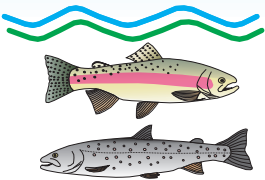

PISCES ENVIRONMENTAL

FISH POPULATION MONITORING AT THE OBED MOUNTAIN MINE IN 2009:
APETOWUN CREEK AND AN UNNAMED TRIBUTARY TO CANYON CREEK



PISCES ENVIRONMENTAL CONSULTING SERVICES LTD.

FISH POPULATION MONITORING AT THE OBED MOUNTAIN MINE IN 2009:
APETOWUN CREEK AND AN UNNAMED TRIBUTARY TO CANYON CREEK

Prepared for:

Coal Valley Resources Inc.
Obed Mountain Mine

Prepared by:

Pisces Environmental Consulting Services Ltd.
Red Deer, AB

February 2010

TABLE OF CONTENTS

1.0 INTRODUCTION..... 1

2.0 OBJECTIVES 1

3.0 STUDY AREA..... 1

3.0 METHODS 6

 4.1 Apetowun Creek 6

 4.2 Canyon Creek Tributary 8

5.0 DISCUSSION AND CONCLUSIONS 9

 5.1 Apetowun Creek 9

 5.2 Canyon Creek Tributary 10

6.0 REFERENCES..... 11

7.0 PERSONAL COMMUNICATIONS..... 11

Appendix A. Details of population estimate calculations.

Appendix B. Lengths and weights of individual fish in the catch.

LIST OF TABLES

Table 1. Sample section characteristics, Apetowun Creek and Canyon Creek tributary, August 2009..... 2

Table 2. Summary of monitoring results for Apetowun Creek, 2000, 2003, 2006, 2009. 9

Table 3. Summary of monitoring results for the Canyon Creek tributary, 2000, 2003, 2006, 2009. 10

LIST OF FIGURES

Figure 1. Location of Obed Mountain Mine and 2009 monitoring sections..... 3

Figure 2. Location of Apetowun Creek monitoring section. 4

Figure 3. Location of Canyon Creek tributary monitoring section..... 5

Figure 4. Rainbow Trout length frequency distribution. 7

Figure 5. Burbot length frequency distribution..... 7

1.0 INTRODUCTION

Coal Valley Resources Inc. operates the Obed Mountain Mine (OMM), an open pit coal mine, east of Hinton, Alberta. The OMM lease area is approximately 3,254 ha and is situated on a high plateau rising approximately 1600 m above sea level. The area is of moderate relief, characterized by rounded hills and upland plateaus. The hills represent a transitional zone between the mountains and foothills.

The lease area is primarily drained by the headwaters of Apetowun Creek, but also by tributaries to Oldman and Canyon creeks as well as the extreme headwaters of Baseline Creek. One component of the environmental monitoring program conducted by the OMM includes monitoring of fish populations in selected streams draining the mine lease area. Two of the four monitoring sites are sampled once every three years.

This document presents the results of fish population monitoring in Apetowun Creek and an unnamed tributary to Canyon Creek conducted in August 2009 by Pisces Environmental Consulting Services Ltd.

2.0 OBJECTIVES

The objective of the 2009 program was to obtain fish population estimates from previously established monitoring sections on Apetowun Creek and an unnamed tributary to Canyon Creek and report on the findings.

3.0 STUDY AREA

Apetowun Creek drains the east slope of the OMM area beginning near the plant site and flowing north-east approximately 18 km to the Athabasca River. Habitat of Apetowun Creek was first described by Zallen (1981). The creek was divided into nine reaches; the upstream reaches (near OMM) were described as having occasional pools, silt laden substrate (particularly in pools) with undercut, silty banks (Zallen 1981).

The headwater tributary of Canyon Creek drains a small portion of the east slope below the OMM development area. The habitat of this branch of Canyon Creek was described by Zallen (1981) as high gradient with variable substrate (fines, gravels, cobbles and boulders). The creek

is distinguished by two prominent canyon reaches where habitat features include numerous chutes and/or cascades and bedrock sandstone outcrops (Zallen 1981).

Monitoring sections were established in 2000 and were described in detail by Allan (2001). Though slight changes in section length have occurred over the period of record (Allan 2001, Pisces 2003, Pisces 2007) section lengths have always exceeded 40 times average channel width and were not less than 150 m, as suggested by Reynolds et al. (2003). In 2009, the Apetowun Creek section was extended to 316 metres long while the Canyon Creek tributary section was extended to 260 metres long as changes in habitat allowed. Log jams and thick riparian vegetation have influenced the length of monitoring sections over the period of record.

