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FISH POPULATION MONITORING AT THE OBED MOUNTAIN MINE IN 2007:  
BASELINE AND OLDMAN CREEKS

Prepared for  
Coal Valley Resources Incorporated  
Obed Mountain Mine  
Hinton, Alberta

By J. Sonnenberg and J. Boorman  
Pisces Environmental Consulting Services Ltd.  
Red Deer, Alberta  
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## 1.0 **INTRODUCTION**

Coal Valley Resources Incorporated (CVRI) operates the Obed Mountain Mine (OMM) east of Hinton, Alberta. The mine began operating in 1984 using surface mining methods to expose and extract the coal. In 2003, mining operations at the OMM were suspended and have not resumed to date.

The Obed lease area comprises 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 headwaters of Baseline Creek (Figure 1).

A component of the environmental monitoring program carried out by the mine includes monitoring of the fish populations in streams draining the mine lease area. Permanent monitoring sections were established on Apetowun Creek and an unnamed tributary to Canyon Creek in 2000, and on Baseline Creek and Oldman Creek in 2001 (Figures 1 and 2). The monitoring program consists of fish population estimates in two of the four stream sections every 3 years.

Pisces Environmental Consulting Services Ltd. (Pisces) was retained by the Obed Mountain Mine to conduct the fish population monitoring program for 2007. Prior to commissioning of this study, Pisces obtained fish population estimates from the monitoring sections on Apetowun Creek and the unnamed tributary to Canyon Creek in 2000, 2003, and 2006 and from the monitoring sections on Baseline and Oldman creeks in 2001, and 2004. No fish population monitoring is scheduled for 2008.

The following document presents the findings of the 2007 installment of the monitoring program.

## 2.0 **OBJECTIVES**

The objectives of the monitoring program in 2007 were to:

- Obtain population estimates from the Oldman and Baseline creek monitoring sections

