Copper Fox Metals Inc.

Schaft Creek Project: Fisheries Baseline 2008

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SCHAFT CREEK PROJECT
Fisheries Baseline 2008

Date: February 2010
Project #1039-001-06

Prepared for:

Copper Fox Metals Inc.

Prepared by:

Rescan™ Tahltan Environmental Consultants

Executive Summary

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Copper Fox Metals Inc.'s proposed Schaft Creek Project has mineral claims situated within the Cassiar Iskut-Stikine Land and Resource Management area which encompasses a total of 5.2 million hectares. The mineral claims of interest are situated near the headwaters of Schaft Creek, a tributary of Mess Creek, which flows into the Stikine River downstream of the community of Telegraph Creek. This report presents the results of the fisheries baseline studies that were undertaken in the summer of 2008.

The main objectives of the 2008 field season were:

- To collect additional information on receiving environment streams, lakes, and wetlands in the immediate vicinity of the proposed mine;
- To identify the salmonid species first captured in Mess Lake in 2007;
- To identify and collect baseline information on potential fish habitat compensation areas; and,
- To confirm the fish-bearing status of certain streams along the proposed access road.

Several receiving area sites were resampled in 2008. Most of these sites were located in the immediate vicinity of the proposed mine infrastructure. The purpose of sampling these sites was to confirm the non-fish-bearing status of certain water bodies (i.e., Skeeter Lake, Upper Schaft Creek), and collect additional fisheries information on sites with the greatest probability of being affected by mine construction or operation. No fish were captured in water bodies that were originally classified as non-fish-bearing. This confirms the fish distribution in the area surrounding the mine site, and limits the potential area of impact to a few fish-bearing water bodies in the Start Lake watershed. Sampling in the Start Lake watershed resulted in the capture of several juvenile, sub-adult and adult rainbow trout. These results indicate that the Start Lake watershed likely has a stable population of rainbow trout with habitat for all life stages.

During receiving environment sampling, several unidentified salmonids (first captured in 2007) were caught in Mess Lake and adipose fins were clipped for genetic analysis. Analyses revealed that these fish were *Oncorhynchus nerka* – likely Kokanee salmon, a freshwater form of sockeye salmon. There is no genetic test that can distinguish Kokanee salmon from sockeye salmon; however, the presence of a large waterfall downstream of Mess Lake would likely prevent the upstream migration of sockeye salmon. These fish were not caught anywhere else in the Project area, and likely spawn in small tributaries and groundwater upwellings in the immediate vicinity of Mess Lake. They are therefore not likely to be affected by the construction or operation of the Schaft Creek mine.

Two potential compensation areas were identified and assessed for their existing fish habitat and fish community values: Upper Start Creek between Start Lake and Lake 7, and Upper Mess Creek upstream of the confluence of Arctic Creek and Mess Creek. Upper Start Creek was divided into four reaches. Two of the Start Creek reaches are swift-flowing with few pools and relatively low instream cover. These reaches have high potential for compensation activities through the creation of meander bends and pools. Upper Mess Creek was divided into two reaches. Habitat in these reaches was relatively uniform with few pools and swift flow. Very few fish were captured or seen in this section, making it less favourable for compensation.

Seven stream crossings originally surveyed in 2007 were resampled in 2008 to confirm their fish-bearing status. Of the seven stream surveyed, fish were captured in four of them. Although the fish were mostly captured well downstream of the crossing sites, the absence of permanent barriers to fish migration mean that these streams should be considered fish-bearing.

Acknowledgements

Acknowledgements

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1. Introduction

1.1 PROJECT BACKGROUND

Copper Fox Metals Inc. (Copper Fox)'s Schaft Creek Project is currently in the pre-Application phase of the British Columbia environmental assessment process. Baseline fisheries studies were undertaken by Copper Fox in preparation of an Environmental Assessment Application under the *B.C. Environmental Assessment Act*. This report presents the findings of the baseline fisheries studies completed in 2008 and presents potential fish habitat compensation areas.

Copper Fox is a Canadian mineral exploration and development company focused on developing the Schaft Creek deposit located in north-western British Columbia, approximately 60 km south of the village of Telegraph Creek (Figure 1.1-1). The Schaft Creek deposit was discovered in 1957 and has since been investigated by prospecting, geological mapping, geophysical surveys as well as diamond and percussion drilling. The deposit is situated within the upper source regions of Schaft Creek, which drains northerly into Mess Creek and onwards into the Stikine River. The Stikine River is an international river that crosses the US/Canadian border near Wrangell, Alaska. The Schaft Creek deposit is a polymetallic (copper-gold-silver-molybdenum) deposit located in the Liard District of north-western British Columbia (Latitude 57° 22′ 42′′; Longitude 130°, 58′ 48.9″). The property is comprised of 40 mineral claims covering an area totalling approximately 20,932 ha within the Cassiar Iskut-Stikine Land and Resource Management Plan (Figure 1.1-2).

The Schaft Creek Project is located within the traditional territory of the Tahltan Nation. Copper Fox has been in discussions with the Tahltan Central Council (TCC) and the Tahltan Heritage Resources Environmental Assessment Team (THREAT) since initiating exploration activities in 2005. Copper Fox will continue to work together with the Tahltan Nation as work on the Schaft Creek Project continues.

The Schaft Creek Project entered the British Columbia EA process in August 2006. Although a formal federal decision has not yet been made, the Project will likely require federal approval as per the Canadian Environmental Assessment Act. Copper Fox has targeted the third quarter 2010 for submission of their Schaft Creek EA Application.

The current mine plan would see ore mined from an open pit at a rate of 100,000 tonnes per day. The mine plan includes 812 million tonnes of Measured and Indicated Mineable resources providing for an estimated 23 year mine life. The Project is estimated to generate up to 2,100 jobs during the construction phase and approximately 700 permanent jobs during mine operations.

The deposit will be mined with large truck/shovel operations and typical drill and blast techniques. The ore will be crushed, milled and filtered on site to produce separate copper and molybdenum concentrates. The Process Plant will include a typical comminution circuit (Semi-Autogenous Mill, Ball Mill and Pebble Crusher) followed by a flotation circuit and a copper circuit with thickener, filtration and concentrate loadout and transportation. The Process Plant includes a designated molybdenum circuit with thickener, filtration, drying and bagging. A tailings thickener and water reclaim system will be used to recycle process water. The circuit will have a design capacity of 108,700 tonnes per day and a nominal capacity of 100,000 tonnes per day (36,000,000 tonnes per year). Approximately

293,000 tonnes of concentrates will be produced each year, which will be transported via truck to the port of Stewart, BC, for onward shipping to markets.

Copper Fox will construct an access road to the mine site (Schaft Creek Access Road; Schaft Road) to the 65.1 kilometre point (65.1 km) of the Galore Creek Access Road (Galore Road). The Schaft Road will cover a distance of 39.5 km from the Galore Road to the Schaft mine site (Figure 1.1-3). Both the Galore and Schaft roads will be gravel roads with six metre wide driving surface.

Pullouts and radio controls will be used to manage two-way traffic on the road. The Schaft Road will be a private road used to service the Schaft Creek mine.

The Galore Road is a fully permitted multi-use road; BC MOF Special Use Permit (S24637). The Galore Road is being constructed by Galore Creek Mining Corporation. Currently, Galore Creek Mining is only planning to construct the Galore Road to 40 km while they review the current Galore Creek Project for which the road was to service. Copper Fox will engage Galore Creek Mining with respect to the completion of the Galore Road, and if necessary, arrange to transfer the MOF Special Use Permit to Copper Fox as the Schaft Creek Project advances.

The Galore Road connects to Highway 37 near Bob Quinn Lake. The total road distance from the Schaft mine site to Highway 37 is 105 km. The majority of the 39.5 km Schaft Road is within the Mess Creek Watershed. In order to avoid geohazards along the Mess Creek valley, the Schaft Road will cross Mess Creek twice (Figure 1.1-3). Mess Creek is considered navigable per Transportation Canada criteria.

After crossing Mess Creek at the north end of the Schaft Road (32.5 km), the route rises up the side of Mount LaCasse crossing Shift Creek (10 m bridge) and Big B Creek (10 m bridge). The route terminates at Snipe Lake (39.5 km). Conventional 30-tonne trucks will be used to transport concentrate from the mine site to the Bob Quinn area along the Schaft and Galore roads. From Bob Quinn to Stewart, convention B-train commercial truck haulage can then be utilized along Highway 37 and 37A. There will be 30 concentrate trucks along this route over a 24 hour period, seven days per week.

Electrical power to the mine site will be provided via a 138 kV transmission line, extending from Bob Quinn Lake to the Project along the proposed corridor for the Galore and Schaft roads. The proposed transmission line assumes that electrical power will be supplied from British Columba Transmission Corporation's (BCTC) proposed new 287 kV Northwest Transmission Line from a point near Bob Quinn Lake.

The Schaft Pit will encompass an area of 4.9 km^2 at the end of the mine life (Figure 1.1-4). The Pit will extend 330 m below the current elevation (520 masl). An ore stockpile and crusher will be located between the Pit and Schaft Creek. Crushed ore will be conveyed to the Plant site on the saddle just east of the Pit. Tailings from the Process Plant will be piped to the Skeeter Tailings Storage Facility (TSF) as a slurry (55% solids).

Over the life of the mine the Project will generate over 812 million tonnes of tailings, which will be managed in the Skeeter TSF. The TSF will not span the low relief watershed divide between Skeeter and Start watersheds. The Skeeter TSF will require three embankments to contain the tailings generated over the life of the mine (Figure 1.1-5). Based on average climatic conditions, the TSF will have a positive water balance. Discharge from the TSF will be to Skeeter Creek.

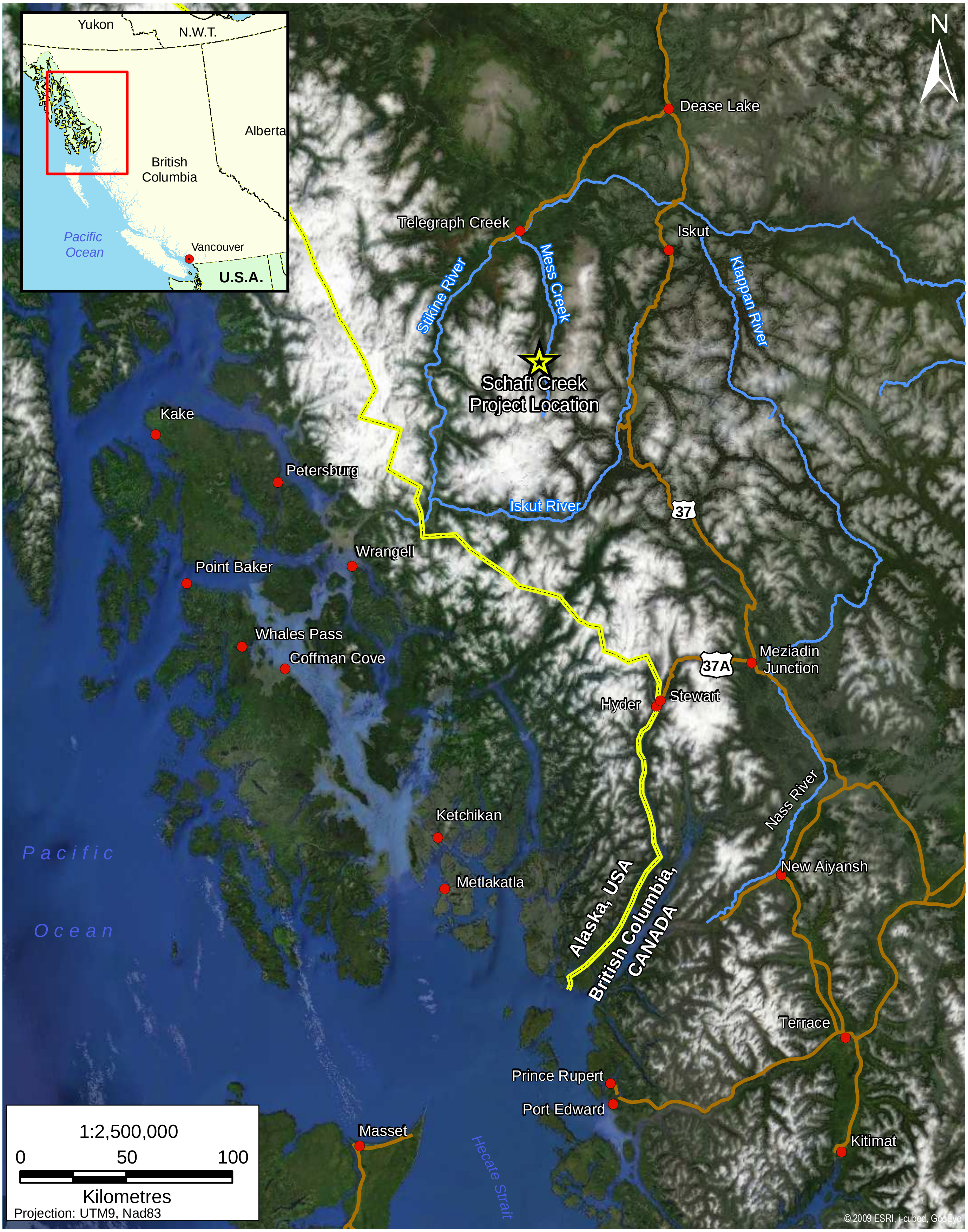

FIGURE 1.1-1

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Location Map for Schaft Creek Project

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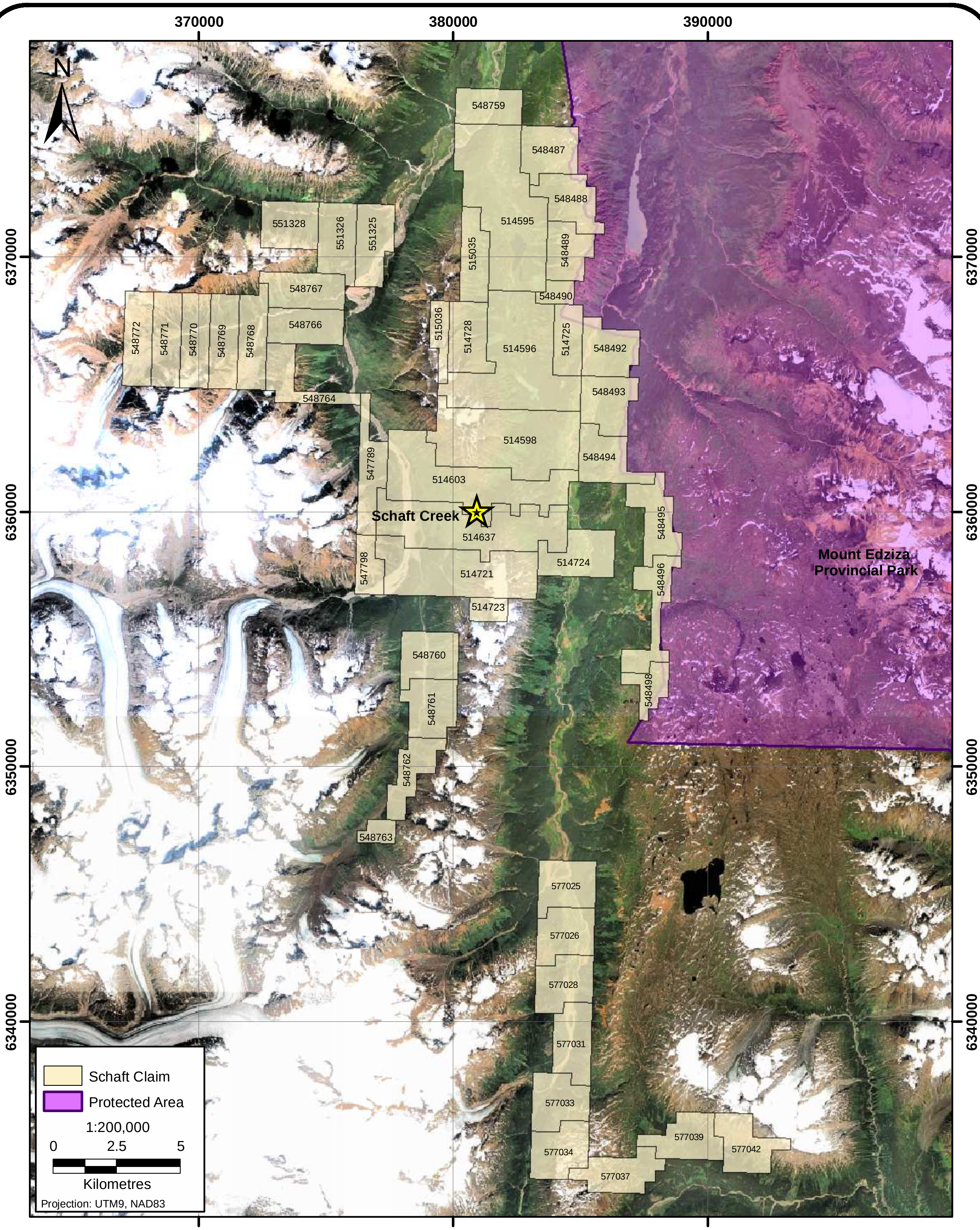

Schaft Creek Project Mineral Claims

FIGURE 1.1-2

gis no. SCH-15-037 Job No. 1039-001-01 November 30, 2009

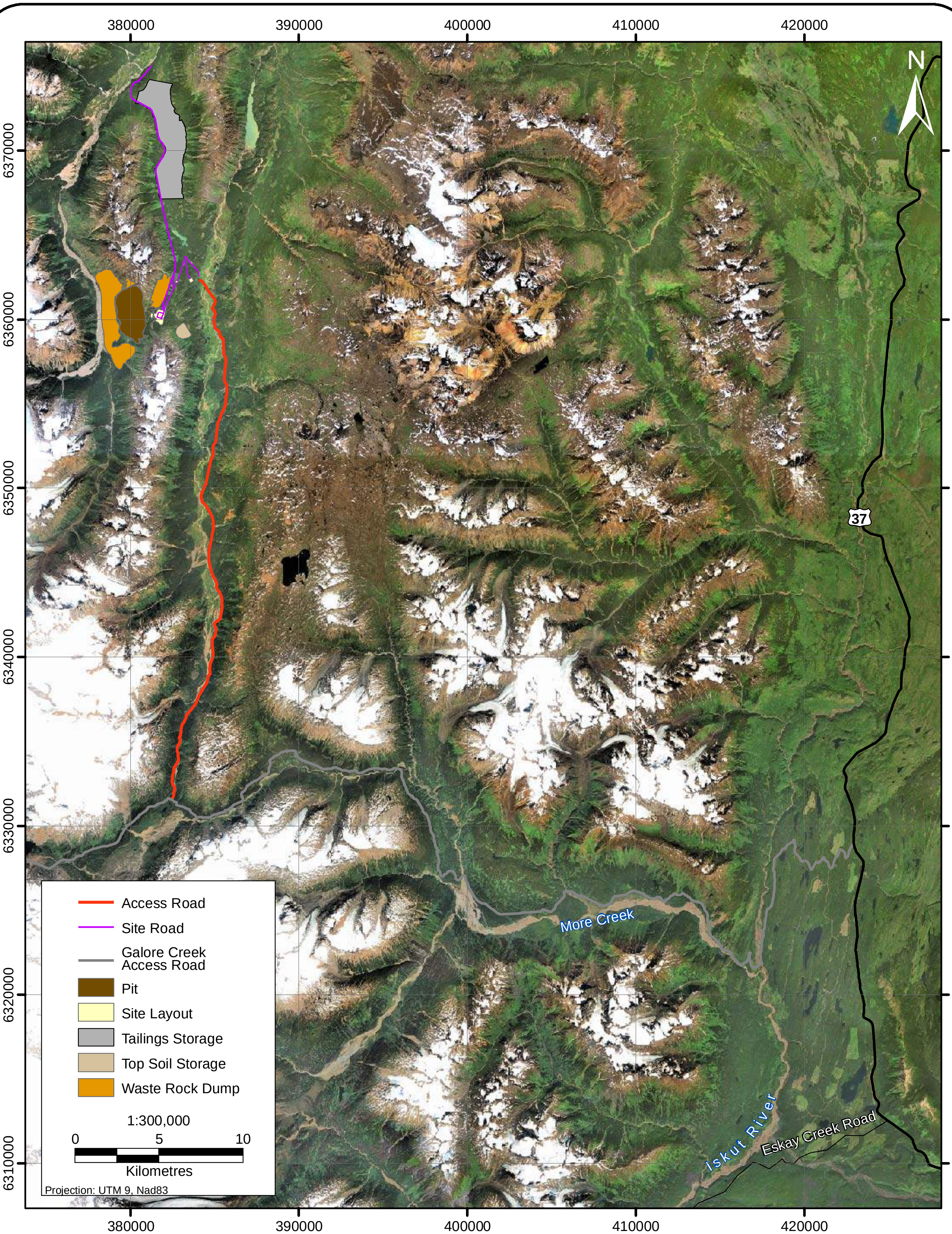

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FIGURE 1.1-3

Schaft Creek Access Road
Mess Creek Valley Option

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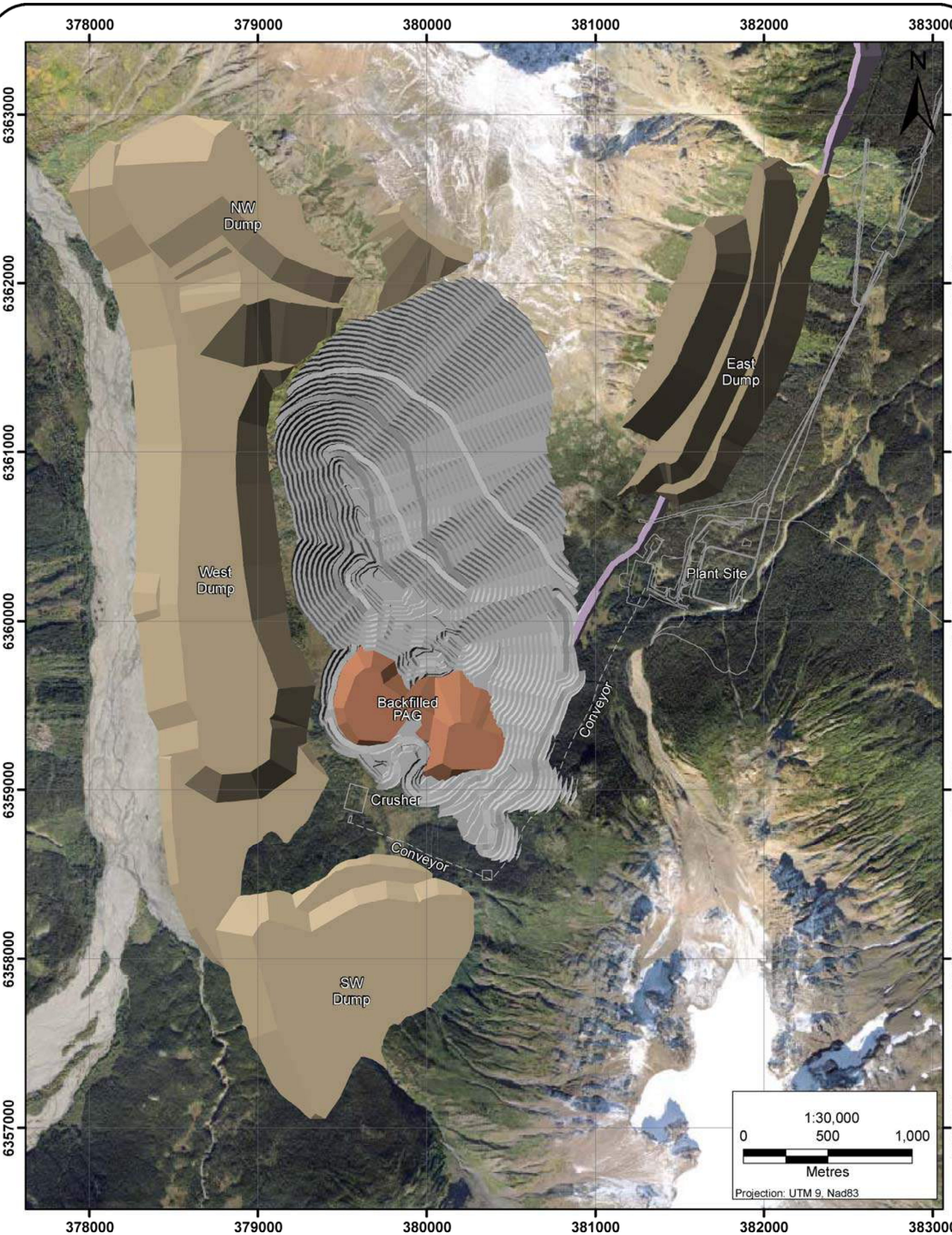

FIGURE 1.1-4

Schaft Creek Project Mine Site

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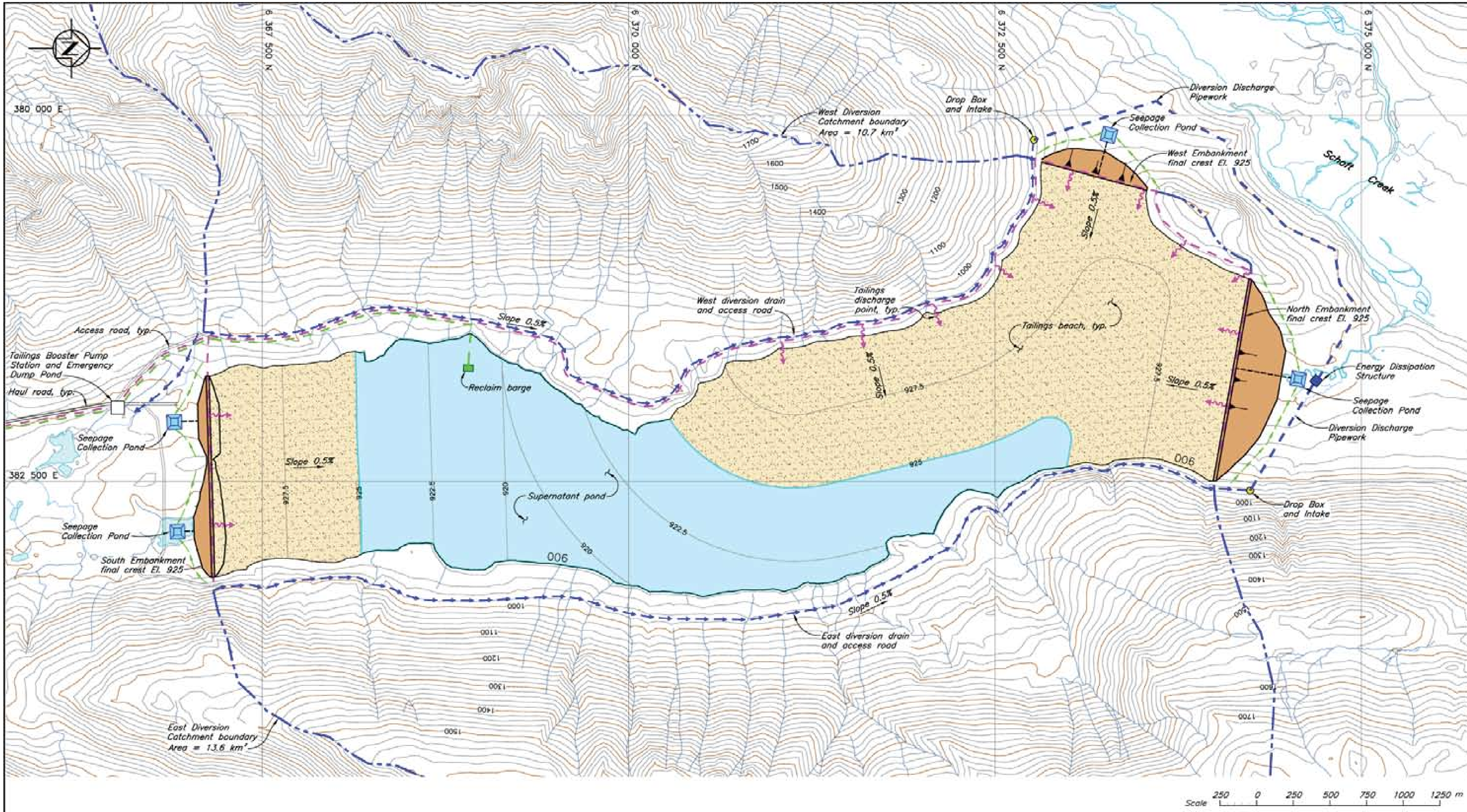

Source: Knight Piésold Consulting

Note: This layout represents the tailings storage facility in the final years of operation prior to closure. Several years before the end of operations and closure, the tailings deposition pattern will be modified to relocate the supernatant pond towards the north of the facility, where a permanent spillway will be constructed in the west abutment of the North Embankment.

FIGURE 1.1-5

Schaft Creek Project - Skeeter Tailings Storage Facility

The Project will generate an estimated 1,547 million tonnes of waste rock. Waste rock dumps are proposed around the perimeter of the Schaft Pit, with the majority of the material being placed on the east side of Schaft Creek (Figure 1.1-4). The current plan assumes the waste rock will be non-acid generating and will not leach metals at or near neutral pH. The plan is subject to change as work progresses on the metal leaching and acid rock drainage program.

The Project will be a fly-in, fly-out operation, and a new airfield capable of handling a Boeing 737 will be constructed to the east of the Pit (Figure 1.1-3).

The preliminary design includes a 1,600 m compacted gravel landing strip, terminal building, fueling facilities, small maintenance facility and control and lighting systems.

A permanent camp will be constructed to support approximately 700 employees. Other facilities include a truck shop, warehouse, administration, maintenance laboratory, explosive storage, water treatment facilities and potable water storage.

1.2 OBJECTIVES

Fisheries work in 2008 focused mainly on refining the dataset for water bodies located within the proposed Project footprint and along the proposed access road, and identifying potential fish habitat compensation areas. This information will be used to supplement data collected in 2006 and 2007 to gain a more complete picture of fish habitat and community in the Schaft Creek Project Area. This information will aid in the assessment of potential impacts when an environmental assessment is conducted. The study objectives for 2008 were to:

- Collect additional fish habitat and community data at select receiving environment sites to confirm information collected in previous years;
- Conduct additional fish sampling in lakes in the Skeeter Creek and Start Creek watersheds to confirm fish-bearing status and habitat quality;
- Confirm the species identification of an unidentified salmonid captured in Mess Lake in 2007 by additional sampling and genetic analysis;
- Collect additional baseline fisheries information on select wetland sites in the Schaft Creek receiving environment.
- Identify potential compensation sites for future habitat compensation projects and collect baseline fish habitat and community information on those sites; and,
- Confirm fish-bearing status of questionable streams along the proposed access corridor.

2. Methods

2. Methods

2.1 STUDY COMPONENTS

2.1.1 Receiving Environment

2.1.1.1 Streams

Study Design

Ten stream sites were surveyed in 2008 as part of the receiving environment study. This included sites on Schaft Creek, Mess Creek, Skeeter Creek, Start Creek and Walkout Creek (Reference). Site locations are shown in Figure 2.1-1.

Fish Habitat

Fish habitat assessments were based on the *Reconnaissance (1:20,000) Fish and Fish Habitat Inventory Program* (RISC 2001) and the *Fish Habitat Assessment Protocol* (Johnston and Slaney 1996). Detailed surveys of fish habitat were conducted for, 200 m-long stream sites. At each site, UTM coordinates were recorded at the beginning and end of each site with a hand-held Global Positioning System (GPS) receiver. Temperature, pH and conductivity were recorded using electronic meters.

Physical features of the streams were assessed within each habitat. Detailed fish habitat assessments (FHAP) were conducted at all ten sites within the proposed mine site and receiving environment following the methods of Johnston and Slaney (1996). FHAP surveys involved differentiating the stream into separate habitat units such as riffles, cascades, glides and pools, then recording an array of habitat variables for each unit. These features included data on stream morphology, substrate, cover for fish and fish habitat type.

Stream habitat within these sites was separated into the following habitat units:

- pool – low velocity area with smooth, non-turbulent flow, low gradient (near 0%), and a concave bottom;
- glide – an area of smooth, non-turbulent flowing water with moderate velocity and gradient less than 4%;
- riffle – an area of turbulent, fast-flowing water with a gradient less than 4%; and,
- cascade – high gradient (>4%) area of turbulent, fast-flowing water.

Data were collected with a measuring tape, meter stick, clinometer (for gradient measurement), or visual estimation. A complete list of the variables measured is presented in Table 2.1-1.

Fish Community

The stream fish community at receiving environment sites was sampled through electrofishing. Electrofishing was conducted over 50 to 300 m of stream, with objective of identifying any fish that may be present. Electrofishing effort was measured in seconds, and the electrofisher settings were recorded. Additional effort was expended at sites thought to be non-fish-bearing in order to confirm that status. Sampled fish were identified, measured, weighed and released back to their habitat. Scales and/or fin rays were collected for aging purposes. Age samples were sent to North/South Consulting Ltd. in Winnipeg for analysis. No lethal sampling was conducted.

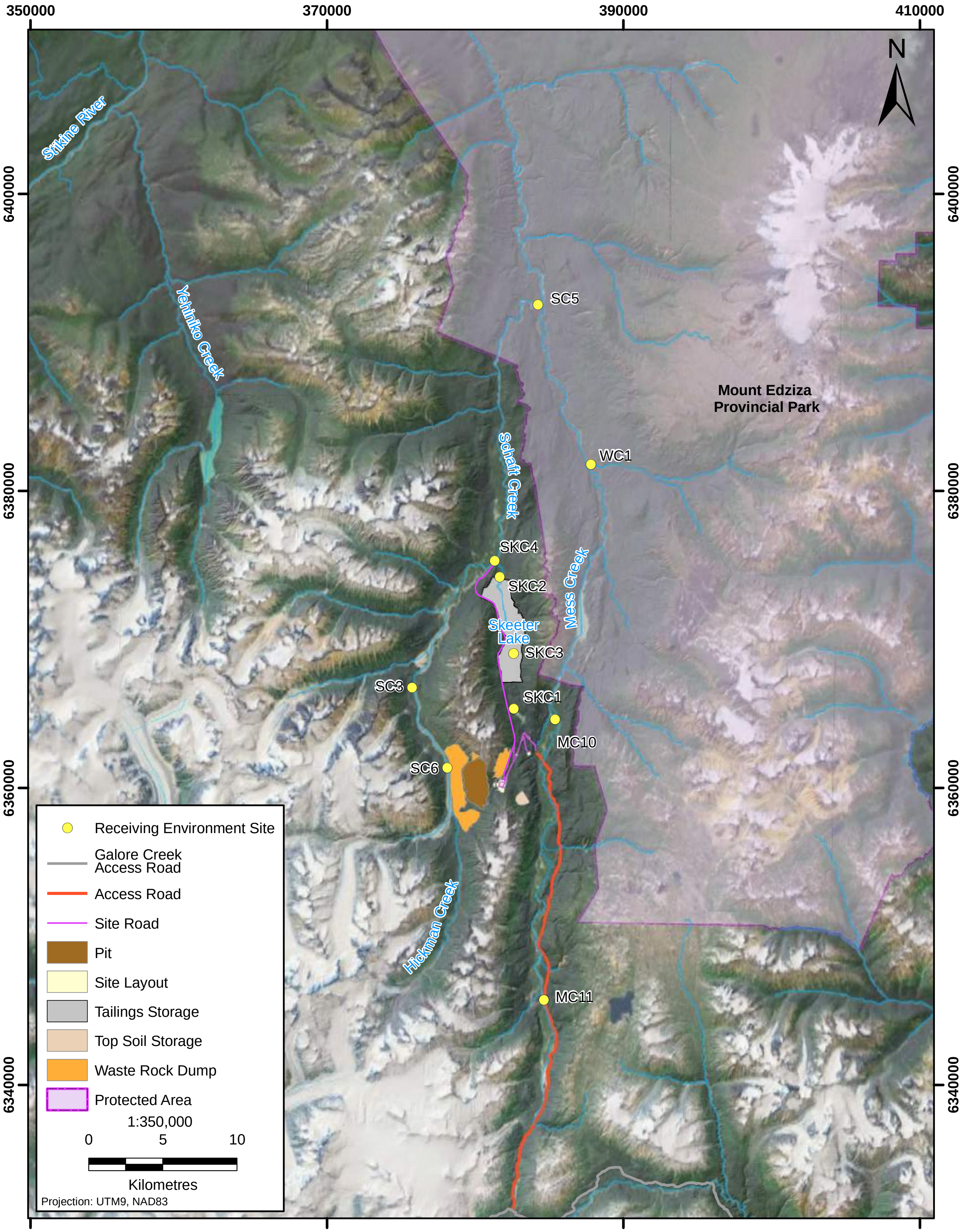

FIGURE 2.1-1

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Locations of Receiving Environment Sites in the Schaft Creek Project Area, 2008

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Table 2.1-1. Fish Habitat Variables Measured at Receiving Environment Sites

Substrate Type	Physical Measurements	Habitat	Cover
% Sand	Length (m)	Habitat type	% Deep pool
% Gravel	Mean depth (m)	Pool type	% Boulder
% Cobble	Bankfull depth (m)	Pool residual depth (m)	% Instream vegetation
% Boulder	Wetted width (m)	Fish passage barriers	% Overhanging vegetation
% Bedrock	Bankfull width (m)	Bank stability	% Undercut bank
Bank texture	Gradient (%)	Confinement	% Large woody debris
D (largest moveable particle)	Bank height (m)	Hillslope coupling	% Small woody debris
D95 (largest particle)	Temperature (°C)	Stream pattern	Canopy closure (%)
	Transparency	Islands/Bars	Riparian vegetation

2.1.1.2 Lakes

Study Design

Four lakes in the vicinity of the proposed tailings area and in the Mess Creek drainage were surveyed in 2008 (Figure 2.1-2). These lakes comprise a sub-sample of lakes initially assessed as part of the receiving environment studies in 2006 and 2007. The objective of sampling in 2008 was to monitor fish populations and confirm fish presence and absence in the vicinity of the proposed tailings facility. In addition, an unidentified salmonid was captured in 2007 in Mess Lake, and was thought to be a species of Pacific salmon. Further sampling was therefore undertaken in Mess Lake to identify this unknown salmonid and to determine the significance of its presence on the Project. Sampling occurred from late August to early September.

Fish Habitat

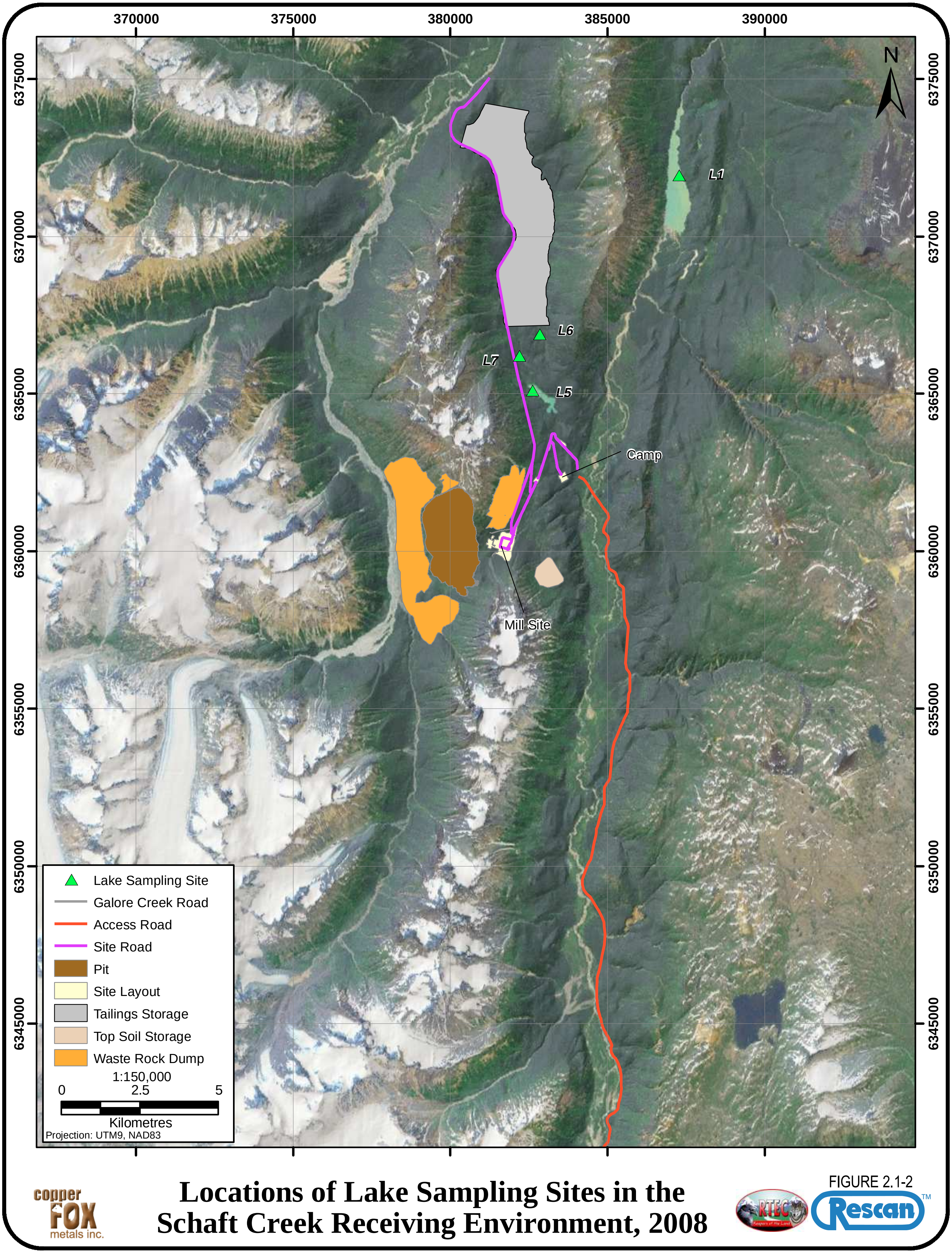
Fish habitat in lakes was characterized using a combination of methods. First, a survey of the shoreline was conducted using a boat. Areas with different substrate types (*i.e.,* sand, gravel, cobble, boulder, bedrock) were delineated on a map of the lake and substrate zones were identified. Once zones of substrate were delineated, emergent vegetation and other cover types were noted and recorded on the map. Spot measurements of depth were also taken, as well as surface temperature, pH and conductivity. Inlets and outlets were mapped, photographed, and described.

Fish Community

The fish community was sampled with gillnets and minnow traps. Experimental sinking gillnets were used that consisted of three panels each (1″, 1.5″ and 2″ stretched mesh size), and measured approximately 109 m^2. The sinking nets are designed to rest on the bottom of the lake. Gillnets were set for one hour to minimize mortality, and if no fish were captured, sets were extended up to 2 hours in duration. The locations, depths, set times and retrieval times were recorded.

Minnow traps were used to sample smaller fish along the shoreline of lakes. Minnow traps are tubular traps with small openings at either end. They were baited with prawn bait, set it shallow, littoral areas and left to fish for up to 24 hours. The locations, depths, set times and retrieval times were recorded.

Captured fish were identified, measured, weighed and released back to their habitat. Scale and/or fin ray samples were collected for aging purposes and sent to North/South Consultants for analysis. Adipose fins were collected from the unidentified salmonids in Mess Lake for genetic analysis.



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Locations of Lake Sampling Sites in the Schaft Creek Receiving Environment, 2008

FIGURE 2.1-2

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Genetic samples were sent to Dr. Eric Taylor at the University of British Columbia for identification. DNA was extracted from ethanol-stored fin tissues using standard spin column protocols (Qiagen Ltd). The DNA of each fish was subject to polymerase chain reaction (PCR) amplification and sequencing of the cytochrome oxidase I (CO1) gene of the mitochondrial DNA genome. This gene is the standard used for fishes for molecular identification using "DNA bar-coding". Resultant sequences (about 853 base pairs) were submitted to the Barcode of Life Database (BOLD) (Hubert *et al.* 2008, Ratnasingham and Hebert 2007) to identify the DNA samples to species.

2.1.1.3 Wetlands

Study Design

In 2008, three wetlands in the receiving environment were surveyed for fish habitat and community (Figure 2.1-3). Sampling occurred in June, with the objective of the sampling being to clarify fish habitat quality and community composition in those wetlands that will be directly impacted during mine operations.

Fish Habitat

Wetland fish habitat was quantified using a combination of transects and point measurements of open-water habitat. Channels within each wetland were mapped using a handheld GPS unit. Average channel width and depth were measured and dominant cover type and amount was estimated every 20 to 30 m. Small ponds within wetlands were surveyed with a single point. The width and length of the ponds were estimated and the amount of cover and dominant cover type were recorded. For large ponds, several GPS points were taken around the perimeter so that area estimates could be obtained using geographical information systems (GIS), and the habitat characteristics were noted. In addition, the general quality of habitat for rearing, overwintering, spawning and migration was noted.

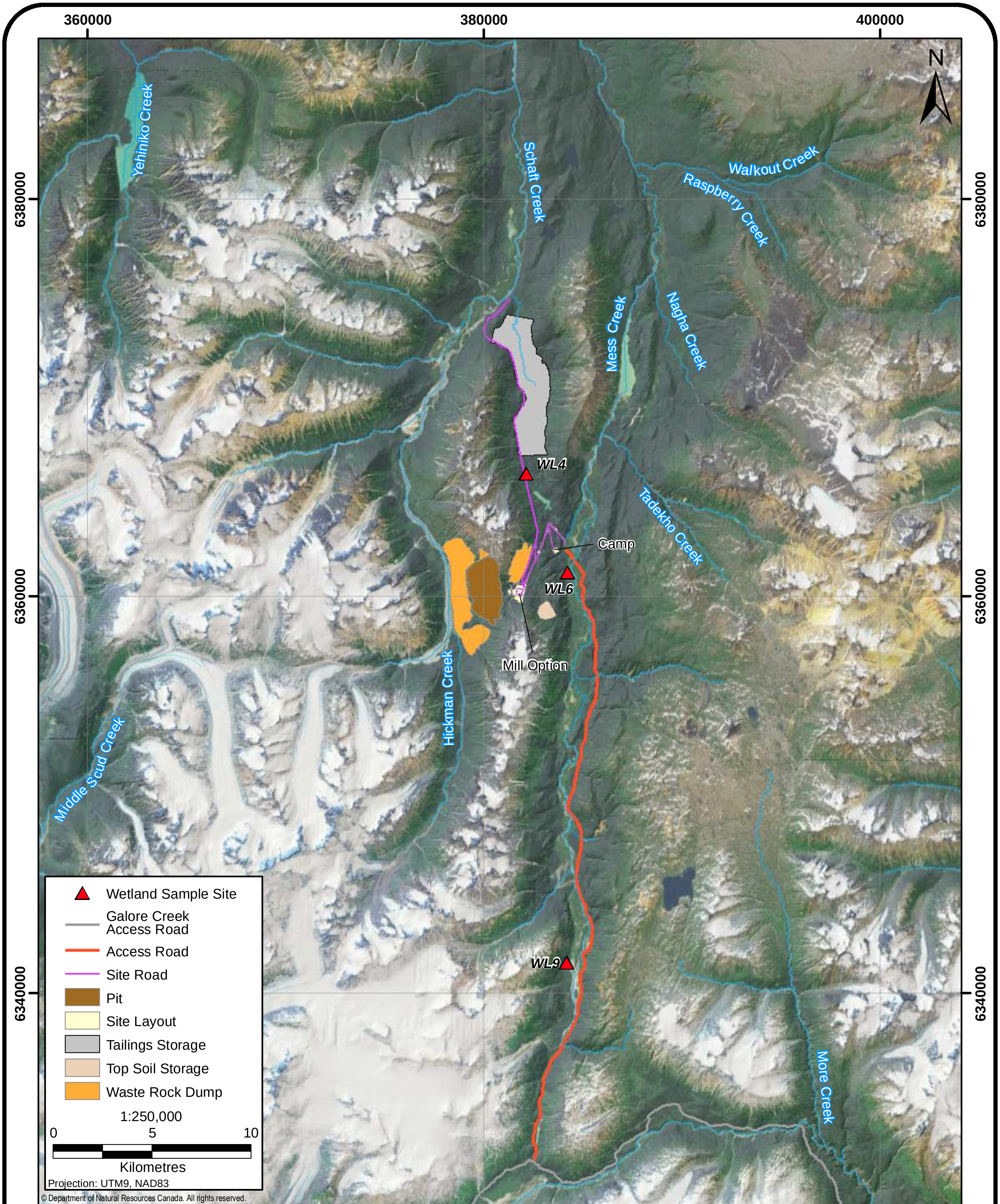
Fish Community

The fish community of wetlands was sampled using a combination of electrofishing and minnow traps. Electrofishing was conducted in narrow or shallow channels found in the wetlands, while minnow traps were set in deeper water habitats and ponds within the wetland. Electrofishing effort was measured in seconds, and the electrofisher settings were recorded. Minnow traps were set for up to 24 hours. The locations, depths, set times and retrieval times were recorded. Information on fish species richness, size distribution, fish condition and relative abundance was obtained. Captured fish were identified, measured to the nearest 1 mm, and weighed to the nearest 0.1 g before being released back into their habitat. Pelvic fin clips and/or scales were collected from fish for aging purposes. Age samples were sent to North/South Consultants for analysis.

2.1.2 Compensation Scoping

2.1.2.1 Study Design

The Schaft Creek Project will likely require some fish habitat compensation to offset alterations or losses of fish habitat due to mine construction or operation. Several potential compensation areas were identified with the assistance of a water resources engineer. First, potential compensation areas were identified from the air based on topography, stability of water supply, and accessibility. These sites were later surveyed on the ground to determine current fish habitat value and fish community composition. Figure 2.1-4 shows the locations of the potential fish habitat compensation sites that were surveyed on the ground.



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Locations of Study Wetlands in the Schaft Creek Project Area 2008

FIGURE 2.1-3

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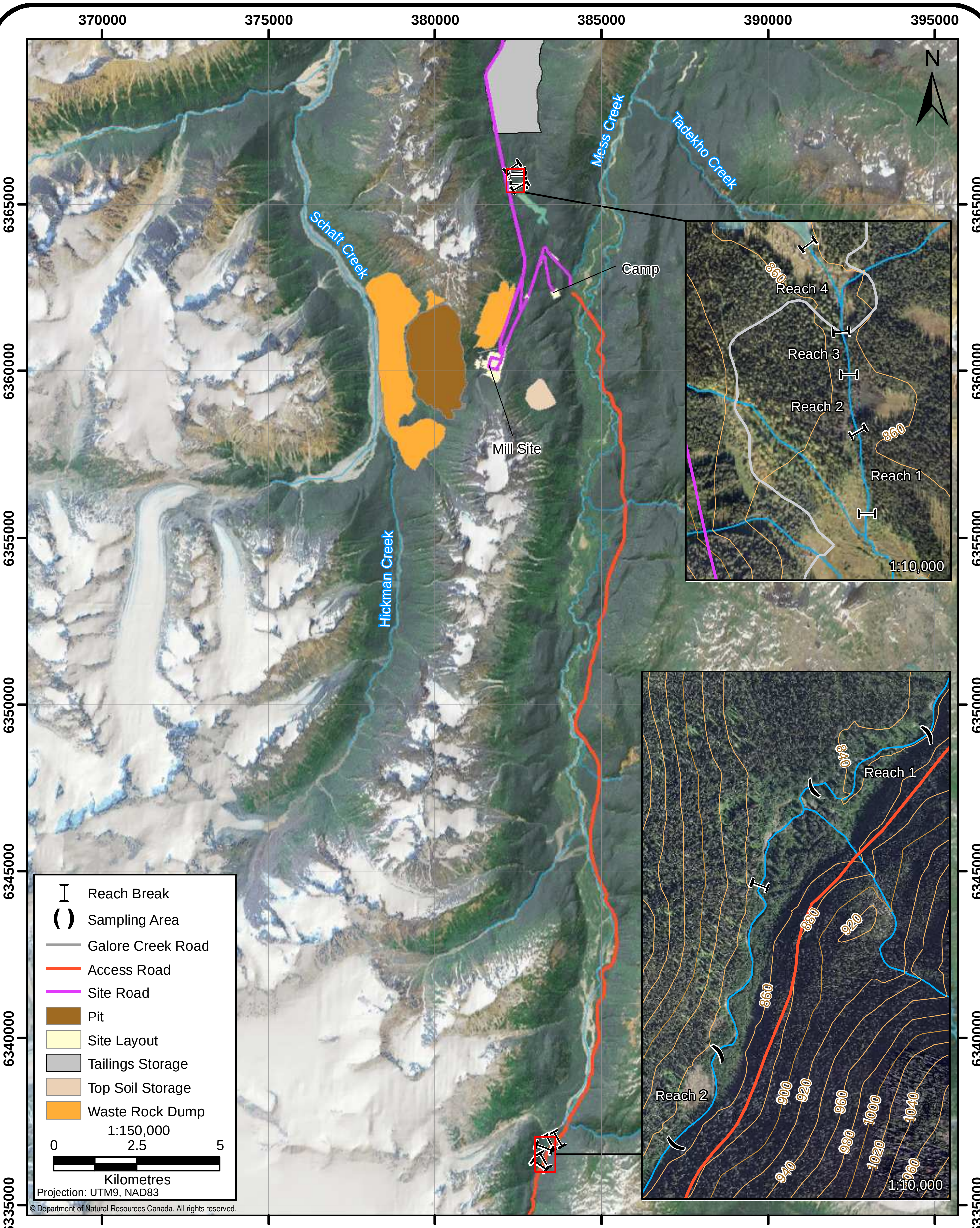

Locations of Potential Fish Habitat Compensation Areas in the Schaft Creek Project Area

FIGURE 2.1-4

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2.1.2.2 Fish Habitat

Once potential compensation areas were identified from the air, fish habitat was assessed on the ground. Four reaches were surveyed in Start Creek, and two reaches were surveyed in Mess Creek. The methods used to assess fish habitat were the same as those used for receiving environment stream sites (Section 2.1.1.1).

2.1.2.3 Fish Community

The fish community in each potential compensation reach was assessed using a combination of electrofishing and minnow traps. Electrofishing was conducted in stream channels and shallow areas, while minnow traps were set in deeper water habitats, pools and ponds. Electrofishing effort was measured in seconds, and the electrofisher settings were recorded. Minnow traps were set for up to 24 hours. The locations, depths, set times and retrieval times were recorded. Captured fish were identified, measured, and weighed before being release back into their habitat. Pelvic fin clips and/or scales were collected from fish for aging purposes.

2.1.3 Proposed Road Route

2.1.3.1 Study Design

Stream crossings along the proposed access corridor were first surveyed and classified in August 2007. At stream crossings where no barriers were present, the classification was defaulted to fish-bearing, even if no fish were caught. In order to confirm the fish-bearing status of these streams, sampling must occur during at least two seasons. Therefore, defaulted streams were revisited in early July 2008 to confirm their fish-bearing status. Figure 2.1-5 shows the locations of streams along the access road that were revisited in 2008.

2.1.3.2 Fish Community

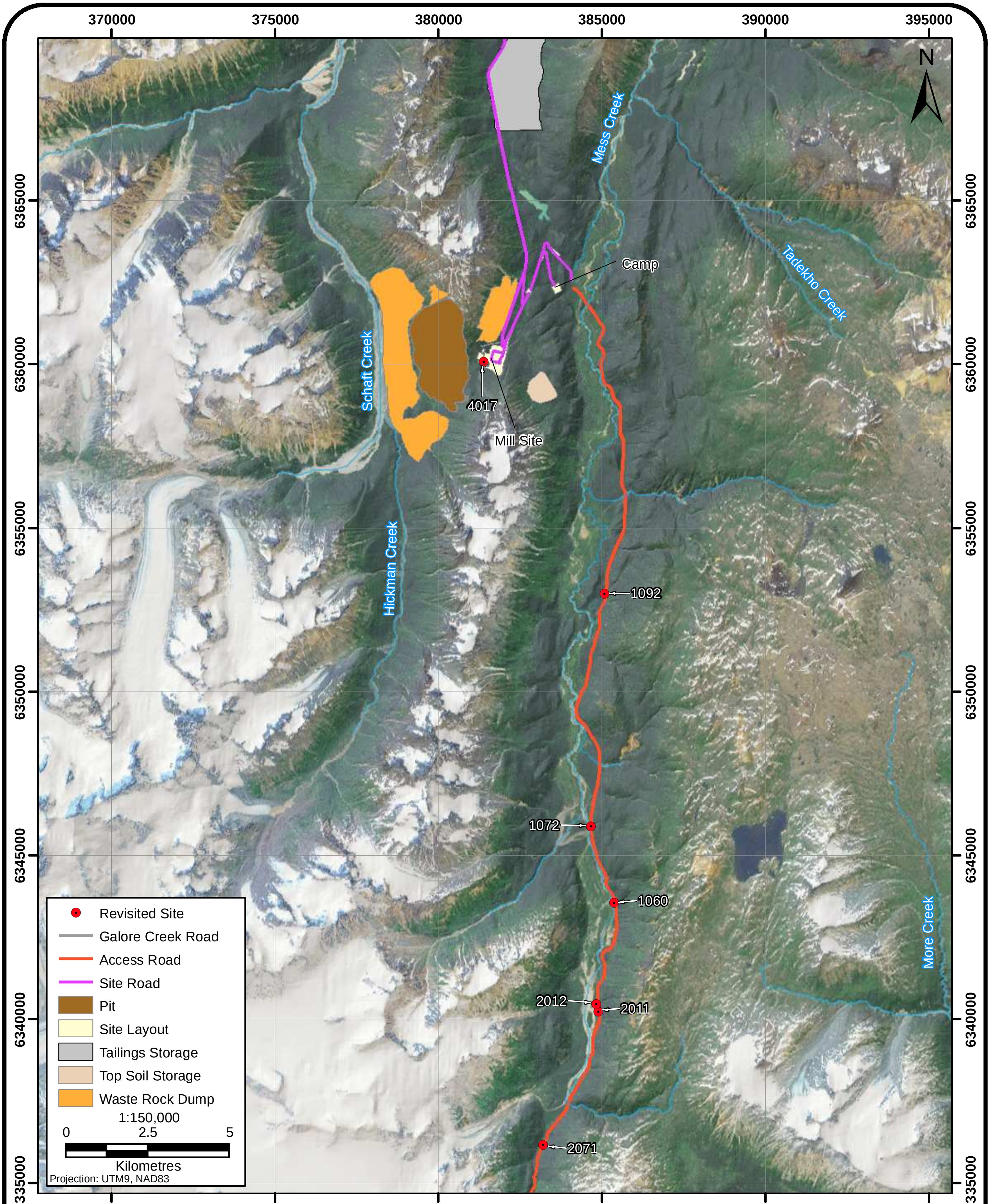
The stream fish communities were sampled using backpack electrofishing. If no fish were captured at the road crossing, then sampling continued downstream until either a barrier or a fish was encountered. Barrier features were noted, photographed and measured, and sampling took place both upstream and downstream of the barrier to determine if it prevents fish passage. Biological data were collected on captured fish, including species, relative abundance, fishing effort, fork length, wet weight, and general physical observations. Scales and/or fins rays were collected from captured fish for aging purposes. Fish were released alive back into their habitat.