Sample section characteristics for Apetowun Creek and the Canyon Creek tributary for 2009 are described in Table 1.

Table 1. Sample section characteristics, Apetowun Creek and Canyon Creek tributary, August 2009.

Stream	Date	Length (m)	Area (m ²)	Sampling Duration (s)
Apetowun Creek	August 30	316	660.4	Run #1 - 2458 Run #2 - 2569 Run #3 - 2266
Canyon Creek Tributary	August 30	260	390.0	Run #1 - 2210 Run #2 - 1466

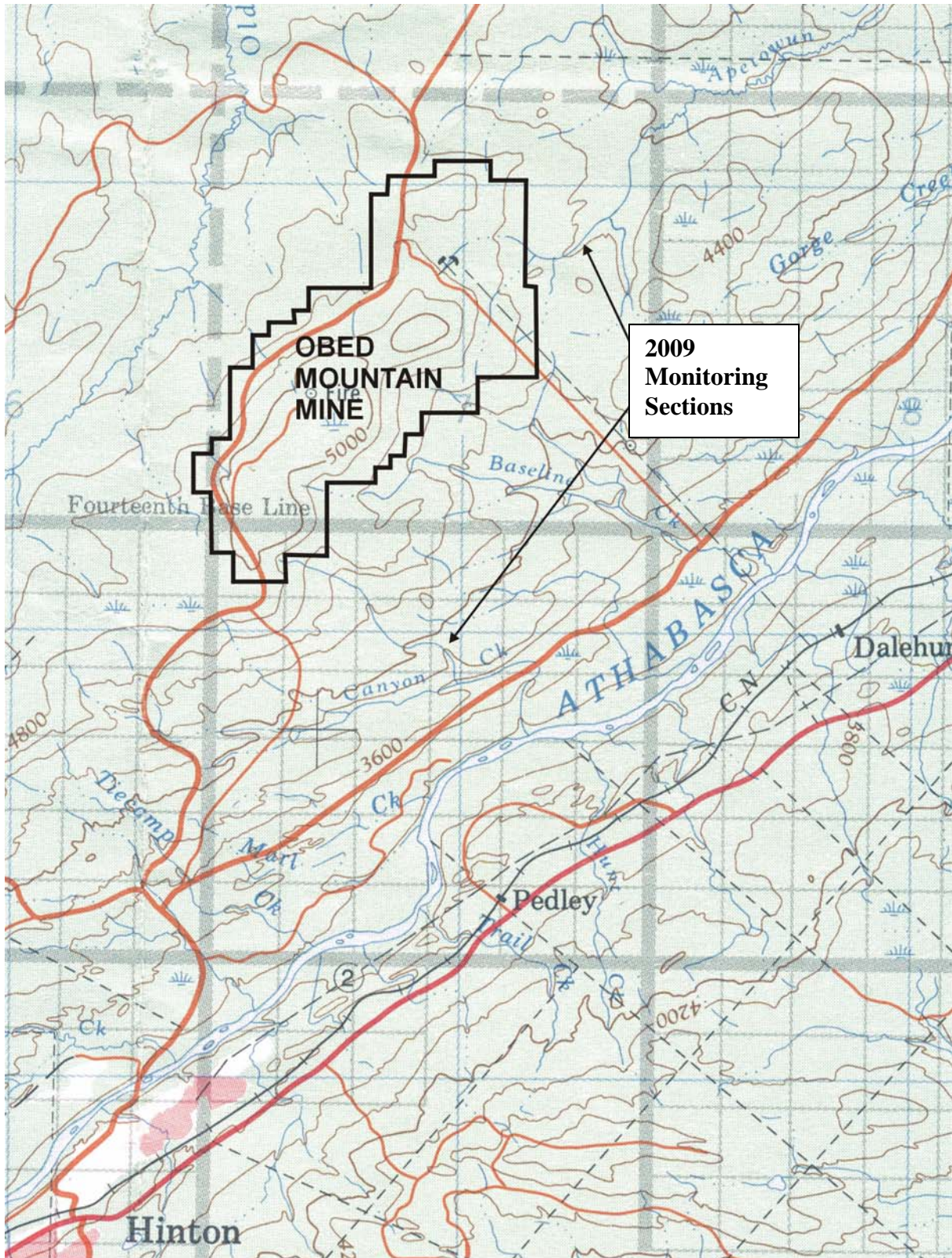


Figure 1. Location of Obed Mountain Mine and 2009 monitoring sections.

