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Slimy Sculpin Metals Data for Red Devil Creek Used to Develop Benthos-to-Sculpin Trophic Transfer Factors

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Appendix G

Slimy Sculpin Metals Data for Red Devil Creek Used to Develop Benthos-to-Sculpin Trophic Transfer Factors

This appendix presents the slimy sculpin (*Cottus cognatus*) metals data for Red Devil Creek (see Tables G-1 and G-2). The fish were collected by the United States Department of Interior Bureau of Land Management (BLM) in 2010 and 2011. The EPCs developed from the sculpin data (see Table G-3) were used in the BERA Supplement to develop benthos-to-sculpin trophic transfer factors (see Appendix I).

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Table G-1. Sculpin Metals Data from Red Devil Creek Used in Baseline Ecological Risk Assessment (BERA, E&E 2014) and BERA Supplement.

Sample Month-Year	LabID	Client Samp ID	Sb (mg/kg		As (mg/kg wet)		Ba (mg/kg wet)		Be (mg/kg		Cd (mg/kg wet)		Cr (mg/kg		Cu (mg/kg wet)		Pb (mg/kg wet)		Mn (mg/kg wet)		Hg (mg/kg		Ni (mg/kg wet)		Se (mg/kg		V (mg/kg wet)		Zn (mg/kg	
			Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
June 2010	253	RD 4/Slimey Sculpin	1.513		2.352		3.341		0.025	U	0.025	U	0.039		1.965	J	0.025	J-	9.423		0.09		0.045		1.127		0.132		20.657	J-
June 2010	255	RD 7/Slimey Sculpin	2.173		3.029		2.688		0.025	U	0.025	U	0.046		2.263	J	0.025	UJ	11.292		0.09		0.050		0.986		0.095		19.812	J-
June 2010	256	RD 8/Slimey Sculpin	0.399		1.132	J	2.405		0.025	U	0.052		0.028		0.720	J-	0.025	U	8.955		0.05		0.039		1.291		0.122		18.718	J-
June 2010	257	RD 9/Slimey Sculpin	0.615		1.439		2.82		0.025	U	0.047		0.035		0.816	J-	0.025	U	13.854		0.06		0.044		0.834		0.206		26.846	J-
June 2010	258	RD 10/Slimey Sculpin	0.479		1.098	J	2.008		0.025	U	0.027		0.057		0.885	J-	0.025	U	9.76		0.07		0.044		0.851		0.102		17.129	J-
June 2010	259	RD 11/Slimey Sculpin	1.374		2.554		2.602		0.025	U	0.025	U	0.062		1.016	J-	0.025	U	9.502		0.13		0.069		1.43		0.123		21.938	J-
June 2010	260	RD 12/Slimey Sculpin	4.044		3.387		3.066		0.025	U	0.059		0.069		0.969	J-	0.026		8.562		0.63		0.095		1.199		0.161		23.009	J-
June 2010	261	RD 13/Slimey Sculpin	1.496		4.493		4.347		0.025	U	0.103		2.431		1.149	J-	0.025	U	15.994		0.23		0.113		1.052		0.359		30.716	J-
June 2010	262	RD 15/Slimey Sculpin	1.151		2.63		3.067		0.025	U	0.037		0.053		1.693		0.025	U	8.442		0.09		0.064		0.912		0.136		22.158	J-
Aug 2010	530	2-RD-1-SC	18.692		9.645		3.794		0.025	U	0.025	U	0.074		0.907		0.035	J	11.099		2.2593		0.105		2.975		0.16		24.836	
Aug 2010	531	2-RD-2-SC	12.303		13.222		5.402		0.025	U	0.030		0.062		0.940		0.029	J	21.275		1.8515		0.160		1.836		0.214		29.581	
Aug 2010	532	2-RD-3-SC	14.224		8.231		3.609		0.025	U	0.025	U	0.053		0.720		0.029	J	9.044		1.5268		0.083		1.596		0.152		20.634	
Aug 2010	533	2-RD-4-SC	22.281		11.785		3.103		0.025	U	0.025	U	0.104		0.917		0.040		6.653		3.7009		0.119		2.025		0.195		22.897	
Aug 2010	534	2-RD-5-SC	23.668		20.099		4.097		0.025	U	0.025	U	0.13		1.383		0.046		10.345		3.1578		0.231		2.414		0.243		22.666	
Aug 2010	535	2-RD-6-SC	10.482		14.878		2.829		0.025	U	0.029		0.105		1.105		0.031		9.831		1.35536		0.211		2.223		0.22		28.516	
Aug 2010	536	2-RD-7-SC	17.199		18.099		3.884		0.025	U	0.025	U	0.097		0.973		0.039		9.836		1.74736		0.183		2.252		0.266		27.254	
Aug 2010	537	2-RD-8-SC	38.1		24.06		5.15		0.025	U	0.032		0.188		1.164		0.079		11.712		3.6834		0.263		2.234		0.317		26.68	
