Reconnaissance Lake Inventory
of
Unnamed Lake

WSC: 239-333700-26500-38700
Waterbody Identifier: 00265FOXR

Prepared for:

Ministry of Environment
Prince George

Prepared by:
Triton Environmental Consultants Ltd.
201 – 1157 5th Avenue
Prince George, B.C.
V2L 3L1

Approved by:

_____

Ryan Liebe, B.Sc., R.P.Bio.,
2006

PROJECT REFERENCE INFORMATION

MWLAP Region:	Omineca-Peace
MWLAP District:	Mackenzie
FW Management Unit:	7-41
DFO Habitat Management Area:	Muskwa – Kechika
Forest Region:	Northern Interior Forest Region
Forest District:	Mackenzie Forest District
Forest Licensee	N/A

WATERSHED INFORMATION

Watershed Group:	Fox River
Watershed Code:	239-333700-26500-38700
Waterbody Identifier:	00265FOXR
UTM at Lake Outlet:	10 363736E 6405152N
Order at Lake Outlet:	2
Number of Tributaries:	One mapped inlet, one permanent outlet
Drainage Area:	19.68 km^2
Magnitude:	2
Elevation:	975 m
NTS Map:	94F/14
TRIM Map:	094F.074
BEC Zone:	BWBS
Air Photos:	15BCB01021 #28

LAKE SAMPLING SUMMARY

Lake Survey Type:	Secondary (2001 RISC Standards)
Water Surface Area:	21.81 ha
Max. Depth:	16.0 m
Secchi Depth:	6.7 m
Shoreline Perimeter:	3.24 km
Lake Length:	980 m
Number of Islands:	0
Species Captured in Lake:	BB, BT, LKC, LSU, MW, RB, WSU

CONTRACTOR INFORMATION

Project Manager:	*Name:*	Ryan Liebe, R.P. Bio.
	Address:	Triton Environmental Consultants Ltd. 201 – 1157 5th Avenue, Prince George, B.C. V2L 3L1
	Phone:	(250) 562-9155
Field crew:	*Names:*	Dan Tisseur, R.P.Bio, Rachel Manson
Report prepared by:	*Name*	Rachel Manson
Report edited by:	*Name*	Ryan Liebe
Maps prepared by:	*Name:*	Triton Environmental Consultants Ltd.
	Address:	201 – 1157 5th Avenue, Prince George, B.C. V2L 3L1
	Phone:	(250) 562-9155

DISCLAIMER

This product has been accepted as being in accordance with approved standards within the limits of Ministry quality assurance procedures. Users are cautioned that interpreted information on this product developed for the purposes of the Forest and Range Practices Act is subject to review by a statutory decision maker for the purposes of determining whether or not to approve an operational plan.

ACKNOWLEDGMENTS

Funding for this inventory was provided by the Muskwa Kechika Trust Fund.

Triton would like to thank Lynn Blouw (Ministry of Environment – Prince George) for making this work possible. Additionally, Triton would like to thank Sean Rickards (Yellowhead Helicopters) for providing access to the study area.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1. INTRODUCTION

1.1 Project Scope/Objectives

Triton Environmental Consultants Ltd. (Triton) was retained to conduct a 1:50,000 Overview Fish and Fish Habitat Inventory of the Fox River Watershed Group (Part II). A secondary lake survey was conducted on an unnamed lake as part of the project. Information was collected on the lakes' bathymetry, drainage, terrain, vegetation, access, fish populations, limnology, aquatic plants and wildlife. The objectives of this survey were to determine the quality of fish habitat, whether or not fish were present, and if they were, which species were present.

1.2 Location

The unnamed lake is located in the Kwadacha Wilderness Park in a group of small lakes located just south of Quentin Lake (Figure 1). The lake is situated within the Boreal White and Black Spruce (BWBS) biogeoclimatic zone that extends along the valley bottom of the Rocky Mountain Trench north of Fort Ware. The forests are primarily white spruce (*Picea glauca*), and lodgepole pine (*Pinus contorta* var. *latifolia*), with some black spruce (*Picea mariana*) at the lower elevations. Table 1 provides a summary of geographical information for the unnamed lake.

Table 1. Summary of geographical information for unnamed lake.

Referencing Summary			
Lake Name	unnamed lake	Survey Type	Secondary
Watershed Code	239-333700-26500-38700	Waterbody ID	00265FOXR
BEC Zone	BWBS	UTM at Outlet	10.363736E.6405152N
Surface Area	21.8 ha	Order	2nd order
Magnitude	2 (based on map)	Setting	VF
Elevation	975 m (TRIM)	Coupling	DC
Aspect	SE	TRIM Map	094F.074
NTS Map	94F/14	Air Photos	15BCB01021 #028
# of inlets/outlets	One mapped inlet, one perm. outlet	Access	H

1.2.1 Access

Development in the vicinity of the study area is limited to the Kwadacha Nation (Fort Ware), and an abandoned mine near the headwaters of the Paul River. The nearest road access to the area was obtained by the Paul River FSR, which branches off the Finlay FSR north of the Williston Reservoir. From the old Cirque Mine at the headwaters of the Paul River, access to the lake by helicopter requires a 34 km trip at a bearing of roughly 38° (NE).

Figure 1. Overview Map of Study Area

Scale 1: 300,000

4000 0 4000 8000 Meters

Date: 2006/01/19 (yyyy/mm/dd)

Created By: M. LeRuez of TRITON ENVIRONMENTAL CONSULTANTS LTD.

Map#: n:\active\foxr\apr\2005_fox_final_mapping.apr
Layout#: Lake Overview Map

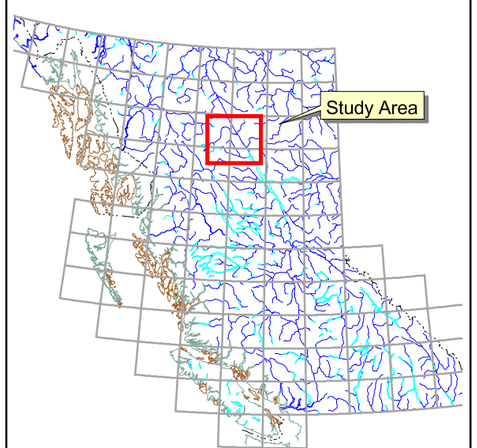
Features

- Watershed Boundary
- 4th Order Basin
- 0 Order Stream
- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream
- 6th Order Stream
- 7th Order Stream
- Sample Site
- Lake
- Wetland
- 2004 Inventory Area

BASE MAP INFORMATION

Project No:	3662
Projection:	UTM
Datum:	NAD83
UTM Zone:	10
Source:	1:50 000 B.C Watershed Atlas

INSET MAP



239-333700-26500-38700
(00265FOXR)

094F.074

2. RESOURCE INFORMATION

2.1 First Nations Issues

The Fox River Watershed Group is within the traditional territory of the Kwadacha Nation (Triton 2005a). No outstanding First Nations issues were identified during this project.