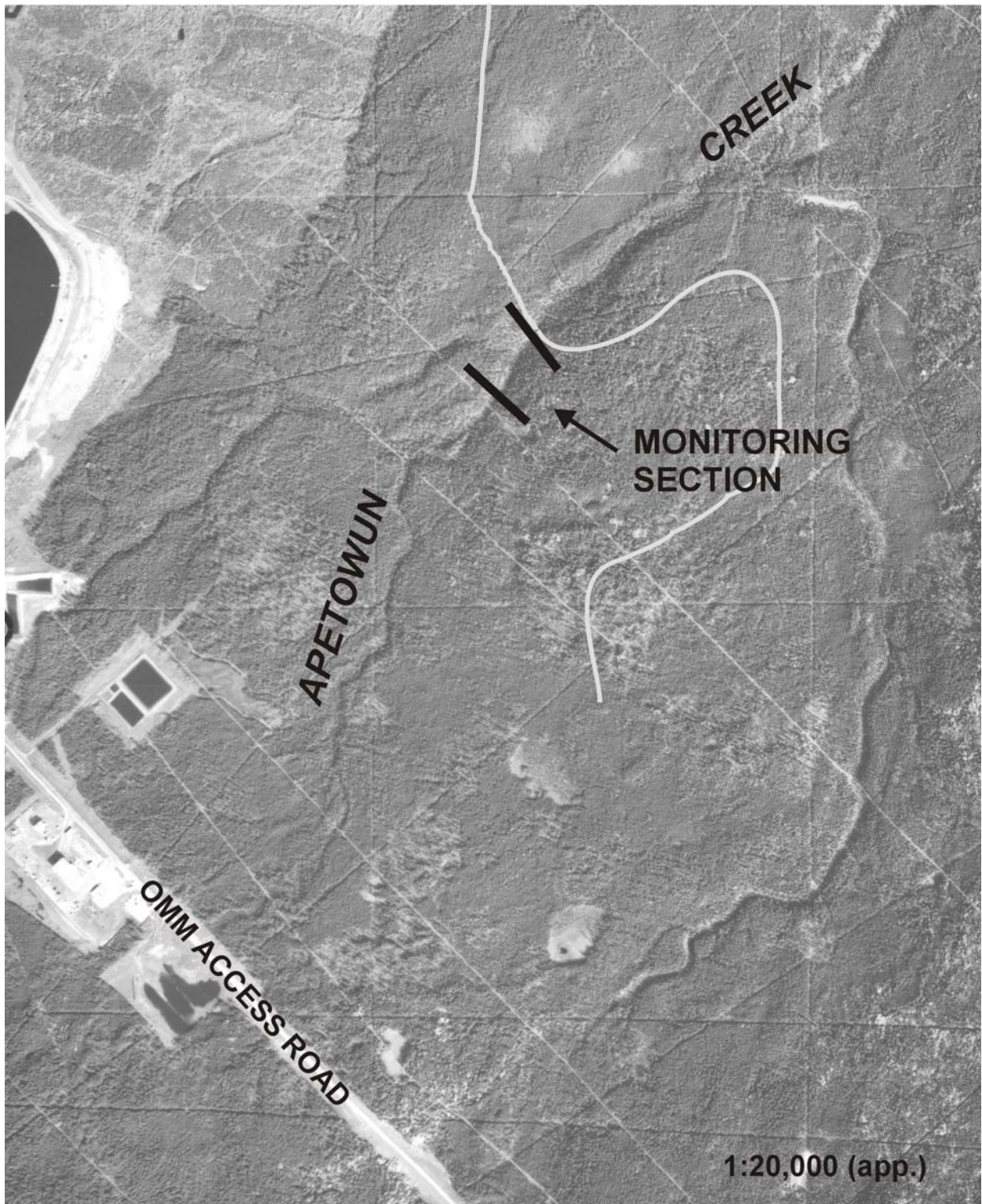


Figure 2. Location of Apetowun Creek monitoring section.