- Report on the findings

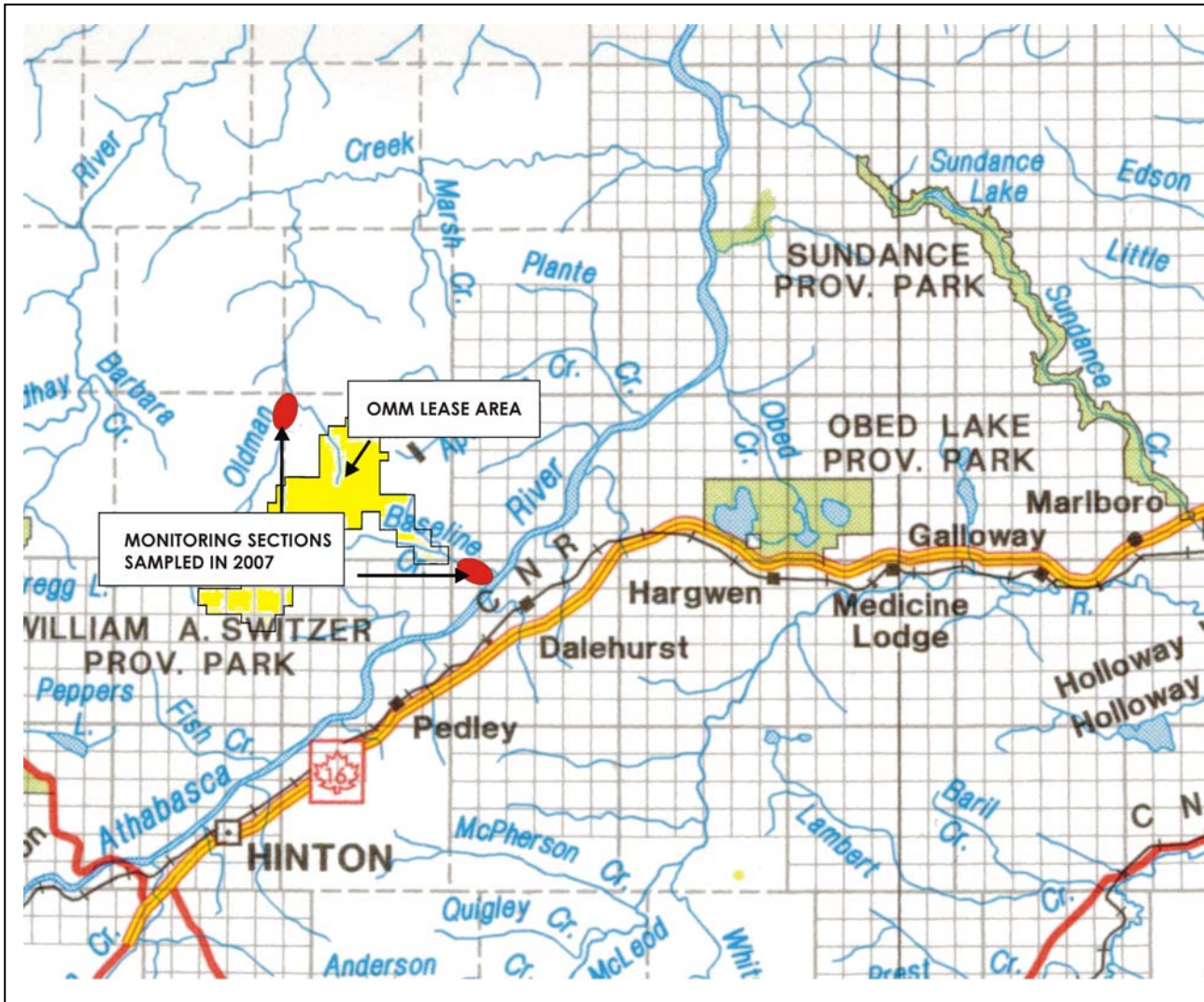


Figure 1. Study Area



Baseline Creek monitoring section



Oldman Creek monitoring section



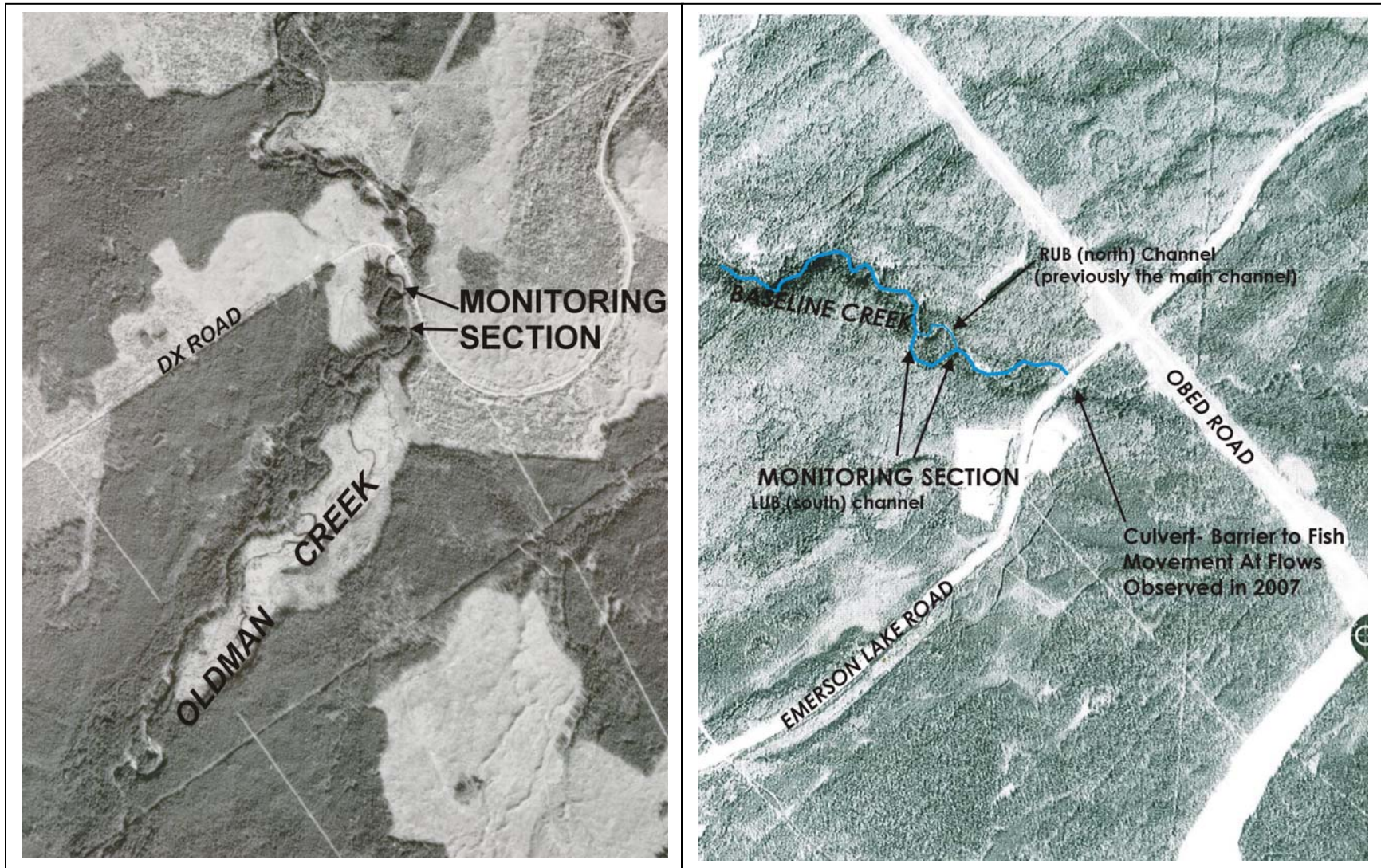


Figure 2. Monitoring sections on Oldman and Baseline creeks.