2.2 Fisheries

A query of the fisheries information summary system (FISS) revealed that there are no existing records of fish presence within the unnamed lake.

Kwadacha River Watershed

Existing fish records for waterbodies in the upper Kwadacha River watershed (upstream of the Warneford River confluence), include Chesterfield Lake, Quentin Lake, and the Warneford River. Quentin Lake is known to contain pygmy whitefish (*Prosopium coulteri*) and mountain whitefish (*Prosopium williamsoni*), but also has records for bull trout (*Salvelinus confluentus*) and longnose sucker (*Catostomus catostomus*). The Warneford River, which drains into the Kwadacha River, is also known to contain bull trout. Chesterfield Lake is known to contain rainbow trout (*Oncorhynchus mykiss*), bull trout and mountain whitefish. All other watercourses in the upper Kwadacha watershed, including Haworth Lake, Chesterfield Creek, Ipec Lake, the Aramis Lakes, and the North Kwadacha River have no existing fish records available on web-based search tools (*e.g.* Fish Wizard and FISS).

The majority of existing information for the upper Kwadacha River watershed comes from Ministry of Environment (1982) lake surveys completed on three of the largest lakes within the project area. Lake surveys and habitat assessments of tributaries to the lakes were completed for Haworth, Chesterfield and Quentin lakes. The results of these surveys were as follows:

- No fish were captured in Haworth Lake, or observed at two of its tributaries and its outlet.
- Chesterfield Lake was found to contain rainbow trout, Dolly Varden[1] (bull trout), and mountain whitefish. No fish were observed in two tributaries to the lake (including Chesterfield Creek), or at the outlet of the lake.
- Quentin Lake was found to contain Dolly Varden (bull trout), mountain whitefish, pygmy whitefish, and longnose sucker. No fish were observed at the inlet or outlet to

[1] Although some existing records indicate the presence of Dolly Varden (*Salvelinus malma*) in the project area, a regional analysis (Haas 1996) has resulted in the determination that the fish in this area are most likely all bull trout.

the lake (Warneford River) or at a third order tributary to the Warneford River immediately downstream of the Quentin Lake.

Quentin Lake was more recently sampled by staff of the Peace/Williston Fish and Wildlife Compensation Program (PWFWCP). Fish species captured included bull trout, mountain whitefish, pygmy whitefish, longnose sucker, rainbow trout, lake trout (*Salvelinus namaycush*), and lake whitefish (*Coregonus clupeaformis;* PWFWCP 2003).

A limited amount of information exists for the lower Kwadacha River. The lower Kwadacha River mainstem is known to contain mountain whitefish, rainbow trout, slimy sculpin (*Cottus cognatus*) and pygmy whitefish, which were captured by Triton crews during the Fox River Watershed 1:50,000 overview FFHI in 2004. In 1996 Timberwest, more recently known as Slocan Mackenzie (and now Canfor), completed four 1:20,000 inventory sites in tributaries to the lower Kwadacha River watershed. Of the sites surveyed, fish were not captured at three of the sites and the final site was not sampled (Timberwest 1996).

A single Arctic grayling (*Thymallus arcticus*) was captured during stream surveys for the 1:50,000 Overview Fish and Fish Habitat Inventory of the Fox River Watershed Group (Part II), at a site on the Warneford River downstream of Quentin Lake (Triton 2006). The only other species of fish that may be within the upper Kwadacha watershed is kokanee (*Oncorhynchus nerka*), which are known to occur in the Finlay River.

2.3 Development and Land Use

At present there is no significant development within the study area, with only the occasional guide/outfitter cabin on some of the larger lakes. The remainder of the study area is undeveloped, with a large portion located within the Kwadacha Wilderness Park. There are no roads into the park, and the area can only be accessed by foot or air. Two trails exist into the park, the first starting at Trutch on the Alaska Highway, then extending north along the Prophet River to the Muskaw Valley where it follows the Muskwa River down to Fern Lake. The second access trail starts just west of Sikanni Chief on the Alaska Highway heading north until it meets with the first trail. The park itself also contains a few undeveloped trails and primitive camps sites, which are only suggested for experienced backpackers and horseback riders.

Development in the vicinity of the study area is limited to the Kwadacha Nation (Fort Ware), located 20 km to the southwest and an abandoned mine near the headwaters of the Paul River. Forestry roads and cutblocks are abundant south of the study area (*e.g.* the Buffalo Head operating area to the northeast of the Williston Reservoir).

2.4 Impacts and Uses by Wildlife

The study area is home to a diverse number of wildlife and avian species. The upland rolling terrain, muskeg and forests in the lower river valley provide habitat for woodland caribou, moose, deer, and elk. The area is home to several resident populations of large carnivores including wolves, grizzly bear, and black bear. The area is also home to furbearers such as marten, lynx, beaver and muskrat. Small mammals, owls, waterfowl, cavity nesters, and raptors are common to the area.

2.5 Existing Water Quality Data

Prior to this study there was no available water quality data for the unnamed lake.

3. METHODS

A secondary lake survey was conducted on August 25 and 26, 2005 by Dan Tisseur and Rachel Manson of Triton Environmental Consultants, according to the *Reconnaissance* (*1:50,000*) *Fish and Fish Habitat Inventory: Standards and Procedures* (Ministry of Fisheries 2001) and as proposed in the pre-field planning report (Triton 2005b). Site and lake data were entered into the Field Data Information System (FDIS version 7.6). Table 2 lists the specifications of sampling equipment used in the field.

Table 2. Equipment used in the 2005 lake inventory of unnamed lake.

Quantity	Description
1	Multi-panel lake sampling sinking gillnet
1	2 – panel (0.75” and 1”) small mesh sinking gillnet to target pygmy whitefish
1	Ohaus Scout electronic balance
1	Accu-Weigh T-4 spring scale (2 kg)
1	Inflatable Polaris boat (10 ft)
1	4.5 HP Mercury outboard motor
1	Lowrance X16 depth sounder
1	VanDorn bottle
1	YSI dissolved oxygen meter
1	Hach H_2S kit
1	Fry board
1	Garmin 12XLS GPS unit
1	Olympus Stylus 300 digital camera
1	First aid kit
1	Oaktron pH meters
1	Oaktron conductivity meters
5	Minnow traps
1	Thermometer
1	Secchi Disk

3.1 Deviation from project plan

There were six lakes originally identified as candidates for sampling during the planning phase of the program (the three lakes that make up the Aramis Lakes and the group of lakes surrounding 00251FOXR), however only the largest of these lakes were formally identified in the planning report (00349FOXR, 00251FOXR). Unfortunately, upon observing the lakes from the helicopter the only lake of the six that was suitable for sampling and had a reasonable landing site was 00265FOXR. Due to a past forest fire in the region, landing around all the lakes was difficult due to blow down, and standing snags.