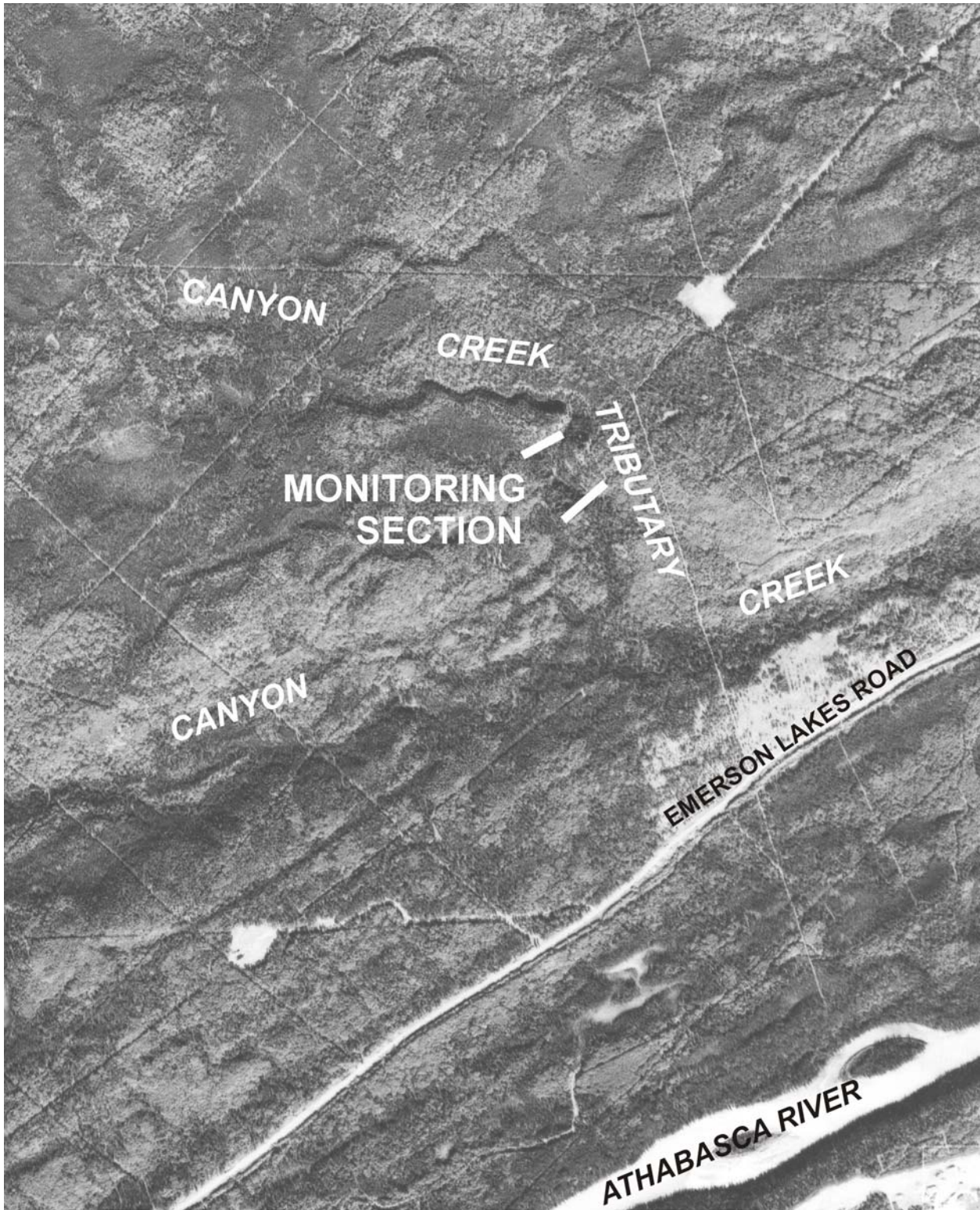


Figure 3. Location of Canyon Creek tributary monitoring section.

3.0 METHODS

Fish population estimates were obtained using the removal method (Zippen 1958) and calculated using MicroFish 3.0 (Van Deventer and Platts 1989). All captured fish were measured to fork length (mm) and weighed (g).

4.0 RESULTS

4.1 Apetowun Creek

Rainbow Trout (*Oncorhynchus mykiss*) and Burbot (*Lota lota*) were the two species captured in Apetowun Creek in 2009.

The population estimate for rainbow trout in the monitoring section was 18, equal to the total catch, and yielded a density estimate of 2.73 fish per 100 m². Details of the results of the population estimate calculations are given in Appendix A. Catch per unit effort (CPUE) for the first electrofishing pass (Run #1) was 0.44 fish per minute.

