-
303	-	-	N	SPSC	20-Jul-16	7:50	1	U	65	-	-
304	-	-	N	ARCO	20-Jul-16	7:50	1	U	65	-	-
305	-	-	N	ARCO	20-Jul-16	7:50	1	U	71	-	-
306	-	-	N	ARCO	20-Jul-16	7:50	1	U	82	-	-
307	-	-	N	ARCH	20-Jul-16	18:10	1	D	155	-	-
308	-	-	N	ARCH	20-Jul-16	18:10	1	D	154	-	-
309	-	-	N	SPSC	20-Jul-16	18:10	1	D	113	-	-
310	-	-	N	SPSC	20-Jul-16	18:10	1	D	76	-	-
311	-	-	N	SPSC	20-Jul-16	18:10	1	D	78	-	-
312	-	-	N	SPSC	20-Jul-16	18:10	1	D	62	-	-
313	-	-	N	SPSC	20-Jul-16	18:10	1	D	65	-	-
314	-	-	N	SPSC	20-Jul-16	18:10	1	D	68	-	-
315	-	-	N	SPSC	20-Jul-16	18:10	1	D	69	-	-
316	-	-	N	SPSC	20-Jul-16	18:10	1	D	59	-	-
317	-	-	N	SPSC	20-Jul-16	18:10	1	D	76	-	-
318	-	-	N	SPSC	20-Jul-16	18:10	1	D	77	-	-
319	-	-	N	SPSC	20-Jul-16	18:10	1	D	78	-	-
320	-	-	N	SPSC	20-Jul-16	18:10	1	D	69	-	-
321	-	-	N	SPSC	20-Jul-16	18:10	1	D	62	-	-
322	-	-	N	SPSC	20-Jul-16	18:10	1	D	83	-	-
323	-	-	N	SPSC	20-Jul-16	18:10	1	D	70	-	-
324	-	-	N	SPSC	20-Jul-16	18:10	1	D	61	-	-
325	-	-	N	SPSC	20-Jul-16	18:10	1	D	70	-	-
326	-	-	N	SPSC	20-Jul-16	18:10	1	D	63	-	-
327	-	-	N	ARCH	20-Jul-16	18:20	1	U	166	-	-
328	-	-	N	ARCH	20-Jul-16	18:20	1	U	152	-	-
329	-	-	N	ARCH	20-Jul-16	18:20	1	U	134	-	-
330	-	-	N	ARCH	20-Jul-16	18:20	1	U	148	-	-
331	-	-	N	ARCH	20-Jul-16	18:20	1	U	149	-	-
332	-	-	N	SPSC	20-Jul-16	18:20	1	U	68	-	-
333	-	-	N	SPSC	20-Jul-16	18:20	1	U	65	-	-
334	-	-	N	SPSC	20-Jul-16	18:20	1	U	70	-	-
335	-	-	N	SPSC	20-Jul-16	18:20	1	U	78	-	-
336	-	-	N	SPSC	20-Jul-16	18:20	1	U	66	-	-
337	-	-	N	ARCO	20-Jul-16	18:20	1	U	59	-	-



APPENDIX B

Fish Catch Data for the Two-Way Fyke Net Trap

Table B1: Fish Catch Data from the Fyke Trap on Nulahugyuk Creek, 7 to 25 July 2016

Fish ID#	PIT Tag# ^b	2014 Floy Tag#	2014 Recap.? (Y/N)	Species	Date	Time	No. of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
338	-	-	N	ARCO	20-Jul-16	18:20	1	U	68	-	-
339	52774	-	N	ARCH	21-Jul-16	8:55	1	U	560	-	-
340	52783	-	N	ARCH	21-Jul-16	8:55	1	U	700	-	-
341	-	-	N	LKTR	21-Jul-16	8:55	1	U	105	-	-
342	-	-	N	ARCO	21-Jul-16	8:55	1	U	80	-	-
343	-	-	N	SPSC	21-Jul-16	8:55	1	U	67	-	-
344	-	-	N	SPSC	21-Jul-16	8:55	1	U	68	-	-
345	-	-	N	SPSC	21-Jul-16	8:55	1	U	70	-	-
346	-	-	N	ARCH	21-Jul-16	18:35	1	D	178	-	-
347	-	-	N	ARCH	21-Jul-16	18:35	1	D	148	-	-
348	-	-	N	ARCH	21-Jul-16	18:35	1	D	155	-	-
349	-	-	N	ARCH	21-Jul-16	18:35	1	D	149	-	-
350	-	-	N	SPSC	21-Jul-16	18:35	1	D	65	-	-
351	-	-	N	SPSC	21-Jul-16	18:35	1	D	70	-	-
352	-	-	N	SPSC	21-Jul-16	18:35	1	D	81	-	-
353	-	-	N	SPSC	21-Jul-16	18:35	1	D	70	-	-
354	-	-	N	SPSC	21-Jul-16	18:35	1	D	70	-	-
355	-	-	N	SPSC	21-Jul-16	18:35	1	D	65	-	-
356	-	-	N	SPSC	21-Jul-16	18:35	1	D	72	-	-
357	-	-	N	SPSC	21-Jul-16	18:35	1	D	95	-	-
358	-	-	N	SPSC	21-Jul-16	18:35	1	D	98	-	-
359	-	-	N	SPSC	21-Jul-16	18:35	1	D	70	-	-
360	-	-	N	SPSC	21-Jul-16	18:35	1	D	72	-	-
361	-	-	N	SPSC	21-Jul-16	18:35	1	D	72	-	-
362	-	-	N	SPSC	21-Jul-16	18:35	1	D	75	-	-
363	-	-	N	SPSC	21-Jul-16	18:35	1	D	67	-	-
364	-	-	N	SPSC	21-Jul-16	18:35	1	D	75	-	-
365	-	-	N	SPSC	21-Jul-16	18:35	1	D	73	-	-
366	-	-	N	SPSC	21-Jul-16	18:35	1	D	70	-	-
367	-	-	N	SPSC	21-Jul-16	18:35	1	D	73	-	-
368	-	-	N	ARCH	21-Jul-16	18:35	1	D	-	-	-
369	52702	-	N	ARCH	22-Jul-16	9:15	1	U	862	6,250	0.976
370	52744	-	N	ARCH	22-Jul-16	9:15	1	U	681	3,650	1.156
371	-	-	N	ARCH	22-Jul-16	9:15	1	U	143	-	-
372	-	-	N	ARCH	22-Jul-16	9:15	1	U	157	-	-
373	-	-	N	SPSC	22-Jul-16	9:15	1	U	79	-	-
- ^a	-	-	N	SPSC	22-Jul-16	9:15	5	U	-	-	-
374	-	-	N	ARCH	22-Jul-16	10:00	1	D	156	-	-
- ^a	-	-	N	SPSC	22-Jul-16	10:00	7	D	-	-	-
375	-	-	N	ARCO	22-Jul-16	10:00	1	D	-	-	-
376	-	-	N	ARCH	23-Jul-16	18:30	1	D	183	-	-
377	-	-	N	ARCH	23-Jul-16	18:30	1	D	153	-	-
378	-	-	N	ARCH	23-Jul-16	18:30	1	D	169	-	-
379	-	-	N	ARCH	23-Jul-16	18:30	1	D	166	-	-



APPENDIX B

Fish Catch Data for the Two-Way Fyke Net Trap

Table B1: Fish Catch Data from the Fyke Trap on Nulahugyuk Creek, 7 to 25 July 2016

Fish ID#	PIT Tag# ^b	2014 Floy Tag#	2014 Recap.? (Y/N)	Species	Date	Time	No. of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
380	-	-	N	ARCH	23-Jul-16	18:30	1	D	155	-	-
381	-	-	N	ARCH	23-Jul-16	18:30	1	D	168	-	-
382	-	-	N	ARCH	23-Jul-16	18:30	1	D	171	-	-
383	-	-	N	ARCH	23-Jul-16	18:30	1	D	168	-	-
384	-	-	N	ARCH	23-Jul-16	18:30	1	D	163	-	-
385	-	-	N	ARCH	23-Jul-16	18:30	1	D	185	-	-
386	-	-	N	ARCH	23-Jul-16	18:30	1	D	165	-	-
387	-	-	N	ARCH	23-Jul-16	18:30	1	D	156	-	-
388	-	-	N	ARCH	23-Jul-16	18:30	1	D	165	-	-
389	-	-	N	ARCH	23-Jul-16	18:30	1	D	164	-	-
390	-	-	N	ARCH	23-Jul-16	18:30	1	D	164	-	-
391	-	-	N	ARCH	23-Jul-16	18:30	1	D	145	-	-
392	-	-	N	ARCH	23-Jul-16	18:30	1	D	133	-	-
393	-	-	N	ARCH	23-Jul-16	18:30	1	D	145	-	-
394	-	-	N	SPSC	23-Jul-16	18:30	1	D	119	-	-
395	-	-	N	SPSC	23-Jul-16	18:30	1	D	111	-	-
396	-	-	N	SPSC	23-Jul-16	18:30	1	D	79	-	-
397	-	-	N	SPSC	23-Jul-16	18:30	1	D	72	-	-
398	-	-	N	SPSC	23-Jul-16	18:30	1	D	81	-	-
399	-	-	N	SPSC	23-Jul-16	18:30	1	D	75	-	-
400	-	-	N	SPSC	23-Jul-16	18:30	1	D	75	-	-
401	-	-	N	SPSC	23-Jul-16	18:30	1	D	85	-	-
402	-	-	N	SPSC	23-Jul-16	18:30	1	D	79	-	-
403	-	-	N	SPSC	23-Jul-16	18:30	1	D	75	-	-
404	-	-	N	SPSC	23-Jul-16	18:30	1	D	75	-	-
405	-	-	N	SPSC	23-Jul-16	18:30	1	D	75	-	-
406	-	-	N	SPSC	23-Jul-16	18:30	1	D	73	-	-
407	-	-	N	SPSC	23-Jul-16	18:30	1	D	64	-	-
408	-	-	N	SPSC	23-Jul-16	18:30	1	D	75	-	-
409	-	-	N	SPSC	23-Jul-16	18:30	1	D	65	-	-
410	-	-	N	SPSC	23-Jul-16	18:30	1	D	76	-	-
411	-	-	N	SPSC	23-Jul-16	18:30	1	D	78	-	-
412	-	-	N	SPSC	23-Jul-16	18:30	1	D	75	-	-
413	-	-	N	SPSC	23-Jul-16	18:30	1	D	72	-	-
- ^a	-	-	N	SPSC	23-Jul-16	18:30	17	D	-	-	-
- ^a	-	-	N	ARCH	23-Jul-16	18:30	2	D	-	-	-
414	-	-	N	ARCH	24-Jul-16	18:35	1	D	104	-	-
415	-	-	N	ARCH	24-Jul-16	18:35	1	D	176	-	-
416	-	-	N	ARCH	24-Jul-16	18:35	1	D	148	-	-
417	-	-	N	ARCH	24-Jul-16	18:35	1	D	166	-	-
418	-	-	N	ARCH	24-Jul-16	18:35	1	D	155	-	-
419	-	-	N	ARCH	24-Jul-16	18:35	1	D	158	-	-
420	-	-	N	ARCH	24-Jul-16	18:35	1	D	161	-	-
421	-	-	N	ARCH	24-Jul-16	18:35	1	D	152	-	-



APPENDIX B

Fish Catch Data for the Two-Way Fyke Net Trap

Table B1: Fish Catch Data from the Fyke Trap on Nulahugyuk Creek, 7 to 25 July 2016

Fish ID#	PIT Tag# ^b	2014 Floy Tag#	2014 Recap.? (Y/N)	Species	Date	Time	No. of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
422	-	-	N	ARCH	24-Jul-16	18:35	1	D	155	-	-
423	-	-	N	ARCH	24-Jul-16	18:35	1	D	162	-	-
424	-	-	N	ARCH	24-Jul-16	18:35	1	D	167	-	-
- ^a	-	-	N	SPSC	24-Jul-16	18:35	27	D	-	-	-
- ^a	-	-	N	ARCO	24-Jul-16	18:35	1	D	-	-	-
- ^a	-	-	N	SPSC	24-Jul-16	18:50	31	U	-	-	-
- ^a	-	-	N	ARCI	25-Jul-16	10:00	1	U	-	-	-
- ^a	-	-	N	SPSC	25-Jul-16	10:00	3	U	-	-	-
- ^a	-	-	N	ARCH	25-Jul-16	10:00	3	U	-	-	-
- ^a	-	-	N	SPSC	25-Jul-16	10:10	17	D	-	-	-

Note: Table excludes a description of efforts or net checks when no fish were captured.

^a No fish ID number was assigned to fish that were enumerated only (not weighed or measured for length). The number of fish captured is provided in the "Number of Fish" column.

^b All PIT tag identification numbers began with the same 7 digits (2280001), not displayed in this table.

^c Fish escaped or fish was not checked for an existing FLOY or PIT tag (re-capture).

ID = identification; # = number; PIT tag = Passive Integrated Transponder tag; - = no data; Recap.? = Has this individual been captured before, where N = No, and Y = Yes, this individuals was captured prior to 2016 (FLOY or PIT tag present); ARCH = Arctic Char, ARCO = Arctic Cod, ARCI = Arctic Cisco, LKTR = Lake Trout, SPSC = Spoonhead Sculpin; D = downstream; U = upstream; mm = millimetres; g = grams; k = condition factor ($k = [\text{weight}/\text{length}^3] \times 100000$).



APPENDIX B

Fish Catch Data for the Two-Way Fyke Net Trap

Table B2: Recapture Summary of Tagged Fish – 7 to 25 July 2016

Fish ID#	PIT Tag# ^b	FLOY Tag#	Species	Date	Time	Initial Catch Date	Fish Direction
188	52780	0465 ^a	ARCH	8-Jul-16	10:00	8-Jul-16	D
189	52701	0468 ^a	ARCH	8-Jul-16	11:20	8-Jul-16	D
189	52701	0468 ^a	ARCH	22-Jul-16	9:15	8-Jul-16	U
190	52757	-	ARCH	11-Jul-16	8:30	8-Jul-16	D
191	52756	-	ARCH	8-Jul-16	12:00	8-Jul-16	D
192	52181 ^a	-	ARCH	8-Jul-16	12:30	8-Jul-16	D
192	52181	-	ARCH	22-Jul-16	9:15	8-Jul-16	U
194	52779	0453 ^a	ARCH	9-Jul-16	16:00	9-Jul-16	D
196	52778	-	ARCH	10-Jul-16	16:00	9-Jul-16	D
197	52754	-	ARCH	9-Jul-16	16:00	9-Jul-16	D
197	52754	-	ARCH	23-Jul-16	8:15	9-Jul-16	U
199	52752	-	ARCH	9-Jul-16	16:00	9-Jul-16	D
199	52752	-	ARCH	17-Jul-16	7:45	9-Jul-16	U
199	52752	-	ARCH	17-Jul-16	12:00	9-Jul-16	D
201	52749	-	ARCH	9-Jul-16	16:00	9-Jul-16	D
202	52748	-	ARCH	10-Jul-16	15:30	9-Jul-16	D
203	52185 ^a	-	ARCH	9-Jul-16	16:00	9-Jul-16	D
242	52712	-	ARCH	16-Jul-16	8:00	14-Jul-16	U
242	52712	-	ARCH	19-Jul-16	20:25	14-Jul-16	D
339	52774	-	ARCH	22-Jul-16	10:00	21-Jul-16	D

^a Fish was also recognized as 2014 re-capture.

^b All PIT tag identification numbers began with the same 7 digits (2280001), not displayed in this table.

ID = identification; # = number; PIT tag = Passive Integrated Transponder; - = no data; N/A = not applicable; ARCH = Arctic Char; D = downstream; U = upstream.



APPENDIX C

Remediation Plan



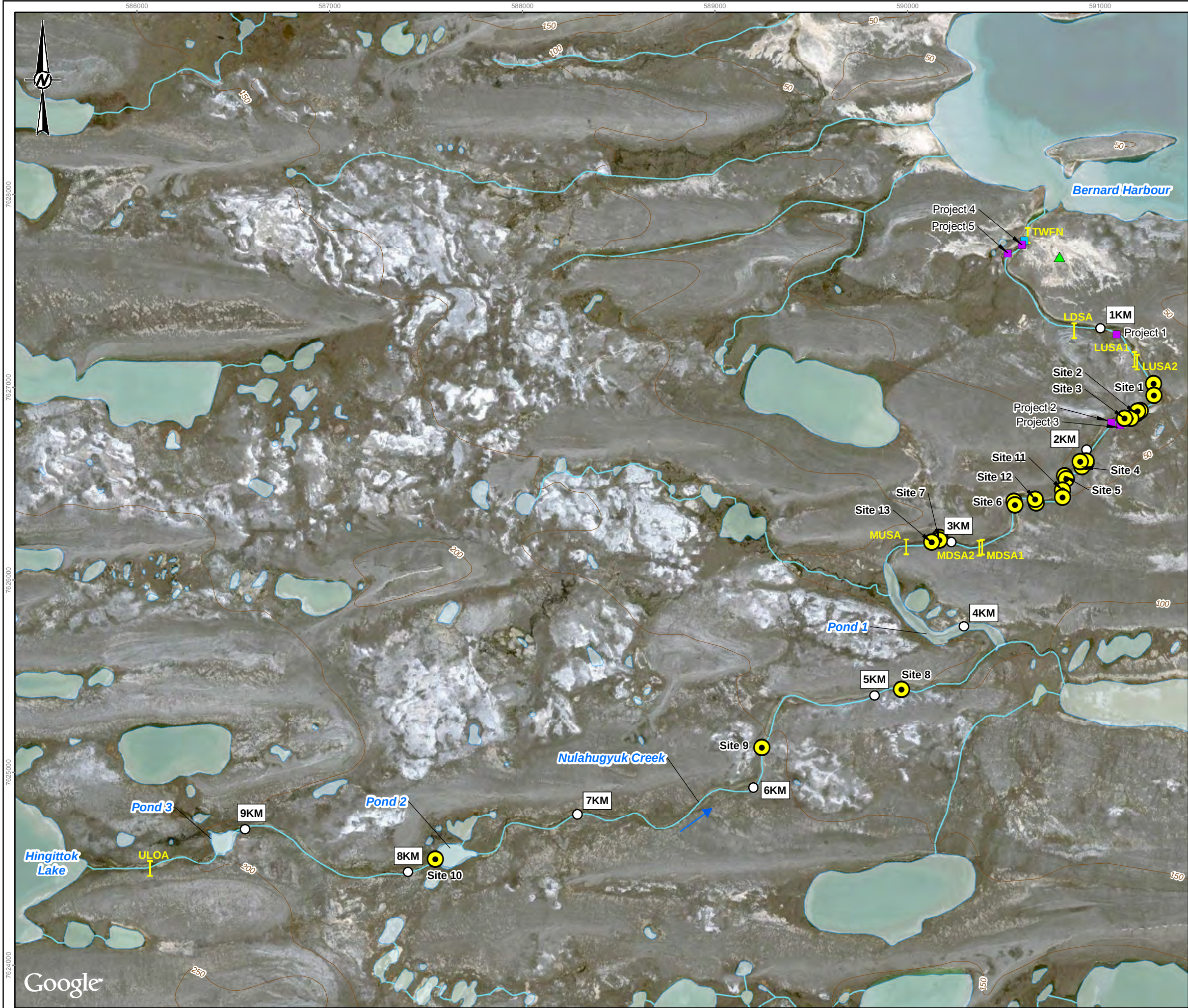
A reconnaissance survey of Nulahugyuk Creek was completed on 16 July 2014 to identify problem locations which have the potential to negatively affect the upstream migration of Arctic Char. Negative effects to Arctic Char migration include impeded access to the spawning lake and physiological stress or mortality from exposure due to stranding; both of which may lead to reductions in fishery productivity. A follow-up survey was completed on 23 to 24 July 2015 to collect additional information on the problem locations and identify where stream enhancement (i.e., remediation) activities could facilitate migration. An objective for the 2016 field program was to conduct habitat surveys of the creek to finalize the remediation plan, including updates to descriptions of problem locations where low-flow channels could be constructed to improve fish passage.

Potential barriers to fish passage were identified at 13 sites or locations on the creek during habitat surveys on 10 to 14 July 2016 (Table 3-5; Figure C1). These locations were characterized as difficult for adult Arctic Char to migrate upstream because of boulder barriers, 'broken' thalwegs and lack of water depth that can result in strandings and mortalities. The problem sites are where low-flow-channel projects may improve fish passage and ultimately benefit the production of Arctic Char. Three sites were identified as the highest priority for site remediation, as a rank 3, followed by five rank 2 locations, and five rank 1 locations where remediation efforts are needed. Five of the problem sites were identified within a sharp bend in the lower section of the creek, starting 1.3 km from the mouth of Nulahugyuk Creek and for an upstream distance of approximately 800 m. Many strandings and mortalities were incidentally observed along this section during 2012 and 2014. Furthermore, most of the problem sites where remediation work is proposed (approximately 77%) are within the lower 3 km of the creek, which is consistent with previous habitat assessments of the creek (Golder and ANL 2007).

