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BLM Data Used to Calculate Benthic Biota Sediment Accumulation Factors

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Appendix P

Sediment and Benthic Macroinvertebrate Metals Data for Red Devil Creek and Reference Creeks and Biota Sediment Accumulation Factors

This appendix includes arsenic, antimony, mercury, and methylmercury data for sediment and benthic-macroinvertebrate samples collected from Red Devil Creek and nearby reference creeks in June 2010 by the Bureau of Land Management (BLM), Alaska State Office, Anchorage, Alaska, and uses these data to calculate biota-sediment accumulation factors (BSAFs). Figure 6-7 shows the locations of the reference creeks relative to Red Devil Creek.

Table P-1 Benthic Macroinvertebrate Data for Selected Contaminants for Red Devil Creek and Reference Creeks Along the Middle Kuskokwim River (June 2010 BLM Samples).

Lab ID	BLM Sample ID	Arsenic		Antimony		Mercury		Methylmercury	
		(µg/ wet g)	QA Qual.	(µg/ wet g)	QA Qual.	(µg/ wet g)	QA Qual.	(ng/wet g)	QA Qual.
197	NONAME CK #2/Macro	0.621		0.077		0.02		57.5	
215	DOWNEY 1/Macro	1.102		0.036	J	0.03		14.6	
216	DOWNEY 2/Macro	0.878		0.03	J	0.02		18.8	
217	DOWNEY 3/Macro	0.815		0.028	J	0.03		17.5	
244	ICE CK 1/Macro	1.065		0.095		0.05		23	
245	ICE CK 2/Macro	0.749		0.054		0.02		12.3	
246	ICE CK3/Macro	1.35		0.204		0.01		9.8	
263	RED DEVIL 1/Macro	81.238		20.389		2.01		23.8	
264	RED DEVIL 2/Macro	98.798		18.953		2.38		59.4	
265	RED DEVIL 3/Macro	126.444		21.437		1.6		50.4	
300	FULLER CK 1/Macro	1.373		0.097		0.03		10.8	
301	FULLER CK 2/Macro	1.63		0.098		0.03		8.1	
319	VR A/Macro	0.626		0.425		0.08		41.8	
320	VR B/Macro	0.903		0.113		0.04		9.4	
321	VR C/Macro	0.614		0.06		0.03		11.6	
322	VR D/Macro	0.661		0.058		0.02		8.7	
349	McCally CK 1/Macro	1.908		0.328		0.03		13	
350	McCally CK 2/Macro	1.95		0.367		0.02		10.1	
366	California CK 1/Macro	0.482		0.125		0.01		6.3	

Source: M. Varner, BLM Alaska State Office, Anchorage, AK.

Key: BLM = Bureau of Land Management

	Arithmetic Mean	As (µg/g wet)	Sb (µg/g wet)	Hg (ug/g wet)	MeHg (ng/g wet)
No Name Creek		0.62	0.077	0.020	57.500
Downey Creek		0.93	0.031	0.027	16.967
Ice Creek		1.05	0.118	0.027	15.033
Red Devil Creek		102.16	20.260	1.997	44.533
Fuller Creek		1.50	0.098	0.030	9.450
Vreeland Creek		0.70	0.164	0.043	17.875
California		0.48	0.125	0.010	6.300

	Geometric Mean	As (µg/g wet)	Sb (µg/g wet)	Hg (µg/g wet)	MeHg (ng/g wet)
No Name Creek		0.62	0.077	0.020	57.500
Downey Creek		0.92	0.031	0.026	16.873
Ice Creek		1.02	0.102	0.022	14.048
Red Devil Creek		100.49	20.234	1.971	41.457
Fuller Creek		1.50	0.097	0.030	9.353
Vreeland Creek		0.69	0.114	0.037	14.111
California		0.48	0.125	0.010	6.300

Table P-2 Sediment Data for Selected Contaminants for Red Devil Creek and Reference Creeks Along the Middle Kuskokwim River (June 2010 BLM Samples)^a