The population estimate for Burbot in the monitoring section was 73 with a total catch of 47 and a density estimate of 18.7 fish per 100 m². Details of the results of the population estimate calculations are given in Appendix A. CPUE for the first electrofishing pass (Run #1) was 0.46 fish per minute.

The mean fork length of rainbow trout in the catch was 153 mm (range 73 to 212) and the mean weight was 50.8 g (range 4 to 111). The lengths and weights of individual fish in the catch are given in Appendix B. Figure 4 shows the length frequency distribution of the rainbow trout catch. There appears to be at least 2, perhaps 3 or more, age classes present.

The mean fork length of Burbot in the catch was 143.1 mm (range 68 to 200) and the mean weight was 17.8 g (range 2 to 37). The lengths and weights of individual fish in the catch are given in Appendix B. Figure 5 shows the length frequency distribution of the Burbot catch. There appears to be at least 2, perhaps 3 or more, age classes present.

Discharge at the downstream end of the study section on the date of survey was 0.065 m³/s and water temperature was 12 °C.

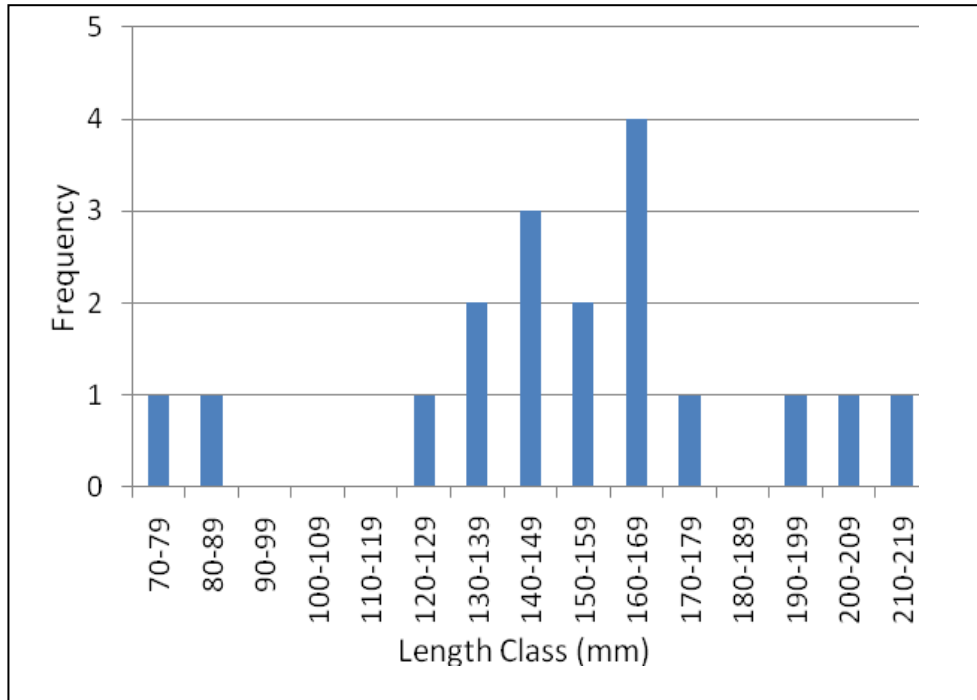


Figure 4. Rainbow Trout length frequency distribution.