The remediation program will focus on constructing low-flow channels and directional weirs at the 13 proposed enhancement sites described in detail in the tables below (Tables C1 to C13). The Golder field crew and HTO students will use the information in the tables for the construction of the remediation structures at each site. Although this document provides a description and guideline for constructing the low-flow channel sites, the crew will use their best judgement of the current conditions to determine the most effective design. The final design may differ from what is described in this remediation plan.

Design considerations include the following:

- Where low-flow channels or weirs must be oriented against the natural direction of flows, the largest available boulders should be positioned on the upstream side of the weir to prevent blow-outs at high velocities during the spring freshet.
- When a low-flow channel is constructed in an area where the creek is relatively wide, it is recommended that multiple channels or extended directional weirs be considered to aid upstream navigation.
- Where flows are dispersed and water depths are low, additional weirs should be considered (using large boulders) at the upstream end of the channel to direct flows into the channel to increase water depths.
- Where possible, large boulders should be included as a natural feature in the low-flow channels to provide in-stream cover and enhance the structural integrity of the channels.



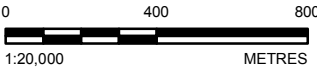
LEGEND

- ELEVATION CONTOUR
- WATERCOURSE
- WATERBODY
- CAMP
- CHANNEL MANIPULATION PROJECT 2012
- FYKE NET
- KILOMETRE MARKER
- PIT TAG ARRAY

- LDSA - LOWER DOWNSTREAM ARRAY
- MUSA - MIDDLE UPSTREAM ARRAY
- ULO - UPPER LAKE OUTLET ARRAY
- LUSA1 - LOWER UPSTREAM ARRAY 1
- LUSA2 - LOWER UPSTREAM ARRAY 2
- MDSA1 - MIDDLE DOWNSTREAM ARRAY 1
- MDSA2 - MIDDLE DOWNSTREAM ARRAY 2
- TWFN - TWO WAY FYKE NET (ARRAY)



DRAFT



NOTES

1. THE LOW-FLOW CHANNELS (CHANNEL MANIPULATION PROJECTS) WERE CONSTRUCTED IN 2012 (GOLDER 2013)

REFERENCE

GOOGLE EARTH IMAGERY: © 2014 DIGITAL GLOBE
CANVEC BASE DATA: © DEPARTMENT OF NATURAL RESOURCES CANADA, 2012. ALL RIGHTS RESERVED.
NAD 83 UTM ZONE 11N

CLIENT



PROJECT
BACK RIVER PROJECT
NUNAVUT, CANADA

TITLE
LOCATIONS OF PROPOSED ENHANCEMENT SITES ON
NULAHUGYUK CREEK

CONSULTANT	YYYY-MM-DD	2016-06-16
	PREPARED	LMR/ANK
	DESIGN	KD
	REVIEW	-
	APPROVED	-



PROJECT No. 1545534 PHASE 4000 Rev. A FIGURE C1



APPENDIX C

Remediation Plan 2016

Table C1: Remediation Planning Notes for Low-Flow Channel Site 1

Priority for Enhancement	High		Notes: ■ Proposed low-flow channel at Site 1 is located at a sharp bend in the creek where the creek widens and flows are dispersed. ■ Fish travelling upstream will become stranded if they continue up the RDB at this location because it is shallow and is dry further upstream. There is no room to turn around. ■ Level of effort for this site may require more than that used for Project 5 in 2012.
Fish Stranding Observed?	Yes (2012 and 2014)		
Approximate Minimum Length	Low-flow channel (41 m), plus two weirs (6 m, and 30 m)		
Approximate Distance From Mouth	1.4 km		
Location of Channel Start and End Points (UTM 11W)			
Waypoint	Easting	Northing	
306	591278	7627020	
307	591279	7626958	
Recommendation	■ Construct a 41-m low-flow channel to direct fish diagonally up the center of the creek, towards the LDB where there is deeper flowing water. This low-flow channel would connect the thalwegs and allow for easier fish passage with less likelihood of stranding. ■ Two rock weirs should be constructed on either side of the channel to direct fish into the low-flow channel and block access up the shallow RDB where strandings occur further upstream. Weir 1 (approximately 30 m long) will be constructed towards the RDB, and Weir 2 (approximately 6 m long) will be constructed towards the LDB.		

m = metres; km = kilometres; HTO = Kugluktuk Hunters and Trappers Organization ; LDB = left downstream bank; RDB = right downstream bank.



APPENDIX C

Remediation Plan 2016

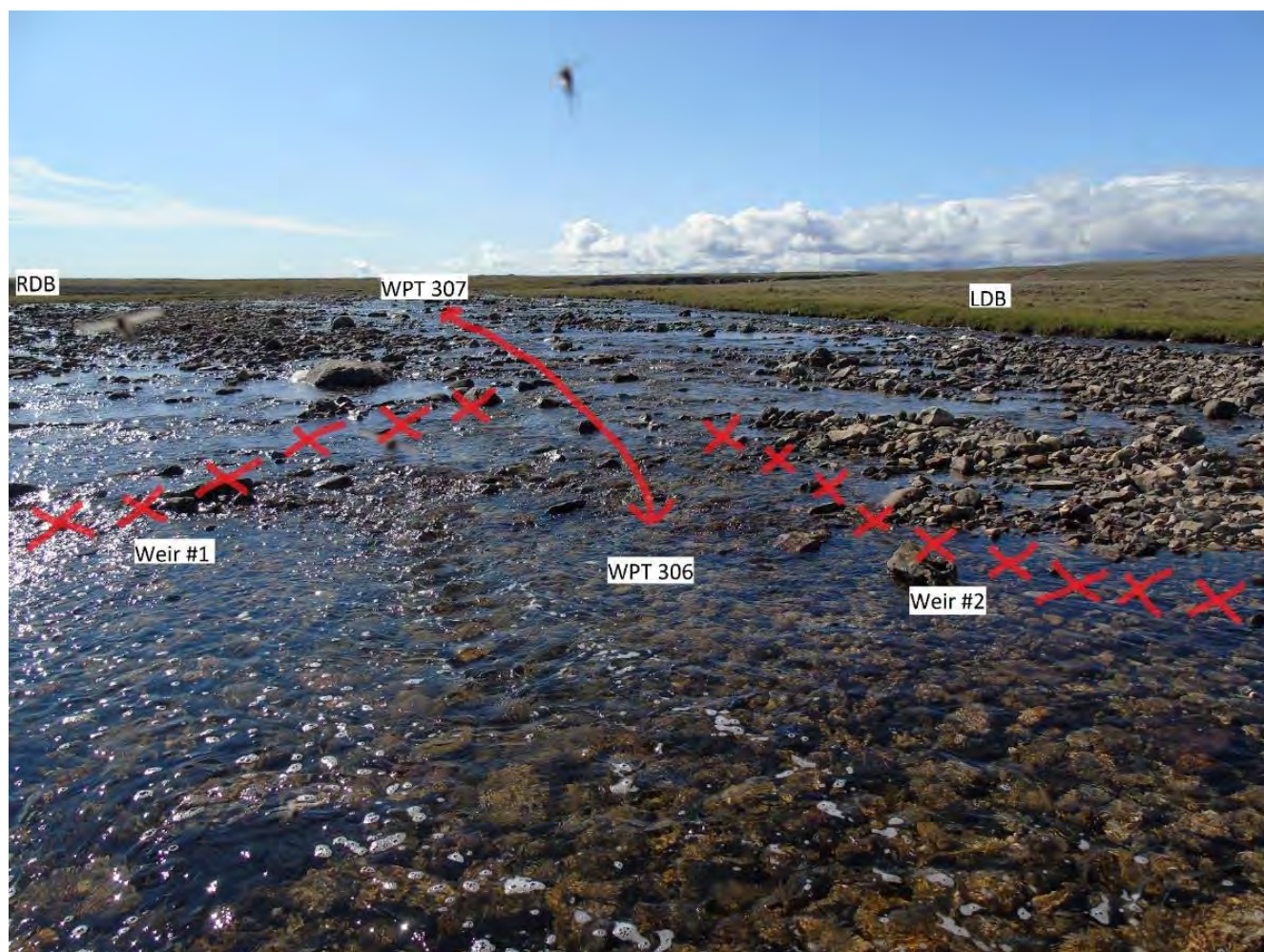


Photo C1: View upstream of proposed Low-Flow Channel Site 1 showing where the directional weirs and low-flow channel should be constructed.



APPENDIX C

Remediation Plan 2016

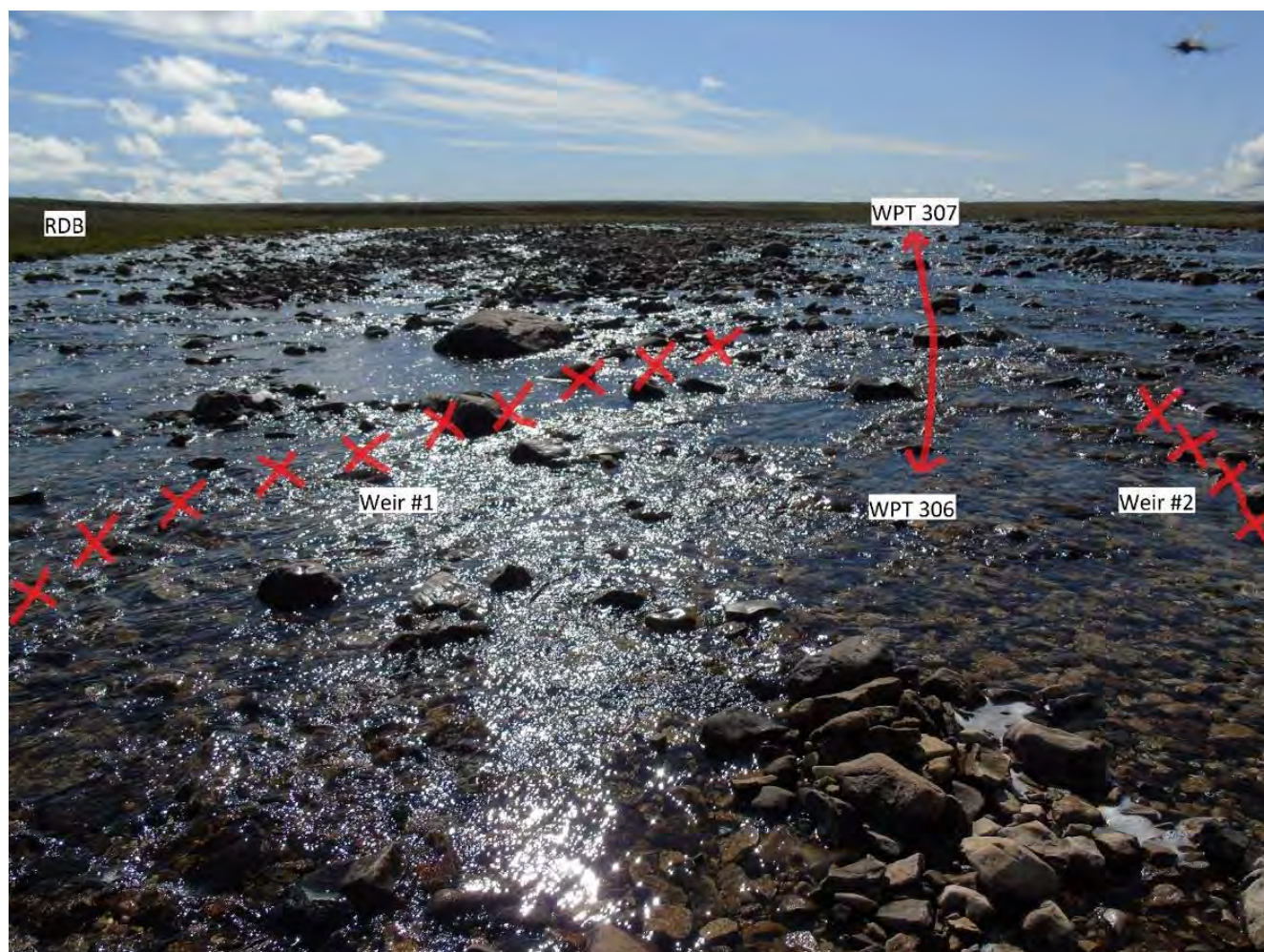


Photo C2: View upstream of the proposed Low-Flow Channel Site 1 showing the shallow RDB and where placement of the weir, and low-flow channel should be constructed.



APPENDIX C

Remediation Plan 2016



Photo C3: View upstream of the proposed Low-Flow Channel Site 1 showing where weir 1 should be constructed to block access up the shallow RDB

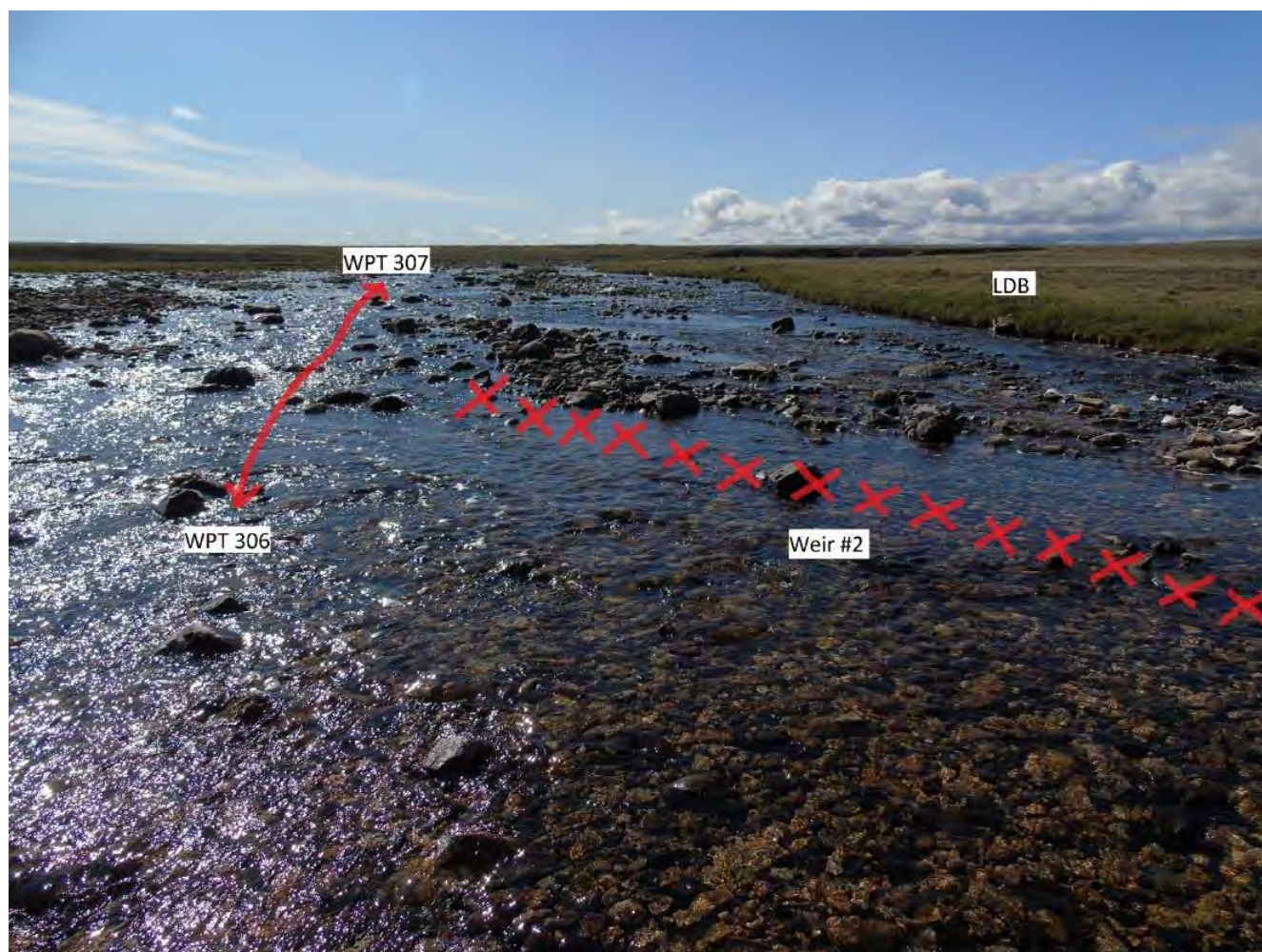


Photo C4: View upstream of the proposed Low-Flow Channel Site 1 showing where Weir 2 should be constructed to direct fish towards the center of the channel



APPENDIX C

Remediation Plan 2016

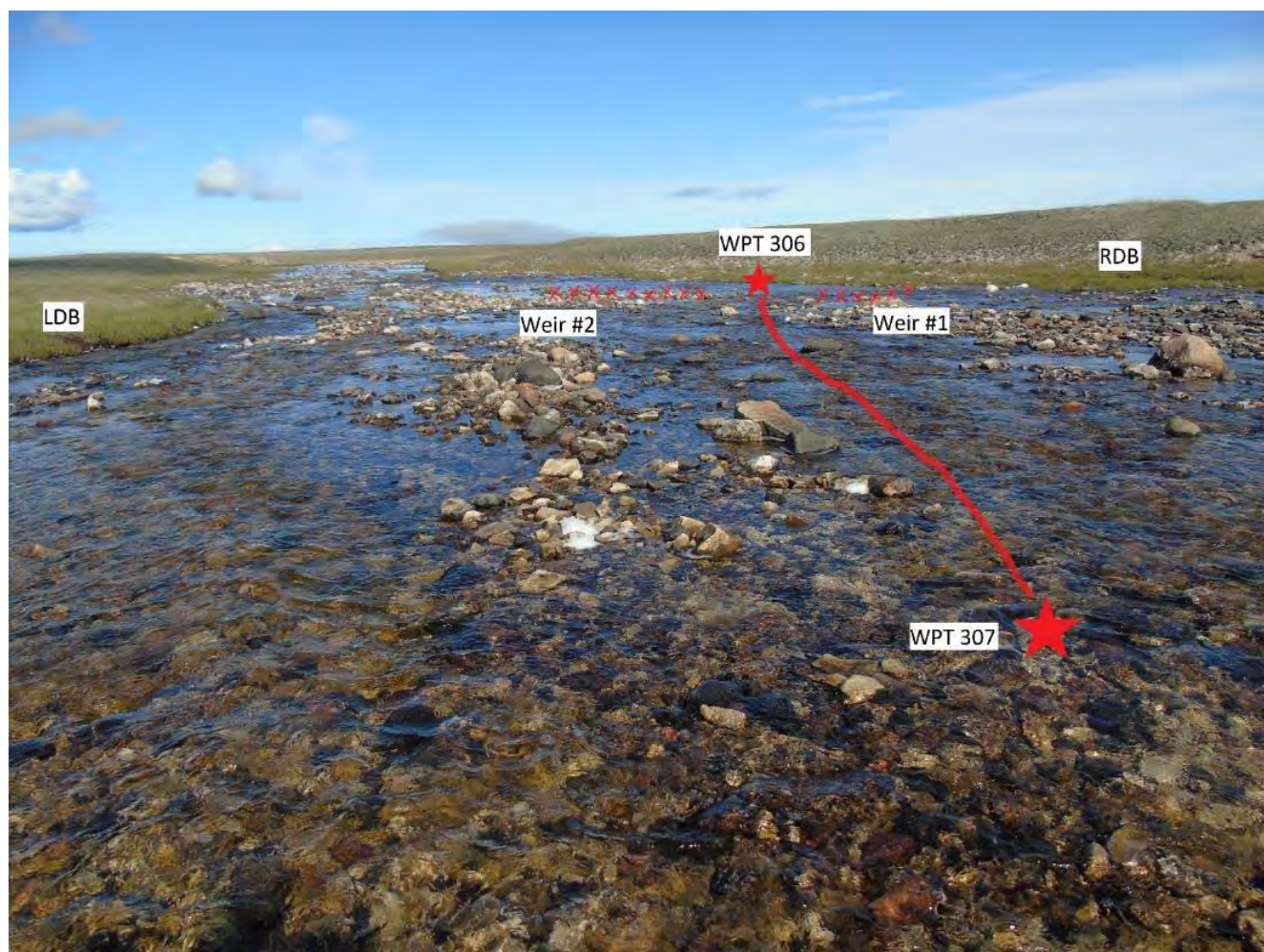


Photo C5: View downstream of the proposed Low-Flow Channel Site 1 showing where the low flow channel and directional weirs should be constructed.



APPENDIX C

Remediation Plan 2016

Table C2: Remediation Planning Notes for Low-Flow Channel Site 2

Table 5.2: Remediation Planning Notes for Low Flow Channel Site 2			
Priority	Medium		Notes: ■ Proposed low-flow channel for Site 2 is located in a sharp bend in the creek where flows are dispersed. ■ Fish migrating upstream in this section will encounter a moderate gradient with moderate velocities but shallow depths that spans most of the creek. If fish follow the LDB they risk stranding further upstream where it becomes shallow and dry in sections at low-flows. ■ Proposed low-flow channels for Site 2 are downstream of existing 2012 Projects 2 and 3.
Fish Stranding Observed?	Yes (2012 and 2014)		
Approximate Minimum Length	Two Channels (26 m, and 16 m) plus a 10-m long weir		
Approximate Distance From Mouth	1.6 km		
Location of Channel Start and End Points (UTM 11W)			
Waypoint	Easting	Northing	
311	591209	7626879	
312	591188	7626862	
313	591195	7626876	
Recommendation	■ Construct two, low-flow channels to connect isolated thalwegs to locations with higher flow. Channel 1 (approximately 26 m long) will direct fish up the center of the channel and away from the LDB where stranding can occur at upstream locations. Channel 2 (approximately 16 m long) would provide another option to direct fish away from the LDB to the centre of the channel. ■ A 10-m diversion or directional weir may be required from the mouth of Channel 2 to the LDB to direct fish into the channel and away from swimming up the LDB where there is a high risk of stranding; this determination will be made by the remediation crew.		

m = metres; km = kilometres; HTO = Kugluktuk Hunters and Trappers Organization ; LDB = left downstream bank; RDB = right downstream bank.