2.2 DATA ANALYSIS

SYSTAT statistics software (Systat 2004) was used for all statistical analyses. Normal probability plots were employed to test for normality among variables. Data were transformed with natural logarithms to meet assumptions of normality. Analyses of variance (ANOVA) and analyses of covariance (ANCOVA) were used to test for differences among means.

Fish communities were characterized using relative abundance, catch-per-unit-effort (CPUE), length-frequency distributions, weight-length regressions, age-frequency distributions, and condition factor.

Catch-per-unit-effort is an index of relative abundance that can be used to compare fish populations among different areas. It is defined as the number of fish captured per sampling device per unit time.



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Locations of Revisited Sites along the Schaft Creek Access Road

FIGURE 2.1-5

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For electrofishing, CPUE was calculated as:

(1) $$CPUE = \frac{\text{number of fish caught}}{100\,s}$$

where seconds (s) refers to the amount of time electricity was applied to the water. For minnow trapping, CPUE is calculated as the number of fish captured per trap hour in a standard minnow trap, and for gillnetting, CPUE is calculated as the number of fish captured per 100 m^2 of gillnet area per hour.

A general linear model (GLM) was used to test for equality in the slopes of the length-weight regressions among receiving environment streams. If the slopes were equal (*i.e.* there was no significant effect of the interaction between length and stream on the weight of fish tested), then analysis of covariance (ANCOVA), with length as the covariate, was used to test for differences in weight (*i.e.* the *y*-intercepts of the regressions) among sites. If the slopes of the regressions were not equal, this indicated that the relationship between length and weight differed among sites and the *y*-intercepts of the regressions could not be compared.

Condition is an index of the relative health of fish. It was calculated for all fish for which length and weight data were obtained, and was based on the following formula from Ricker (1975):

(2) $$Condition = \frac{weight\ (g) \times 10^5}{length\ (mm)^3}$$

Von Bertalanffy growth models were fit to length-age data using SigmaPlot's non-linear regression function. The equation for this model is:

(3) $$L_t = L_\infty (1 - e^{(-K(t-t_0))})$$

where L_t is the length (mm) at age t (years), L_∞ is the length (mm) that the fish would attain if it were allowed to grow for an infinitely long time, K is a growth coefficient (year $^{-1}$), and t_0 is the age (years) at zero length.

Length-frequency distributions were constructed to visualize the distribution of fish among size classes. Age-frequency distributions were also used to present the distribution of fish by age. These plots are useful in looking for differences in population structure among sites.

Frequency distributions were also used to visualize the distribution of various habitat types throughout the receiving environment.

3. Results and Discussion

3. Results and Discussion

3.1 RECEIVING ENVIRONMENT

3.1.1 Streams

3.1.1.1 Fish Habitat

An overview fish habitat assessment was conducted at 10 receiving environment sites within the Mess, Schaft, and Skeeter Creek watersheds and one reference environment site within the Walkout Creek Watershed. Assessments were conducted in June, July and August of 2008. Overview fish habitat assessments were conducted in accordance with the Reconnaissance 1:20,000 Fish and Fish Habitat Inventory Protocol (RISC 2001) and the Reconnaissance 1:20,000 Fish and Fish Habitat Inventory: Site Card Field Guide (RISC 1999). Fish habitat details are presented in the form of completed site cards in Appendix 1-1.

<u>Stream Channel Measurements</u>

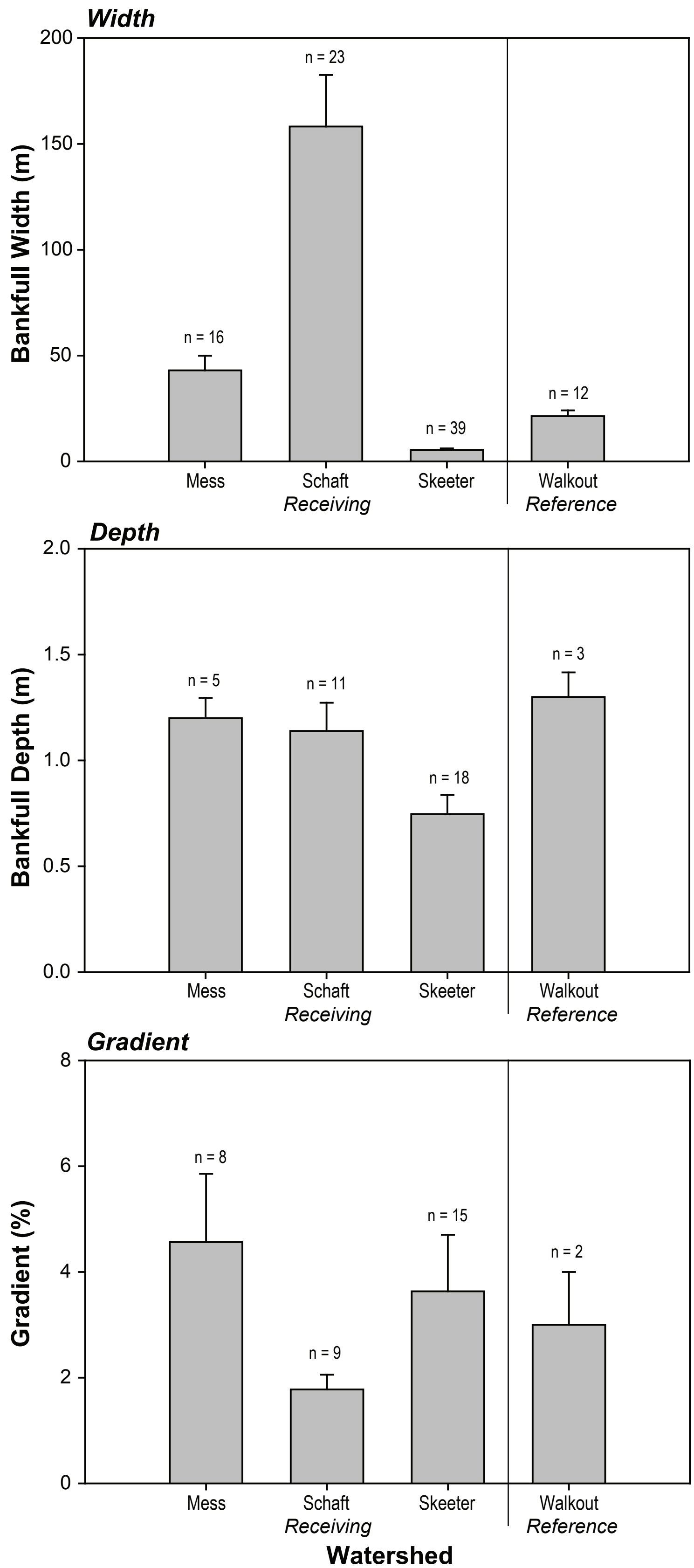
The average bankfull width of all sites measured ranged from 5.5 m (Skeeter) to 158.2 m (Schaft). The Schaft Creek Watershed had the highest average bankfull width, which was three times greater than the next highest average bankfull width (Mess). Average bankfull depths for streams within the Mess, Schaft and Walkout Creek watersheds were relatively similar, ranging from 1.1 m (Schaft) to 1.3 m (Walkout). The Skeeter Creek Watershed had the lowest average bankfull depth of 0.75 m. The average gradient for streams within the receiving environment watersheds ranged from 1.8 (Schaft) to 4.6% (Mess). The reference environment watershed (Walkout) had an average gradient of 3.0%, relatively similar to the receiving environment watersheds. The high average gradient for the Mess Creek watershed is derived from one high-gradient site surveyed near the headwater reach. Most of the watershed downstream had a low gradient. Figure 3.1-1 summarizes average bankfull width, depth and gradient for each watershed.

The channel width for each watershed within the receiving and reference environments is summarized in Figure 3.1-2. The channel width frequency distribution varied between watershed in the receiving and reference environment. The Schaft Creek Watershed, with the highest average channel width, was predominantly of the >100 m channel width class (74%). The Skeeter and Walkout Creek watersheds were predominantly of the 10 to 19.9 (95%) and 20 to 29.9 m (67%) channel width class, respectively. The channel width class within the Mess Creek Watershed was widely distributed, with the predominant channel widths being the 80 to 89.9 (19%) and 30 to 39.9 m (31%) classes.

<u>Channel Morphology and Disturbance</u>

Figure 3.1-3 presents the frequency of stream channel morphologies encountered by watershed. The majority of the receiving environment streams possessed riffle-pool morphology, followed by large channel, and cascade-pool morphology, in each watershed. Cascade-pool morphology was absent at streams within the Schaft Creek Watershed. Riffle-pool and cascade-pool morphology was present at the reference site.

Within the receiving environment watersheds, cobble was the most frequently observed dominant substrate type, followed by fines and then gravel and boulder. The Schaft Creek Watershed had a noticeably high frequency of cobble, while fines were dominant within the Mess Creek Watershed. Fines, gravel and cobble were equally frequent as the dominant substrate within the Skeeter Creek Watershed.



Note: Error bars represent one standard error of the mean.

FIGURE 3.1-1

Mean Bankfull Widths, Depths and Gradient of Streams in the Receiving and Reference Environment Watersheds, 2008

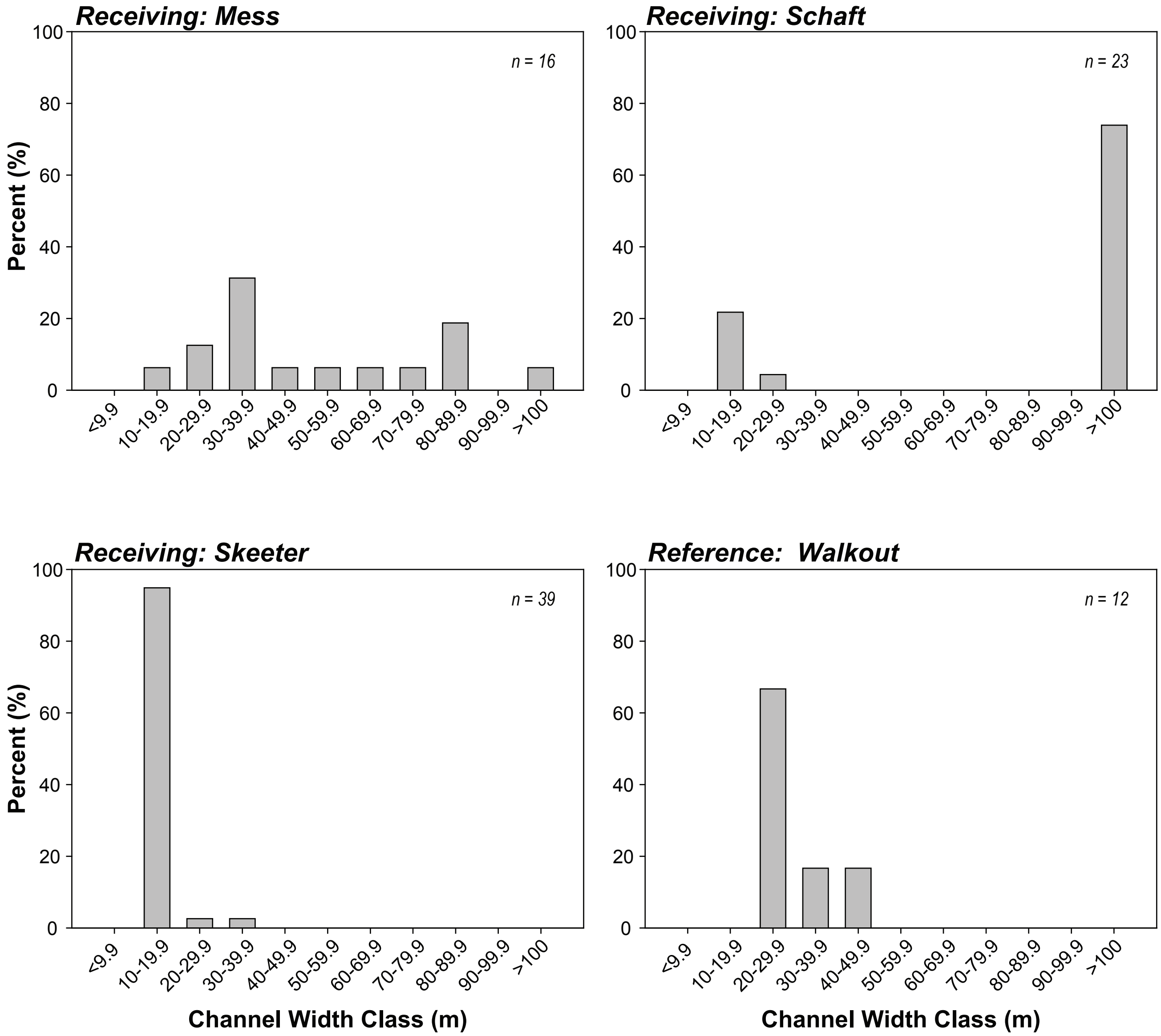


FIGURE 3.1-2

Summary of Bankful Widths for all Streams in the Receiving and Reference Environment Watersheds, 2008

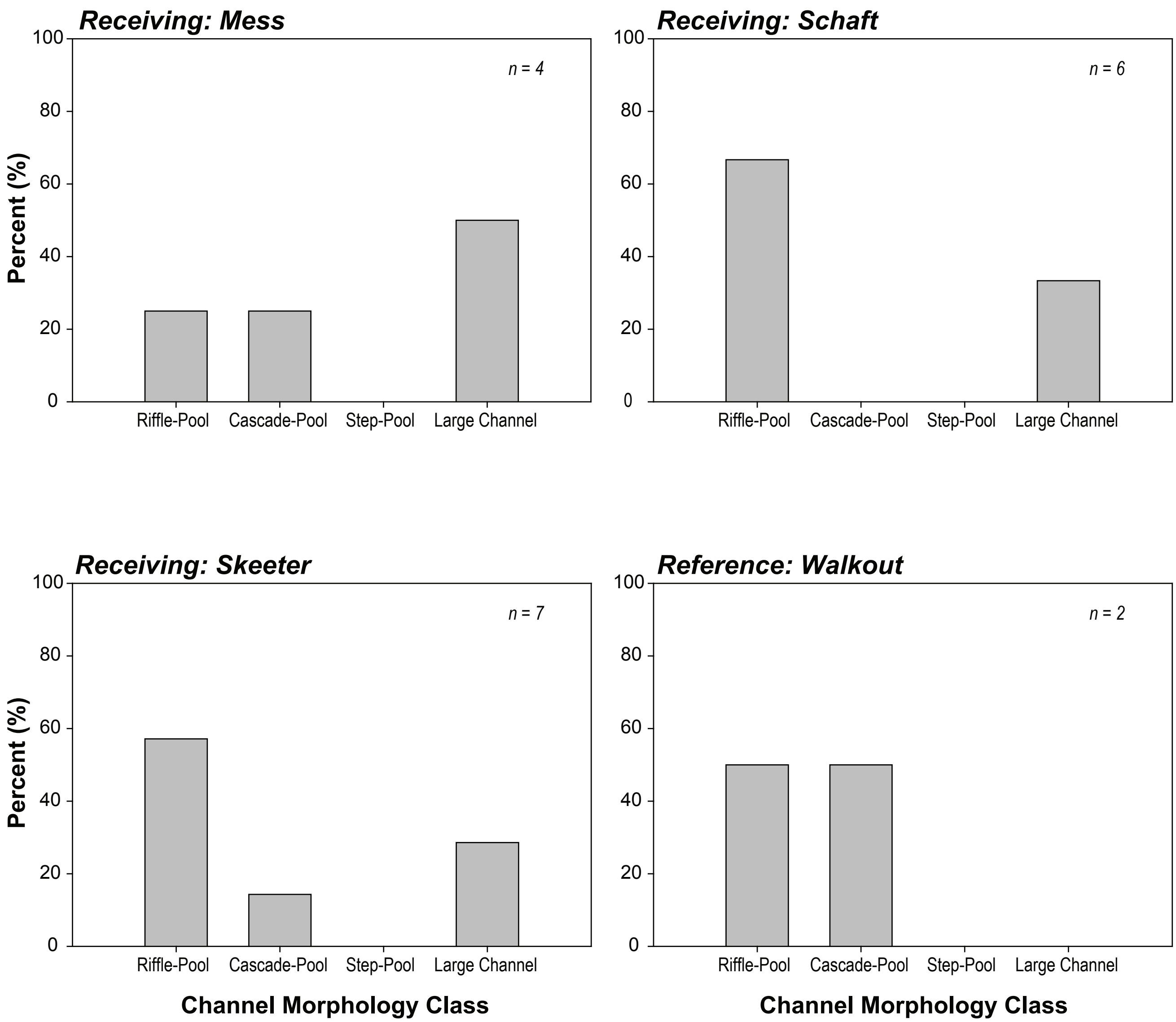


FIGURE 3.1-3

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Summary of Channel Morphology Classifications for all Streams in the Receiving and Reference Environment Watersheds, 2008

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The dominant substrate within Walkout Creek was composed of cobble and boulder. Figure 3.1-4 shows a dominant channel substrate histogram for all streams by watershed.

Within the receiving environment watersheds, fines were the most frequently observed sub-dominant substrate type, followed by gravel. Sub-dominant cobble, boulder and bedrock substrate were infrequently observed. Walkout Creek possessed relatively equal amounts of cobble and boulders as the sub-dominant substrate. Sub-dominant substrate types for the Project area watersheds are presented in Figure 3.1-5.

Channel disturbances from sediment inputs, obstructions and erosion can affect fish habitat quality. Figure 3.1-6 shows a channel disturbance histogram for all streams by watershed. Channel disturbances were pooled into five categories: organic, banks, large woody debris (LWD), morphology and sedimentation. Within each category the following disturbances could be present:

- Organics – beaver dam;
- Banks – abandoned channels, eroding banks, avulsions;
- LWD – small woody debris, large woody debris, recently formed debris jams;
- Morphology – extensive riffle or cascades, minimal pool area, elevated mid-channel bars, multiple channels or braids, disturbed stone-lines; and,
- Sedimentation – homogeneous bed texture, sediment fingers, sediment wedges, extensive bars, extensively scoured zones.

Channel disturbances recorded within the receiving environment included all five categories. Morphological disturbances were the most frequently recorded disturbance category in the receiving environment watersheds, except in Mess Creek, where morphological and LWD disturbances were equally recorded. Organic disturbances were the least recorded disturbance category in the receiving environment. All five disturbance categories were recorded in the Walkout Creek.

Channel pattern is a description of the path of the channel banks in relation to a straight line (RISC 1999). Tortuous, regular, and irregular meandering and sinuous and straight channel patterns were present (Figure 3.1-7). The straight channel pattern was predominant along Schaft Creek (67%), while regular meanders were predominant in Mess Creek (75%). Pattern channel classification was more or less evenly distributed among sites within the Skeeter Creek Watershed. Sinuous and straight channel patterns were present within Walkout Creek.

Confinement refers to the ability of a channel to migrate laterally on a valley flat adjacent to surrounding slopes (RISC 1999). The distribution of channel confinement within the receiving and reference environment watersheds are presented in Figure 3.1-8. All channel confinement types, with the exception of confined channels (restricted from lateral migration by valley walls), were observed. Stream channels within the receiving environment were predominantly classified as unconfined (not restricted from lateral movement by valley walls) and occasionally confined (can migrate laterally in the majority of the valley flat). Frequently confined channels (restricted from lateral migration by valley walls, but can store sediments on valley flats) were present at the Mess and Skeeter Creek watersheds, while entrenched channels (confined by valleys, eroded gullies or bedrock) were only observed within the Skeeter Creek Watershed. The stream channels of the Schaft Creek were classified as unconfined and occasionally confined.

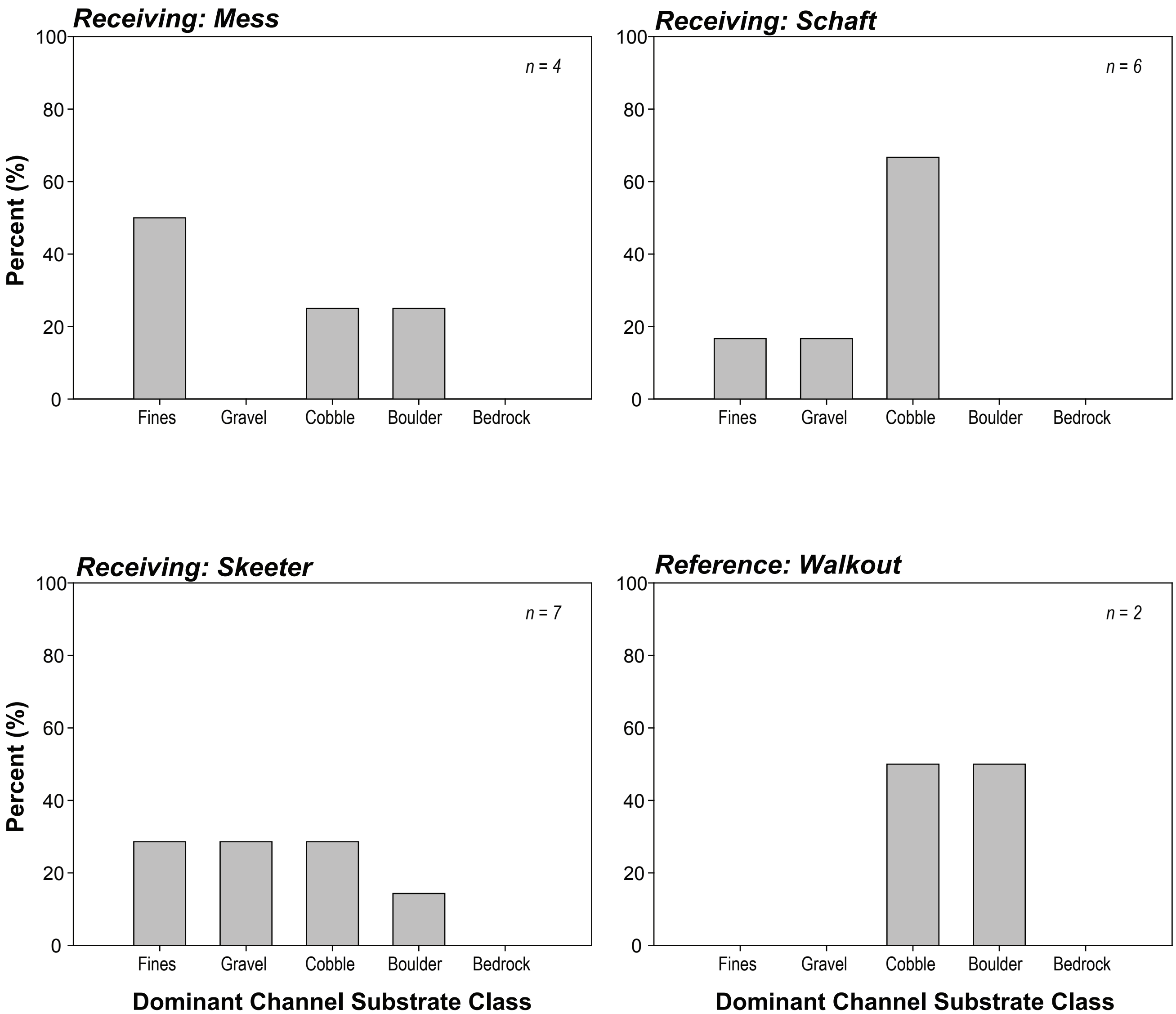

FIGURE 3.1-4

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Summary of Dominant Substrate Class for all Streams in the Receiving Environment Streams, 2008

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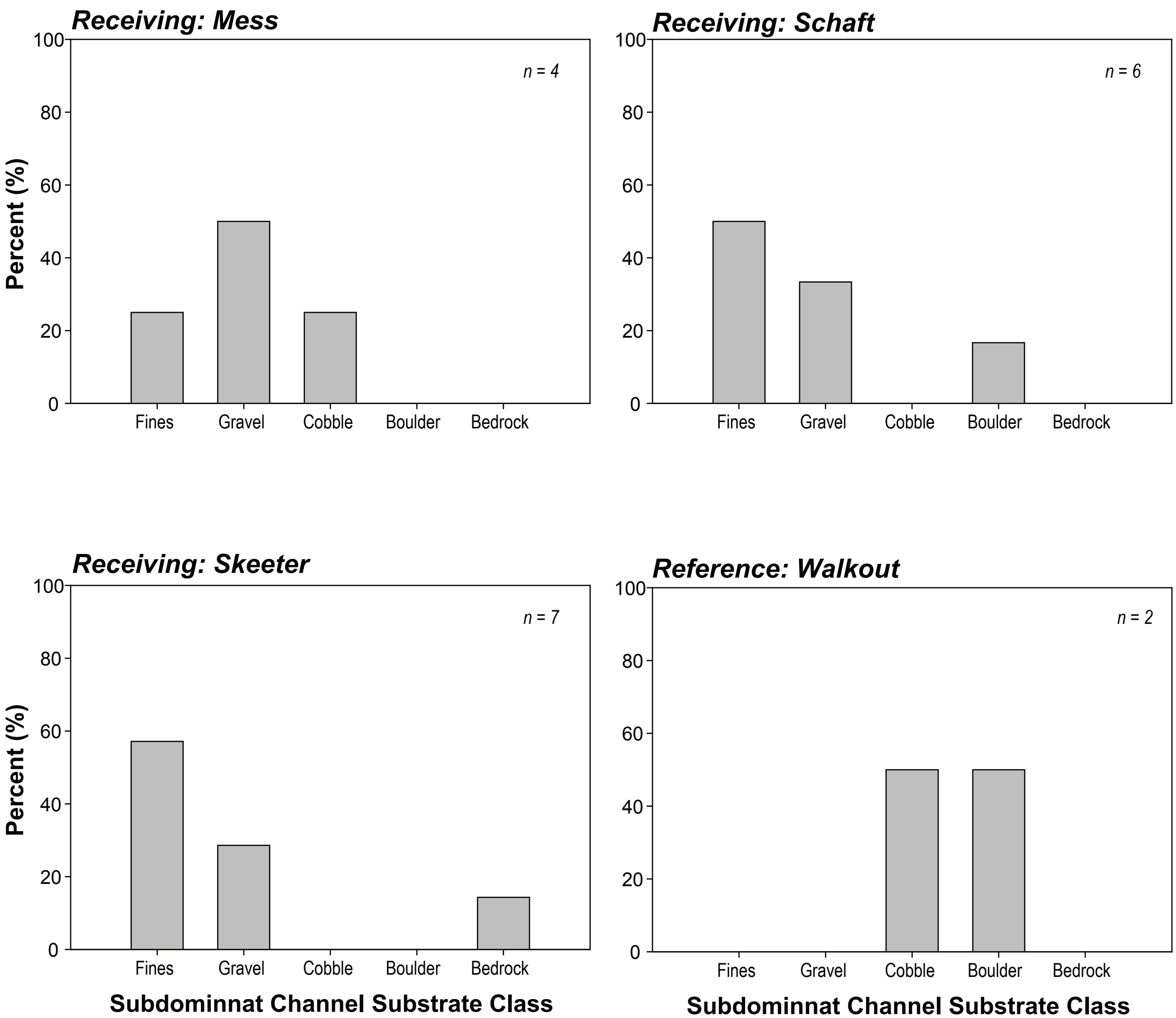

FIGURE 3.1-5

Summary of Subdominant Substrate Class for all Streams in the Receiving and Reference Environment Watersheds, 2008

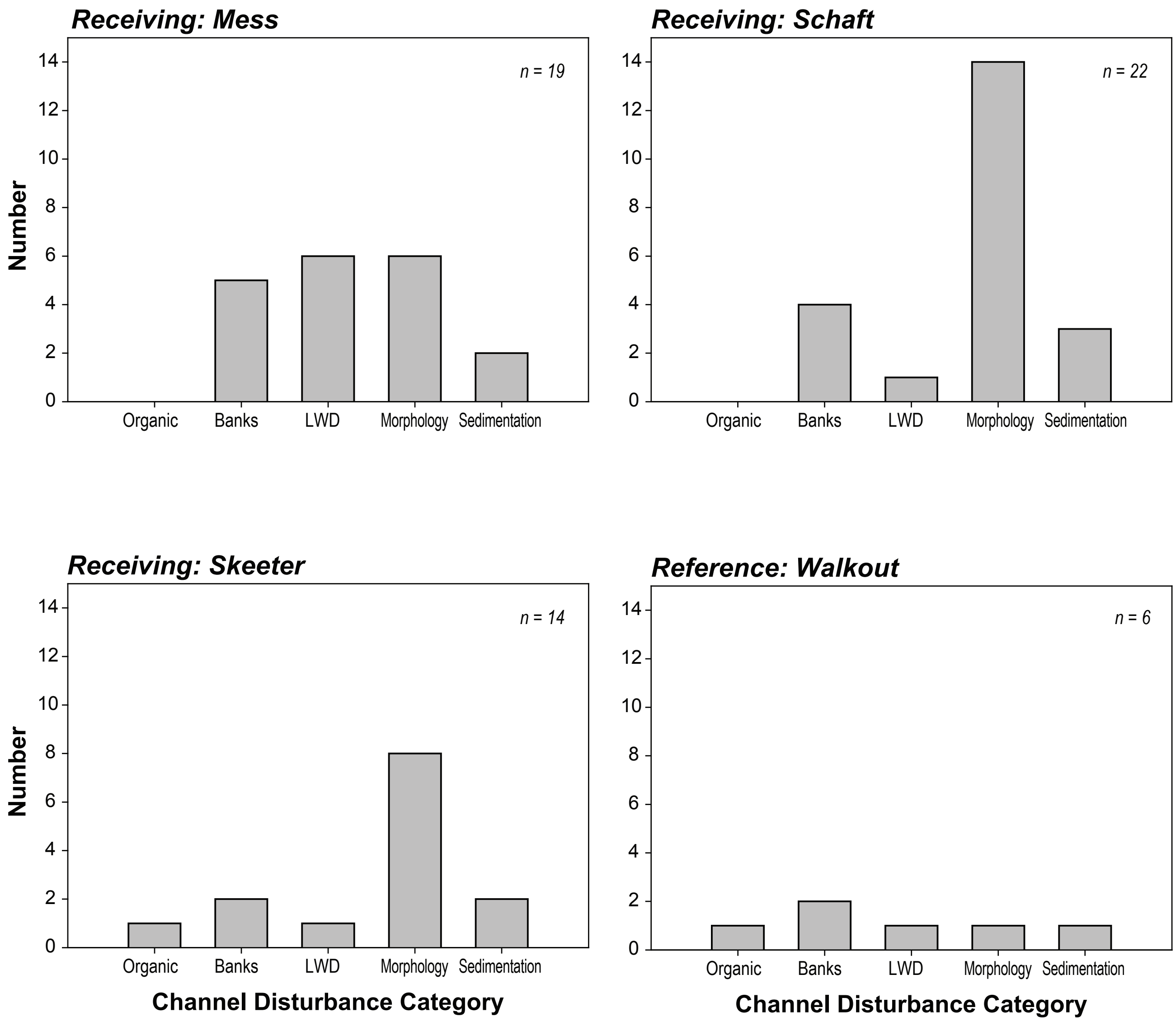

FIGURE 3.1-6

Summary of Channel Disturbance for all Streams in the Receiving and Reference Environment Watersheds, 2008

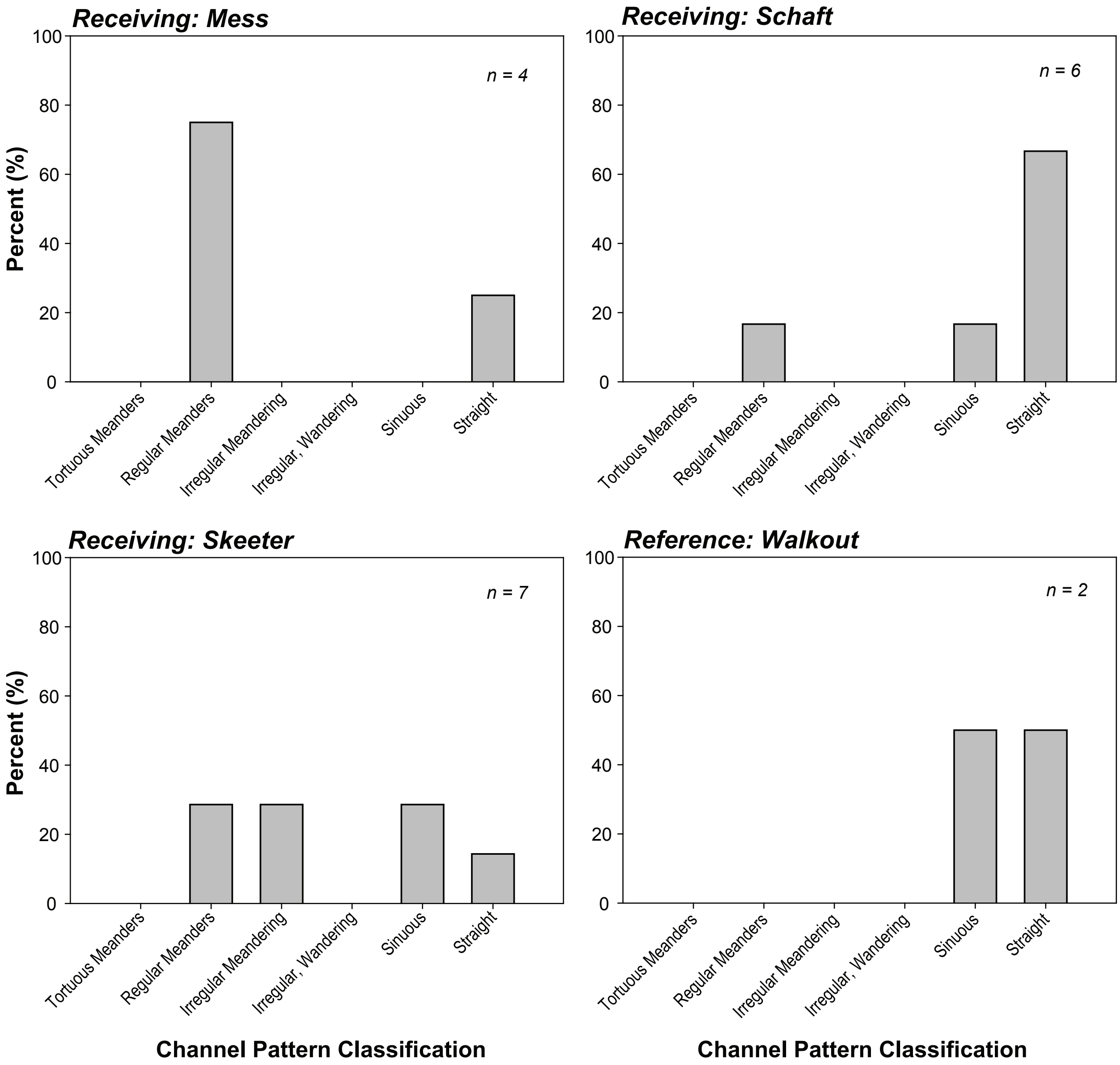

FIGURE 3.1-7

Summary of Channel Pattern Classification for all Streams in the Receiving and Reference Environment Watersheds, 2008

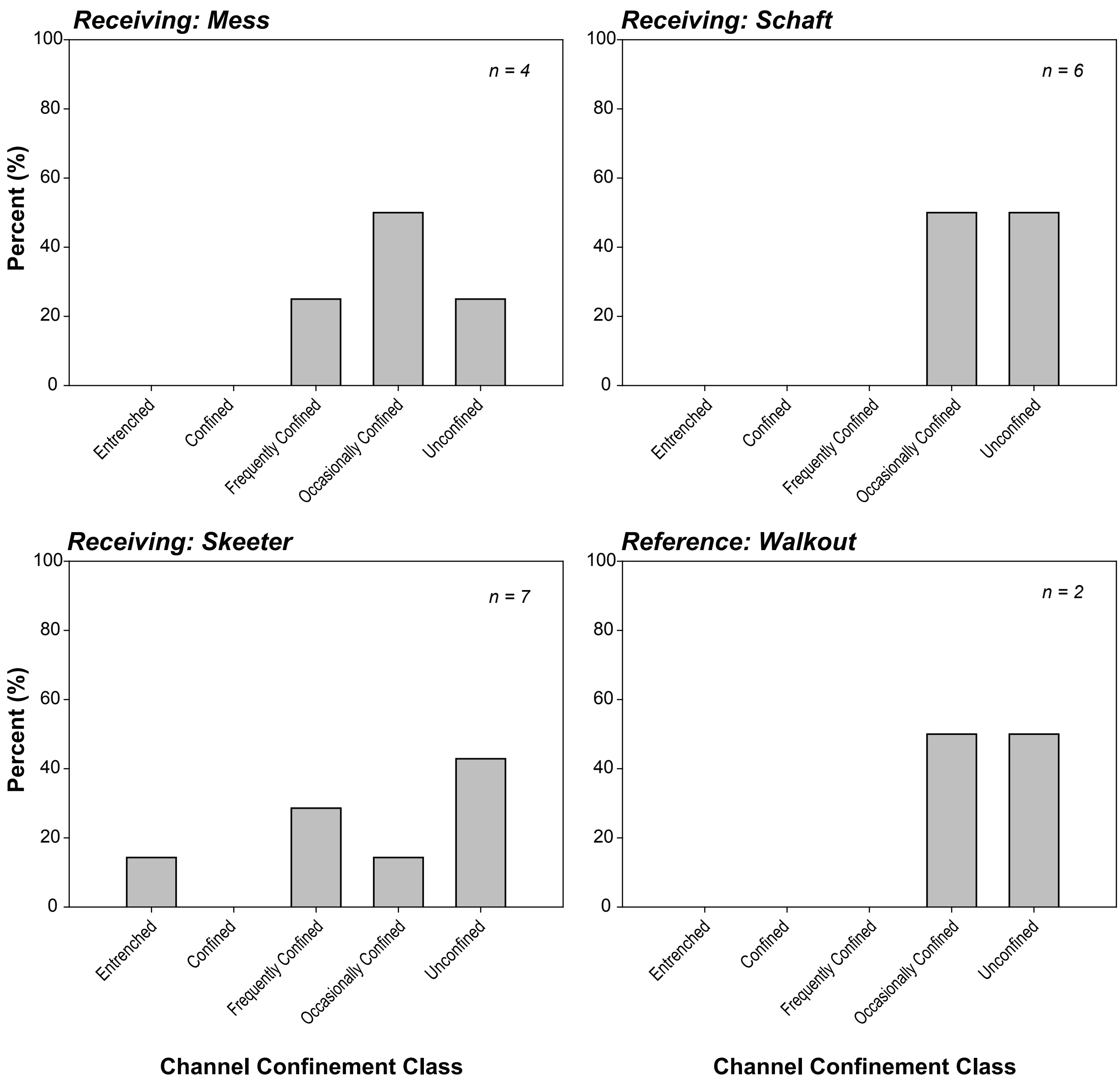

FIGURE 3.1-8

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Summary of Channel Confinement Classification for all Streams in the Receiving and Reference Environment Streams, 2008

Coupling is the described as the potential for sediment mobilized on the hillslopes to enter a stream channel (RISC 1999). Figure 3.1-9 summarizes the classification of coupling. The majority of stream channels were decoupled (hillslope sediment from a landslide would normally not enter the stream channel). Partially coupled (a portion of hillslope sediment from a landslide would enter the stream channel) and coupled (hillslope sediment from a landslide would enter the stream channel) stream channels were present within the Mess and Schaft Creek watersheds. Partially coupled stream channels were absent within the Skeeter Creek Watershed. The stream channels of the reference environment watershed were decoupled.

Water Quality Parameters

Average water temperatures within the receiving environment watersheds ranged from 7.4°C (Schaft) to 9.4°C (Skeeter), with an overall average of 8.3°C. The average water temperature of Walkout Creek was 9°C. The average conductivity of streams within the Mess (122.8 µS/cm) and Skeeter Creek (152.0 µS/cm) watersheds was relatively similar. The average conductivity of streams within the Schaft Creek Watershed was comparatively lower, with an average of 57.7 µS/cm. The average conductivity of Walkout Creek was 48.0 µS/cm, similar to Schaft Creek. The average pH of receiving and reference environment watersheds were similar, ranging from 8.06 (Skeeter) to 8.25 (Schaft). Table 3.1-1 shows a summary of water quality characteristics for all streams by watershed.

Fish Habitat Characteristics

Functional large woody debris (LWD) is described as large pieces of wood that have become embedded in a stream, directly influencing the morphology of the stream channel by affecting sediment storage and local flow conditions (RISC 1999). Figure 3.1-10 summarizes the abundance of functional LWD for all streams by watershed. The majority of receiving environment streams possessed few (<1 piece per bankfull width) pieces of LWD. Streams within the Schaft Creek Watershed possessed no LWD (33%), abundant LWD (> or = 1 pieces per bankfull width) (17%), or few LWD (50%), while Mess Creek sites possessed either no pieces of LWD or few pieces. The Skeeter Creek watershed only possessed few pieces of LWD. Few pieces of LWD were present within Walkout Creek.

The distribution of LWD within the receiving and reference environment watersheds are summarized in Figure 3.1-11. The distribution of LWD is described as either "even" or "clumped". LWD that is categorized as even occurs throughout the stream channel, while clumped LWD is an accumulation of LWD in the same location (RISC 1999). The percent of even LWD distribution for watersheds within the receiving environment ranged from 43 (Skeeter) to 50% (Mess and Schaft), while clumped LWD distribution ranged from 0 (Mess) to 43% (Skeeter). The distribution of LWD in Walkout Creek was equally even and clumped.

Stream banks are classified by shape: undercut (extends out over the wetted channel, vertical (45° to 90° gradient), sloping (gradual slope; less than 45° gradient), and overhanging (bank extends out over the non-wetted part of the channel) (RISC 1999). Figure 3.1-12 summarizes the frequency of bank shapes for all streams by watershed. The majority of streams within receiving environment watersheds possessed sloping banks. Streams within the Skeeter Creek Watershed possessed vertical (14%), undercut (29%), and sloping (57%) banks, while only sloping banks were present within the Mess and Schaft Creek watersheds. Steep (50%) and sloping (50%) banks were present in Walkout Creek.

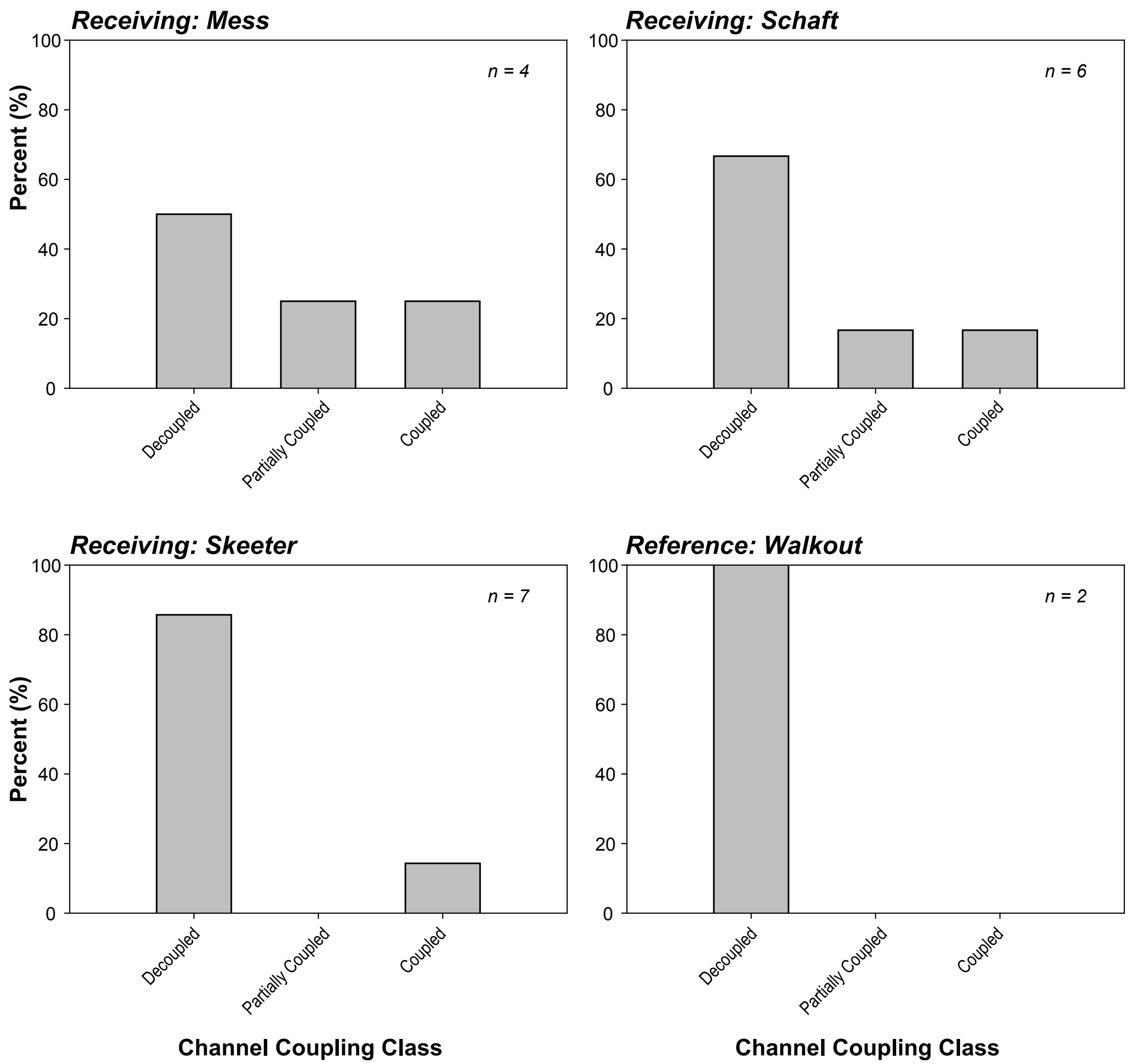

FIGURE 3.1-9

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Summary of Hillside Coupling Classifications for all Streams in the Receiving and Reference Environment Streams, 2008

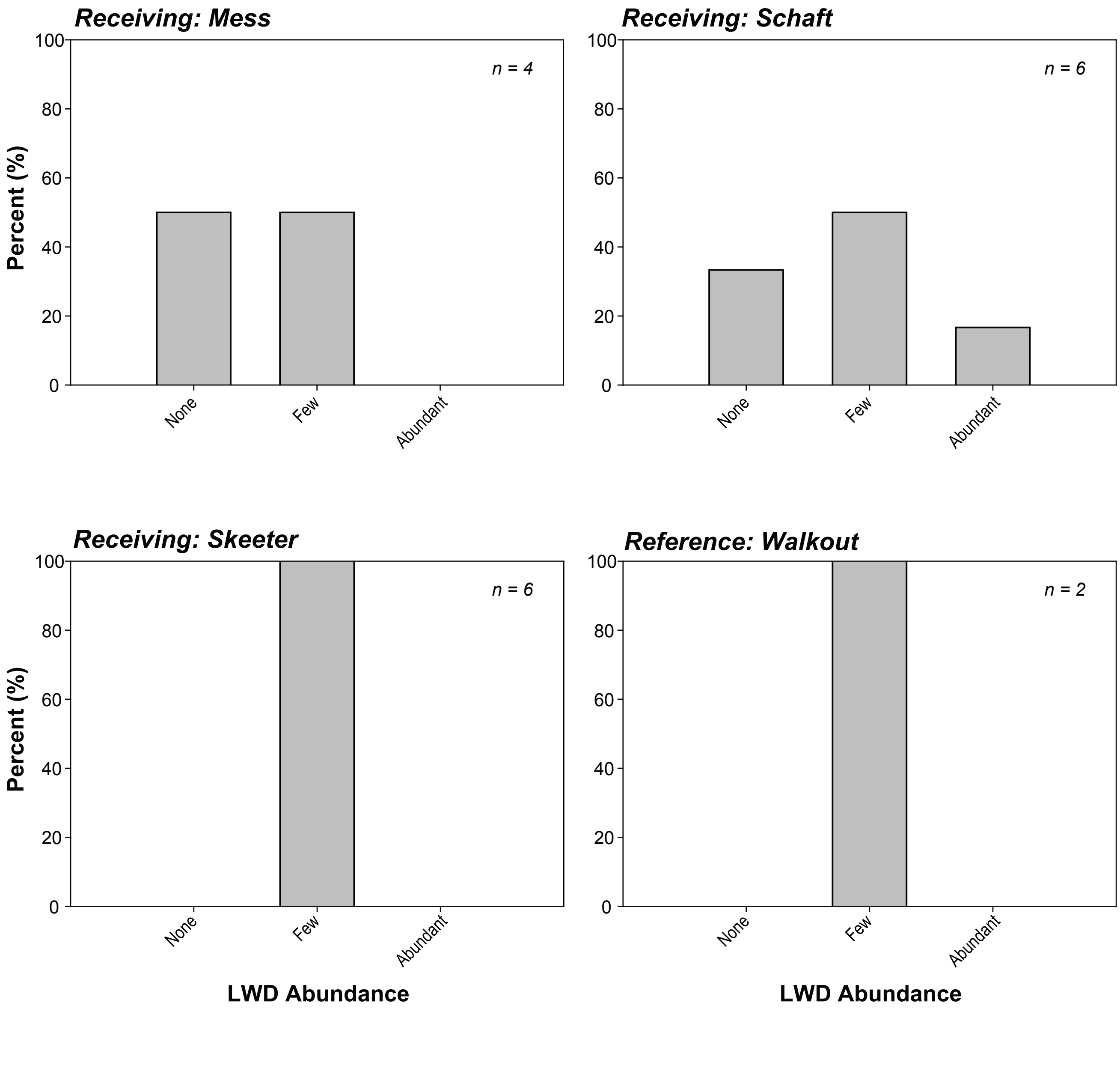

FIGURE 3.1-10

Summary of Functional Large Woody Debris Abundance for all Streams in the Receiving and Reference Environment Streams, 2008

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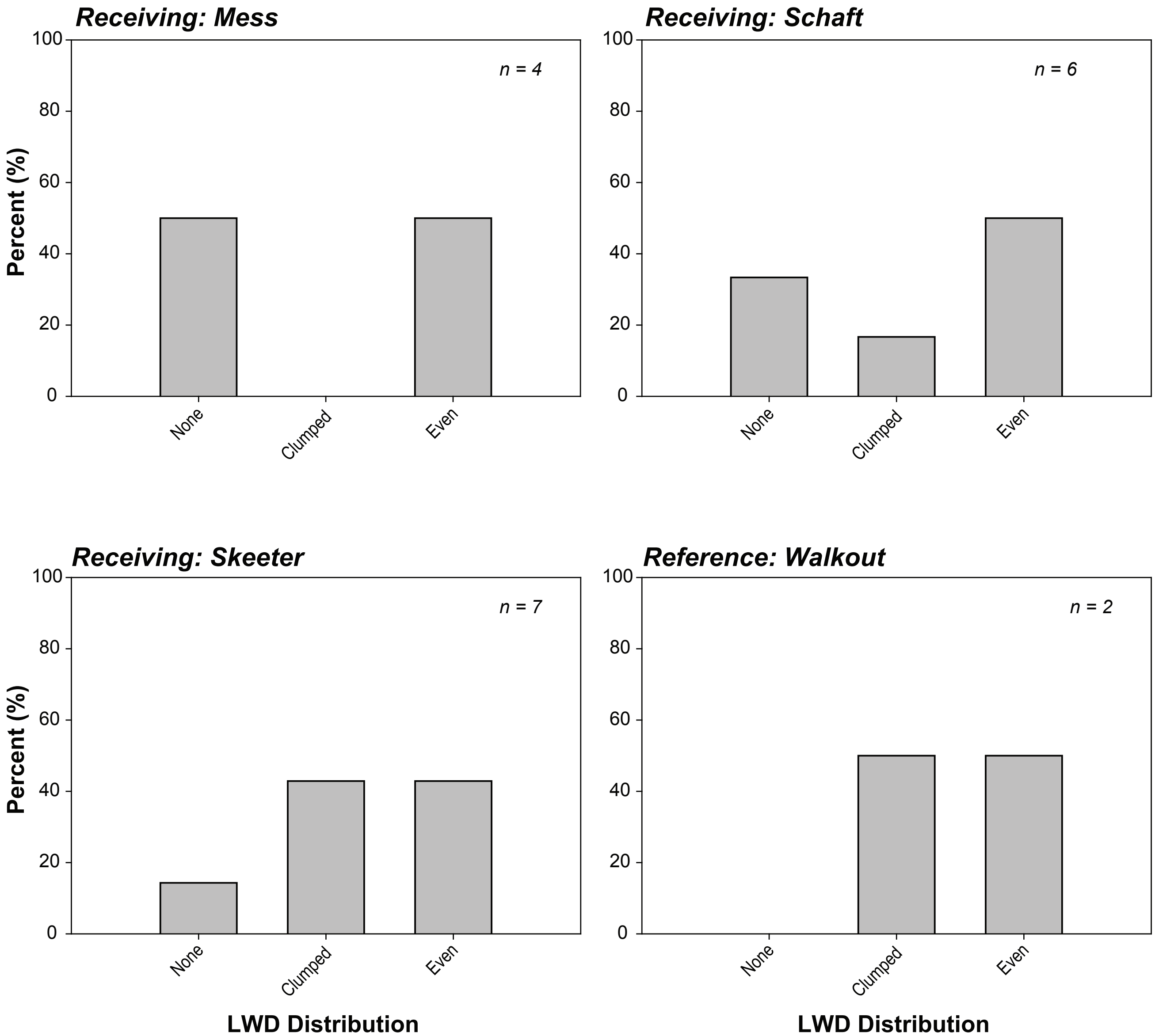

FIGURE 3.1-11

Summary of Functional Large Woody Debris Distribution for all Streams in the Receiving and Reference Environment Streams, 2008

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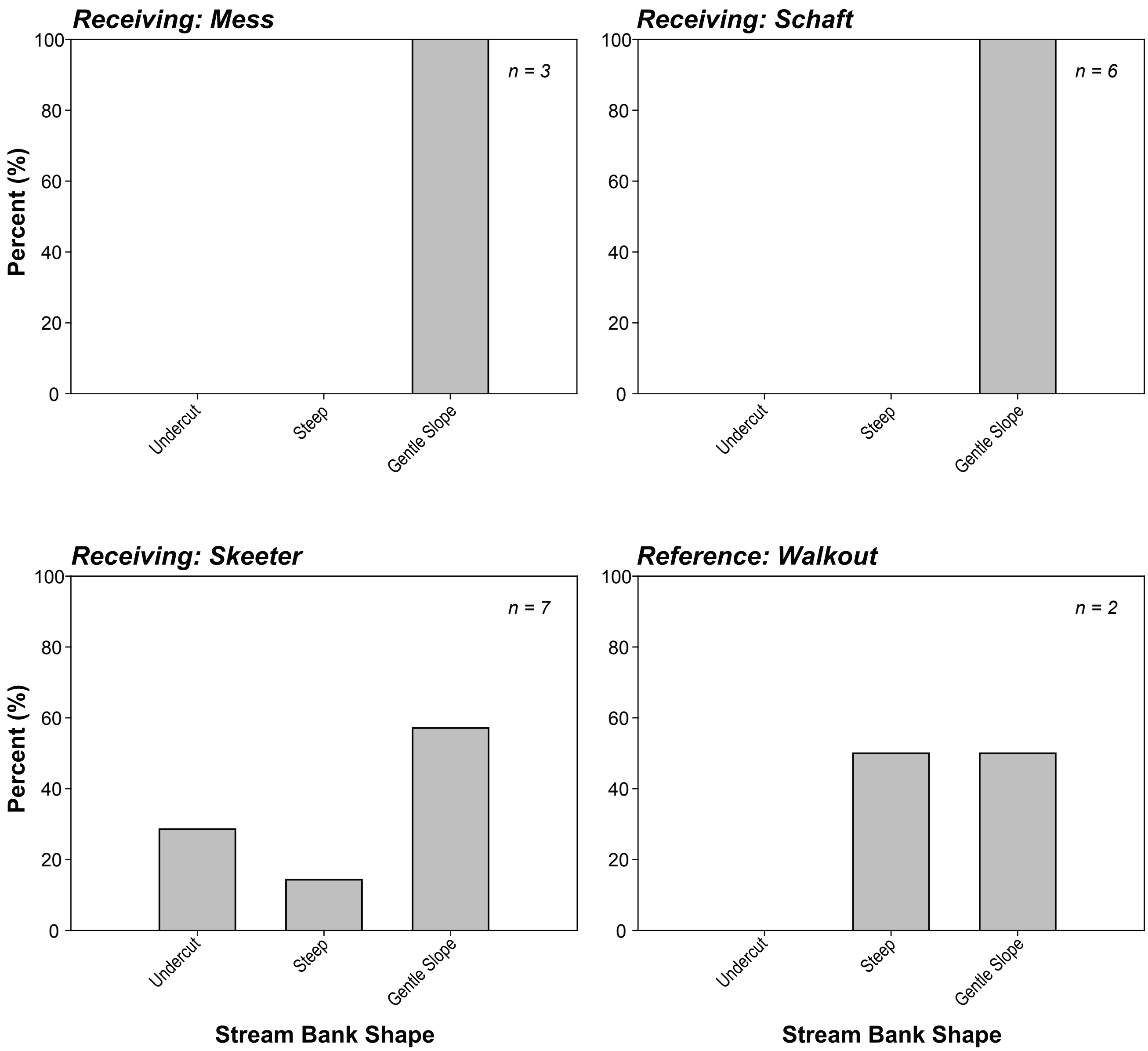

FIGURE 3.1-12

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Summary of Bank Shape for all Streams in the Receiving and Reference Environment Streams, 2008

Table 3.1-1. Summary of Water Quality Characteristics for all Streams in the Receiving and Reference Environment Watersheds, 2008

Watershed	Total Number of Surveys	Average Temperature (°C)	SE	n	Average Conductivity (µS/cm)	SE	n	Average pH	SE	n
Receiving Environment										
Mess	4	7.8	0.85	4	122.8	8.20	4	8.21	0.15	4
Schaft	6	7.4	1.41	6	57.7	6.30	6	8.25	0.06	6
Skeeter	7	9.4	1.13	6	152.0	12.83	6	8.06	0.09	5
Overall	17	8.3	0.63	18	102.5	11.63	18	8.2	0.05	17
Reference Environment										
Walkout	2	9	1.5	2	48.0	8.00	2	8.15	0.15	2

Bank texture refers to the substrate materials that compose the banks of the stream. Figure 3.1-13 summarizes stream bank texture for all streams by watershed. Fines were the most frequently recorded bank texture in all watersheds.