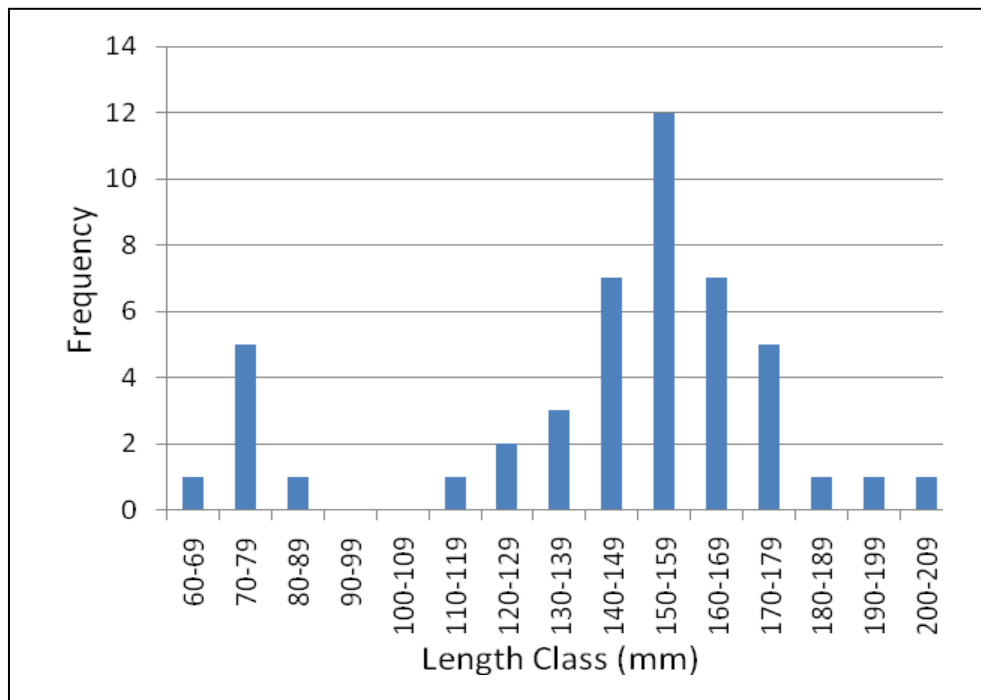


Figure 5. Burbot length frequency distribution.

4.2 Canyon Creek Tributary

Brook Trout (*Salvelinus fontinalis*) was the only species of fish captured in the Canyon Creek tributary in 2009.

A valid population estimate could not be obtained since there were no captures during the second pass of the electrofishing survey. Using the total catch (3), density is estimated at 0.77 fish per 100 m². Details of the results of the population estimate calculations are given in Appendix A. Catch per unit effort (CPUE) for the first run was 0.08 fish per minute.

The mean fork length of Brook Trout in the catch was 135 mm (range 132 to 138) and the mean weight was 26 g (range 24 to 30). The lengths and weights of individual fish in the catch are given in Appendix B.

Discharge at the downstream end of the study section on the date of survey was 0.001 m³/s and water temperature was 10.7 °C.

5.0 DISCUSSION AND CONCLUSIONS

5.1 Apetowun Creek

The Rainbow Trout density estimate in the Apetowun Creek monitoring section was the lowest on record in 2009 (Table 5.1). The CPUE (fish per minute) for Rainbow Trout in 2009 was lower than in 2006 but was approximately double what was recorded in 2000 by Pisces, and reported by Zallen in 1981. There appears to be fewer Rainbow Trout in Apetowun Creek in 2009 compared to past sampling events. The lower CPUE in 2000 as compared to 2003 and 2006 may be the result of high flows encountered in 2000 which were nearly double the discharge measured during more recent sampling events.

The Burbot density estimate in the Apetowun Creek monitoring section was the highest on record in 2009 surpassing the former high density encountered in 2006. Burbot were captured in the Apetowun Creek section in 2000 but were not captured or observed within the study section in 2003 (Table 5.1). The Foothills Model Forest (FMF) reported the capture of Burbot at a site located immediately downstream of the OMM monitoring section (R.McCleary, Pers. comm.) and Zallen (1981) reported the capture of Burbot from a section of Apetowun Creek that overlapped the OMM monitoring section. In 2006, the density estimate far exceeded previous estimates and CPUE was substantially higher than in previous years (Table 5.1). The absence or low density of Burbot in certain years may be due to the presence of a barrier (or barriers) downstream of the OMM study section that impedes fish passage into the study section in certain years, or at specific times within the year, when flows are low. Considering the high densities of Burbot encountered in 2006 and 2009, it is also possible reproduction is occurring within Apetowun Creek and the monitoring section is providing rearing habitat for juvenile fish.

Table 2. Summary of monitoring results for Apetowun Creek, 2000, 2003, 2006, 2009.