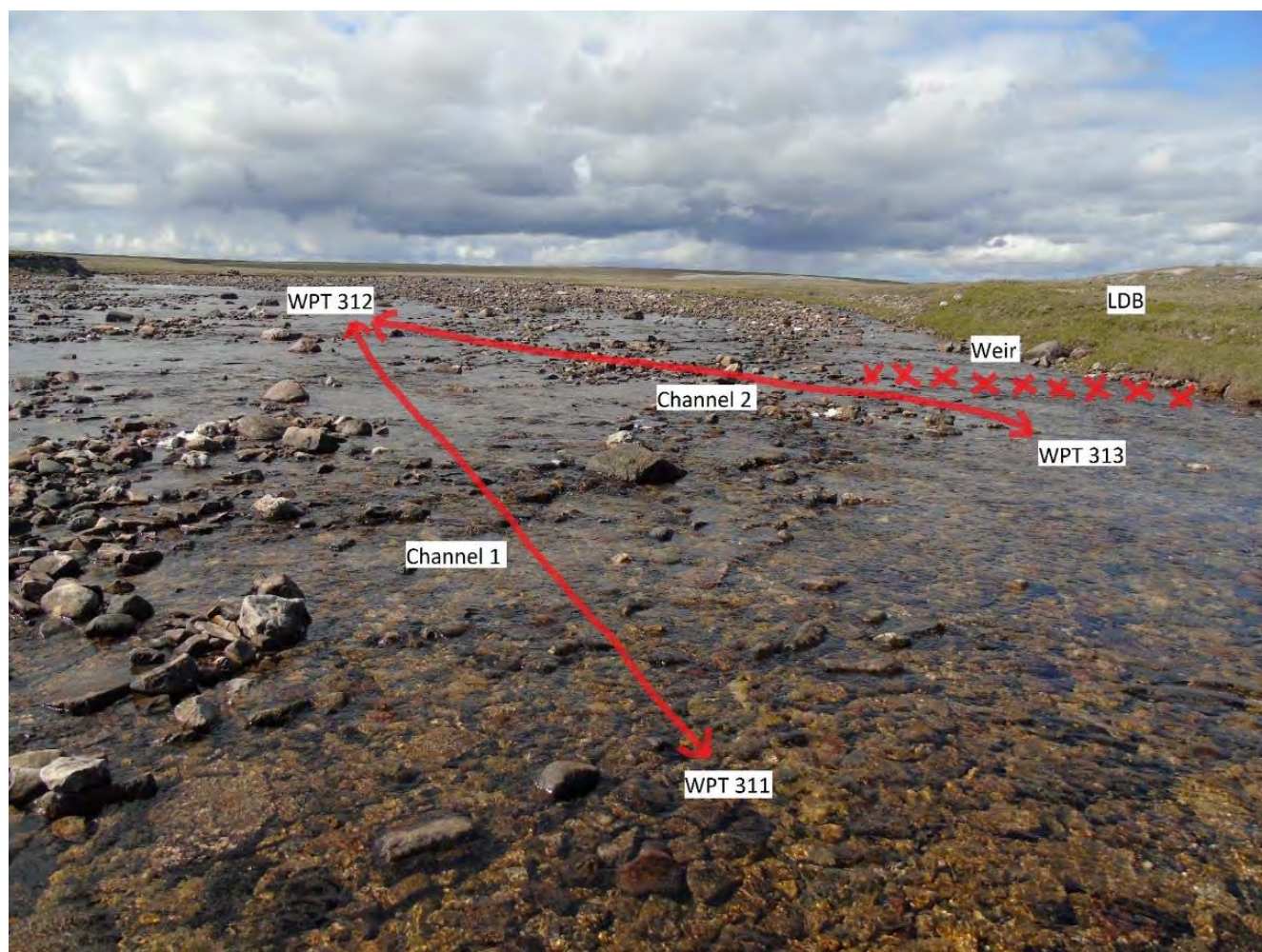


Photo C6: View upstream at proposed Low-Flow Channel Site 2 showing where Channel 1, Channel 2, and the directional weir should be constructed.



Photo C7: View looking upstream at the LDB where the directional weir should be constructed to prevent fish stranding along the LDB.



APPENDIX C

Remediation Plan 2016

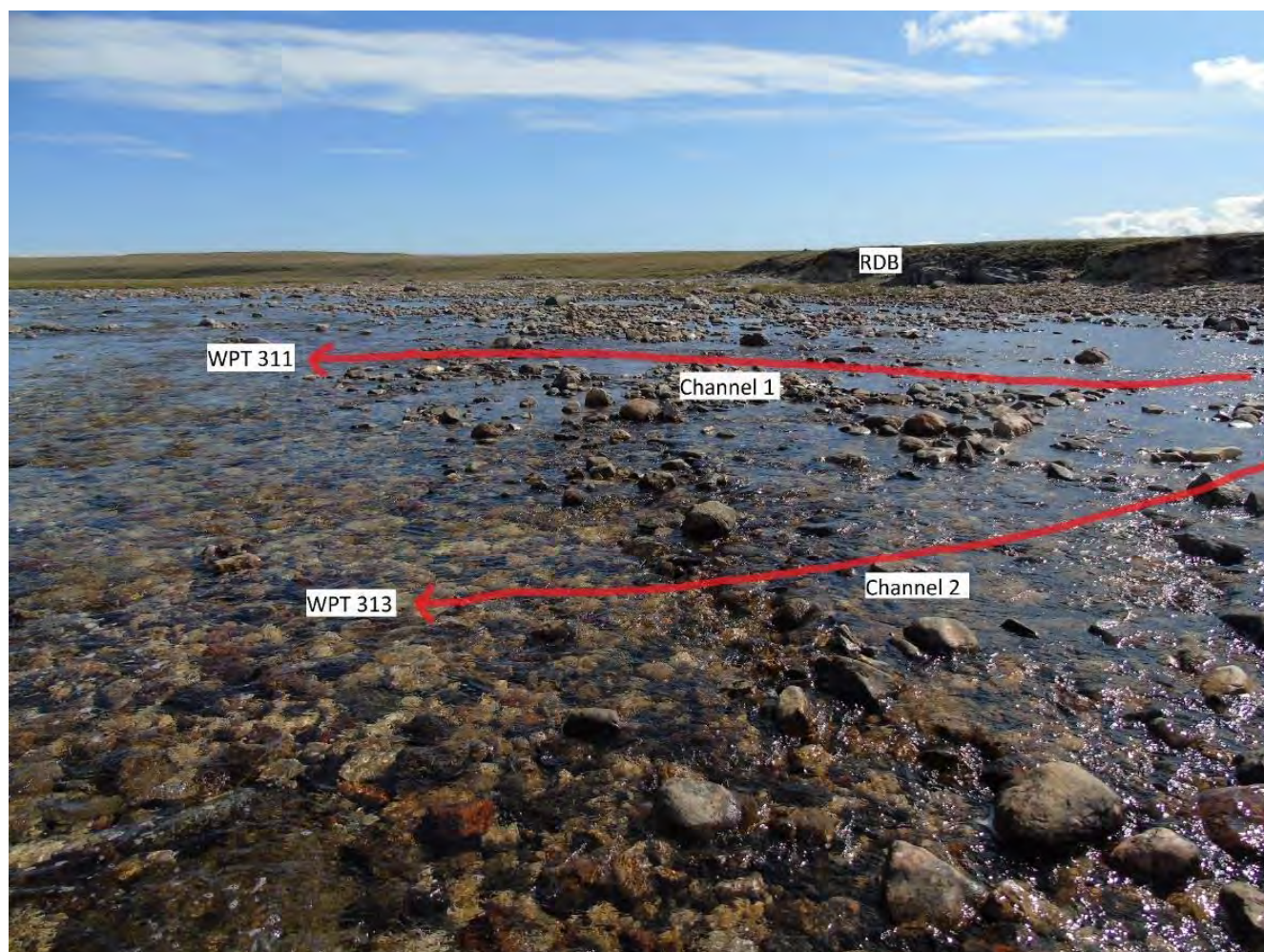


Photo C8: View downstream looking at the RDB showing where Channel 1 and Channel 2 should be constructed. This photo also shows the dry RDB and deeper LDB area where fish will originate when migrating upstream.



APPENDIX C

Remediation Plan 2016

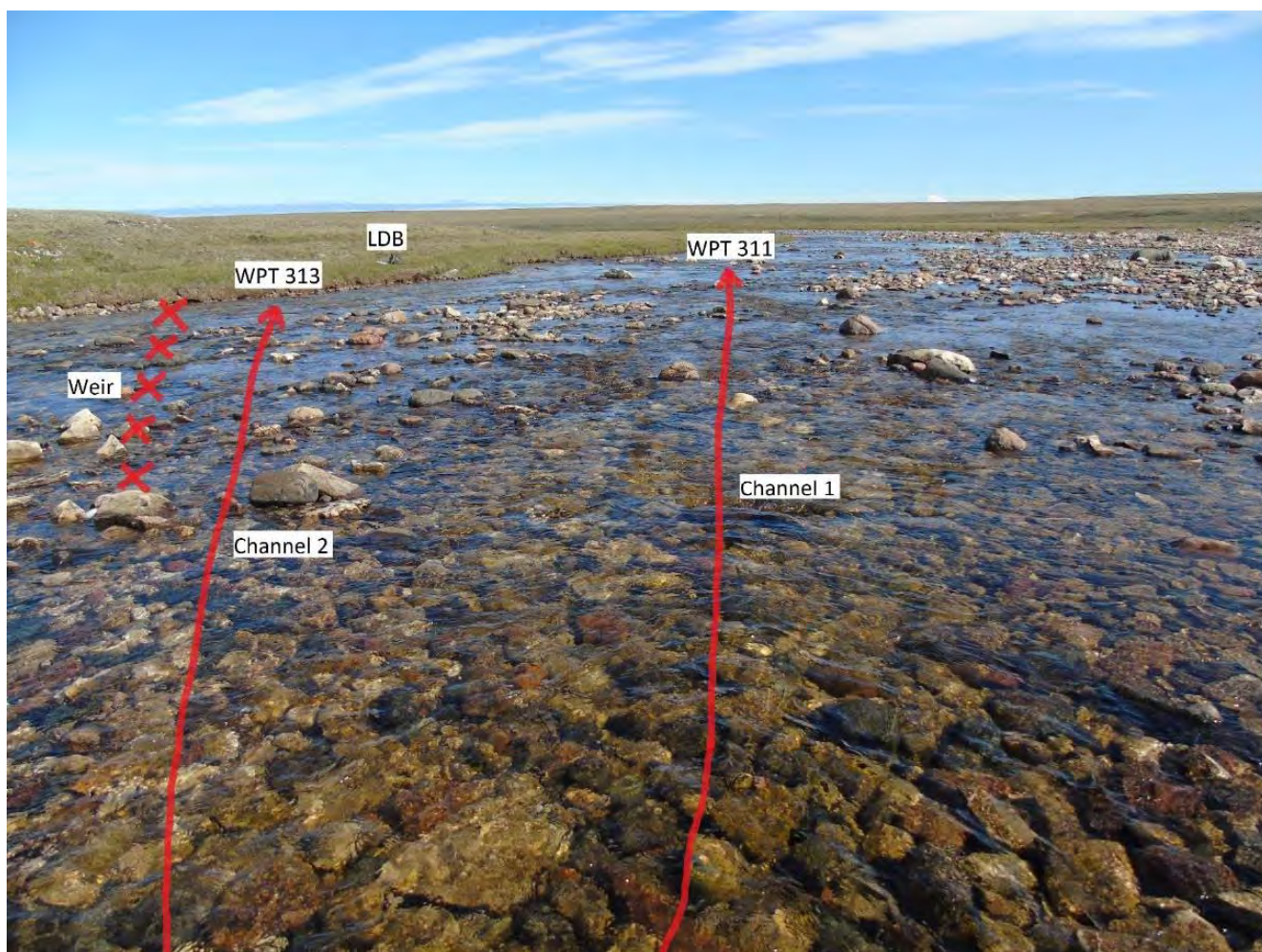


Photo C9: View looking downstream at the LDB, showing where each channel and the weir should be constructed to facilitate fish migration.



APPENDIX C

Remediation Plan 2016

Table C3: Remediation Planning Notes for Low-Flow Channel Site 3

Priority	Medium		Notes: ■ In this section of the creek, there is sufficient depth for fish to travel up the RDB. Though more difficult, fish may also travel up the center, and towards the LDB where flow is faster but the water is shallow. ■ An unimpeded migration route is required to connect deep water sections (e.g., thalwegs, small pools) where fish might be holding ■ Site 3 is immediately below 2012 Projects 2 and 3.
Fish Stranding Observed?	Yes (2012 and 2014)		
Approximate Minimum Length	34-m channel or a 16-m weir		
Approximate Distance From Mouth	1.7 km		
Location of Channel Start and End Points (UTM 11W)			
Waypoint	Easting	Northing	
316	591160	7626839	
317	591127	7626839	
Recommendation	■ Construct a 34-m channel to provide migrating fish the option of swimming up through the center or LDB of the creek; an alternative design would be a rock weir from the LDB to the centre of the creek, directing fish to the RDB. ■ Final design of the remediation site will be determined in the field by the remediation crew.		

m = metres; km = kilometres; HTO = Kugluktuk Hunters and Trappers Organization ; LDB = left downstream bank; RDB = right downstream bank.



APPENDIX C

Remediation Plan 2016

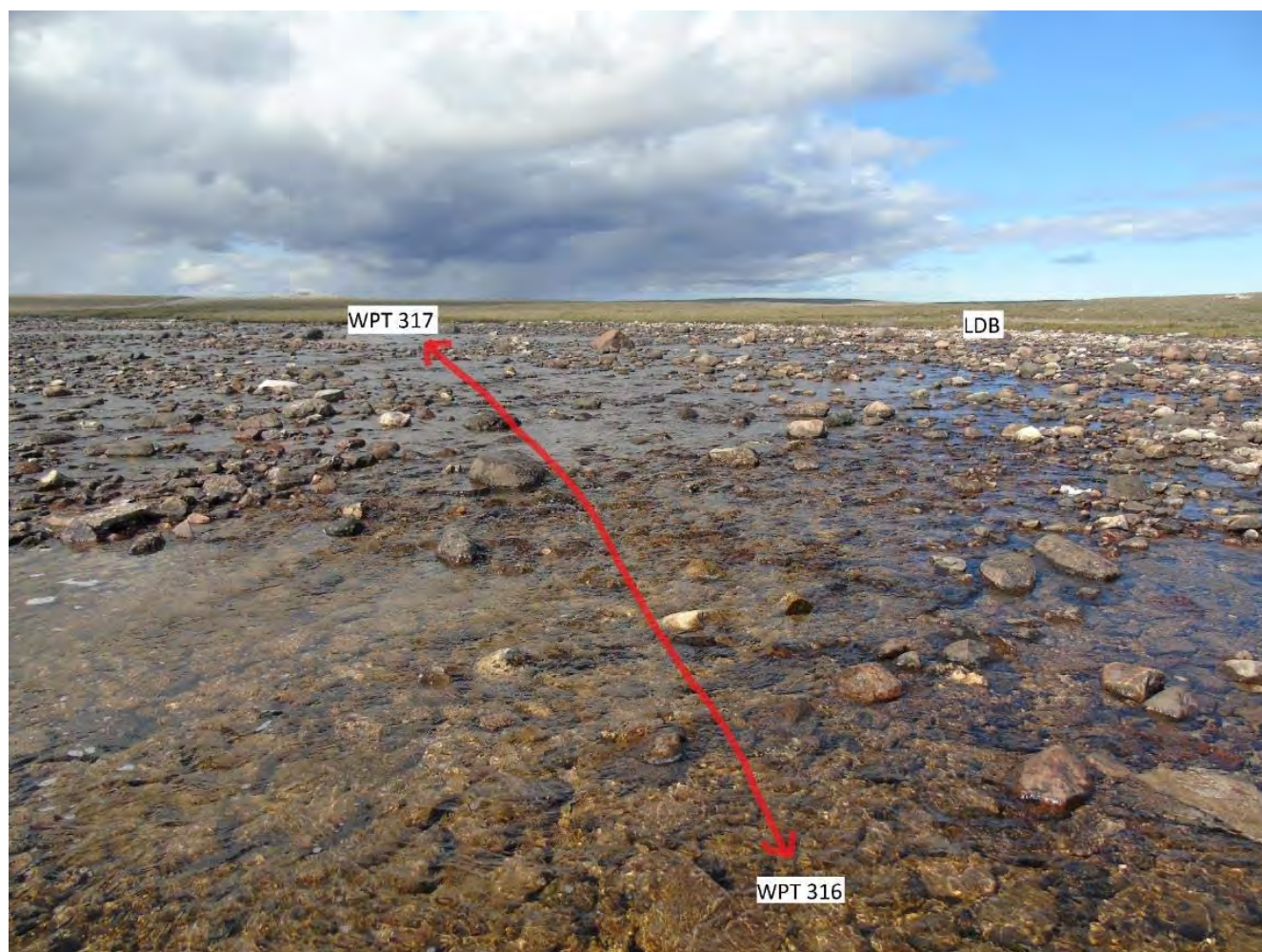


Photo C10: View looking upstream towards potential Low-Flow Channel Site 3 where low-flow channel should be constructed to provide the option for migration up the LDB.



APPENDIX C

Remediation Plan 2016

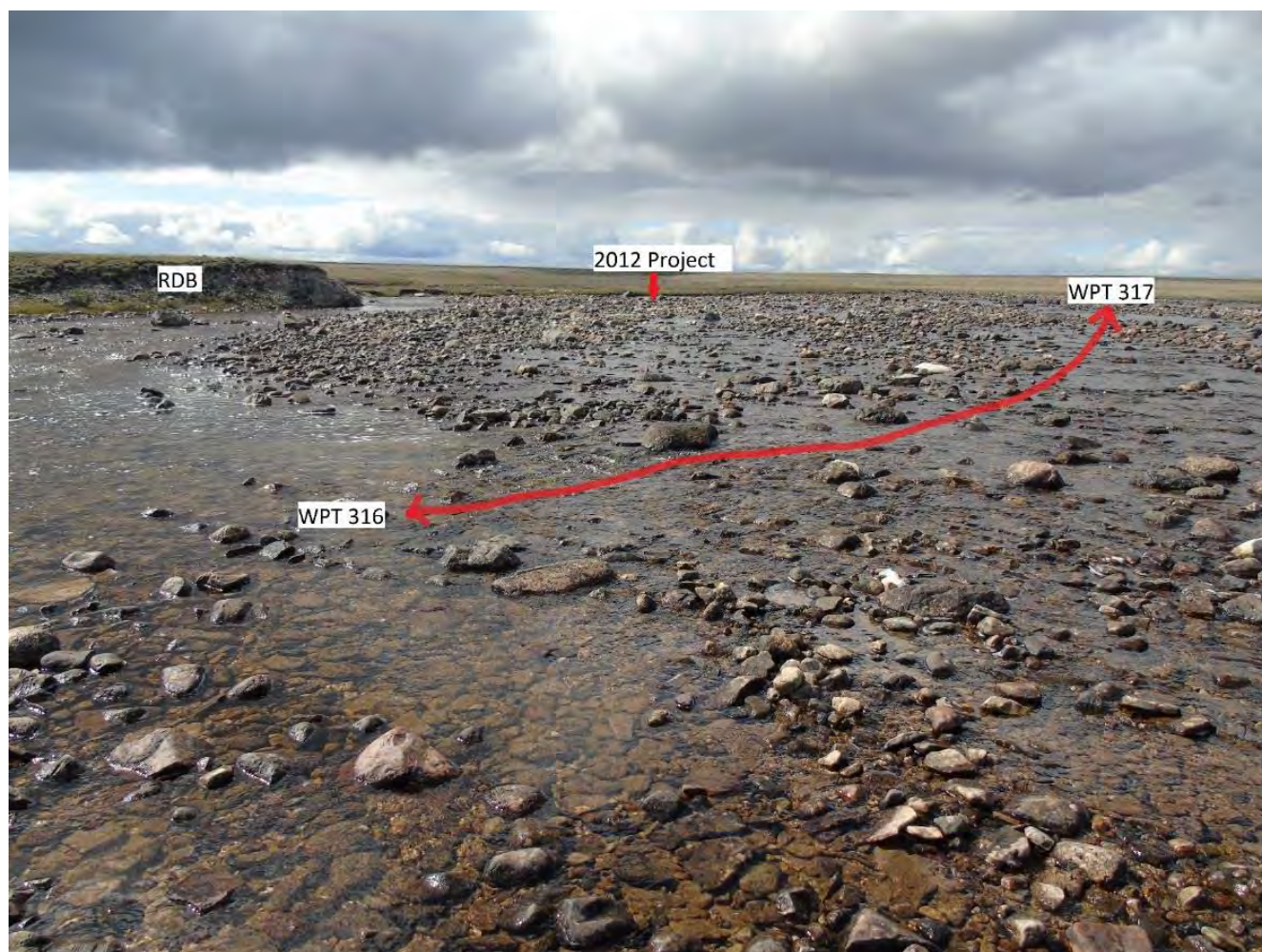


Photo C11: View looking upstream at potential Low-Flow Channel Site 3 where the low-flow channel should be constructed to direct fish towards the LDB. This photo also shows the deeper RDB where fish travel up towards 2012 Project 3.