4. RESULTS AND DISCUSSION

4.1 Logistics

Please refer to section 3.1 regarding lake selection for the lake survey. The lake was accessed by helicopter. Slinging of the gear did occur as although the raft and motor fit inside the interior of the aircraft, the amount of other gear required at the lake made slinging the gear more practical.

4.2 Immediate Shoreline

The shoreline of the unnamed lake is predominantly wetland (95%), with small sections of vegetated shore (3%) and rock (2%). The substrates along the lakeshore consist of fine, unconsolidated sediment with some areas of rock (eastern shoreline). The deepest point in the lake was found to be 16.0 m, and approximately 50% of the lake is littoral (*i.e*. above 6 m). Representative shoreline views are shown in photo plates 17 to 23 and 26 to 29 in Appendix 1.

4.3 Terrain

The landscape in the area of the unnamed lake is characterized by the prevalence of low rolling plains along the edge of the valley bottom. The forest in the area is made up of white spruce, black spruce and lodgepole pine. There are also numerous standing snags surrounding the lake, which is evidence of a forest fire that occurred within the area in 1999. Regeneration is naturally occurring, as the shrub layer surrounding the lake contains many young trees and shrubs. With the exception of the occasional patch of standing snags with a shrub understory, the lake is completely surrounded by forest.

4.4 Aquatic Flora

There was a limited amount of aquatic vegetation within the lake; however denser communities existed along the shoreline. These communities were primarily made up of a mixture of sedges and tall grasses. A few groups of plants present within the lake included *Potamegeton* sp. and *Elodia* sp. Decomposing mats of algae and vegetation were also present around the southeast and northeast shorelines of the lake. The

decomposition of vegetative matter results in a high biological oxygen demand, which can result in low oxygen levels within a lake system. Oxygen levels can become critical during winter as there is limited oxygen exchange on the surface of a frozen lake. The result can be minor fish kills of more susceptible species (*e.g.* salmonids), to a complete kill of all fish within the lake. Low winter dissolved oxygen levels do not appear to be extreme in the unnamed lake as there is a healthy multi-aged fish population which includes species sensitive to low dissolved oxygen (Figure 7).

4.5 Site Summary

Two gill nets and five minnow traps were deployed in the lake to determine the fish species composition. Minnow trap sites were spread out around the perimeter of the lake. The longer of the two sinking gill nets was set off the eastern shore of the lake, and the shorter of the two gill nets with a smaller mesh size, targeted at capturing pygmy whitefish, was set in the middle of the northeast bay of the lake.

Figure 2, an annotated air photo of the unnamed lake, shows the locations of the gill nets and minnow trap sites, limnological location, stream referencing, and lake outlet, while the lake outline (Figure 3) shows the E-line, spot sounding depths, and the deepest point in addition to the previously listed features.

4.6 Bathymetry

Bathymetric information was collected in the field according to the *Bathymetric Standards for Lake Inventories* (Ministry of Fisheries 1999). A copy of the air photo and a mapped outline of the lake were taken into the field and sample locations, photos, limnological site and lake features were annotated onto these documents during the field survey. Bank scour indicated that the maximum water level is 0.2 m above the water level at the time of the survey.

An interesting characteristic of the lake basin noted during the lake survey was the presence of a deep hole (~16 m) located in the northeast portion of the lake. It is likely that is depression was created during glacial pull back during the formation of the lake, when glacial drift material was deposited along with segments of broken ice from the retreating glacier. Over time these ice blocks melted resulting in lakes containing depressions of irregular shape, size and depth (Wetzel 1983).

4.7 Limnological Sampling

Limnological sampling took place on August 26, 2005 at 13:17. Parameters measured at the station are presented in Table 3.

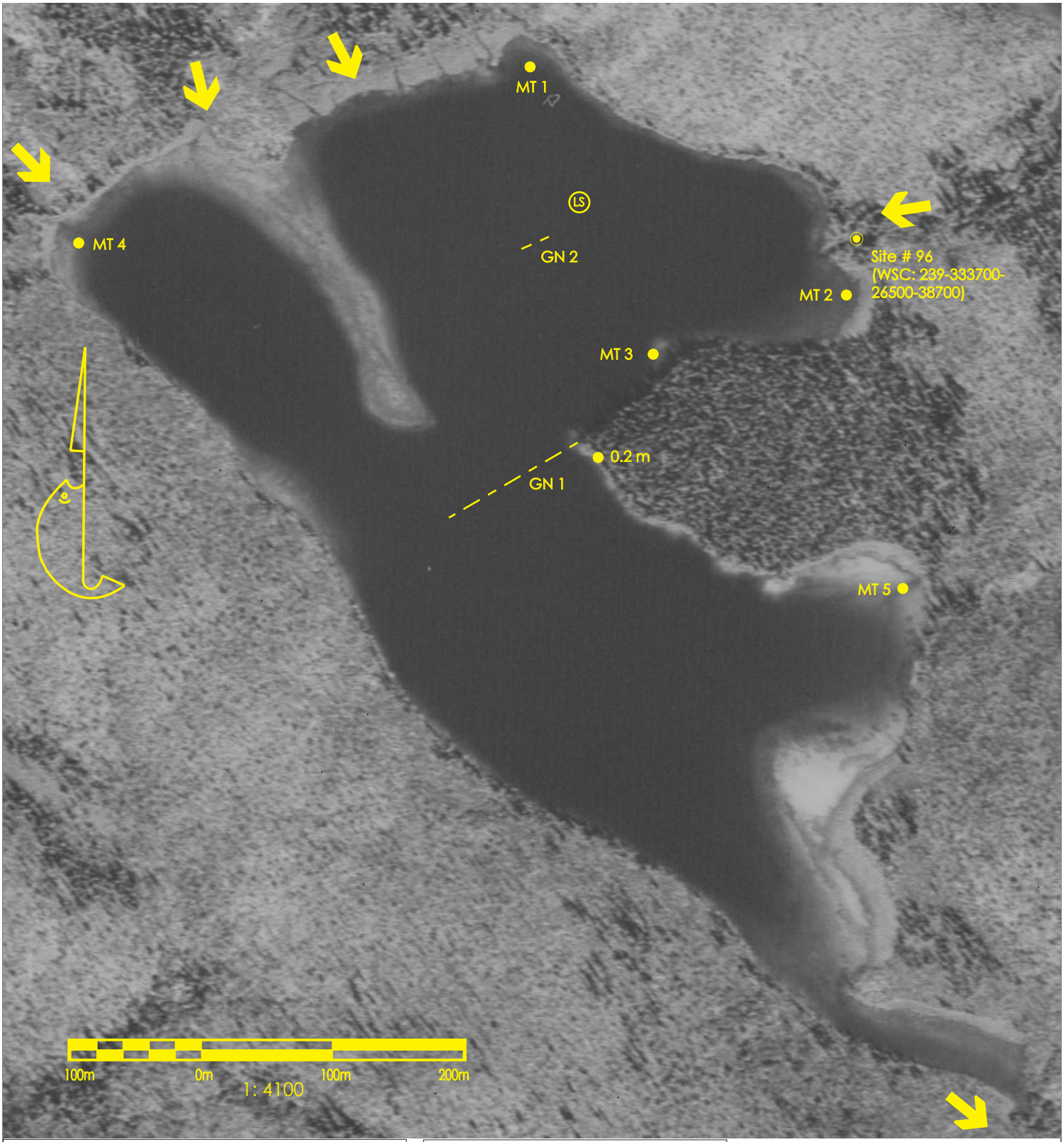
Table 3. Parameters measured at the limnological station.