Year	Species	Population Estimate	Density Estimate (fish/100m ²)	CPUE (first run) (fish/min)
2000	Rainbow trout	17	5.1	0.22
	Burbot	4	1.2	0.075
2003	Rainbow Trout	27	5.26	0.71
	Burbot	-	-	-
2006	Rainbow Trout	35	6.06	0.48
	Burbot	61	10.57	0.53
2009	Rainbow Trout	18	2.73	0.44
	Burbot	73	18.7	0.46

5.2 Canyon Creek Tributary

Brook Trout density and CPUE was the lowest on record in 2009. There was a decline in estimated Brook Trout density in the tributary exceeding an order of magnitude between 2000 and 2003; in 2006, a slight increase from 2003 was noted (Table 5.2). A similar dramatic decline in CPUE was evident from 2000 to 2003 with CPUE increasing slightly in 2006 (Table 5.2). Discharge within the study section was substantially higher in 2000 ($0.022 \text{ m}^3/\text{s}$) as compared to 2003 ($0.005 \text{ m}^3/\text{s}$), 2006 ($0.002 \text{ m}^3/\text{s}$), and 2009 ($0.001 \text{ m}^3/\text{s}$) suggesting that there may be a link between discharge and Brook Trout density within the study section. No Rainbow Trout were captured or observed in either 2000 (Allan 2001), 2003 (Pisces 2003) or 2006 (Machney and Boorman 2007), however Zallen (1981) reported that Rainbow Trout were more abundant than Brook Trout in 1980.

Table 3. Summary of monitoring results for the Canyon Creek tributary, 2000, 2003, 2006, 2009.

Year	Species	Population Estimate	Density Estimate (fish/100m ²)	CPUE (first run) (fish/min)
2000	Brook Trout	86	20.4	1.21
2003	Brook Trout	27	1.22	0.09
2006	Brook Trout	n/a	3.3	0.12
2009	Brook Trout	n/s	0.77	0.08

6.0 REFERENCES

- Allan, J. H. 2001. Assessment of fisheries resources in Apetowun Creek and an unnamed tributary to Canyon Creek in 2000. Report of Pisces Environmental Consulting Services Ltd. to Luscar Ltd. Obed Mountain Mine, Hinton, Alberta. 15 pp. + App.
- Machney and Boorman. 2007. Fish population monitoring at the Obed Mountain Mine in 2009: Apetowun Creek and an unnamed tributary to Canyon Creek. *Prepared for Coal Valley Resources Inc. by Pisces Environmental Consulting Services Ltd.*
- Mackay, W., G. Ash, H. Norris (eds.). 1990. Fish Ageing Methods for Alberta. R.L.&L. Environmental Services Ltd. in assoc. with Alberta Fish and Wildlife Division and University of Alberta, Edmonton. 113pp.
- Matrix. 2009. Obed Mountain Mine – renewal Application Surface Water Management Plan. Prepared for CVRI OMM by Matrix Solutions Inc.
- Pisces Environmental Consulting Services Ltd. Results of monitoring fish populations on and adjacent to the Obed Mountain Mine, Apetowun Creek and an unnamed tributary to Canyon Creek.
- Reynolds, L., A. T. Herlihy, P. R. Kaufmann, S. V. Gregory and R. M. Hughes. 2003. Electrofishing effort requirements for assessing species richness and biotic integrity in western Oregon streams. *N. Am. J. Fisheries Management* 23:450-461.
- Van Deventer, J. S. and W. S. Platts. 1989. Microcomputer Software System for Generation of Population Statistics from Electrofishing Data – User’s Guide to MicroFish 3.0. General Technical Report INT-254. U. S. Dept. Agriculture, Forest Service, Intermountain Research Station, Ogden, UT. 29 pp.
- Zallen, M. 1981. Fisheries Surveys in Streams Near the Obed-Marsh Development Area – Summer 1980. Report of ESL Environmental Sciences Ltd. to Union Oil of Canada Ltd., Calgary, Alberta. 19 pp. + App.
- Zippen, C. 1958. The Removal Method of Population Estimation. *J. Wildl. Man.* 22(1):82-90.

7.0 PERSONAL COMMUNICATIONS

R. McCleary, Foothills Model Forest, Hinton, Alberta.

APPENDIX A.
Details of population estimate calculations

Table A1. Detailed population estimate parameters for rainbow trout from Apetowun Creek.	
Removal pattern	15, 2, 1
Total catch	18
Population estimate	18
Lower 95% confidence limit	18.0
Upper 95% confidence limit	18.8
Capture probability	0.818

Table A2. Detailed population estimate parameters for burbot from Apetowun Creek.	
Removal pattern	19, 18, 10
Total catch	47
Population estimate	73
Lower 95% confidence limit	47.0
Upper 95% confidence limit	120.1
Capture probability	0.288