APPENDIX C

Remediation Plan 2016

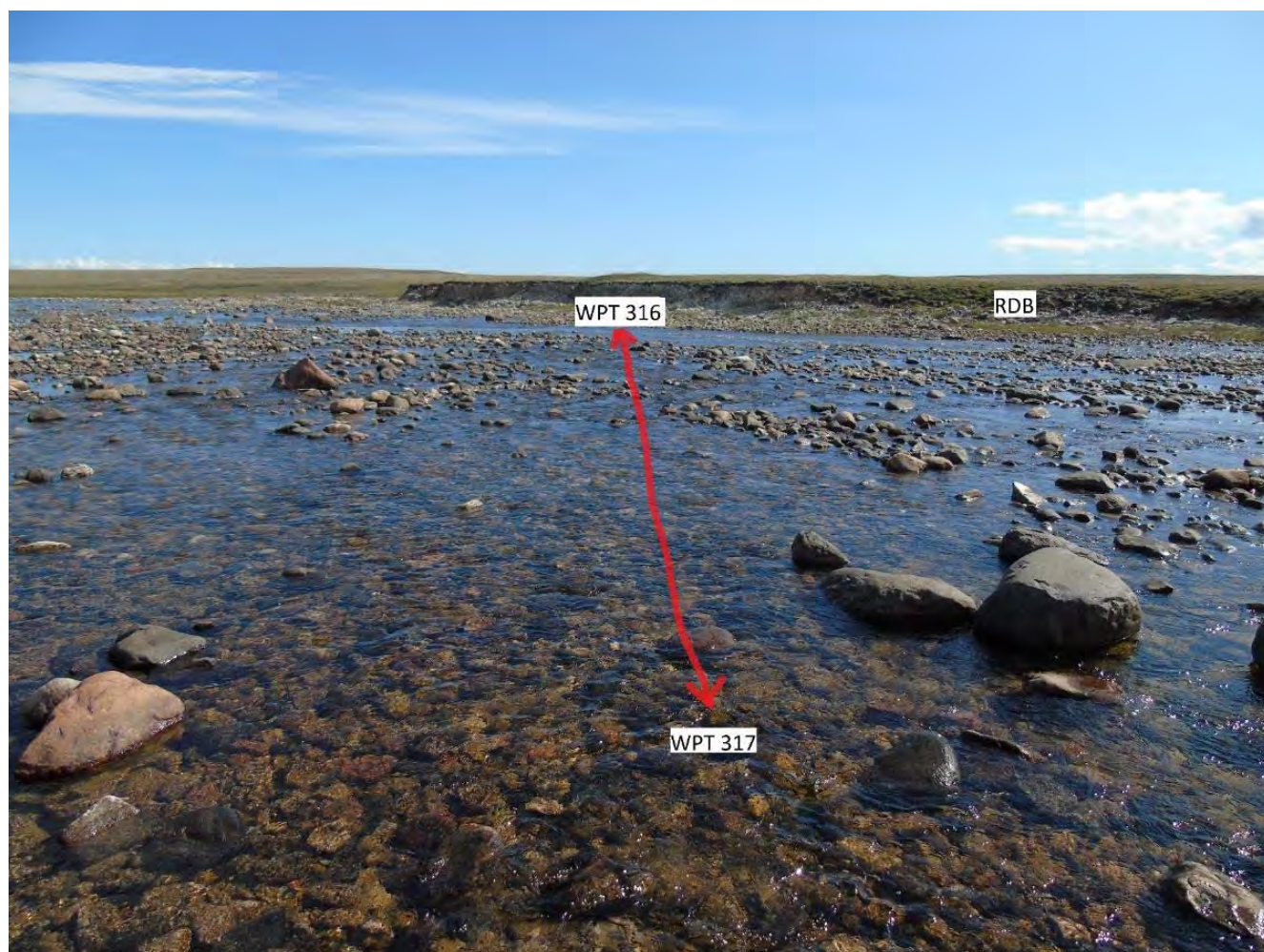


Photo C12: View looking downstream towards the RDB where the low-flow channel should be constructed to connect deeper areas of the creek.



APPENDIX C

Remediation Plan 2016

Table C4: Remediation Planning Notes for Low-Flow Channel Site 4

Priority	Medium		Notes: ■ Fish swimming upstream in this section will encounter good flows but shallow depths along the RDB and also through the center of the channel from the LDB. Fish may attempt to travel in either direction following the flow, and therefore, two low-flow channels should be constructed to provide multiple for unimpeded swimming upstream. ■ The design should consider maintaining connectivity with the next upstream remediation site; this will be considered by the remediation field crew in 2016. ■ A second channel at this location would give fish another migration route option and position fish to be in a good location for continued migration through the next upstream remedition site that is proposed (i.e., Site 5).
Fish Stranding Observed?	Yes (2012 and 2014)		
Approximate Minimum Length	30-m channel and an 18 m weir		
Approximate Distance From Mouth	2.0 km		
Location of Channel Start and End Points (UTM 11W)			
Waypoint	Easting	Northing	
318	590927	7626609	
319	590906	7626587	
320	590927	7626616	
321	590897	7626613	
Recommendation	■ Construct two, low-flow channels to connect the thalwegs to locations with deeper flows. ■ Channel 1 (approximately 31 m) will direct fish up the RDB where there is sufficient depth further upstream. ■ Channel 2 (approximately 32 m) will direct fish diagonally up the center towards the LDB to connect thalwegs and position fish through the next upstream low-flow channel site that is proposed.		

m = metres; km = kilometres; HTO = Kugluktuk Hunters and Trappers Organization ; LDB = left downstream bank; RDB = right downstream bank.



APPENDIX C

Remediation Plan 2016

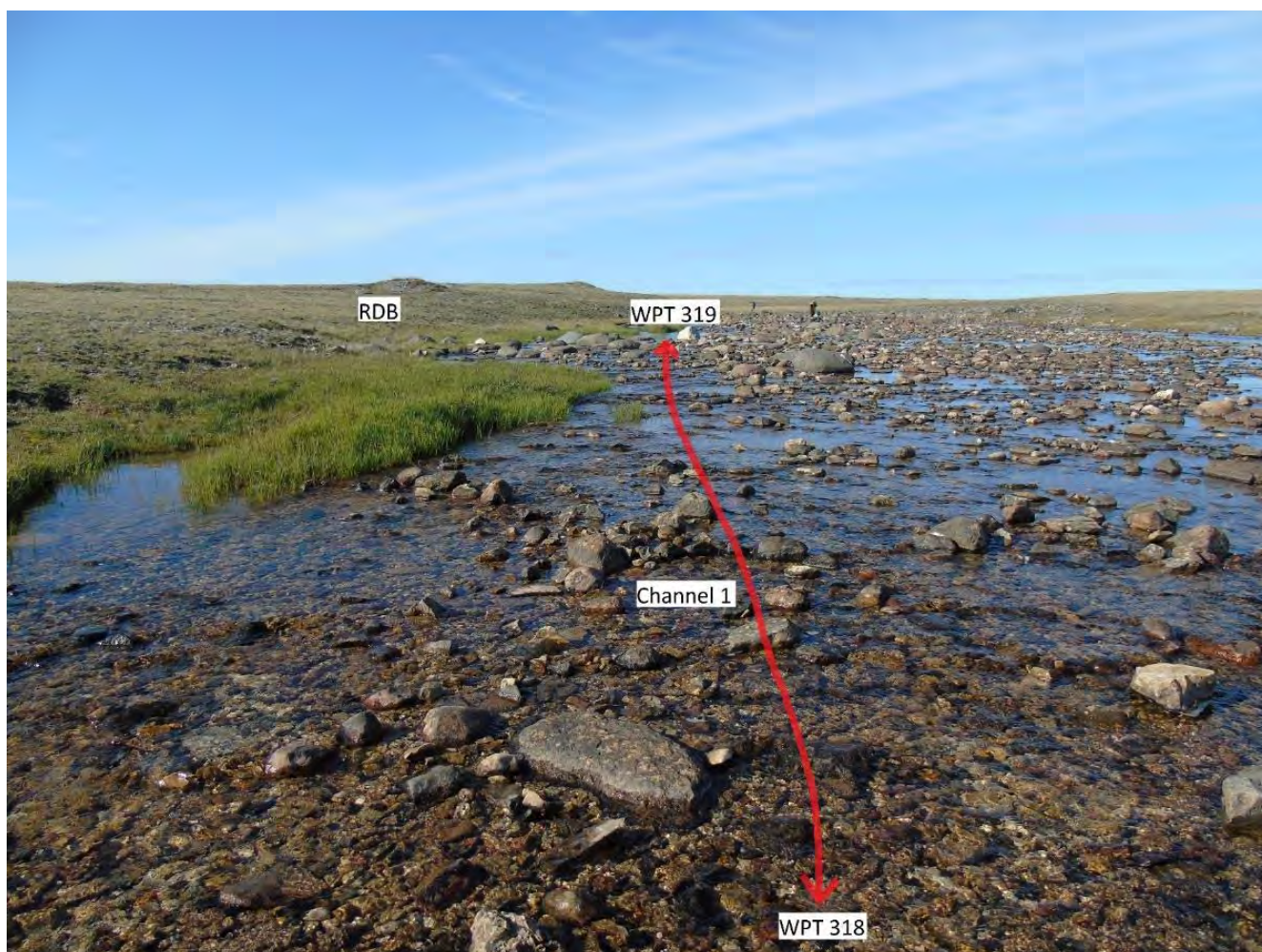


Photo C13: View upstream towards potential Low-Flow Channel Site 4 showing where low-flow Channel 1 should be constructed along the RDB.



APPENDIX C

Remediation Plan 2016

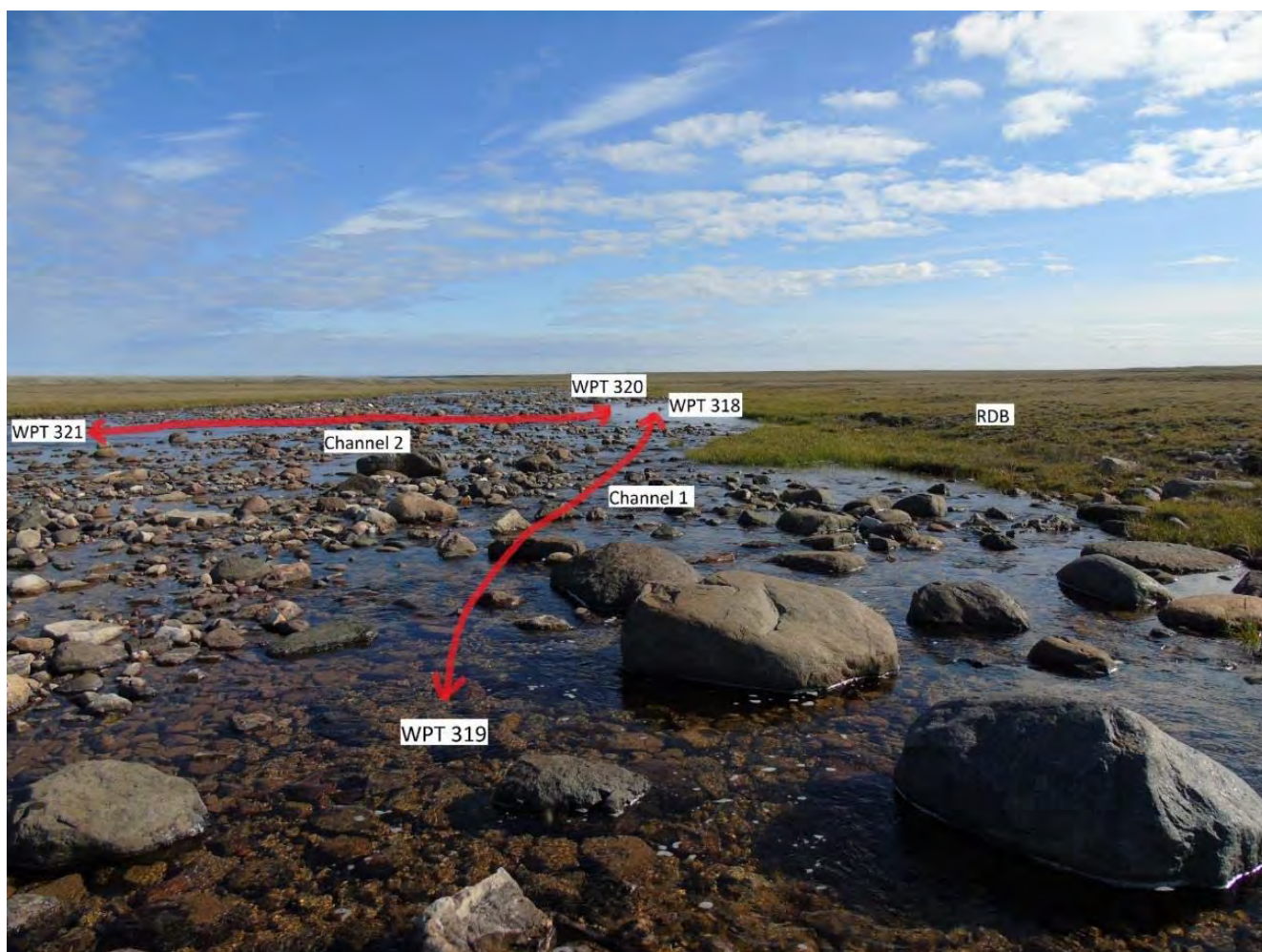


Photo C14: View downstream towards potential Low-Flow Channel Site 4 showing where low-flow Channels 1 and 2 should be constructed to connect the thalwegs and provide options for upstream migration.



APPENDIX C

Remediation Plan 2016

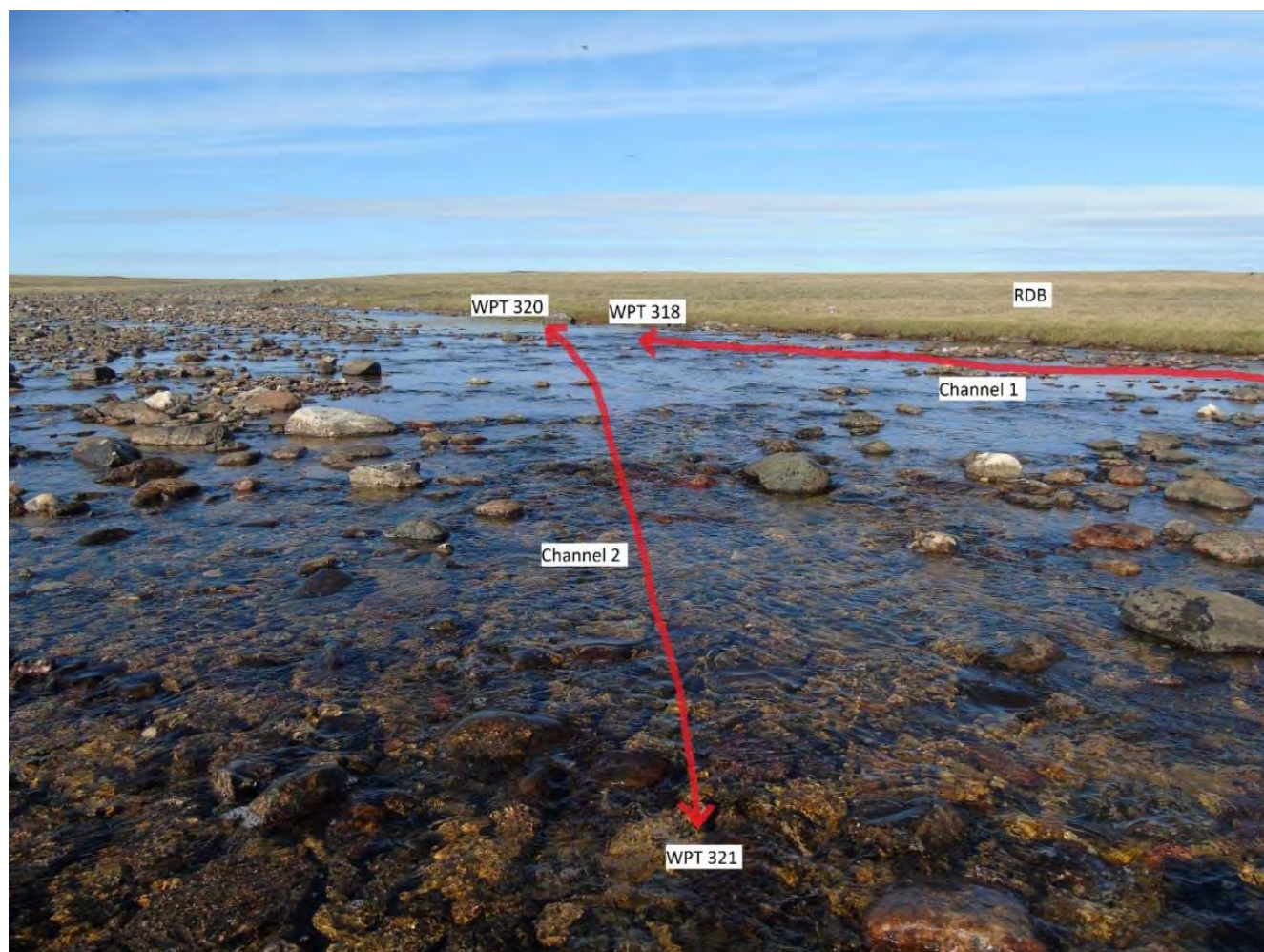


Photo C15: View downstream towards potential Low-Flow Channel Site 4 showing where low-flow Channels 1 and 2 should be constructed to connect the thalwegs and provide options for upstream migration.



APPENDIX C

Remediation Plan 2016



Photo C16: View upstream showing where low-flow Channel 2 directs fish, up the LDB towards proposed Site 5.



Table C5: Remediation Planning Notes for Low-Flow Channel Site 5

Priority	High		Notes: ■ In this section of the creek, fish must swim up the LDB due to the RDB being dry and impassable. Fish are also faced with a 30 to 60 cm gradient of shallow flows and boulders that spans the width of the creek, and at low-water levels this is a barrier to fish movement. ■ The LDB is the only obvious route for fish migration, and a low-flow channel should be constructed here. ■ This is the highest priority of all proposed remediation sites for 2016. ■ This site may be similar in design and effort to Project 2 from 2012. ■ Large boulders are present.
Fish Stranding Observed?	Yes (2012 and 2014)		
Approximate Length	22 m channel		
Approximate Distance From Mouth	2.2 km		
Location of Channel Start and End Points (UTM 11W)			
Waypoint	Easting	Northing	
322	590815	7626539	
323	590824	7626522	
Recommendation	■ Construct a 22 m long, low-flow channel to direct fish from the LDB, up the middle of the creek to a pool on the right downstream bank. ■ Efforts should also restrict access to the shallow LDB by constructing a short weir (approximately 6 m) from the LDB to the mouth of the channel. ■ Where possible, integrate large boulders into the low-flow channel design to provide instream cover and maintain structural integrity of the channel.		

m = metres; km = kilometres; HTO = Kugluktuk Hunters and Trappers Organization ; LDB = left downstream bank; RDB = right downstream bank.