### 3.0 **METHODS**

Fish population estimates were obtained from within the monitoring sections using the removal method (Zippen 1958). Both ends of the sections were blocked with nets and then electrofished three times with a Smith Root Type 24 back pack electrofisher. Population estimates were calculated using MicroFish 3.0 (Van Deventer and Platts 1989). Monitoring section lengths exceeded 150 metres or 40X channel width (McCormick and Hughes 2002).

All captured fish were measured to fork length in millimetres (total length for burbot and sculpins) and weight in grams.

In 2007, monitoring section lengths and locations were adjusted from previous years. A significant flood event had occurred along Baseline Creek since the last monitoring visit in 2004 resulting in a significant channel change. The majority of the flow of Baseline Creek now occurs in the south or left upstream (LUB), channel (Figure 2) which was virtually dry in previous monitoring years. In Oldman Creek, the length of the section had to be slightly shortened from 2004 due to the expansion of a log jam and a shortage of appropriate blocking net locations (Appendix A, Photo 5).

### 4.0 **RESULTS**

#### 4.1 **BASELINE CREEK**

The Baseline Creek monitoring section was 270 m in length with an area of 1080 m<sup>2</sup>. Discharge on August 25<sup>th</sup>, the date of survey, was measured at 0.205 m<sup>3</sup>/s.

Brook trout (*Salvelinus fontinalis*) was the only species captured in the monitoring section in 2007. Summary parameters for the catch are shown in Table 1. Details for the population estimation and fork lengths and weights for individual fish in the catch are provided in Appendix B.

Table 1. Summary of fish captured from Baseline Creek.

Species	n	Population Estimate (95% confidence interval)	Density n/100 m <sup>2</sup>	Fork Length (mm)			Weight (g)		
				Mean	Min	Max	Mean	Min	Max
BKTR	153	161 (153-170)	14.9	123.3	48	206	25.5	1	101

Figure 3 shows the length frequency distribution for the brook trout catch. It is likely the specimens on the far left are young of year (YOY) trout, other age class determinations cannot be made as aging data for Baseline Creek is limited.

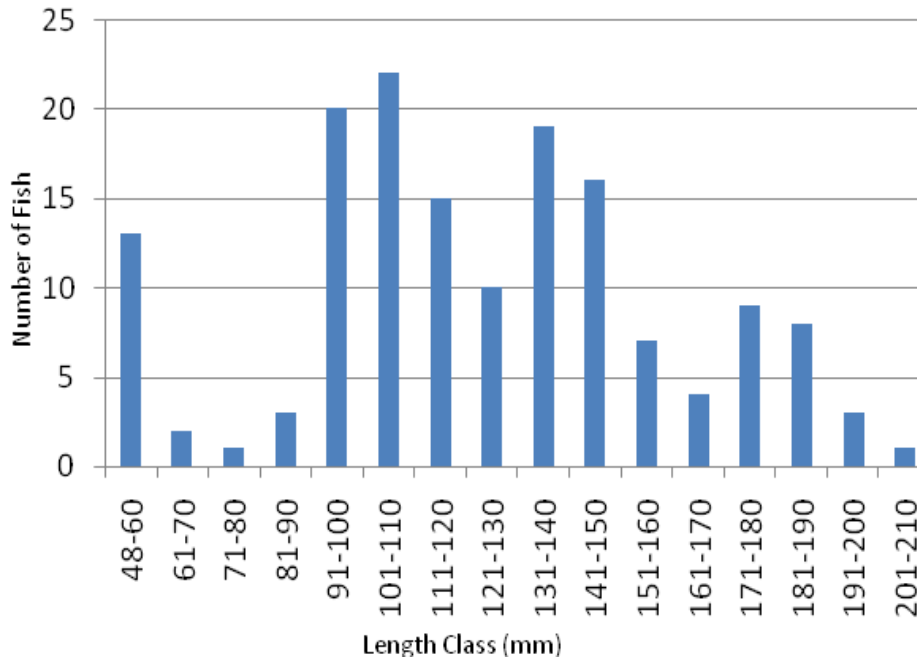


Figure 3. Length frequency distribution for brook trout from Baseline Creek, 2007.

#### 4.2 OLDMAN CREEK

The Oldman Creek monitoring section was 265 m in length with an area of 2650 m<sup>2</sup>. Discharge on August 24<sup>th</sup>, the date of survey, was measured at 0.413 m<sup>3</sup>/s.

Three species, rainbow trout (*Oncorhynchus mykiss*), burbot (*Lota lota*) and spoonhead sculpin (*Cottus ricei*) were captured from the monitoring section in 2007. Summary parameters for the catch are shown in Table 2. Details for the population estimations and fork lengths and weights for individual fish in the catch are provided in Appendix B.