Parameter Measured	Result	Method
Maximum depth	16.0 m	Lowrance X-16
Water clarity	6.7 m	Secchi depth
Water colour	Light brown	Visual estimate
pH (surface/bottom)	8.64/8.06	pH stick (P2)
Ice depth	N/A	Visual estimate
Weather description	High overcast with sunny breaks and winds coming form the west.	

4.7.1 Stratification

Figure 4 shows the dissolved oxygen, and temperature profiles for the unnamed lake. The temperature graphs shows that the lake water temperature shows no decline in the top 6 m, a sharp decline between 6-12 m and then once again becomes stable at 12-16 m, indicating the lake is showing true thermal stratification. The temperature ranges from 15.8°C at the surface to 4.8°C at 16 m.

The dissolved oxygen readings in the epiliminion were suitable for salmonids. Both rainbow trout and bull trout were caught in the lake and require dissolved oxygen levels of 7 mg/L or greater (Ford *et al.* 1992). Dissolved oxygen levels in the upper 6 m were found to be as high as 9.25 mg/L. However, the hypolimnion was extremely anoxic with considerably lower dissolved oxygen levels. The dissolved oxygen levels were 1.41 mg/L at 9 m deep and decreased to 0.68 mg/L at a depth of 16 m.



Surveyed by: Dan Tisseur, Lynn Blouw, Rachel Manson
Lake Outline Source: Air Photo 15BCB01021-028
Survey Date: August 25-26, 2005

Unnamed Lake
(WSC 239-333700-26500-38700)

Waterbody ID# 00265FOX	UTM: 10.363736.6405152

Reconnaissance Inventory of UnnamedLake. Proj. # 3662

PREPARED FOR:
Ministry of Environment
(Prince George)

BY
TRITON ENVIRONMENTAL CONSULTANTS LTD.

Prepared By: D.T.	Tech Check: R.L.	Approved

Legend

- LS — Limnology station
- GN_1 — Gillnet locations
- MT5 — Minnow trap location
- Benchmark
- Stream survey site
- Direction of flow
- High water mark (0.2m)

Figure 2. Annotated aerial photograph of Unnamed Lake.

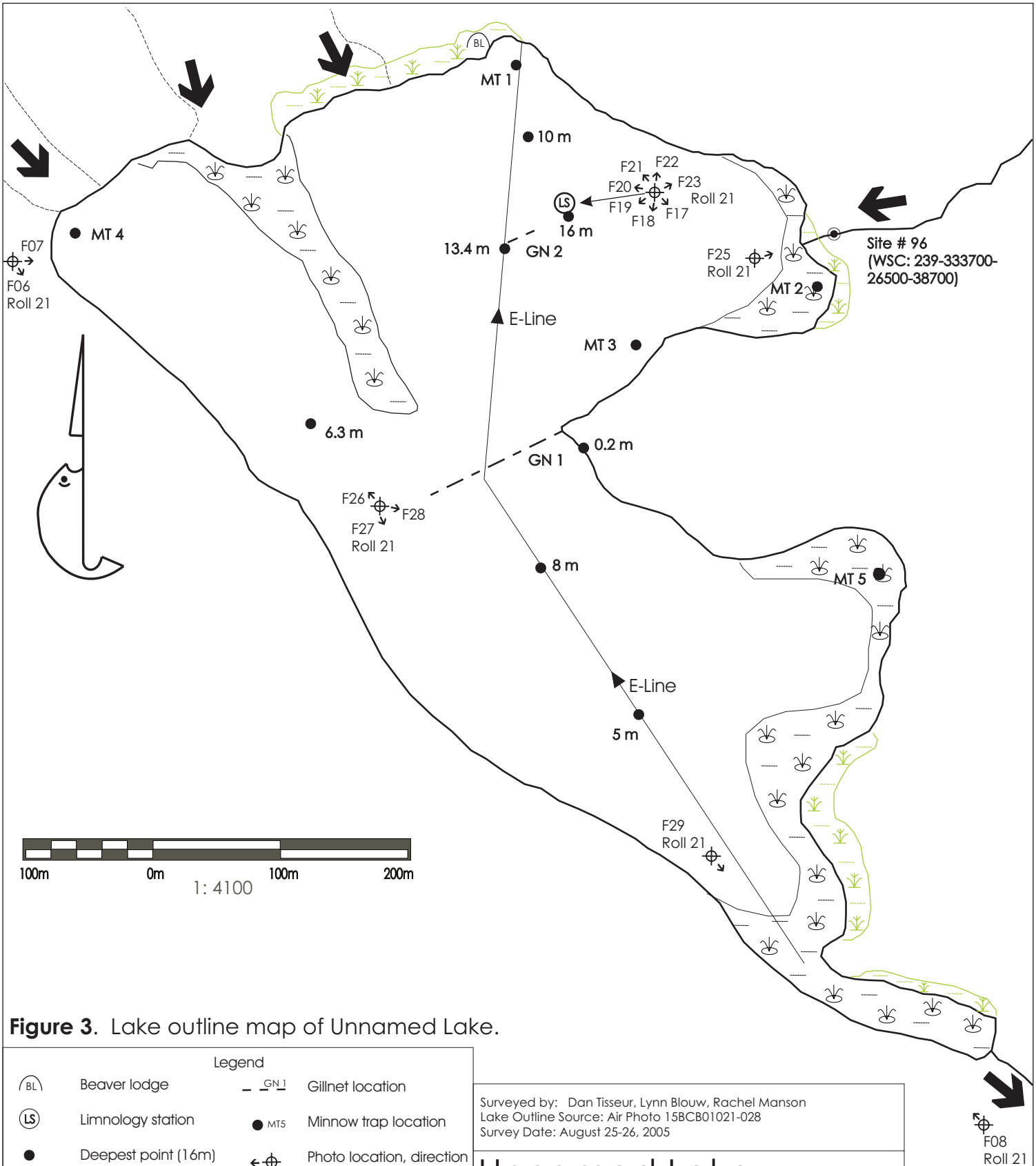


Figure 3. Lake outline map of Unnamed Lake.