APPENDIX C

Remediation Plan 2016

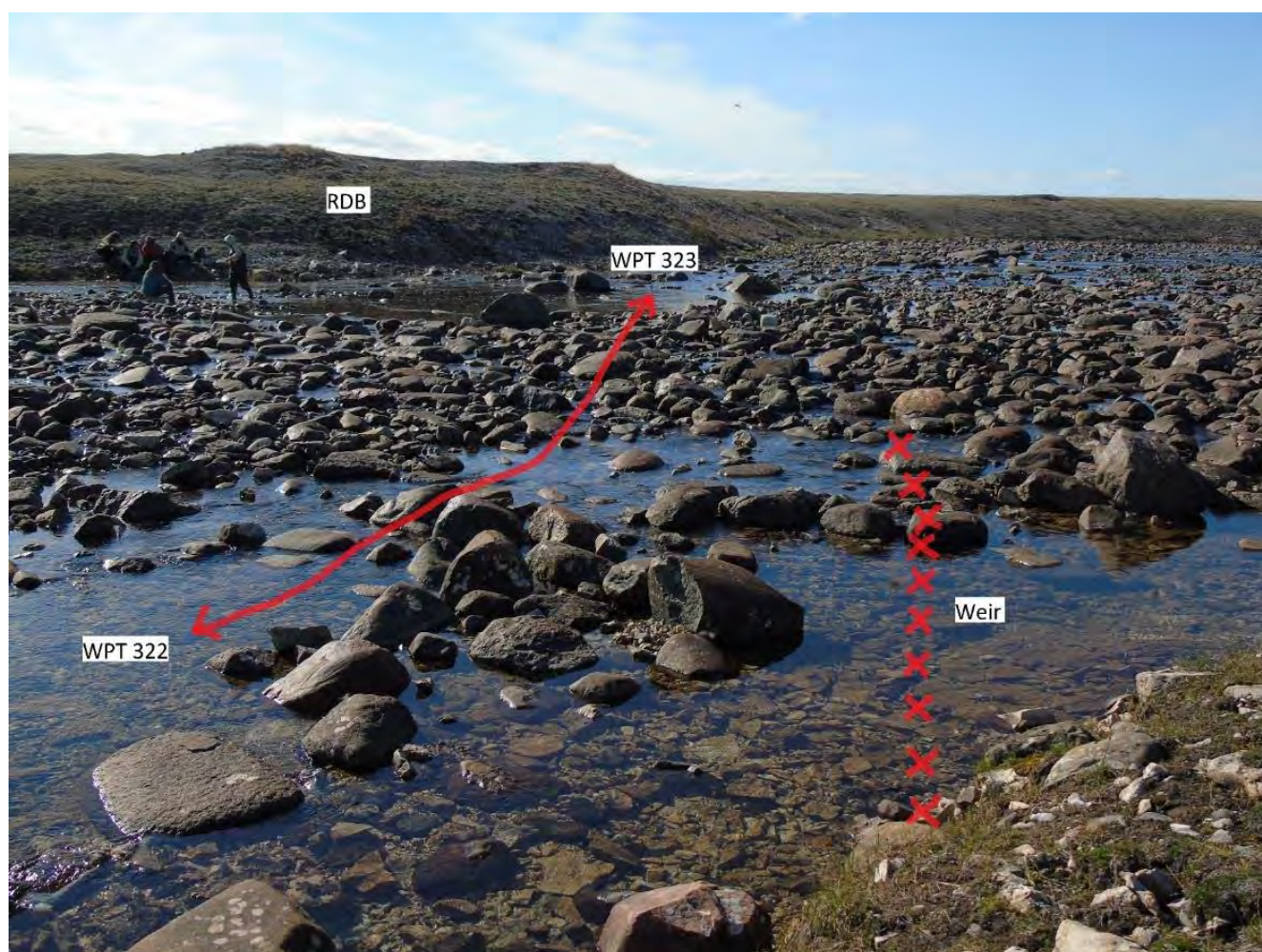


Photo C17: View upstream towards potential Low-Flow Channel Site 5 showing where the low-flow channel should be constructed to allow fish passage from the LDB towards the deeper RDB. A directional weir should also be constructed along the LDB towards the proposed channel, blocking access up the shallow LDB.



APPENDIX C

Remediation Plan 2016

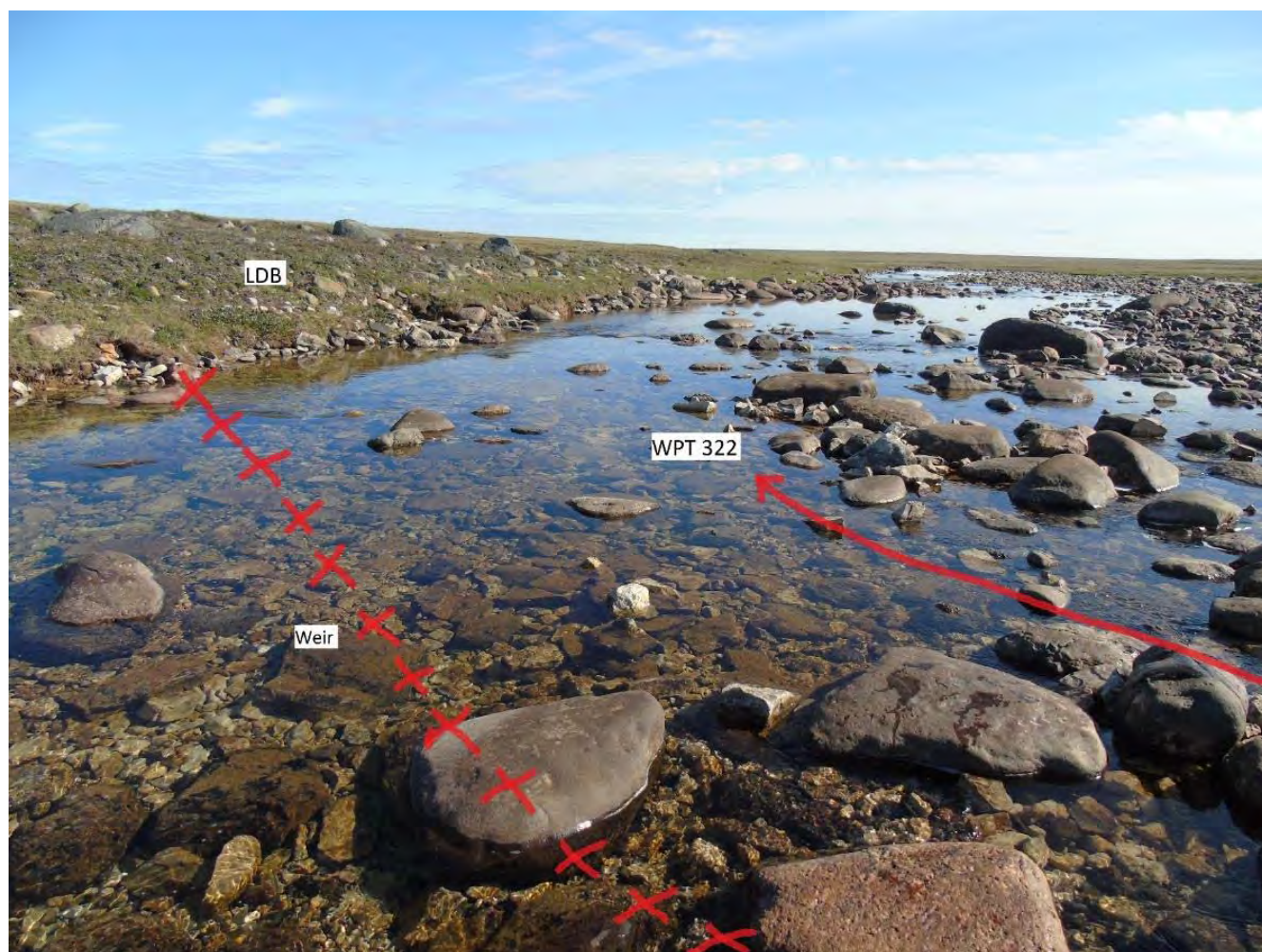


Photo C18: View downstream showing the current path of fish travel up the LDB due to the dry middle and RDB areas of creek. Also shown is the starting location of the proposed low-flow channel and directional weir blocking access up the LDB which becomes dry further upstream.



APPENDIX C

Remediation Plan 2016



Photo C19: View upstream towards potential Low-Flow Channel Site 5 showing the dry LDB and where the low-flow channel should be constructed to connect the thalweg with the deeper RDB upstream. Also shown is where the directional weir should be constructed along the LDB to direct fish into the low-flow channel.



APPENDIX C

Remediation Plan 2016

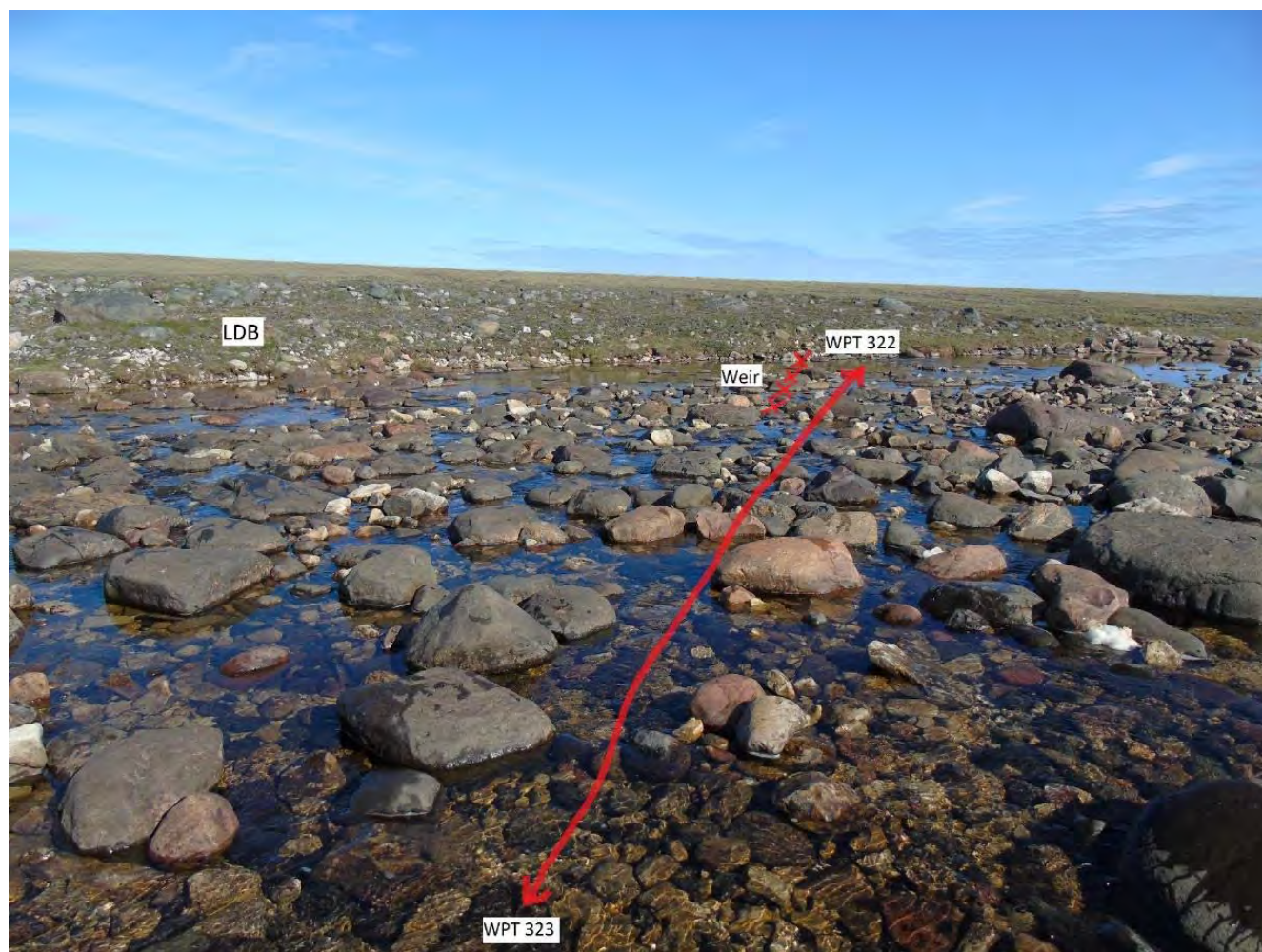


Photo C20: View downstream towards the LDB showing where the low-flow channel should be constructed to connect the deeper LDB and RDB thalwegs.



APPENDIX C

Remediation Plan 2016

Table C6: Remediation Planning Notes for Low-Flow Channel Site 6

Priority	High		Notes: ■ In this section of the creek shallow depths in the center and along the RDB result in fish having to migrate up the LDB to a large pool. Upstream of the pool, the only route of travel is along a 30 to 60 cm gradient of shallow flows, boulders and large cobble that spans the width of the creek for a distance of 45 m. It is expected that there is a high risk of stranding through this section. ■ Due to fish holding in a large pool downstream of the proposed channel, it is recommended that the mouth of the constructed channel be wider than usual (approximately 3 m) to make it obvious where the channel is as fish attempt to leave the pool.
Fish Stranding Observed?	Yes (2014)		
Approximate Minimum Length	45 m channel		
Approximate Distance From Mouth	2.5 km		
Location of Channel Start and End Points (UTM 11W)			
Waypoint	Easting	Northing	
330	590554	7626407	
331	590559	7626388	
Recommendation	■ Construct a 45 m low-flow channel to connect the deeper pool on the LDB to the thalweg in the center of the channel further upstream. Weirs constructed on either side of the channel may assist in directing fish up the low-flow channel from the pool.		

m = metres; km = kilometres; HTO = Kugluktuk Hunters and Trappers Organization ; LDB = left downstream bank; RDB = right downstream bank.



APPENDIX C

Remediation Plan 2016

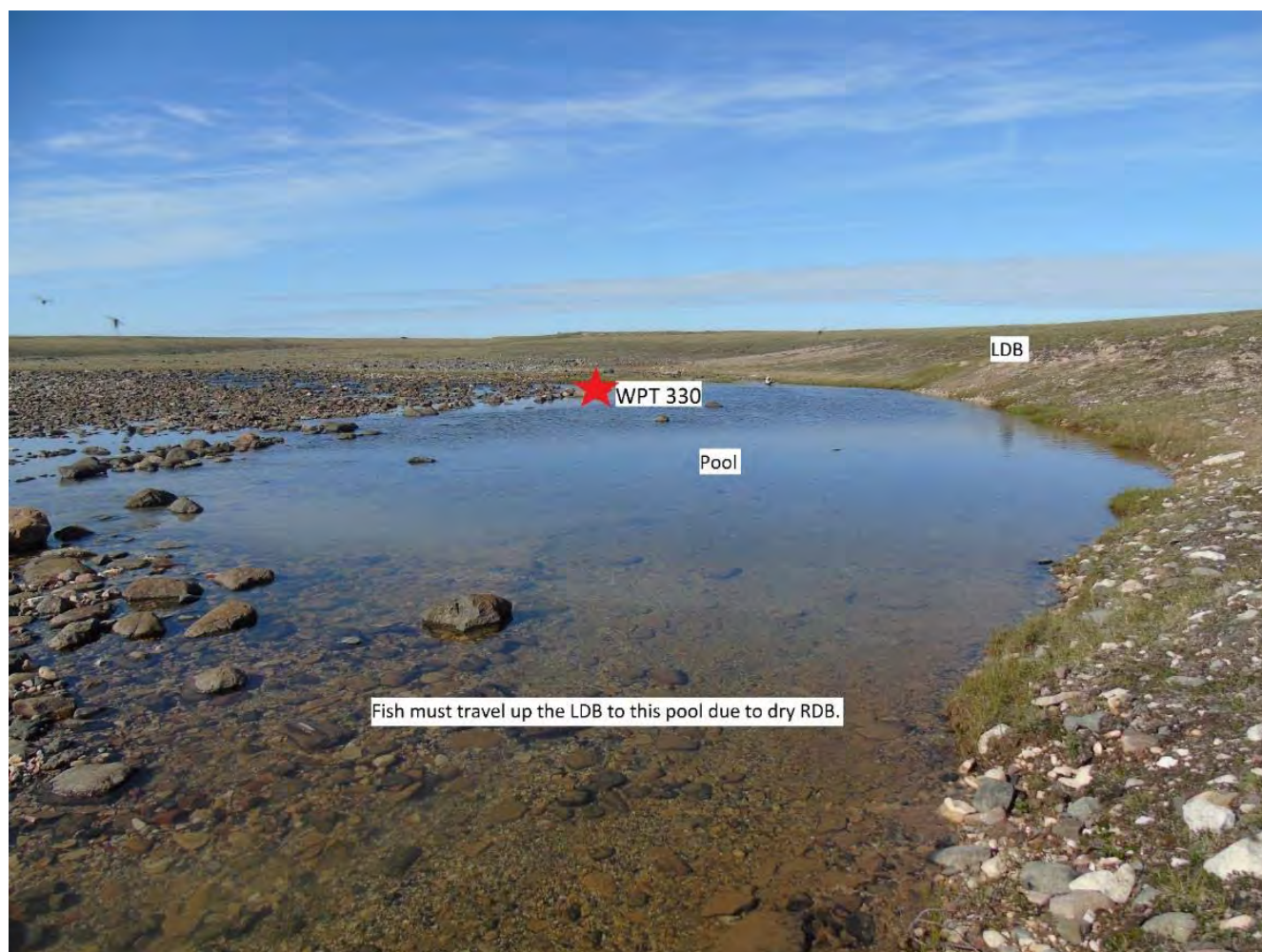


Photo C21: View looking upstream at the pool that fish must reach before travelling upstream to proposed Site 6.



APPENDIX C

Remediation Plan 2016

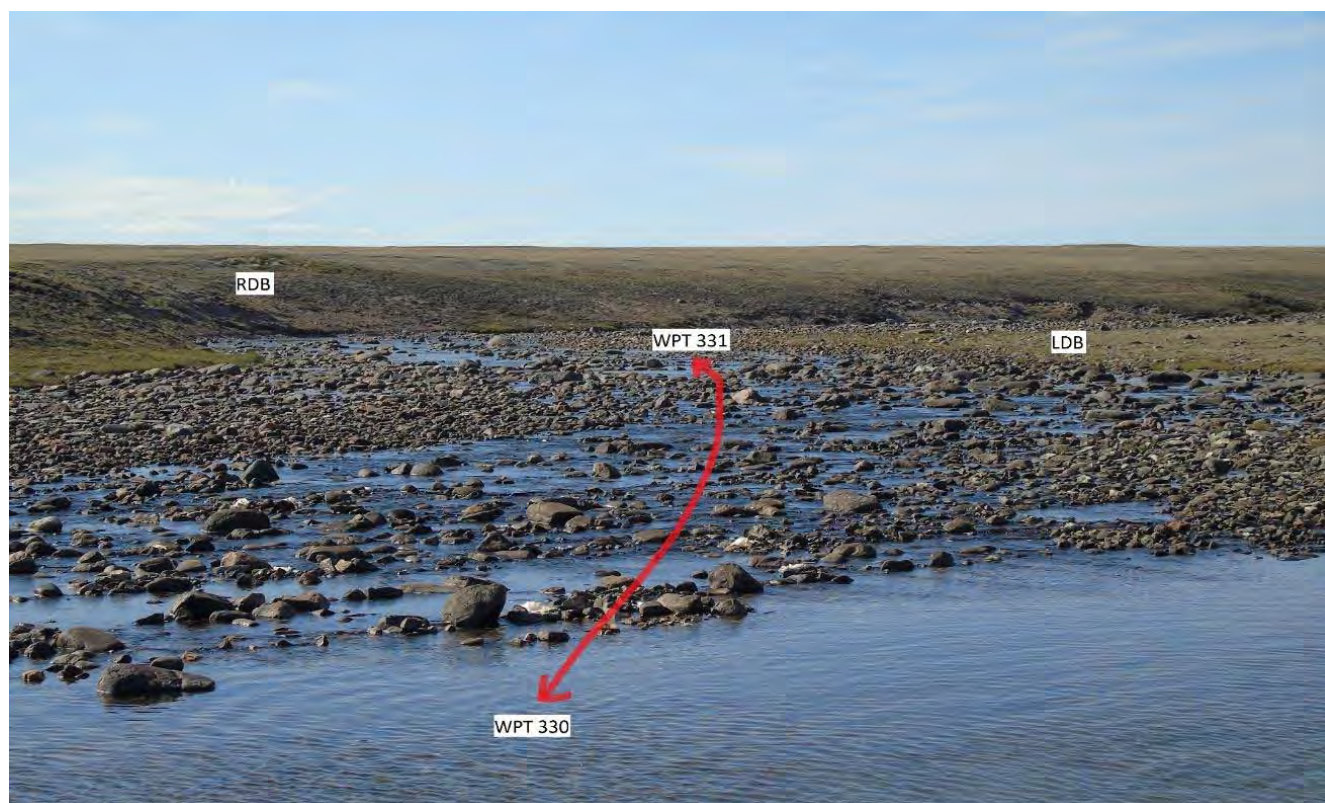


Photo C22: View upstream towards Low-Flow Channel Site 6 showing where the channel should be constructed to facilitate fish passage.