Cover is described as any structure within the wetted channel (or within 1 m above the water surface) that provides hiding, resting or feeding places for fish. Total cover is a percentage estimate of the amount of cover provided by all the forms present within the section of stream surveyed (RISC 1999). Figure 3.1-14 presents a histogram of total cover abundance for all streams by watershed. The majority of streams possessed between trace (<5%) and moderate (5 to 20%) amounts of cover. Two sites in the Skeeter Creek watershed show abundant (>20%) cover.

Figure 3.1-15 summarizes the frequency of dominant cover types recorded for all streams by watershed. LWD and deep pools were the most frequently observed dominant cover types within the receiving environment watersheds, followed by boulders. SWD and boulders were the dominant cover type in Walkout Creek.

Figure 3.1-16 presents the frequency of sub-dominant cover types recorded for all streams by watershed. Overhanging vegetation, LWD, and SWD were the most prevalent sub-dominant cover types, while deep pools, undercut banks, and boulders were less prevalent.

Riparian vegetation is described as vegetation on land alongside the high water line of the stream and extending to the portion of land that is influenced by the flow of the stream (RISC 1999). Figure 3.1-17 shows the dominant riparian vegetation recorded for all streams by watershed. Shrubs were the major dominant riparian vegetation type in the Mess and Skeeter Creek watersheds, while the mixed coniferous and deciduous forest was the dominant riparian vegetation type in the Schaft Creek and Walkout Creek watersheds. Grasses were the least recorded riparian types.

Fish Habitat Suitability

While various species have widely differing habitat requirements, field crews focused on the general habitat requirements of juvenile and adult salmonids because of their abundance in the Project area.

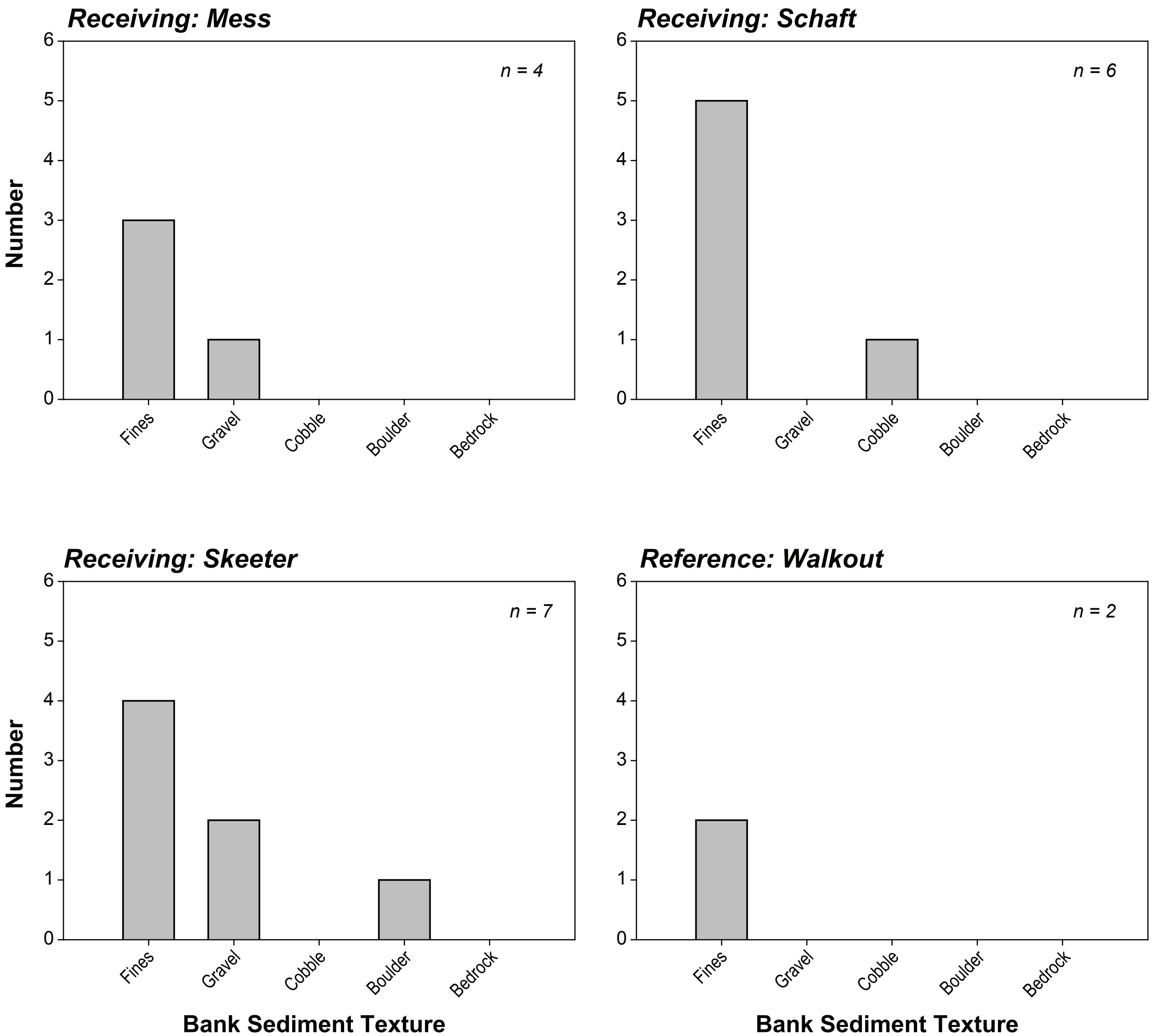

FIGURE 3.1-13

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Summary of Bank Sediment Texture for all Streams in the Receiving and Reference Environment Streams, 2008

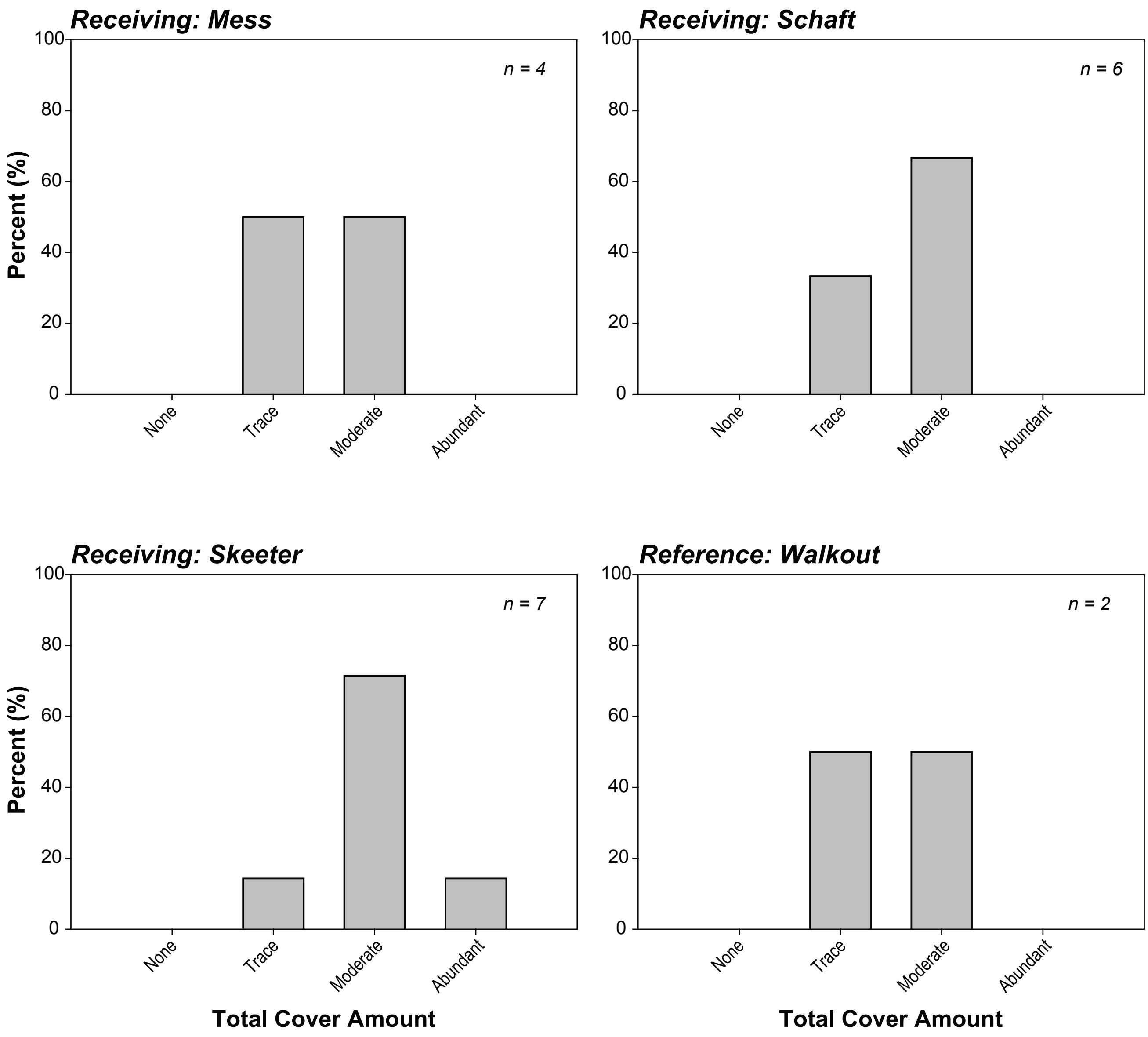

FIGURE 3.1-14

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Summary of Total Cover Amounts for all Streams in the Receiving and Reference Environment Streams, 2008

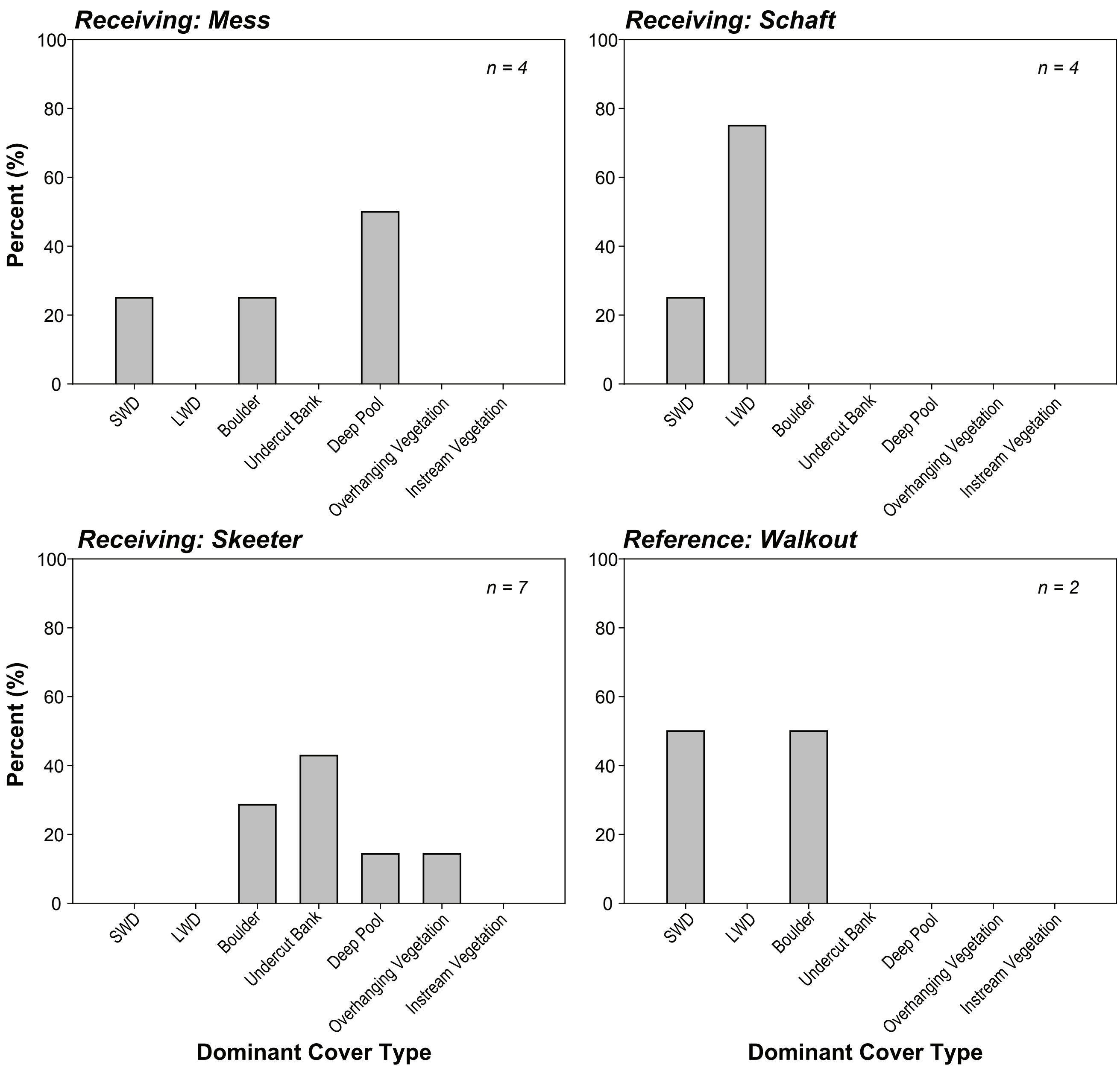

FIGURE 3.1-15

Summary of Dominant Cover Type for all Streams in the Receiving and Reference Environment Streams, 2008

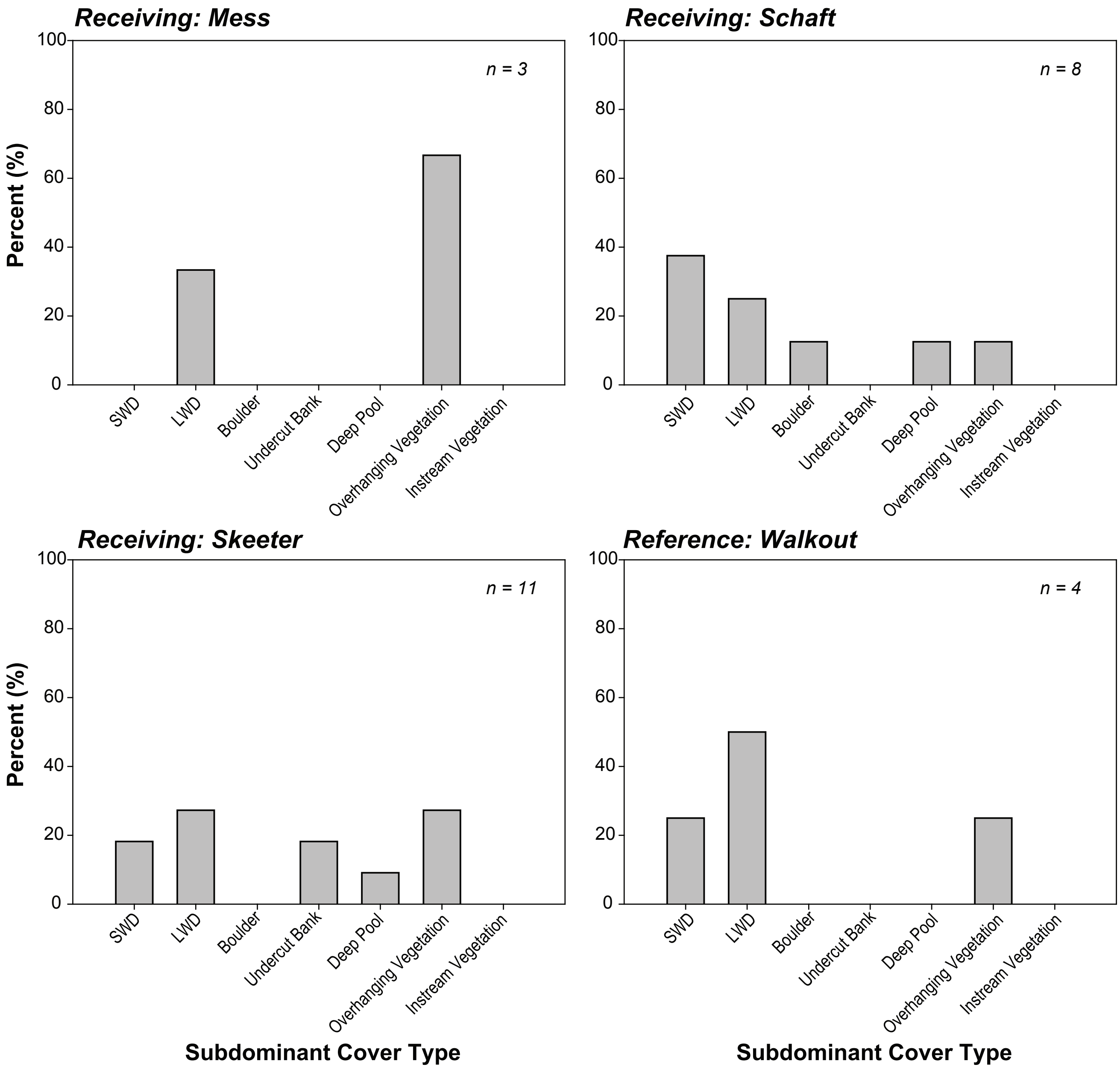

FIGURE 3.1-16

Summary of Subdominant Cover Type for all Streams in the Receiving and Reference Environment Streams, 2008

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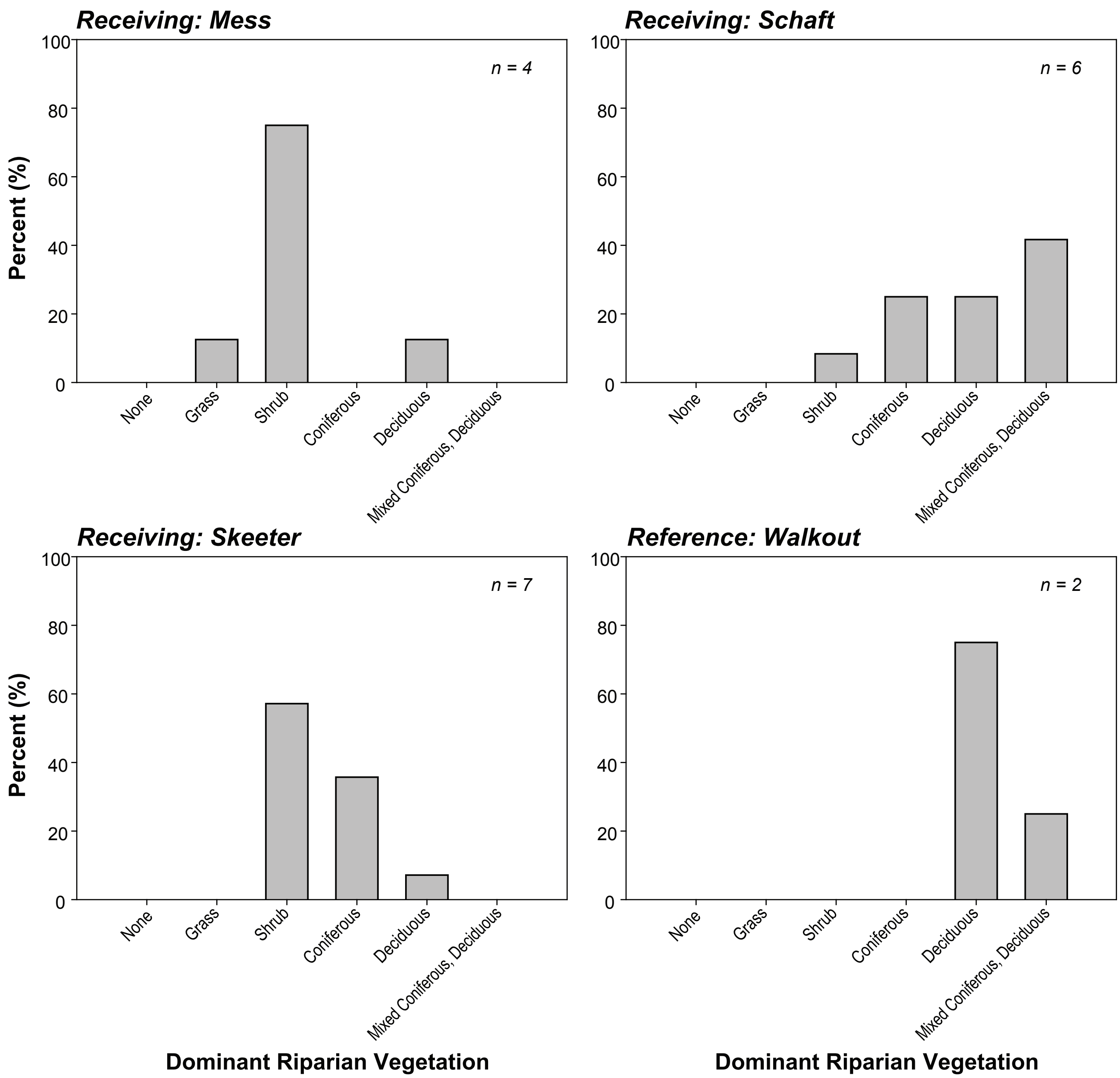

FIGURE 3.1-17

Summary of Dominant Riparian Vegetation for all Streams in the Receiving and Reference Environment Streams, 2008

and their importance to local user groups. Habitat suitability for spawning, rearing and overwintering habitat was determined using the following rankings:

- "None" means that no habitat is present for any life history stage;
- "Poor" means that the majority of the necessary physical/biophysical components of the life history stage are missing;
- "Fair" means that some of the necessary physical/biophysical components of the life history stage are present; and
- "Good" means that all of the necessary physical/biophysical components of the life history stage are present.

The suitability of spawning habitat of all streams within the receiving environment watersheds is summarized in Figure 3.1-18. The spawning habitat was most frequently ranked as poor within the receiving environment watersheds. The frequency of good habitat ranked was from 17 (Schaft) to 33% (Skeeter). The spawning suitability for the reference environment watershed was equally ranked as poor and fair. Figure 3.1-19 presents the suitability of rearing habitat within all watersheds. The rearing habitat of receiving environment watersheds was most commonly ranked as being fair, followed by poor and good. Walkout Creek showed the highest percentage of good habitat. Figure 3.1-20 summarizes the over-wintering habitat suitability for all watersheds. The suitability of over-wintering habitat within the receiving environment watersheds ranged from poor to good. Good over-wintering habitat was common in Mess Creek, while fair quality habitat was common in Schaft Creek and poor was most common in the Skeeter Creek Watershed. The over-wintering habitat of Walkout Creek was ranked as poor or fair.

3.1.1.2 Fish Habitat – Detailed

A total of 18 detailed fish habitat assessments were conducted during the months of June, July, and August. Streams in the Mess, Schaft, Skeeter and Walkout Creek watersheds were surveyed. These assessments were conducted in accordance with the Fish Habitat Assessment Procedures (Johnston and Slaney 1996). Stream habitat data are listed in Appendix 1-2.

<u>Stream Channel Measurements</u>

Table 3.1-2 presents comparisons of channel dimensions for all streams by watershed. The Schaft and Mess Creek watersheds were comparatively larger than the Skeeter and Walkout Creek watersheds (Plate 3.1-1). The mean wetted width in each watershed ranged from 4 m (Skeeter Creek) to 125 m (Schaft Creek), while the mean bankfull depth ranged from 0.82 m (Skeeter Creek) to 1.35 m (Mess Creek). Wetted and bankfull depth measurements were estimated for Schaft and Mess Creek watersheds, due to high water flow and unsafe wading conditions. Field crews were limited to visually estimating the wetted and bankfull depths. The average gradient was relatively similar between watersheds, ranging from 2% (Skeeter) to 4% (Mess). The high average gradient in Mess Creek is skewed by one site located near the headwaters, where the gradient was 9%.

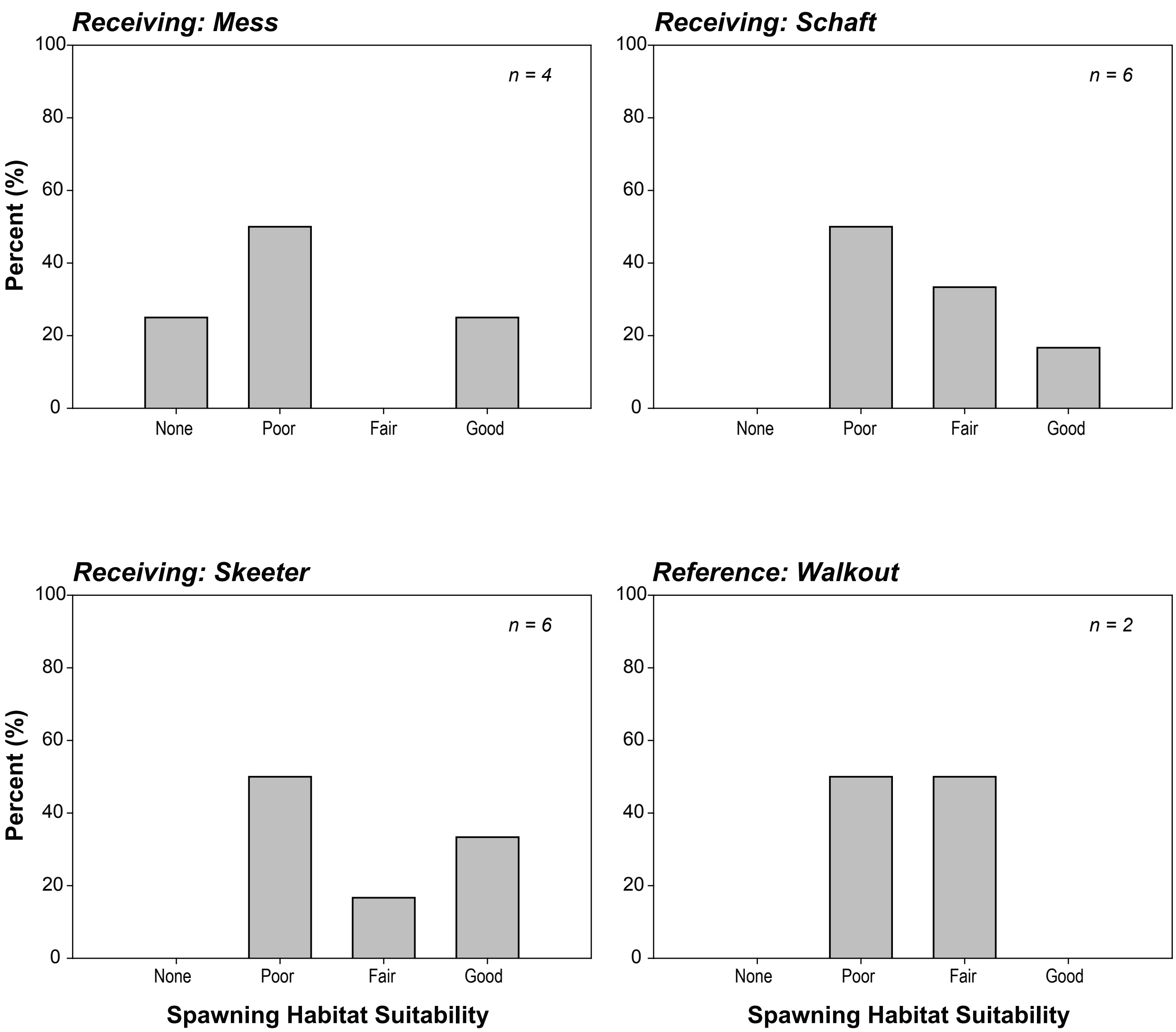

FIGURE 3.1-18

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Summary of Spawning Habitat Suitability for all Streams in the Receiving and Reference Environment Streams, 2008

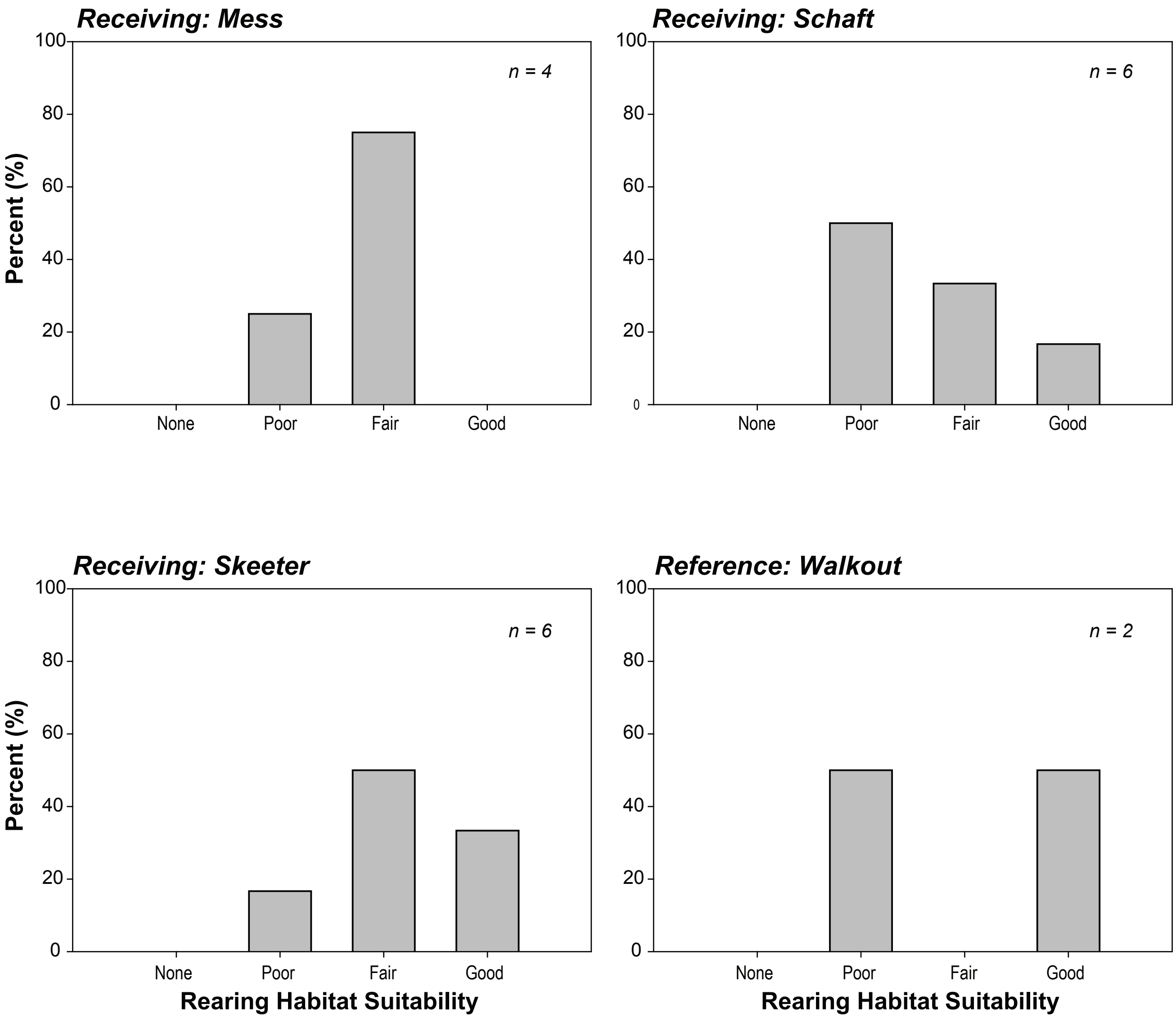

FIGURE 3.1-19

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Summary of Rearing Habitat Suitability for all Streams in the Receiving and Reference Environment Streams, 2008

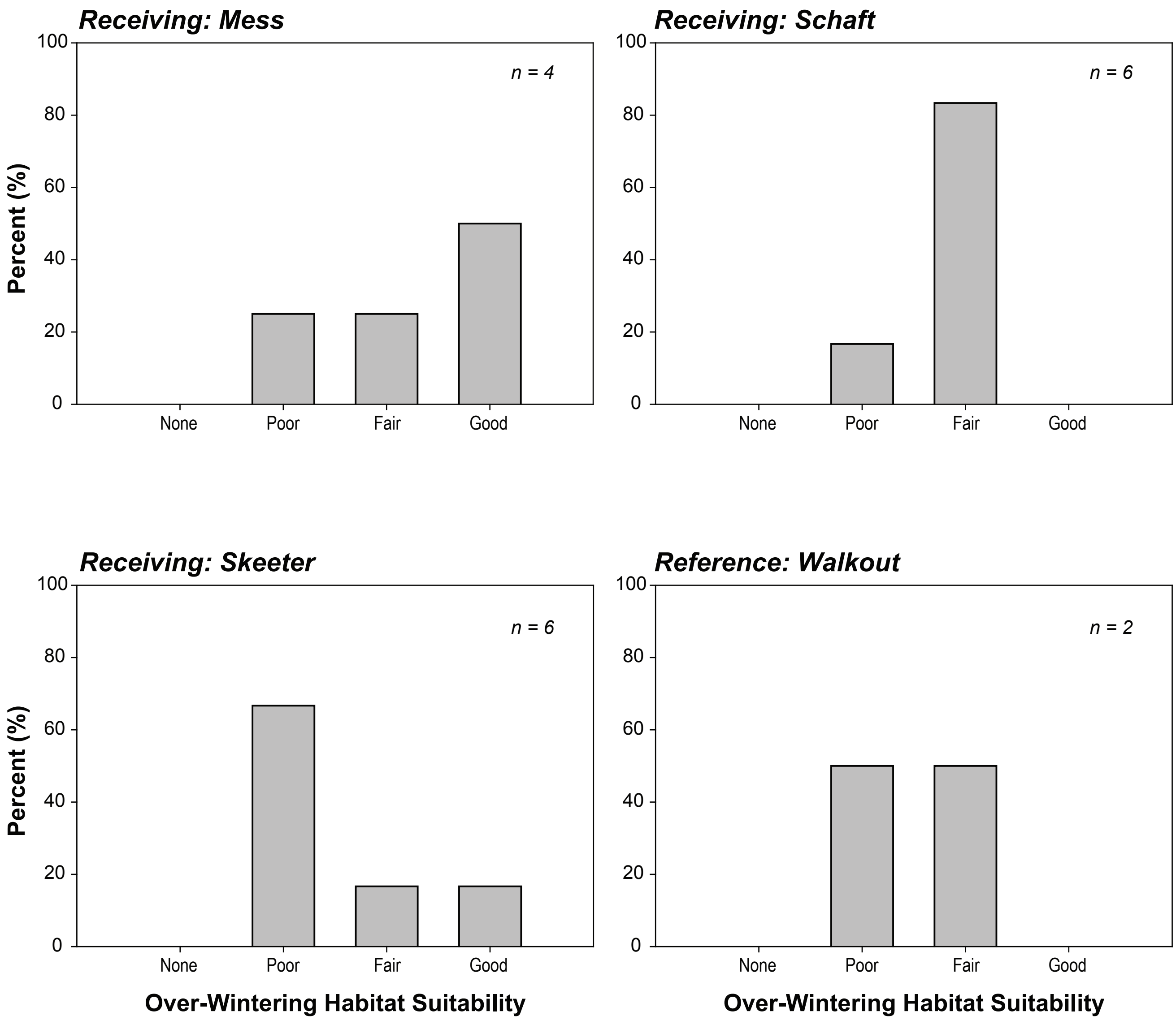

FIGURE 3.1-20

Summary of Over-Wintering Habitat Suitability for all Streams in the Receiving and Reference Environment Streams, 2008

(a) (b) (c) (d)

Plate 3.1-1. An aerial view of the Mess (a), and Schaft (b) creeks, and a downstream view of the Skeeter (c), and Walkout (d) creeks.

Table 3.1-2. Summary of Channel Characteristics for all Streams in the Receiving and Reference Environment Watersheds, 2008

	Receiving Environment			Reference Environment
	Mess Creek (n = 3)	Schaft Creek (n = 6)	Skeeter Creek (n = 7)	Walkout Creek (n = 2)
Characteristic				
Gradient (%)				
Min	1.0	0.5	0.0	2.0
Max	9.5	3.0	6.0	4.0
Mean	4.0	1.7	2.2	3.0
Wetted width (m)				
Min	6	2	0	17
Max	46	260	15	17
Mean	31	125	4	17

(continued)

Table 3.1-2. Summary of Channel Characteristics for all Streams in the Receiving and Reference Environment Watersheds, 2008 (completed)

	Receiving Environment			Reference Environment
	Mess Creek (n = 3)	Schaft Creek (n = 6)	Skeeter Creek (n = 7)	Walkout Creek (n = 2)
Bankfull Width (m)				
Min	24	2	1	16
Max	80	393	16	17
Mean	51	215	5	17
Wetted depth (m)				
Min	0.16	0.15	0.06	0.30
Max	70.00	0.64	1.20	0.80
Mean	0.38	0.27	0.55	0.55
Bankfull depth (m)				
Min	1.25	0.60	0.12	1.10
Max	1.50	1.50	1.50	1.30
Mean	1.35	1.05	0.82	1.20

Notes:
n = number of surveys completed.

Habitat and Cover

The habitat characteristics for all streams by watershed are summarized in Table 3.1-3.

Table 3.1-3. Summary of Habitat Characteristics for all Streams in the Receiving and Reference Environment Watersheds, 2008

	Receiving Environment			Reference Environment
	Mess Creek (n = 3)	Schaft Creek (n = 6)	Skeeter Creek (n = 7)	Walkout Creek (n = 2)
Characteristic				
Habitat Unit (%)				
Cascade	19	0	13	50
Glide	33	11	68	0
Pool	0	2	4	0
Riffle	48	87	15	50
Bed Material (%)				
Sand	18	22	42	5
Gravel	13	22	34	10
Cobble	50	50	20	40
Boulder	21	7	4	45
Bedrock	0	0	0	0
Instream cover (%)				
Pool	3	1	6	2
Boulder	6	5	1	8
Instream vegetation	0	0	0	0
Overhanging vegetation	3	2	7	5

(continued)

Table 3.1-3 Summary of Habitat Characteristics for all Streams in the Receiving and Reference Environment Watersheds, 2008 (completed)

	Receiving Environment			Reference Environment
	Mess Creek (n = 3)	**Schaft Creek (n = 6)**	**Skeeter Creek (n = 7)**	**Walkout Creek (n = 2)**
Instream cover (%) cont'd				
Undercut bank	0	0	8	2
Large-Woody Debris	1	7	4	4
Small-Woody Debris	3	5	3	6
Total	*17*	*19*	*30*	*27*
Bank Stability				
Left Bank	0.13	0.35	0.38	0.25
Right Bank	0.25	0.27	0.42	0.25
Riparian cover (%)				
Left Bank	0	21	9	60
Right Bank	0	20	14	70

Notes:
n = number of surveys completed.
Bank Stability: highly stable = 1.0, stable = 0.5, unstable = 0.0.

Mess Creek is characterized by cascade (19%), glide (33%), and riffle (48%) habitat units. No pools were identified. The predominant bed material present within the watershed was cobble (50%), which was then followed by boulder (21%), sand (18%), and gravel (13%). The most dominant form of instream cover present in Mess Creek was boulders (6%), while LWD (1%), SWD (3%), over-hanging vegetation (3%), and pools (3%) were present in trace amounts (Plate 3.1-2). The mean total amount of instream cover available for fish in the Mess Creek Watershed was the lowest (17%), in comparison to all other watersheds. No riparian cover was present within the Mess Creek sites. This is due to the presence of sedge wetlands along most of the banks of the river where sampling occurred.

The Schaft Creek Watershed was characterized by a high percentage of riffle habitat (87%) (Plate 3.1-3). Some glide (11%) and pool (2%) habitats were observed. No cascade habitat units were identified within the Schaft Creek sites. The major bed material present was cobble (50%), while gravel and sand were present in equal amounts (22%). Some large boulders were identified within the watershed. The mean total amount of instream cover present (19%) within the Schaft Creek Watershed was similar to the Mess Creek Watershed. The predominant instream cover types were boulders (5%), SWD (5%), and LWD (5%). Riparian cover on both banks was approximately 20%.

The majority of habitat types identified within the Skeeter Creek Watershed were glides (68%) (Plate 3.1-4). Pools (4%), cascades (13%), and riffles (15%) were less frequent within the watershed. The bed material was primarily composed of cobble (20%), gravel (34%), and sand (42%). The primary types of instream cover present were pools (6%), overhanging vegetation (7%), and undercut banks (8%). Streams within the Skeeter Creek Watershed had the highest amount of total instream cover (30%), in comparison to all other watersheds. A small amount of riparian was present on the left (3%) and right (4%) banks.

The Walkout Creek Watershed is characterized by cascade and riffle habitat (Plate 3.1-5). The bed material was primarily composed of cobble (40%), and boulder (45%), while sand (5%) and gravel (10%) were present in small amounts. Instream cover was present in the form of pools (2%), undercut banks (2%), LWD (4%), overhanging vegetation (5%), SWD (6%), and boulders (8%). The mean total amount of instream cover available for fish species within the Walkout Creek Watershed was 27%, which was the second highest relative to all other watersheds. No riparian cover was present within the Walkout Creek Watershed.

Plate 3.1-2. Excellent small woody debris cover located on Mess Creek.

Plate 3.1-3. A downstream view of riffle habitat present within the Schaft Creek Watershed.

Plate 3.1-4. A good example of a glide habitat unit located within the Skeeter Creek Watershed.

Plate 3.1-5. A downstream view of cascade habitat present within the Walkout Creek Watershed.

3.1.1.3 Fish Community

Species Composition and CPUE

A total of ten receiving environment sites were sampled two times each in July and August of 2008. Three of these sites were non-fish-bearing, based on previous years sampling; however, they were re-sampled to strengthen the evidence for this conclusion. Electrofishing was conducted at all sites, with the effort expended ranging from 166 s at MC-10 in August 2008 to 1,338 s at MC-10 in July 2008. In general, more effort was expended at sites thought to be non-fish-bearing in order to confirm that status. Rainbow trout was the only species captured among the receiving environment stream sites. Appendix 1-3 presents sampling effort and CPUE data, while Appendix 1-4 presents individual fish data for receiving environment sites.

CPUE was averaged among watersheds, and non-fish-bearing sites were separated out to remove bias from the dataset. Mean CPUE in fish-bearing watersheds ranged from 0.49 fish/100 s in the Mess Creek Watershed to 1.45 fish/100 s in the lower Skeeter Creek Watershed (SKC-4). There was no significant difference in CPUE among watersheds (ANOVA; $F_{4,6} = 0.53$, $P = 0.72$).

Length, Weight and Condition

A length-frequency distribution is presented with all of the fish captured throughout the mine receiving environment because of low sample size. The length-frequency distribution for receiving environment trout is tri-modal, with peaks at 60 to 80 mm, 160 to 180 mm and 220 to 240 mm (Figure 3.1-21). These results indicate potentially three age-classes among rainbow trout in the Project area. Fish from Mess Creek generally fell into the smaller age classes, while fish from Walkout Creek and Schaft Creek fell into the larger categories. Fish from Skeeter Creek and Start Creek were fairly evenly distributed among the size classes.

Mean fork length and weight were compared among receiving environment watersheds using an ANOVA. There were significant differences in fork length (ANOVA; $F_{4,49} = 3.45$, $P < 0.05$) and wet weight (ANOVA; $F_{4,45} = 3.19$, $P < 0.05$) among watersheds. Rainbow trout from the Mess Creek Watershed were significantly smaller in both length and weight than trout from Reference Creek and Schaft Creek, but did not differ significantly from other watersheds (Figure 3.1-22).

The weight-length regressions for rainbow trout were tested for each watershed (Figure 3.1-23). Despite a low sample number in the Mess Creek Watershed, all of the regressions were significant (REGRESS; $P < 0.05$). A general linear model was used to compare the slopes of the weight-length regressions for fish from all watersheds. There was no significant effect of the interaction between length and watershed on the weight of fish (GLM; $F_{4,40} = 1.80$, $P = 0.15$), indicating that the slopes of the weight-length regressions were equal and that weight-at-length could be compared among watersheds. Weight-at-length differed significantly among watersheds (ANCOVA; $F_{4,44} = 3.27$, $P < 0.05$). Rainbow trout captured in Mess Creek were significantly lighter across all given lengths than fish from Start Creek ($P < 0.05$). Fish from Mess Creek were also slightly smaller across all given lengths than fish from Walkout Creek and Schaft Creek ($P < 0.01$ for both comparisons).

A comparison of fish condition factor among watersheds gave conflicting results. The condition factor of rainbow trout did not differ significantly among watersheds (ANOVA; $F_{4,45} = 1.80$, P = 0.15). The lack of a significant effect of watershed on fish condition may stem from the comparison of fish of different sizes.

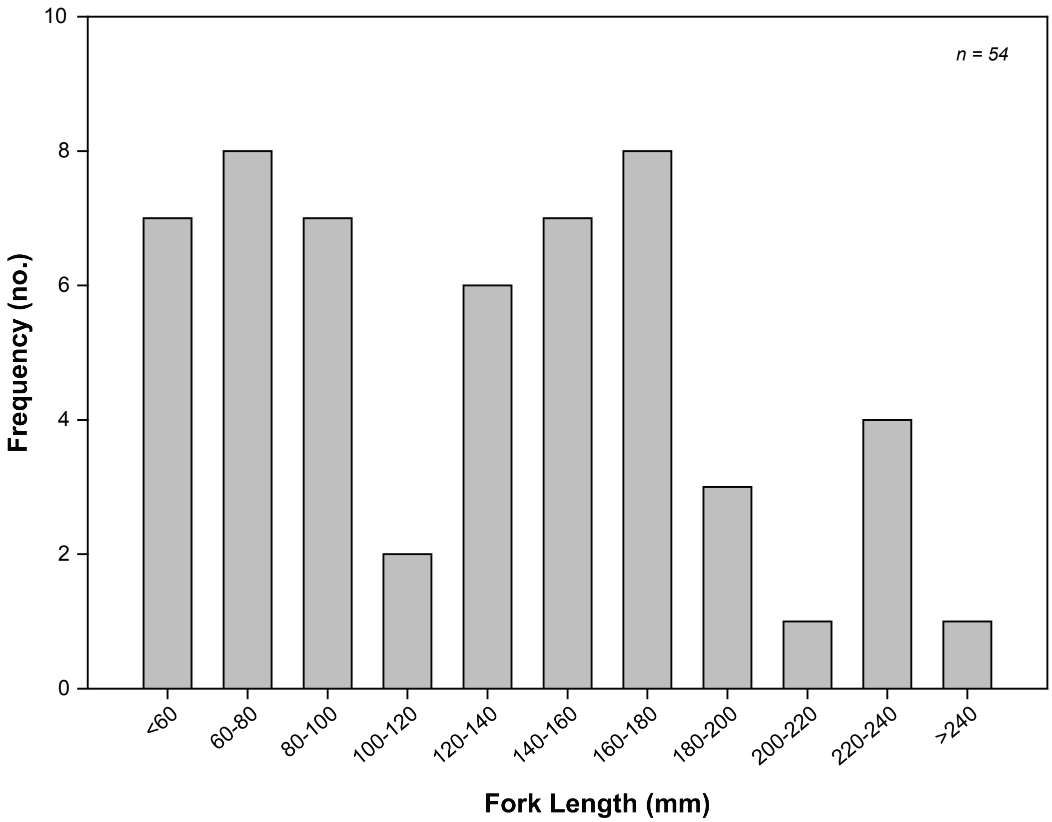

FIGURE 3.1-21

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Length-Frequency Distribution of Rainbow Trout from Receiving and Reference Environment Sites

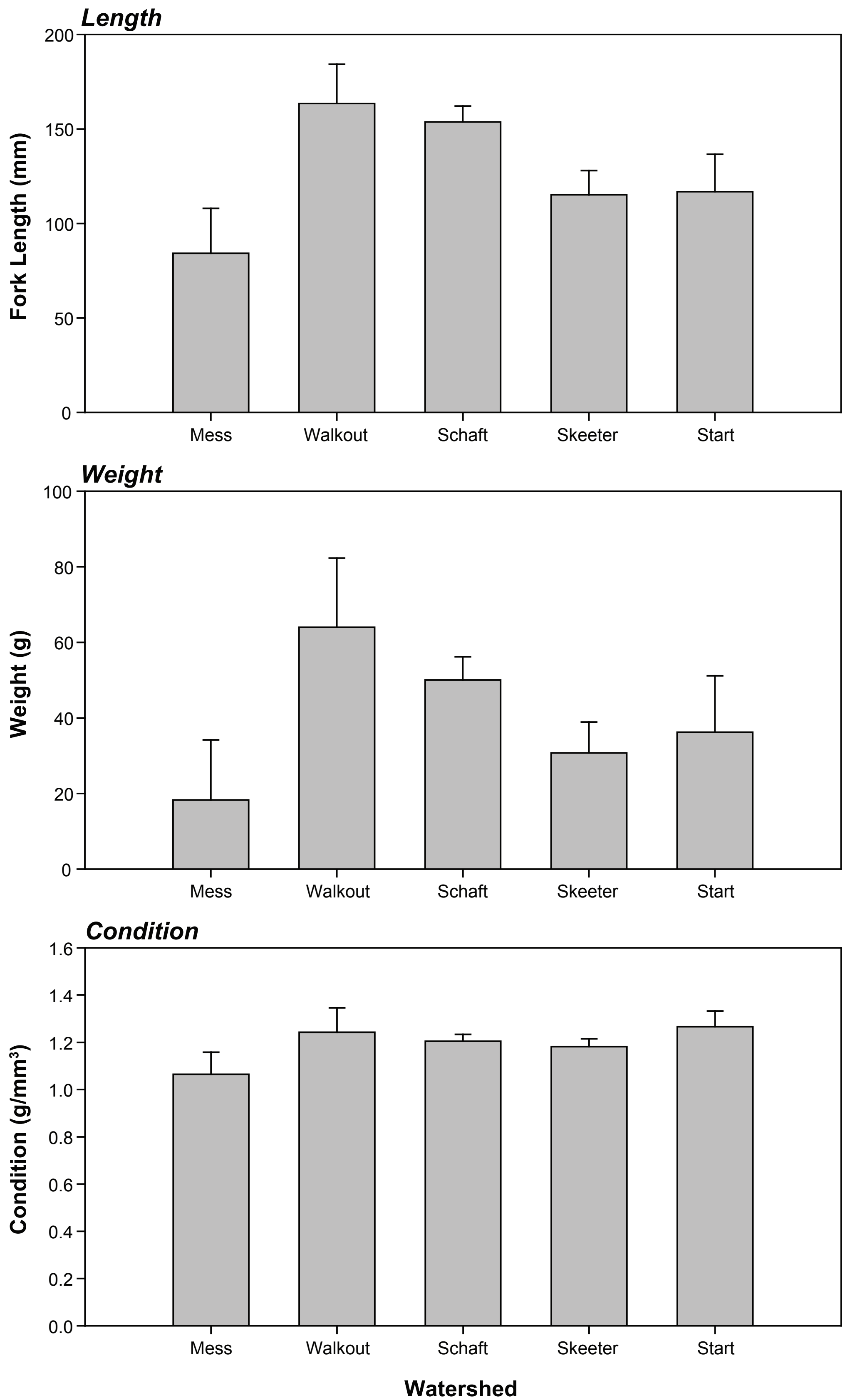

FIGURE 3.1-22

Length, Weight and Condition of Rainbow Trout Captured in Receiving and Reference Environment Watersheds

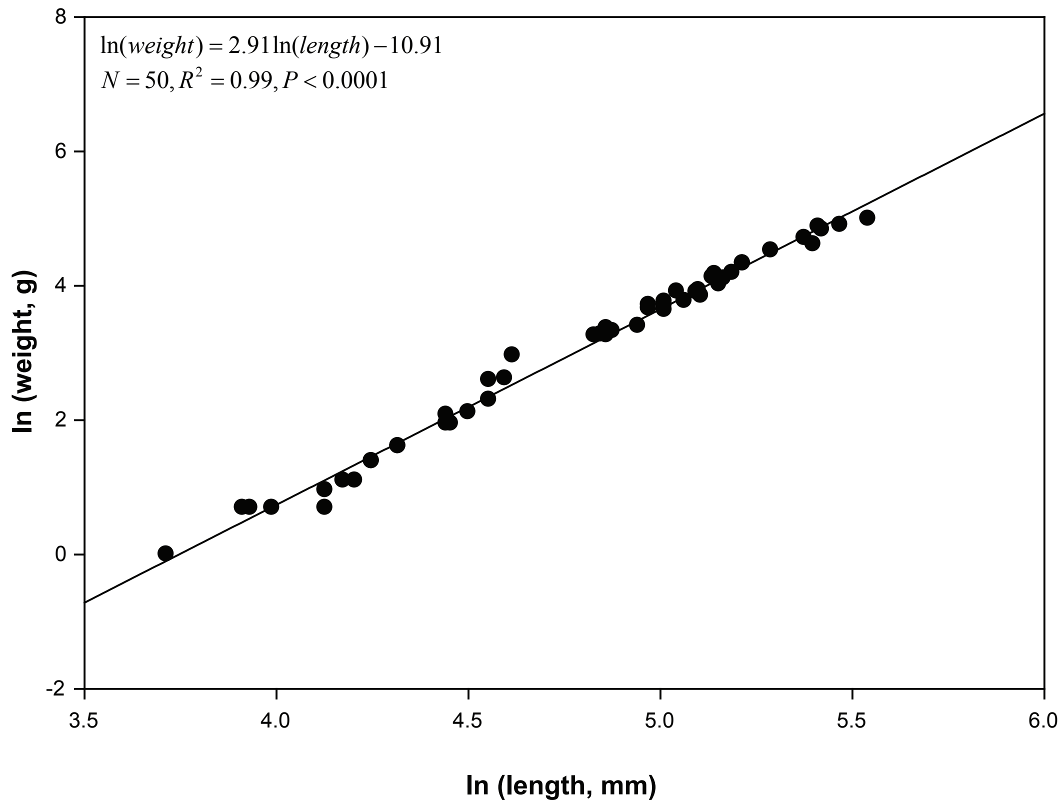

FIGURE 3.1-23

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Weight-Length Regression of Rainbow Trout Captured in Receiving and Reference Environment Watersheds

Condition factor increases with length in fish where the slope of the weight-length regression exceeds 3. (Anderson and Neumann 1996); therefore, condition should only be compared among fish of equal sizes. The slopes of the weight-length regressions for each watershed ranged from 2.62 to 3.07, and although they did not differ significantly, the slope of the Mess Creek regression was highest. Fish from Mess Creek also account for most of the differences in fish size and weight-at-length in comparisons among watersheds. Therefore, weight-at-length is likely a more valid comparison than condition factor in this case.

Age and Growth

Too few fish were captured from each of the receiving environment watersheds to construct meaningful age-frequency distributions for each watershed. Instead, data was compiled for all watersheds to construct a receiving environment age-frequency distribution (Figure 3.1-24). The most abundant age class captured in receiving environment streams was the age-2 class, followed by age-3 and age-4. Few age-1 and no age-0 fish were captured in receiving environment streams. These results indicate that the majority of fish in receiving environment streams are older juvenile or adult fish. Since the majority of sites are on larger streams and rivers, it is not surprising to see so many older fish, since young of the year and juvenile fish tend to inhabit smaller streams with abundant cover and shelter from the flow.

A von Bertalanffy growth model was fit to the age and length data of fish captured in the Schaft Creek receiving environment (Figure 3.1-25). The model was significant ($P < 0.01$) and age explained 58% of the variation in fish length. The maximum rainbow trout length predicted from the model was 272 mm, with a growth coefficient of 0.30 years^{-1}.

3.1.2 Lakes

3.1.2.1 Fish Habitat

Lake habitat was described in terms of substrate composition along the shoreline. Shoreline substrate composition is presented in Appendix 2-1.

Lake 1 (Mess Lake)

Mess Lake is located on the mainstem of Mess Creek, approximately 55 km south of the Stikine River (Plate 3.1-6). It is a large, turbid lake bordered by steep talus slopes to the west and sloping shorelines to the east. Mess Lake was previously sampled in 2007, at which time the maximum depth of the lake was measured at 15 m. In 2008, the surface temperature at the time of sampling ranged from 6.4°C to 11.5°C, depending on the proximity of the sampling site to the main inflow of the lake. In generally, sites closer to the inflow of Mess Creek were warmer than sites farther away from the inflow. The surface conductivity also varied among sites, measuring between 107 and 350 µS/cm. There was no discernable pattern to explain the variation in conductivity among sites. The pH of the surface water was slightly basic at all sites, ranging from 7.75 to 8.25.

The eastern shore of Mess Lake was dominated by bedrock and boulder substrate, while the west side of the lake was composed mainly of cobble and gravel (Figure 3.1-26). Gravels and fines were abundant at the lake inflow at the south end of the lake and fines were abundant near the outflow at the north end. Substrate composition differs slightly from the 2007 survey; however, this may be due to differences in the estimation techniques used by the surveyors. The 2007 survey was more detailed in its delineation of substrate zones, but the general pattern of substrate composition was similar to 2008.