Date	Time	Creek Name	Local	Arsenic	Antimony	Mercury	Methyl Hg
				(mg/kg dry)	(mg/kg dry)	(µg/kg dry)	(µg/kg dry)
Jun 20 2010	1150	Red Devil Creek	Site	3900	10000	232000	51
Jun 20 2010	1200	Red Devil Creek	Site	4000	9300	210000	22
Jun 21 2010	950	Vreeland Creek	Bkgd	9.5	1.1	200	2.2
Jun 21 2010	1000	Vreeland Creek	Bkgd	10	1.3	216	1.7
Jun 21 2010	1530	Fuller Creek	Bkgd	13	3.6	127	0.4
Jun 21 2010	1540	Fuller Creek	Bkgd	11	1.7	123	0.72
Jun 22 2010	1310	Downey Creek	Bkgd	11	2.8	6950	2
Jun 22 2010	1320	Downey Creek	Bkgd	11	6.5	229	1.2
Jun 22 2010	1120	California Creek	Bkgd	15	9	123	0.64
Jun 22 2010	1130	California Creek	Bkgd	12	4.9	113	1.6
Jun 24 2010	1400	Ice Creek	Bkgd	9.1	1.3	122	0.84
Jun 24 2010	1410	Ice Creek	Bkgd	12	1.3	115	1
Jun 22 2010	1540	No Name Creek	Bkgd	9.4	1.4	971	0.86
Jun 22 2010	1550	No Name Creek	Bkgd	9.5	1.5	122	0.81

Source: M. Varner, BLM Alaska State Office, Anchorage, AK.

Key: Bkgd = background, BLM = Bureau of Land Management, RDC = Red Devil Creek.

Note: a = BLM collected duplicate sediment samples at each location.

	Arsenic (mg/kg dry)	Antimony (mg/kg dry)	Mercury (µg/kg dry)	Methyl Hg (µg/kg dry)
Max (RDC) or Min (Bkgd)				
Red Devil Creek	4000	10000	232000	51
Vreeland Creek	9.5	1.1	200	1.7
Fuller Creek	11	1.7	123	0.4
Downey Creek	11	2.8	229	1.2
California Creek	12	4.9	113	0.64
Ice Creek	9.1	1.3	115	0.84
No Name Creek	9.4	1.4	122	0.81

Table P-3 Arsenic, Antimony, Mercury, and Methylmercury in Co-located Samples of Benthic Macroinvertebrates and Sediment and Biota-Sediment Accumulation Factors.

Creek Name	Local	Sediment ^a				Benthic Macroinvertebrates ^b					BSAF ^c			
		Arsenic (mg/kg dry)	Antimony (mg/kg dry)	Mercury (µg/kg dry)	Methyl Hg (µg/kg dry)	Arsenic (mg/kg wet)	Antimony (mg/kg wet)	Mercury (µg/kg wet)	Methyl Hg (µg/kg wet)	% Methyl Hg	Arsenic	Antimony	Mercury	Methyl Hg
California Creek	Bkgd	12	4.9	113	0.64	0.48	0.13	10.0	6.3	63%	0.040	0.026	0.088	9.8
Downey Creek	Bkgd	11	2.8	229	1.2	0.92	0.03	26.2	16.9	64%	0.084	0.011	0.114	14.1
Fuller Creek	Bkgd	11	1.7	123	0.4	1.50	0.10	30.0	9.4	31%	0.136	0.057	0.244	23.4
Ice Creek	Bkgd	9.1	1.3	115	0.84	1.02	0.10	21.5	14.0	65%	0.113	0.078	0.187	16.7
No Name Creek	Bkgd	9.4	1.4	122	0.81	0.62	0.08	20.0	57.5	~100%	0.066	0.055	0.164	71.0
Vreeland Creek	Bkgd	9.5	1.1	200	1.7	0.69	0.11	37.2	14.1	38%	0.073	0.103	0.186	8.3
Red Devil Creek	Site	4000	10000	232000	51	100	20.2	1971	41.5	2%	0.025	0.002	0.008	0.8

Key:

Bkgd = background

BSAF = biota-sediment accumulation factor

Geometric Mean BSAF for Reference Creeks	0.079	0.044	0.155	17.8
Red Devil Creek BSAF	0.025	0.002	0.008	0.8
Background-to-Site Ratio	3.2	22	18	22

a = Maximum of duplicate samples for Red Devil Creek and minimum of duplicate samples from reference creeks collected in June 2010.

b = Geometric Mean of up to four samples from each creek collected in June 2010.

c = (Benthic macroinvertebrate concentration [wet]) / (sediment concentration [dry]). Percent moisture data not available for benthic macroinvertebrate samples.