Table 2. Summary parameters for the catch from Oldman Creek

Species	n	Population Estimate (95% confidence interval)	Density n/100 m <sup>2</sup>	Fork Length (mm)			Weight (g)		
				Mean	Min	Max	Mean	Min	Max
RNTR	90	96 (90-104)	3.6	117.7	44	242	21.3	1	159
BURB	38	n/a		163.3	41	247	33	12	101
SPSC	3	n/a		91.3	72	104	8	3	12

Figure 4 shows the length frequency distribution for rainbow trout captured from Oldman Creek. Although there is little corroborative ageing data for rainbow trout from Oldman Creek, it is expected the 4 specimens at the far left may represent age 1 fish. Several other age classes appear to be present, however no ages can be assigned.

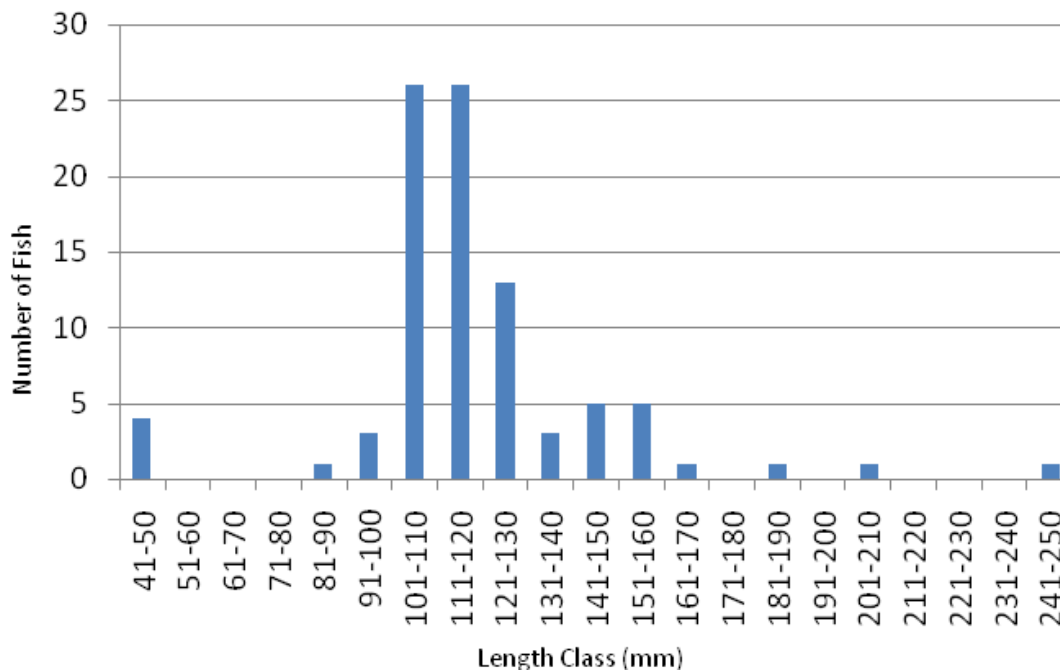


Figure 4. Length frequency distribution for rainbow trout from Oldman Creek, 2007.

## 5.0 **DISCUSSION**

### 5.1 **BASELINE CREEK**

Five species of fish have been captured in Baseline Creek downstream of the Emerson Lakes Road crossing; brook trout, rainbow trout, bull trout, burbot and mountain whitefish (*Prosopium williamsoni*, Hawryluk 1977; Schwartz 2002; Pisces 2005; C. Johnson, Foothills Model Forest, personal communication). Bull trout, burbot and mountain whitefish have not been reported from upstream of the Emerson Lake Road. Typically, bull trout, burbot, and mountain whitefish occur very infrequently and the fish population is increasingly dominated by brook trout, to the degree that in 2004 and 2007, brook trout were the only species captured in the monitoring section upstream of the Emerson Lake Road.

Since the early 1980's, brook trout appear to have become increasingly dominant in Baseline Creek within 3km upstream of the Emerson Lakes Road (Figure 6). Further upstream, approximately 6+ km, the fish population historically consisted exclusively of rainbow trout (Zallen 1981; C. Johnson, pers. comm.). Brook trout have also dominated the catch downstream of the Emerson Lakes Road since 1977 (Hawryluk 1977; Zallen 1981; C. Johnson, pers. comm.), ranging from 55% of the catch in 1977 to 98% in 1996.

Table 3 summarizes the available fish density estimate data for Baseline Creek over time. Brook trout densities appear to be increasing over time, while rainbow trout densities appear to be decreasing. The data set is not adequate to identify any definite trends.

Table 3. Trout density in Baseline Creek over time.