APPENDIX C

Remediation Plan 2016

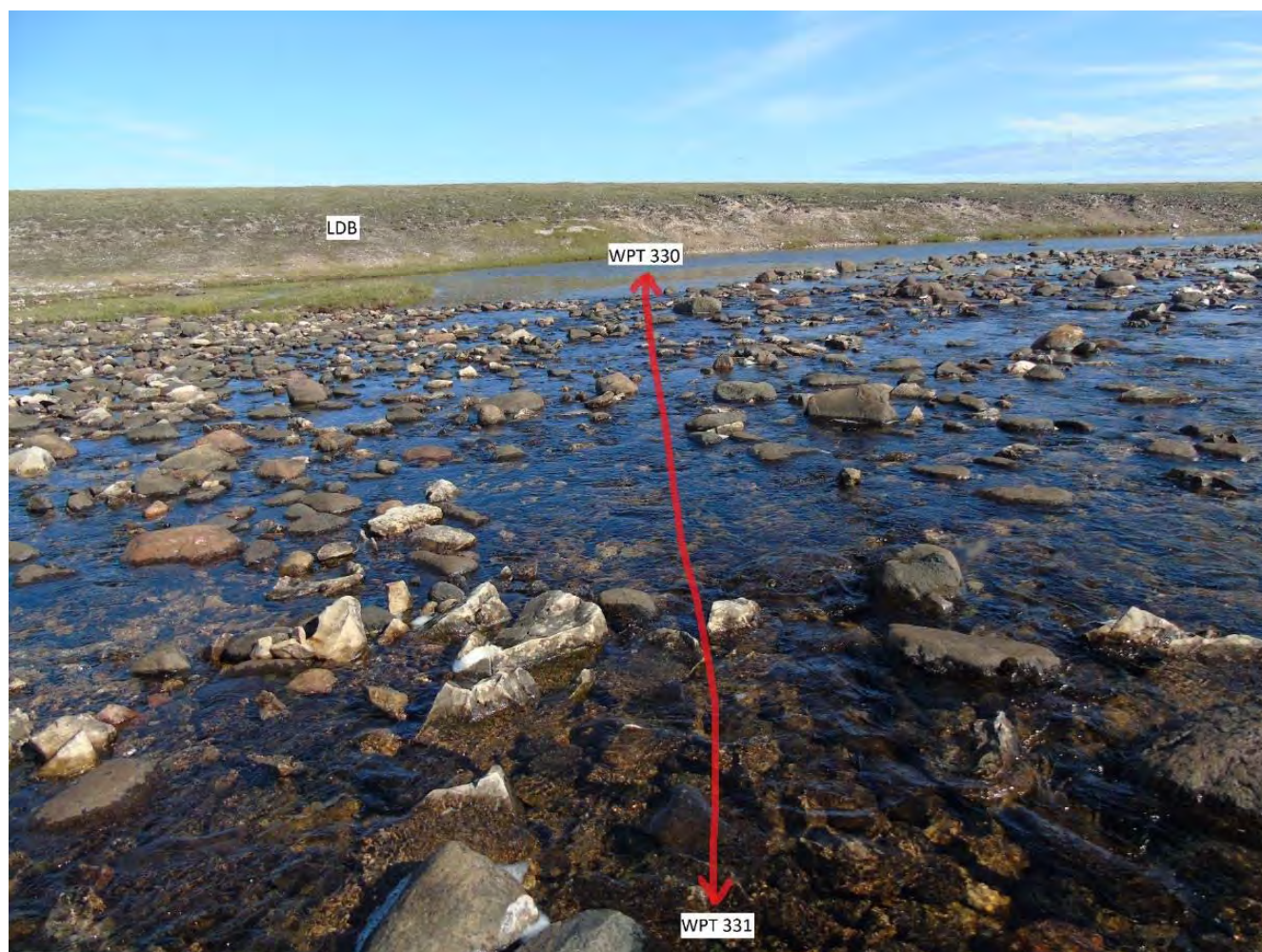


Photo C23: View downstream towards the LDB and pool showing where the low-flow channel should be constructed to connect thalwegs.



APPENDIX C

Remediation Plan 2016

Table C7: Remediation Planning Notes for Low-Flow Channel Site 7

Priority	Medium		Notes: ■ In this section of the creek, fish migrating upstream must swim from a pool on the LDB, up a gradient of 30 to 60 cm of large cobble for approximately 14 m before reaching the thalweg in the center of the creek. ■ At the time of the survey the only route of travel during low-flows would be along the LDB. ■ This site is similar to the pre-construction section for 2012 Project 3. ■ Due to the short distance of the proposed channel, it is recommended that a wider than normal channel (approximately 2-3 m) be constructed.
Fish Stranding Observed?	Yes (2012)		
Approximate Minimum Length	14 m channel		
Approximate Distance From Mouth	3.1 km		
Location of Channel Start and End Points (UTM 11W)			
Waypoint	Easting	Northing	
332	590167	7626219	
333	590165	7626206	
Recommendation	■ Construct a 14-m low-flow channel from the pool along the LDB towards the center of the creek where the water is deeper. The connection of deep water areas would facilitate fish passage. ■ At higher water levels fish may continue up the LDB where there remains a potential for stranding. Therefore, a rock weir should be constructed to direct fish from the LDB into the low-flow channel, reducing the risk of stranding. ■ Build channel around large boulders (to provide instream cover and stability for the channel) if possible.		

m = metres; km = kilometres; HTO = Kugluktuk Hunters and Trappers Organization ; LDB = left downstream bank; RDB = right downstream bank.



APPENDIX C

Remediation Plan 2016

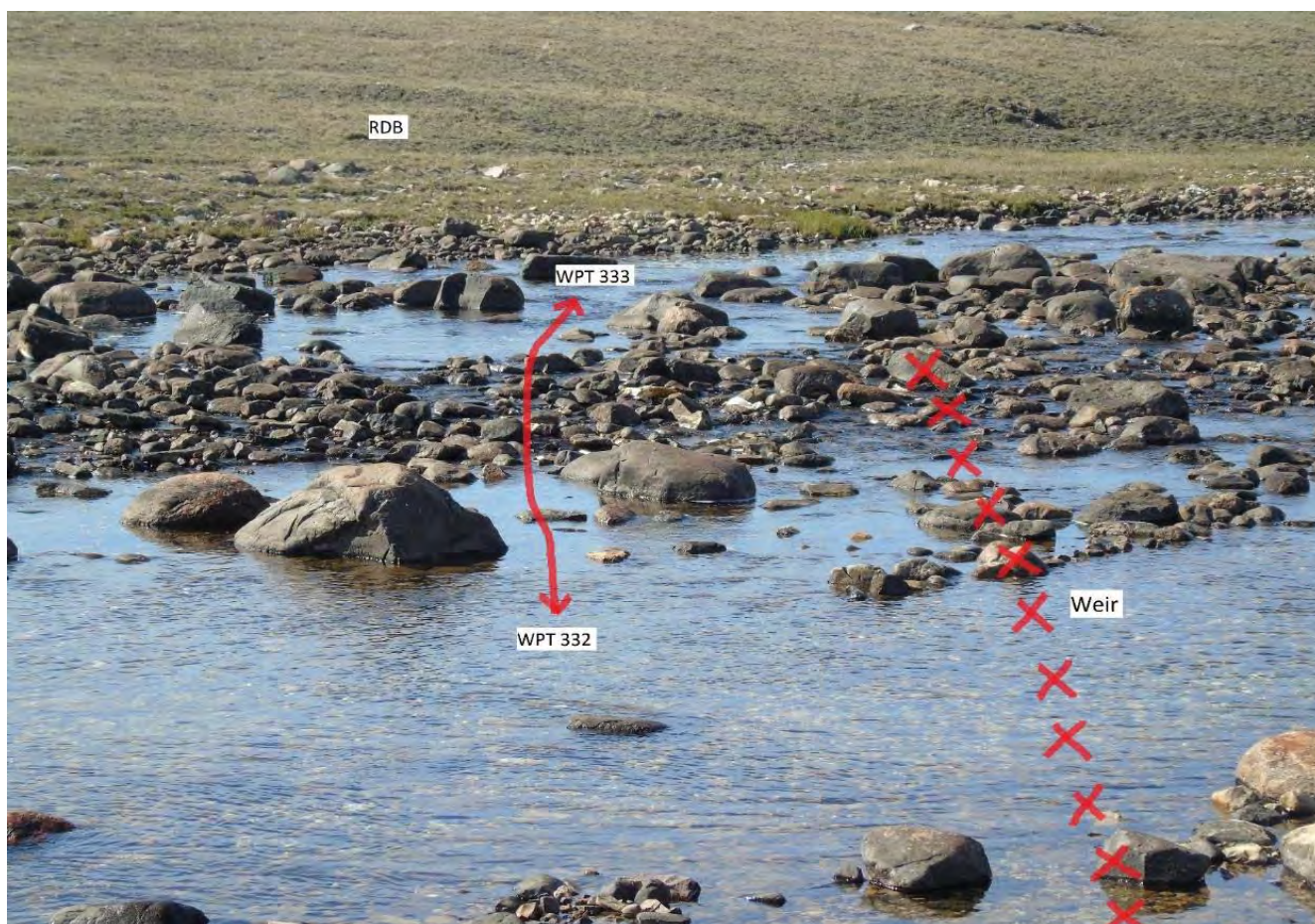


Photo C24: View upstream towards potential Low-Flow Channel Site 7 showing the RDB and where the low-flow channel should be constructed. Also shown is the directional weir that should be constructed to direct fish from the LDB into the channel.



APPENDIX C

Remediation Plan 2016

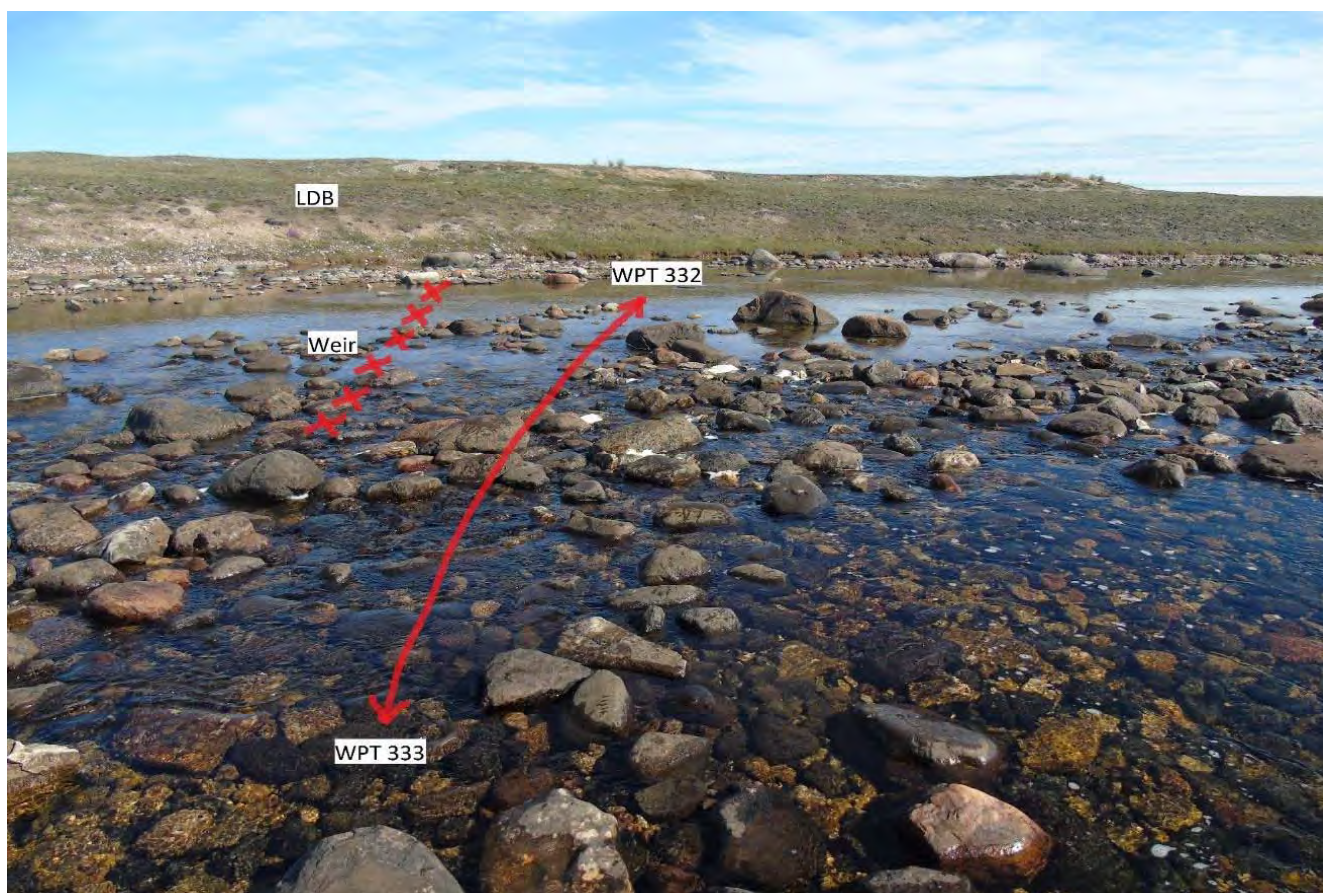


Photo C25: View downstream towards the LDB showing where the low flow channel should be constructed to connect the pool to the thalweg in the center of the channel. Also shown is the location of the directional weir that should be constructed to direct fish into the channel and stop migration up the shallow LDB.



APPENDIX C

Remediation Plan 2016

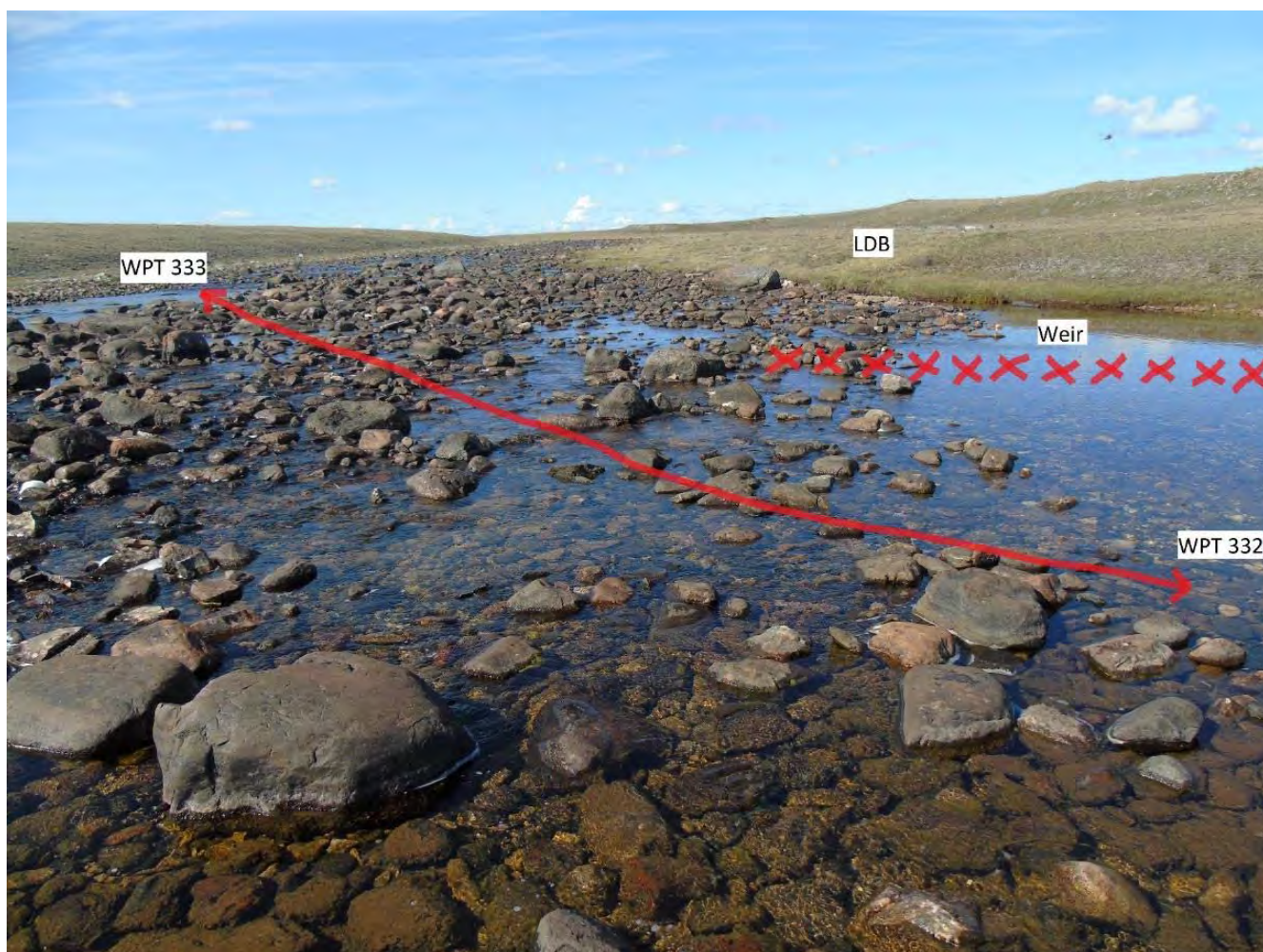


Photo C26: View upstream looking at where the channel should be constructed to connect the pool along the LDB to the thalweg in the center of the channel further upstream.

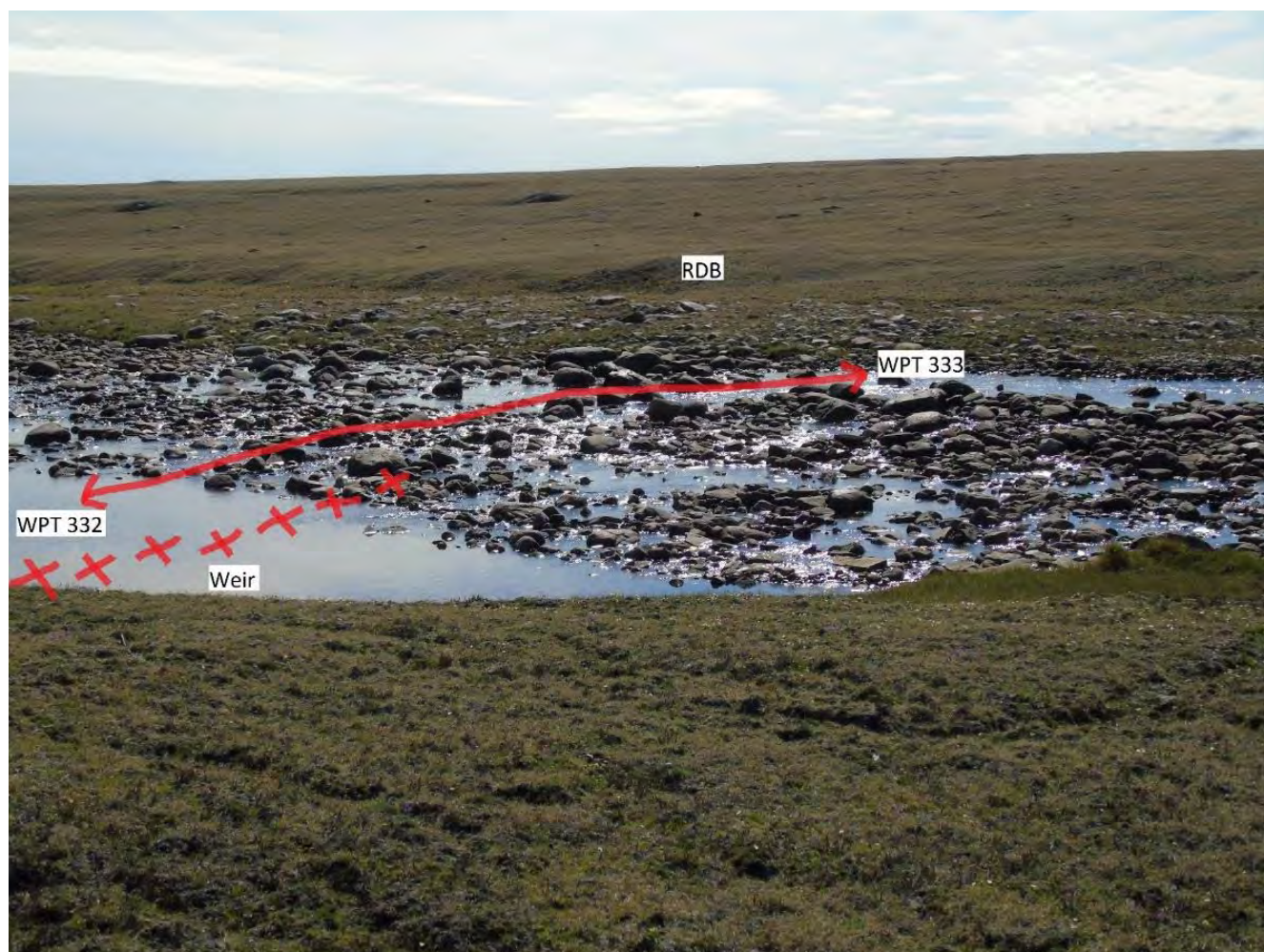


Photo C27: Looking towards the RDB, showing where the channel should be constructed to connect the pool along the LDB to the center of the channel further upstream.



APPENDIX C

Remediation Plan 2016

Table C8: Remediation Planning Notes for Low-Flow Channel Site 8

Priority	Low	Notes: ■ At this location there are small holding pools along the RDB, but if fish continue up the RDB there is potential for stranding further upstream at low-water conditions. A low-flow channel should be constructed to direct fish from the RDB, up the center of the channel towards the LDB where there is deeper water for passage. ■ This site is similar to pre-construction conditions at 2012 Project 3. ■ Site is approximately 600 m above the lowermost pond on the creek. ■ Remediation design of this site to be finalized in the field during the 2016 field program.
Fish Stranding Observed?	No data available	
Approximate Minimum Length	35 m channel	
Approximate Distance From Mouth	4.9 km	
Easting	589969	
Northing	7625431	
Recommendation	■ Construct a low-flow channel (approximately 35 m) to connect deeper areas and direct fish from the RDB up the center towards the LDB. ■ A directional weir (approximately 15 m) should be constructed from the RDB to the mouth of the proposed channel to direct fish into the channel and block access up the shallow RDB.	