Table A3. Detailed population estimate parameters for brook trout from the Canyon Creek tributary.	
Removal pattern	3, 0
Total catch	3
Population estimate	Total Catch = 3
Lower 95% confidence limit	n/a
Upper 95% confidence limit	n/a
Capture probability	n/a

APPENDIX B.
Lengths and weights of individual fish in the catch

Electrofishing Record

Date:	30-Aug-09			
Stream Name:	Apetowun Creek			
Project:	Obed -Monitoring Fish Populations			
UTM reference:	0472595E 5939100N 11U			
Run#	1			
Section length (m):	316			
Duration seconds):	2458			
Sample #	Species	Fork Length (mm)	Weight (g)	Comments
1	RNTR	190	90	
2	RNTR	124	25	
3	RNTR	73	4	
4	RNTR	178	64	
5	RNTR	167	53	
6	RNTR	149	39	
7	RNTR	165	60	
8	RNTR	141	37	
9	RNTR	145	32	
10	RNTR	135	35	
11	RNTR	150	53	
12	RNTR	167	71	
13	RNTR	87	9	
14	RNTR	161	48	
15	RNTR	212	107	
16	BURB	175	28	
17	BURB	162	23	
18	BURB	165	26	
19	BURB	151	25	
20	BURB	112	8	
21	BURB	176	29	
22	BURB	153	25	
23	BURB	152	19	
24	BURB	133	15	
25	BURB	151	17	
26	BURB	68	3	
27	BURB	163	20	
28	BURB	131	16	
29	BURB	152	23	
30	BURB	162	26	
31	BURB	146	17	
32	BURB	76	3	
33	BURB	77	3	
34	BURB	81	3	
23	BURB	152	19	
24	BURB	133	15	
25	BURB	151	17	
26	BURB	68	3	
27	BURB	163	20	
28	BURB	131	16	
29	BURB	152	23	
30	BURB	162	26	
31	BURB	146	17	
32	BURB	76	3	
33	BURB	77	3	
34	BURB	81	3	

Electrofishing Record

Date:	30-Aug-2009			
Stream Name:	Apetowun Creek			
Project:	Obed -Monitoring Fish Populations			
UTM reference:	0472595E 5939100N 11U			
Run #	2			
Section length (m):	316			
Duration (seconds):	2569			
Sample #	Species	Fork Length (mm)	Weight (g)	Comments
1	BURB	196	29	1
2	BURB	137	17	2
3	BURB	153	17	3
4	BURB	152	18	4
5	BURB	163	20	5
6	BURB	176	27	6
7	BURB	154	17	7
8	BURB	169	23	8
9	BURB	154	19	9
10	BURB	170	26	10
11	BURB	157	19	11
12	BURB	144	17	12
13	BURB	144	17	13
14	BURB	200	37	14
15	BURB	141	15	15
16	BURB	124	11	16
17	BURB	142	15	17
18	BURB	71	3	18
19	RNTR	137	28	19
20	RNTR	206	111	20

Electrofishing Record

Date:	30-Aug-2009			
Stream Name:	Apetowun Creek			
Project:	Obed -Monitoring Fish Populations			
UTM reference:	0472595E 5939100N 11U			
Run #	3			
Section length (m):	316			
Duration (seconds):	2266			
Sample #	Species	Fork Length (mm)	Weight (g)	Comments
1	RNTR	158	49	1
2	BURB	173	28	2
3	BURB	142	19	3
4	BURB	168	21	4
5	BURB	151	20	5
6	BURB	79	3	6
7	BURB	122	10	7
8	BURB	145	14	8
9	BURB	156	19	9
10	BURB	183	26	10
11	BURB	73	2	11

Electrofishing Record

Date:	30-Aug-2009			
Stream Name:	Unnamed tributary to Canyon Creek			
Project:	Obed -Monitoring Fish Populations			
UTM reference:	0469701E 5929554 11U			
Run #	1			
Section length (m):	260			
Duration (seconds):	2210			
Sample #	Species	Fork Length (mm)	Weight (g)	Comments
1	BKTR	138	30.2	1
2	BKTR	134	24.3	2
3	BKTR	132	24.6	3

Electrofishing Record

Date:	30-Aug-2009			
Stream Name:	Unnamed tributary to Canyon Creek			
Project:	Obed -Monitoring Fish Populations			
UTM reference:	0469701E 5929554 11U			
Run #	2			
Section length (m):	260			
Duration (seconds):	1466			
Sample #	Species	Fork Length (mm)	Weight (g)	Comments
No fish captured or observed				