Data Source	Sample Site	Density n/100 m <sup>2</sup>		
		Rainbow trout	Brook trout	All trout
Hawryluk 1977	d/s Emerson Lakes Road	5.4	6.2	10.3
C. Johnson pers. comm. <sup>1</sup>	96152, d/s Emerson Lakes Road	1.0	8.5	9.5
Schwartz 2002	u/s Emerson Lakes Road <sup>2</sup>	0.14	14.6	14.8
Pisces 2005	u/s Emerson Lakes Road	0	20.8	20.8
This Study	u/s Emerson Lakes Road	0	14.9	14.9

<sup>1</sup>Sampling conducted in 1998.

<sup>2</sup>Permanent monitoring section established on Baseline Creek in 2001.

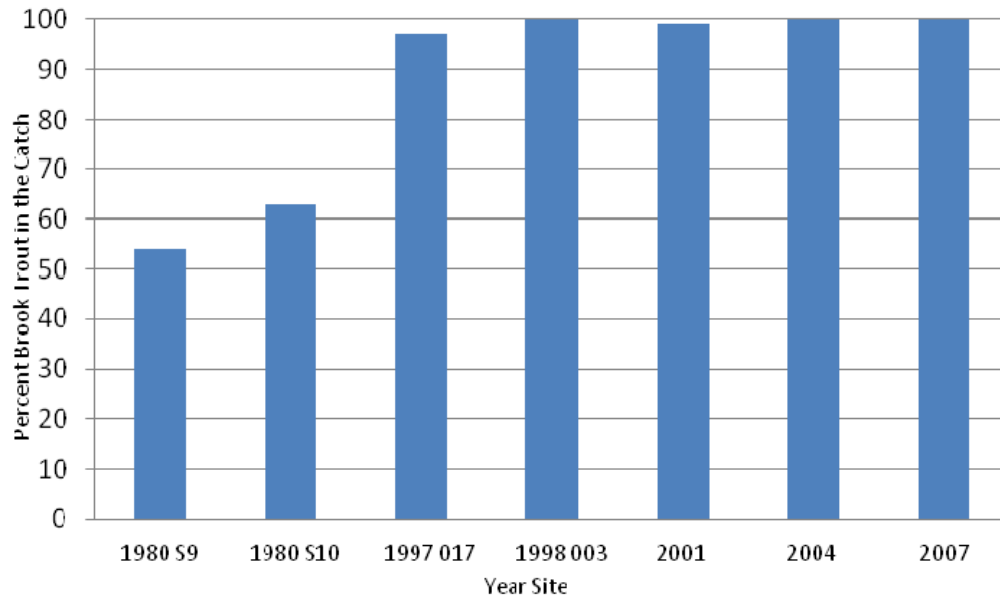


Figure 5. Percent brook trout in catches (survey sampling and population estimates) from Baseline Creek upstream of the Emerson Lakes Road crossing. Data for sites 9 and 10 in 1980 from Zallen (1981). Data for sites 1997 017 and 1998 003 from Johnson (pers. comm.). Data for 2001 from Schwartz (2002). Data from 2004 from Pisces 2005.

## 5.2 OLDMAN CREEK

Four species of fish have been reported from Oldman Creek in the vicinity of the monitoring section; rainbow trout (RNTR), burbot (BURB), mountain whitefish (MNWH) and spoonhead sculpin (SPSC, Table 4). The capture of a bull trout (BLTR) in the monitoring section in 2004 may constitute a substantial upstream range extension (approximately 28 km) for this species in Oldman Creek. Although there has been substantial variation in percentage species composition (Table 4), rainbow trout remain the dominant species.

Table 4. Percent catch composition for Oldman Creek in the monitoring section.

Data source	Year	SPECIES (% of catch)				
		RNTR	BURB	MNWH	SPSC	BLTR
C. Johnson, pers. comm..	1998	87	8	5	0	0
Schwartz 2002	2001	46	34	20	0	0
Pisces 2005	2004	78	9	0	11	1
This study.	2007	69	29	0	2	0

Rainbow trout density in the monitoring section was reported as 0.90 fish/100 m<sup>2</sup> in 2001 (Schwartz 2002), 1.76 fish/100 m<sup>2</sup> in 2004 (Pisces 2005), and 3.6 fish/100 m<sup>2</sup> in 2007 (this study), suggesting an increase in rainbow trout density over time. However, the data set is not adequate to identify any definite trends.

## 6.0 **REFERENCES**

- Hawryluk, R. 1977. A preliminary survey of Baseline Creek. Alberta Recreation, Parks and Wildlife, Fish and Wildlife Div., Edson, AB. 24 pp.
- McCormick, F. H. and R. M. Hughes. 2002. Aquatic vertebrates. Pages 203-226 in D. V. Peck, J. M. Lazorchak and D. J. Klemm, editors. Western pilot study: field operations manual for wadeable streams. U.S Environmental Protection Agency, Corvallis, Oregon.
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- Schwartz, T. 2002. Obed Mine fisheries monitoring 2001: Baseline and Oldman creeks. Report of Pisces Environmental Consulting Services Ltd. to Luscar Ltd, Obed Mountain Mine, Hinton, AB. 18 pp + App.
- Van Deventer, J. S. and W. S. Platts. 1989. Microcomputer Software System for Generation of Population Statistics from Electrofishing Data – User’s Guide for 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. Report of ESL Environmental Sciences Ltd. to Union Oil of Canada Ltd., Calgary, AB. 19 pp + App.
- Zippen, C. 1958. The removal method of population estimation. J. Wildl. Man. 22(1):82-90.