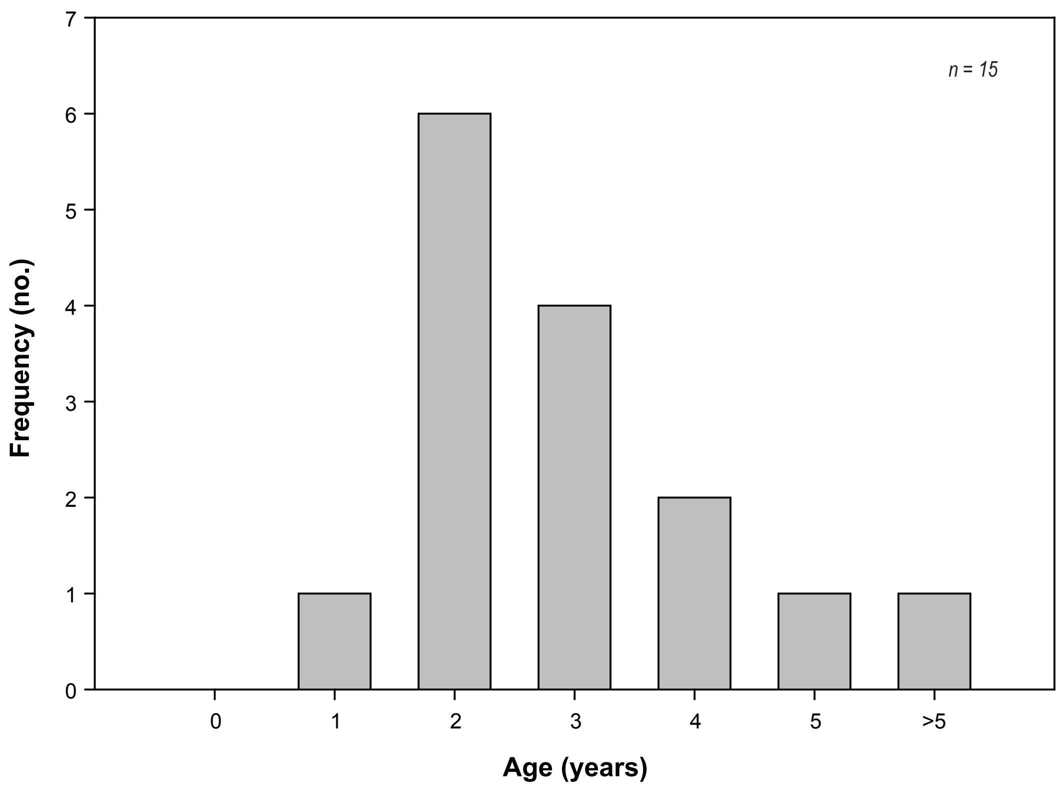

FIGURE 3.1-24

Age-Frequency Distribution for Rainbow Trout Captured in Receiving and Reference Environment Streams

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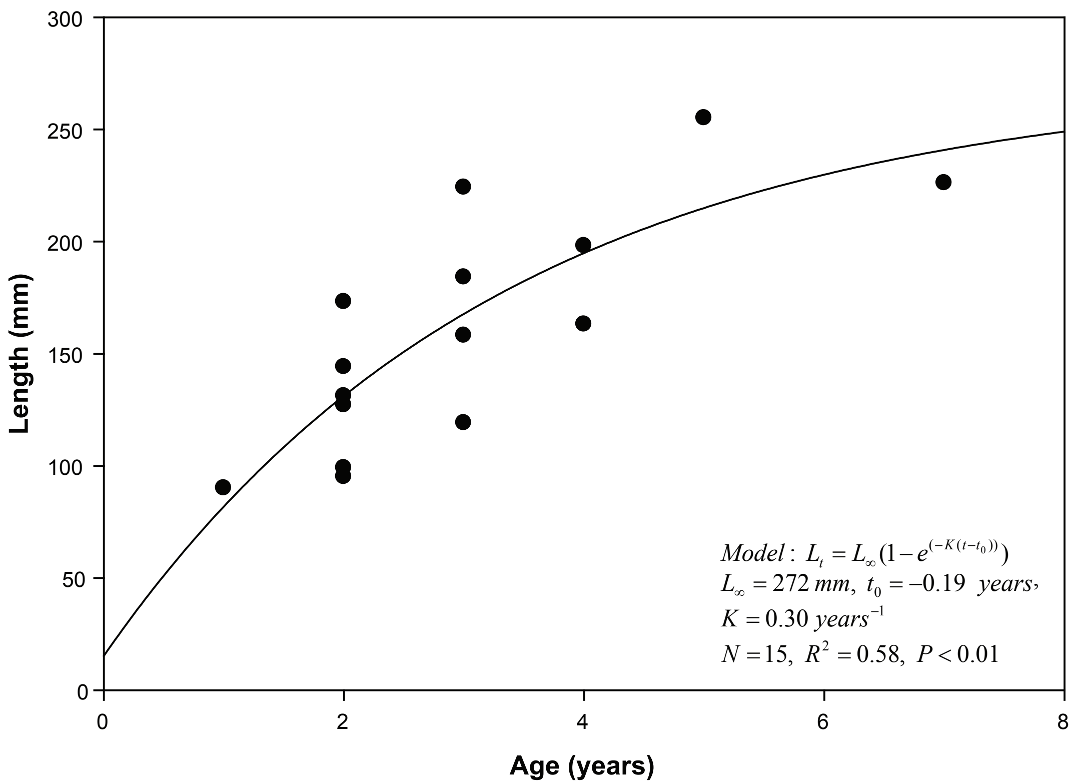

FIGURE 3.1-25

Von Bertalanffy Growth Model for Rainbow Trout Captured in Receiving Environment Watersheds

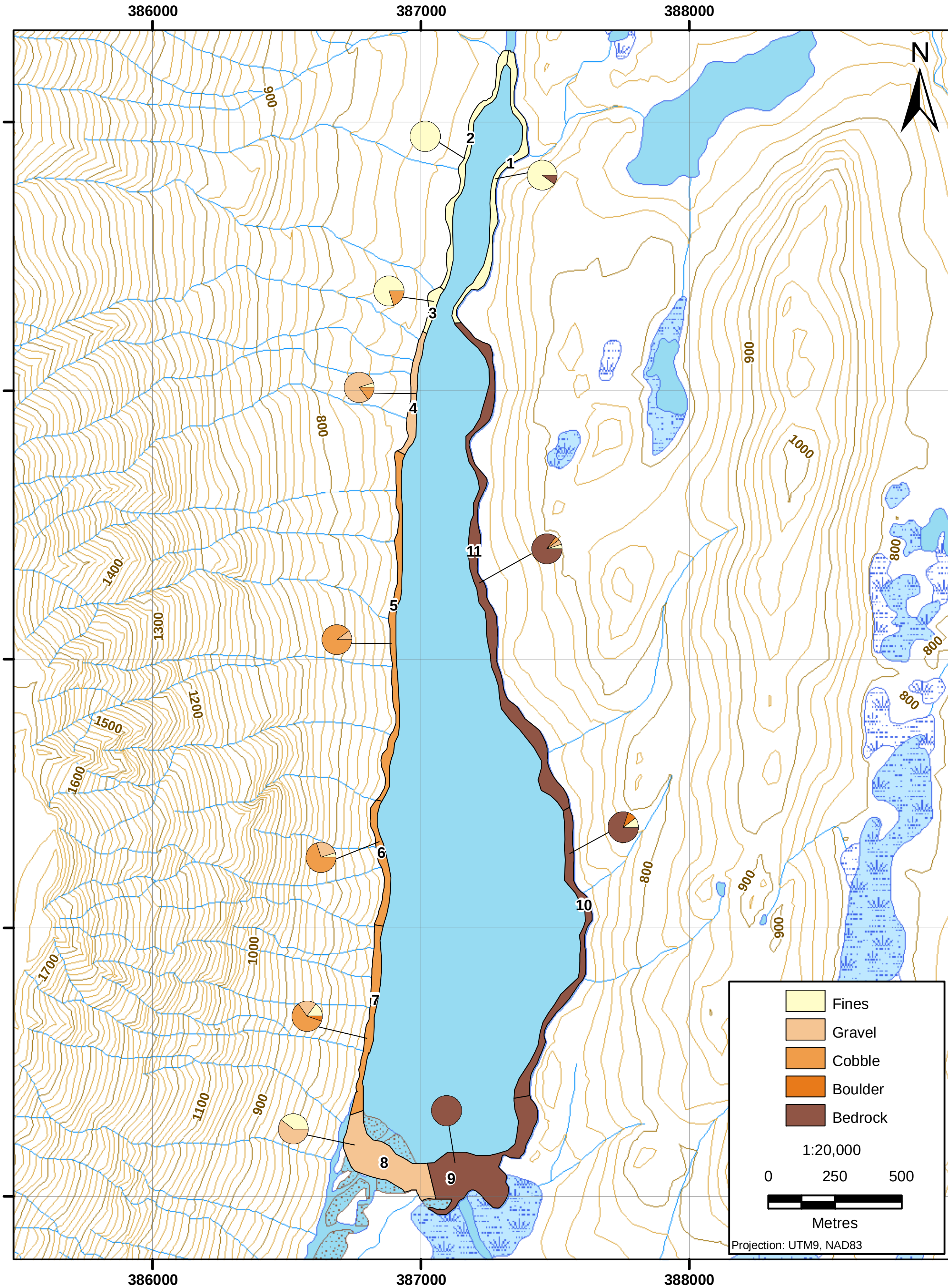

FIGURE 3.1-26

Lake Habitat Units and Substrate Types in Mess Lake (L1)

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Plate 3.1-6. South end of Mess Lake near the inflow of Mess Creek, July 2008.

As in 2007, high turbidity provided most of the cover to fish in the lake. Occasional logs and boulders provide additional cover along the shoreline. Because of the high turbidity and low cover, habitat quality in the lake is generally poor to fair; however, it may provide important overwintering habitat to fish living in adjacent streams. Some fair to good spawning habitat was identified in small tributary streams and groundwater upwellings in the southern end of the lake. Good quality rearing and overwintering habitat was also present near the Mess Creek inflow where sedges, aquatic vegetation and deep pools were abundant.

<u>Lake 2 – Skeeter Lake</u>

Skeeter Lake is a relatively deep, clear lake located on Skeeter Creek in a valley between Schaft Creek and Mess Creek (Plate 3.1-7). It falls within the footprint of one of the proposed tailings facility options. It is non-fish-bearing based on several years of sampling and a definitive fish barrier downstream on Skeeter Creek. In 2007, the maximum depth of the lake was estimated to be 40 m. On July 7, 2008, the surface temperature of the lake in the southeast arm was 11.9°C, the conductivity was 184 µS/cm, and the pH was 8.25. Fine substrates dominate the shoreline around most of the lake, with sporadic patches of gravel-dominated shoreline and bedrock (Figure 3.1-27). Several small inflow streams were identified around the perimeter of the lake in 2008. These streams have good quality spawning and rearing habitat that could support salmonids (if they were present). Cover in the lake consists of abundant LWD, especially at the outlet. This cover could provide high quality rearing and overwintering habitat.

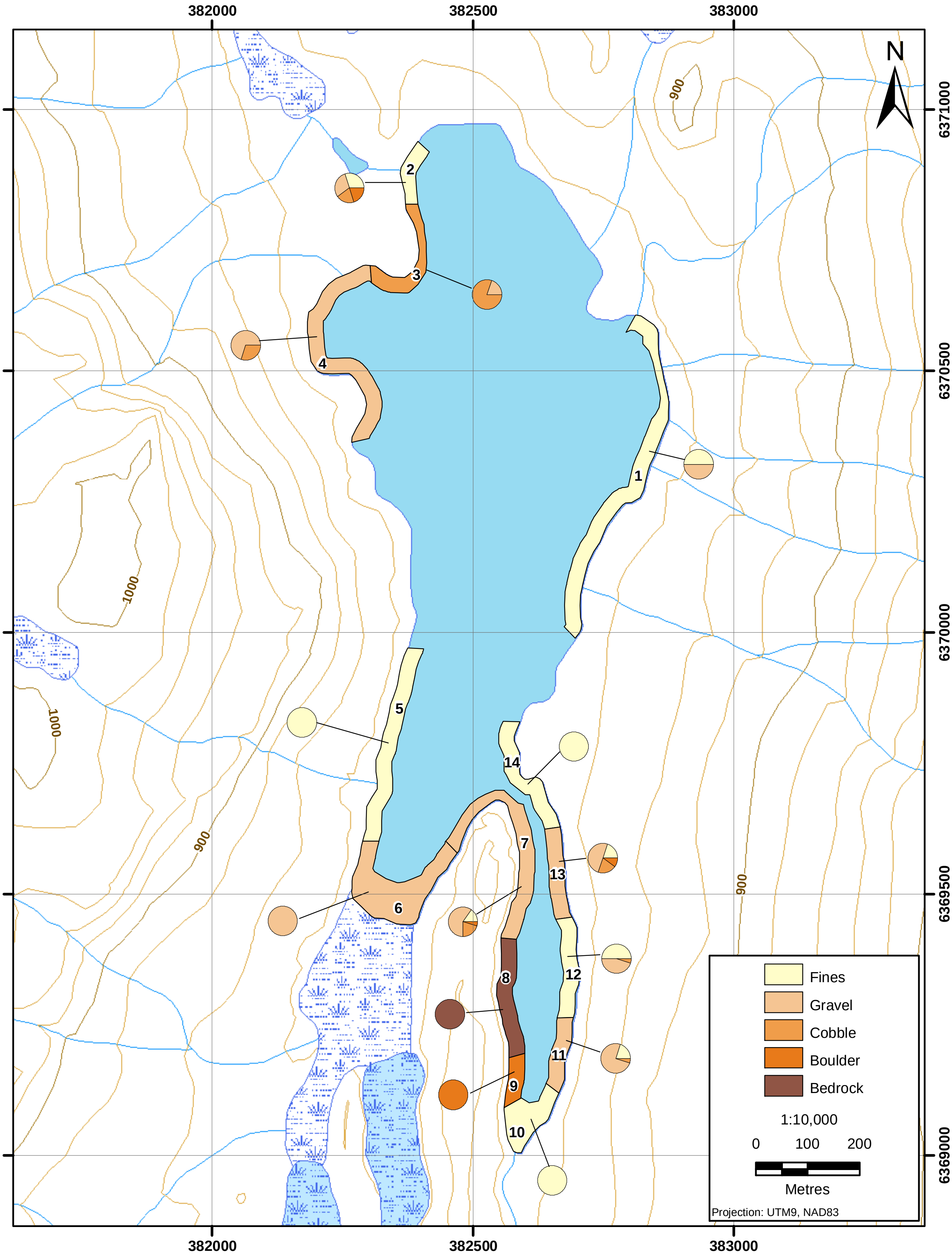

FIGURE 3.1-27

Lake Habitat Units and Substrate Types in Skeeter Lake (L2)

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Plate 3.1-7. Skeeter Lake looking north.

Lake 5 (Start Lake)

Start Lake is a moderately sized, deep (35 m), turbid lake located in the southern part of the valley that is located between Schaft Creek and Mess Creek (Plate 3.1-8). It empties to the south, eventually draining into Mess Creek, as is separated from Skeeter Lake by a height of land. The surface temperature of the lake in July 2008 was 10.0°C, the conductivity was 145 µS/cm, and the pH was 8.01. The shoreline substrate of the lakeshore is dominated by cobble in the north and east parts of the lake, and by fines in the south part of the lake. Some areas of boulder substrate were also recorded (Figure 3.1-28). Eight inlet streams were identified, three of which contain habitat suitable for salmonid spawning. Some of the other inlets also have fair to good rearing habitat. The main inlet to the stream at the north end is turbid during the spring and early summer, and likely supplies most of the glacial sediments that cloud the lake; however, most of the other tributaries are clear.

Cover is provided by the high turbidity and depth, as well as by large woody debris and boulders along the shoreline. Some aquatic vegetation is present near the inlet streams. Habitat quality in the lake is fair to good due to the depth, abundant cover and presence of suitable spawning habitat in the tributary streams.

Lake 6

Lake 6 is a small, shallow (1.7 m) lake located northeast of Start Lake (Plate 3.1-9). It drains south, and its water eventually flows into Mess Creek. It is non-fish-bearing based on several years of sampling, poor habitat quality and poor fish passability in the outlet stream. No water quality information was collected at this lake; however, in previous years, water quality was comparable to other lakes in the area. Most of the lakeshore and bottom are dominated by fine substrates, (Figure 3.1-29). Two small inflow streams, each with a channel width less than 0.5 m were identified. These streams do not provide any good quality spawning or rearing habitat due to shallow depth and low flow.

Plate 3.1-8. Start Lake looking north.

Plate 3.1-9. Lake 6 looking northwest.

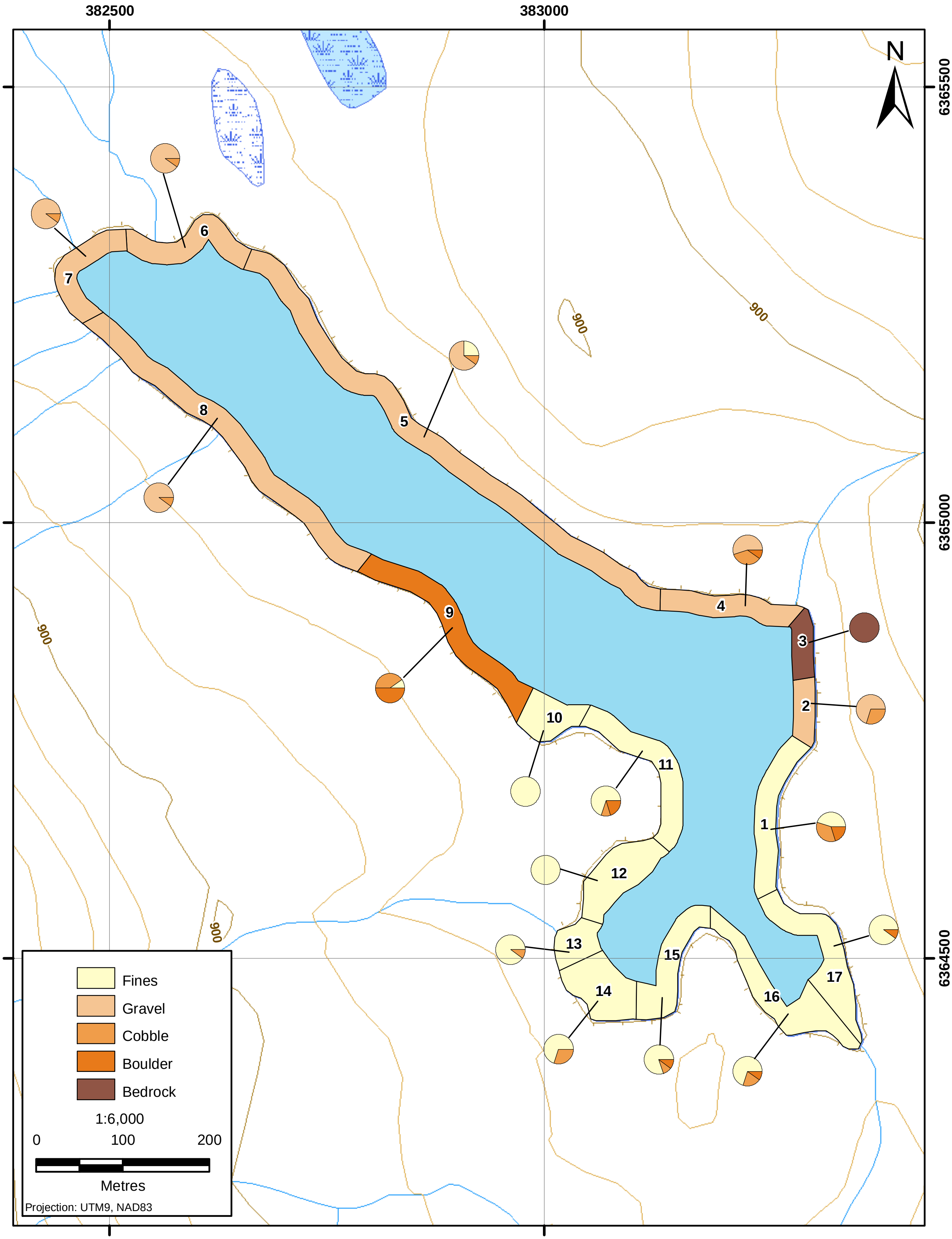

FIGURE 3.1-28

Lake Habitat Units and Substrate Types in Lake L5

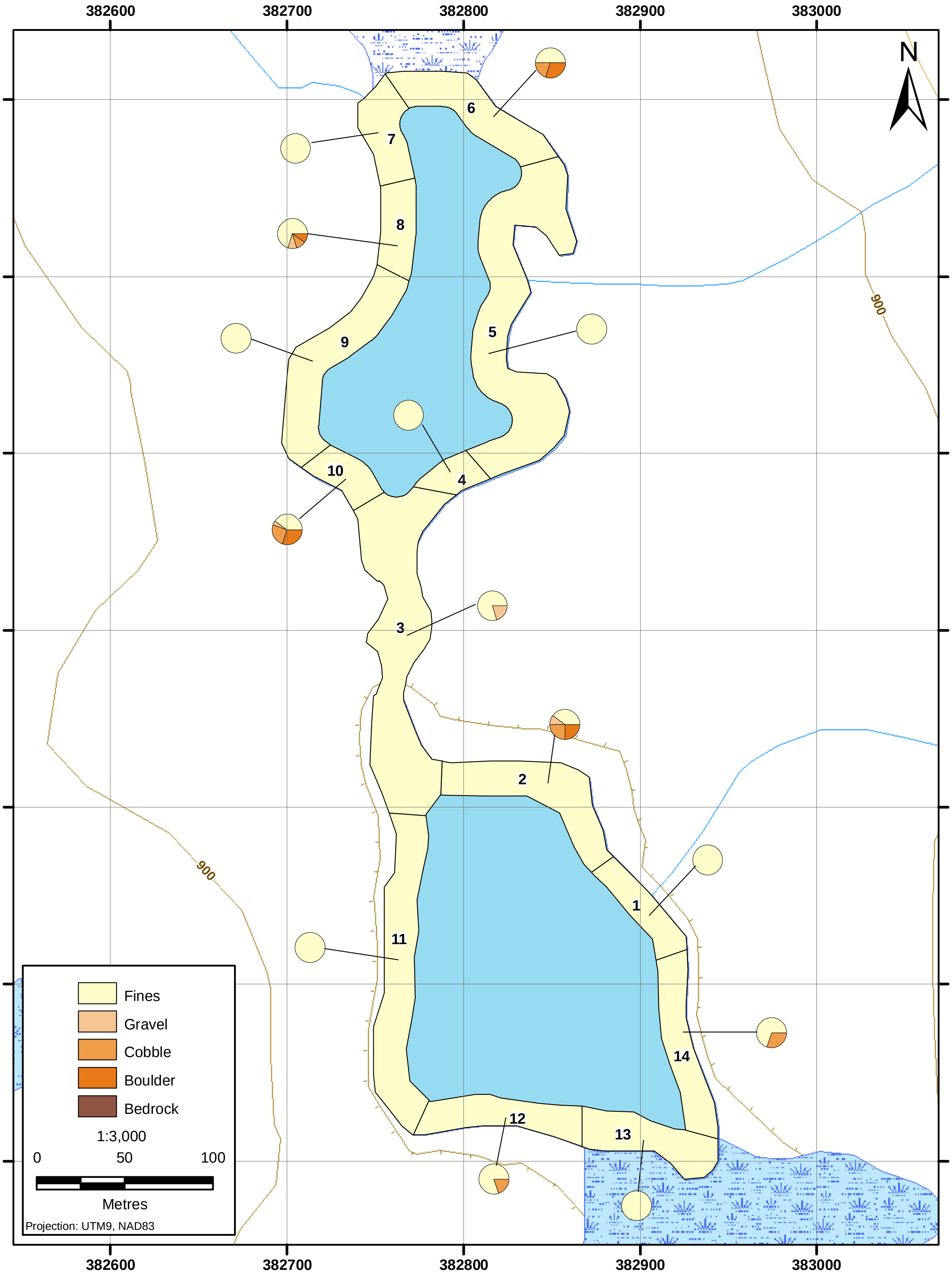

FIGURE 3.1-29

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Lake Habitat Units and Substrate Types in Lake L6

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The shallow depth and clarity of this lake do not provide much cover. Shelter is mainly provided by large woody debris along the shoreline. Habitat quality is generally poor due to the shallow depth, low cover and absence of spawning habitat.

Lake 7

Lake 7 is a small, shallow (1.3 m), unmapped lake located north of Start Lake (Plate 3.1-10). It drains south, flowing into Start Creek, which is the main tributary to Start Lake. The lake has a large shallow area that is connected to a deeper, smaller lagoon by a narrow passage. Water quality measurements were taken in both areas of the lake and differed significantly. In the large, shallow part of the pond, the temperature was 6.6°C, pH was 7.7 and conductivity was 137 µS/cm. In the deeper area, the surface temperature was 13.9°C, pH was 8.14, and the conductivity was 196 µS/cm. The difference in water quality may stem from the fact that the larger area of the pond collects water from several tributaries; whereas, the lagoon has no tributaries and is relatively isolated from the main body of water. Thus, the water in the lagoon likely has a longer residence time before it flushes out of the lake, and the narrow inlet prevents mixing with the main body of water.

Plate 3.1-10. Aerial view of Lake 7 showing the main body of the lake in the foreground and the deep lagoon in the background.

A substrate figure was not produced for Lake 7 because it does not show up on any maps; however, the substrate composition was described. Most of the lakeshore and bottom are dominated by fine substrates, with exceptions near the small lagoon at the east side of the lake, where cobble substrate was common. A sedge wetland occupies the north shore of the lake. Four tributaries were identified around the small lake, including one that contained suitable habitat for spawning.

The shallow depth and clarity in the main body of this lake do not provide much cover. Shelter is mainly provided by large woody debris along the shoreline. In the lagoon, there is abundant cover from LWD and floating algal mats (Plate 3.1-11).

Habitat quality in the main body of the lake is fair to good along the margins where cover is abundant, but poor in the middle due to the shallow depth and lack of shelter. Habitat quality in the lagoon is good for rearing and overwintering due to the abundant cover and depth.

3.1.2.2 Fish Community

Species Composition and CPUE

Of the five lakes sampled in 2008, three are known to contain fish (Mess Lake and Start Lake and Lake 7), and the other two (Skeeter Lake and Lake 6) are presumed to be non-fish-bearing based on the presence of barriers, poor habitat quality, and the results of three years of sampling (2006 through 2008). Fish sampling data for lakes is presented in Appendix 2-2 and individual fish data is presented in Appendix 2-3.

Most of the lakes in the Schaft Creek Project area contain only rainbow trout; however, in 2007 an unidentified salmonid was captured in Mess Lake. Targeted sampling in 2008 resulted in the capture of 38 of these unidentified salmonids (Plate 3.1-12). Adipose fins were collected from 24 of these fish, and a total of 21 samples were assayed to genetically identify them to species. All 21 samples were identified as *Oncorhynchus nerka*. Given the size of the fish collected (all less than 20 cm), and the presence of a large waterfall barrier downstream on Mess Creek, it is assumed that these fish are Kokanee salmon, the land-locked life form of sockeye salmon. Kokanee were only captured in Mess Lake and are presumed to spawn in small tributaries of the lake and possibly on gravel shoals and groundwater upwellings along the lake shore.

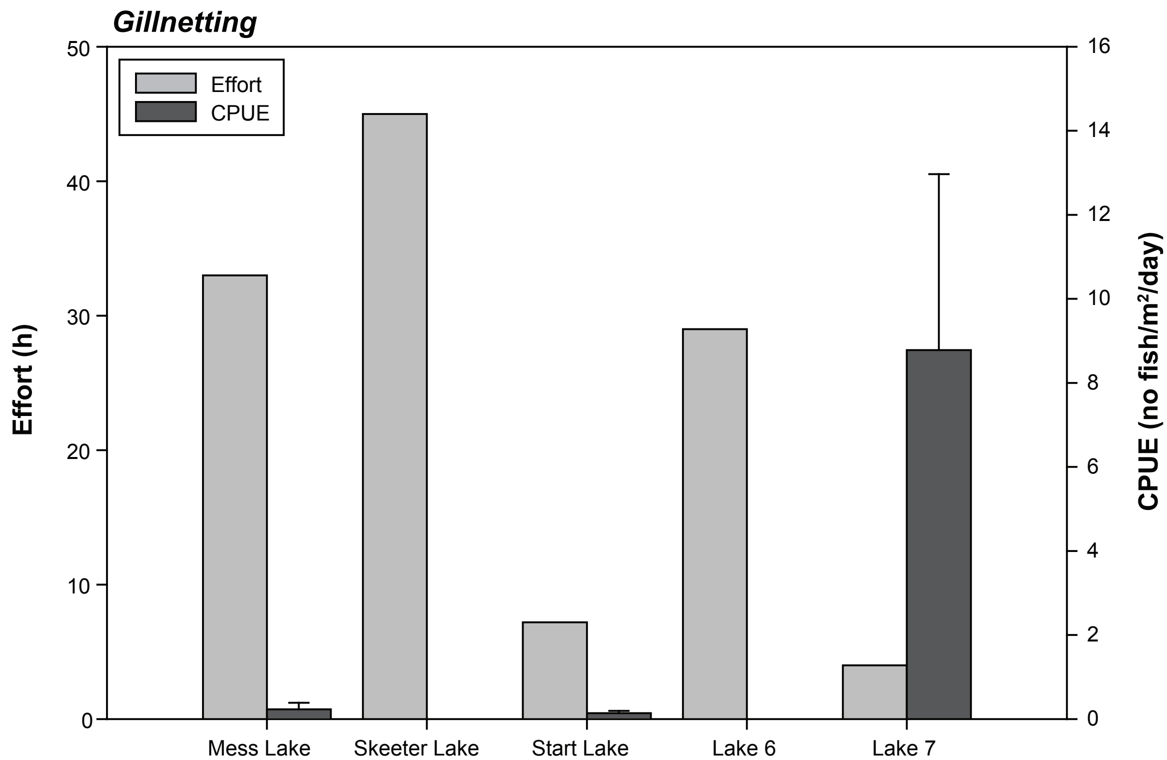
Lakes were sampled with gillnets and minnow traps in July 2008. Total gillnet effort in each lake ranged from 4 hours in Lake 7 to 45 hours in Skeeter Lake (Figure 3.1-30). The number of hours sampled by gillnet was dependent on the number of fish being caught, with short sets being conducted in lakes where the number of fish being caught was so large that mortality was a concern. Minnow traps were set along the shorelines of the lakes to collect smaller or juvenile fish. Total minnow trap effort ranged from 282 hours in Lake 6 to 1,156 hours in Mess Lake. For gillnet sampling, CPUE was highest in Start Lake (29 fish/m^2/24 h). For minnow trap sampling, the highest CPUE occurred in Lake 7 (3.8 fish/trap/24 h). The discrepancy in this pattern is likely due to the size of fish targeting by each sampling method. Fish captured in the gillnet in Start Lake were generally large adults, while fish captured in other lakes were smaller. Also, minnow trapping targets smaller fish, which are more abundant in Lake 7. No fish were captured in Skeeter Lake or Lake 6.

Length, Weight and Condition

A length-frequency distribution was produced for fish in each of the fish-bearing lakes in the Project area (Figure 3.1-31). In Mess Lake, rainbow trout lengths formed a bimodal distribution, with modes at less that 40 mm, and 140 to 160 mm. There were also weak modes at 100 to 120 mm, and 180 to 200 mm that may represent additional age classes. Kokanee salmon in Mess Lake showed a strong unimodal distribution, with a single large mode between 140 and 160 mm. Few Kokanee under 120 mm were captured. Too few fish were captured in Start Lake to construct a meaningful length-frequency distribution; however, the size range of fish captured in that lake indicates that larger fish (i.e., greater than 300 mm) are more prevalent in this lake than elsewhere (Plate 3.1-13).

Plate 3.1-11. Minnow trap set in the lagoon section of the lake. Note the large woody debris and algae providing cover for fish.

Plate 3.1-12. Kokanee salmon captured in Mess Lake in 2008.



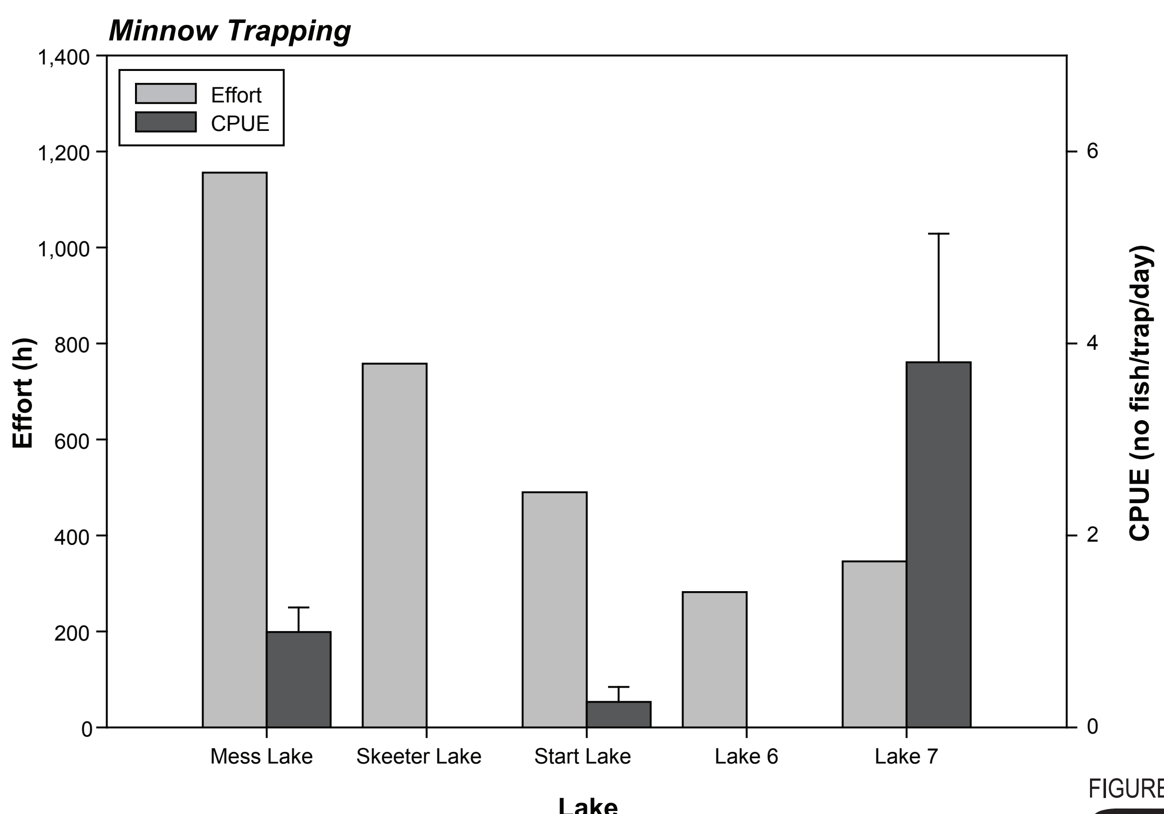


FIGURE 3.1-30

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Gillnet and Minnow Trap Effort and CPUE in Project Area Lakes, 2008

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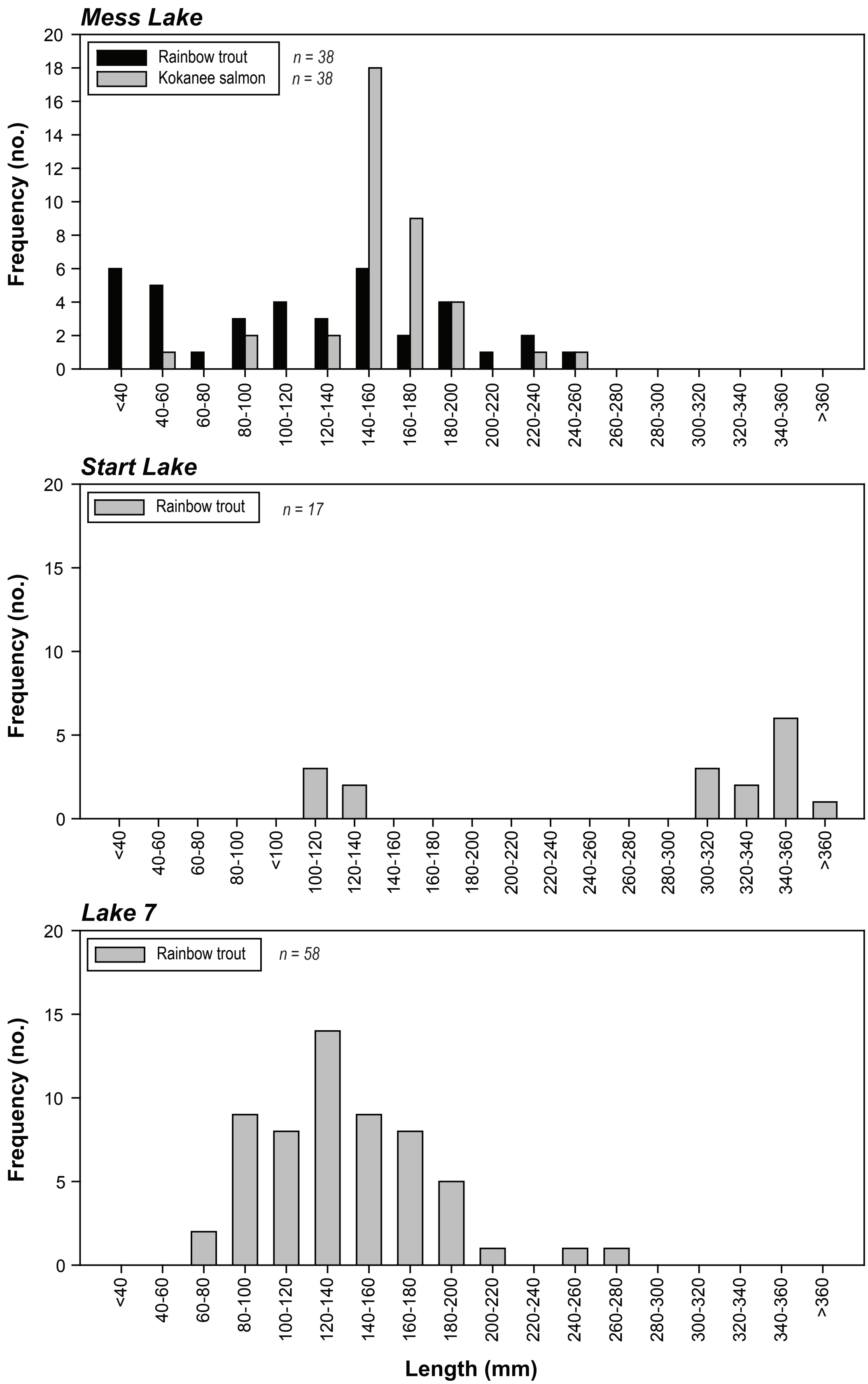

FIGURE 3.1-31

Length-Frequency Distribution for Fish Captured in Project Area Lakes, 2008

Plate 3.1-13. Large adult rainbow trout captured in Start Lake in 2008.

The length-frequency distribution for Lake 7 shows a single large mode between 120 and 140 mm, with a weaker mode between 80 and 100 mm. In general, the length-frequency distributions for each lake show that the majority of fish in each lake fall into the 120 to 160 mm size range; however, fish captured in Start Lake appear to be much larger than fish captured in other lakes. Mess Lake was the only lake in which fish smaller than 80 mm were captured.

Figure 3.1-32 shows the mean length, weight and condition of fish captured in each of the Project area lakes in 2008. Rainbow trout length differed significantly among all of lakes, with fish from Start Lake being largest, and fish from Mess Lake being smallest, on average (ANOVA: length, $F_{2,106} = 40.71$, $P < 0.01$). Results for rainbow trout weight are skewed because the large fish captured at Start Lake were too heavy for the scale available, so only smaller fish were weighed.

A general linear model was used to test for differences in the slope of the weight-length regressions among lakes. This analysis revealed that the slopes of the regressions were not significantly different (GLM; $F_{2,89} = 0.16$, $P = 0.85$); therefore, weight-at-length could be compared. Rainbow trout from Mess Lake were significantly heavier across all given lengths than fish from Lake 7 (ANCOVA; $F_{2,89} = 8.13$, $P < 0.01$; Figure 3.1-33); however, fish from Start Lake were not significantly different from fish from either Lake 7 or Mess Lake.

Age and Growth

An age-frequency distribution was created to show the population structure of the fish populations in the Schaft Creek Project area lakes (Figure 3.1-34). For Kokanee salmon in Mess Lake, the age-frequency distribution revealed that most of the fish captured fell into the age-2 class, with smaller numbers of age-1 and age-3 fish. No young-of-the-year Kokanee salmon were captured in Mess Lake.

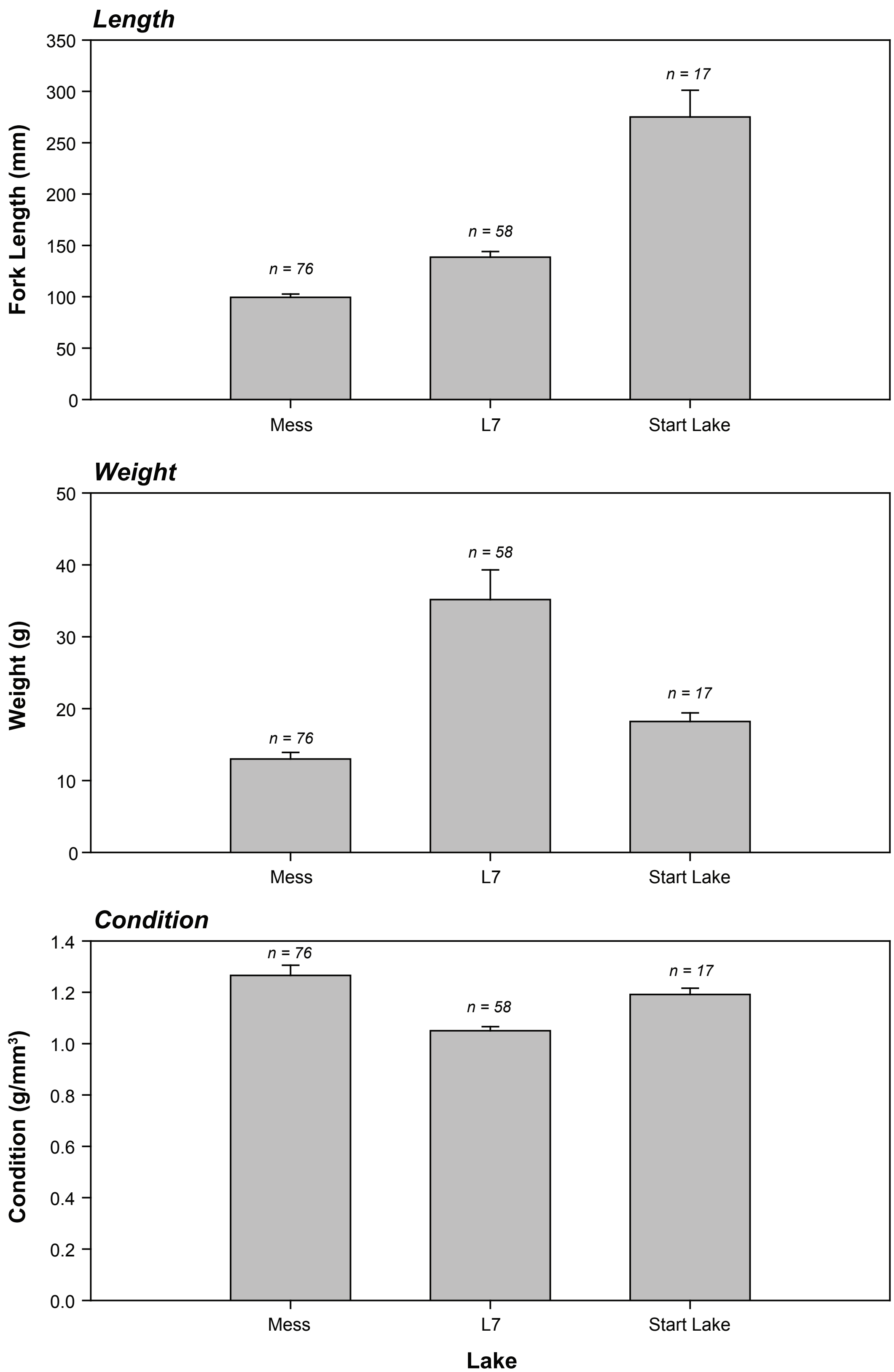

FIGURE 3.1-32

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Mean (+/- 1 SE) Length, Weight and Condition of Rainbow Trout in Project Area Lakes, 2008

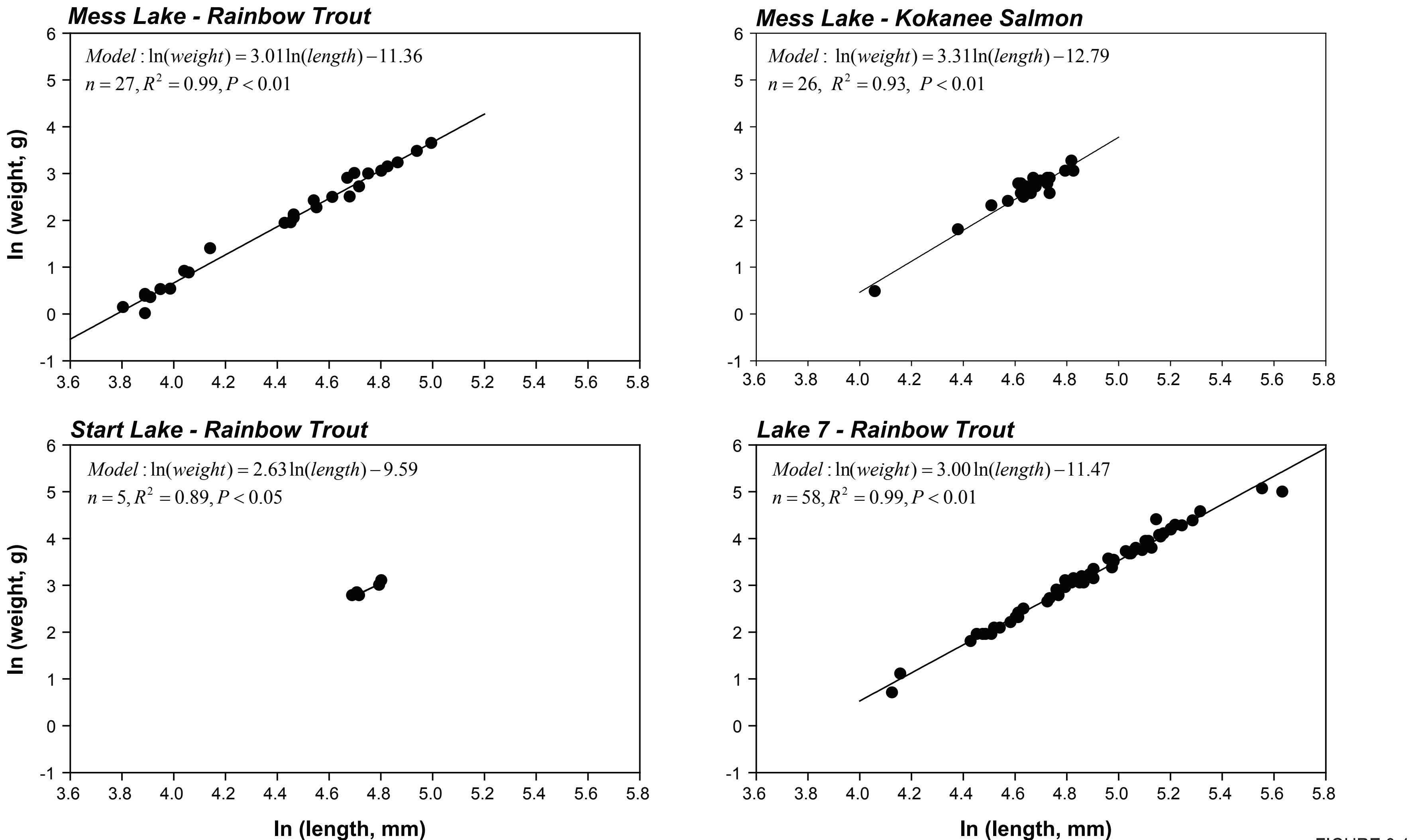

FIGURE 3.1-33

Weight-Length Regressions for Fish Captured in Project Area Lakes, 2008

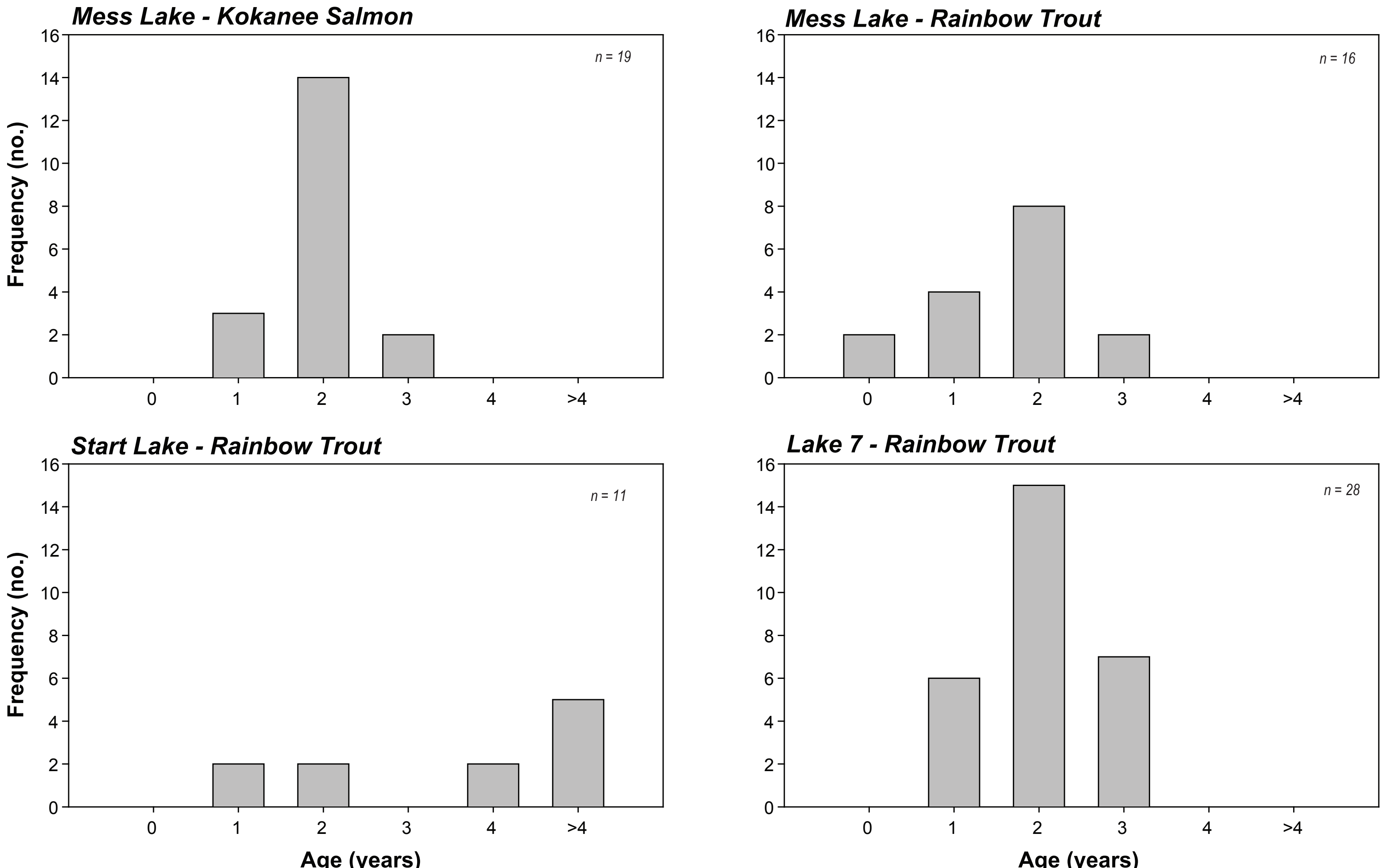

FIGURE 3.1-34

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Age-Frequency Distributions for Fish Captured in Project Area Lakes, 2008

It is likely, based on the small sizes of Kokanee captured, that the fish in this lake have a 3 year life-cycle and spawn at small sizes.

Rainbow trout in Mess Lake had a similar age-frequency distribution to Kokanee salmon, with the majority of fish falling into the 2-year age class. Small numbers of young-of-the-year were captured, as well as age-1 and age-3 fish. The presence of age-0 fish in Mess Lake may be due to the sampling, which focused on near-shore areas in the south end of the lake where there was abundant cover. In most lakes, small fry are not present because they rear in tributary streams where there is more cover. In Lake 7, there was also a large number of age-2 rainbow trout, followed by age-1 and age-3 fish. No young-of-the-year were captured in that lake. In Start Lake, the age-frequency distribution did not follow a similar pattern to the other fish-bearing lakes. Most of the fish captured fell into the age-4 and older category, with some fish being aged at 5 or 6 years. This may indicate that Start Lake provides abundant resources for older fish that allows them to mature longer than fish in other Project area lakes. The relative paucity of younger fish may indicate that fish are rearing longer in the tributary streams before migrating into the lake to mature.

Attempts to fit age to length data for rainbow trout in Project area lakes with a von Bertalanffy growth curve were not successful. Results were either not significant or predicted unrealistic asymptotic lengths for fish. One reason for this could be errors in the analysis of ageing structures. In analyses of cutthroat trout scales in Alaska, up to 40% of the samples were found to be missing first year annuli (Ericksen 1999). In many of these cases, a larger number of circuli appear before the second year annulus, resulting in an underestimation of the true age of the fish. The two fish that were assessed as being young-of-the-year in Schaft lakes both measured over 80 mm in length, which would be abnormally large for a fry. Thus, it is possible that some underestimates of age resulted in a skewing of the age-length data such that an accurate growth curve could not be fit.

3.1.3 Wetlands

3.1.3.1 Fish Habitat

Fish habitat was assessed in three wetlands of the Schaft Creek receiving environment. The wetlands are: WL4 (Plate 3.1-14), WL6 (Plate 3.1-15) and WL9 (Plate 3.1-16). These wetlands were previously assessed in 2007 (Rescan 2008); however the 2008 assessment focused on shallow open-water habitats. The amount of open water habitat ranged from 25,674 m^2 in WL4 to 33,805 m^2 in WL6 (Table 3.1-4). Most wetlands within the Schaft Creek Project area were large; therefore, the area surveyed is not representative of the size of the wetlands or the amount of wetland habitat available to fish. Rather, it is meant to be a representative sample of shallow open-water wetland habitat in the area that can be used to estimate the relative abundance of good quality fish habitat in wetlands. Wetland fish habitat measurements are presented in Appendix 3-1.

Habitat for salmonid rearing, overwintering, spawning and migration was rated as poor to good for each wetland transect. Good quality rearing habitat is that which has abundant cover, depth and flow to provide shelter from predators and to prevent stagnant conditions from forming. Overwintering requirements for most fish include deep water that will not freeze to the bottom, and abundant cover that will protect fish from predators. Spawning habitat for salmonids is usually scarce in wetlands as they require good flow and gravel substrates. Exceptions occur at wetland outlets or where streams flow through wetlands from other sources. Finally, migration habitat is classified as good if depth and flow are sufficient to pass fish, and if there are no barriers to migration such as seepages, jams or falls.

Plate 3.1-14. Aerial view of WL4.

Plate 3.1-15. Aerial view of WL6.

Plate 3.1-16. Aerial view of WL9.

Good quality rearing habitat was abundant in wetlands 4 and 9, while wetland 6 had fair quality rearing habitat. Poor quality overwintering and migration habitat was present in all wetlands. The wetlands were either stagnant, shallow or choked with vegetation; which provided poor migration habitat. Spawning habitat was poor in wetlands 6 ad 9, while wetland 4 had fair quality spawning habitat in adjacent tributary streams.

The dominant and subdominant substrate type in most wetlands was fine sediment/organics, which is expected due to the low gradients and slow flow generally found in most wetlands. A small amount of gravel occasionally dominated wetland transects in wetland 4, usually in small riffle zone of streams running through wetlands.

The dominant cover type for each open-water wetland was assessed. Small woody debris and LWD where the dominant and sub-dominate cover type for wetland 4, respectively. Instream vegetation and deep pools where the dominant and sub-dominate cover type for wetland 6, respectively. Small woody debris and LWD where the dominant and sub-dominate cover type for wetland 9, respectively.

Table 3.1-4. Open-Water Pond Wetland Areas, 2008

Wetland	UTM	Area (m²)
WL4	9V 382321 6366244	25,674
WL6	9V 384263 6361221	33,805
WL9	9V 384000 6341464	25,908

3.1.3.2 Fish Community

Rainbow trout were the only species captured in wetlands in 2008. Rainbow trout were captured in wetlands 4 and 9; however no fish were caught in wetland 6. Wetland 4 is located in the Skeeter Valley adjacent to Start Lake. Wetlands 6 and 9 are located adjacent to Mess Creek. Data on electrofishing and minnow trapping effort in wetlands is presented in Appendices 3-2 and 3-3. Individual fish data is presented in Appendix 3-4.

Fish were captured by electrofishing and minnow trapping. Electrofishing effort ranged from 380 electrofishing seconds in wetland 6 to 1,223 electrofishing seconds in wetland 9 (Figure 3.1-35). Among wetlands where fish were captured, electrofishing CPUE was very similar and ranged from 0.72 fish/100 s in wetland 4 to 0.82 fish/100 s in wetland 9.

Minnow trap effort ranged from 106.0 trap hours in wetland 6 to 126.6 trap hours in wetland 9 (Figure 3.1-35). Fish were captured in minnow traps in wetlands 4 and 9. Among wetlands where fish were captured, CPUE ranged from 0.23 fish/trap/24 h in wetland 4 to 1.52 fish/trap/24 h in wetland 9.

Wetland 9 had the highest CPUE for both sampling methods. This wetland is located adjacent to Mess Creek at the south end of the drainage. It is composed of a beaver-pond with a breached dam and an outflow stream that flows directly into Mess Creek. Water in both the pond and the outflow stream is clear, and the outflow stream has excellent habitat complexity and cover. These features make this water body ideal for rainbow trout.

Table 3.1-5 summarizes length, weight, condition and age data for rainbow trout captured in the wetlands. Rainbow trout were not statistically compared between wetlands due to low sample size. Generally, mean length ranged from 135.3 mm to 145.3 mm, mean weight ranged from 20 g to 29.1 g, and mean age ranged from 2.3 years to 2.6 years in receiving environment wetlands.