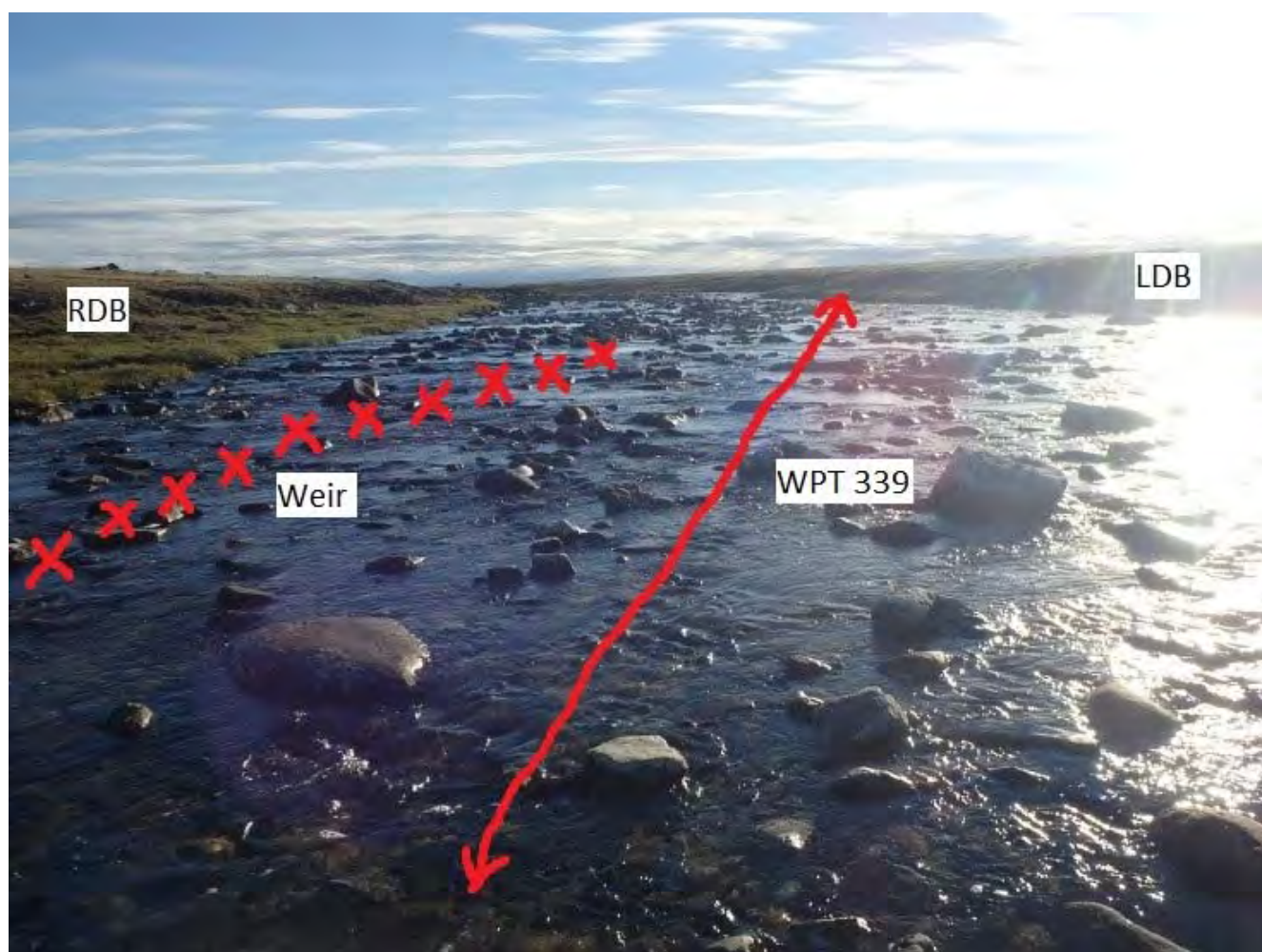


Photo C28: Looking upstream at potential Low-Flow Channel Site 8 where the channel should be constructed to connect RDB and LDB thalwegs. Also shown is where the directional weir should be constructed to direct fish into the channel and block access up the shallow RDB.



Photo C29: Looking downstream at potential Low-Flow Channel Site 8 showing where low-flow channel and directional weir should be constructed.



APPENDIX C

Remediation Plan 2016

Table C9: Remediation Planning Notes for Low-Flow Channel Site 9

Priority	Low	Notes: ■ Fish travelling up the LDB have potential to become stranded. ■ The RDB currently provides a better (i.e., non-obstructed) route for fish passage. A low-flow channel should be constructed to connect thalwegs and direct fish away from the LDB and up the center towards the RDB. ■ Large boulders present at Site 9. ■ Final remediation design of this section to be determined during the 2016 field program.
Fish Stranding Observed?	No data available	
Approximate Minimum Length	40 m channel	
Approximate Distance From Mouth	5.8 km	
Easting	589244	
Northing	7625128	
Recommendation	■ Construct a low-flow channel (approximately 40 m) to connect the LDB thalweg to the RDB thalweg. ■ A rock weir (approximately 10 m) should also be constructed to direct fish to the RDB and block access to shallow locations along the LDB. ■ Design the channel around large boulders (to provide instream cover and stream stability) if possible.	



Photo C30: Looking upstream towards proposed Low-Flow Channel Site 9 showing where channel and directional weir should be constructed.



Photo C31: Looking downstream towards potential Low-Flow Channel Site 9 showing where channel and directional weir should be constructed.



APPENDIX C

Remediation Plan 2016

Table C10: Remediation Planning Notes for Low-Flow Channel Site 10

Priority	Low	Notes: ■ During low flows fish that swim up the center of the channel may become stranded. Fish may swim more easily up LDB and RDB routes where depths and flows are more suitable for passage. Two directional rock weirs would direct fish away from the center of the channel and towards either banks-side thalweg for migration. ■ Site located approximately 2 km downstream of Hingittok Lake where Nulahugyuk Creek flows into Pond 2. ■ Remediation design of this section to be finalized in the field during the 2016 field program. ■ Travel time to this site from camp should be considered when planning the schedule for the field program; this is the most upstream remediation site under consideration.
Fish Stranding Observed?	No data available	
Approximate Minimum Length	14 m (two adjacent weirs)	
Approximate Distance From Mouth	7.9 km	
Easting	587549	
Northing	7624548	
Recommendation	■ Construct two directional rock weirs located at the inlet of Pond 2 (i.e., second pond from mouth) to direct fish towards either thalweg on the LDB or RDB and away from the shallow center of the channel. ■ Weir 1 (approximately 12 m) should be constructed from the center of the channel towards the RDB (but not connected to the RDB) directing fish towards the RDB thalweg. Weir 2 (approximately 14 m) should be constructed from the center of the channel towards the LDB (but not connected to the LDB) directing fish towards the LDB thalweg.	

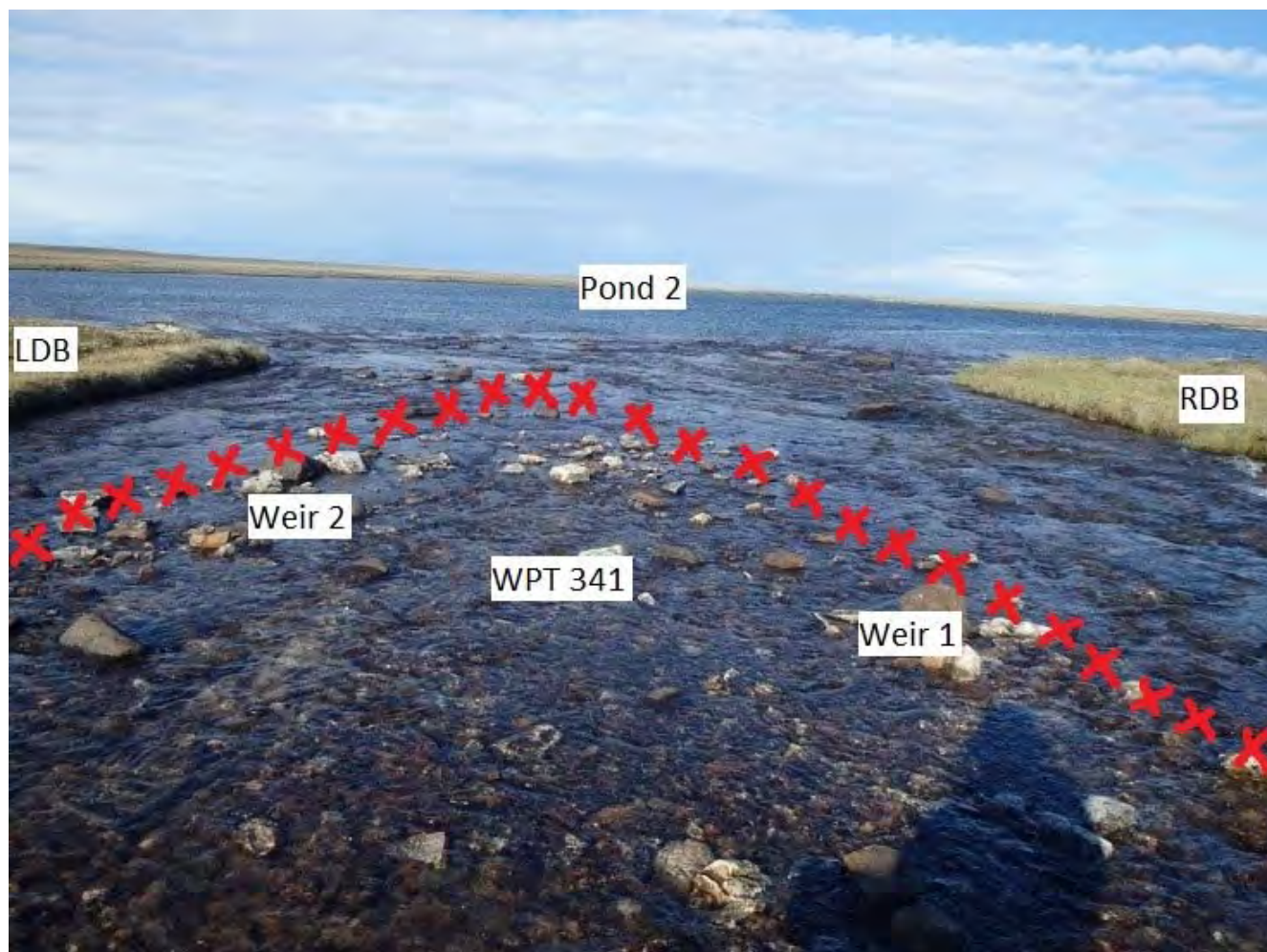


Photo C32: Looking downstream towards proposed Low-Flow Channel Site 10 showing where directional weirs should be built to direct fish towards the deeper LDB and RDB.

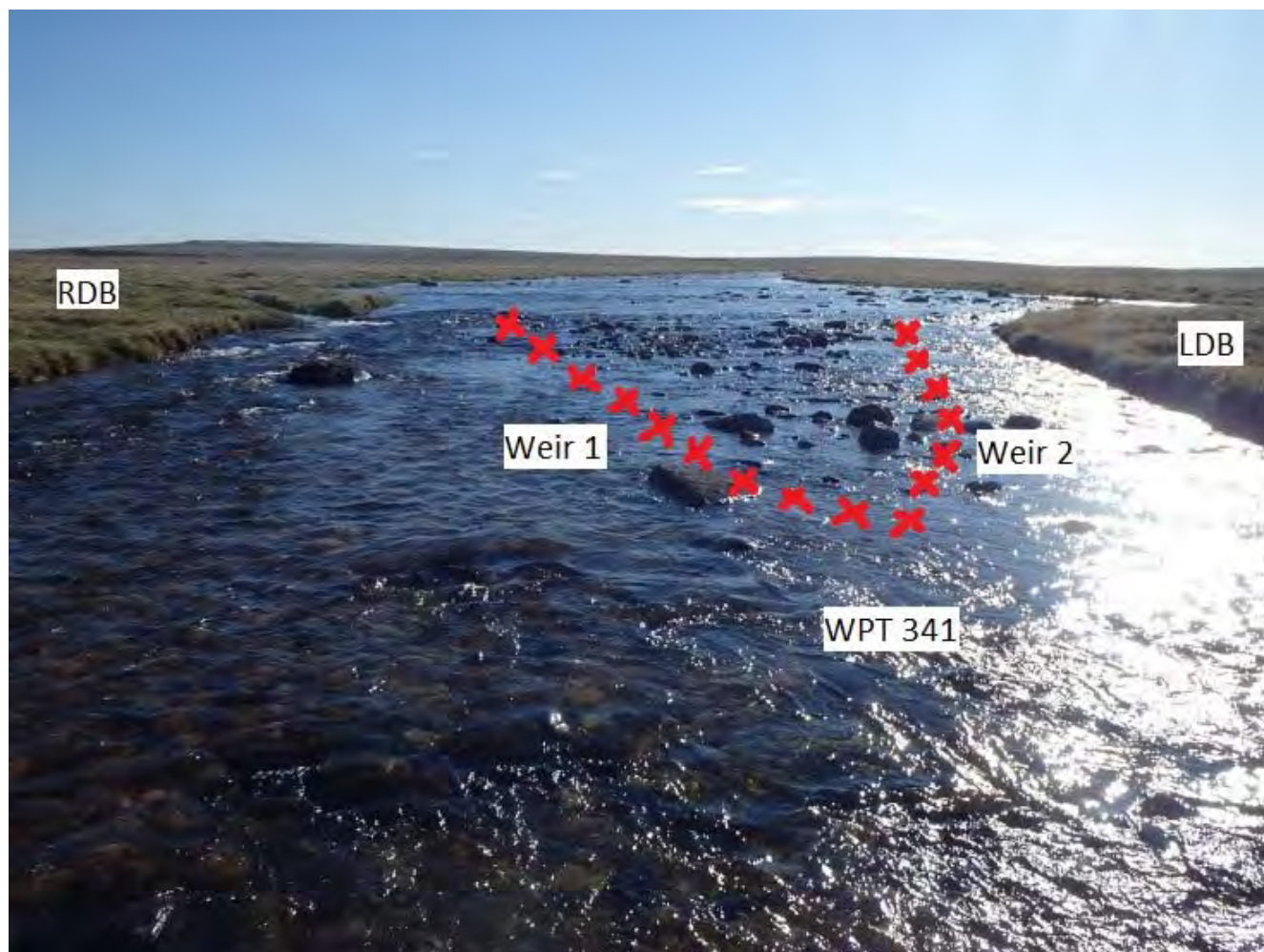


Photo C33: Looking upstream towards potential Low-Flow Channel Site 10 showing where directional weirs should be constructed to direct fish towards the deeper LDB and RDB.



Table C11: Remediation Planning Notes for Low-Flow Channel Site 11

Priority	Low		Notes: ■ In this section of the creek water is dispersed over a wide, shallow area with no obvious thalweg. Fish can travel upstream with some effort; however, a low-flow channel would facilitate fish migration between proposed Site 5 and Site 12. ■ Enhancement of this section of the creek is a low priority, but will assess in maintaining in connectivity between Site 5 and Site 12. ■ Wide section of the creek; final design of the channel may include extended weirs to direct fish into the channel, as needed.
Fish Stranding Observed?	No		
Approximate Minimum Length	38 m channel		
Approximate Distance From Mouth	2.2 km		
Location of Channel Start and End Points (UTM 11W)			
Waypoint	Easting	Northing	
325	590806	7626464	
326	590806	7626428	
Recommendation	■ Construct a 38 m low-flow channel, providing an unobstructed route to the deeper areas further upstream.		

m = metres; km = kilometres; HTO = Kugluktuk Hunters and Trappers Organization ; LDB = left downstream bank; RDB = right downstream bank.

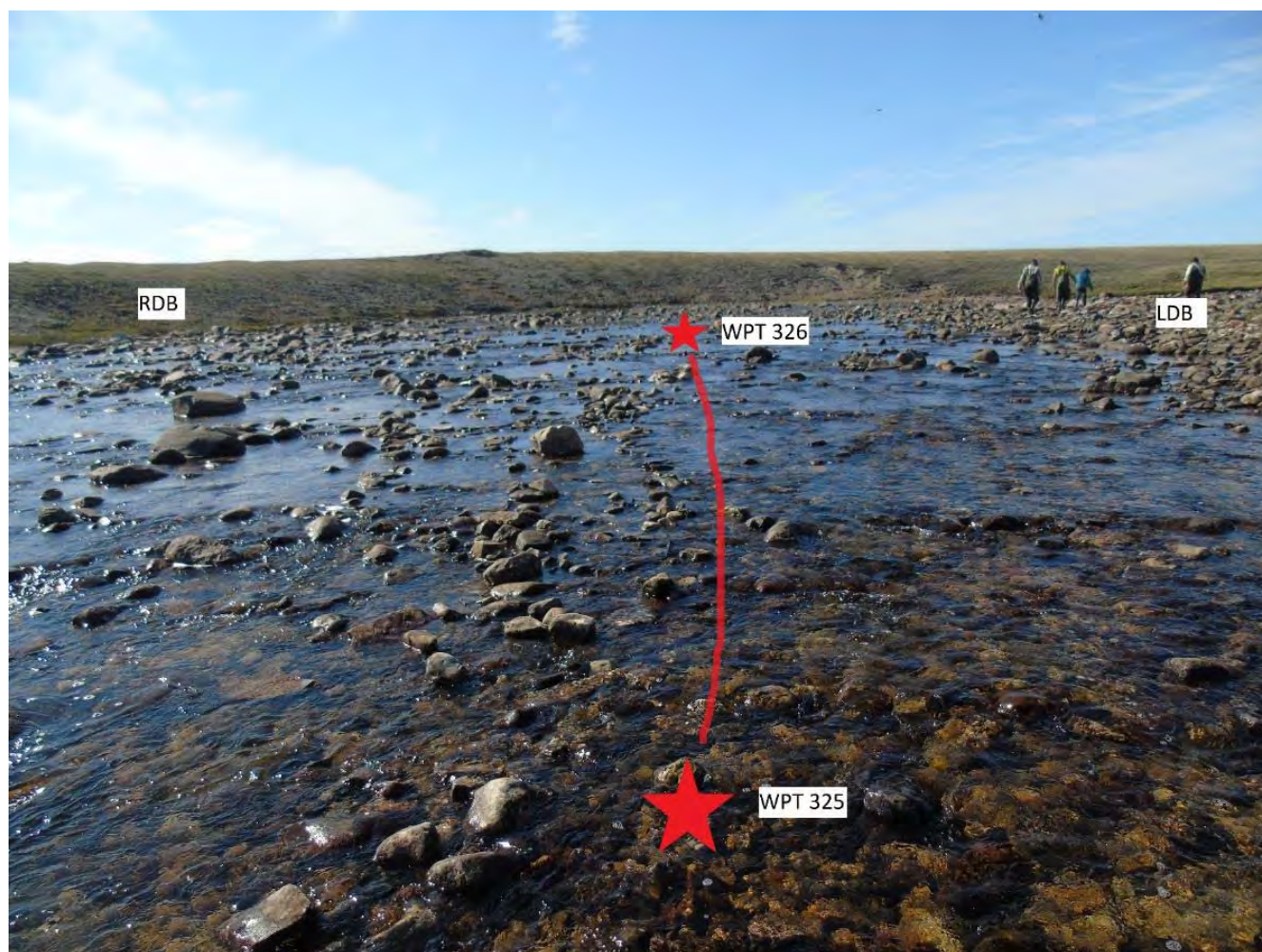


Photo C34: View upstream showing where the low-flow channel should be constructed to create a more functional thalweg.