Legend

BL	Beaver lodge	GN 1	Gillnet location
LS	Limnology station	MT5	Minnow trap location
	Deepest point (16m) & spot depths		Photo location, direction roll # and frame #
	Stream survey site		Bathymetric transect / direction
	Permanent stream		Flow direction
	Drainage		
	Wetland vegetation		High water mark (0.2m)
	Aquatic macrophytes		

Surveyed by: Dan Tisseur, Lynn Blouw, Rachel Manson
Lake Outline Source: Air Photo 15BCB01021-028
Survey Date: August 25-26, 2005

Unnamed Lake
(WSC 239-333700-26500-38700)

Waterbody ID# 00265FOX	UTM: 10.363736.6405152

Reconnaissance Inventory of UnnamedLake. Proj. # 3662

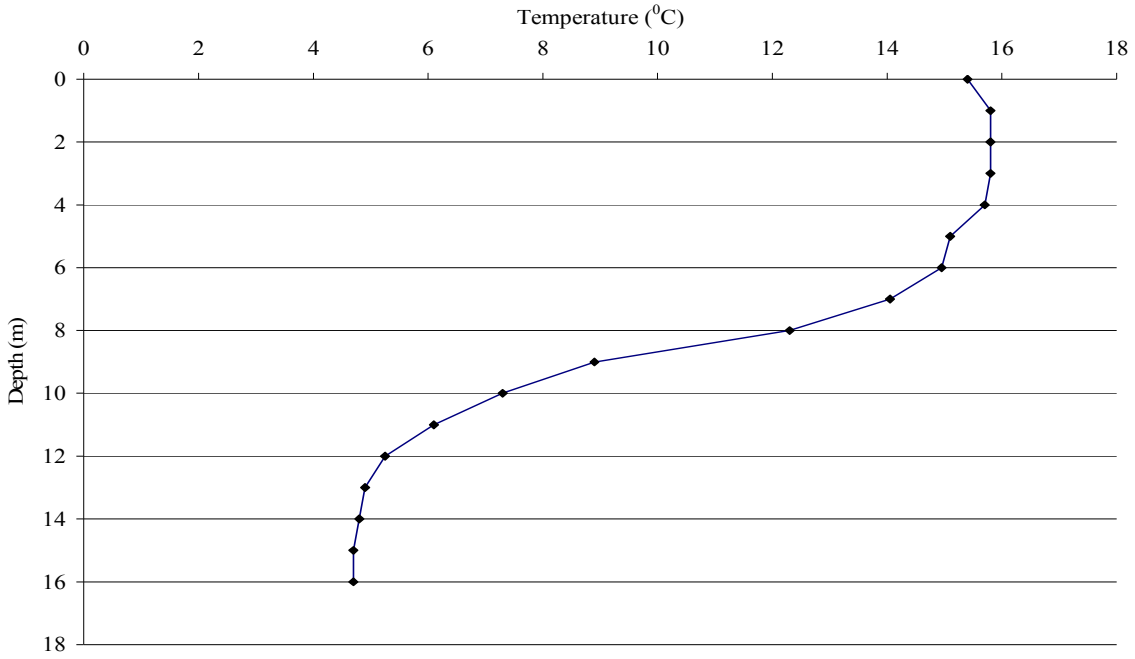
PREPARED FOR:
Ministry of Environment
(Prince George)

BY
TRITON ENVIRONMENTAL CONSULTANTS LTD.

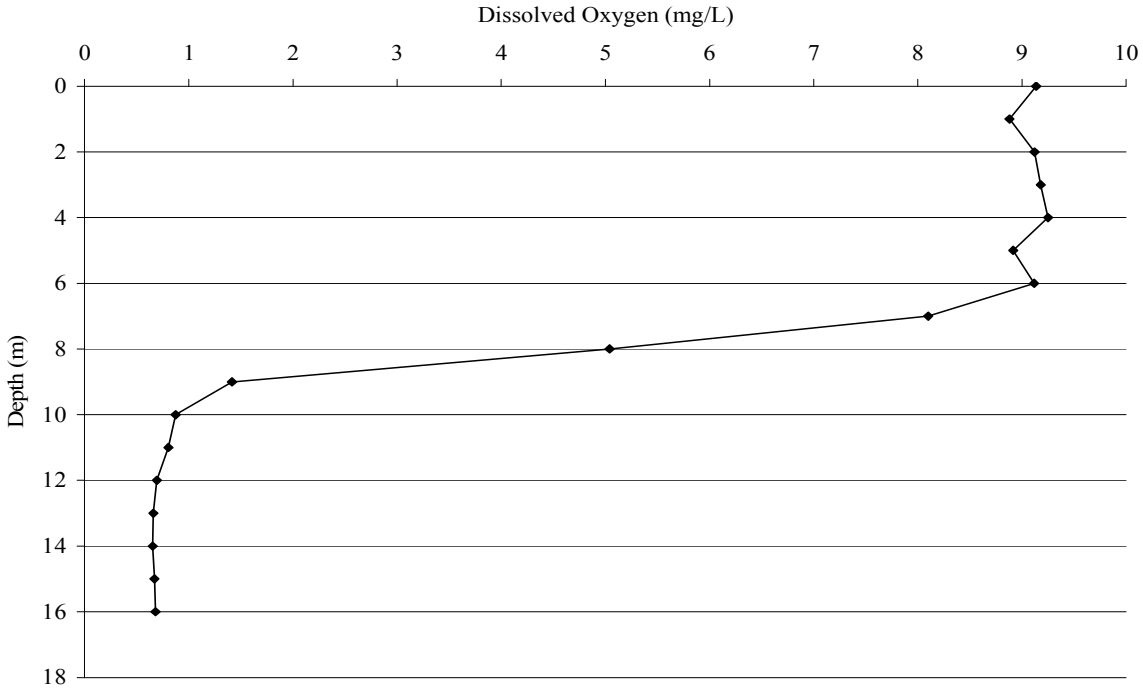
Prepared By: D.T.	Tech Check: R.L.	Approved

Figure 4. Limnological profiles for unnamed lake (00265FOXR).

a) Temperature



b) Dissolved oxygen



4.7.2 Trophic Level

Several characteristics of the unnamed lake indicate that it is mesotrophic. The lake has good transparency, clear colour, and higher oxygen levels than a eutrophic lake. Also, the amount of littoral plants and abundance of sedges and grass along the shore indicate it is definitely not oligotrophic (Cole 1994).