Table 3.1-5. Mean Length, Weight, Condition and Age of Fish Captured in Receiving Environment Wetlands, 2008

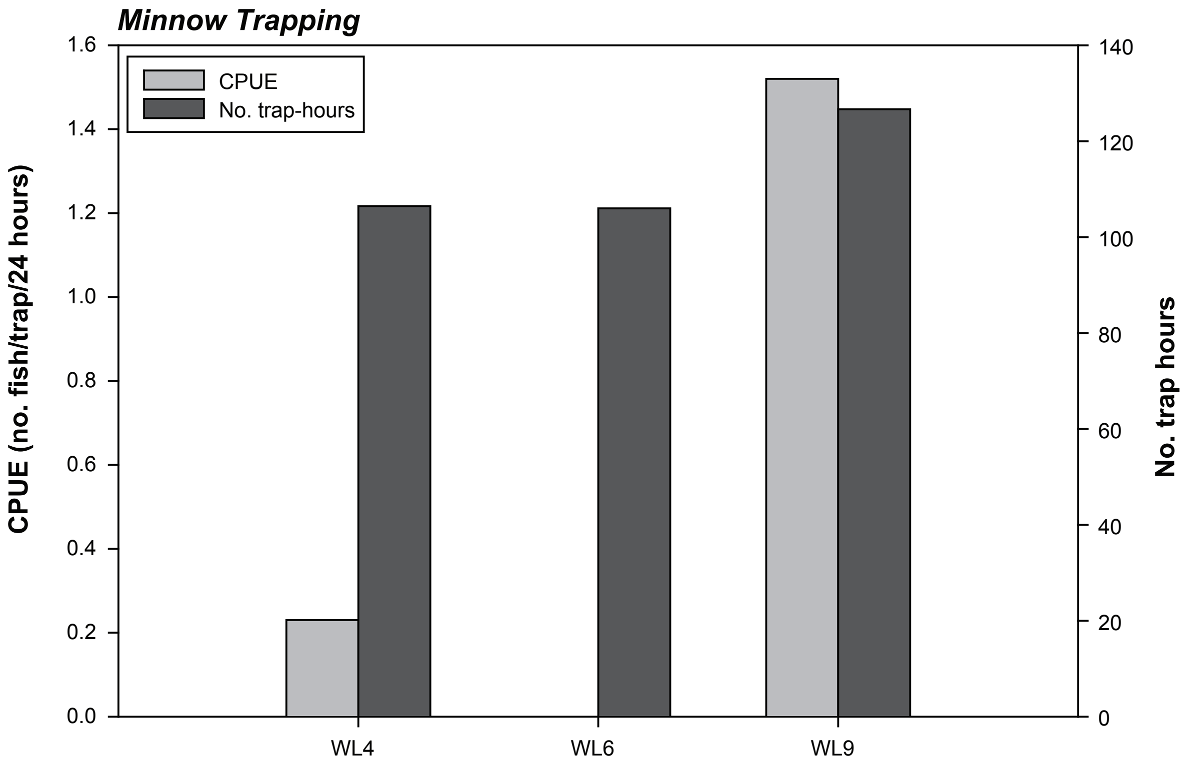
Wetland	Length (mm)					Weight (g)				
	N	Mean	SE	Min	Max	N	Mean	SE	Min	Max
WL4	6	145.3	13.6	115	189	1	20	-	20	20
WL6	-	-	-	-	-	-	-	-	-	-
WL9	18	135.3	8.5	86	241	8	29.1	3.3	15	45

Wetland	Condition (g/mm^3)					Age (years)				
	N	Mean	SE	Min	Max	N	Mean	SE	Min	Max
WL4	1	1.16	-	1.16	1.16	5	2.6	0.4	2	4
WL6	-	-	-	-	-	-	-	-	-	-
WL9	8	1.25	0.06	0.99	1.5	10	2.3	0.37	1	4

Notes:
Dashes indicates no data available
SE = standard error

There were not enough fish captured in each wetland to construct meaningful length-frequency distributions for each site; therefore, data was pooled to present a length-frequency distribution for all wetlands. The histogram demonstrates that most fish measured between 100 and 140 mm (Figure 3.1-36).

Due to low sample size in individual wetlands, all fish data were pooled to present a single regression for rainbow trout from Schaft Creek wetlands. The relationship between length and weight was highly significant ($P < 0.001$), and length explained 86% of the variation in fish weight (Figure 3.1-37).



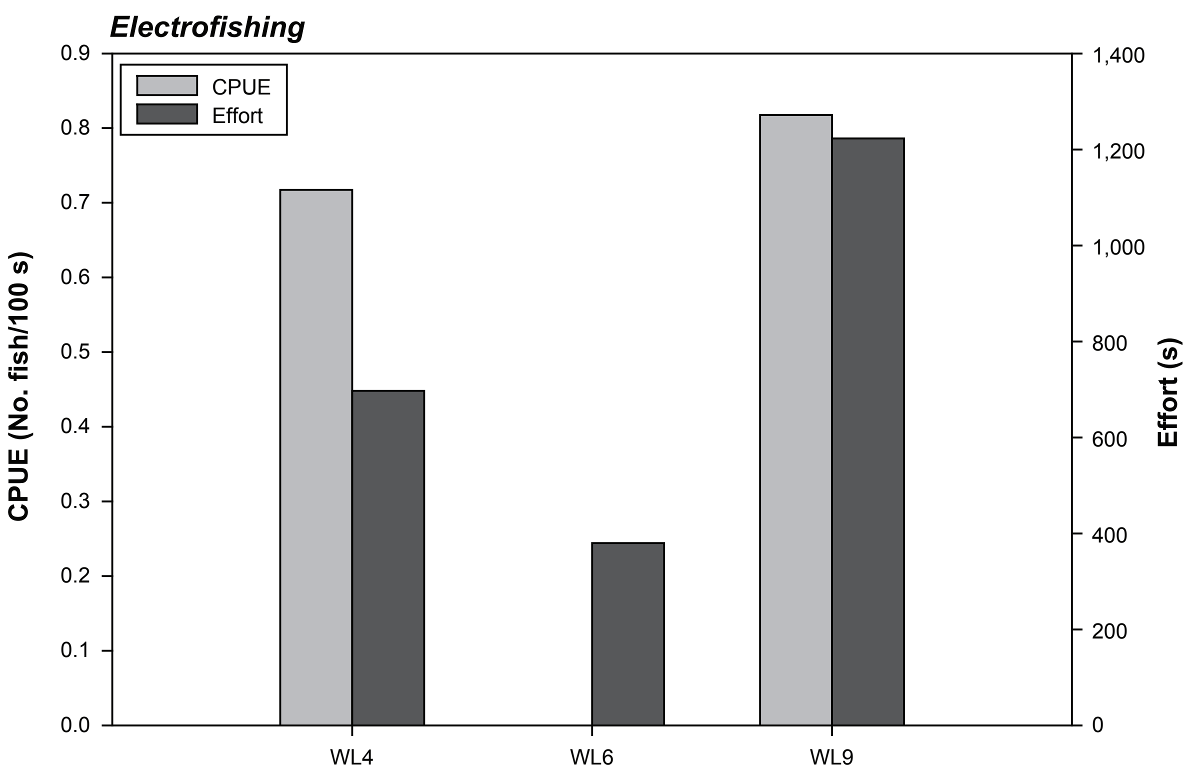


FIGURE 3.1-35

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Sampling Effort and CPUE in Schaft Wetlands, 2008

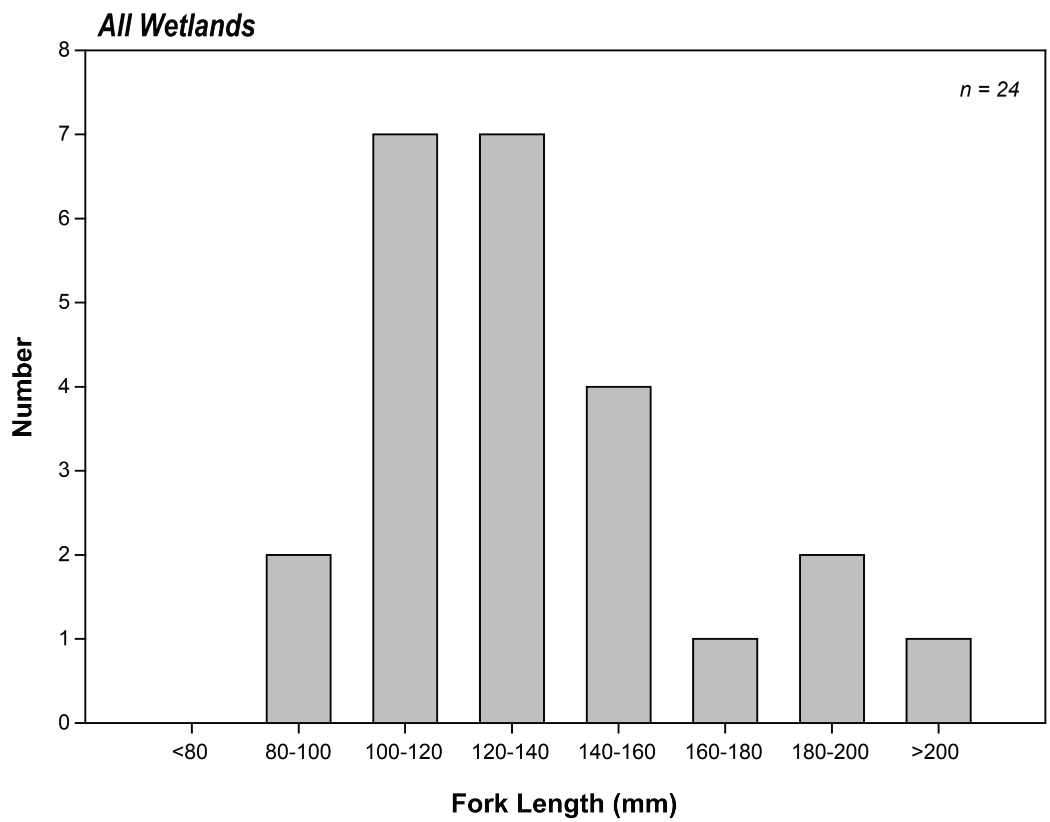

FIGURE 3.1-36

Length-Frequency Distribution of Rainbow Trout in Schaft Wetlands, 2008

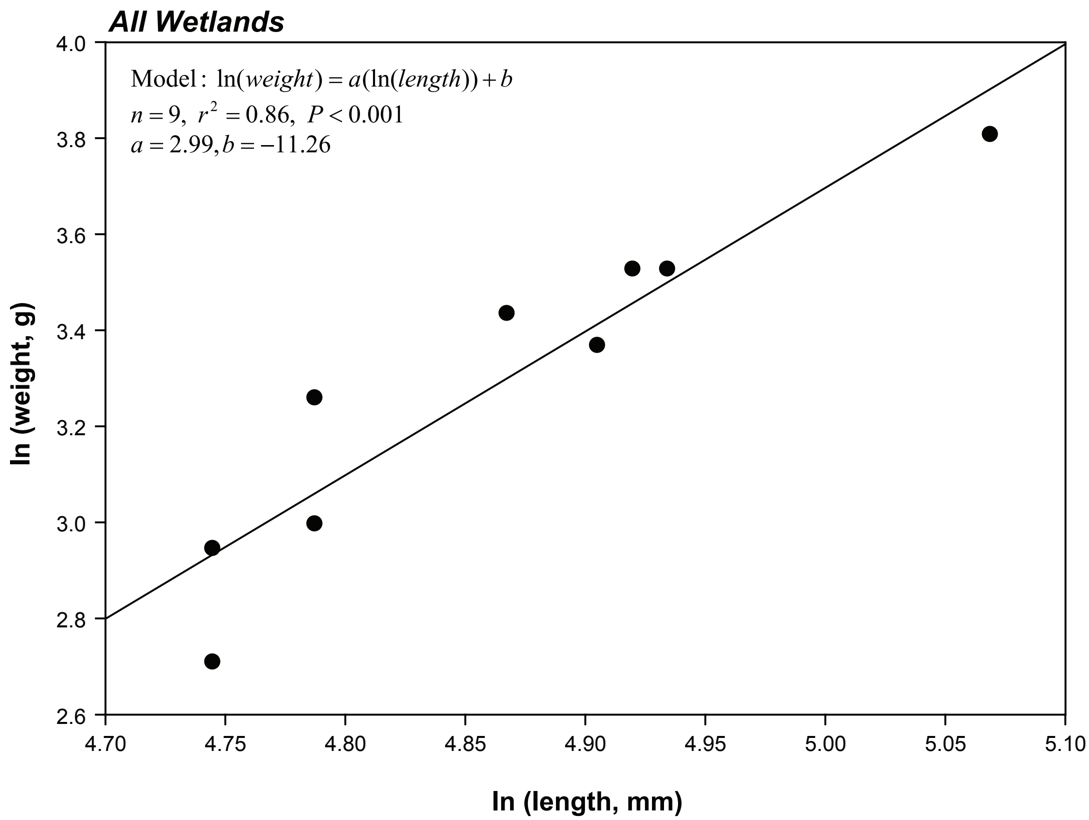

FIGURE 3.1-37

Weight-Length Regression for Rainbow Trout in Schaft Wetlands, 2008

Not enough fish were captured from each wetland to construct meaningful age-frequency distributions; thus, a single histogram was constructed for all fish captured in wetlands. The majority of fish captured in wetlands were aged at 2 years (Figure 3.1-38).

A von Bertalanffy growth model was constructed for all fish captured in wetlands to relate age to growth. The resulting model was significant ($P < 0.001$) and age accounted for 82% of the variation in fish length (Figure 3.1-39). The model predicted a maximum fish length of 260 mm, with a growth coefficient of 0.33 $years^{-1}$.

In general, fish living in wetlands in the Schaft Creek Project area were healthy. Sites in the fish-bearing areas had an abundance of fish with suitable rearing habitat.

3.2 COMPENSATION SCOPING

3.2.1 Introduction

Preliminary investigations into potential fish habitat compensation areas were conducted in the summer of 2008. These surveys were undertaken with a water resources engineer (Alan Thomson, MRM, P.Eng.) and were intended to identify areas that were suitable for compensation habitat to be constructed. In scoping potential compensation habitat, several factors were taken into consideration:

- Proximity to existing fish habitat;
- Stability of soils and existing stream banks;
- Water quality; and,
- Potential for bedload movement.

Compensation habitat should be constructed in areas with existing fish habitat nearby because it ensures that the constructed habitat will be accessible to the existing fish population. Stability of soils and stream banks will ensure that the constructed habitat will not require excessive maintenance to prevent erosion, and to maintain fish passage corridors and habitat function. Good water quality is necessary to ensure that the habitat will be useable throughout the year and that deoxygenation, sedimentation, and other issues will not affect fish. Finally, considering the potential for bedload movement will ensure that constructed habitat will remain stable and will not require maintenance to maintain functionality.

3.2.2 Fish Habitat

Four reaches were identified for potential compensation in Start Creek between Start Lake and Lake 7.

Two reaches in upper Mess Creek (upstream of the confluence with Arctic Creek) were identified and surveyed as well. Each reach was surveyed in detail and physical stream characteristics and fish habitat characteristics are summarized in Table 3.2-1. The objective of this survey was to identify which reaches were most suitable for compensation activities due to their physical or biological characteristics. Appendix 4-1 presents detailed fish habitat data for the potential compensation sites.

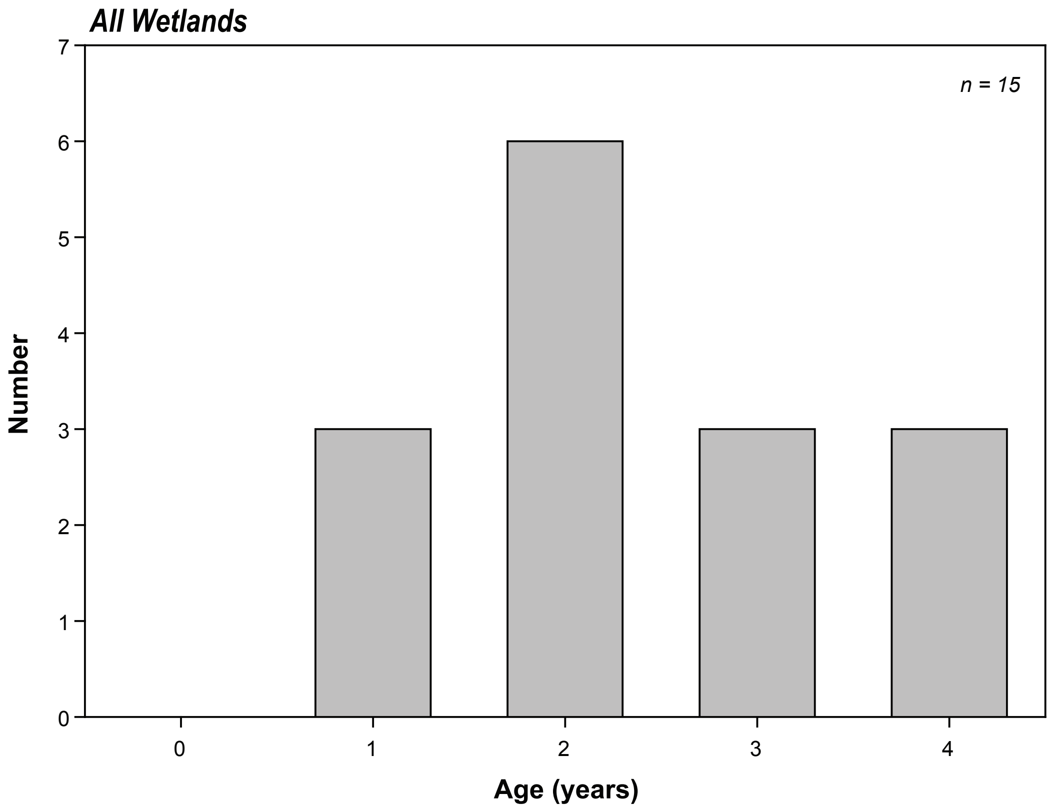

FIGURE 3.1-38

Age-Frequency Distribution of Rainbow Trout in Schaft Wetlands, 2008

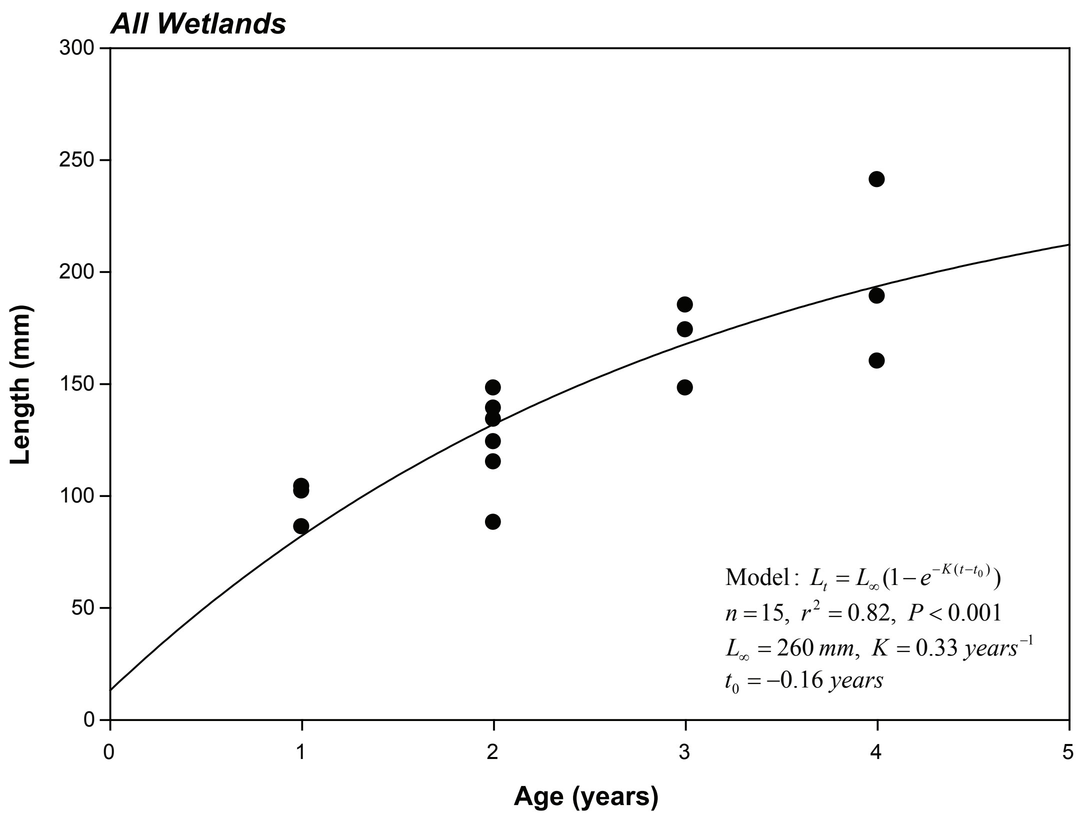

FIGURE 3.1-39

Von Bertalanffy Growth Model for Rainbow Trout from Schaft Wetlands, 2008

Table 3.2-1. Summary of Physical Stream Characteristics in Compensation Reaches

	Start Creek				Upper Mess Creek	
	Reach 1	Reach 2	Reach 3	Reach 4	Reach 1	Reach 2
Total Distance Surveyed (m)	183.4	205	101.5	228.9	160	98.4
Habitat Units (% composition by length)						
Cascade	0.0	0.0	0.0	0.0	0.0	18.7
Glide	0.0	21.0	16.7	54.8	4.4	0.0
Pool	6.8	12.7	17.5	25.7	8.1	15.0
Riffle	93.2	66.3	65.7	19.5	87.5	66.3
Channel Dimensions						
Mean Gradient (%)	1.3	0.7	2.7	1.2	0.8	2.0
Mean Wetted Depth (m)	0.29	-	0.43	0.55	0.24	0.50
Mean Bankfull Depth (m)	0.63	-	0.71	0.81	0.47	0.78
Mean Wetted Width (m)	3.19	5.44	3.24	6.30	6.55	7.40
Mean Bankfull Width (m)	3.49	6.60	3.80	7.13	7.53	8.68
Substrate Composition						
% Fine	30.6	37.0	9.7	65.3	17.4	3.9
% Gravel	62.5	59.9	68.8	32.2	77.6	29.4
% Cobble	6.3	3.2	21.5	2.1	5.0	66.7
% Boulder	0.6	0.0	0.0	0.4	0.0	0.0
Bank Height (m)						
Left Bank	0.20	0.17	0.25	0.40	0.23	0.27
Right Bank	0.25	0.15	0.30	0.38	0.23	0.29
Bank Stability						
Left Bank	0.44	0.14	0.50	0.48	0.50	0.50
Right Bank	0.31	0.00	0.44	0.48	0.50	0.50
Instream Cover (%)						
Pools	11.9	24.8	6.4	5.0	11.2	5.2
Boulders	1.9	0.0	0.0	0.4	0.0	0.0
Instream Vegetation	0.0	0.0	0.0	29.0	0.0	0.0
Overhanging Vegetation	46.3	0.0	0.8	0.3	7.9	11.6
Undercut Bank	3.7	1.9	3.3	1.2	6.3	0.2
Large Woody Debris	4.4	4.0	7.7	9.6	7.5	5.0
Small Woody Debris	3.3	3.1	5.4	2.1	4.1	1.6
Pools						
Total Number	7	6	4	10	5	3
Average Max Depth (m)	0.5	0.6	0.6	0.6	0.8	0.7
Canopy						
Average Canopy Cover	1.5	0.0	15.0	0.2	2.0	11.7
Left Bank Cover	17.0	0.0	64.0	37.9	5.0	100.0
Right Bank Cover	13.3	0.0	80.0	53.3	5.0	98.3

Bank stability is measured on a scale of 0-1 with 0 being unstable, 0.5 being stable and 1.0 being highly stable

Reach 1 of Start Creek starts at its confluence with a small tributary that flows in from the west and continues upstream for 183 m until it reaches a beaver dam. This reach is generally swift with low habitat complexity and few pools (Plate 3.2-1). The majority of habitat in this reach is contained in riffles (93% by length), and the mean depth is generally shallow (0.63 m bankfull depth). Wetted width and bankfull width are similar throughout the reach (3.19 m and 3.49 m, respectively). The substrate composition of reach 1 is dominated by gravel, followed by fines, and small proportions of cobble and boulder. Bank heights through this reach are relatively low but stable. Instream cover in reach 1 is dominated by overhanging vegetation, with smaller proportions of pools. Very little woody debris, undercut banks and boulders are present in this reach. A total of seven pools were measured in reach 1, with maximum depths averaging 0.5 m. The majority of pools were plunge pools formed by water cascading over woody debris (Plate 3.2-2). Canopy cover and riparian cover were relatively low. This reach is surrounded by shrubs and small deciduous trees that do not extend out over the stream.

Reach 2 of Start Creek begins at a beaver dam and passes through a drained beaver pond. Flows were generally slower in this area, with the stream meandering through old pond sediments before passing through the breached dam (Plate 3.2-3). This reach was 205 m long and dominated by riffle habitat, followed by glides and pools. Wetted depth and bankfull depth were not measured because the banks of the stream were poorly defined and the bottom was very soft and muddy through this section. The wetted width averaged 5.44 m through the beaver pond reach. Almost 60% of the substrate was composed of gravels, followed by fines. A small amount of cobble was also present. The banks of the stream through this reach were relatively low and unstable – a result of the absence of streamside vegetation in the drained beaver pond (Plate 3.2-4). Instream cover in this reach is dominated by pools (24.8%), which have an average maximum depth of 0.6 m. Canopy cover and riparian cover are absent due to the unvegetated beaver pond sediments surrounding the stream.

Plate 3.2-1. Start Creek reach 1 looking upstream. Note the swift current and low cover.

Plate 3.2-2. Example of a plunge pool created by large woody debris in reach 1 of Start Creek.

Plate 3.2-3. Reach 2 of Start Creek flows through a former beaver pond. An assistant points out the old pond level and the breached dam is visible in the background.

Plate 3.2-4. View looking upstream of the reach through the drained beaver pond, showing the unstable, unvegetated banks.

The third reach of Start Creek begins at the upstream end of the drained beaver pond and extends as far as an old stream crossing near the outlet of Lake 7. This section is 101.5 m long and is dominated by riffles (65.7% by length), followed by pools and glides (Plate 3.2-5). The gradient of this reach is higher on average than that of the other reaches of Start Creek (2.7%). Wetted and bankfull widths in reach 3 were similar to those in reach 1 (3.24 m and 3.80 m, respectively); however, wetted and bankfull depths were slightly deeper (0.43 and 0.71 m, respectively). This reach is dominated by gravel substrate, followed by cobble. A small amount of fines are also present. The left and right banks of the stream through this reach average 0.25 and 0.30 m, respectively and are stable. Instream cover is relatively low throughout this reach, with the most abundant forms of cover being LWD, SWD and pools. Only four pools were measured, with an average maximum depth of 0.6 m. Canopy and riparian cover are highest in this reach where the stream flows through coniferous forest.

The fourth reach of Start Creek extends from the old stream crossing to the outlet of Lake 7. This reach is surrounded by sedge wetland and bog habitat as it drains the lake. The gradient is relatively low and glides and pools dominate the habitat, followed by riffles. The reach has large-channel morphology, with relatively deep wetted and bankfull depths and a wide channel (Plate 3.2-6). Fine sediment dominates the substrate, followed by gravel and very small amounts of cobble and boulder. The banks are relatively high and stable throughout the reach. Instream cover is moderately abundant and is dominated by aquatic vegetation, followed by LWD and pools. A total of 10 pools were measured in this section, each with an average maximum depth of 0.6 m. Canopy cover is very low; however, the stream banks are well-vegetated with sedges, shrubs and coniferous trees.

Plate 3.2-5. Reach 3 of Start Creek looking upstream at riffle habitat and low instream cover.

Plate 3.2-6. Reach 4 of Start Creek, looking downstream at the wide, large-channel morphology.

The potential compensation reaches on Mess Creek are located upstream of the confluence with Arctic Creek and downstream of the cascade reach that drains Lake 3 at the top of the watershed. Reach 1 of this section is a low gradient, sinuous reach with low habitat complexity and cover (Plate 3.2-7). It is dominated by riffle habitat (87.5%) with small proportions of pool and glide habitat. Despite its relatively low gradient (0.8%), it has a shallow channel and swift flow. The wetted width averaged 6.55 m in August 2008, and the bankfull width averaged 7.53 m. The substrate composition was dominated by gravel, followed by fines and a small amount of cobble. The banks of this reach are relatively low and stable. Instream cover in reach 1 was low and dominated by pools, followed by relatively equal proportions of woody debris and undercut banks. Canopy and riparian cover were also low due to the shrubby riparian vegetation and small deciduous trees surrounding the stream.

Plate 3.2-7. Reach 1 of upper Mess Creek, looking upstream.

Reach 2 of upper Mess Creek is slightly steeper and contains some cascade habitat in addition to riffles, glides and pools (Plate 3.2-8).

Reach 2 has a higher gradient (2%) and deeper wetted and bankfull widths (7.40 and 8.68 m, respectively) than reach 1 of upper Mess Creek. The substrate was dominated by larger cobble substrate, followed by gravel and fines. The substrate was relatively uniform throughout the reach, with few pockets of smaller material. Bank heights throughout the reach were relatively low but stable. Contrary to reach 1, instream cover in reach 2 was dominated by overhanging vegetation; however, overall cover abundance was low. Only three pools were measured in this 98 m reach, with an average maximum depth of 0.7 m. Both canopy and riparian cover were higher than in reach 1 due to thick deciduous and occasional coniferous riparian vegetation.

Plate 3.2-8. Reach 2 of upper Mess Creek, looking downstream at the relatively uniform channel and low cover.

3.2.3 Fish Community

Species Composition and CPUE

Start Creek was sampled in August 2008 using electrofishing and minnow trapping. Electrofishing was conducted in all reaches, and the effort expended in each reach ranged from 370 s in Reach 3 to 849 s in Reach 1 (Table 3.2-2). Rainbow trout were the only species captured in all reaches. Catch-per-unit-effort (CPUE) ranged from 0.82 fish/100 s in Reach 1 to 4.35 fish/100 s in Reach 4. The highest CPUE tended to be in the two reaches that are relatively slow-flowing with abundant cover. Reach 1 is the steepest, fastest-flowing reach, and relatively few fish were captured there. Fish sampling effort is presented in Appendix 4-2 and individual fish data is presented in Appendix 4-3.

Minnow trapping was only conducted in Reach 4 because it was the only reach where deep, slow water was present. A total of 10 traps were set for 16 hours each. CPUE averaged 1.2 fish/trap/24 h.

Upper Mess Creek was also sampled using electrofishing and minnow trapping in August 2008. Electrofishing was conducted on both reaches, with over 1,100 s of electrofishing effort being expended in each reach (Table 3.2-2). Despite the high effort, only two fish were captured in Reach 2. One adult fish was observed but not captured in Reach 1. The low CPUE is likely because of the low cover and low abundance of pools in both reaches.

Table 3.2-2. Summary of Electrofishing and Minnow Trapping CPUE in Potential Compensation Reaches

Site	Electrofishing			Minnow Trapping				Comment
	EF Seconds	No. Fish	CPUE (no. fish/100 s)	No. Traps	No. Fish	Mean CPUE (No. fish/trap/24 hours)	SE	
Start Creek								
Reach 1	849	7	0.82	-	-	-	-	
Reach 2	738	22	2.98	-	-	-	-	
Reach 3	370	9	2.43	-	-	-	-	
Reach 4	621	27	4.35	10	8	1.20	0.30	
Upper Mess Creek								
Reach 1	1148	0	0.00	-	-	-	-	1 VO
Reach 2	1169	2	0.17	10	0	0.00	0.00	

Notes:
SE = standard error of the mean
VO = visual observation
EF = electrofishing

Length, Weight and Condition

Table 3.2-3 summarizes the mean length, weight and condition of rainbow trout captured in the potential compensation reaches of Upper Start and Upper Mess Creeks. Statistical analyses were limited to comparisons of the Upper Start Creek reaches due to the low number of fish captured and observed in Upper Mess Creek.

Table 3.2-3. Summary of Length, Weight and Condition for Rainbow Trout Captured in Potential Compensation Areas

Site	N	Length (mm)				Weight (g)				Condition (g/mm^3)			
		Min	Max	Mean	SE	Min	Max	Mean	SE	Min	Max	Mean	SE
Start Creek													
Reach 1	7	62	130	95	9	2.5	24.0	11.8	2.8	1.05	1.41	1.19	0.05
Reach 2	16	52	202	116	11	2.0	92.7	25.2	6.6	0.98	1.55	1.20	0.04
Reach 3	9	52	221	132	19	1.5	105.2	29.8	11.1	0.97	1.27	1.10	0.03
Reach 4	27	81	223	128	6	5.2	119.1	28.4	4.8	0.91	1.40	1.14	0.02
Upper Mess Creek													
Reach 2	1	260	260	260	-	-	-	-	-	-	-	-	-

Notes:
N = number
Min = minimum
Max = maximum
SE = standard error of the mean

These results indicate that rainbow trout throughout Upper Start Creek are of similar size and condition. Given the absence of barriers between reaches, and the relatively short length of the stream, it is likely that rainbow trout in the stream do not remain confined to any particular reach.

A length-frequency distribution was constructed for all of Upper Start Creek to show the proportion of fish in each size class (Figure 3.2-1). The results show a tri-modal distribution with the majority of fish occurring in the 100 to 120 mm size class. Smaller modes were present at 140 to 160 mm and over 220 mm. These results indicate that Upper Start Creek is used primarily by older juveniles and sub-

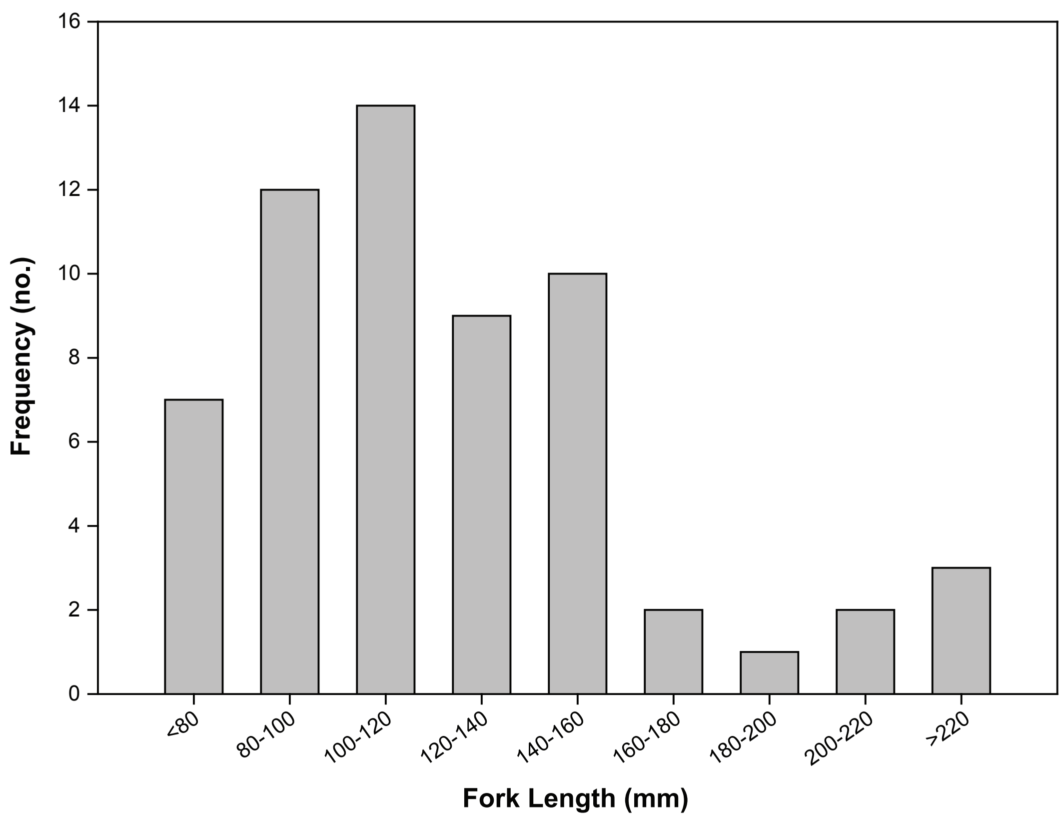

FIGURE 3.2-1

Length-Frequency Distribution of Rainbow Trout Captured in Upper Start Creek

adult rainbow trout, with few young-of-the-year and adult fish. This may be reflective of the type of habitat present, which is mostly fast riffle-run habitat that may be too swift for smaller fish. Larger fish likely inhabit the lakes upstream and downstream of this stream where food and cover is more abundant.

Average fish length did not differ significantly among the four reaches of Upper Start Creek (ANOVA, $F_{3,55} = 1.85$, $P = 0.15$). Similarly, average fish weight did not differ among the reaches (ANOVA, $F_{3,54} = 1.66$, $P = 0.19$).

A weight-length regression for all of the fish captured in Start Creek was significant ($P < 0.01$), with length explaining 99% of the variation in weight (Figure 3.2-2). A general linear model was used to compare the slopes of the weight-length regressions among the Start Creek reaches. The interaction between site and fish length did not have a significant effect on fish weight (GLM, $F_{3,49} = 1.36$, $P = 0.27$), indicating that the slopes of the regressions were equal and weight-at-length could be compared among sites.

Weight-at-length (an index of fish condition) did not differ among the four reaches of Upper Start Creek (ANCOVA, $F_{3,53} = 1.21$, P = 0.32). An examination of fish condition factor supports this result, with no significant difference in fish condition factor occurring among sites in Upper Start Creek (ANOVA, $F_{3,54} = 1.41$, P = 0.25).

<u>Age and Growth</u>

An age-frequency distribution was prepared to show the age structure of the rainbow trout population in the Start Creek Watershed. The frequency distribution was unimodal, with most of the fish occurring in the 2-year age class, followed by the 1-year and 3-year age classes (Figure 3.2-3). This indicates that Start Creek is likely used primarily by rearing and feeding juvenile and sub-adult fish. These results are in concordance with the results of the length-frequency distribution.

A von Bertalanffy growth model was constructed to relate age to growth for all fish captured in Start Creek (Figure 3.2-4). The growth model was significant ($P < 0.01$), with age accounting for 29% of the variation in fish length. The model predicted an asymptotic fish length of 180 mm and a growth coefficient of 0.49 years^{-1}.

3.2.4 Conclusions

Based on the results of the habitat surveys and sampling, Start Creek was identified as the most promising option for compensation habitat construction. This was based on

- the presence of rainbow trout overwintering and feeding habitat both upstream and downstream of the site;
- proven access to the site for fish;
- relative low habitat complexity in at least two of the reaches;
- excellent water quality with low turbidity;
- low potential for major influxes of sediment; and,
- accessibility for construction from existing and proposed roads.

Upper Mess Creek was largely discounted because although there is good water quality and room for habitat improvement due to low existing habitat complexity, very few fish were captured or observed and the density of fish present in the upper Mess Creek Watershed may limit the success of any compensation project in providing actual value for fish species.

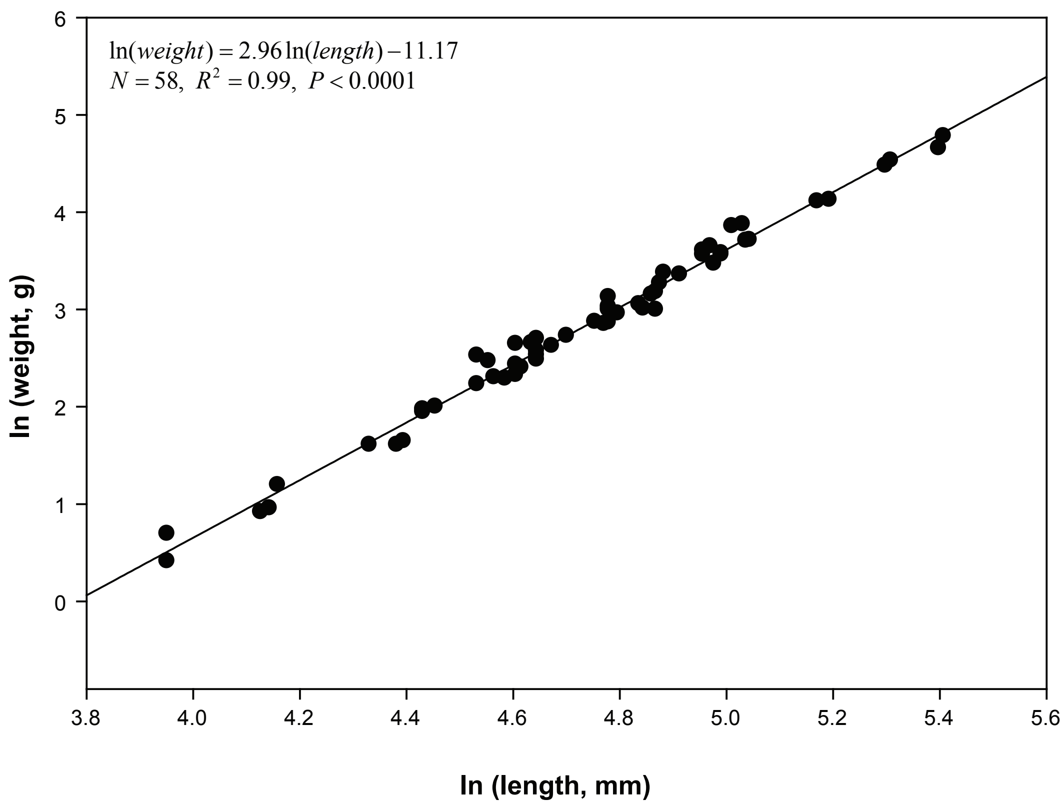

FIGURE 3.2-2

Weight-Length Regression for Rainbow Trout Captured in Start Creek

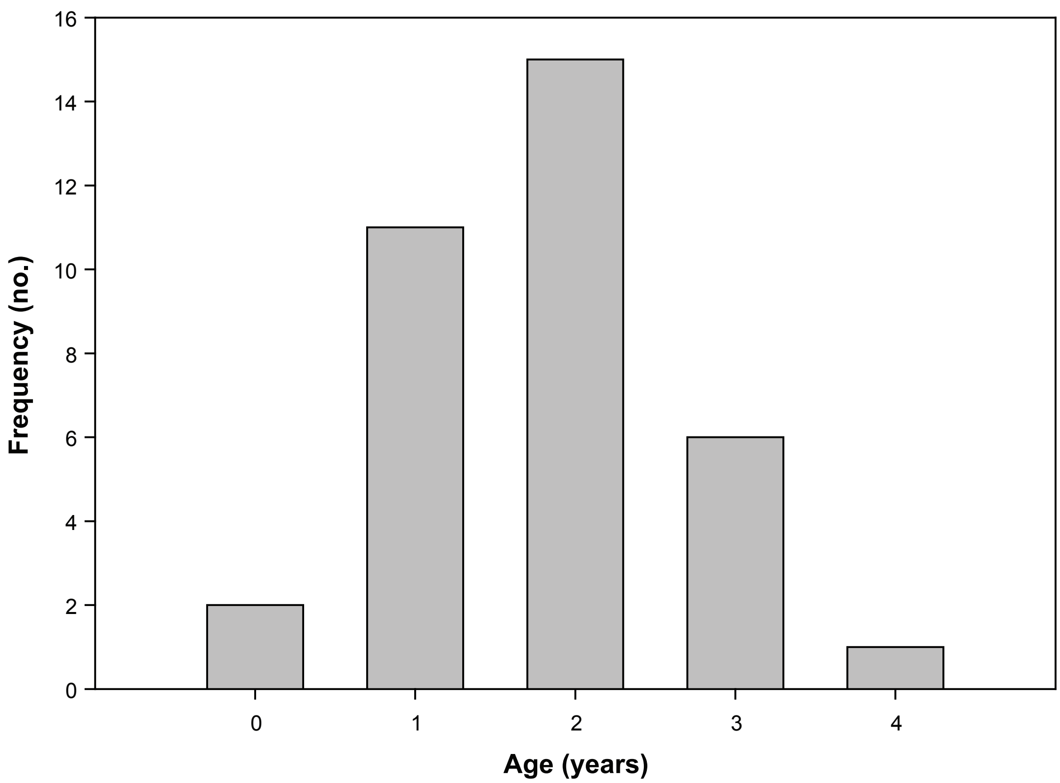

FIGURE 3.2-3

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Start Creek Rainbow Trout Age-Frequency Distribution

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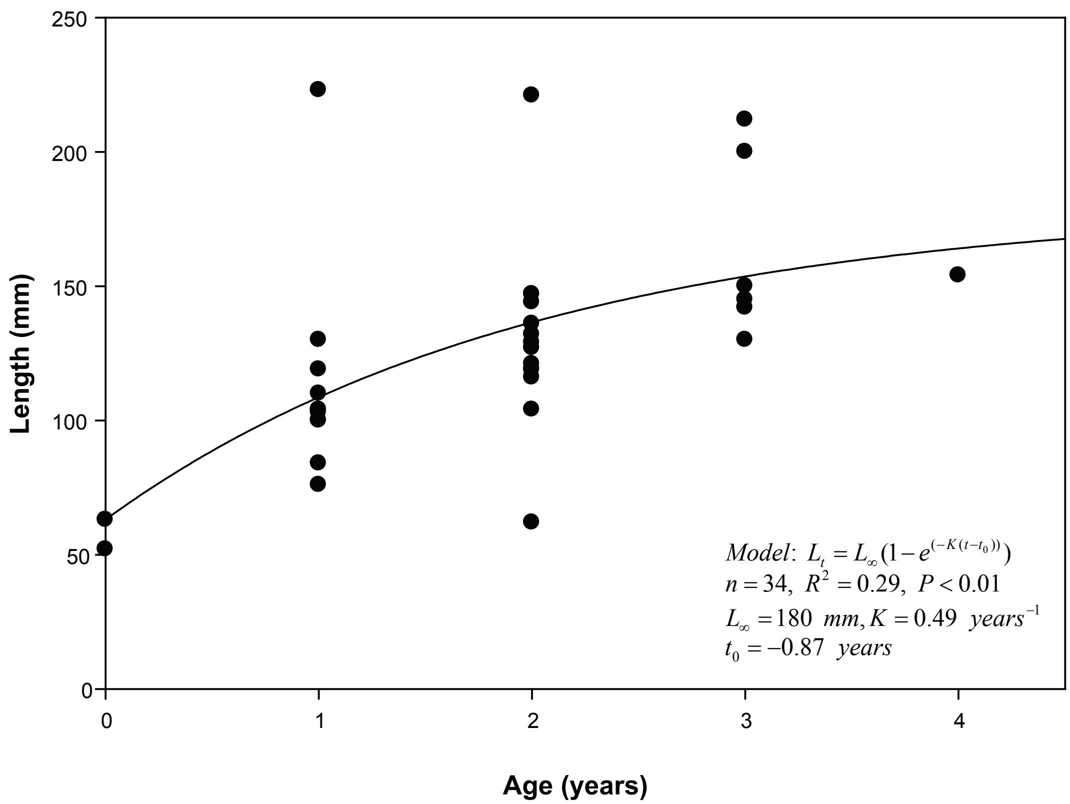

FIGURE 3.2-4

Rescan

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Von Bertalanffy Growth Curve for Rainbow Trout Captured in Start Creek

Potential options for compensation in Start Creek include recontouring the channel so that it meanders across the alluvial fan, creating off-channel habitat in the form of side-channels and pools and creating groundwater ponds for overwintering. Channel meandering would have the effect of lengthening the amount of habitat available, and slowing down stream flow. Pool-riffle morphology could be incorporated into the stream channel to provide abundant rearing areas, as well as spawning platforms for resident rainbow trout. The most suitable reaches for channel meandering or side-channel construction are the riffle reaches (1 and 3) which currently have relatively homogenous channels with swift flow and few pools. Reach 1 in particular has an expansive, lightly treed area on the right bank where the excavation of new channels may be possible. Alternatively, pools could be created in the main channel of Start Creek by engineering riffles to hold back water. The creation of off-channel pools could likely be constructed in any of the reaches and connected to the main stream via short channels.

3.3 PROPOSED ROAD ROUTE

3.3.1 Revisited Sites

A total of seven stream crossings along the proposed Schaft Creek Access Road were revisited in 2008 to confirm fish-bearing or non-fish-bearing status. Each stream was followed downstream from the road crossing to the mainstem of Mess Creek, and habitat was sampled with an electrofisher along the way. Streams were deemed to be fish-bearing if a fish was captured or seen, or if no permanent barriers to migration were observed between the mainstem of Mess Creek and the stream crossing location.

Of the seven streams that were re-sampled in 2008, fish were captured or seen in four of them (Table 3.3-1). In most of the streams where fish were caught, the captures occurred well downstream of the actual stream crossing locations; however, the absence of permanent barriers to migration between the capture location and the stream crossing means that the crossing locations must be considered to be fish-bearing. Stream crossing sampling effort data can be found in Appendix 5.

Table 3.3-1. Summary of Revisited Stream Crossings and Final Classifications

ILP	Effort (seconds)	Total Fish	Species	Barriers?	Final Classification	Comment
2011	342	0	NFC	N	S6	Marginal habitat throughout - not fish-bearing.
1060	322	1	RB	N	S4	Fish caught near confluence with Mess Creek. Marginal habitat at stream crossing, but no barriers.
1072	190	1	RB	N	S4	Visual observation approximately 10 m US from Mess Creek confluence in marginal step-pool habitat. No barriers to stream crossing.
1092	331	1	RB	N	S4	Fish caught 60 m DS of crossing
2071	641	0	NFC	Y	S6*	Non-fish-bearing at crossing point due to gradient (30%), but default fish-bearing 10 m DS of crossing
2012	304	1	RB	N	S4	Fish caught near Mess Creek confluence. No barriers to stream crossing.
4017	507	0	NFC	N	[S4]	No fish captured, but good habitat quality and no barriers down to nearest stream.

NFC = no fish caught, RB = rainbow trout, Y = yes, N = no, US = upstream, DS = downstream

4. Summary

4. Summary

The 2008 Fisheries Baseline Study for the Schaft Creek Project focused on confirming previously collected information, expanding on the knowledge base, and collecting information that will help to create a precise and accurate environmental assessment. The majority of work conducted was done on water bodies within the mine receiving environment in close proximity to the proposed mine infrastructure. Baseline work on potential compensation areas and confirmation of fish-bearing status along the proposed road route was also conducted.

In the mine receiving environment, the majority of stream sites are located on Schaft Creek and Mess Creek, large rivers that drain the watersheds surrounding the Schaft Creek Project. These streams are large, glacial rivers that have high turbidity, low cover and relatively swift flow. While fish are present in most of the area, these large streams provide little value to the resident rainbow trout, which generally prefer smaller, clearer streams with abundant cover.

Such streams are found in the Skeeter and Start Creek valleys. The Skeeter Creek Watershed will be occupied by the proposed tailings disposal facility, so it was imperative to confirm the distribution of fish and the quality of habitat in this area. Skeeter Creek is a small, steep stream with a significant waterfall barrier. There is fair to good quality fish habitat in the lower 75 m of the stream, but the majority of the watershed is confirmed to be non-fish-bearing based on three successive years of fish sampling. Habitat quality in the upper Skeeter Creek Watershed is high, and would provide good quality habitat if fish were present.

The Start Creek Watershed also provides good quality habitat for rainbow trout in the form of deep lakes and small, clear streams; however, the impact of the proposed mine on this watershed is predicted to be lower. Start Lake contains the largest and oldest rainbow trout found in the study area, indicating that the Start Creek Watershed may be highly productive in comparison with other watersheds in the study area.

The Start Creek Watershed is also a good area for potential compensation projects due to its good water quality, access and existing fish population. Several compensation options for the area between Start Lake and Lake 7 were identified. Fish habitat compensation may also be possible in the upper Mess Creek Watershed; however, this area is less preferable due to the low density of fish, cold stream temperatures and poor access for construction equipment.

Several streams along the proposed access road were revisited in 2008 to confirm their fish-bearing status. Several streams were found to have fish in their lower reaches, and no barriers were found to prevent fish from accessing the proposed stream crossings. Marginal habitat quality was also found in most of these streams, and this resulted in some streams being designated as non-fish-bearing due to poor habitat quality and two successive years of sampling resulting in no fish being caught.

The proposed Schaft Creek mine is located in the upper Schaft Creek Watershed, and the mine site itself does not contain any fish-bearing water bodies. The potential effects of future development on fish and fish habitat will be mainly along the proposed access road, and within the Skeeter Creek and Start Creek watersheds.

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Appendix 1-1

Receiving Environment Site Cards and Photos

SITE CARD

WATERSHED CODE							
STREAM NAME (Gaz)	Mess Creek	(Local)	LB channel				
ILP MAP #		ILP #		NID MAP #		NID #	153
REACH #		SITE #		FIELD UTM	9 385313 6364859	SITE LG	201 R ACCESS H
DATE	06/29/2008	TIME	1 3 0 8	AGENCY	Rescan	CREW	DF SL FISH FORM Y N

CHANNEL	mtd					
CHANNEL WIDTH (m)	GE	39.00	27.50	24.50	34.00	46.50
WETTED WIDTH (m)	GE	39.00	27.50	24.50	34.00	46.50
RES. POOL DEPTH (m)	GE					

GRADIENT (%): 1 GE

Wb Dp (m): 1 | STAGE: L M H | no vis ch | dry/int | DW | Tribs

WATER			
EMS		REQ #	
TEMP	9.6	COND	104
Ph	8.25	TURB	T

COVER

COVER Total: T

Type	SWD	LWD	B	U	DP	OV	IV
AMT	T	N	N	N	D	SD	N
LOC							

CROWN CLOSURE: 0% 1-20% 21-40% 41-70% 71-90% <90% — 0 1 2 3 4 5 (selected: 0)

LWD FNC: N F A | DIST: C E | INSTREAMVEG: N A M V

	LB		RB
SHP	U V S O	SHP	U V S O
TEXTURE	F G C B R A	TEXTURE	F G C B R A
RIP VEG.	N G S C D M W	RIP VEG.	N G S C D M W
STAGE	INIT SHR PS YF MF NA	STAGE	INIT SHR PS YF MF NA

MORPHOLOGY

FLD SIGNS:

BED MATERIAL Dominant: F | Subdom: Gr

D95 (cm): 75 | D (cm): | Morph: G-P

DISTURBANCE INDICATORS: O1 B1 B2 B3 D1 D2 D3 C1 / C2 C3 C4 C5 S1 S2 S3 S4 S5

PATTERN	TM ME IM IR SI ST
ISLANDS	N O IM F S AN
BARS	N SIDE DIAG MID SPAN BR
COUPLING	DC PC CO
CONFINEMENT	EN CO FC OC UN N/A

FEATURES

C	NID MAP #	NID #	TYPE	HT/LG	mtd	PHOTO	COMMENTS	UTM	mtd
						R F			
						R F			
						R F			
						R F			

HABITAT QUALITY

rearing: fair - channel is deep with some overhanging vegetation; entire habitat is glide. Water has no visibility so hard to identify microhabitats

spawning: poor - identified one gravel bar (caught 1 fry) but majority of channel is deep and filled with silt.

overwintering: fair - during low flow pools could form providing fish habitat; no deep pools evident

overall: marginal - Mess Creek may offer overwintering refuge for RB but quality of habitat is typically not good for trout.

FSZ

PHOTO DOCUMENTATION

ROLL #	PHOTO #	DIR	COMMENTS
DIG	278	U	Upstream view at start of site
DIG	279	X	Cross-stream view at start of site
DIG	280	D	Downstream view at start of site

WILDLIFE

GROUP	WILDLIFE OBSERVATIONS	GROUP	WILDLIFE OBSERVATIONS

COMMENTS

C		C	
	stream class = S1		

SITE CARD

WATERSHED CODE						
STREAM NAME (Gaz)	Mess Creek		(Local)	RB channel		
ILP MAP #		ILP #		NID MAP #		NID # 156
REACH #		SITE #	MC-10	FIELD UTM	9 385572 6364588	SITE LG 60 GE ACCESS H
DATE	06/29/2008	TIME	1 4 0 0	AGENCY	Rescan	CREW DF SL FISH FORM **Y** N

CHANNEL	mtd								GRADIENT (%)	
CHANNEL WIDTH (m)	GE	26.52	29.26	44.35						
WETTED WIDTH (m)	GE	26.52	29.26	44.35					1	GE
RES. POOL DEPTH (m)	GE									
Wb Dp (m)		STAGE	L M **H**	no vis ch	dry/int					

WATER			
EMS		REQ #	
TEMP	9.6	COND	104
Ph	8.25	TURB	T

COVER

COVER	Total	T	DW	Tribs			
Type	SWD	LWD	B	U	DP	OV	IV
AMT	SD	N	N	N	N	SD	N
LOC							

CROWN CLOSURE	0%	1-20%	21-40%	41-70%	71-90%	<90%
	0	1	2	3	4	5

LWD FNC	N	**F**	A	DIST	C	**E**	INSTREAMVEG	N A M V
LB SHP	U V **S** O				RB SHP	U V **S** O		
TEXTURE	**F** G C B R A				TEXTURE	**F** G C B R A		
RIP VEG.	N G **S** C D M W				RIP VEG.	N G **S** C D M W		
STAGE	INIT **SHR** PS YF MF NA				STAGE	INIT **SHR** PS YF MF NA		

MORPHOLOGY

FLD SIGNS								
BED MATERIAL Dominant	F	Subdom						
D95 (cm)	N	D (cm)	N	Morph	G-P			
DISTURBANCE INDICATORS								
O1	B1	**B2**	B3	**D1**	**D2**	D3	C1	
C2	C3	**C4**	C5	S1	S2	S3	S4	S5
PATTERN	TM	ME	**IM**	IR	SI	ST		
ISLANDS	N	**O**	IM	F	S	AN		
BARS	N	**SIDE**	DIAG	MID	SPAN	BR		
COUPLING	**DC**	PC	CO					
CONFINEMENT	EN	CO	FC	OC	**UN**	N/A		

FEATURES

C	NID MAP #	NID #	TYPE	HT/LG	mtd	PHOTO	COMMENTS	UTM	mtd
						R F			
						R F			
						R F			
						R F			

HABITAT QUALITY

refer to site card MC-10 (LB)

FSZ

PHOTO DOCUMENTATION

ROLL #	PHOTO #	DIR	COMMENTS

WILDLIFE

GROUP	WILDLIFE OBSERVATIONS	GROUP	WILDLIFE OBSERVATIONS

COMMENTS

C		C	
	no fish caught		

Photo 278. An Upstream view at the start of the site.

Photo 279. A cross stream view at the start of the site.

Photo 280. A downstream view at the start of the site.

SITE CARD

WATERSHED CODE					
STREAM NAME (Gaz)	Mess Creek	(Local)	MC10		
ILP MAP #		ILP #		NID MAP #	NID #
REACH #		SITE #	MC10	FIELD UTM	9 / 385392 / 6364597
SITE LG	200	ACCESS	H		
DATE	08/10/2008	TIME	0 8 4 5	AGENCY	Rescan
CREW	LT CS	FISH FORM	Y N		

CHANNEL	mtd	
CHANNEL WIDTH (m)	GE	80.00
WETTED WIDTH (m)	GE	40.00
RES. POOL DEPTH (m)	GE	0.20
Wb Dp (m)	1.3	
GRADIENT (%)	4	
STAGE	L M H no vis ch dry/int	
	DW Tribs	

WATER			
EMS		REQ #	
TEMP	8.2	COND	137
Ph	8.3	TURB	T

COVER

COVER	Total	M					
Type	SWD	LWD	B	U	DP	OV	IV
AMT	T	T	N	T	D	S	T
LOC	P	P	P	P	P	P	P

CROWN CLOSURE	0%	1-20%	21-40%	41-70%	71-90%	<90%
	0	1	2	3	4	5

LWD FNC: N F A DIST C E

INSTREAMVEG: N A M V

	LB	RB
SHP	U V S O	U V S O
TEXTURE	F G C B R A	F G C B R A
RIP VEG.	N G S C D M W	N G S C D M W
STAGE	INIT SHR PS YF MF NA	INIT SHR PS YF MF NA

MORPHOLOGY

FLD SIGNS			
BED MATERIAL Dominant	S	Subdom	Gr
D95 (cm)	2	D (cm)	2
Morph	R-Pg		

DISTURBANCE INDICATORS: O1 B1 B2 B3 D1 D2 D3 C1 / C2 C3 C4 C5 S1 S2 S3 S4 S5

PATTERN: TM ME IM IR SI ST

ISLANDS: N O IM F S AN

BARS: N SIDE DIAG MID SPAN BR

COUPLING: DC PC CO

CONFINEMENT: EN CO FC OC UN N/A

FEATURES

C	NID MAP #	NID #	TYPE	HT/LG	mtd	PHOTO		COMMENTS	UTM	mtd
						R	F			
						R	F			
						R	F			
						R	F			

HABITAT QUALITY

overwintering habitat: good for s/c outside of main channel, this main channel poor for o/w. Rearing - fair - some deep pool in system.

spawning: good at higher water - gravel along bank pea sized good for trout.

overall: critical due to spawning and overwintering habitat in s/c

FSZ

PHOTO DOCUMENTATIO

ROLL #	PHOTO #	DIR	COMMENTS
DIG	884	U	Upstream view of site.
DIG	880		Aerial view of site.