## 7.0 **PERSONAL COMMUNICATIONS**

C. Johnson, Foothills Model Forest, Hinton, AB. Fish inventory reports for Baseline and Oldman creeks.

**Appendix A:**

Colour Plates





Plate 1. Baseline Creek culvert crossing on Emerson Road.



Plate 2. Baseline Creek riffle habitat within monitoring section.



Plate 3. Looking upstream at base of bedrock dominated section on Baseline Creek.



Plate 4. Upstream end of bedrock section on Baseline Creek.



Plate 5. Oldman Creek downstream end of monitoring section. Note log jam.



Plate 6. Looking upstream from downstream end of Oldman Creek monitoring section.

**APPENDIX B:**

Fish Capture and Population Estimate Record

Table B1. Population estimate parameters for the monitoring section on Baseline Creek

Number of runs	3
Duration of runs (s)	6538 4650 3177
Species	BKTR
Removal pattern	100-38-15
Total catch	153
Population estimate	161
Chi square	0.054
Population estimate SE	4.482
Lower confidence interval	153.000
Upper confidence interval	169.873
Capture probability	0.624
Capture probability SE	0.046
Lower confidence interval	0.533
Upper confidence interval	0.716

## Electrofishing Record

Stream Name: Baseline Creek				
Date: 24-Aug-07				
Project: OMM Fish Population Monitoring				
UTM Reference: 474972E 5932112N Zn 12 (NAD83)				
Section Length (m): 270				
Duration (seconds): 6538, 4650, 3177				
1	BKTR	48	1	Run 1
2	BKTR	49	1	Run 1
3	BKTR	57	1	Run 1
4	BKTR	57	1	Run 1
5	BKTR	57	2	Run 1
6	BKTR	58	2	Run 1
7	BKTR	60	2	Run 1
8	BKTR	61	2	Run 1
9	BKTR	87	7	Run 1
10	BKTR	88	9	Run 1
11	BKTR	91	8	Run 1
12	BKTR	93	9	Run 1
13	BKTR	93	10	Run 1
14	BKTR	94	7	Run 1
15	BKTR	94	9	Run 1
16	BKTR	95	10	Run 1
17	BKTR	97	9	Run 1
18	BKTR	97	10	Run 1
19	BKTR	98	10	Run 1
20	BKTR	98	12	Run 1
21	BKTR	99	10	Run 1
22	BKTR	99	12	Run 1
23	BKTR	100	10	Run 1
24	BKTR	101	11	Run 1
25	BKTR	101	11	Run 1
26	BKTR	102	12	Run 1
27	BKTR	103	9	Run 1
28	BKTR	103	10	Run 1
29	BKTR	103	10	Run 1
30	BKTR	103	11	Run 1
31	BKTR	103	12	Run 1
32	BKTR	103	12	Run 1
33	BKTR	104	12	Run 1
34	BKTR	108	13	Run 1
35	BKTR	108	16	Run 1
36	BKTR	111	13	Run 1
37	BKTR	111	17	Run 1
38	BKTR	112	14	Run 1
39	BKTR	112	15	Run 1
40	BKTR	112	15	Run 1
41	BKTR	112	16	Run 1
42	BKTR	113	14	Run 1
43	BKTR	117	11	Run 1
44	BKTR	118	14	Run 1
45	BKTR	118	16	Run 1
46	BKTR	119	20	Run 1
47	BKTR	121	19	Run 1
48	BKTR	121	21	Run 1
49	BKTR	123	23	Run 1
50	BKTR	125	22	Run 1
51	BKTR	126	21	Run 1