4.8 Inlets and Outlets

There is one inlet and one outlet to the unnamed lake. The inlet (WSC 239-333700-26500-38700) was inspected and a site card (including sampling) was completed. The lake inlet was determined to be fish-bearing, and had an average channel width of 8.18 m and gradient of 4%. The reach provides moderate to high value rearing habitat associated with abundant cover and moderate gradient. Infrequent accumulations of gravels indicate low value spawning habitat and there is no overwintering habitat available as the streams pools are too shallow.

Sampling efforts within the inlet produced three different species of fish: burbot (*Lota lota*), rainbow trout and slimy sculpin. The outlet was also directly connected to the lake, with no obstructions to fish passage being observed within the first 20 m of the stream.

4.9 Fish Age, Size and Life History

4.9.1 Fish Sampling Summary

Seven different species of fish were captured during the lake survey. These species included: burbot, lake chub (*Couesius plumbeus*), longnose sucker, mountain whitefish, rainbow trout, bull trout, and white sucker (*Catostomus commersoni*). Minnow trapping and gill netting efforts during the lake survey are summarized in Table 4. For location of nets and traps, see figures 2 and 3**.**

Table 4. Data for gill netting and minnow trapping in unnamed lake (00265FOXR).

Method (#)	Date and Time Set	Effort (h:mm)	Species Captured
Sinking gill net (1)	August 25, 19:57	07:53	LSU (6), MW (37), RB (29), WSU (17), BB (2), BT (4)
Sinking gill net (2)	August 25, 20:14	07:39	NFC
Minnow Trap (1)	August 25, 19:21	09:33	WSU (1), LKC (4)
Minnow Trap (2)	August 25, 19:24	09:36	LKC (6)
Minnow Trap (3)	August 25, 19:28	09:38	LKC (11), BB (1), LSU (1)
Minnow Trap (4)	August 25, 19:33	09:44	BB (1)
Minnow Trap (5)	August 25, 19:42	09:49	NFC

Length and weight data was collected from all game fish captured, while length data was the only parameter collected for the coarse fish captured. Data for all fish is summarized is Tables 5 and 6.

Table 5. Summary of fork length and weight data for sport fish captured in 00265FOXR.

		rainbow trout	mountain whitefish	burbot	bull trout
Fork Length(mm)	**Number**	29	37	4	4
	Minimum	163	139	187	311
	Maximum	343	458	242	366
	Mean	257	231	211	342
	Standard Deviation	40	49	25	23
Weight (g)*	**Number**	30	35	4	4
	Minimum	53	139	24	325
	Maximum	500	200	52	500
	Mean	211	165	41	460
	Standard Deviation	91	194	12	83

*weights over 200g are measured with a spring scale (+/- 10g).

Table 6. Summary of fork length and total length data for non-sport fish captured in 00265FOXR.

		longnose sucker	white sucker	lake chub
Fork Length (mm)	**Number**	7	18	21
	Minimum	117	121	81
	Maximum	485	458	121
	Mean	278	238	93
	Standard Deviation	140	89	12

4.9.2 Individual Fish Data Results

4.9.2.1 Fish Age, Size and Life History

All of the rainbow trout and bull trout obtained in the survey were caught in the sinking gill net located off the northeast point of the lake, and not a single juvenile was caught in any of the five minnow traps that had been set. All but three of the rainbow trout and all of the bull trout captured were adults. Nine otolith samples from the rainbow trout and three otolith samples from the bull trout captured during the lake survey were submitted for aging. The results of the aging analysis indicated that the rainbow trout captured within the unnamed lake ranged from age 3 to age 6, and the bull trout ranged in age from 4 to age 5 (Figure 7). A variety of length frequencies for rainbow trout are evident within the unnamed lake, with the size range of 250-300 mm containing the highest number of fish (Figure 5). Length frequency graphs were not completed for bull trout due to the small number of fish captured (n=4) and the fact that all bull trout captured ranged in size from 300–375 mm.

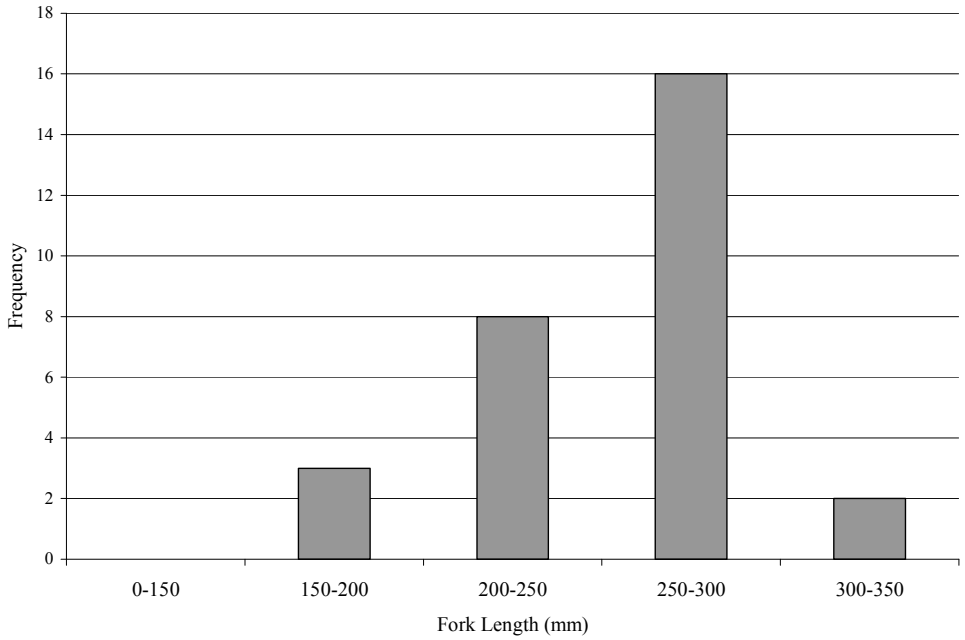


Figure 5. Length frequency distribution for rainbow trout in 00265FOXR.

Mountain whitefish were the most abundant sport fish captured during the lake survey and were only captured in sinking gill net number 1. Mountain whitefish show a wide range of length frequencies (Figure 6) within the unnamed lake. A sub-sample of aging structures (scales) were submitted for aging. In total, eight scales samples were submitted for aging, the results of which show that the unnamed lake contains mountain whitefish of various ages (3, 5, 6, 11 years of age; Figure 7).