WILDLIFE

GROUP	WILDLIFE OBSERVATIONS	GROUP	WILDLIFE OBSERVATIONS
	extensive wolf, grize, and goose tracks on sandbar		

COMMENTS

C		C	
	stream class = S1		

Photo 884. A upstream view of the site.

Photo 880. A aerial view of the site.

SITE CARD

WATERSHED CODE								
STREAM NAME (Gaz)	Mess Creek			(Local)				
ILP MAP #		ILP #		NID MAP #		NID #	150	
REACH #	1	SITE #	MC-11	FIELD UTM	9	384572	6345966	SITE LG 410 MT ACCESS H
DATE	06/29/2008	TIME		AGENCY	Rescan	CREW	DF SL	FISH FORM Y N

CHANNEL	mtd						GRADIENT (%)	
CHANNEL WIDTH (m)	GE	23.32	25.15	36.58	38.40			
WETTED WIDTH (m)	GE	15.09	20.12	32.00	32.46	106.07	2	CL
RES. POOL DEPTH (m)	GE						2	CL
Wb Dp (m)		STAGE	L	M	H	no vis ch	dry/int	
						DW	Tribs	

WATER

EMS		REQ #	
TEMP	5.5	COND	136
Ph	7.77	TURB	T

MORPHOLOGY

FLD SIGNS								
BED MATERIAL Dominant	CO	Subdom	F					
D95 (cm)	35	D (cm)	35	Morph	R-P			
DISTURBANCE INDICATORS								
O1	B1	B2	B3	D1	D2	D3	C1	
C2	C3	C4	C5	S1	S2	S3	S4	S5
PATTERN	TM	ME	IM	IR	SI	ST		
ISLANDS	N	O	I	F	S	AN		
BARS	N	SIDE	DIAG	MID	SPAN	BR		
COUPLING	DC	PC	CO					
CONFINEMENT	EN	CO	FC	OC	UN	N/A		

COVER

COVER						Total	
Type	SWD	LWD	B	U	DP	OV	IV
AMT	D	SD	N	N	N	T	N
LOC	P	P				A	

CROWN CLOSURE	0%	1-20%	21-40%	41-70%	71-90%	<90%
	0	1	2	3	4	5

LWD FNC	N	F	A	DIST	C	E	INSTREAMVEG	N	A	M	V
LB SHP	U	V	S	O		RB SHP	U	V	S	O	
TEXTURE	F	G	C	B	R	A	TEXTURE	F	G	C	B R A
RIP VEG.	N	G	S	C	D	M W	RIP VEG.	N	G	S	C D M W
STAGE	INIT	SHR	PS	YF	MF NA	STAGE	INIT	SHR	PS	YF	MF NA

FEATURES

C	NID MAP #	NID #	TYPE	HT/LG	mtd	PHOTO			COMMENTS	UTM			mtd
		151	trib	un		R	F	267-2	Tributary	9	384372	6346271	GPS
						R	F						
						R	F						
						R	F						

HABITAT QUALITY

rearing = poor; little cover - stream morphology mainly riffle - opportunity for fish only at edges of mainstem and a sidechannel
spawning = none; no clean gravel
overwintering = good; during low water main channel might form good pools

FSZ

PHOTO DOCUMENTATION

ROLL #	PHOTO #	DIR	COMMENTS
DIG	237	X	Cross stream view from start of site.
DIG	238	U	Upstream view from start of site.
DIG	239	D	Downstream view from start of site.

WILDLIFE

GROUP	WILDLIFE OBSERVATIONS	GROUP	WILDLIFE OBSERVATIONS

COMMENTS

C		C	
	Stream class = S1		
	-stream has nice riffles but no pools		
	-one trib was located; shallow riffle - fish was caught on the edge of the		
	mainstem just upstream of the trib.		
	on trib at 0m makr on RB - hidden by riparian veg. (possible fish habitat)		

Photo 237. A cross stream view from the start of the site.

Photo 238. An upstream view from the start of the site.

Photo 239. A downstream view from the start of the site.

SITE CARD

WATERSHED CODE								
STREAM NAME (Gaz)	Mess Creek		(Local)	MC-11				
ILP MAP #		ILP #		NID MAP #		NID #		
REACH #		SITE #	MC-11	FIELD UTM	9	382882	6334287	SITE LG 100	ACCESS H
DATE	08/10/2008	TIME	1 1 4 5	AGENCY	Rescan	CREW	LT CS	FISH FORM Y N

CHANNEL	mtd							GRADIENT (%)
CHANNEL WIDTH (m)	GE	24.80	23.70	20.50	14.70	11.00	10.00	
WETTED WIDTH (m)	GE	5.80	6.80	6.20	9.00	3.50	4.60	
RES. POOL DEPTH (m)	GE	0.13	0.10	0.21				
Wb Dp (m)	1.5	STAGE	L	M	H	no vis ch	dry/int	

WATER			
EMS		REQ #	
TEMP	8	COND	114
Ph	8.5	TURB	C

MORPHOLOGY								
FLD SIGNS	alluvial deposits, ext. bars, mult. Cha							
BED MATERIAL Dominant	B	Subdom	C					
D95 (cm)	262	D (cm)	90	Morph	C-P			
DISTURBANCE INDICATORS	O1	B1	B2	B3	D1	D2	D3	C1
	C2	C3	C4	C5	S1	S2	S3	S4	S5
PATTERN	TM	ME	IM	IR	SI	ST		
ISLANDS	N	O	IM	F	S	AN		
BARS	N	SIDE	DIAG	MID	SPAN	BR		
COUPLING	DC	PC	CO					
CONFINEMENT	EN	CO	FC	OC	UN	N/A		

COVER	Total	M					
Type	SWD	LWD	B	U	DP	OV	IV
AMT	T	T	D	N	T	T	N
LOC	P	P	P	P	P	P	P

DW Tribs

CROWN CLOSURE	0%	1-20%	21-40%	41-70%	71-90%	<90%
	0	1	2	3	4	5

LWD FNC	N	F	A	DIST	C	E		
INSTREAMVEG	N	A	M	V				
LB SHP	U	V	S	O	RB SHP	U V S O		
TEXTURE	F G C B R A			TEXTURE	F G C B R A			
RIP VEG.	N G S C D M W			RIP VEG.	N G S C D M W			
STAGE	INIT SHR PS YF MF NA			STAGE	INIT SHR PS YF MF NA			

FEATURES

C	NID MAP #	NID #	TYPE	HT/LG	mtd	PHOTO		COMMENTS	UTM			mtd
			F	0.5	0.1	R	F	1st step in 15% stepped-bo d/s	9	382848	6334332	
						R	F					
						R	F					
						R	F					

HABITAT QUALITY

rearing habitat: fair
overwintering: poor
spawning: poor
Overall: marginal - rapid flows pocket water behind Bo and shallow 20 channels provide velocity refuge, otherwise too swift for rearing. Insect production - small aquatic mayfly nymphs noted. Area experiences debris input from steep slopes (avalanches) and from high runoff volumes (D = 0.09). Extensive Bo scour on banks. Gravels embedded in fines. No fish seen or caught. In 7005 upper Mess there was RB dound therefore S2.

FSZ

PHOTO DOCUMENTATION

ROLL #	PHOTO #	DIR	COMMENTS
DIG	08-10-03		small trib entering CG1 at RB approximately 0+ m
08/10	08-10-04	u/s	CG2 - 9% cascade-pool
08/10	08-10-05	u/s	CG2 - 9% cascade-pool
08/10	08-10-06		CG1

WILDLIFE

GROUP	WILDLIFE OBSERVATIONS	GROUP	WILDLIFE OBSERVATIONS
	moose observed in area		

COMMENTS

C		C	
	stream class = S2		

Photo 08-10-3. A small tributary entering CG1 at RB approximately 0m.

Photo 08-10-4. An upstream view of CG2 (9% gradient cascade-pool).

Photo 08-10-5. An upstream view of CG2 (9% gradient cascade-pool).

Photo 08-10-6. An upstream view of CG1.

SITE CARD

WATERSHED CODE								
STREAM NAME (Gaz)	Schaft Creek			(Local)				
ILP MAP #		ILP #		NID MAP #		NID #	121	
REACH #		SITE #	SC-3	FIELD UTM	9	375759	6366754	SITE LG 200 MT; ACCESS H
DATE	06/28/2008	TIME	1400	AGENCY	Rescan	CREW	DF SL	FISH FORM Y N

CHANNEL	mtd							GRADIENT (%)	
CHANNEL WIDTH (m)	GE	136.20	150.00	183.80	208.50	208.50	182.90		
WETTED WIDTH (m)	GE	74.00	66.80	97.80	106.10	96.90	45.70	2	CL
RES. POOL DEPTH (m)	GE							3	CL
Wb Dp (m)		STAGE	L	M	H	no vis ch	dry/int		

WATER			
EMS		REQ #	
TEMP	10.5	COND	7.5
Ph	8.18	TURB	T

COVER								
COVER	Total	T	DW	Tribs				
Type	SWD	LWD	B	U	DP	OV	IV	
AMT	SD	D						
LOC	S	S						
LWD FNC	N	F	A	DIST	C	E		
INSTREAMVEG	N	A	M	V				
LB SHP	U	V	S	O				
RB SHP	U	V	S	O				
TEXTURE (LB)	F	G	C	B	R	A		
TEXTURE (RB)	F	G	C	B	R	A		
RIP VEG. (LB)	N	G	S	C	D	M	W	
RIP VEG. (RB)	N	G	S	C	D	M	W	
STAGE (LB)	INIT	SHR	PS	YF	MF	NA		
STAGE (RB)	INIT	SHR	PS	YF	MF	NA		

CROWN CLOSURE	0%	1-20%	21-40%	41-70%	71-90%	<90%
	0	1	2	3	4	5

MORPHOLOGY								
FLD SIGNS	eroded banks							
BED MATERIAL Dominant	CO	Subdom	F					
D95 (cm)	35	D (cm)	35	Morph	R-P			
DISTURBANCE INDICATORS	O1	B1	B2	B3	D1	D2	D3	C1
	C2	C3	C4	C5	S1	S2	S3	S4 S5
PATTERN	TM	ME	IM	IR	SI	ST		
ISLANDS	N	O	IM	F	S	AN		
BARS	N	SIDE	DIAG	MID	SPAN	BR		
COUPLING	DC	PC	CO					
CONFINEMENT	EN	CO	FC	OC	UN	N/A		

FEATURES C	NID MAP #	NID #	TYPE	HT/LG	mtd	PHOTO		COMMENTS	UTM	mtd
						R	F			
						R	F			
						R	F			
						R	F			

HABITAT QUALITY
rearing habitat: poor - extensive riffle habitat in sidechannels with few micro-habitats. No overhanging vegetation.
occasional SWD/LWD to offer refuge
spawning habitat = poor - some gravel patches but silty water deposits fines on most
overwintering = fair - deeper channel would pool up in the winter offering refuge but no predominant pools

FSZ

PHOTO DOCUMENTATION ROLL #	PHOTO #	DIR	COMMENTS
DIG	212	X	Cross stream view from start of site.
DIG	213	D	Downstream view from start of site.
DIG	214	U	Upstream view from start of site.

WILDLIFE GROUP	WILDLIFE OBSERVATIONS	GROUP	WILDLIFE OBSERVATIONS

COMMENTS C		C	
	Stream class = S5		
	this section has several side channels; however the channels		
	do not offer good habitat-they extensive riffles and are quite		
	shallow (0.40 m)		

Photo 212. A cross stream view from the start of the site.

Photo 213. A downstream view from the start of the site.

Photo 214. An upstream view from the start of the site.

SITE CARD

WATERSHED CODE								
STREAM NAME (Gaz)	Schaft Creek		(Local)	SC-3				
ILP MAP #		ILP #		NID MAP #		NID #		
REACH #		SITE #	SC-3	FIELD UTM	9	375673	6366778	SITE LG 100 / ACCESS H
DATE	08/07/2008	TIME	0830	AGENCY	Rescan	CREW	LT TS	FISH FORM Y N

CHANNEL	mtd							GRADIENT (%)
CHANNEL WIDTH (m)	GE	8.30	5.70	7.20	10.30	7.30	9.20	
WETTED WIDTH (m)	GE	6.00	5.40	6.60	7.30	5.30	7.10	
RES. POOL DEPTH (m)	GE	0.20	0.18					

Wb Dp (m) 0.7 0.7 0.6 STAGE **L** M H no vis ch dry/int

WATER			
EMS		REQ #	
TEMP	5	COND	34
Ph	8.31	TURB	T

FLD SIGNS: alluvial mat on banks

BED MATERIAL Dominant: F Subdom: G

D95 (cm): 10 D (cm): 12 Morph: R-Pg

COVER

Total: M — DW Tribs

Type	SWD	LWD	B	U	DP	OV	IV
AMT							
LOC							

CROWN CLOSURE: 0 (0%), **1** (1-20%), 2 (21-40%), 3 (41-70%), 4 (71-90%), 5 (<90%)

LWD FNC: N **F** A DIST C **E** INSTREAMVEG N A **M** **V**

	LB	RB
SHP	U V **S** O	U V **S** O
TEXTURE	**F** G C B R A	**F** G C B R A
RIP VEG.	N G S **C** D M W	N G **S** C D M W
STAGE	INIT SHR PS **YF** MF NA	INIT **SHR** PS YF MF NA

MORPHOLOGY

DISTURBANCE INDICATORS: O1 B1 **B2** B3 D1 D2 D3 **C1** **C2** C3 C4 C5 S1 S2 S3 S4 S5

PATTERN	TM ME IM **IR** SI ST
ISLANDS	N **O** IM F S AN
BARS	N SIDE DIAG **MID** SPAN BR
COUPLING	**DC** PC CO
CONFINEMENT	EN CO FC **OC** UN N/A

FEATURES

C	NID MAP #	NID #	TYPE	HT/LG	mtd	PHOTO		COMMENTS	UTM			mtd
						R	F					
						R	F					
						R	F					
						R	F					

HABITAT QUALITY

Velocity refuge in some areas

rearing: fair - as majority of flows through channel too swift for rearing.

overwintering: fair -

spawning: fair -

Overall habitat availability considered marginal - low refuge, high clay content, gravels embedded in fines. Main cover provided by OV.

Above 60m, channel narrows and deepens, some pool habitat here and fair for rearing.

FSZ

PHOTO DOCUMENTATION

ROLL #	PHOTO #	DIR	COMMENTS

WILDLIFE

GROUP	WILDLIFE OBSERVATIONS	GROUP	WILDLIFE OBSERVATIONS
	grizzly, black bear and moose tracks		

COMMENTS

C		C	

SITE CARD

WATERSHED CODE								
STREAM NAME (Gaz)	Schaft Creek		(Local)					
ILP MAP #		ILP #		NID MAP #		NID #	119	
REACH #		SITE #	SC-5	FIELD UTM	9	384244	6392563	SITE LG 200 MT / ACCESS H
DATE	06/28/2008	TIME	1 0 0 8	AGENCY	Rescan	CREW	DF LS	FISH FORM Y N

CHANNEL	mtd							GRADIENT (%)	
CHANNEL WIDTH (m)	GE	251.50	245.06	167.34	111.56	110.60	108.80		
WETTED WIDTH (m)	GE	288.90	283.50	190.20	171.00	157.28	108.81	3	CL
RES. POOL DEPTH (m)	GE								
Wb Dp (m)		STAGE	L	M	H	no vis ch	dry/int		

WATER					
EMS			REQ #		
TEMP	10.9	T4	COND	64	S3
Ph	8.2	P1	TURB		

COVER	Total	T	DW	Tribs			
Type	SWD	LWD	B	U	DP	OV	IV
AMT	SD	D	N	N	N	T	N
LOC	A	A					

CROWN CLOSURE					
0%	1-20%	21-40%	41-70%	71-90%	<90%
0	1	2	3	4	5

LWD FNC	N **F** A	DIST C **E**
INSTREAMVEG	**N** A M V	
LB SHP	U V **S** O	RB SHP U V **S** O
TEXTURE	F G **C B** R A	TEXTURE F G **C B** R A
RIP VEG.	N G S C **D** M W	RIP VEG. N G S C **D** M W
STAGE	INIT SHR PS YF **MF** NA	STAGE INIT SHR PS YF **MF** NA

MORPHOLOGY								
FLD SIGNS								
BED MATERIAL Dominant	Cb	Subdom	Gr					
D95 (cm)	60	D (cm)	60	Morph	R-P			
DISTURBANCE INDICATORS	O1	**B1**	**B2**	B3	D1	**D2**	D3	C1
	C2	**C3**	**C4**	C5	S1	S2	S3	S4 S5
PATTERN	TM	ME	IM	IR	SI	ST		
ISLANDS	N	O	**I**	F	S	AN		
BARS	**N**	SIDE	DIAG	MID	SPAN	BR		
COUPLING	**DC**	PC	CO					
CONFINEMENT	EN	CO	FC	OC	**UN**	N/A		

FEATURES

C	NID MAP #	NID #	TYPE	HT/LG	mtd	PHOTO		COMMENTS	UTM		mtd
						R	F				
						R	F				
						R	F				
						R	F				

HABITAT QUALITY

rearing habitat = poor - few microhabitats offering cover for fish from mainstem
spawning habitat = poor - infrequent gravel; lots of sediment
overwintering = fair; potential winter holding areas, pockets of deep water
overall habitat = marginal; similar (homogenous habitat with no distinct features

FSZ

PHOTO DOCUMENTATION

ROLL #	PHOTO #	DIR	COMMENTS
DIG	175	D	Downstream view of mainstem.
DIG	176	X	Cross stream view of mainstem.
DIG	206		Aerial view of site.

WILDLIFE

GROUP	WILDLIFE OBSERVATIONS	GROUP	WILDLIFE OBSERVATIONS

COMMENTS

C		C	
	stream class = S1		
	glacial fed stream		
	many cobble bars and some vegetated islands		
	primarily riffle habitat		
	deciduous riparian vegetation on both banks		

Photo 175. A downstream view of the mainstem.

Photo 176. A cross stream view of the mainstem.

Photo 206. An aerial view of the site.

SITE CARD

WATERSHED CODE			
STREAM NAME (Gaz)	Schaft Creek	(Local)	SC-5
ILP MAP #		ILP #	
NID MAP #		NID #	
REACH #		SITE #	SC-5
FIELD UTM	9 384079 6392612	SITE LG	200
ACCESS	H	DATE	08/07/2008
TIME	0900	AGENCY	Rescan
CREW	LT CS	FISH FORM	Y N

CHANNEL	mtd		GRADIENT (%)	
CHANNEL WIDTH (m)	GE	180.00		
WETTED WIDTH (m)	GE	90.00	<1	Cl
RES. POOL DEPTH (m)	GE	0.28		
Wb Dp (m)	1	STAGE: L M H no vis ch dry/int		

WATER			
EMS		REQ #	
TEMP	5	COND	57
Ph	8	TURB	T

MORPHOLOGY							
FLD SIGNS							
BED MATERIAL Dominant	C	Subdom	G				
D95 (cm)	26.5	D (cm)	26.5	Morph	R-Pg		
DISTURBANCE INDICATORS	O1 B1 B2 B3 D1 D2 D3 C1 C2 C3 C4 C5 S1 S2 S3 S4 S5						
PATTERN	TM ME IM IR SI ST						
ISLANDS	N O IM F S AN						
BARS	N SIDE DIAG MID SPAN BR						
COUPLING	DC PC CO						
CONFINEMENT	EN CO FC OC UN N/A						

COVER							
Type	SWD	LWD	B	U	DP	OV	IV
AMT	D	D	T	T	T	S	T
LOC	P	P	P	P	P	P	P

Total: DW Tribs

CROWN CLOSURE: 0% 1-20% 21-40% 41-70% 71-90% <90% — 0 1 2 3 4 5

LWD FNC: N F A — DIST: C E — INSTREAMVEG: N A M V

	LB	RB
SHP	U V S O	U V S O
TEXTURE	F G C B R A	F G C B R A
RIP VEG.	N G S C D M W	N G S C D M W
STAGE	INIT SHR PS YF MF NA	INIT SHR PS YF MF NA

FEATURES

C	NID MAP #	NID #	TYPE	HT/LG	mtd	PHOTO		COMMENTS	UTM			mtd
						R	F	damned pool approx. 160m sq.	9	384091	6392596	
						R	F					
						R	F					
						R	F					

HABITAT QUALITY

Rearing: infrequent along reach associated with debris accumulation along banks and point bars. Fish activity is high in these locations indicated while EF'ing these sites - many fish seen, not as many captured. Water very turbid. Sand bars with C and Gr, in-water coarser materials. Gr and smaller C good for spawning.

overwintering = fair (Bo and Co), spawn = good, rearing = fair

overall = important

FSZ

PHOTO DOCUMENTATION

ROLL #	PHOTO #	DIR	COMMENTS
DIG	1	d/s	damned pool actually just slow water - shallow plunge pool (0.3m) and lat. Scour pool in background next to SWD (0.3m) s
DIG	2	d/s	u/s view of main flow near LB
DIG	3	d/s	d/s view of main flow near LB
DIG	4	d/s	view from MC island of RB at 0+100m
DIG	5		From 100 m to 200 m along sample reach

WILDLIFE

GROUP	WILDLIFE OBSERVATIONS	GROUP	WILDLIFE OBSERVATIONS

COMMENTS

C		C	

Photo 1. Dammed pool was actually just slow water - shallow plunge pool (0.3

m) and scour pool in background next to SWD.

Photo 2. An upstream view of the main flow near the left bank.

Photo 3. A downstream view of the main flow near the left bank.

Photo 4. A view from the main channel island of right bank at 0 to 100 m.

Photo 5. A view from 100m to 200m mark of the site.

SITE CARD

WATERSHED CODE											
STREAM NAME (Gaz)	Skeeter Creek			(Local)							
ILP MAP #		ILP #		NID MAP #		NID #					
REACH #		SITE #	SKC-1	FIELD UTM	9	382609	6365353	SITE LG	200	MT	ACCESS H
DATE	06/26/2008			TIME	1503	AGENCY	Rescan	CREW	DF	SL	FISH FORM Y N

CHANNEL	mtd									GRADIENT (%)	
CHANNEL WIDTH (m)	GE	24.30	6.10	6.50	5.70	4.40	4.70				
WETTED WIDTH (m)	GE	5.90	2.05	3.10	5.40	3.80	3.10			3	Cl
RES. POOL DEPTH (m)	GE	0.20	0.10	0.00	0.35	0.30				3	Cl

Wb Dp (m) 0.4 0.6 0.8 MT | STAGE L **M** H | no vis ch | dry/int | DW | Tribs

WATER					
EMS			REQ #		
TEMP	8.4	T4	COND	144	S3
Ph	7.91	P1	TURB	C	

COVER								Total
Type	SWD	LWD	B	U	DP	OV	IV	
AMT	T	T	N	D	T	SD	T	
LOC	P	P		P	P	P	P	

LWD FNC N **F** A | DIST C **E** | INSTREAMVEG N A M V

CROWN CLOSURE: 0% 0 | 1-20% **1** | 21-40% 2 | 41-70% 3 | 71-90% 4 | <90% 5

LB SHP	U	V	**S**	O		RB SHP	**U**	V	S	O			
TEXTURE	F	**G**	**C**	B	R	A	TEXTURE	F	**G**	**C**	B	R	A
RIP VEG.	N	G	**S**	C	D	M	W	RIP VEG.	N	G	**S**	C	D M W
STAGE	INIT	**SHR**	PS	YF	MF	NA	STAGE	INIT	**SHR**	PS	YF	MF	NA

MORPHOLOGY									
FLD SIGNS	gravel bars								
BED MATERIAL Dominant	CO	Subdom	Gr						
D95 (cm)	17	D (cm)	17	Morph	R-P				
DISTURBANCE INDICATORS									
	O1	B1	**B2**	B3	D1	D2	D3	C1	
	C2	**C3**	**C4**	C5	S1	S2	S3	**S4**	S5
PATTERN	TM	ME	IM	IR	**SI**	ST			
ISLANDS	**N**	O	IM	F	S	AN			
BARS	N	SIDE	DIAG	MID	SPAN	**BR**			
COUPLING	**DC**	PC	CO						
CONFINEMENT	EN	CO	FC	OC	**UN**	N/A			

FEATURES C	NID MAP #	NID #	TYPE	HT/LG	mtd	PHOTO		COMMENTS	UTM			mtd
						R	F					
						R	F					
						R	F					
						R	F					

HABITAT QUALITY
rearing habitat: fair - undercut banks and overhanging vegetation provide cover; not a lot of slow moving water.
spawning habitat: good - gravel present
overwintering habitat: poor; no deep pools
overall habitat: important - good diversity of riffle-pool habitat/gravel for spawning

FSZ

ROLL #	PHOTO #	DIR	COMMENTS
DIG	100		braided channel flowing into Start Lake.
DIG	101		steeper section - cascade; highly eroded.
DIG	84	U	Start of site looking upstream.
DIG	85	D	Downstream view of site.
DIG	103		Aerial view of site looking upstream.

GROUP	WILDLIFE OBSERVATIONS	GROUP	WILDLIFE OBSERVATIONS

C	COMMENTS	C	
	Stream class = S3		
	eroding cobble banks (unstable at site)		
	stream fans at mouth		
	good access for fish from mouth		

Photo 84. An upstream view at the start of the site.

Photo 85. A downstream view at the start of the site.

Photo 100. A downstream view of a braided channel section flowing into Start Lake.

Photo 101. Upstream view of a steep cascade section with highly eroded banks.

Photo 103. An aerial view looking upstream.

SITE CARD

WATERSHED CODE							
STREAM NAME (Gaz)	Skeeter Creek		(Local)	SKC-1			
ILP MAP #		ILP #		NID MAP #		NID #	
REACH #		SITE #	SKC-1	FIELD UTM	9	382598	6365361
SITE LG	100		ACCESS	H			
DATE	08/08/2008	TIME	1 4 4 5	AGENCY	Rescan	CREW	LT CS
FISH FORM	**Y**	N					

CHANNEL

CHANNEL	mtd									GRADIENT (%)	
CHANNEL WIDTH (m)	GE	9.00	13.80	7.00	9.60	3.70	6.60				
WETTED WIDTH (m)	GE	3.50	3.80	4.10	3.80	3.70	3.60			2	Cl
RES. POOL DEPTH (m)	GE	0.34	0.10							3	Cl
Wb Dp (m)	0.46 0.35 0.6	STAGE	L	M	H	no vis ch	dry/int				

WATER

EMS	124	REQ #	
TEMP	9	COND	124
Ph	8	TURB	T

MORPHOLOGY

FLD SIGNS	fluvial materials in rif. Area							
BED MATERIAL Dominant	C	Subdom	F					
D95 (cm)	0.2	D (cm)	0.2	Morph	R-Pg			
DISTURBANCE INDICATORS								
O1	B1	**B2**	B3	D1	**D2**	D3	**C1**	
C2	C3	**C4**	**C5**	**S1**	S2	S3	S4	S5
PATTERN	TM	ME	**IM**	IR	SI	ST		
ISLANDS	**N**	O	IM	F	S	AN		
BARS	N	**SIDE**	DIAG	MID	SPAN	BR		
COUPLING	**DC**	PC	CO					
CONFINEMENT	EN	CO	FC	**OC**	UN	N/A		

COVER

COVER	Total	T					
Type	SWD	LWD	B	U	DP	OV	IV
AMT	T	T	D	T	T	T	N
LOC	P	P	P	P	P	P	P

DW	Tribs					
CROWN CLOSURE	0%	1-20%	21-40%	41-70%	71-90%	<90%
	0	1	2	3	4	5

LWD FNC	N	**F**	A	DIST	C	**E**	
INSTREAMVEG	**N**	A	M	V			
LB SHP	U	V	**S**	O			
TEXTURE	F	**G**	**C**	B	R	A	
RIP VEG.	N	**G**	**S**	C	D	M	W
STAGE	INIT	**SHR**	PS	YF	MF	NA	
RB SHP	U	V	**S**	O			
TEXTURE	F	**G**	**C**	B	R	A	
RIP VEG.	N	**G**	**S**	C	D	M	W
STAGE	INIT	**SHR**	PS	YF	MF	NA	

FEATURES

C	NID MAP #	NID #	TYPE	HT/LG	mtd	PHOTO		COMMENTS	UTM			mtd
						R	F					
						R	F					
						R	F					
						R	F					

HABITAT QUALITY

Habitat along this reach is marginal. Bank degradation has led to uniform habitat, swift water with out sufficient bank stab and intream structures to create velocity refuge for fish. Majority of habitat edgewater and back-eddies

Overwintering habitat: poor

Rearing habitat: poor

Spawning habitat: poor

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PHOTO DOCUMENTATIO

ROLL #	PHOTO #	DIR	COMMENTS
DIG	08-08-01	u/s	CG1 u/s view run
	08-08-02	u/s	CG2 u/s view riffle
	08-08-03	u/s	CG3 u/s view run
	08-08-04	u/s	d/s view of RB instability along CG3

WILDLIFE

GROUP	WILDLIFE OBSERVATIONS	GROUP	WILDLIFE OBSERVATIONS

COMMENTS

C		C	
	Stream class = S2		

Photo 08-08-1. An upstream CG1 view of a run.

Photo 08-08-2. An upstream CG2 view of a riffle.

Photo 08-08-3. An upstream CG3 view of a run.

Photo 08-08-4. A downstream view of RB instability along CG3.

SITE CARD

WATERSHED CODE									
STREAM NAME (Gaz)	Skeeter Creek		(Local)						
ILP MAP #		ILP #		NID MAP #		NID #	1011		
REACH #		SITE #	SKC-2	FIELD UTM	9	381656	6374217	SITE LG	200 MT
ACCESS	H								
DATE	06/27/2008	TIME	1450	AGENCY	Rescan	CREW	DF SL	FISH FORM	**Y** N

CHANNEL	mtd							GRADIENT (%)	
CHANNEL WIDTH (m)	GE	4.20	6.30	5.50	6.40	7.30	5.60		
WETTED WIDTH (m)	GE	4.00	6.40	5.20	6.20	7.00	5.40	1	VE
RES. POOL DEPTH (m)	GE							1	VE
Wb Dp (m)	1.2 0.9 1.25	STAGE	L	**M**	H	no vis ch	dry/int		

WATER			
EMS		REQ #	
TEMP		COND	
Ph		TURB	

MORPHOLOGY									
FLD SIGNS									
BED MATERIAL Dominant		Subdom							
D95 (cm)		D (cm)		Morph					
DISTURBANCE INDICATORS									
O1	B1	B2	B3	D1	D2	D3	C1		
C2	C3	C4	C5	S1	S2	S3	S4	S5	
PATTERN	TM	**ME**	IM	IR	SI	ST			
ISLANDS	**N**	O	IM	F	S	AN			
BARS	**N**	SIDE	DIAG	MID	SPAN	BR			
COUPLING	**DC**	PC	CO						
CONFINEMENT	EN	CO	FC	OC	**UN**	N/A			

COVER								
COVER	Total	MF	DW	Tribs				
Type	SWD	LWD	B	U	DP	OV	IV	
AMT	SD	SD	N	D	N	T	N	
LOC	P	P	P	P	P	P	P	
LWD FNC	N	F	A	DIST	C	E		

CROWN CLOSURE					
0%	1-20%	21-40%	41-70%	71-90%	<90%
0	1	2	3	4	5

INSTREAMVEG	N	A	M	V

LB SHP	**U**	V	S	O				
TEXTURE	**F**	G	C	B	R	A		
RIP VEG.	N	G	**S**	C	D	M	W	
STAGE	INIT	**SHR**	PS	YF	MF	NA		
RB SHP	**U**	V	S	O				
TEXTURE	**F**	G	C	B	R	A		
RIP VEG.	N	G	**S**	C	D	M	W	
STAGE	INIT	**SHR**	PS	YF	MF	NA		

FEATURES

C	NID MAP #	NID #	TYPE	HT/LG	mtd	PHOTO			COMMENTS	UTM			mtd
		1012	BD	0.2/0.5	VE	R	DIG	F 159	2 small BDs	9	381714	6374200	GP3
						R		F					
						R		F					
						R		F					

HABITAT QUALITY

rearing: fair - deep channel with undercut banks but lacks riffle habitat for feeding

spawning: poor - substrate mainly fines with few isolated pockets of gravel

overwintering: poor - deep channel but no defined pools

FSZ

PHOTO DOCUMENTATION

ROLL #	PHOTO #	DIR	COMMENTS
DIG	164	U	Upstream view of site.
DIG	159		View of beaver dam.
DIG	173		Aerial view of site.

WILDLIFE

GROUP	WILDLIFE OBSERVATIONS	GROUP	WILDLIFE OBSERVATIONS

COMMENTS

C		C	
	Stream class = S5		
	fairly large and deep channel but lacks riffle habitat - all glide		
	habitat		

Photo 164. An upstream view of the site.

Photo 159. A view of a beaver dam.

Photo 173. An aerial view of the site.

SITE CARD

WATERSHED CODE									
STREAM NAME (Gaz)		(Local)							
ILP MAP #		ILP #		NID MAP #		NID #			
REACH #	1	SITE #	SKC-3	FIELD UTM	9	382557	6368872	SITE LG	200 MT
ACCESS	H								
DATE	2008/0626	TIME	1050	AGENCY	Rescan	CREW	DF SL	FISH FORM	Y N

CHANNEL	mtd							GRADIENT (%)
CHANNEL WIDTH (m)	GE	8.00	2.70	2.30	2.20	1.50	1.80	
WETTED WIDTH (m)	GE	3.00	2.50	2.20	2.00	1.00	1.60	
RES. POOL DEPTH (m)	GE	0.05	0.37	0.20	0.20	0.10		
Wb Dp (m)	0.16 0.35 0.6	STAGE	L	M	H	no vis ch	dry/int	

WATER			
EMS		REQ #	
TEMP		COND	
Ph		TURB	

FLD SIGNS: none

COVER

COVER	Total	M				
Type	SWD	LWD	B	U	DP	OV	IV
AMT	T	T	T	SD	N	D	N
LOC	P	P	P	P	P	P	P

LWD FNC: N **F** A — DIST: **C** E — INSTREAMVEG: N A M V

CROWN CLOSURE: DW Tribs

0%	1-20%	21-40%	41-70%	71-90%	<90%
0	**1**	2	3	4	5

LB SHP	**U** V S O	RB SHP	**U** V S O
TEXTURE	**F** **G** C B R A	TEXTURE	**F** **G** C B R A
RIP VEG.	N G **S** C D M W	RIP VEG.	N G **S** C D M W
STAGE	INIT **SHR** PS YF MF NA	STAGE	INIT **SHR** PS YF MF NA

MORPHOLOGY

BED MATERIAL Dominant	G	Subdom	F		
D95 (cm)	50	D (cm)	20	Morph	

DISTURBANCE INDICATORS: O1 B1 B2 B3 D1 D2 D3 C1 C2 C3 C4 C5 S1 S2 S3 S4 S5

PATTERN	TM ME **IM** IR SI ST
ISLANDS	**N** O IM F S AN
BARS	**N** SIDE DIAG MID SPAN BR
COUPLING	**DC** PC CO
CONFINEMENT	EN CO FC OC **UN** N/A

FEATURES

C	NID MAP #	NID #	TYPE	HT/LG	mtd	PHOTO		COMMENTS	UTM		mtd
						R	F				
						R	F				
						R	F				
						R	F				

HABITAT QUALITY

rearing habitat: fair = good undercut cover but no deep pools
overwinter: poor = shallow pools
spawning: fair = infrequent gravel patches
overall: important - habitat offers good cover for the rearing of fish but lacks pools; has some good gravel patches

FSZ

PHOTO DOCUMENTATION

ROLL #	PHOTO #	DIR	COMMENTS
DIG	73		Minnow trap #1.
DIG	76		A nice glide.
DIG	78		Downstream view of site.
DIG	79		Glide habitat with overhanging vegetation.

WILDLIFE

GROUP	WILDLIFE OBSERVATIONS	GROUP	WILDLIFE OBSERVATIONS

COMMENTS

C		C	
	stream class = S6		

Photo 73. A Minnow trap baited and set.

Photo 76. A downstream view of a nice glide.

Photo 78. A downstream view of the site with overhanging vegetation.

Photo 79. Glide habitat with overhanging vegetation.

SITE CARD

WATERSHED CODE								
STREAM NAME (Gaz)	Skeeter Creek			(Local)	SKC-3			
ILP MAP #		ILP #		NID MAP #		NID #		
REACH #		SITE #	SKC-3	FIELD UTM	9	382579	6369027	SITE LG 117 / ACCESS H
DATE	08/08/2008	TIME	1 1 3 2	AGENCY	Rescan	CREW	LT CS	FISH FORM **Y** N

CHANNEL	mtd							GRADIENT (%)		
CHANNEL WIDTH (m)	GE	1.20	1.20	2.20	2.10	2.70	3.40			
WETTED WIDTH (m)	GE	1.60	1.40	2.10	2.20	2.20	2.10	2		Cl
RES. POOL DEPTH (m)	GE	0.11	0.31	0.22				1		Cl
Wb Dp (m)	0.22	STAGE	**L**	M	H	no vis ch	dry/int			

WATER				
EMS			REQ #	
TEMP	8		COND	120
Ph	8		TURB	C

COVER	Total	M	DW	Tribs			
Type	SWD	LWD	B	U	DP	OV	IV
AMT	T	T	T	D	T	S	T
LOC	P	P	P	P	P	P	P

CROWN CLOSURE	0%	1-20%	21-40%	41-70%	71-90%	<90%
	0	**1**	2	3	4	5

LWD FNC	N	**F**	A	DIST	C	**E**	INSTREAMVEG	N	A	**M** V
LB SHP	U V **S** O						RB SHP	U V **S** O		
TEXTURE	**F** G C B R A						TEXTURE	**F** G C B R A		
RIP VEG.	N G **S** **C** D M W						RIP VEG.	N G **S** **C** D M W		
STAGE	INIT SHR PS YF **MF** NA						STAGE	INIT SHR PS YF **MF** NA		

MORPHOLOGY								
FLD SIGNS								
BED MATERIAL Dominant	G	Subdom	F					
D95 (cm)	1	D (cm)	29	Morph	R-Pg			
DISTURBANCE INDICATORS								
O1	B1	B2	B3	D1	D2	D3	C1	
C2	C3	C4	C5	S1	S2	S3	S4	S5
PATTERN	TM	ME	IM	IR	**SI**	ST		
ISLANDS	**N**	O	IM	F	S	AN		
BARS	N	**SIDE**	DIAG	MID	SPAN	BR		
COUPLING	**DC**	PC	CO					
CONFINEMENT	EN	CO	**FC**	OC	UN	N/A		

FEATURES

C	NID MAP #	NID #	TYPE	HT/LG	mtd	PHOTO		COMMENTS	UTM			mtd
						R	F					
						R	F					
						R	F					
						R	F					

HABITAT QUALITY

If fish present, this stream would provide critical habitat for spawning and early rearing. Abundant clean gravels and u/c bank.

All habitat (OW, R, S) is good for trout.

FSZ

PHOTO DOCUMENTATION

ROLL #	PHOTO #	DIR	COMMENTS
DIG	10		Upstream view of site.
DIG	9		Downstream view of site.

WILDLIFE

GROUP	WILDLIFE OBSERVATIONS	GROUP	WILDLIFE OBSERVATIONS

COMMENTS

C		C	
	Stream class = S3		
	No fish caught while EF-ing this site.		

Photo 10. A upstream view of the site.

Photo 9. A downstream view of the site.

SITE CARD

WATERSHED CODE					
STREAM NAME (Gaz)	Skeeter Creek	(Local)			
ILP MAP #		ILP #		NID MAP #	NID # 1005
REACH #		SITE # SKC-4	FIELD UTM 9 381349 6375298	SITE LG 100 GE	ACCESS H
DATE	06/27/2008	TIME 0730	AGENCY Rescan	CREW DF SL	FISH FORM Y N

CHANNEL	mtd	GRADIENT (%)
CHANNEL WIDTH (m)	GE	
WETTED WIDTH (m)	GE	
RES. POOL DEPTH (m)	GE	
Wb Dp (m)		STAGE L M H no vis ch dry/int DW Tribs

WATER

EMS			REQ #		
TEMP	10.2	T4	COND	170	S3
Ph	8.32	P1	TURB	C	

MORPHOLOGY

FLD SIGNS

BED MATERIAL Dominant | Subdom

D95 (cm) | D (cm) | Morph

DISTURBANCE INDICATORS: O1 B1 B2 B3 D1 D2 D3 C1 / C2 C3 C4 C5 S1 S2 S3 S4 S5

PATTERN: TM ME IM IR SI ST

ISLANDS: N O IM F S AN

BARS: N SIDE DIAG MID SPAN BR

COUPLING: DC PC CO

CONFINEMENT: EN CO FC OC UN N/A

COVER

COVER | Total

Type	SWD	LWD	B	U	DP	OV	IV
AMT							
LOC							

CROWN CLOSURE: 0% (0), 1-20% (1), 21-40% (2), 41-70% (3), 71-90% (4), <90% (5)

LWD FNC: N F A DIST C E

INSTREAMVEG: N A M V

LB SHP: U V S O | RB SHP: U V S O

TEXTURE: F G C B R A | TEXTURE: F G C B R A

RIP VEG.: N G S C D M W | RIP VEG.: N G S C D M W

STAGE: INIT SHR PS YF MF NA | STAGE: INIT SHR PS YF MF NA

FEATURES

C	NID MAP #	NID #	TYPE	HT/LG	mtd	PHOTO				COMMENTS	UTM			mtd
		1006	F	2/5	GE	GE	DIG	F	108	first falls	9	381674	6374902	GPS
		1007	F	15/20	GE	R	DIG	F	109	second falls	9	381590	6374992	GPS
		1008	F	35/30	GE	R	DIG	F	112	fish barrier	9	381613	6374997	GPS
		1009	F	45/30	GE	R	DIG	F	119	unpassable falls	9	381489	6375113	GPS

HABITAT QUALITY

upstream of gradient change stream is slow moving glide (SKC-2) - turns into cascade habitat with large fish barrier falls

stream is canyonized

did not do full survey of entire 1000m section

located fish barriers

FSZ

PHOTO DOCUMENTATIO

ROLL #	PHOTO #	DIR	COMMENTS
DIG	142		Cascade habitat looking downstream.
DIG	139		Cascade habitat looking upstream.
DIG	153		Aerial view of falls.

WILDLIFE

GROUP	WILDLIFE OBSERVATIONS	GROUP	WILDLIFE OBSERVATIONS

COMMENTS

C		C	

Photo 108. NID 1006; first set of falls.

Photo 109. NID 1007; second set of falls.

Photo 112. NID 1008.

Photo 119. NID 1009.

Photo 142. Cascade habitat looking downstream

Photo 139. Cascade habitat looking upstream

Photo 153. Aerial view of falls

SITE CARD

WATERSHED CODE								
STREAM NAME (Gaz)	Skeeter Creek	(Local)	SKC-4					
ILP MAP #		ILP #		NID MAP #		NID #		
REACH #		SITE #	SKC-4	FIELD UTM	9	381355	6375232	SITE LG 100	ACCESS H
DATE	08/07/2008	TIME	1 3 2 0	AGENCY	Rescan	CREW	LT CS	FISH FORM **Y** N

CHANNEL	mtd				GRADIENT (%)
CHANNEL WIDTH (m)	GE	4.60	4.10	4.90	6.10
WETTED WIDTH (m)	GE	2.20	3.70	4.70	5.30
RES. POOL DEPTH (m)	GE	0.13	0.25		
Wb Dp (m)	0.97 1.2 0.88	STAGE	**L** M H	no vis ch DW	dry/int Tribs

WATER			
EMS		REQ #	
TEMP	13.5	COND	194
Ph	8.4	TURB	C

MORPHOLOGY									
FLD SIGNS									
BED MATERIAL Dominant	B	Subdom	BR						
D95 (cm)		D (cm)	1.14	Morph	R-Pbc				
DISTURBANCE INDICATORS	O1	B1	B2	B3	D1	D2	D3	**C1**	
	C2	C3	C4	**C5**	S1	S2	S3	S4	S5
PATTERN	**TM**	ME	IM	IR	SI	ST			
ISLANDS	N	**O**	IM	F	S	AN			
BARS	**N**	SIDE	DIAG	MID	SPAN	BR			
COUPLING	DC	PC	**CO**						
CONFINEMENT	EN	**CO**	FC	OC	UN	N/A			

COVER	Total						
Type	SWD	LWD	B	U	DP	OV	IV
AMT	T	S	D	S	S	S	T
LOC	P	P	P	P	P	P	P

CROWN CLOSURE	0%	1-20%	21-40%	41-70%	71-90%	<90%
	0	**1**	2	3	4	5

LWD FNC: N **F** A — DIST: **C** E — INSTREAMVEG: **N** A M V

LB SHP	U	**V**	S	O						
TEXTURE	F	G	C	**B**	**R**	A				
RIP VEG.	N	G	**S**	**C**	D	M	W			
STAGE	INIT	SHR	PS	YF	**MF**	NA				
RB SHP	U	**V**	S	O						
TEXTURE	F	G	C	**B**	**R**	A				
RIP VEG.	N	G	**S**	**C**	D	M	W			
STAGE	INIT	SHR	PS	YF	**MF**	NA				

FEATURES

C	NID MAP #	NID #	TYPE	HT/LG	mtd	PHOTO				COMMENTS	UTM			mtd
						R		F	####	confluence pool 17% cascade				
						R		F						
						R		F						
						R		F						

HABITAT QUALITY

FSZ

PHOTO DOCUMENTATION

ROLL #	PHOTO #	DIR	COMMENTS
07/08	07-08-5		pool at confluence from RB - d/s
	07-08-7		u/s view cascade (17%) from 70-100m (actually longer)
	07-08-8		riffle section 20-80m (8%) u/s view

WILDLIFE

GROUP	WILDLIFE OBSERVATIONS	GROUP	WILDLIFE OBSERVATIONS

COMMENTS

C		C	

Photo 07-08-5. Downstream view of pool at confluence from RB.

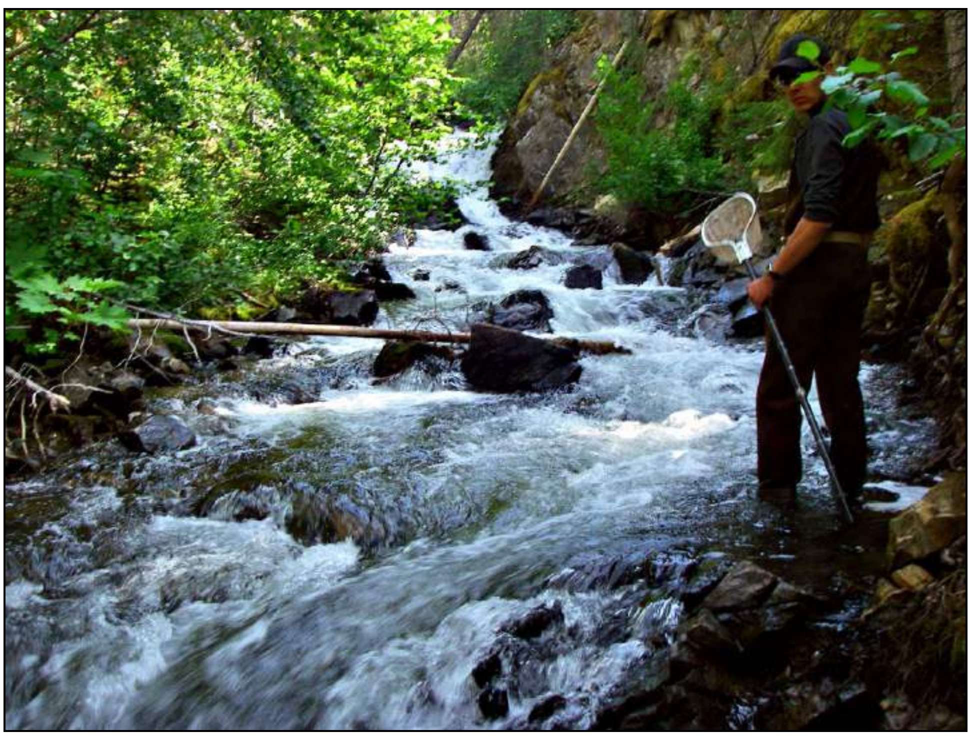

Photo 07-08-7. Upstream view of cascade (17%) from 70-100m (actually longer).

Photo 07-08-8. Upstream view of riffle section 20-80m (8%).

SITE CARD

WATERSHED CODE							
STREAM NAME (Gaz)	Walkout Creek			(Local)	WC-1		
ILP MAP #		ILP #		NID MAP #		NID #	
REACH #	1	SITE #	1	FIELD UTM	9	387709	6381774
SITE LG	200	GE	ACCESS	H			
DATE	07/05/2008	TIME	1 5 4 0	AGENCY	Rescan	CREW	KM DF
FISH FORM	Y	N					

CHANNEL

CHANNEL	mtd						
CHANNEL WIDTH (m)	GE	36.58	17.37	33.83	16.46	21.03	27.43
WETTED WIDTH (m)	GE	24.69	16.46	33.83	8.23	13.72	14.63
RES. POOL DEPTH (m)	GE						

GRADIENT (%)

Wb Dp (m): 1.3 1.5 GE | STAGE: L **M** H | no vis ch | dry/int | DW | Tribs

WATER

EMS			REQ #		
TEMP	7	T3	COND	40	S3
Ph	8	P2	TURB	M	GE
FLD SIGNS					

MORPHOLOGY

BED MATERIAL Dominant	B	Subdom	C		
D95 (cm)	40	D (cm)	35	Morph	CP

DISTURBANCE INDICATORS: **O1** **B1** **B2** B3 **D1** D2 D3 C1 C2 C3 C4 C5 S1 S2 S3 S4 S5

PATTERN: TM ME IM IR **SI** ST

ISLANDS: N O **I** F S AN

BARS: N **SIDE** **DIAG** **MID** SPAN BR

COUPLING: **DC** PC CO

CONFINEMENT: EN CO FC OC **UN** N/A

COVER

COVER Total: L

Type	SWD	LWD	B	U	DP	OV	IV
AMT	D	S	T	T	T	S	N
LOC	S	P/S	P	S	S	S	

CROWN CLOSURE: 0% (0), **1-20% (1)**, 21-40% (2), 41-70% (3), 71-90% (4), <90% (5)

LWD FNC: N **F** A | DIST: C **E** | INSTREAMVEG: **N** A M V

LB SHP	U **V** S O	RB SHP	U **V** S O
TEXTURE	F G **C** B R A	TEXTURE	**F** G **C** B R A
RIP VEG.	N G S C **D** M W	RIP VEG.	N G S C D **M** W
STAGE	INIT SHR PS YF **MF** NA	STAGE	INIT SHR PS YF **MF** NA

FEATURES

C	NID MAP #	NID #	TYPE	HT/LG	mtd	PHOTO		COMMENTS	UTM			mtd
						R	F					
						R	F					
						R	F					
						R	F					

HABITAT QUALITY

rearing habitat = mostly poor, fair in side channels

spawning habitat = mostly poor, maybe some in side channels, but could dry up at low water

overwintering = poor, no deep pools, low cover

FSZ

PHOTO DOCUMENTATION

ROLL #	PHOTO #	DIR	COMMENTS
DIG	1		Downstream view of site.
DIG	2		Upstream view of site.

WILDLIFE

GROUP	WILDLIFE OBSERVATIONS	GROUP	WILDLIFE OBSERVATIONS

COMMENTS

C		C	

Photo 1. A downstream view of the site.

Photo 2. A upstream view of the site.