Species #	Species	Fork Length (mm)	Weight (g)	Comments
53	BKTR	127	21	Run 1
54	BKTR	129	22	Run 1
55	BKTR	131	28	Run 1
56	BKTR	132	24	Run 1
57	BKTR	133	25	Run 1
58	BKTR	134	24	Run 1
59	BKTR	129	22	Run 1
60	BKTR	136	23	Run 1
61	BKTR	137	28	Run 1
62	BKTR	138	31	Run 1
63	BKTR	140	31	Run 1
64	BKTR	143	14	Run 1
65	BKTR	143	31	Run 1
66	BKTR	143	35	Run 1
67	BKTR	145	32	Run 1
68	BKTR	146	32	Run 1
69	BKTR	146	40	Run 1
70	BKTR	147	32	Run 1
71	BKTR	147	39	Run 1
72	BKTR	148	34	Run 1
73	BKTR	148	36	Run 1
74	BKTR	148	37	Run 1
75	BKTR	148	38	Run 1
76	BKTR	149	39	Run 1
77	BKTR	154	41	Run 1
78	BKTR	156	37	Run 1
79	BKTR	156	38	Run 1
80	BKTR	156	43	Run 1
81	BKTR	157	38	Run 1
82	BKTR	159	54	Run 1
83	BKTR	163	53	Run 1
84	BKTR	167	54	Run 1
85	BKTR	168	45	Run 1
86	BKTR	171	58	Run 1
87	BKTR	172	57	Run 1
88	BKTR	178	55	Run 1
89	BKTR	178	66	Run 1
90	BKTR	178	67	Run 1
91	BKTR	178	74	Run 1
92	BKTR	180	69	Run 1
93	BKTR	183	73	Run 1
94	BKTR	184	69	Run 1
95	BKTR	184	72	Run 1
96	BKTR	185	86	Run 1
97	BKTR	186	6	Run 1
98	BKTR	188	54	Run 1
99	BKTR	193	78	Run 1
100	BKTR	197	66	Run 1

52	BKTR	127	21	Run 1
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## Electrofishing Record continued

Species #	Species	Fork Length (mm)	Weight (g)	Comments
1	BKTR	52	2	Run 2
2	BKTR	55	1	Run 2
3	BKTR	58	2	Run 2
4	BKTR	59	2	Run 2
5	BKTR	78	6	Run 2
6	BKTR	92	8	Run 2
7	BKTR	93	8	Run 2
8	BKTR	95	10	Run 2
9	BKTR	96	9	Run 2
10	BKTR	97	10	Run 2
11	BKTR	98	10	Run 2
12	BKTR	98	11	Run 2
13	BKTR	101	11	Run 2
14	BKTR	101	12	Run 2
15	BKTR	103	12	Run 2
16	BKTR	103	13	Run 2
17	BKTR	106	14	Run 2
18	BKTR	110	13	Run 2
19	BKTR	110	15	Run 2
20	BKTR	112	16	Run 2
21	BKTR	117	17	Run 2
22	BKTR	129	22	Run 2
23	BKTR	131	22	Run 2
24	BKTR	133	25	Run 2
25	BKTR	133	25	Run 2
26	BKTR	135	27	Run 2
27	BKTR	136	27	Run 2
28	BKTR	136	28	Run 2
29	BKTR	137	29	Run 2
30	BKTR	137	31	Run 2
31	BKTR	144	34	Run 2
32	BKTR	145	32	Run 2
33	BKTR	170	62	Run 2
34	BKTR	178	65	Run 2
35	BKTR	182	62	Run 2
36	BKTR	188	70	Run 2
37	BKTR	193	101	Run 2
38	BKTR	206	93	Run 2

Species #	Species	Fork Length (mm)	Weight (g)	Comments
1	BKTR	53	1	Run 3
2	BKTR	55	1	Run 3
3	BKTR	61	3	Run 3
4	BKTR	87	8	Run 3
5	BKTR	101	12	Run 3
6	BKTR	103	11	Run 3
7	BKTR	104	11	Run 3
8	BKTR	111	14	Run 3
9	BKTR	120	18	Run 3
10	BKTR	127	23	Run 3
11	BKTR	138	27	Run 3
12	BKTR	138	28	Run 3
13	BKTR	142	37	Run 3
14	BKTR	151	36	Run 3
15	BKTR	171	50	Run 3

Table B2. Population estimate parameters for the monitoring section on Oldman Creek

Number of runs	3
Duration of runs (s)	5769 6717 5562
Species	RNTR
Removal pattern	56-24-10
Total catch	90
Population estimate	96
Chi square	0.075
Population estimate SE	4.202
Lower confidence interval	90.000
Upper confidence interval	104.341
Capture probability	0.466
Capture probability SE	0.718
Lower confidence interval	0.466
Upper confidence interval	0.718