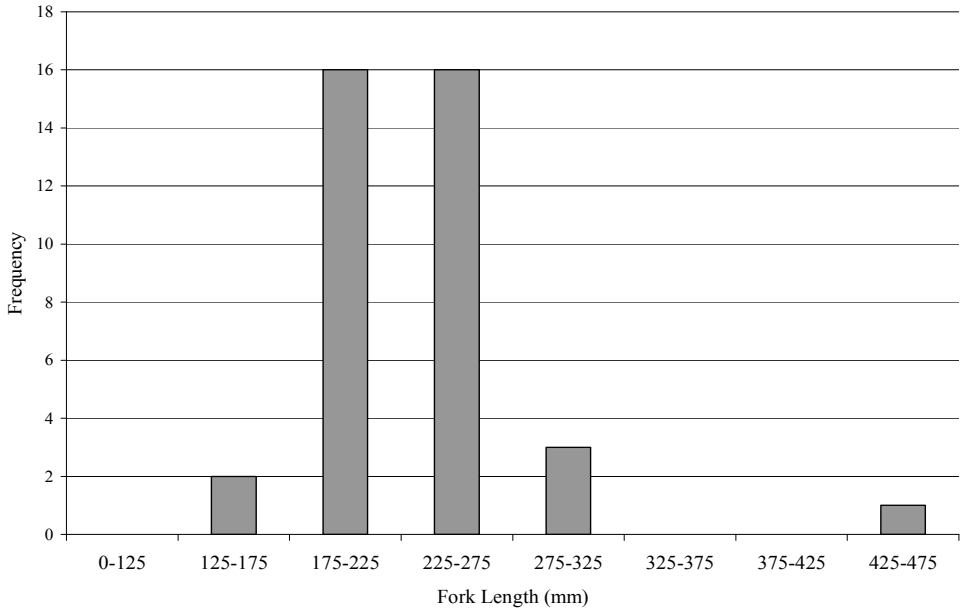


Figure 6. Length frequency distribution for mountain whitefish in 00265FOXR.

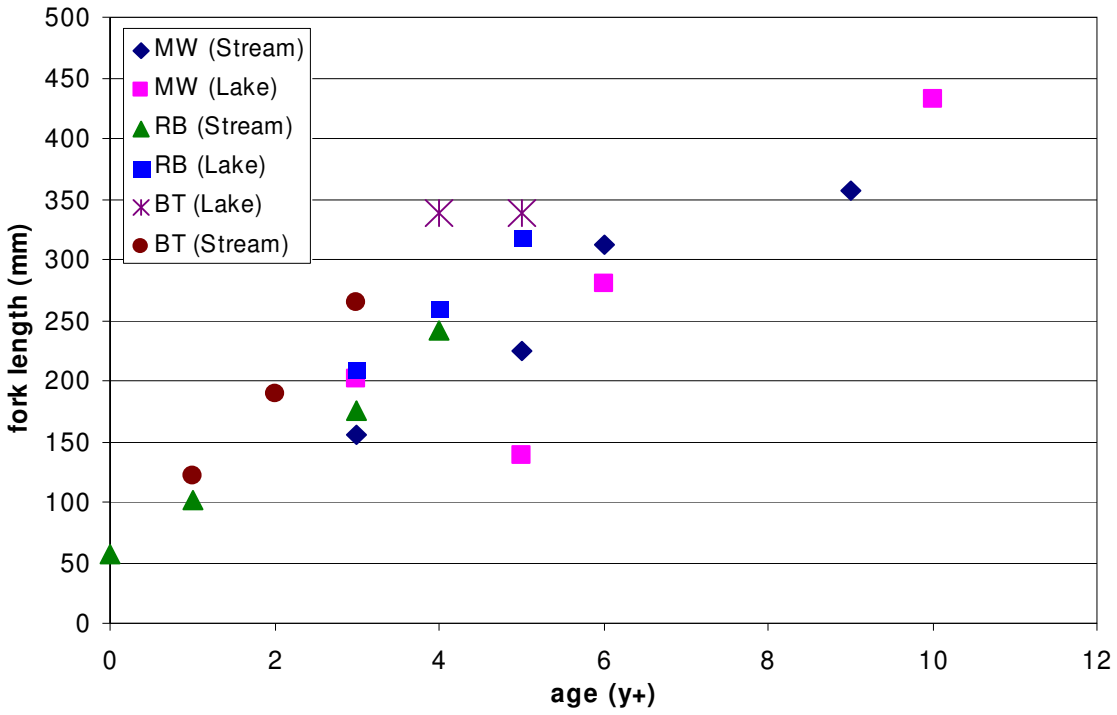


Figure 7. Mean length-at-age for bull trout, mountain whitefish, and rainbow trout captured in streams and during the lake survey.

The age 5 mountain whitefish point (n=1) in Figure 7 appears to be an outlier, and may be the result of an incorrectly aged scale. Rainbow trout captured in the lake appear to be longer at age compared to rainbow trout captured in streams. This seems reasonable as lakes are typically warmer, have a higher productivity, which generally results in larger fish at a specific age compared to cooler, less productive streams. This trend is not so clear with all age classes of mountain whitefish, potentially due to the small sample size.

Due to the distance from a river capable of providing overwintering habitat, and the lack of overtiring habitat in tributary streams, it is likely that most fish in the lake are year-round residents. The combination of the deep basin (14 m) and the inlet flow during the winter appears to maintain winter dissolved oxygen at sufficient levels to sustain a population of fish. Fish residing in the lake could spawn in the lakes tributaries (spawning habitat noted in lake inlet (WSC 239-333700-26500-38700)). Although it is some distance (3 km) from the lake to the mainstem of the Warneford River, no barriers were noted. Therefore, it is likely that there is some level of exchange of fish between the Warneford River and the unnamed lake.

4.10 Significant Features and Fisheries Observations

4.10.1 Fish and Fish Habitat

All adult rainbow trout and bull trout were captured in gill net 1, which was located within both the littoral and pelagic zones of the lake. Gill net 2, which was set in only the pelagic zone, at a depth of approximately 13 m, returned no fish. This is most likely due to the lack of oxygen available to fish at depths greater that 9 m (Section 4.7.1). No juvenile rainbow or bull trout were caught in any of the minnow traps, but six were obtained during electrofishing of the inlet. Moderate to high rearing habitat for juveniles was observed in the inlet stream. Additionally, the inlet was assessed as having low value spawning habitat with no overwintering habitat observed.

The capture of juvenile rainbow trout in the inlet tributary (but not in the lake), may be explained by susceptibility to predation. Juvenile fish are less susceptible to predation in the relatively shallow inlet stream compared to rearing in the lake which is full of large adult predators.

4.10.2 Habitat Concerns

There are no fish habitat concerns. There currently is no development or planned development in the vicinity of the lake.

4.10.3 Restoration and Rehabilitation Opportunities

No restoration or rehabilitation opportunities were identified.