Appendix 1-2

Receiving Environment Detailed Habitat Data

Appendix 1-2. Receiving Environment Detailed Habitat Data

				Downstream UTM		Upstream UTM		Water Quality									Depth (m)		Width (m)	
Station ID	Watershed	Survey Date	Survey Crew	Easting	Northing	Easting	Northing	Temp (°C)	pH	Turbidity	Cond. (µS/cm)	Stage	Habitat type	Dist from start (m)	Length (m)	Slope (%)	Wetted	Bankfull	Wetted	Bankfull
MC-10	Mess Creek	10-Aug-08	LT, TS	385392	6364597	385526	6364439	8.2	8.3	T	137	L	G	0	200	1.0	70.00	1.30	40.0	80.0
MC-11	Mess Creek	29-Jun-08	DF, SL	384376	6346228	384591	6345894	5.5	7.77	-	136	-	R	0	410	2.0	na	na	46.0	48.0
MC-11	Mess Creek	10-Aug-08	LT, TS	382882	6334287	382872	6334195	8	8.5	C	114	L	R	0	35	8.5	0.16	1.25	5.8	24.8
MC-11	Mess Creek	10-Aug-08	LT, TS	382882	6334287	382872	6334195	8	8.5	C	114	L	C	35	45	9.5	na	1.50	6.8	23.7
SC-3	Schaft Creek	28-Jun-08	DF, SL			375799	6366589	10.5	8.18	T	75	-	R	0	200	2.5	na	na	81.0	195.0
SC-3	Schaft Creek	09-Aug-08	LT, TS	375673	6366778	375663	6366670	5	8.31	T	34	L	G	0	20	1.0	0.20	0.70	6.0	8.3
SC-3	Schaft Creek	09-Aug-08	LT, TS	375673	6366778	375663	6366670	5	8.31	T	34	L	G	20	21	1.0	0.20	0.70	6.6	7.2
SC-3	Schaft Creek	09-Aug-08	LT, TS	375673	6366778	375663	6366670	5	8.31	T	34	L	G	41	7	1.0	0.18	0.68	7.1	10.4
SC-3	Schaft Creek	09-Aug-08	LT, TS	375673	6366778	375663	6366670	5	8.31	T	34	L	R	48	13	1.0	0.20	0.60	7.1	9.2
SC-3	Schaft Creek	09-Aug-08	LT, TS	375673	6366778	375663	6366670	5	8.31	T	34	L	G	61	39	2.0	0.64	0.61	2	2
SC-5	Schaft Creek	28-Jun-08	DF, SL	384244	6392563	384029	6392606	10.9	8.2	T	64	-	R	0	200	3.0	na	na	166.0	200.0
SC-5	Schaft Creek	07-Aug-08	LT, TS	384198	6392579	383932	6392659	5	8	T	57	L	R	0	100	0.5	0.24	1.00	260.0	280.0
SC-5	Schaft Creek	07-Aug-08	LT, TS	384198	6392579	383932	6392659	5	8	T	57	L	P	80	20	0.5	0.43	1.00	260.0	280.0
SC-5	Schaft Creek	07-Aug-08	LT, TS	384198	6392579	383932	6392659	5	8	T	57	L	P	100	16	0.5	0.40	1.00	260.0	280.0
SC-5	Schaft Creek	07-Aug-08	LT, TS	384198	6392579	383932	6392659	5	8	T	57	L	R	116	220	0.5	0.24	1.00	260.0	280.0
SC-6	Schaft Creek	07-Jul-08	KM, DF	378146	6360982			0	0	T	-	-	R	0	400	2.0	0.40	1.50	228.6	393.2
SC-6	Schaft Creek	09-Aug-08	LT, TS	387812	6361369	378203	6361173	10	8.36	T	46	L	G	0	200	1.0	0.15	na	7.6	na
SKC-1	Skeeter Creek	26-Jun-08	DF, SL	382614	6365344			8.4	7.91	C	144	-	R	0	87	3.0	0.32	0.55	2.4	3.2
SKC-1	Skeeter Creek	26-Jun-08	DF, SL	382614	6365344			8.4	7.91	C	144	-	C	87	60	5.0	0.35	0.70	3.1	4.7
SKC-1	Skeeter Creek	26-Jun-08	DF, SL	382614	6365344			8.4	7.91	C	144	-	R	147	50	3.0	0.23	0.50	3.7	6.0
SKC-1	Skeeter Creek	08-Aug-08	LT, TS	382598	6365361	382529	6365423	9	8	T	124	L	G	0	60	2.0	0.26	0.46	na	na
SKC-1	Skeeter Creek	08-Aug-08	LT, TS	382598	6365361	382529	6365423	9	8	T	124	L	R	60	11	3.0	0.16	0.35	5.3	7.3
SKC-1	Skeeter Creek	08-Aug-08	LT, TS	382598	6365361	382529	6365423	9	8	T	124	L	G	77	23	3.0	0.25	0.60	4.0	11.0
SKC-2	Skeeter Creek	27-Jun-08	DF, SL	381653	6374220	381657	6374153	13.1	8.01	C	177	-	G	0	200	1.0	1.00	1.30	4.6	4.8
SKC-2	Skeeter Creek	08-Aug-08	LT, TS	381710	6374195	381664	6374170	11.5	8	C	187	L	P	0	20	0.5	0.80	0.80	6.6	6.6
SKC-2	Skeeter Creek	08-Aug-08	LT, TS	381710	6374195	381664	6374170	11.5	8	C	187	L	G	20	80	0.5	1.20	1.25	5.1	5.1
SKC-3	Skeeter Creek	26-Jun-08	DF, SL	382576	6369021	382559	6368880	5.7	8.3	C	143	M	G	0	16	2.0	0.13	0.45	0.4	8.9
SKC-3	Skeeter Creek	26-Jun-08	DF, SL	382576	6369021	382559	6368880	5.7	8.3	C	143	M	G	16	24	2.0	0.25	0.40	2.2	2.3
SKC-3	Skeeter Creek	26-Jun-08	DF, SL	382576	6369021	382559	6368880	5.7	8.3	C	143	M	P	40	7.9	1.0	0.47	0.40	1.1	1.3
SKC-3	Skeeter Creek	26-Jun-08	DF, SL	382576	6369021	382559	6368880	5.7	8.3	C	143	M	G	47.9	180	3.0	0.17	0.50	2.1	2.3
SKC-3	Skeeter Creek	08-Aug-08	LT, TS	382579	6369027	382555	6368946	8	8	C	120	L	G	0	36	2.0	0.20	0.18	1.6	1.2
SKC-3	Skeeter Creek	08-Aug-08	LT, TS	382579	6369027	382555	6368946	8	8	C	120	L	G	36	7	2.0	0.16	0.26	1.5	1.2
SKC-3	Skeeter Creek	08-Aug-08	LT, TS	382579	6369027	382555	6368946	8	8	C	120	L	P	43	3	3.0	0.53	0.66	1.7	1.4
SKC-3	Skeeter Creek	08-Aug-08	LT, TS	382579	6369027	382555	6368946	8	8	C	120	L	G	46	10	1.0	0.21	0.31	2.5	2.4
SKC-3	Skeeter Creek	08-Aug-08	LT, TS	382579	6369027	382555	6368946	8	8	C	120	L	R	56	4	1.0	0.09	0.13	2.3	2.2
SKC-3	Skeeter Creek	08-Aug-08	LT, TS	382579	6369027	382555	6368946	8	8	C	120	L	G	60	17	1.0	0.26	0.33	1.9	1.7
SKC-3	Skeeter Creek	08-Aug-08	LT, TS	382579	6369027	382555	6368946	8	8	C	120	L	R	77	10	1.0	0.10	0.24	2.2	2.1
SKC-3	Skeeter Creek	08-Aug-08	LT, TS	382579	6369027	382555	6368946	8	8	C	120	L	G	87	3	1.0	0.21	0.30	2.2	2.7
SKC-3	Skeeter Creek	08-Aug-08	LT, TS	382579	6369027	382555	6368946	8	8	C	120	L	G	90	13	1.0	0.13	0.22	2.1	3.4
SKC-3	Skeeter Creek	08-Aug-08	LT, TS	382579	6369027	382555	6368946	8	8	C	120	L	R	103	14	1.0	0.06	0.12	3.4	3.8
SKC-4	Skeeter Creek	27-Jun-08	DF, SL	381316	6375322	381349	6375298	10.2	8.32	C	170	-	C	0	50	6.0	0.55	1.50	4.5	5.0
SKC-4	Skeeter Creek	27-Jun-08	DF, SL	381316	6375322	381349	6375298	10.2	8.32	C	170	-	G	50	30	0.0	1.00	1.50	15.0	16.0
WC-1	Walkout Creek	05-Jul-08	KM, DF	387709	6381774			7	8	M	40	-	C	0	200	4.0	0.80	1.30	16.5	17.4
WC-1	Walkout Creek	10-Aug-08	LT, TS	387801	6381800	387902	6381803	10	8.3	C	56	L	R	0	100	2.0	0.30	1.10	na	16.3

(continued)

Appendix 1-2. Receiving Environment Detailed Habitat Data (completed)

	Substrate Composition (%)					Pools			Barrier		Bank Height (m)		Bank Stability		Cover (%)							Canopy Cover (%)		
Station ID	Sand	Gravel	Cobble	Boulder	Bedrock	Type	Max Depth (m)	Crest Depth (m)	Type	T/P	Left	Right	Left	Right	Pool	Boulder	Instream Vegetation	Overhanging Vegetation	Undercut Bank	LWD	SWD	Canopy	Left Riparian	Right Riparian
MC-10	80	20	0	0	0	S	<1.0	1			40.00	20.00	U	S	5	0	0	2	1	2	2	0	1	1
MC-11	15	5	80	1	0						1.00	0.20	S	S	0	0	0	5	0	T	5	0	0	0
MC-11	20	20	20	40	0						1.20	0.92	U	U	0	15	0	0	0	2	2	0	0	0
MC-11	20	20	20	40	0	S	0.50	0.47			1.30	0.85	U	U	10	10	0	2	0	1	1	2	0	0
SC-3	1	5	90	5	0						3.00	1.00	U	U	0	0	0	0	0	5	1	0	0	0
SC-3	80	20	0	0	0						0.40	0.32	S	U	0	0	0	5	0	0	0	2	10	5
SC-3	55	35	10	0	0						0.44	0.29	S	U	0	0	0	10	0	0	0	5	30	5
SC-3	50	30	20	0	0						0.26	0.39	S	S	0	0	0	10	0	5	5	5	10	10
SC-3	40	40	20	0	0	S	0.56	0.36			0.23	0.24	S	S	5	0	0	10	0	5	10	10	20	20
SC-3	30	55	15	0	0	S	0.70	0.52			0.18	0.20	S	S	5	0	0	25	5	5	5	80	40	40
SC-5	5	5	70	20	0						2.50	3.00	S	S	0	0	0	1	1	20	15	0	0	0
SC-5	30	30	30	10	0						0.20	1.00	S	S	2	2	0	0	0	5	5	0	0	0
SC-5	20	20	28	2	0	S	0.45	0.24			0.20	1.67	U	U	2	2	0	0	0	5	5	0	0	0
SC-5	40	40	20	0	0	S	0.50	0.12			0.01	0.02	U	U	2	2	0	0	0	5	5	0	0	0
SC-5	30	30	30	10	0						0.20	0.80	S	S	2	2	0	0	0	5	5	0	0	0
SC-6	20	10	70	0	0						1.00	1.00	S	S	0	1	0	1	0	2	1	0	100	100
SC-6	20	45	30	5	0	S	0.72	0.51			na	0.36	U	U	2	25	0	0	0	5	2	0	0	0
SKC-1	5	35	60	0	0						1.00	0.50	U	S	0	0	1	5	5	0	5	0	0	0
SKC-1	1	30	70	0	0						0.70	0.70	U	U	0	0	0	10	5	1	1	0	0	0
SKC-1	1	30	70	0	0						0.40	0.55	U	S	0	0	0	15	5	1	1	0	0	0
SKC-1	10	25	60	5	0						0.23	0.17	U	U	0	10	0	10	5	0	0	0	2	2
SKC-1	5	5	85	5	0	S	0.55	0.21			0.13	0.20	U	U	1	10	0	10	7	1	1	0	0	1
SKC-1	10	35	35	20	0	S	0.60	0.5			0.34	0.32	U	U	2	5	0	5	5	5	5	0	2	5
SKC-2	95	5	0	0	0						1.30	1.30	S	S	0	0	0	5	10	5	5	0	0	0
SKC-2	60	40	0	0	0	D	1.20	0.2			0.30	0.20	S	S	30	0	0	0	5	5	1	10	10	10
SKC-2	100	0	0	0	0	D	1.60	0.8			0.25	0.15	S	S	30	0	0	0	10	0	1	2	5	5
SKC-3	35	65	0	0	0						0.65	0.55	S	S	0	0	1	5	15	7	5	0	5	5
SKC-3	25	70	5	1	0						0.45	0.45	S	S	0	1	0	15	10	1	10	1	1	1
SKC-3	20	65	0	0	0	U	0.50	0.2			0.45	0.45	S	S	10	0	0	5	15	0	T	0	1	1
SKC-3	10	90	1	1	0						0.45	0.65	S	S	0	0	0	15	15	1	T	1	1	1
SKC-3	5	95	0	0	0	U	0.29	0.18			0.10	0.10	S	S	1	0	1	5	5	1	1	10	30	30
SKC-3	15	85	0	0	0						0.10	0.10	S	S	2	0	0	15	1	1	1	10	30	30
SKC-3	15	85	0	0	0	D	0.61	0.3			0.13	0.13	S	S	10	0	0	5	5	1	1	5	20	20
SKC-3	30	70	0	0	0	S	0.36	0.13			0.10	0.11	S	S	5	0	0	5	10	1	1	5	5	20
SKC-3	30	70	0	0	0						0.04	0.06	S	S	2	0	0	10	10	0	0	0	5	5
SKC-3	40	60	0	0	0	S	0.50	0.21			0.09	0.02	S	S	5	0	0	5	10	1	0	0	10	10
SKC-3	30	70	0	0	0						0.14	0.10	S	S	0	0	0	10	20	0	0	5	2	2
SKC-3	30	70	0	0	0	S	0.34	0.2			0.09	0.13	S	S	5	0	0	15	1	0	0	40	10	40
SKC-3	40	55	5	0	0	S	0.31	0.17			0.12	0.12	S	S	5	0	0	15	5	1	0	2	0	20
SKC-3	30	70	0	0	0						0.06	0.18	S	S	0	0	0	10	10	1	1	0	0	10
SKC-4	1	10	60	30	5				CH	P	1.00	1.50	S	S	5	1	0	20	1	15	5	0	0	0
SKC-4	90	10	0	0	0						3.00	2.00	S	S	10	0	0	1	1	20	10	0	0	0
WC-1	5	15	20	60	0						0.80	1.20	S	S	2	1	0	5	2	5	10	0	0	0
WC-1	5	5	60	30	0						0.40	0.88	U	U	2	15	0	5	2	2	2	0	0	0

Notes:

Crew
LT = Lora Tryon
DF = Dave Fauquier
TS = Tamara Skubovius
SL = Samantha Louie
KM = Kirsten MacKenzie

Turbidity
C = clear
M = moderate
T = turbid

Stage
L = low
M = moderate
H = high

Habitat Unit
P = pool
G = glide
R = riffle
C = cascade

Pool Type
S = scour
D = dam

Barriers
CH = chute
P = permanent
T = temporary

Bank stability
U = unstable
S = stable
H = highly stable

Cover
LWD = large woody debris
SWD = small woody debris
T = trace

Appendix 1-3

Receiving Environment Fish Sampling Effort and Catch-Per-Unit-Effort

Appendix 1-3. Receiving Environment Fish Sampling Effort and Catch-Per-Unit-Effort

Site	Watershed	Date	EF Seconds	# Fish	CPUE (#fish/100sec)
MC-10	Mess	29-Jun-08	1,338	1	0.07
MC-10	Mess	9-Aug-08	166	3	1.81
MC-11	Mess	29-Jun-08	1,336	1	0.07
MC-11	Mess	10-Aug-08	625		0.00
SC-3	Upper Schaft	28-Jun-08	1,125		0.00
SC-3	Upper Schaft	7-Aug-08	691		0.00
SC-5	Lower Schaft	28-Jun-08	841	4	0.48
SC-5	Lower Schaft	7-Aug-08	419	7	1.67
SC-6	Upper Schaft	9-Aug-08	752		0.00
SKC-1	Start	28-Jun-08	938	8	0.85
SKC-1	Start	8-Aug-08	774	3	0.39
SKC-2	Upper Skeeter	27-Jun-08	968		0.00
SKC-2	Upper Skeeter	7-Aug-08	347		0.00
SKC-2	Upper Skeeter	8-Aug-08	677		0.00
SKC-3	Upper Skeeter	26-Jun-08	1,073		0.00
SKC-3	Upper Skeeter	8-Aug-08	519		0.00
SKC-4	Lower Skeeter	27-Jun-08	745	18	2.42
SKC-4	Lower Skeeter	7-Aug-08	199	1	0.50
WC-1	Reference	5-Jul-08	276	7	2.54
WC-1	Reference	10-Aug-08	440	1	0.23

Notes:
EF = electrofishing
CPUE = catch-per-unit-effort

Appendix 1-4

Receiving Environment Individual Fish Data

Appendix 1-4. Receiving Environment Individual Fish Data

Date	Local Name	Watershed	Site #	Method	Species	Length (mm)	Weight (g)	Condition (g/mm^3)	Age Structure	Age Sample #	Age
29-Jun-08	MC-10	Mess	317	EF	RB	59					
9-Aug-08	MC-10	Mess	317	EF	RB	54	2	1.27			
9-Aug-08	MC-10	Mess	317	EF	RB	62	2	0.84			
9-Aug-08	MC-10	Mess	317	EF	RB	67	3	1.00			
29-Jun-08	MC-11	Mess	550	EF	RB	179	66	1.15			
28-Jun-08	SC-5	Schaft	320	EF	RB	95	10	1.17			
28-Jun-08	SC-5	Schaft	320	EF	RB	155	50	1.34			
28-Jun-08	SC-5	Schaft	320	EF	RB	164	51	1.16			
28-Jun-08	SC-5	Schaft	320	EF	RB	170	62	1.26			
7-Aug-08	SC-5	Schaft	320	EF	RB	175	60.8	1.13	SC	1	UA
7-Aug-08	SC-5	Schaft	320	EF	RB	119			SC	2	3
7-Aug-08	SC-5	Schaft	320	EF	RB	171	64.9	1.30	SC	3	UA
7-Aug-08	SC-5	Schaft	320	EF	RB	173	55.6	1.07	SC	4	2
7-Aug-08	SC-5	Schaft	320	EF	RB	127	26.4	1.29	SC	5	2
7-Aug-08	SC-5	Schaft	320	EF	RB	184	76.1	1.22	SC	6	3
7-Aug-08	SC-5	Schaft	320	EF	RB	158	43.5	1.10	SC	7	3
28-Jun-08	SKC-1	Start	500	EF	RB	129	29	1.35	FR	1	UA
28-Jun-08	SKC-1	Start	500	EF	RB	144	38.9	1.30	FR	2	UA
28-Jun-08	SKC-1	Start	500	EF	RB	237	134.9	1.01	FR	3	UA
28-Jun-08	SKC-1	Start	500	EF	RB	41	1	1.45			
28-Jun-08	SKC-1	Start	500	EF	RB	49	1	0.85			
28-Jun-08	SKC-1	Start	500	EF	RB	51	2	1.51			
28-Jun-08	SKC-1	Start	500	EF	RB	86	7	1.10			
28-Jun-08	SKC-1	Start	500	EF	RB	129	26	1.21			
8-Aug-08	SKC-1	Start	500	EF	RB	224	131.4	1.17	SC	1	3
8-Aug-08	SKC-1	Start	500	EF	RB	95	13.4	1.56	SC	2	2
8-Aug-08	SKC-1	Start	500	EF	RB	99	13.7	1.41	SC	3	2
27-Jun-08	SKC-4	Skeeter	312	EF	RB	221	101	0.94	FR	10	UA
27-Jun-08	SKC-4	Skeeter	312	EF	RB	184	76	1.22	FR	11	UA
27-Jun-08	SKC-4	Skeeter	312	EF	RB	216	111	1.10	FR	12	UA
27-Jun-08	SKC-4	Skeeter	312	EF	RB	50					
27-Jun-08	SKC-4	Skeeter	312	EF	RB	50	2	1.60			
27-Jun-08	SKC-4	Skeeter	312	EF	RB	65	3	1.09			
27-Jun-08	SKC-4	Skeeter	312	EF	RB	70	4	1.17			
27-Jun-08	SKC-4	Skeeter	312	EF	RB	70	4	1.17			
27-Jun-08	SKC-4	Skeeter	312	EF	RB	75	5	1.19			
27-Jun-08	SKC-4	Skeeter	312	EF	RB	75	5	1.19			
27-Jun-08	SKC-4	Skeeter	312	EF	RB	85	8	1.30			
27-Jun-08	SKC-4	Skeeter	312	EF	RB	85	7	1.14			
27-Jun-08	SKC-4	Skeeter	312	EF	RB	125	26	1.33			
27-Jun-08	SKC-4	Skeeter	312	EF	RB	140	30	1.09			
27-Jun-08	SKC-4	Skeeter	312	EF	RB	150	43	1.27			
27-Jun-08	SKC-4	Skeeter	312	EF	RB	150	38	1.13			
27-Jun-08	SKC-4	Skeeter	312	EF	RB	150	41	1.21			
27-Jun-08	SKC-4	Skeeter	312	EF	RB	165	47	1.05			
7-Aug-08	SKC-4	Skeeter	312	EF	RB	62	2.6	1.09			
5-Jul-08	WC-1	Reference	318	EF	RB	163	49.68	1.15	FR	1	4
5-Jul-08	WC-1	Reference	318	EF	RB	255	147.64	0.89	FR	2	5
5-Jul-08	WC-1	Reference	318	EF	RB	198	92.22	1.19	FR	3	4
5-Jul-08	WC-1	Reference	318	EF	RB	226	125.9	1.09	FR	4	7
5-Jul-08	WC-1	Reference	318	EF	RB	144	41	1.37	FR	5	2
5-Jul-08	WC-1	Reference	318	EF	RB	131	27.8	1.24	FR	6	2
5-Jul-08	WC-1	Reference	318	EF	RB	101	19.34	1.88			
10-Aug-08	WC-1	Reference	318	EF	RB	90	8.3	1.14	FR	1	1

Notes:
RB = rainbow trout
SC = scale
FR = fin ray
UA = unaged

Appendix 2-1

Lake Habitat Substrate Zones

Appendix 2-1. Lake Habitat Substrate Zones

Lake	Zone #	Substrate Composition (%)					Total
		Fine	Gravel	Cobble	Boulder	Bedrock	
Mess Lake (L1)	1	90	0	0	0	10	100
Mess Lake (L1)	2	100	0	0	0	0	100
Mess Lake (L1)	3	80	0	20	0	0	100
Mess Lake (L1)	4	5	80	15	0	0	100
Mess Lake (L1)	5	0	10	90	0	0	100
Mess Lake (L1)	6	5	25	70	0	0	100
Mess Lake (L1)	7	15	20	60	5	0	100
Mess Lake (L1)	8	40	60	0	0	0	100
Mess Lake (L1)	9	0	0	0	0	100	100
Mess Lake (L1)	10	10	0	0	10	80	100
Mess Lake (L1)	11	5	5	5	0	85	100
Skeeter Lake (L2)	1	50	50	0	0	0	100
Skeeter Lake (L2)	2	30	30	20	20	0	100
Skeeter Lake (L2)	3	0	20	80	0	0	100
Skeeter Lake (L2)	4	0	70	30	0	0	100
Skeeter Lake (L2)	5	100	0	0	0	0	100
Skeeter Lake (L2)	6	0	100	0	0	0	100
Skeeter Lake (L2)	7	15	60	20	5	0	100
Skeeter Lake (L2)	8	0	0	0	0	100	100
Skeeter Lake (L2)	9	0	0	0	100	0	100
Skeeter Lake (L2)	10	100	0	0	0	0	100
Skeeter Lake (L2)	11	20	75	5	0	0	100
Skeeter Lake (L2)	12	50	45	5	0	0	100
Skeeter Lake (L2)	13	20	50	20	10	0	100
Skeeter Lake (L2)	14	100	0	0	0	0	100
Start Lake (L5)	1	45	0	30	25	0	100
Start Lake (L5)	2	0	70	30	0	0	100
Start Lake (L5)	3	0	0	0	0	100	100
Start Lake (L5)	4	0	55	35	10	0	100
Start Lake (L5)	5	25	65	10	0	0	100
Start Lake (L5)	6	0	90	10	0	0	100
Start Lake (L5)	7	0	90	10	0	0	100
Start Lake (L5)	8	0	90	10	0	0	100
Start Lake (L5)	9	10	0	40	50	0	100
Start Lake (L5)	10	100	0	0	0	0	100
Start Lake (L5)	11	70	0	10	20	0	100
Start Lake (L5)	12	100	0	0	0	0	100
Start Lake (L5)	13	90	0	10	0	0	100
Start Lake (L5)	14	70	0	30	0	0	100
Start Lake (L5)	15	80	0	10	10	0	100
Start Lake (L5)	16	70	0	20	10	0	100
Start Lake (L5)	17	90	0	0	10	0	100
L6	1	100	0	0	0	0	100
L6	2	40	10	25	25	0	100
L6	3	80	20	0	0	0	100
L6	4	100	0	0	0	0	100
L6	5	100	0	0	0	0	100
L6	6	50	0	20	30	0	100
L6	7	100	0	0	0	0	100
L6	8	70	10	10	10	0	100
L6	9	100	0	0	0	0	100
L6	10	40	5	25	30	0	100
L6	11	100	0	0	0	0	100
L6	12	80	0	20	0	0	100
L6	13	100	0	0	0	0	100
L6	14	70	0	30	0	0	100

Appendix 2-2

Lake Sampling Effort and Catch-Per-Unit-Effort

Appendix 2-2. Lake Sampling Effort and Catch-Per-Unit-Effort

Site	Method	#	Haul	Date In	Time In	Date Out	Time Out	Total Time (h)	Net Length	Depth (m) In	Depth (m) Out	Mesh Size (mm)	Gillnet area (m^2)	Set	RB	KO	Total #	CPUE
Mess Lake (L1)	GN	1	1	03-Jul	03/07/2008 12:37	04-Jul	04/07/2008 14:24	25	6 panels	2.1	3.1	63.5, 88.9, 38.1, 50.8, 76.2, 25.4	208	MD	0	0	0	0.00
Mess Lake (L1)	GN	2	1	04-Jul	04/07/2008 9:38	04-Jul	04/07/2008 12:05	2	6 panels	6.8	7.4	63.5, 88.9, 38.1, 50.8, 76.2, 25.4	208	MD	0	2	2	0.12
Mess Lake (L1)	GN	2	2	04-Jul	04/07/2008 12:06	04-Jul	04/07/2008 13:30	1	6 panels	6.8	7.4	63.5, 88.9, 38.1, 50.8, 76.2, 25.4	208	MD	0	0	0	0.00
Mess Lake (L1)	GN	3	1	04-Jul	04/07/2008 14:17	04-Jul	04/07/2008 15:35	1	6 panels	3.2	2.8	63.5, 88.9, 38.1, 50.8, 76.2, 25.4	208	MD	0	3	3	0.35
Mess Lake (L1)	GN	4	1	05-Jul	05/07/2008 8:45	05-Jul	05/07/2008 10:13	1	6 panels	1.1	11.8	63.5, 88.9, 38.1, 50.8, 76.2, 25.4	208	MD	0	0	0	0.00
Mess Lake (L1)	GN	5	1	05-Jul	05/07/2008 10:27	05-Jul	05/07/2008 12:15	1	6 panels	1.2	10.4	63.5, 88.9, 38.1, 50.8, 76.2, 25.4	208	MD	0	11	11	1.27
Mess Lake (L1)	GN	6	1	05-Jul	05/07/2008 12:32	05-Jul	05/07/2008 13:34	1	6 panels	1.2	10.6	63.5, 88.9, 38.1, 50.8, 76.2, 25.4	208	MD	0	1	1	0.12
Mess Lake (L1)	GN	6	1	05-Jul	05/07/2008 12:32	05-Jul	05/07/2008 13:34	1	6 panels			63.5, 88.9, 38.1, 50.8, 76.2, 25.4	208	MD	0	0	0	0.00
Mess Lake (L1)	MT	1	1	03-Jul	03/07/2008 9:46	04-Jul	04/07/2008 17:45	31		0.8		6.35		BT	1	0	1	0.77
Mess Lake (L1)	MT	10	1	03-Jul	03/07/2008 11:03	04-Jul	04/07/2008 15:07	28		0.3		6.35		BT	1	0	1	0.86
Mess Lake (L1)	MT	101	1	03-Jul	03/07/2008 9:30	06-Jul	06/07/2008 9:00	71		0.5		6.35		BT	0	0	0	0.00
Mess Lake (L1)	MT	101	2	04-Jul	04/07/2008 11:11	06-Jul				0.5		6.35		BT	0	0	0	
Mess Lake (L1)	MT	102	1	03-Jul	03/07/2008 9:30	06-Jul	06/07/2008 9:05	71		0.5		6.35		BT	0	0	0	0.00
Mess Lake (L1)	MT	102	2	04-Jul	04/07/2008 13:00	06-Jul				0.1		6.35		BT	0	0	0	
Mess Lake (L1)	MT	103	2	04-Jul	04/07/2008 13:10	06-Jul	06/07/2008 11:11	46		0.85		6.35		BT	0	0	0	0.00
Mess Lake (L1)	MT	105	1	03-Jul	03/07/2008 9:30	06-Jul	06/07/2008 9:10	71		0.5		6.35		BT	0	0	0	0.00
Mess Lake (L1)	MT	105	2	05-Jul	05/07/2008 9:26	06-Jul				0.2		6.35		BT	0	0	0	
Mess Lake (L1)	MT	106	1	03-Jul	03/07/2008 9:30	06-Jul				0.5		6.35		BT	0	0	0	
Mess Lake (L1)	MT	107	2	05-Jul	05/07/2008 9:44	06-Jul				0.25		6.35		BT	0	0	0	
Mess Lake (L1)	MT	109	2	05-Jul	05/07/2008 11:18	06-Jul				0.22		6.35		BT	1	0	1	
Mess Lake (L1)	MT	11	1	03-Jul	03/07/2008 11:27	04-Jul	04/07/2008 15:03	27		0.48		6.35		BT	0	0	0	0.00
Mess Lake (L1)	MT	110	1	05-Jul	05/07/2008 11:32	06-Jul	06/07/2008 11:14	23		0.3		6.35		BT	0	0	0	0.00
Mess Lake (L1)	MT	111	1	05-Jul	05/07/2008 11:34	06-Jul	06/07/2008 11:20	23		0.4		3.175		BT	3	0	3	3.13
Mess Lake (L1)	MT	112	1	05-Jul	05/07/2008 11:36	06-Jul	06/07/2008 11:22	23		0.8		6.35		BT	2	1	3	3.13
Mess Lake (L1)	MT	12	1	03-Jul	03/07/2008 11:34	04-Jul	04/07/2008 15:00	27		0.5		6.35		BT	0	0	0	0.00
Mess Lake (L1)	MT	13	1	03-Jul	03/07/2008 11:50	04-Jul	04/07/2008 14:35	26		0.52		6.35		BT	2	0	2	1.85
Mess Lake (L1)	MT	14a	1	03-Jul	03/07/2008 12:00	04-Jul	04/07/2008 14:30	26		0.7		6.35		BT	0	0	0	0.00
Mess Lake (L1)	MT	14b	1	03-Jul	03/07/2008 15:36	04-Jul	04/07/2008 16:36	24		0.3		6.35		BT	3	0	3	3.00
Mess Lake (L1)	MT	15	1	03-Jul	03/07/2008 15:43	04-Jul	04/07/2008 16:35	24		0.3		6.35		BT	1	0	1	1.00
Mess Lake (L1)	MT	16	1	04-Jul	04/07/2008 9:55	05-Jul	05/07/2008 13:44	27		0.86		6.35		BT	1	8	9	8.00
Mess Lake (L1)	MT	16	2	05-Jul	05/07/2008 13:45	06-Jul	06/07/2008 8:43	18		0.86		6.35		BT	0	1	1	1.33
Mess Lake (L1)	MT	17	1	04-Jul	04/07/2008 10:05	05-Jul	05/07/2008 15:18	29		0.85		3.175		BT	0	1	1	0.83
Mess Lake (L1)	MT	17	2	05-Jul	05/07/2008 15:19	06-Jul	06/07/2008 8:44	17		0.85		3.175		BT	0	2	2	2.82
Mess Lake (L1)	MT	18	1	04-Jul	04/07/2008 10:11	05-Jul	05/07/2008 15:20	29		0.55		6.35		BT	3	0	3	2.48
Mess Lake (L1)	MT	18	2	05-Jul	05/07/2008 15:21	06-Jul	06/07/2008 9:09	17		0.55		6.35		BT	0	0	0	0.00
Mess Lake (L1)	MT	19	1	04-Jul	04/07/2008 10:12	05-Jul	05/07/2008 15:56	29		0.5		3.175		BT	1	0	1	0.83
Mess Lake (L1)	MT	19	2	05-Jul	05/07/2008 15:56	06-Jul	06/07/2008 9:10	17		0.5		3.175		BT	0	0	0	0.00
Mess Lake (L1)	MT	2	1	03-Jul	03/07/2008 9:53	04-Jul	04/07/2008 17:00	31		0.62		6.35		BT	2	3	5	3.87
Mess Lake (L1)	MT	20	1	04-Jul	04/07/2008 10:18	05-Jul	05/07/2008 15:58	29		0.45		6.35		BT	0	1	1	0.83
Mess Lake (L1)	MT	20	2	05-Jul	05/07/2008 15:58	06-Jul	06/07/2008 9:20	17		0.45		6.35		BT	0	0	0	0.00
Mess Lake (L1)	MT	21	1	04-Jul	04/07/2008 10:22	05-Jul	05/07/2008 16:00	29		0.5		6.35		BT	0	1	1	0.83
Mess Lake (L1)	MT	21	2	05-Jul	05/07/2008 16:00	06-Jul	06/07/2008 9:23	17		0.5		6.35		BT	0	0	0	0.00
Mess Lake (L1)	MT	22	1	04-Jul	04/07/2008 10:26	05-Jul	05/07/2008 16:29	30		0.92		6.35		BT	0	0	0	0.00
Mess Lake (L1)	MT	22	2	05-Jul	05/07/2008 16:30	06-Jul	06/07/2008 9:25	16		0.92		6.35		BT	0	0	0	0.00
Mess Lake (L1)	MT	23	1	04-Jul	04/07/2008 10:31	05-Jul	05/07/2008 16:30	29		0.28		6.35		BT	1	0	1	0.83
Mess Lake (L1)	MT	23	2	05-Jul	05/07/2008 16:30	06-Jul	06/07/2008 9:26	16		0.28		6.35		BT	0	1	1	1.50
Mess Lake (L1)	MT	3	1	03-Jul	03/07/2008 9:30	06-Jul				0.5		6.35		BT	0	0	0	
Mess Lake (L1)	MT	3	1	03-Jul	03/07/2008 9:57	04-Jul	04/07/2008 16:53	30		0.58		6.35		BT	0	0	0	0.00
Mess Lake (L1)	MT	4	1	03-Jul	03/07/2008 9:30	06-Jul				0.5		6.35		BT	1	0	1	
Mess Lake (L1)	MT	4	1	03-Jul	03/07/2008 0:00	04-Jul	04/07/2008 16:50	40		0.72		6.35		BT	0	0	0	0.00

(continued)

Appendix 2-2. Lake Sampling Effort and Catch-Per-Unit-Effort (continued)

Site	Method	#	Haul	Date In	Time In	Date Out	Time Out	Total Time (h)	Net Length	Depth (m) In	Depth (m) Out	Mesh Size	Gillnet area (m^2)	Set	RB	KO	Total #	CPUE
Mess Lake (L1)	MT	5	1	03-Jul	03/07/2008 10:14	04-Jul	04/07/2008 16:45	30		0.65		6.35		BT	0	0	0	0.00
Mess Lake (L1)	MT	6	1	03-Jul	03/07/2008 10:20	04-Jul	04/07/2008 16:40	30		0.7		6.35		BT	0	0	0	0.00
Mess Lake (L1)	MT	7	1	03-Jul	03/07/2008 10:24	04-Jul	04/07/2008 16:37	30		0.7		6.35		BT	0	0	0	0.00
Mess Lake (L1)	MT	8	1	03-Jul	03/07/2008 10:34	04-Jul	04/07/2008 16:30	29		0.7		6.35		BT	0	0	0	0.00
Mess Lake (L1)	MT	9	1	03-Jul	03/07/2008 10:41	04-Jul	04/07/2008 15:55	29		0.62		3.175		BT	1	0	1	0.83
Skeeter Lake (L2)	GN	1	1	06-Jul	06/07/2008 13:55	06-Jul	06/07/2008 16:00	2	6 panels	9.8	16.7	63.5, 88.9, 38.1, 50.8, 76.2, 25.4	208	MD	0	0	0	0.00
Skeeter Lake (L2)	GN	2	1	06-Jul	06/07/2008 16:05	07-Jul	07/07/2008 8:30	16	6 panels	2.2	14.9	63.5, 88.9, 38.1, 50.8, 76.2, 25.4	208	MD	0	0	0	0.00
Skeeter Lake (L2)	MT	1	1	06-Jul	06/07/2008 14:09	07-Jul	07/07/2008 15:20	25		0.32		6.35 & 3.175		BT	0	0	0	0.00
Skeeter Lake (L2)	MT	2	1	06-Jul	06/07/2008 14:13	07-Jul	07/07/2008 15:27	25		0.72		6.35		BT	0	0	0	0.00
Skeeter Lake (L2)	MT	3	1	06-Jul	06/07/2008 14:28	07-Jul	07/07/2008 9:41	19		0.4		6.35		BT	0	0	0	0.00
Skeeter Lake (L2)	MT	4	1	06-Jul	06/07/2008 14:32	07-Jul	07/07/2008 9:43	19		0.5		6.35		BT	0	0	0	0.00
Skeeter Lake (L2)	MT	5	1	06-Jul	06/07/2008 14:35	07-Jul	07/07/2008 10:00	19		0.66		6.35		BT	0	0	0	0.00
Skeeter Lake (L2)	MT	6	1	06-Jul	06/07/2008 14:38	07-Jul	07/07/2008 10:01	19		0.58		6.35		BT	0	0	0	0.00
Skeeter Lake (L2)	MT	7	1	06-Jul	06/07/2008 14:49	07-Jul	07/07/2008 10:49	20		0.35		6.35		BT	0	0	0	0.00
Skeeter Lake (L2)	MT	8	1	06-Jul	06/07/2008 14:52	07-Jul	07/07/2008 10:50	19		0.37		6.35		BT	0	0	0	0.00
Skeeter Lake (L2)	MT	9	1	06-Jul	06/07/2008 15:01	07-Jul	07/07/2008 11:16	20		0.4		6.35		BT	0	0	0	0.00
Skeeter Lake (L2)	MT	10	1	06-Jul	06/07/2008 15:03	07-Jul	07/07/2008 11:18	20		0.3		6.35		BT	0	0	0	0.00
Skeeter Lake (L2)	MT	11	1	06-Jul	06/07/2008 15:12	07-Jul	07/07/2008 11:33	20		1.2		6.35		BT	0	0	0	0.00
Skeeter Lake (L2)	MT	12	1	06-Jul	06/07/2008 15:21	07-Jul	07/07/2008 14:03	22		0.6		6.35		BT	0	0	0	0.00
Skeeter Lake (L2)	MT	13	1	06-Jul	06/07/2008 15:24	07-Jul	07/07/2008 14:07	22		0.62		6.35		BT	0	0	0	0.00
Skeeter Lake (L2)	MT	14	1	06-Jul	06/07/2008 15:33	07-Jul	07/07/2008 14:28	22		0.35		6.35		BT	0	0	0	0.00
Skeeter Lake (L2)	MT	15	1	06-Jul	06/07/2008 15:39	07-Jul	07/07/2008 14:33	22		0.38		6.35		BT	0	0	0	0.00
Skeeter Lake (L2)	MT	16	1	06-Jul	06/07/2008 15:42	07-Jul	07/07/2008 15:20	23		0.56		6.35		BT	0	0	0	0.00
Skeeter Lake (L2)	MT	17	1	06-Jul	06/07/2008 16:12	07-Jul	07/07/2008 16:12	24		0.31		6.35		BT	0	0	0	0.00
Skeeter Lake (L2)	GN	3	1	07-Jul	07/07/2008 9:05	07-Jul	07/07/2008 13:40	4	6 panels	5.1	8.7	63.5, 88.9, 38.1, 50.8, 76.2, 25.4	208	MD	0	0	0	0.00
Skeeter Lake (L2)	GN	4	1	07-Jul	07/07/2008 13:56	08-Jul	08/07/2008 8:20	18	6 panels	5.2	19	63.5, 88.9, 38.1, 50.8, 76.2, 25.4	208	MD	0	0	0	0.00
Skeeter Lake (L2)	MT	1	2	07-Jul	07/07/2008 15:26	08-Jul	08/07/2008 9:52	18							0	0	0	0.00
Skeeter Lake (L2)	MT	2	2	07-Jul	07/07/2008 15:30	08-Jul	08/07/2008 9:50	18							0	0	0	0.00
Skeeter Lake (L2)	MT	3	2	07-Jul	07/07/2008 9:41	08-Jul	08/07/2008 9:33	23							0	0	0	0.00
Skeeter Lake (L2)	MT	4	2	07-Jul	07/07/2008 9:46	08-Jul	08/07/2008 9:30	23							0	0	0	0.00
Skeeter Lake (L2)	MT	5	2	07-Jul	07/07/2008 10:00	08-Jul	08/07/2008 9:28	23							0	0	0	0.00
Skeeter Lake (L2)	MT	6	2	07-Jul	07/07/2008 10:01	08-Jul	08/07/2008 9:26	23							0	0	0	0.00
Skeeter Lake (L2)	MT	7	2	07-Jul	07/07/2008 10:51	08-Jul	08/07/2008 9:20	22							0	0	0	0.00
Skeeter Lake (L2)	MT	8	2	07-Jul	07/07/2008 10:52	08-Jul	08/07/2008 9:17	22							0	0	0	0.00
Skeeter Lake (L2)	MT	9	2	07-Jul	07/07/2008 11:17	08-Jul	08/07/2008 9:10	21							0	0	0	0.00
Skeeter Lake (L2)	MT	10	2	07-Jul	07/07/2008 11:20	08-Jul	08/07/2008 8:58	21							0	0	0	0.00
Skeeter Lake (L2)	MT	11	2	07-Jul	07/07/2008 11:34	08-Jul	08/07/2008 8:45	21							0	0	0	0.00
Skeeter Lake (L2)	MT	12	2	07-Jul	07/07/2008 14:05	08-Jul	08/07/2008 8:29	18							0	0	0	0.00
Skeeter Lake (L2)	MT	17	2	07-Jul	07/07/2008 16:13	08-Jul	08/07/2008 9:54	17		0.31		6.35		BT	0	0	0	0.00
Skeeter Lake (L2)	GN	5	1	08-Jul	08/07/2008 8:48	08-Jul	08/07/2008 10:25	1	6 panels	6.1	9	63.5, 88.9, 38.1, 50.8, 76.2, 25.4	208	MD	0	0	0	0.00
Skeeter Lake (L2)	MT	13	2	07-Jul	07/07/2008 14:08	08-Jul	08/07/2008 8:30	18							0	0	0	0.00
Skeeter Lake (L2)	MT	14	2	07-Jul	07/07/2008 14:29	08-Jul	08/07/2008 10:10	19							0	0	0	0.00
Skeeter Lake (L2)	MT	15	2	07-Jul	07/07/2008 0:00	08-Jul	08/07/2008 10:08	34							0	0	0	0.00
Skeeter Lake (L2)	MT	16	2	07-Jul	07/07/2008 0:00	08-Jul	08/07/2008 9:53	33							0	0	0	0.00
Skeeter Lake (L2)	MT	1	1	11-Jul	11/07/2008 8:45	11-Jul	11/07/2008 12:10	3		0.33		6.35		BT	0	0	0	0.00
Skeeter Lake (L2)	MT	2	1	11-Jul	11/07/2008 8:46	11-Jul	11/07/2008 12:05	3		0.35		6.35		BT	0	0	0	0.00
Skeeter Lake (L2)	MT	3	1	11-Jul	11/07/2008 8:52	11-Jul	11/07/2008 12:03	3		0.3		6.35		BT	0	0	0	0.00
Skeeter Lake (L2)	MT	4	1	11-Jul	11/07/2008 8:53	11-Jul	11/07/2008 12:00	3		0.27		6.35		BT	0	0	0	0.00
Skeeter Lake (L2)	GN	1	1	11-Jul	11/07/2008 9:09	11-Jul	11/07/2008 13:30	4	6 panels	4.1	14.8	63.5, 88.9, 38.1, 50.8, 76.2, 25.4	208	MD	0	0	0	0.00
Skeeter Lake (L2)	MT	5	1	11-Jul	11/07/2008 9:16	11-Jul	11/07/2008 11:57	2		0.38		6.35		BT	0	0	0	0.00

(continued)

Appendix 2-2. Lake Sampling Effort and Catch-Per-Unit-Effort (continued)

Site	Method	#	Haul	Date In	Time In	Date Out	Time Out	Total Time (h)	Net Length	Depth (m) In	Depth (m) Out	Mesh Size	Gillnet area (m^2)	Set	RB	KO	Total #	CPUE
Skeeter Lake (L2)	MT	6	1	11-Jul	11/07/2008 9:18	11-Jul	11/07/2008 11:58	2		0.7		6.35		BT	0	0	0	0.00
Skeeter Lake (L2)	MT	7	1	11-Jul	11/07/2008 9:26	11-Jul	11/07/2008 11:59	2		0.31		6.35		BT	0	0	0	0.00
Skeeter Lake (L2)	MT	8	1	11-Jul	11/07/2008 9:22	11-Jul	11/07/2008 12:00	2		3.2		6.35		BT	0	0	0	0.00
Skeeter Lake (L2)	MT	9	1	11-Jul	11/07/2008 9:43	11-Jul	11/07/2008 11:37	1		0.49		6.35		BT	0	0	0	0.00
Skeeter Lake (L2)	MT	10	1	11-Jul	11/07/2008 9:44	11-Jul	11/07/2008 11:38	1		0.42		6.35		BT	0	0	0	0.00
Skeeter Lake (L2)	MT	11	1	11-Jul	11/07/2008 9:45	11-Jul	11/07/2008 11:40	1		0.45		6.35		BT	0	0	0	0.00
Skeeter Lake (L2)	MT	12	1	11-Jul	11/07/2008 9:46	11-Jul	11/07/2008 11:41	1		0.45		6.35		BT	0	0	0	0.00
Start Lake (L5)	MT	17	1	08-Jul	08/07/2008 14:41	09-Jul	09/07/2008 16:20	25		0.56		6.35		BT	0	0	0	0.00
Start Lake (L5)	MT	18	1	09-Jul	09/07/2008 8:23	09-Jul	09/07/2008 16:21	7		0.35		6.35		BT	0	0	0	0.00
Start Lake (L5)	GN	3	1	09-Jul	09/07/2008 13:39	09-Jul	09/07/2008 14:15	0.8	6 panels	5.3	3.8	63.5, 88.9, 38.1, 50.8, 76.2, 25.4	208		0	0	0	0.00
Start Lake (L5)	GN	3	2	09-Jul	09/07/2008 14:15	09-Jul	09/07/2008 15:30	1	6 panels	3.8		63.5, 88.9, 38.1, 50.8, 76.2, 25.4	208		0	0	0	0.00
Start Lake (L5)	GN	1	1	08-Jul	08/07/2008 12:30	08-Jul	08/07/2008 13:31	1	6 panels	16.1	12.1	63.5, 88.9, 38.1, 50.8, 76.2, 25.4	208		0	0	0	0.00
Start Lake (L5)	GN	2	1	08-Jul	08/07/2008 13:43	08-Jul	08/07/2008 15:15	1	6 panels	5.6	3.7	63.5, 88.9, 38.1, 50.8, 76.2, 25.4	208		0	0	0	0.00
Start Lake (L5)	MT	1	1	08-Jul	08/07/2008 12:50	09-Jul	09/07/2008 10:36	21		0.3		6.35		BT	2	0	2	2.29
Start Lake (L5)	MT	2	1	08-Jul	08/07/2008 12:56	09-Jul	09/07/2008 10:32	21		0.9		6.35		BT	0	0	0	0.00
Start Lake (L5)	MT	3	1	08-Jul	08/07/2008 13:01	09-Jul	09/07/2008 10:30	21		0.3		6.35		BT	0	0	0	0.00
Start Lake (L5)	MT	4	1	08-Jul	08/07/2008 13:11	09-Jul	09/07/2008 10:25	21		1		6.35		BT	0	0	0	0.00
Start Lake (L5)	MT	5	1	08-Jul	08/07/2008 13:12	09-Jul	09/07/2008 10:22	21		0.7		6.35		BT	0	0	0	0.00
Start Lake (L5)	MT	6	1	08-Jul	08/07/2008 13:16	09-Jul	09/07/2008 14:30	25		0.42		6.35		BT	0	0	0	0.00
Start Lake (L5)	MT	7	1	08-Jul	08/07/2008 13:47	09-Jul	09/07/2008 14:24	24		0.43		6.35		BT	0	0	0	0.00
Start Lake (L5)	MT	8	1	08-Jul	08/07/2008 13:54	09-Jul	09/07/2008 14:20	24		0.42		6.35		BT	0	0	0	0.00
Start Lake (L5)	MT	9	1	08-Jul	08/07/2008 13:54	09-Jul	09/07/2008 14:30	24		0.4		6.35		BT	0	0	0	0.00
Start Lake (L5)	MT	10	1	08-Jul	08/07/2008 14:03	09-Jul	09/07/2008 14:31	24		0.26		6.35		BT	0	0	0	0.00
Start Lake (L5)	MT	11	1	08-Jul	08/07/2008 14:10	09-Jul	09/07/2008 16:11	26		0.81		6.35		BT	0	0	0	0.00
Start Lake (L5)	MT	12	1	08-Jul	08/07/2008 14:19	09-Jul	09/07/2008 16:06	25		0.5		6.35		BT	2	0	2	1.92
Start Lake (L5)	MT	13	1	08-Jul	08/07/2008 14:26	09-Jul	09/07/2008 16:09	25		1.3		6.35		BT	0	0	0	0.00
Start Lake (L5)	MT	14	1	08-Jul	08/07/2008 14:29	09-Jul	09/07/2008 16:12	25		0.53		6.35		BT	0	0	0	0.00
Start Lake (L5)	MT	15	1	08-Jul	08/07/2008 14:35	09-Jul	09/07/2008 16:15	25		0.4		6.35		BT	0	0	0	0.00
Start Lake (L5)	MT	16	1	08-Jul	08/07/2008 14:40	09-Jul	09/07/2008 16:20	25		0.5		6.35		BT	0	0	0	0.00
Start Lake (L5)	MT	16	1	10-Jul	10/07/2008 8:40	10-Jul	10/07/2008 16:00	7		0.52		6.35		BT	0	0	0	0.00
Start Lake (L5)	MT	1	1	10-Jul	10/07/2008 8:45	10-Jul	10/07/2008 15:58	7		0.56		6.35		BT	0	0	0	0.00
Start Lake (L5)	MT	2	1	10-Jul	10/07/2008 8:52	10-Jul	10/07/2008 15:56	7		0.48		6.35		BT	0	0	0	0.00
Start Lake (L5)	MT	3	1	10-Jul	10/07/2008 8:56	10-Jul	10/07/2008 15:54	6		0.33		6.35		BT	0	0	0	0.00
Start Lake (L5)	MT	4	1	10-Jul	10/07/2008 9:12	10-Jul	10/07/2008 15:52	6		0.49		6.35		BT	0	0	0	0.00
Start Lake (L5)	MT	5	1	10-Jul	10/07/2008 9:14	10-Jul	10/07/2008 15:51	6		0.57		6.35		BT	0	0	0	0.00
Start Lake (L5)	MT	6	1	10-Jul	10/07/2008 9:15	10-Jul	10/07/2008 15:50	6		0.35		3.175		BT	0	0	0	0.00
Start Lake (L5)	MT	7	1	10-Jul	10/07/2008 9:16	10-Jul	10/07/2008 15:48	6		0.69		6.35		BT	0	0	0	0.00
Start Lake (L5)	MT	8	1	10-Jul	10/07/2008 9:17	10-Jul	10/07/2008 15:49	6		0.39		6.35		BT	1	0	1	4.00
Start Lake (L5)	MT	9	1	10-Jul	10/07/2008 9:24	10-Jul	10/07/2008 15:48	6		0.38		6.35		BT	0	0	0	0.00
Start Lake (L5)	MT	10	1	10-Jul	10/07/2008 9:28	10-Jul	10/07/2008 15:47	6		0.44		6.35		BT	0	0	0	0.00
Start Lake (L5)	MT	11	1	10-Jul	10/07/2008 9:32	10-Jul	10/07/2008 15:46	6		0.55		6.35		BT	0	0	0	0.00
Start Lake (L5)	MT	12	1	10-Jul	10/07/2008 9:36	10-Jul	10/07/2008 15:44	6		0.4				MD	0	0	0	0.00
Start Lake (L5)	GN	1	1	10-Jul	10/07/2008 10:30	10-Jul	10/07/2008 11:00	0.5	6 panels	3.5	4.6	63.5, 88.9, 38.1, 50.8, 76.2, 25.4	208	MD	1	0	1	0.23
Start Lake (L5)	GN	1	2	10-Jul	10/07/2008 11:00	10-Jul	10/07/2008 11:46	0.8	6 panels	3.5	4.6	63.5, 88.9, 38.1, 50.8, 76.2, 25.4	208	MD	1	0	1	0.14
Start Lake (L5)	GN	2	1	10-Jul	10/07/2008 13:26	10-Jul	10/07/2008 14:15	0.8	6 panels	4.1	5.9	63.5, 88.9, 38.1, 50.8, 76.2, 25.4	208	MD	1	0	1	0.14
Start Lake (L5)	GN	3	1	10-Jul	10/07/2008 14:25	10-Jul	10/07/2008 15:15	0.8	6 panels	5.1	3.6	63.5, 88.9, 38.1, 50.8, 76.2, 25.4	208	MD	2	0	2	0.29
Start Lake (L5)	GN	3	2	10-Jul	10/07/2008 15:15	10-Jul	10/07/2008 15:41	0.5	6 panels	5.1	3.6	63.5, 88.9, 38.1, 50.8, 76.2, 25.4	208	MD	2	0	2	0.46
L6	MT	1	1	12-Jul	12/07/2008 17:02	13-Jul	13/07/2008 12:10	19		0.35		6.35		BT	0	0	0	0.00
L6	MT	2	1	12-Jul	12/07/2008 17:04	13-Jul	13/07/2008 11:40	18		1.1		6.35		BT	0	0	0	0.00
L6	MT	3	1	12-Jul	12/07/2008 17:07	13-Jul	13/07/2008 12:11	19		0.3		6.35		BT	0	0	0	0.00

(continued)

Appendix 2-2. Lake Sampling Effort and Catch-Per-Unit-Effort (completed)

Site	Method	#	Haul	Date In	Time In	Date Out	Time Out	Total Time (h)	Net Length	Depth (m) In	Depth (m) Out	Mesh Size	Gillnet area (m^2)	Set	RB	KO	Total #	CPUE
L6	MT	4	1	12-Jul	12/07/2008 17:10	13-Jul	13/07/2008 12:12	19		0.25		6.35		BT	0	0	0	0.00
L6	MT	5	1	12-Jul	12/07/2008 17:11	13-Jul	13/07/2008 11:48	18		0.37		6.35		BT	0	0	0	0.00
L6	MT	6	1	12-Jul	12/07/2008 17:13	13-Jul	13/07/2008 11:44	18		0.82		6.35		BT	0	0	0	0.00
L6	MT	7	1	12-Jul	12/07/2008 17:25	13-Jul	13/07/2008 11:42	18		0.55		6.35		BT	0	0	0	0.00
L6	MT	8	1	12-Jul	12/07/2008 17:29	13-Jul	13/07/2008 11:40	18		0.4		6.35		BT	0	0	0	0.00
L6	MT	9	1	12-Jul	12/07/2008 17:34	13-Jul	13/07/2008 13:10	19		0.3		6.35		BT	0	0	0	0.00
L6	MT	10	1	12-Jul	12/07/2008 17:30	13-Jul	13/07/2008 10:09	16		0.45		6.35		BT	0	0	0	0.00
L6	MT	11	1	12-Jul	12/07/2008 17:40	13-Jul	13/07/2008 10:10	16		0.32		6.35		BT	0	0	0	0.00
L6	MT	12	1	12-Jul	12/07/2008 17:42	13-Jul	13/07/2008 10:12	16		1.2		6.35		BT	0	0	0	0.00
L6	MT	13	1	12_jul	12/07/2008 17:44	13-Jul	13/07/2008 11:18	17		0.31		6.35		BT	0	0	0	0.00
L6	MT	14	1	12-Jul	12/07/2008 17:46	13-Jul	13/07/2008 11:17	17		0.25		6.35		BT	0	0	0	0.00
L6	MT	15	1	12-Jul	12/07/2008 17:49	13-Jul	13/07/2008 11:45	17		0.4		6.35		BT	0	0	0	0.00
L6	MT	16	1	12-Jul	12/07/2008 17:50	13-Jul	13/07/2008 11:47	17		0.32		6.35		BT	0	0	0	0.00
L6	GN	1	1	12-Jul	12/07/2008 9:15	13-Jul	13/07/2008 12:25	27	1 panel	2.5	2.8	25.4	35	MD	0	0	0	0.00
L6	GN	2	1	12-Jul	13/07/2008 11:18	13-Jul	13/07/2008 12:20	1	1 panel	2.2	2.5	76.2	35	MD	0	0	0	0.00
L6	GN	3	1	13-Jul	13/07/2008 11:18	13-Jul	13/07/2008 12:15	1	2 panels	2.6	1.4	88.9	70	MD	0	0	0	0.00
L7	MT	1	1	11-Jul	11/07/2008 0:00	12-Jul	12/07/2008 11:12	35		0.45		6.35		BT	1	0	1	0.69
L7	MT	2	1	11-Jul	11/07/2008 15:58	12-Jul	12/07/2008 11:13	19		0.6		6.35		BT	10	0	10	12.63
L7	MT	3	1	11-Jul	11/07/2008 16:04	12-Jul	12/07/2008 13:17	21		0.88		6.35		BT	10	0	10	11.43
L7	MT	4	1	11-Jul	11/07/2008 16:06	12-Jul	12/07/2008 12:37	20		0.75		6.35		BT	1	0	1	1.20
L7	MT	5	1	11-Jul	11/07/2008 16:13	12-Jul	12/07/2008 12:36	20		1.6		6.35		BT	3	0	3	3.60
L7	MT	6	1	11-Jul	11/07/2008 16:20	12-Jul	12/07/2008 12:39	20		0.6		6.35		BT	8	0	8	9.60
L7	MT	7	1	11-Jul	11/07/2008 16:26	12-Jul	12/07/2008 14:04	21		2.5		6.35		BT	2	0	2	2.29
L7	MT	8	1	11-Jul	11/07/2008 16:28	12-Jul	12/07/2008 14:05	21		0.63		6.35		BT	1	0	1	1.14
L7	MT	9	1	11-Jul	11/07/2008 16:48	12-Jul	12/07/2008 14:48	22		0.78		6.35		BT	0	0	0	0.00
L7	MT	10	1	11-Jul	11/07/2008 16:50	12-Jul	12/07/2008 14:50	21		0.5		6.35		BT	0	0	0	0.00
L7	MT	11	1	11-Jul	11/07/2008 17:00	12-Jul	12/07/2008 14:51	21		0.7		6.35		BT	1	0	1	1.14
L7	MT	12	1	11-Jul	11/07/2008 17:04	12-Jul	12/07/2008 14:53	21		0.83		6.35		BT	1	0	1	1.14
L7	MT	13	1	11-Jul	11/07/2008 17:06	12-Jul	12/07/2008 14:57	21		0.5		6.35		BT	0	0	0	0.00
L7	MT	14	1	11-Jul	11/07/2008 17:10	12-Jul	12/07/2008 14:25	21		0.55		6.35		BT	14	0	14	16.00
L7	MT	15	1	11-Jul	11/07/2008 17:14	12-Jul	12/07/2008 15:05	21		0.31		6.35		BT	0	0	0	0.00
L7	MT	16	1	11-Jul	11/07/2008 17:16	12-Jul	12/07/2008 15:06	21		0.25		6.35		BT	0	0	0	0.00
L7	GN	1	1	12-Jul	12/07/2008 9:17	12-Jul	12/07/2008 9:20	0.1	2 panels	4.1	3.6	76.2	70	MD	7	0	7	24.00
L7	GN	1	2	12-Jul	12/07/2008 9:20	12-Jul	12/07/2008 9:27	0.2	2 panels	4.1	3.6	76.2	70	MD	4	0	4	6.86
L7	GN	2	1	12-Jul	12/07/2008 10:12	12-Jul	12/07/2008 10:17	0.2	2 panels	4.1	3.6	38.1	70	MD	6	0	6	10.29
L7	GN	3	1	12-Jul	12/07/2008 10:45	12-Jul	12/07/2008 11:15	0.5	1 panel	-		76.2	35	MD	2	0	2	2.74
L7	GN	3	2	12-Jul	12/07/2008 11:15	12-Jul	12/07/2008 14:15	3	1 panel	-		76.2	35	MD	0	0	0	0.00

Notes:

Method
GN = gillnet
MT = minnow trap

Set
BT = bottom
MD = middle

Fish
RB = rainbow trout
KO = kokanee salmon
CPUE = catch-per-unit-effort

Appendix 2-3

Lake Individual Fish Data

Appendix 2-3. Lake Individual Fish Data

Date	Local Name	Site #	Method	#	Haul	Species	Length (mm)	Weight (g)	Condition (g/mm^3)	Age Structure	Age Sample #	Age	Genetic Structure	Genetic Sample #
3-Jul-08	Mess Lake (L1)	600	MT	23	2	KO	58	1.6	0.82				tissue sample	7
4-Jul-09	Mess Lake (L1)	600	MT	101	1	KO	72	-	-	scale	1	1	tissue sample	2
3-Jul-08	Mess Lake (L1)	600	MT	20	1	KO	80	6	1.17	scale	51	UA	tissue sample	52
3-Jul-08	Mess Lake (L1)	600	MT	21	1	KO	91	10	1.33	scale	49	2	tissue sample	50
3-Jul-08	Mess Lake (L1)	600	MT	16	1	KO	97	11	1.21	scale	34	1	tissue sample	35
3-Jul-08	Mess Lake (L1)	600	GN	5	1	KO	101	16	1.55	scale	14	2	tissue sample	15
3-Jul-08	Mess Lake (L1)	600	GN	5	1	KO	102	16	1.51	scale	6	UA	tissue sample	7
3-Jul-08	Mess Lake (L1)	600	GN	3	1	KO	102	-	-	scale	10	UA	tissue sample	11
3-Jul-08	Mess Lake (L1)	600	GN	5	1	KO	102	13	1.23	scale	12	UA	tissue sample	13
3-Jul-08	Mess Lake (L1)	600	GN	2	1	KO	103	-	-	scale	5	2	tissue sample	6
3-Jul-08	Mess Lake (L1)	600	MT	16	1	KO	103	12	1.10	scale	32	UA	tissue sample	33
3-Jul-08	Mess Lake (L1)	600	GN	5	1	KO	104	15	1.33	scale	10	UA	tissue sample	11
3-Jul-08	Mess Lake (L1)	600	GN	5	1	KO	105	13	1.12	scale	2	2	tissue sample	3
3-Jul-08	Mess Lake (L1)	600	GN	3	1	KO	105	-	-	scale	14	2	tissue sample	15
3-Jul-08	Mess Lake (L1)	600	GN	6	1	KO	105	13	1.12	scale	24	2	tissue sample	25
3-Jul-08	Mess Lake (L1)	600	MT	16	1	KO	106	13	1.09	scale	30	2	tissue sample	31
3-Jul-08	Mess Lake (L1)	600	MT	16	1	KO	106	14	1.18	scale	38	2	tissue sample	39
3-Jul-08	Mess Lake (L1)	600	MT	16	1	KO	106	14	1.18	scale	40	UA	tissue sample	41
3-Jul-08	Mess Lake (L1)	600	MT	2	1	KO	107	-	-	scale	21	2	tissue sample	22
3-Jul-08	Mess Lake (L1)	600	GN	5	1	KO	107	18	1.47	scale	22	2	tissue sample	23
3-Jul-08	Mess Lake (L1)	600	GN	5	1	KO	108	16	1.27	scale	16	2	tissue sample	17
3-Jul-08	Mess Lake (L1)	600	GN	5	1	KO	108	15	1.19	scale	18	UA	tissue sample	19
3-Jul-08	Mess Lake (L1)	600	GN	5	1	KO	110	17	1.28	scale	20	UA	tissue sample	21
3-Jul-08	Mess Lake (L1)	600	MT	101	1	KO	113	18	1.25	fin ray	3	UA		
3-Jul-08	Mess Lake (L1)	600	MT	112	1	KO	113	16.8	1.16	scale	8	UA	tissue sample	9
3-Jul-08	Mess Lake (L1)	600	MT	16	1	KO	113	16	1.11	scale	28	1	tissue sample	29
3-Jul-08	Mess Lake (L1)	600	MT	16	1	KO	114	13	0.88	scale	26	2	tissue sample	27
3-Jul-08	Mess Lake (L1)	600	MT	17	1	KO	114	18	1.21	scale	43	2	tissue sample	44
3-Jul-08	Mess Lake (L1)	600	GN	2	1	KO	116	-	-	scale	3	UA	tissue sample	4
3-Jul-08	Mess Lake (L1)	600	MT	2	1	KO	116	-	-	scale	19	UA	tissue sample	20
3-Jul-08	Mess Lake (L1)	600	GN	3	1	KO	117	-	-	scale	12	3	tissue sample	13
3-Jul-08	Mess Lake (L1)	600	MT	17	2	KO	120	-	-	scale	5	UA	tissue sample	6
3-Jul-08	Mess Lake (L1)	600	MT	16	1	KO	121	21	1.19	scale	36	UA	tissue sample	37
3-Jul-08	Mess Lake (L1)	600	GN	5	1	KO	124	26	1.36	scale	4	UA	tissue sample	5
3-Jul-08	Mess Lake (L1)	600	GN	5	1	KO	125	21	1.08	scale	8	3	tissue sample	9
3-Jul-08	Mess Lake (L1)	600	MT	2	1	KO	125	-	-	scale	17	2	tissue sample	18
3-Jul-08	Mess Lake (L1)	600	MT	17	2	KO	150	-	-	scale	3	UA	tissue sample	4
3-Jul-08	Mess Lake (L1)	600	MT	16	2	KO	160	-	-	scale	1	UA	tissue sample	2
3-Jul-08	Mess Lake (L1)	600	EF	1	1	RB	45	1.14	1.25					
3-Jul-08	Mess Lake (L1)	600	EF	1	1	RB	49	1.51	1.28					
3-Jul-08	Mess Lake (L1)	600	EF	1	1	RB	49	1.45	1.23					
3-Jul-08	Mess Lake (L1)	600	MT	14b	1	RB	49	1	0.85					
3-Jul-08	Mess Lake (L1)	600	MT	109	1	RB	49	-	-					
3-Jul-08	Mess Lake (L1)	600	MT	106	1	RB	50	1.41	1.13					
3-Jul-08	Mess Lake (L1)	600	EF	1	1	RB	52	1.67	1.19					
3-Jul-08	Mess Lake (L1)	600	MT	4	1	RB	52	-	-					
3-Jul-08	Mess Lake (L1)	600	MT	107	1	RB	54	1.69	1.07					
3-Jul-08	Mess Lake (L1)	600	EF	1	1	RB	57	2.47	1.33					
3-Jul-08	Mess Lake (L1)	600	EF	1	1	RB	58	2.39	1.22					
3-Jul-08	Mess Lake (L1)	600	MT	23	1	RB	63	4	1.60					
3-Jul-08	Mess Lake (L1)	600	MT	105	1	RB	75	12	2.84	scale	1	UA	tissue sample	
3-Jul-08	Mess Lake (L1)	600	MT	13	1	RB	75	-	-	scale	7	UA		
3-Jul-08	Mess Lake (L1)	600	MT	15	1	RB	79	14	2.84	scale	53	1		
3-Jul-08	Mess Lake (L1)	600	MT	105	1	RB	84	6.88	1.16	fin ray	4	0		