## Electrofishing Record

Stream Name: Oldman Creek				
Date: 24-Aug-07				
Project: OMM fish population monitoring				
UTM Reference: 4649783E 5942256N Zn 12 (NAD83)				
Section Length (m) 265				
Duration (seconds): 5769, 6717, 5562				
1	BURB	144	60	Run 1
2	BURB	152	61	Run 1
3	BURB	161	62	Run 1
4	BURB	169	63	Run 1
5	BURB	179	64	Run 1
6	BURB	182	65	Run 1
7	BURB	182	66	Run 1
8	BURB	204	53	Run 1
9	BURB	219	54	Run 1
10	RNTR	50	55	Run 1
11	RNTR	88	56	Run 1
12	RNTR	98	10	Run 1
13	RNTR	101	9	Run 1
14	RNTR	101	10	Run 1
15	RNTR	101	11	Run 1
16	RNTR	103	11	Run 1
17	RNTR	104	12	Run 1
18	RNTR	104	13	Run 1
19	RNTR	106	11	Run 1
20	RNTR	106	12	Run 1
21	RNTR	106	16	Run 1
22	RNTR	107	12	Run 1
23	RNTR	107	12	Run 1
24	RNTR	107	13	Run 1
25	RNTR	107	14	Run 1
26	RNTR	108	11	Run 1
27	RNTR	108	13	Run 1
28	RNTR	108	13	Run 1
29	RNTR	110	13	Run 1
30	RNTR	110	14	Run 1
31	RNTR	111	14	Run 1
32	RNTR	111	14	Run 1
33	RNTR	111	15	Run 1
34	RNTR	112	14	Run 1
35	RNTR	113	15	Run 1
36	RNTR	114	15	Run 1
37	RNTR	114	15	Run 1
38	RNTR	114	18	Run 1
39	RNTR	115	14	Run 1
40	RNTR	115	15	Run 1
41	RNTR	116	16	Run 1
42	RNTR	117	19	Run 1
43	RNTR	118	16	Run 1
44	RNTR	119	18	Run 1
45	RNTR	120	18	Run 1
46	RNTR	121	17	Run 1
47	RNTR	121	19	Run 1
48	RNTR	121	19	Run 1
49	RNTR	122	17	Run 1
50	RNTR	122	20	Run 1
51	RNTR	122	21	Run 1
52	RNTR	123	20	Run 1
53	RNTR	125	21	Run 1

Species #	Species	Fork Length (mm)	Weight (g)	Comments
54	RNTR	127	21	Run 1
55	RNTR	131	23	Run 1
56	RNTR	132	28	Run 1
57	RNTR	141	35	Run 1
58	RNTR	143	29	Run 1
59	RNTR	143	33	Run 1
60	RNTR	146	36	Run 1
61	RNTR	151	37	Run 1
62	RNTR	157	42	Run 1
63	RNTR	157	43	Run 1
64	RNTR	168	58	Run 1
65	RNTR	202	98	Run 1
66	SPSC	104	12	Run 1

## Electrofishing Record continued

Species #	Species	Fork Length (mm)	Weight (g)	Comments
1	BURB	132	14	Run 2
2	BURB	139	18	Run 2
3	BURB	141	19	Run 2
4	BURB	142	23	Run 2
5	BURB	143	18	Run 2
6	BURB	143	20	Run 2
7	BURB	153	19	Run 2
8	BURB	153	25	Run 2
9	BURB	154	25	Run 2
10	BURB	179	36	Run 2
11	BURB	184	44	Run 2
12	BURB	184	45	Run 2
13	BURB	193	51	Run 2
14	BURB	204	60	Run 2
15	BURB	206	54	Run 2
16	BURB	247	101	Run 2
17	RNTR	44	<1	Run 2
18	RNTR	47	1	Run 2
19	RNTR	94	7	Run 2
20	RNTR	104	11	Run 2
21	RNTR	106	13	Run 2
22	RNTR	106	14	Run 2
23	RNTR	108	12	Run 2
24	RNTR	111	14	Run 2
25	RNTR	111	15	Run 2
26	RNTR	112	16	Run 2
27	RNTR	114	16	Run 2
28	RNTR	118	18	Run 2
29	RNTR	119	17	Run 2
30	RNTR	119	18	Run 2
31	RNTR	120	19	Run 2
32	RNTR	122	18	Run 2
33	RNTR	125	19	Run 2
34	RNTR	128	23	Run 2
35	RNTR	137	30	Run 2
36	RNTR	148	39	Run 2
37	RNTR	155	41	Run 2
38	RNTR	158	41	Run 2
39	RNTR	184	69	Run 2
40	RNTR	242	159	Run 2
41	SPSC	72	3	Run 2
42	SPSC	98	9	Run 2

Species #	Species	Fork Length (mm)	Weight (g)	Comments
1	BURB	41	<1	Run 3
2	BURB	128	12	Run 3
3	BURB	136	19	Run 3
4	BURB	139	19	Run 3
5	BURB	141	16	Run 3
6	BURB	143	18	Run 3
7	BURB	147	23	Run 3
8	BURB	148	22	Run 3
9	BURB	157	27	Run 3
10	BURB	171	31	Run 3
11	BURB	176	33	Run 3
12	BURB	183	33	Run 3
13	BURB	207	57	Run 3
14	RNTR	46	<1	Run 3
15	RNTR	97	10	Run 3
16	RNTR	103	11	Run 3
17	RNTR	104	12	Run 3
18	RNTR	107	12	Run 3
19	RNTR	108	13	Run 3
20	RNTR	111	15	Run 3
21	RNTR	113	16	Run 3
22	RNTR	119	20	Run 3
23	RNTR	121	24	Run 3