4.11 Wildlife observations

The Common Loon (*Gavia immer*), moose (*Alces alces*), beaver (*Castor canadensis*) and Osprey (*Pandion carolinensis*) were all observed at the unnamed lake. In addition to the wildlife previously noted, there was also an abundant number of young, recently hatched, western toads (*Bufo borealis*) both on the lakes surface and along the surrounding shoreline.

No rare vertebrates were observed during the lake survey (B.C. Conservation Data Centre: 2000 Provincial Vertebrate Animal Tracking List).

4.12 Cited References

B.C. Conservation Data Centre. 2000. BC Conservation Data Center, Rare Vertebrate Animal Tracking List, Prince George Forest District, June 2000 http://www.env.gov.bc.ca/rib/wis/cdc/tracking.htm

Cole, G.A. 1994. Textbook of Limnology. Waveland Press Inc.: Prospect Heights, IL.

Ford, B.S., Higgins, P.S., Lewis, A.F., Cooper, K.L, Watson, T.A., Ennis, G.L and R.L. Sweeting. 1992. Literature reviews of the life history, habitat requirements, and mitigation/compensation strategies for 13 species of sport fish in the Peace and Columbia River drainages of British Columbia. Prepared for Habitat Management Division, Pacific Region, Department of Fisheries and Oceans, by Triton Environmental Consultants Ltd. 273 pp.

Haas, G. 1996. Bull trout and Dolly Varden identification workshop. BC Ministry of Environment, Lands and Parks, Fisheries Branch, Research and Development. University of BC, Vancouver, BC.

Ministry of Environment. 1982. Haworth Lake, Weissener Lake, Quentin Lake and Chesterfield Lake MV 7-41. Ministry of Environment- Resource Analysis Branch, Prince George, BC.

Ministry of Environment. 2001. Kwadacha wilderness provincial park. Ministry of Environment. http://www.env.gov.bc.ca/bcparks/explore/parkpgs/kwadacha.html

Ministry of Fisheries, Fisheries Inventory Section. 1999. Bathymetric Standards for Lake Inventories, Version 2.0. Resources Inventory Committee. Victoria B.C.

Ministry of Fisheries, Fisheries Inventory Section. 2001. Reconnaissance (1:50,000) Fish and Fish Habitat Inventory; Standards and Procedures, Version 2.0. Resources Inventory Committee. Victoria, B.C.

Peace Williston Fisheries and Wildlife Compensation Program. 2003. Raw data from Quentin and Weissener Lake.

Timberwest. 1996. 1:20,000 Fish and Fish Habitat Inventory. Volume 1: Report.

Triton Environmental Consultants Ltd. 2006. Overview (1:50,000) FFHI of a portion of the Fox River (239-350100-) Watershed Group – Part II. Prepared for the Ministry of Environment, Prince George. March 2006.

Triton Environmental Consultants Ltd. 2005a. Proposal to Conduct: Overview 1:50,000 Fish and Fish Habitat Inventory of the Fox River Watershed Group Part II. Prepared for Ministry of Sustainable Resource Management, by Triton Environmental Consultants Ltd. July 20, 2005.

Triton Environmental Consultants Ltd. 2005b. Pre-field Project Planning Report for the Fox River Watershed Group Part II. by Triton Environmental Consultants Ltd. August 11, 2005.

Triton Environmental Consultants Ltd. 2005c. Overview (1:50,000) FFHI of a portion of the Fox River (239-350100-) Watershed Group. Prepared for the Ministry of Sustainable Resource Management, Prince George. February 2005.

Wetzel. 1983. Limnology. Second Edition. Saunders College Publishing. Toronto, Ont.

4.13 Additional References

MacKinnon, A., J. Pojar and R. Coupé. 1999. Plants of Northern British Columbia. Second Edition. BC Ministry of Forests and Lone Pine Publishing. Vancouver, BC.

Ministry of Environment, Lands and Parks, Fish Inventory Unit. January 1997. Fish Collection Methods and Standards, Version 4.0. Resources Inventory Committee draft.

Warrington, 1994. Identification Keys to the Aquatic Plants of British Columbia. Water Quality Branch, Water Management Division. B.C. Ministry of Environment, Lands and Parks.

APPENDICES

Appendix 1. Lake summary form for unnamed lake

Appendix 2. Fish data collection forms for unnamed lake

Appendix 3. Tributary reach and site summary reports for unnamed lake.

Appendix 4. Photographs

Photograph: 6 **Site**: 113 **Date**: August 26, 2005
Comment: Aerial view looking east across lake.

Photograph: 8 **Site**: 113 **Date**: August 26, 2005
Comment: Aerial view looking northwest across lake.

Photograph: 17 **Site**: 113 **Date**: August 26, 2005
Comment: Showing the east shore of the lake.

Photograph: 18 **Site**: 113 **Date**: August 26, 2005
Comment: Showing the southeast shore of the lake.

Photograph: 19 **Site**: 113 **Date**: August 26, 2005
Comment: Showing the south shore of the lake.

Photograph: 20 **Site**: 113 **Date**: August 26, 2005
Comment: Showing the southwest shore of the lake.

Photograph: 21 **Site**: 113 **Date**: August 26, 2005
Comment: Showing the west shore of the lake.

Photograph: 22 **Site**: 113 **Date**: August 26, 2005
Comment: Showing the north shore of the lake.

Photograph: 23 **Site**: 113 **Date**: August 26, 2005
Comment: Showing the northeast shore of the lake.

Photograph: 24 **Site**: 113 **Date**: August 26, 2005
Comment: Showing a beaver lodge on the lake shore.

Photograph: 25 **Site**: 113 **Date**: August 26, 2005
Comment: Looking upstream at the inlet.

Photograph: 26 **Site**: 113 **Date**: August 26, 2005
Comment: Looking northwest to the corner of the lake.

Photograph: 27 **Site**: 113 **Date**: August 26, 2005
Comment: Looking southeast towards the outlet.

Photograph: 28 **Site**: 113 **Date**: August 26, 2005
Comment: Looking southeast towards the bay. The camp can be seen to the right of the photograph.

Photograph: 29 **Site**: 113 **Date**: August 26, 2005
Comment: Looking southeast towards the outlet.

Photograph: 11 **Site**: 113 **Date**: August 26, 2005
Comment: Showing a 485 mm longnose sucker.

Photograph: 12 **Site**: 113 **Date**: August 26, 2005
Comment: Showing a 338 mm bull trout.

Photograph: 13 **Site**: 113 **Date**: August 26, 2005
Comment: Showing a 338 mm bull trout (top) and a 343 mm rainbow trout (bottom).

Photograph: 15 **Site**: 113 **Date**: August 26, 2005
Comment: Showing a longnose and white sucker captured in the lake.

Photograph: 16 **Site**: 113 **Date**: August 26, 2005
Comment: Showing a 212 mm mountain whitefish.