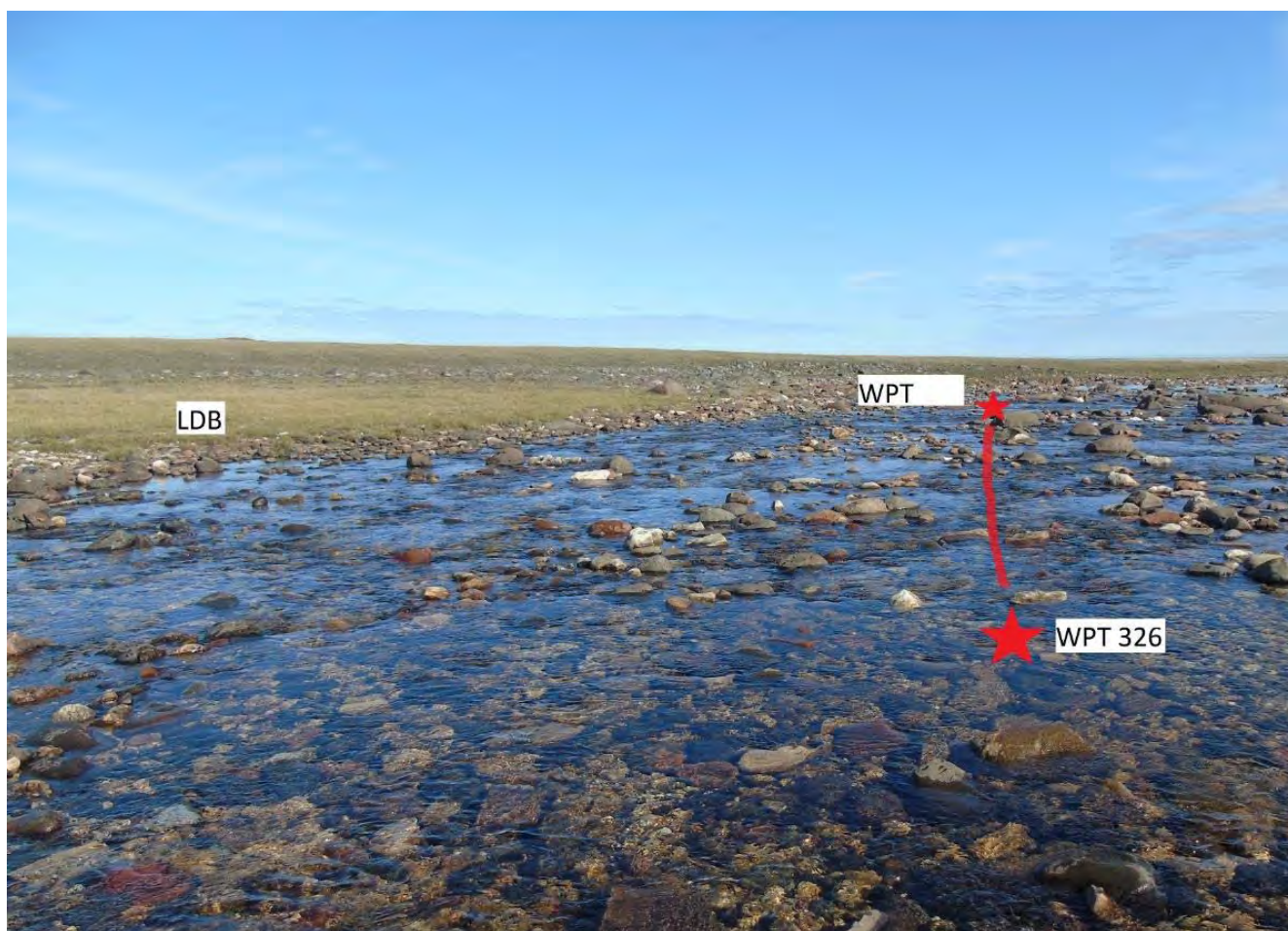


Photo C35: View downstream showing where the low-flow channel should be constructed to create a more functional thalweg and connect it with the deeper water section upstream.



APPENDIX C

Remediation Plan 2016

Table C12: Remediation Planning Notes for Low-Flow Channel Site 12

Priority	Medium		Notes: ■ Fish can swim through a deeper route along the RDB; however, the RDB becomes dry and impassable further upstream. Another option is needed for the upstream migration of char. ■ Fish should be directed diagonally upstream towards the LDB where deep water continues; access to the RDB route should be blocked.
Fish Stranding Observed?	No		
Approximate Minimum Length	19-m channel plus weir		
Approximate Distance From Mouth	2.4 km		
Location of Channel Start and End Points (UTM 11W)			
Waypoint	Easting	Northing	
328	590669	7626399	
329	590663	7626417	
Recommendation	■ Construct a 19-m low-flow channel to connect the deeper thalweg of the RDB, diagonally upstream to the thalweg of the LDB. ■ Two rock weirs are to be considered to direct fish into the channel. Weir 1 should be constructed from the RDB to the channel mouth to direct fish into the channel and block access to the shallow RDB. ■ A second weir on the other side of the channel may be required to direct fish into the channel. ■ The final length and orientation of the weirs are to be determined in the field during summer 2016.		

m = metres; km = kilometres; HTO = Kugluktuk Hunters and Trappers Organization ; LDB = left downstream bank; RDB = right downstream bank.



APPENDIX C

Remediation Plan 2016

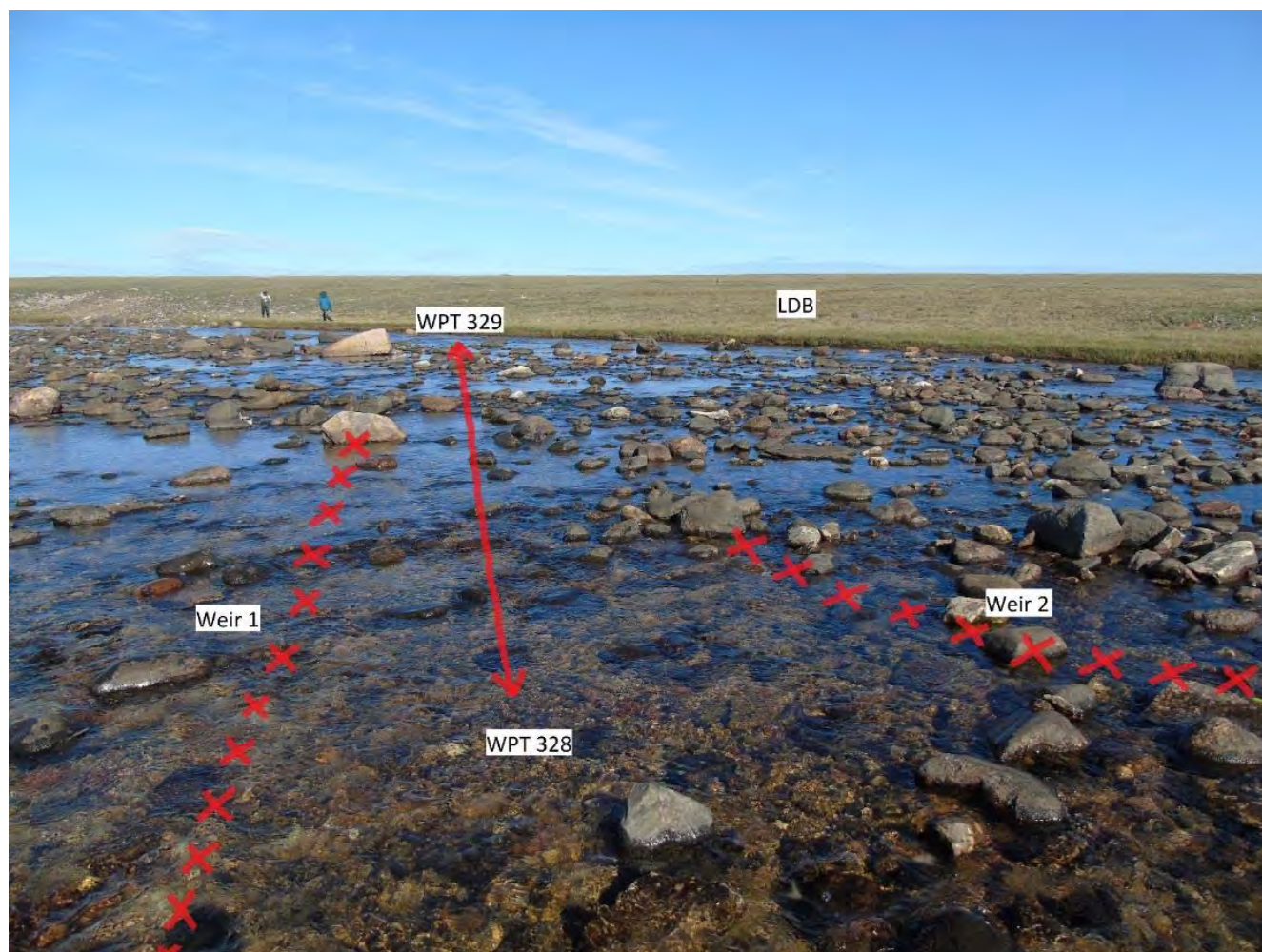


Photo C36: View upstream showing where the low-flow channel should be constructed to connect the RDB and LDB thalwegs. Also shown are the directional weirs which should be built to direct fish into the channel and block access up the shallow RDB.



APPENDIX C

Remediation Plan 2016

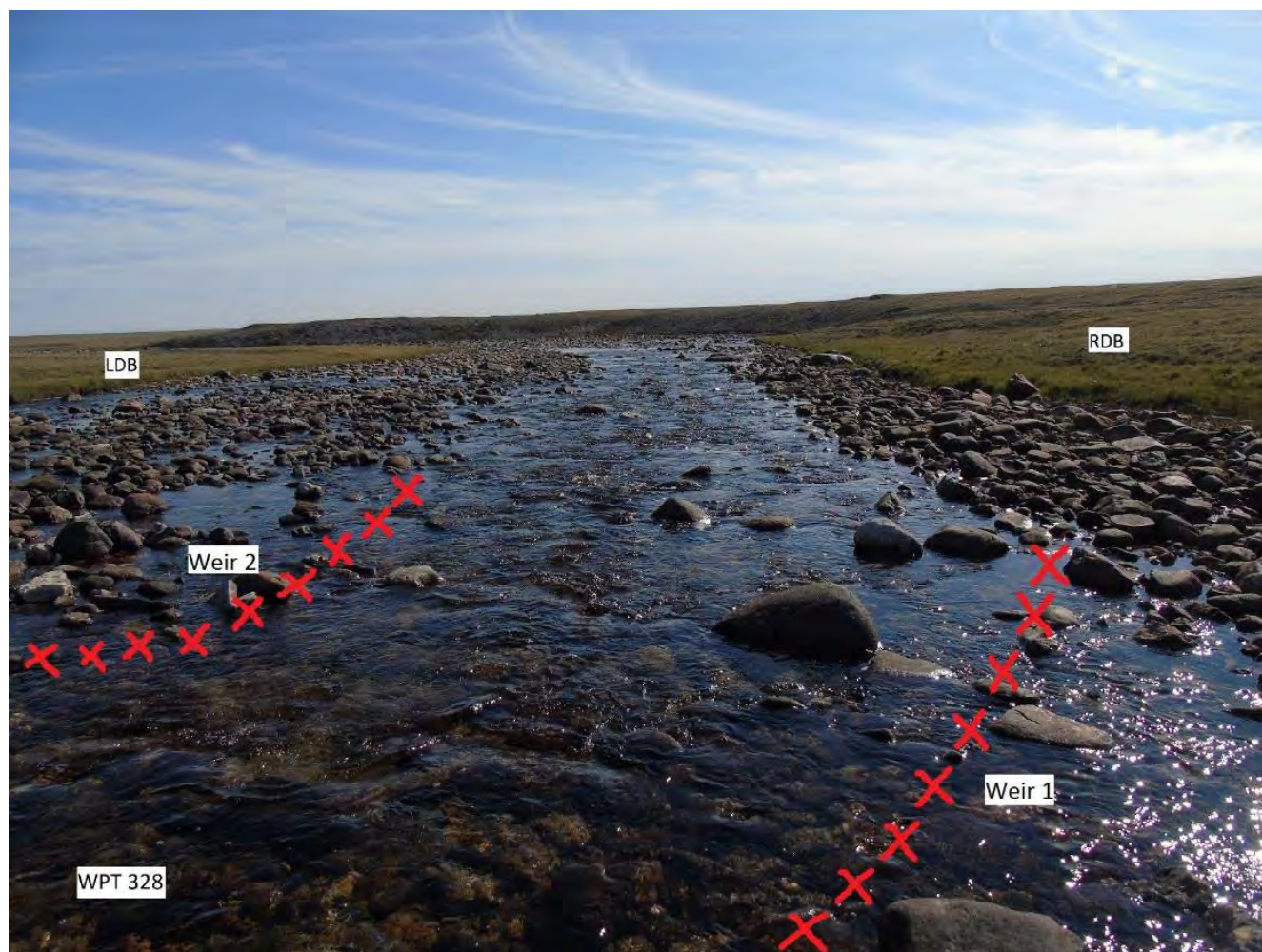


Photo C37: View downstream from WPT 328 showing where the fish will travel from along the center / RDB of the creek, leading fish to proposed Site 12.

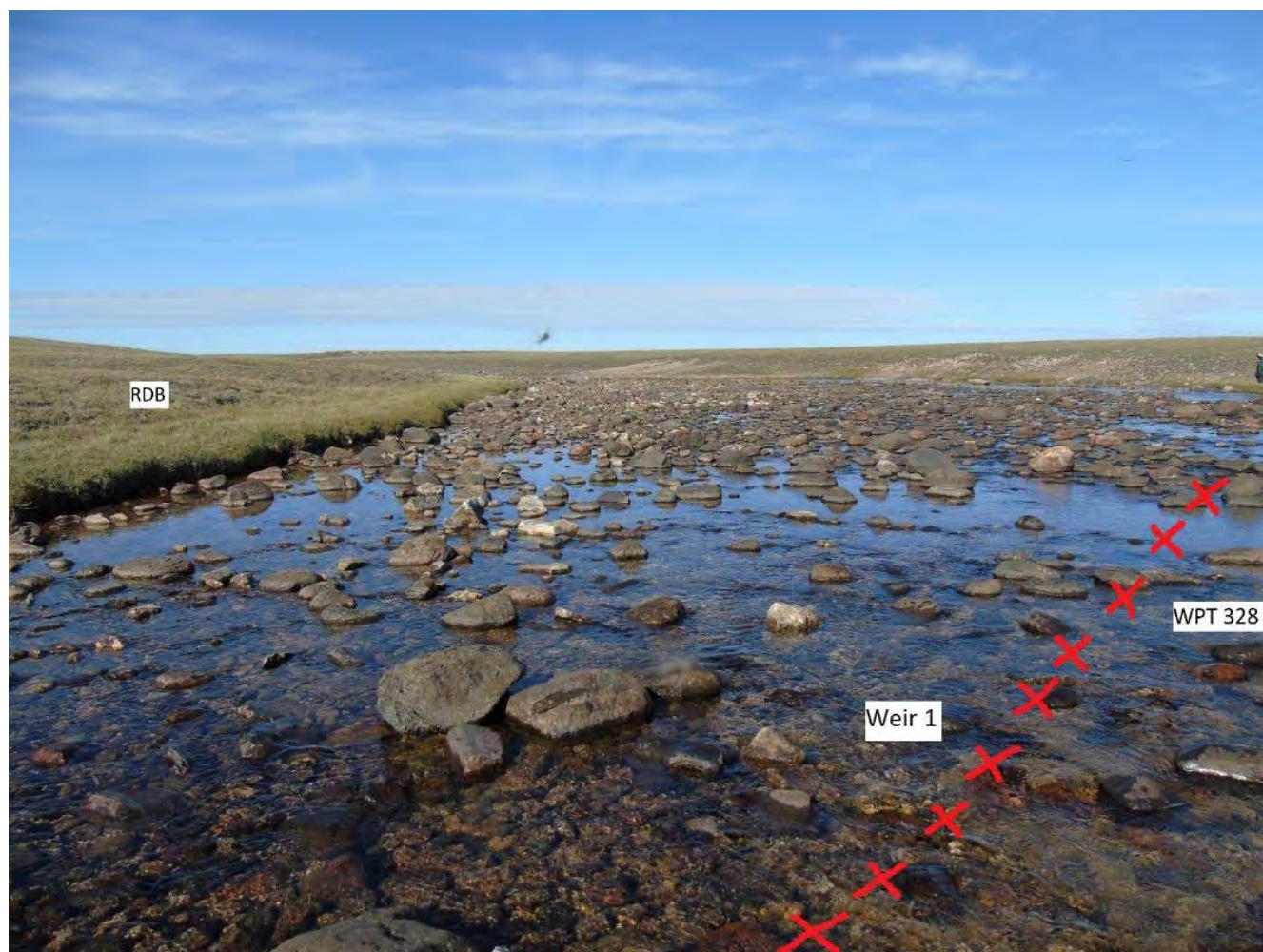


Photo C38: View upstream showing the impassable RDB with high potential for stranding fish at higher water levels and where Weir 1 should be constructed to block access up the RDB.



Photo C39: View upstream showing the dry RDB and where the channel should be constructed to divert fish from the RDB to the deeper LDB.



APPENDIX C

Remediation Plan 2016

Tale C13: Remediation Planning Notes for Low-Flow Channel Site 13

Priority	Low	Notes: ■ Fish swimming through this location will encounter a one-meter wide section of boulders across the creek. The problem area is not a complete barrier at low-flows, but does create a minor blockage across some of the channel width. ■ This is the lowest priority of all proposed sites and will require minimal effort to complete. ■ This site is immediately above Site 7.
Fish Stranding Observed?	No	
Approximate Minimum Length	10 m (boulder removal)	
Approximate Distance From Mouth	3.1 km	
Easting	590127	
Northing	7626194	
Recommendation	■ Reposition the boulders so that they are more staggered, instead of straight across the channel, facilitating fish passage. ■ Small and medium-sized boulders should be moved to allow fish to pass between larger boulders (i.e., retain large boulders so they continue to provide in-stream cover along the migration path).	

m = metres; km = kilometres; HTO = Kugluktuk Hunters and Trappers Organization ; LDB = left downstream bank; RDB = right downstream bank.



Photo C40: View downstream showing boulders in channel that should be repositioned to allow for easier fish passage.

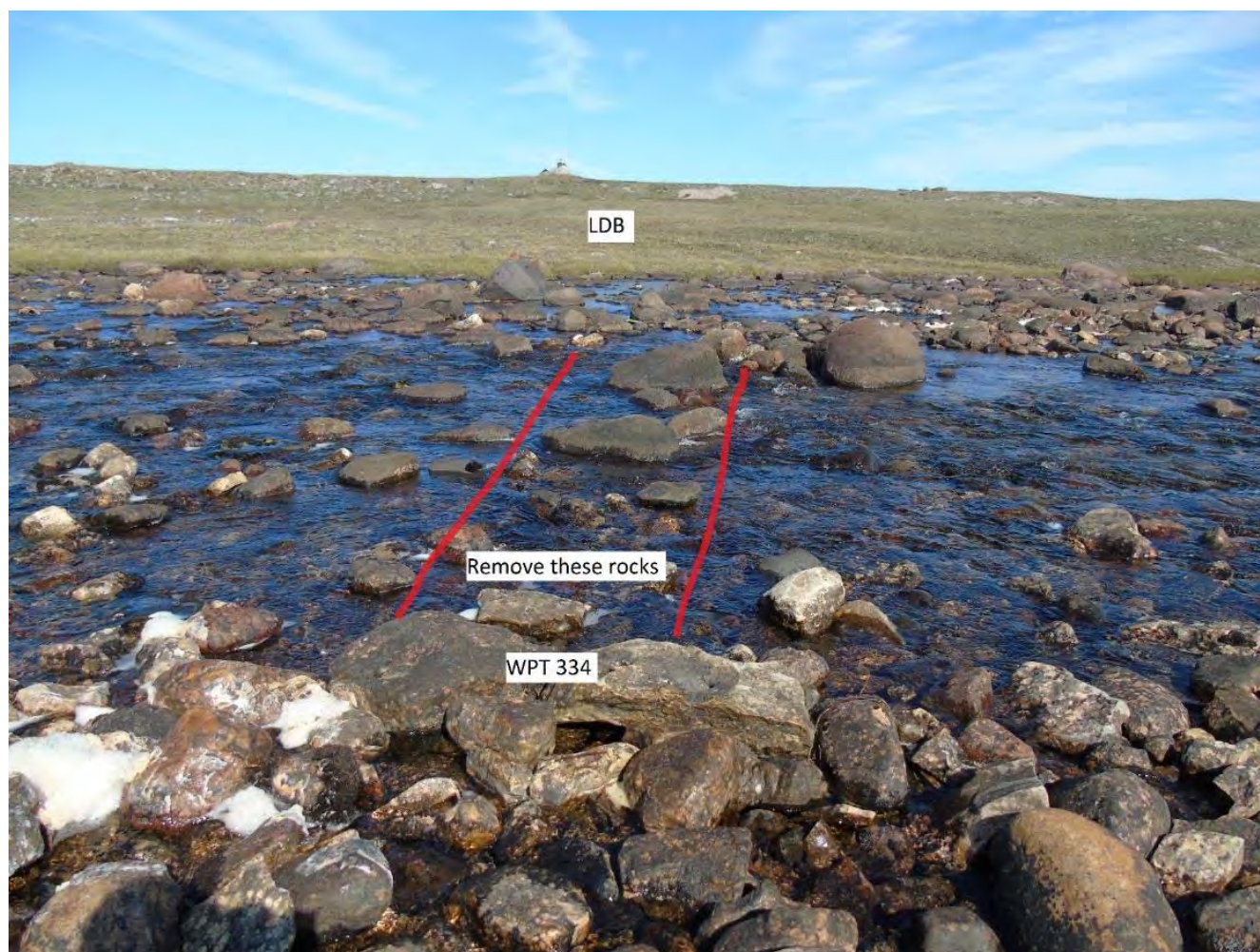


Photo C41: View looking towards the LDB showing how boulders line up in the creek to make fish passage difficult.

As a global, employee-owned organisation with over 50 years of experience, Golder Associates is driven by our purpose to engineer earth's development while preserving earth's integrity. We deliver solutions that help our clients achieve their sustainable development goals by providing a wide range of independent consulting, design and construction services in our specialist areas of earth, environment and energy.

For more information, visit golder.com

Africa	+ 27 11 254 4800
Asia	+ 86 21 6258 5522
Australasia	+ 61 3 8862 3500
Europe	+ 44 1628 851851
North America	+ 1 800 275 3281
South America	+ 56 2 2616 2000

solutions@golder.com
www.golder.com

Golder Associates Ltd.
16820 107 Avenue
Edmonton, Alberta, T5P 4C3
Canada
T: +1 (780) 483 3499