Aug 2010	538	2-RD-9-SC	10.145		9.314		3.156		0.025	U	0.025	U	0.155		0.761		0.027		10.888		0.68364		0.151		2.423		0.182		27.235	
Aug 2010	539	2-RD-10-SC	18.29		14.624		4.471		0.025	U	0.038		0.106		0.943		0.045		17.558		1.9511		0.225		1.825		0.276		35.373	
Aug 2010	540	2-RD-11-SC	6.512		6.864		3.308		0.025	U	0.056		0.038	J	0.882		0.025	U	11.192		0.8909		0.137		1.852		0.21		29.254	
Aug 2010	541	2-RD-12-SC	17.486		12.339		3.514		0.025	U	0.025	U	0.071		0.911		0.029		10.351		2.80423		0.115		1.533		0.211		26.177	
June 2011	1110258-01	RDSS1-1	na		5.81		4.56		0.057	U	0.03		0.05	U	1.41		0.034		22.40		0.273		0.171		0.68		0.038	U	32	
June 2011	1110258-02	RDSS1-2	na		4.51		1.93		0.057	U	0.044		0.05	U	1.13		0.003	U	7.46		0.269		0.015	U	0.92		0.038	U	26.1	
June 2011	1110258-03	RDSS1-3	na		1.62		4.83		0.066	U	0.066		0.06	U	1.1		0.004	U	19.20		0.161		0.018	U	0.98		0.044	U	33.5	
June 2011	1110258-04	RDSS1-4	na		6.07		1.60		0.066	U	0.026		0.06	U	1.01		0.004	U	9.17		0.123		0.018	U	0.78		0.044	U	26.3	
June 2011	1110258-05	RDSS1-5	na		9.11		3.21		0.063	U	0.037		0.05	U	1.02		0.004	U	22.70		0.142		0.017	U	0.64		0.041	U	20.3	
June 2011	1110258-06	RDSS1-6	na		7.78		2.29		0.058	U	0.031		0.05	U	1.08		0.003	U	16.40		0.159		0.016	U	0.9		0.038	U	26.1	
June 2011	1110258-07	RDSS1-7	na		2.49		3.94		0.059	U	0.033		0.05	U	1.12		0.004	U	14.20		0.102		0.016	U	0.92		0.039	U	24.4	
June 2011	1110258-08	RDSS1-8	na		1.98		1.79		0.06	U	0.026		0.05	U	1.09		0.004	U	14.00		0.0858		0.016	U	0.96		0.040	U	21.3	
June 2011	1110258-09	RDSS1-9	na		4.95		3.49		0.065	U	0.054		0.06	U	1.01		0.004	U	8.27		0.279		0.018	U	0.76		0.043	U	24.5	
June 2011	1110258-10	RDSS1-10	na		2.9		5.14		0.06	U	0.076		0.05	U	1.07		0.039		40.70		0.135		0.016	U	1.05		0.040	U	30.3	
June 2011	1110258-11	RDSS1-11	na		3.13		3.90		0.066	U	0.049		0.06	U	1.02		0.004	U	14.00		0.131		0.018	U	0.59		0.043	U	26.7	
June 2011	1110258-12	RDSS1-12	na		7.89		3.49		0.064	U	0.033		0.05	U	1.08		0.004	U	17.10		0.158		0.168		0.61		0.042	U	24.1	
Sept 2011	1110264-01	RDSS2-1	na		12.2		4.63		0.065	U	0.003	U	0.06	U	1.23		0.004	U	12.50		0.219		0.155		1.18		0.043	U	21.9	
Sept 2011	1110264-02	RDSS2-2	na		6.94		3.74		0.059	U	0.003	U	0.05	U	0.99		0.004	U	10.20		0.0998		0.016	U	0.58		0.039	U	22	
Sept 2011	1110264-03	RDSS2-3	na		3.66		0.99		0.061	U	0.062		0.05	U	1		0.004	U	3.49		0.114		0.017	U	0.94		0.040	U	20.6	
Sept 2011	1110264-04	RDSS2-4	na		45.9		6.96		0.061	U	0.003	U	0.05	U	1.52		0.053		23.00		0.504		0.274		1.19		0.33		26.3	
Sept 2011	1110264-05	RDSS2-5	na		11.1		1.36		0.059	U	0.036		0.05	U	1.56		0.003	U	14.20		0.336		0.155		1.34		0.039	U	26.1	
Sept 2011	1110264-06	RDSS2-6	na		15.2		4.84		0.061	U	0.03		0.05	U	1.23		0.004	U	8.81		0.239		0.178		1.28		0.040	U	15.9	
Sept 2011	1110264-07	RDSS2-7	na		17.7		1.66		0.067	U	0.003	U	0.06	U	1.38		0.004	U	9.67		0.153		0.108		0.61		0.044	U	16.4	
Sept 2011	1110264-08	RDSS2-8	na		40.5		2.59		0.065	U	0.003	U	0.06	U	1.61		0.004	U	23.50		0.427		0.3		1.01		0.043	U	21.1	
Sept 2011	1110264-09	RDSS2-9	na		25		2.97		0.065	U	0.033		0.05	U	1.07		0.004	U	30.30		0.181		0.258		1.34		0.43		26.9	
Sept 2011	1110264-10	RDSS2-10	na		22.3		1.63		0.058	U	0.003		0.05	U	1.8		0.052		19.40		0.341		0.503		1.35		0.31		23.6	
Sept 2011	1110264-11	RDSS2-11	na		12.3		1.95		0.063	U	0.06		0.05	U	1.27		0.004	U	11.60		0.223		0.115		1.48		0.042	U	24.9	
Sept 2011	1110264-12	RDSS2-12	na		9.27		2.11		0.063	U	0.022		0.05	U	1.18		0.055		9.11		0.999		0.132		0.67		0.042	U	19.7	