(continued)

Appendix 2-3. Lake Individual Fish Data (continued)

Date	Local Name	Site #	Method	#	Haul	Species	Length (mm)	Weight (g)	Condition (g/mm^3)	Age Structure	Age Sample #	Age	Genetic Structure	Genetic Sample #
3-Jul-08	Mess Lake (L1)	600	MT	102	1	RB	86	6.97	1.10	fin ray	1	0		
3-Jul-08	Mess Lake (L1)	600	EF	1	1	RB	87	8.25	1.25	fin ray	1	UA		
3-Jul-08	Mess Lake (L1)	600	MT	111	1	RB	87	7.7	1.17	scale	13	UA		
3-Jul-08	Mess Lake (L1)	600	MT	9	1	RB	91	-	-	scale	16	1		
3-Jul-08	Mess Lake (L1)	600	EF	1	1	RB	94	11.12	1.34	fin ray	2	1		
3-Jul-08	Mess Lake (L1)	600	MT	112	1	RB	95	9.6	1.12	scale	10	2		
3-Jul-08	Mess Lake (L1)	600	MT	102	1	RB	101	11.98	1.16	fin ray	2	1		
3-Jul-08	Mess Lake (L1)	600	MT	1	1	RB	103	-	-	scale	25	UA		
3-Jul-08	Mess Lake (L1)	600	MT	2	1	RB	104	-	-	scale	24	2		
3-Jul-08	Mess Lake (L1)	600	MT	19	1	RB	107	18	1.47	scale	48	UA		
3-Jul-08	Mess Lake (L1)	600	MT	112	1	RB	108	12.1	0.96	scale	11	UA		
3-Jul-08	Mess Lake (L1)	600	MT	111	1	RB	110	20	1.50	scale	12	2		
3-Jul-08	Mess Lake (L1)	600	MT	14b	1	RB	112	15	1.07	scale	54	UA		
3-Jul-08	Mess Lake (L1)	600	MT	111	1	RB	116	19.8	1.27	scale	14	2		
3-Jul-08	Mess Lake (L1)	600	MT	18	1	RB	122	21	1.16	scale	46	UA		
3-Jul-08	Mess Lake (L1)	600	MT	16	1	RB	125	23	1.18	scale	42	2		
3-Jul-08	Mess Lake (L1)	600	MT	2	1	RB	128	-	-	scale	23	UA		
3-Jul-08	Mess Lake (L1)	600	MT	18	1	RB	130	25	1.14	scale	47	2		
3-Jul-08	Mess Lake (L1)	600	MT	18	1	RB	140	32	1.17	scale	45	3		
3-Jul-08	Mess Lake (L1)	600	MT	10	1	RB	146	-	-	scale	9	3		
3-Jul-08	Mess Lake (L1)	600	MT	14b	1	RB	148	38	1.17	scale	55	2		
3-Jul-08	Mess Lake (L1)	600	MT	13	1	RB	152	-	-	scale	8	2		
12-Jul-08	L-7	606	GN	1	2	RB	143	35	1.20	scale	1	2		
12-Jul-08	L-7	606	GN	1	2	RB	124	21	1.10	scale	2	UA		
12-Jul-08	L-7	606	GN	1	2	RB	117	18	1.12	scale	3	1		
12-Jul-08	L-7	606	GN	1	2	RB	169	44	0.91	scale	4	UA		
12-Jul-08	L-7	606	GN	1	2	RB	146	33	1.06	scale	5	2		
12-Jul-08	L-7	606	GN	1	2	RB	135	23	0.93	scale	6	UA		
12-Jul-08	L-7	606	GN	1	2	RB	146	34	1.09	scale	7	2		
12-Jul-08	L-7	606	GN	2	1	RB	172	81	1.59	scale	8	UA		
12-Jul-08	L-7	606	GN	2	1	RB	182	65	1.08	scale	9	3		
12-Jul-08	L-7	606	GN	2	1	RB	198	79	1.02	scale	10	UA		
12-Jul-08	L-7	606	GN	2	1	RB	165	51	1.14	scale	11	2		
12-Jul-08	L-7	606	GN	2	2	RB	182	66	1.09	scale	12	UA		
12-Jul-08	L-7	606	GN	2	2	RB	177	60	1.08	scale	13	3		
12-Jul-08	L-7	606	GN	2	2	RB	204	96	1.13	scale	14	UA		
12-Jul-08	L-7	606	GN	2	2	RB	185	72	1.14	scale	15	3		
12-Jul-08	L-7	606	GN	2	2	RB	167	51	1.10	scale	16	UA		
12-Jul-08	L-7	606	GN	2	2	RB	190	71	1.04	scale	17	3		
11-Jul-08	L-7	606	MT	5	1	RB	158	42	1.06	scale	18	UA		
11-Jul-08	L-7	606	MT	5	1	RB	135	28	1.14	scale	19	2		
11-Jul-08	L-7	606	MT	5	1	RB	91	7	0.93	scale	20	UA		
11-Jul-08	L-7	606	MT	6	1	RB	92	8	1.03	scale	21	1		
11-Jul-08	L-7	606	MT	6	1	RB	174	58	1.10	scale	22	UA		
11-Jul-08	L-7	606	MT	6	1	RB	101	11	1.07	scale	23	3		
11-Jul-08	L-7	606	MT	6	1	RB	163	42	0.97	scale	24	UA		
11-Jul-08	L-7	606	MT	6	1	RB	121	19	1.07	scale	25	2		
11-Jul-08	L-7	606	MT	6	1	RB	175	56	1.04	scale	26	UA		
11-Jul-08	L-7	606	MT	6	1	RB	100	10	1.00	scale	27	2		
11-Jul-08	L-7	606	MT	6	1	RB	113	14	0.97	scale	28	UA		
11-Jul-08	L-7	606	MT	3	1	RB	89	7	0.99	scale	29	1		
11-Jul-08	L-7	606	MT	3	1	RB	88	7	1.03	scale	30	UA		
11-Jul-08	L-7	606	MT	3	1	RB	130	21	0.96	scale	31	2		
11-Jul-08	L-7	606	MT	3	1	RB	101	10	0.97	scale	32	UA		

(continued)

Appendix 2-3. Lake Individual Fish Data (completed)

Date	Local Name	Site #	Method	#	Haul	Species	Length (mm)	Weight (g)	Condition (g/mm^3)	Age Structure	Age Sample #	Age	Genetic Structure	Genetic Sample #
11-Jul-08	L-7	606	MT	3	1	RB	128	21	1.00	scale	33	2		
11-Jul-08	L-7	606	MT	3	1	RB	98	9	0.96	scale	34	UA		
11-Jul-08	L-7	606	MT	3	1	RB	84	6	1.01	scale	35	2		
11-Jul-08	L-7	606	MT	3	1	RB	103	12	1.10	scale	36	UA		
11-Jul-08	L-7	606	MT	3	1	RB	94	8	0.96	scale	37	1		
11-Jul-08	L-7	606	MT	3	1	RB	101	11	1.07	scale	38	UA		
11-Jul-08	L-7	606	MT	1	1	RB	86	7	1.10	scale	39	1		
11-Jul-08	L-7	606	MT	2	1	RB	129	24	1.12	scale	40	UA		
11-Jul-08	L-7	606	MT	2	1	RB	133	24	1.02	scale	41	1		
11-Jul-08	L-7	606	MT	2	1	RB	114	15	1.01	scale	42	UA		
11-Jul-08	L-7	606	MT	2	1	RB	155	39	1.05	scale	43	3		
11-Jul-08	L-7	606	MT	2	1	RB	156	39	1.03	scale	44	UA		
11-Jul-08	L-7	606	MT	2	1	RB	133	24	1.02	scale	45	2		
11-Jul-08	L-7	606	MT	2	1	RB	153	41	1.14	scale	46	UA		
11-Jul-08	L-7	606	MT	2	1	RB	134	24	1.00	scale	47	2		
11-Jul-08	L-7	606	MT	2	1	RB	133	25	1.06	scale	48	UA		
11-Jul-08	L-7	606	MT	2	1	RB	135	28	1.14	scale	49	2		
12-Jul-08	L-7	606	GN	3	1	RB	280	146	0.67	scale	50	UA		
12-Jul-08	L-7	606	GN	3	1	RB	259	157	0.90	scale	51	3		
11-Jul-08	L-7	606	MT	7	1	RB	125	23	1.18	scale	52	UA		
11-Jul-08	L-7	606	MT	7	1	RB	159	44	1.09	scale	53	2		
11-Jul-08	L-7	606	MT	14	1	RB	145	29	0.95	scale	54	UA		
11-Jul-08	L-7	606	MT	12	1	RB	118	16	0.97	scale	55	2		
11-Jul-08	L-7	606	MT	11	1	RB	121	22	1.24	scale	56	UA		
11-Jul-08	L-7	606	MT	4	1	RB	62	2	0.84					
11-Jul-08	L-7	606	MT	6	1	RB	64	3	1.14					
8-Jul-08	Start Lake (L5)	604				RB	340			scale	2	UA		
8-Jul-08	Start Lake (L5)	604				RB	350			scale	3	5		
8-Jul-08	Start Lake (L5)	604				RB	360			scale	4	UA		
9-Jul-08	Start Lake (L5)	604	MT	1	1	RB	111	17	1.24	scale	1	2		
9-Jul-08	Start Lake (L5)	604	MT	1	1	RB	121	20	1.13	scale	2	UA		
9-Jul-08	Start Lake (L5)	604	MT	8	1	RB	109	16	1.24	scale	3	1		
9-Jul-08	Start Lake (L5)	604	GN	3	1	RB	320			scale	4	4		
9-Jul-08	Start Lake (L5)	604	GN	3	1	RB	340			scale	5	5		
9-Jul-08	Start Lake (L5)	604	GN	3	2	RB	345			scale	6	UA		
9-Jul-08	Start Lake (L5)	604	GN	3	2	RB	320			scale	7	4		
9-Jul-08	Start Lake (L5)	604				RB	112	16	1.14	scale	8	1		
9-Jul-08	Start Lake (L5)	604				RB	122	22	1.21	scale	9	2		
10-Jul-08	Start Lake (L5)	604	GN	1	1	RB	345			scale	1	5		
10-Jul-08	Start Lake (L5)	604	GN	1	2	RB	360			scale	2	5		
10-Jul-08	Start Lake (L5)	604	GN	2	1	RB	310			scale	3	UA		
10-Jul-08	Start Lake (L5)	604				RB	365			scale	4	5		
10-Jul-08	Start Lake (L5)	604				RB	345			scale	5	UA		

Notes:

Method
GN = gillnet
MT = minnow trap
EF = electrofishing

Species
RB = rainbow trout
KO = kokanee salmon

Age
UQ = unaged

Appendix 3-1

Wetland Habitat Data

Appendix 3-1. Wetland Habitat Data

Wetland ID	Date	Point	Location						Connections			Features	
			Zone	Easting	Northing	Length (m)	Width (m)	Depth (m)	Inlet	Outlet	Barrier	NID / UTM	Photo # / Description
WL-4	30/06/2008	1	9	382321	6366244	0	319	na	1			same as point	389-392
WL-4	30/06/2008	2	9	382294	6366230	30	273	na					393-395
WL-4	30/06/2008	3	9	382264	6366228	30	122	na					396-397
WL-4	30/06/2008	4	9	382249	6366221	30	86	na					399-400
WL-4	30/06/2008	5	9	382212	6366195	30	101	na	1			same as point	
WL-4	30/06/2008	6	9	382169	6366205	30	188	na	1				407-409; 411
WL-4	30/06/2008	7	9	382142	6366212	30	44	na	1				
WL-6	30/06/2008	1	9	384263	6361221	113	1					none	374
WL-6	30/06/2008	2	9	384239	6361198	132	1					none	
WL-6	30/06/2008	3	9	384212	6361171	158	1					none	376
WL-6	30/06/2008	4	9	384201	6361143	142	1			1		09 384201 6361145	377-378
WL-6	30/06/2008	5	9	384195	6361120	257	1						
WL-9	30/06/2008	1	9	384000	6341464	30	46	0.5	2				inlet #1 - 330/inlet #2 - 329,331
WL-9	30/06/2008	2	9			30	59	0.5	1			channel - 9 384046 6341340	337
WL-9	30/06/2008	3	9			30	109	0.6					
WL-9	30/06/2008	4	9			30	123	0.6					
WL-9	30/06/2008	5	9			30	144	0.6				channel - 09 384140 6341362	
WL-9	30/06/2008	6	9			30	130	0.6				channel	
WL-9	30/06/2008	7	9			30	112	0.6				start of beaver dam	344
WL-9	30/06/2008	8	9			30	92	0.6					
WL-9	30/06/2008	9	9			30	66	0.6					
WL-9	30/06/2008	10	9			30	41	0.7					350-352
WL-9	30/06/2008	11	9			30	27	0.8					353-355

(continued)

Appendix 3-1. Wetland Habitat Data (completed)

Wetland ID	Substrate		Cover						Vegetation Type (√)						Habitat Quality			
	Dominant	Subdominant	SWD	LWD	B	DP	OV	IV	T	S	H	R	M	A	R	O	S	M
WL-4	Fine	Organic	D	SD	N	N	N	N		√			√		G	P	F	P
WL-4	Fine	Organic	D	SD	N	T	N	N		√			√		G	P	F	P
WL-4	Fine	Organic	D	SD	N	T	N	N		√			√		G	P	F	P
WL-4	Fine	Organic	D	SD	N	T	N	N		√			√		G	P	F	P
WL-4	Fine	Organic	D	SD	N	T	N	N		√			√		G	P	F	P
WL-4	Fine	Organic	D	SD	N	T	N	N		√			√		G	P	F	P
WL-4	Fine	Organic	D	SD	N	T	N	N		√			√		G	P	F	P
WL-6	Fine	Organic	N	N	N	SD	N	D		√					F	P	P	P
WL-6	Fine	Organic	N	N	N	SD	N	P		√					F	P	P	P
WL-6	Fine	Organic	N	N	N	SD	N	D		√					F	P	P	P
WL-6	Fine	Organic	N	N	N	SD	N	D		√					F	P	P	P
WL-6	Fine	Organic	N	N	N	SD	N	D		√					F	P	P	P
WL-9	Fine	Organic	D	SD	N	N	T	T		√					G	P	F	P
WL-9	Fine	Organic	D	SD	N	N	N	T		√					G	P	P	P
WL-9	Fine	Organic	D	SD	N	N	N	T		√					G	P	P	P
WL-9	Fine	Organic	SD	N	N	N	N	D		√					G	P	P	P
WL-9	Fine	Organic	D	SD	N	N	N	T		√					G	P	P	P
WL-9	Fine	Organic	D	SD	N	N	N	T		√					G	P	P	P
WL-9	Fine	Organic	D	SD	N	N	N	T		√					G	P	P	P
WL-9	Fine	Organic	D	SD	N	N	N	T	√	√					G	P	P	P
WL-9	Fine	Organic	D	SD	N	N	N	T	√	√					G	P	P	P
WL-9	Fine	Organic	D	SD	N	N	N	T	√	√					G	P	P	P
WL-9	Fine	Organic	D	SD	N	N	N	T	√	√					G	P	P	P

Notes:

Cover
SWD = small woody debris
LWD = large woody debris
B = boulder
DP = deep pool
OV = overhanging vegetation
IV = instream vegetation

Cover Amount
D = dominant
SD = sub-dominant
T = trace
N = none

Vegetation Type
T = trees
S = shrubs
H = horsetails
R = rushes
M = moss
A = algae

Habitat ***Habitat Quality***
R = rearing P = poor
O = overwi F = fair
S = spawni G = good
M = migration

Appendix 3-2

Wetland Electrofishing Effort

Appendix 3-2. Wetland Electrofishing Effort

Site	Method	#	Time In	Time Out	EF Sec.	Length (m)	Width (m)	Voltage (V)	Frequency (Hz)	Pulse (ms)	Make	Model
WL-4	EF	1	13:30	14:15	697	300	2	300	40	2	SR	12B-POW
WL-6	EF	1	12:30	13:00	380	120	2	300	40	2	SR	LR24
WL-9	EF	1	10:15	11:20	1223	200	2	200	40	2	SR	12B-POW

Notes:
EF = electrofishing
SR = Smith-Root

Appendix 3-3

Wetland Minnow Trap Effort

Appendix 3-3. Wetland Minnow Trap Effort

Site	Method	#	Haul	Date In	Time In	Date Out	Time Out
WL-4	MT	1	1	30-Jun	13:50	01-Jul	7:51
WL-4	MT	2	1	30-Jun	14:13	01-Jul	7:56
WL-4	MT	3	1	30-Jun	14:16	01-Jul	8:00
WL-4	MT	4	1	30-Jun	14:25	01-Jul	8:10
WL-4	MT	5	1	30-Jun	14:35	01-Jul	8:12
WL-4	MT	6	1	30-Jun	14:40	01-Jul	8:18
WL-6	MT	1	1	30-Jun	11:33	01-Jul	8:56
WL-6	MT	2	1	30-Jun	11:40	01-Jul	8:45
WL-6	MT	3	1	30-Jun	11:55	01-Jul	9:03
WL-6	MT	4	1	30-Jun	12:03	01-Jul	9:11
WL-6	MT	5	1	30-Jun	12:10	01-Jul	9:25
WL-9	MT	1	1	30-Jun	8:51	01-Jul	10:06
WL-9	MT	2	1	30-Jun	8:54	01-Jul	10:13
WL-9	MT	3	1	30-Jun	9:00	01-Jul	10:20
WL-9	MT	4	1	30-Jun	9:05	01-Jul	10:30
WL-9	MT	5	1	30-Jun	9:15	01-Jul	10:35

Note:
MT = minnow trap

Appendix 3-4

Wetland Individual Fish Data

Appendix 3-4. Wetland Individual Fish Data

Site	Method	#	H/P	Species	Length (mm)	Weight (g)	Condition (g/mm^3)	Age Structure	Age Sample #	Age
WL-4	MT	3	1	RB	120	20	1.16	-	-	-
WL-4	EF	1	1	RB	115	-	-	FR	1	2
WL-4	EF	1	1	RB	139	-	-	FR	2	2
WL-4	EF	1	1	RB	185	-	-	FR	3	3
WL-4	EF	1	1	RB	124	-	-	FR	4	2
WL-4	EF	1	1	RB	189	-	-	FR	5	4
WL-9	MT	2	1	RB	115	19	1.25	-	-	-
WL-9	MT	3	1	RB	135	29	1.18	-	-	-
WL-9	MT	3	1	RB	115	15	0.99	-	-	-
WL-9	MT	3	1	RB	137	34	1.32	-	-	-
WL-9	MT	3	1	RB	120	26	1.50	-	-	-
WL-9	MT	3	1	RB	130	31	1.41	-	-	-
WL-9	MT	5	1	RB	159	45	1.12	-	-	-
WL-9	MT	5	1	RB	139	34	1.27	-	-	-
WL-9	EF	1	1	RB	241	-	-	FR	1	4
WL-9	EF	1	1	RB	174	-	-	FR	2	3
WL-9	EF	1	1	RB	148	-	-	FR	3	2
WL-9	EF	1	1	RB	160	-	-	FR	4	4
WL-9	EF	1	1	RB	88	-	-	FR	5	2
WL-9	EF	1	1	RB	134	-	-	FR	6	2
WL-9	EF	1	1	RB	148	-	-	FR	7	3
WL-9	EF	1	1	RB	104	-	-	FR	8	1
WL-9	EF	1	1	RB	86	-	-	FR	9	1
WL-9	EF	1	1	RB	102	-	-	FR	10	1

Notes:

Method
EF = electrofishing
MT = minnow trap
H = haul
P = pass

Age structure
FR = fin ray

Appendix 4-1

Compensation Site Detailed Habitat Data

Appendix 4-1. Compensation Site Detailed Habitat Data

			Start UTM		End UTM		Water Quality					Habitat ID			Habitat Dimensions			Depth (m)		Width (m)		Substrate (%)			
Site ID	Date	Crew	Easting	Northing	Easting	Northing	Temp (°C)[1]	Cond. (µS/cm)	pH	Turb. [2]	Stage[3]	Habitat Unit	Habitat Type [4]	Distance from start	Length (m)	% of total length	Slope (%)	Wetted	Bankfull	Wetted	Bankfull	Fine	Gravel	Cobble	Boulder
Start Creek R1	11-Aug-08	LT/TS	382487	6365475	382449	6365652	4	120	8.1	C	M	1	R	0	104	56.71	3	0.18				40	60		
Start Creek R1	11-Aug-08	LT/TS	382487	6365475	382449	6365652	4	120	8.1	C	M	2	P	104	2	1.09	0	0.28	0.36	3.9	4	10	55	30	5
Start Creek R1	11-Aug-08	LT/TS	382487	6365475	382449	6365652	4	120	8.1	C	M	3	R	106	19	10.36	5	0.19		3.4	3.7	30	70		
Start Creek R1	11-Aug-08	LT/TS	382487	6365475	382449	6365652	4	120	8.1	C	M	4	P	124	2	1.09	0	0.28	0.54	3	4	30	30	35	5
Start Creek R1	11-Aug-08	LT/TS	382487	6365475	382449	6365652	4	120	8.1	C	M	5	P	132	2	1.09	0	0.41	0.66	1.4	1.6	40	25	25	10
Start Creek R1	11-Aug-08	LT/TS	382487	6365475	382449	6365652	4	120	8.1	C	M	6	P	155	3	1.64	0	0.39	0.78	3.7	3.9	40	45	10	5
Start Creek R1	11-Aug-08	LT/TS	382487	6365475	382449	6365652	4	120	8.1	C	M	7	R	158	10	5.45	2	0.17		4	4	10	55	30	5
Start Creek R1	11-Aug-08	LT/TS	382487	6365475	382449	6365652	4	120	8.1	C	M	8	P	168	2	1.09	0	0.4	0.75	4	3.7	15	40	40	5
Start Creek R1	11-Aug-08	LT/TS	382487	6365475	382449	6365652	4	120	8.1	C	M	9	R	170	38	20.72	3	0.16	0.44	3.2	4	10	75	15	
Start Creek R1	11-Aug-08	LT/TS	382487	6365475	382449	6365652	4	120	8.1	C	M	10	P	208	1.4	0.76	0	0.42	0.87	2.1	2.5	65	35		
Start Creek R2	12-Aug-08	LT/TS	382449	6365652	382477	6365752	5	131	7.7	C	M	1	R	0	6	2.93	1			3.6	4.2	30	70		
Start Creek R2	12-Aug-08	LT/TS	382449	6365652	382477	6365752	5	131	7.7	C	M	2	G	6	28	13.66	1			4.3	4.9	80	20		
Start Creek R2	12-Aug-08	LT/TS	382449	6365652	382477	6365752	5	131	7.7	C	M	3	P	34	16	7.80	0			10.9	11.6	100			
Start Creek R2	12-Aug-08	LT/TS	382449	6365652	382477	6365752	5	131	7.7	C	M	4	G	50	8	3.90	1			8.7	9.1	80	20		
Start Creek R2	12-Aug-08	LT/TS	382449	6365652	382477	6365752	5	131	7.7	C	M	5	G	59	7	3.41	1			4.9	8.1	10	90		
Start Creek R2	12-Aug-08	LT/TS	382449	6365652	382477	6365752	5	131	7.7	C	M	6	P	63	10	4.88	0			3.3	5.6	25	75		
Start Creek R2	12-Aug-08	LT/TS	382449	6365652	382477	6365752	5	131	7.7	C	M	7	R	73	130	63.41	1			2.4	2.7	20	75	5	
Start Creek R3	12-Aug-08	KM/CS	382465	6365750	382525	6365837	5	130	8.2	C	M	1	G	0	17	16.75	3	0.4	0.7	2.8	3.3	8	90	2	
Start Creek R3	12-Aug-08	KM/CS	382465	6365750	382525	6365837	5	130	8.2	C	M	2	R	7	14.1	13.89	4	0.3	0.6	2.5	3	5	75	20	
Start Creek R3	12-Aug-08	KM/CS	382465	6365750	382525	6365837	5	130	8.2	C	M	3	P	21.1	2.8	2.76	2	0.5	0.7	3.2	3.8	40	60		
Start Creek R3	12-Aug-08	KM/CS	382465	6365750	382525	6365837	5	130	8.2	C	M	4	R	23.9	18.4	18.13	5	0.3	0.6	3.2	4.4	10	50	40	
Start Creek R3	12-Aug-08	KM/CS	382465	6365750	382525	6365837	5	130	8.2	C	M	5	P	42.3	4.1	4.04	2	0.6	1	4.1	4.4	5	95		
Start Creek R3	12-Aug-08	KM/CS	382465	6365750	382525	6365837	5	130	8.2	C	M	6	R	46.4	7.4	7.29	2	0.3	0.5	3	3.5	5	65	30	
Start Creek R3	12-Aug-08	KM/CS	382465	6365750	382525	6365837	5	130	8.2	C	M	7	P	55.8	6.3	6.21	1	0.7	0.8	4.1	4.9	30	70	0	
Start Creek R3	12-Aug-08	KM/CS	382465	6365750	382525	6365837	5	130	8.2	C	M	8	R	62.1	18.5	18.23	4	0.35	0.7	2.4	2.7	5	65	30	
Start Creek R3	12-Aug-08	KM/CS	382465	6365750	382525	6365837	5	130	8.2	C	M	9	P	80.6	4.6	4.53	0	0.5	0.9	4	4.5	30	65	5	
Start Creek R3	12-Aug-08	KM/CS	382465	6365750	382525	6365837	5	130	8.2	C	M	10	R	85.2	8.3	8.18	4	0.3	0.6	3.1	3.5		60	40	
Start Creek R4	12-Aug-08	KM/CS	382525	6365837			5	130	8.2	C	M	1	P	0	3.4	1.49	1	0.5	0.8	5.6	6.7	34	60	5	1
Start Creek R4	12-Aug-08	KM/CS	382525	6365837			5	130	8.2	C	M	2	R	3.4	9.3	4.06	3	0.5	0.9	3.9	4.1	19	80	1	
Start Creek R4	12-Aug-08	KM/CS	382525	6365837			5	130	8.2	C	M	3	P	12.7	2.8	1.22	1	0.4	0.7	5	5.3	30	70		
Start Creek R4	12-Aug-08	KM/CS	382525	6365837			5	130	8.2	C	M	4	G	15.5	11.5	5.02	0	0.4	0.55	4.5	4.6	100			
Start Creek R4	12-Aug-08	KM/CS	382525	6365837			5	130	8.2	C	M	5	R	15.5	3.8	1.66	2	0.5	0.6			80	20		
Start Creek R4	12-Aug-08	KM/CS	382525	6365837			5	130	8.2	C	M	6	P	15.5	2.6	1.14	0	0.7	0.9	4.9	6	50	50		
Start Creek R4	12-Aug-08	KM/CS	382525	6365837			5	130	8.2	C	M	7	G	18.1	5.5	2.40	1	0.35	0.8	2.9	3.2	70	30		
Start Creek R4	12-Aug-08	KM/CS	382525	6365837			5	130	8.2	C	M	8	P	23.6	5.8	2.53	0	0.8	1.1	5.3	5.9	100			
Start Creek R4	12-Aug-08	KM/CS	382525	6365837			5	130	8.2	C	M	9	G	29.4	11.8	5.16	1	0.5	0.8	4.2	4.7	90	8		2
Start Creek R4	12-Aug-08	KM/CS	382525	6365837			5	130	8.2	C	M	10	P	31.2	6	2.62	1	0.5	0.85	4.8	5.8	40	40	20	
Start Creek R4	12-Aug-08	KM/CS	382525	6365837			5	130	8.2	C	M	11	G	37.2	17	7.43	2	0.5	1	4.9	7.7	75	20	5	
Start Creek R4	12-Aug-08	KM/CS	382525	6365837			5	130	8.2	C	M	12	P	54.2	10.6	4.63	1	0.6	0.85	7.5	8.7	90	10		
Start Creek R4	12-Aug-08	KM/CS	382525	6365837			5	130	8.2	C	M	13	R	64.8	10.8	4.72	2	0.6	0.85	7.6	7.7	90	10		
Start Creek R4	12-Aug-08	KM/CS	382525	6365837			5	130	8.2	C	M	14	G	75.6	41.8	18.26	1	0.7	0.9	9.4	10.2	95	5		
Start Creek R4	12-Aug-08	KM/CS	382525	6365837			5	130	8.2	C	M	15	P	117.4	5.9	2.58	0	0.7	1.2	6.9	7.5	90		10	
Start Creek R4	12-Aug-08	KM/CS	382525	6365837			5	130	8.2	C	M	16	G	122.3	21.4	9.35	1	0.4	0.6	17	17	89	10	1	
Start Creek R4	12-Aug-08	KM/CS	382525	6365837			5	130	8.2	C	M	17	P	143.7	5.5	2.40	0	0.63	0.9	7.1	7.8	30	60		10
Start Creek R4	12-Aug-08	KM/CS	382525	6365837			5	130	8.2	C	M	18	G	149.2	16.5	7.21	2	0.4	0.6	9.1	9.8	40	50	10	
Start Creek R4	12-Aug-08	KM/CS	382525	6365837			5	130	8.2	C	M	19	P	165.7	2.5	1.09	0	0.5	0.9	2.5	6.5	20	80		
Start Creek R4	12-Aug-08	KM/CS	382525	6365837			5	130	8.2	C	M	20	R	168.2	20.7	9.04	3	0.4	0.6	8.3	8.6	5	95		
Start Creek R4	12-Aug-08	KM/CS	382525	6365837			5	130	8.2	C	M	21	P	188.9	13.7	5.99	1	1	0.7	4.5	4.8	10	90		
Upper Mess R1	13-Aug-08	LT/TS	383340	6336816	383570	6336925	6	148	8.4	C	M	1	P	0	6	3.75	0.5	0.18		7.1	7.3	5	90	5	
Upper Mess R1	13-Aug-08	LT/TS	383340	6336816	383570	6336925	6	148	8.4	C	M	2	R	6	100	62.50	0.5	0.2	0.55	6.1	7.7	20	75	5	
Upper Mess R1	13-Aug-08	LT/TS	383340	6336816	383570	6336925	6	148	8.4	C	M	3	P	106	7	4.38	1	0.22	0.47	7.1	7.4	40	55	5	
Upper Mess R1	13-Aug-08	LT/TS	383340	6336816	383570	6336925	6	148	8.4	C	M	4	R	113	27	16.88	1	0.33	0.44	6	6.6	10	85	5	
Upper Mess R1	13-Aug-08	LT/TS	383340	6336816	383570	6336925	6	148	8.4	C	M	5	G	140	7	4.38	1	0.28	0.47	6.9	8.7	20	75	5	
Upper Mess R1	13-Aug-08	LT/TS	383340	6336816	383570	6336925	6	148	8.4	C	M	6	R	147	13	8.13	1	0.24	0.4	6.1	7.5	5	90	5	
Upper Mess R2	13-Aug-08	KM/CS	383151	6336287	383063	6336104	6	148	8.4	C	M	1	P	0	4.4	4.47	1	0.7	1	5.9	6.6		70	30	
Upper Mess R2	13-Aug-08	KM/CS	383151	6336287	383063	6336104	6	148	8.4	C	M	2	R	4.4	12.4	12.60	4	0.35	0.7	6.9	9		20	80	
Upper Mess R2	13-Aug-08	KM/CS	383151	6336287	383063	6336104	6	148	8.4	C	M	3	C	128.8	18.4	18.70	5	0.3	0.6	7.8	8.1		20	80	
Upper Mess R2	13-Aug-08	KM/CS	383151	6336287	383063	6336104	6	148	8.4	C	M	4	P	147.2	7.2	7.32	0	0.75	0.95	8.1	8.6	40	40	20	
Upper Mess R2	13-Aug-08	KM/CS	383151	6336287	383063	6336104	6	148	8.4	C	M	5	R	161.4	52.8	53.66	2	0.3	0.55	7	9.2		30	70	
Upper Mess R2	13-Aug-08	KM/CS	383151	6336287	383063	6336104	6	148	8.4	C	M	6	P	214.2	3.2	3.25	0	0.6	0.9	8.7	10.6	30	30	40	

(continued)

Notes:

1 - Water Quality
Temp = temperature
Cond = conductivity
Turb = turbidity

2 - Turbidity
C = clear
L = low
M = moderate
T = turbid

3 - Stage
L = low
M = moderate
H = high

4 - Habitat type
P = pool
G = glide
R = riffle
C = cascade

Appendix 4-1. Compensation Site Detailed Habitat Data (completed)

	Habitat ID			Pools			Bank Height (m)		Bank Stability		Cover (%) [6]							Canopy cover (%)			
Site ID	Habitat Unit	Habitat Type [4]	Distance from start	Type [5]	Max depth (m)	Crest depth (m)	Left Bank	Right Bank	Left Bank	Right Bank	Pool	Boulder	Instream Vegetation	Overhanging Vegetation	Undercut Bank	LWD	SWD	Canopy	Left Bank	Right Bank	Comments
Start Creek R1	1	R	0				0.28	0.2	0.5	0.5	5	2		70	2	2		0	10	10	
Start Creek R1	2	P	104	S	0.5	0.22	0.07	0.2			30	1			2	10	2	0	15	10	
Start Creek R1	3	R	106				0.16	0.18	0.5	0.5	40	2		30	2	5	5	0	40	5	
Start Creek R1	4	P	124	S	0.42	0.14	0.27	0.2	0.5	0	75	2		20		2	2	10	15	15	
Start Creek R1	5	P	132	S	0.57	0.09	0.1	0.2	0.5	0.5	75	2		2	5	10	2	5	5	2	
Start Creek R1	6	P	155	S	0.59	0.28	0.18	0.18	0.5	0	25	2		2	5	10	2	0	15	15	
Start Creek R1	7	R	158				0.26	0.32	0.5	0.5				20			5	0	35	35	
Start Creek R1	8	P	168	S	0.6	0.3	0.28	0.38	0.5	0.5	80	2		10	10	10	5	0	15	20	
Start Creek R1	9	R	170	S	0.35	0.22	0.24	0.26	0.5	0.5	5	2		10	10	10	10	0	20	20	
Start Creek R1	10	P	208	S	0.55	0.3		0.35	0	0	80					20	40	0	0	1	
Start Creek R2	1	R	0				0.3	0.2	0	0					2	5	10	0	0	0	
Start Creek R2	2	G	6	D/S	0.6	0.37	0.17	0.18	0.5	0	50				1	5	5	0	0	0	
Start Creek R2	3	P	34	D/S	0.61	0.32	0.28	0.15	0.5	0	40					15	5	0	0	0	
Start Creek R2	4	G	50	D/S	0.65	0.22	0.09	0.1	0	0	70					5	5	0	0	0	
Start Creek R2	5	G	59	S	0.62	0.27	0.09	0.1	0	0	70				5			0	0	0	
Start Creek R2	6	P	63	S	0.62	0.32	0.12	0.12	0	0	70				5	10	5	0	0	0	
Start Creek R2	7	R	73	S	0.62	0.22	0.13	0.17	0	0	10				2	2	2	0	0	0	
Start Creek R3	1	G	0				0.25	0.3	0.5	0.5					5	5		25	70	90	
Start Creek R3	2	R	7				0.2	0.3	0.5	0.5					5	10		20	90	100	
Start Creek R3	3	P	21.1	D	0.53	0.1	0.2	0.2	0.5	0.5	10				5	15		5	60	90	
Start Creek R3	4	R	23.9				0.25	0.3	0.5	0.5						5	5	30	80	70	
Start Creek R3	5	P	42.3	S	0.64	0.46	0.3	0.4	0.5	0.5	60				10	30		10	80	60	
Start Creek R3	6	R	46.4				0.2	0.2	0.5	0.5					5	2	40	5	60	100	
Start Creek R3	7	P	55.8	S	0.7	0.41	0.3	0.2	0.5	0	30				10	20	10	10	30	90	
Start Creek R3	8	R	62.1				0.3	0.4	0.5	0.5						5	2	40	80	90	
Start Creek R3	9	P	80.6	S	0.5	0.37	0.2	0.4	0.5	0.5	40				5	5	5	5	60	60	
Start Creek R3	10	R	85.2				0.3	0.3	0.5	0.5				10		5	5	0	30	50	
Start Creek R4	1	P	0	S	0.5	0.38	0.4	0.55	0	0	20					5		0	10	25	crossing site
Start Creek R4	2	R	3.4				0.35	0.4	0.5	0.5				5	5	5	20	0	80	95	
Start Creek R4	3	P	12.7	S	0.4	0.33	0.7	0.7	0.5	0.5	30					5	10	0	60	80	
Start Creek R4	4	G	15.5				0.6	0.6	0.5	0.5			15		1		5	5	75	80	
Start Creek R4	5	R	15.5				0.6	0.6	0.5	0.5				5		50	20	0	60	70	mid-stream riffle between channels
Start Creek R4	6	P	15.5	S	0.7	0.2	0.9	1.1	0.5	0.5	10				5			0	0	80	
Start Creek R4	7	G	18.1				0.4	0.35	0.5	0.5					5		1	0	20	80	
Start Creek R4	8	P	23.6	S	0.8	0.4	0.25	0.3	0.5	0.5	20			1	1			0	40	90	
Start Creek R4	9	G	29.4				0.25	0.3	0.5	0.5		5			8	5	3	0	40	60	
Start Creek R4	10	P	31.2	S	0.63	0.35	0.15	0.35	0.5	0.5	10				5	10		0	10	70	
Start Creek R4	11	G	37.2				0.35	0.5	0.5	0.5			20			5		0	30	60	
Start Creek R4	12	P	54.2	S	0.72	0.47	0.25	0.3	0.5	0.5	10		30			10		0	20	70	
Start Creek R4	13	R	64.8				0.25	0.3	0.5	0.5					5	80		0	20	80	
Start Creek R4	14	G	75.6		0.72	0.49	0.2	0.2	0.5	0.5			80			5	2	0	60	60	
Start Creek R4	15	P	117.4	S	0.72	0.49	0.4	0.2	0.5	0.5	5		90			5		0	70	20	
Start Creek R4	16	G	122.3				0.4	0.2	0.5	0.5			75			5		0	60	10	
Start Creek R4	17	P	143.7	S	0.63	0.34	0.4	0.3	0.5	0.5	30	5				20		0	20	20	
Start Creek R4	18	G	149.2				0.25	0.15	0.5	0.5			20				1	0	40	20	
Start Creek R4	19	P	165.7	S	0.5	0.06	0.4	0.2	0.5	0.5	90					10		0	60	20	
Start Creek R4	20	R	168.2				0.4	0.2	0.5	0.5						10		0	10	20	
Start Creek R4	21	P	188.9	S	0.63	0.37	0.4	0.2	0.5	0.5	20					5		0	10	10	
Upper Mess R1	1	P	0	S	1.1	0.2	0.52	0.38	0.5	0.5	60			2		5	5	2	5	5	
Upper Mess R1	2	R	6	S	0.55	0.35	0.17	0.28	0.5	0.5	5			10	10	10	5	2	5	5	
Upper Mess R1	3	P	106	S	1	0.25	0.25	0.18	0.5	0.5	60			5	2	2	2	2	5	5	
Upper Mess R1	4	R	113	S	0.75	0.24	0.1	0.1	0.5	0.5	5			5		2	2	2	5	5	
Upper Mess R1	5	G	140	S	0.75	0.3	0.18	0.15	0.5	0.5	50			2		10	5	2	5	5	
Upper Mess R1	6	R	147				0.14	0.27	0.5	0.5	2			5		2	2	2	5	5	
Upper Mess R2	1	P	0	S	0.7	0.08	0.3	0.25	0.5	0.5	10			20			30	10	100	100	
Upper Mess R2	2	R	4.4				0.3	0.4	0.5	0.5				10			2	20	100	100	
Upper Mess R2	3	C	128.8				0.25	0.3	0.5	0.5				20		5		10	100	100	
Upper Mess R2	4	P	147.2	S	0.8	0.2	0.2	0.22	0.5	0.5	60			5		10		10	100	90	
Upper Mess R2	5	R	161.4				0.24	0.25	0.5	0.5				10		2		10	100	100	
Upper Mess R2	6	P	214.2	S	0.6	0.4	0.3	0.3	0.5	0.5	10				5	70		10	100	100	

Notes:

4 - Habitat type
P = pool
G = glide
R = riffle
C = cascade

5 - Pool type
S = scour
D = dam

6 - Cover
LWD = large woody debris
SWD = small woody debris

Appendix 4-2

Compensation Site Sampling Effort

Appendix 4-2. Compensation Site Sampling Effort.

Location			Sample			Water Quality			Electrofisher Settings									Minnow Trap Settings		Fish Information				Length (mm)		
Date	Local Name	Site #	Method	#	H/P	Temp (˚C)	Cond (µS/cm)	Turbidity	EF Seconds	Length (m)	Width (m)	Enclosure	Voltage (V)	Frequency (Hz)	Pulse (ms)	Make	Model	Set	Soak Time (h)	Species	Stage	Age	Total #	Min.	Max.	Fish Activity
11-Aug-08	Start Creek R1	6	EF	1	1	4	120	C	849	200	3	O	400	30	2	Smith-root	LR-24			RB	J	Unknown	7	62	130	rearing
12-Aug-08	Start Creek R2	5	EF	1	1	5	131	C	282	25	7	O	500	35	2	Smith-root	LR-24			RB	A	Unknown	3	179	202	rearing
12-Aug-08	Start Creek R2	5	EF	1	1	5	131	C	282	25	7	O	500	35	2	Smith-root	LR-24			RB	J	Unknown	14	80	118	rearing
12-Aug-08	Start Creek R2	5	EF	2	1	5	131	C	174	150	5	O	400	30	2	Smith-root	LR-24			RB	J	Unknown	5	52	155	rearing
12-Aug-08	Start Creek R3	3	EF	1	1	5	130	C	370	100	4	O	370	40	4	Smith-root	LR-24			RB	J	Unknown	9	53	221	rearing
12-Aug-08	Start Creek R4	4	EF	1	1	5	130	C	621	50	4	O	370	30	4	Smith-root	LR-24			RB	A	Unknown	19	81	223	rearing
12-Aug-08	Start Creek R4	4	MT	1	1	5	130	C										bottom	16	RB	J	Unknown	1	136		
12-Aug-08	Start Creek R4	4	MT	2	1	5	130	C										bottom	16							
12-Aug-08	Start Creek R4	4	MT	3	1	5	130	C										bottom	16							
12-Aug-08	Start Creek R4	4	MT	4	1	5	130	C										bottom	16	RB	J	Unknown	1	131		
12-Aug-08	Start Creek R4	4	MT	5	1	5	130	C										bottom	16	RB	J	Unknown	2	101	127	
12-Aug-08	Start Creek R4	4	MT	6	1	5	130	C										bottom	16	RB	J	Unknown	1	100		
12-Aug-08	Start Creek R4	4	MT	7	1	5	130	C										bottom	16	RB	J	Unknown	1	100		
12-Aug-08	Start Creek R4	4	MT	8	1	5	130	C										bottom	16	RB	J	Unknown	1	154		
12-Aug-08	Start Creek R4	4	MT	9	1	5	130	C										bottom	16							
12-Aug-08	Start Creek R4	4	MT	10	1	5	130	C										bottom	16	RB	J	Unknown	1	129		
13-Aug-08	Upper Mess R1	1	EF	1	1	6	148	C	1148	300	8	O	400	30	2	Smith-root	LR-24									
13-Aug-08	Upper Mess R2	2	EF	1	1	7	130	C	1169	200	7	O	370	30	4	Smith-root	LR-24			RB	A	Unknown	1	260		rearing
13-Aug-08	Upper Mess R2	2	MT	1	1	7	130	C										bottom	16							
13-Aug-08	Upper Mess R2	2	MT	2	1	7	130	C										bottom	16							
13-Aug-08	Upper Mess R2	2	MT	3	1	7	130	C										bottom	16							
13-Aug-08	Upper Mess R2	2	MT	4	1	7	130	C										bottom	16							
13-Aug-08	Upper Mess R2	2	MT	5	1	7	130	C										bottom	16							
13-Aug-08	Upper Mess R2	2	MT	6	1	7	130	C										bottom	16							
13-Aug-08	Upper Mess R2	2	MT	7	1	7	130	C										bottom	16							
13-Aug-08	Upper Mess R2	2	MT	8	1	7	130	C										bottom	16							
13-Aug-08	Upper Mess R2	2	MT	9	1	7	130	C										bottom	16							
13-Aug-08	Upper Mess R2	2	MT	10	1	7	130	C										bottom	16							
13-Aug-08	Upper Mess R2	2	VO	1	1	7	130	C												RB	A	Unknown	1			rearing

Notes:

Sample methods
EF = electrofishing
MT = minnow trapping

Water Quality
Temp = temperature
Cond = conductivity
C = clear

EF = electrofisher
O = open

RB = rainbow trout
J = juvenile
A = adult

Min. = minimum
Max = maximum

Appendix 4-3

Compensation Site Individual Fish Data

Appendix 4-3. Compensation Site Individual Fish Data

Local Name	Site #	Method	#	Species	Length (mm)	Weight (g)	Condition (g/mm^3)	ln (length)	ln (weight)	ln (condition)	Sex	Age Structure	Sample #	Age
Start Creek R1	6	EF	1	RB	62	2.5	1.05	4.13	0.92	0.05	U	SC	5	2
Start Creek R1	6	EF	1	RB	76	5	1.14	4.33	1.61	0.13	U	SC	4	1
Start Creek R1	6	EF	1	RB	84	7.2	1.21	4.43	1.97	0.19	U	SC	6	1
Start Creek R1	6	EF	1	RB	100	14.1	1.41	4.61	2.65	0.34	U	SC	7	1
Start Creek R1	6	EF	1	RB	103	14.2	1.30	4.63	2.65	0.26	U	SC	1	1
Start Creek R1	6	EF	1	RB	110	15.3	1.15	4.70	2.73	0.14	U	SC	2	1
Start Creek R1	6	EF	1	RB	130	24	1.09	4.87	3.18	0.09	U	SC	3	1
Start Creek R2	5	EF	2	RB	52	2	1.42	3.95	0.69	0.35	U			
Start Creek R2	5	EF	1	RB	64	3.3	1.26	4.16	1.19	0.23	U			
Start Creek R2	5	EF	1	RB	80	5	0.98	4.38	1.61	-0.02	U			
Start Creek R2	5	EF	1	RB	84	7	1.18	4.43	1.95	0.17	U	FR	6	NA
Start Creek R2	5	EF	1	RB	86	7.4	1.16	4.45	2.00	0.15	U	FR	3	NA
Start Creek R2	5	EF	2	RB	93	12.5	1.55	4.53	2.53	0.44	U	SC	11	NA
Start Creek R2	5	EF	1	RB	95	11.8	1.38	4.55	2.47	0.32	U	FR	1	NA
Start Creek R2	5	EF	1	RB	96	10	1.13	4.56	2.30	0.12	U	FR	2	NA
Start Creek R2	5	EF	1	RB	107	13.8	1.13	4.67	2.62	0.12	U	FR	9	NA
Start Creek R2	5	EF	1	RB	118	17.3	1.05	4.77	2.85	0.05	U	FR	7	NA
Start Creek R2	5	EF	2	RB	119	20	1.19	4.78	3.00	0.17	U	SC	12	NA
Start Creek R2	5	EF	2	RB	142	36.8	1.29	4.96	3.61	0.25	U	SC	10	NA
Start Creek R2	5	EF	2	RB	155	41	1.10	5.04	3.71	0.10	U	SC	13	NA
Start Creek R2	5	EF	1	RB	176	61	1.12	5.17	4.11	0.11	U	FR	4	NA
Start Creek R2	5	EF	1	RB	180	62	1.06	5.19	4.13	0.06	U	FR	5	NA
Start Creek R2	5	EF	1	RB	202	92.7	1.12	5.31	4.53	0.12	U	FR	8	NA
Start Creek R3	3	EF	1	RB	52	1.51	1.07	3.95	0.41	0.07	U	FR	9	0
Start Creek R3	3	EF	1	RB	63	2.6	1.04	4.14	0.96	0.04	U	FR	8	0
Start Creek R3	3	EF	1	RB	104	11.98	1.07	4.64	2.48	0.06	U	FR	7	1
Start Creek R3	3	EF	1	RB	119	17.58	1.04	4.78	2.87	0.04	U	FR	5	1
Start Creek R3	3	EF	1	RB	132	29.26	1.27	4.88	3.38	0.24	U	FR	6	2
Start Creek R3	3	EF	1	RB	142	35.25	1.23	4.96	3.56	0.21	U	FR	4	3
Start Creek R3	3	EF	1	RB	147	35.33	1.11	4.99	3.56	0.11	U	FR	3	2
Start Creek R3	3	EF	1	RB	212			5.36			U	FR	1	3
Start Creek R3	3	EF	1	RB	221	105.23	0.97	5.40	4.66	-0.03	U	FR	2	2
Start Creek R4	4	EF	1	RB	81	5.19	0.98	4.39	1.65	-0.02	U	FR	26	NA
Start Creek R4	4	EF	1	RB	93	9.32	1.16	4.53	2.23	0.15	U	FR	24	NA
Start Creek R4	4	EF	1	RB	98	9.87	1.05	4.58	2.29	0.05	U	FR	25	NA
Start Creek R4	4	MT	6	RB	100	10.22	1.02	4.61	2.32	0.02	U	FR	5	NA
Start Creek R4	4	MT	7	RB	100	11.38	1.14	4.61	2.43	0.13	U	FR	4	1
Start Creek R4	4	MT	5	RB	101	11.05	1.07	4.62	2.40	0.07	U			
Start Creek R4	4	EF	1	RB	104	13.11	1.17	4.64	2.57	0.15	U	FR	21	1
Start Creek R4	4	EF	1	RB	104	14.83	1.32	4.64	2.70	0.28	U	FR	23	NA
Start Creek R4	4	EF	1	RB	104	12.54	1.11	4.64	2.53	0.11	U	FR	22	2
Start Creek R4	4	EF	1	RB	116	17.67	1.13	4.75	2.87	0.12	U	FR	12	2
Start Creek R4	4	EF	1	RB	119	20.62	1.22	4.78	3.03	0.20	U	FR	15	2
Start Creek R4	4	EF	1	RB	119	22.81	1.35	4.78	3.13	0.30	U	FR	19	2
Start Creek R4	4	EF	1	RB	121	19.29	1.09	4.80	2.96	0.09	U	FR	20	2
Start Creek R4	4	EF	1	RB	126	21.18	1.06	4.84	3.05	0.06	U	FR	3	NA
Start Creek R4	4	MT	5	RB	127	20.25	0.99	4.84	3.01	-0.01	U	FR	8	2
Start Creek R4	4	MT	10	RB	129	23.41	1.09	4.86	3.15	0.09	U	FR	9	2
Start Creek R4	4	EF	1	RB	130	20.02	0.91	4.87	3.00	-0.09	U	FR	2	3
Start Creek R4	4	MT	4	RB	131	26.3	1.17	4.88	3.27	0.16	U	FR	1	
Start Creek R4	4	MT	1	RB	136	28.79	1.14	4.91	3.36	0.13	U	FR	14	2
Start Creek R4	4	EF	1	RB	144	38.43	1.29	4.97	3.65	0.25	U	FR	13	2
Start Creek R4	4	EF	1	RB	145	32.14	1.05	4.98	3.47	0.05	U	FR	18	3
Start Creek R4	4	EF	1	RB	147	35.84	1.13	4.99	3.58	0.12	U	FR	17	2
Start Creek R4	4	EF	1	RB	150	47.32	1.40	5.01	3.86	0.34	U	FR	16	3
Start Creek R4	4	EF	1	RB	153	48.19	1.35	5.03	3.88	0.30	U	FR	7	NA
Start Creek R4	4	MT	8	RB	154	40.71	1.11	5.04	3.71	0.11	U	FR	11	4
Start Creek R4	4	EF	1	RB	200	87.9	1.10	5.30	4.48	0.09	U	FR	10	3
Start Creek R4	4	EF	1	RB	223	119.07	1.07	5.41	4.78	0.07	U	FR	6	1
Upper Mess R2	2	EF	1	RB	260			5.56			U	F/SC	1	2

Notes:

EF = electrofishing
MT = minnow trapping
RB = rainbow trout
U = unknown

SC = scale
FR = fin ray
NA = not analyzed

Appendix 5

Stream Crossing Site Sampling Effort

Appendix 5. Stream Crossing Site Sampling Effort

Site Information					UTM				Sample					Water Quality			Electrofisher Settings			
Local Name	Date	ILP	Site	NID	Zone	Easting	Northing	Crew	Method	#	H/P	Time in	Time out	Temp (°C)	Cond (µS/cm)	Turb	EF Seconds	Length (m)	Width (m)	Encl.
M38	2008/07/03	2011	312	8000	9	384899	6340250	KM DF	EF	1	1	13:00	14:00			C	342	150	2	O
M54	2008/07/04	1060	161	8002	9	385383	6343556	KM DF	EF	2	1	8:20	9:00	5	370	C	322	150	2	O
M64 Tish Creek	2008/07/04	1072	173	8003	9	384668	6345904	KM DF	EF	2	1	9:50	10:20	5	210	C	190	100	2	O
M64 Tish Creek	2008/07/04	1072	173	8004	9	384668	6345904	KM DF	VO	1	1	9:50	10:20	5	210	C				
M77	2008/07/04	1092	193	8005	9	385087	6352997	KM DF	EF	2	1	13:10	13:40	9	100	C	331	200	2	O
M206 Tish Creek	2008/07/05	2071	340	8006	9	383200	6336175	KM DF	EF	2	1	8:10	8:45	4	240	C	641	200	4	O
N/A	2008/07/06	2012	313	8007	9	384826	6340470	KM DF	EF	2	1	11:20	12:00	7	180	C	304	100	2	O
N/A	2008/07/06	4017	419	8008	9	381372	6360077	KM DF	EF	2	1	13:30	14:15				507	100	2	O

Notes:

(continued)

Method
EF = electrofishing
VO = visual observation

Water Quality
Temp = temperature
Cond = conductivity
Turb = turbidity
C = clear

Electrofisher Settings
O = open
SR = Smith-Root

Species
NFC = no fish caught
RB = rainbow trout

Stage
J = juvenile

Fish Activity
R = rearing

Sex
U = unknown

Appendix 5. Stream Crossing Site Sampling Effort (completed)

Local Name	Electrofisher Settings					Fish Information											
	Voltage (V)	Frequency (Hz)	Pulse (ms)	Make	Model	Species	Stage	Total Fish	Fish Activity	Length (mm)	Weight (g)	Sex	Maturity	Age Structure	Sample #	Age
M38	400	40	2	SR	12B-POW	NFC		0								
M54	300	40	2	SR	12B-POW	RB	J	1	R	121	22.1	U	U	FR	1	
M64 Tish Creek	400	40	2	SR	12B-POW	NFC		0								
M64 Tish Creek						RB	J	1	R	80		U	U			
M77	500	40	2	SR	12B-POW	RB	J	1	R	146	36.5	U	U	FR	1	
M206 Tish Creek	400	40	2	SR	12B-POW	NFC		0								
N/A	400	40	2	SR	LR-24	RB	J	1	R	156	9.8	U	U	FR	1	
N/A	400	40	2	SR	LR-24	NFC		0								

Notes:

Method
EF = electrofishing
VO = visual observation

Water Quality
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Cond = conductivity
Turb = turbidity
C = clear

Electrofisher Settings
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SR = Smith-Root

Species
NFC = no fish caught
RB = rainbow trout

Stage
J = juvenile

Fish Activity
R = rearing

Sex
U = unknown