Key:

J = estimated value; na = not analyzed; Q = qualifier; U = not detected (listed value is method detection limit).

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Table G-2. Sculpin Methylmercury and Total Mercury Data from Red Devil Creek Used in the Baseline Ecological Risk Assessment (BERA, E&E 2014) and BERA Supplement for the Red Devil Mine Site.

Sample Month-Year	LabID	Client Samp ID	Methyl Hg (mg/kg wet) Result	Q	Total Hg (mg/kg wet) Result	Q	Fraction Methyl Hg
June 2010*	1007189-40	RD 5, 6, 14	0.312		na		na
Aug 2010	1009071-04	2-RD-9-SC	0.16		0.684		0.23
June 2011	1110258-01	RDSS1-1	0.114		0.273		0.42
June 2011	1110258-02	RDSS1-2	0.164		0.269		0.61
June 2011	1110258-03	RDSS1-3	0.0501		0.161		0.31
Sept 2011	1110264-01	RDSS2-1	0.135		0.219		0.62
Sept 2011	1110264-02	RDSS2-2	0.0827		0.0998		0.83
							0.50 Average

* Composite sample of 3 sculpin

Key:
na = not available

Table G-3. ProUCL Output Summary for Sculpin Metals Data from Red Devil Creek Used in Baseline Ecological Risk Assessment (BERA, E&E 2014) and BERA Supplement.

Data Set	Analyte	Units	Number of Observations	Number of Detections	Mean of Detected	SD of Detected	Maximum Detected	Distribution (detects only)	UCL Statistic	95% UCL	EPC	EPC Source
Sculpin	Antimony	mg/kg wet	21	21	10.6	10.18	38.1	Gamma	95% Approximate Gamma UCL	17.06	17.06	95% UCL
Sculpin	Arsenic	mg/kg wet	45	45	10.35	9.642	45.9	Gamma	95% Approximate Gamma UCL	12.98	12.98	95% UCL
Sculpin	Barium	mg/kg wet	45	45	3.295	1.243	6.96	Normal	95% Student's-t UCL	3.606	3.606	95% UCL
Sculpin	Beryllium	mg/kg wet	45	0	--	--	--	--	--	--	--	--
Sculpin	Cadmium	mg/kg wet	45	30	0.042	0.0193	0.103	Not Discernable	95% KM (Chebyshev) UCL	0.0456	0.0456	95% UCL
Sculpin	Chromium	mg/kg wet	45	21	0.191	0.515	2.431	Not Discernable	95% KM (t) UCL	0.199	0.199	95% UCL
Sculpin	Copper	mg/kg wet	45	45	1.157	0.324	2.263	Lognormal*	95% CLT UCL*	1.236	1.236	95% UCL
Sculpin	Lead	mg/kg wet	45	18	0.0396	0.0138	0.079	Normal	95% KM (t) UCL	0.0228	0.0228	95% UCL
Sculpin	Manganese	mg/kg wet	45	45	13.71	6.84	40.7	Lognormal*	95% CLT UCL*	15.39	15.39	95% UCL
Sculpin	Mercury	mg/kg wet	45	45	0.731	1.007	3.701	Not Discernable	95% Chebyshev (Mean, Sd) UCL	1.386	1.386	95% UCL
Sculpin	Methylmercury	mg/kg wet	7	7	0.145	0.0841	0.312	Normal	95% Student's-t UCL	0.207	0.207	95% UCL
Sculpin	Nickel	mg/kg wet	45	33	0.153	0.0955	0.503	Normal	95% KM (t) UCL	0.142	0.142	95% UCL
Sculpin	Selenium	mg/kg wet	45	45	1.281	0.584	2.975	Gamma	95% Approximate Gamma UCL	1.432	1.432	95% UCL
Sculpin	Vanadium	mg/kg wet	45	24	0.215	0.0878	0.433	Normal	95% KM (t) UCL	0.181	0.181	95% UCL
Sculpin	Zinc	mg/kg wet	45	45	24.51	4.36	35.37	Normal	95% Student's-t UCL	25.61	25.61	95% UCL

Key:

CLT = Central limit theorem
EPC = Exposure point concentration
KM = Kaplan-Meier
SD = Standard deviation
UCL = Upper confidence level

Note:

* Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.