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Compilation of stream macroinvertebrate data for the Birch Creek, Beaver Creek, Fortymile River, and Minto Flats drainages, Alaska

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INTRODUCTION

This report summarizes an investigation made by the State of Alaska, Department of Natural Resources, Division of Geological and Geophysical Surveys (DGGS) in cooperation with the U.S. Bureau of Land Management (BLM) from August to November 1987. The objective of the investigation is to: (1) inventory the benthic invertebrate community in the Fortymile River drainage, (2) compile available benthic invertebrate data on the Fortymile River, Birch Creek, Beaver Creek, and Minto Flats drainages, and (3) determine whether cumulative placer mining impacts on the benthic invertebrate community in these four drainages have been documented.

FORTYMILE RIVER

Field Investigation

Material and Methods. Benthic invertebrates were collected in the South Fork Fortymile River drainage on August 18-22, 1987 at the following sites:

site 1 West Fork Dennison Fork Fortymile River at Taylor Highway Bridge
site 2 Mosquito Fork Fortymile River at Taylor Highway Bridge
site 3 South Fork Fortymile River at Taylor Highway Bridge
site 4 Walker Fork Fortymile River at mouth
site 5 Napoleon Creek at mouth
site 6 Butte Creek at mouth
site 7 South Fork Fortymile River above North Fork
site 8 North Fork Fortymile River above South Fork
site 9 Wade Creek at mouth
site 10 Walker Fork Fortymile River above Wade Creek

Site locations are shown on figure 1. Sites 1 and 6 are on unmined streams; all other sites are on past or presently mined streams.

Two quantitative benthos samples and one qualitative kick sample were collected from shallow run habitats to inventory the benthic invertebrate community. The stream substrate type was visually estimated at each site (Table 1). Photographs of sampling sites and substrate type are shown in the

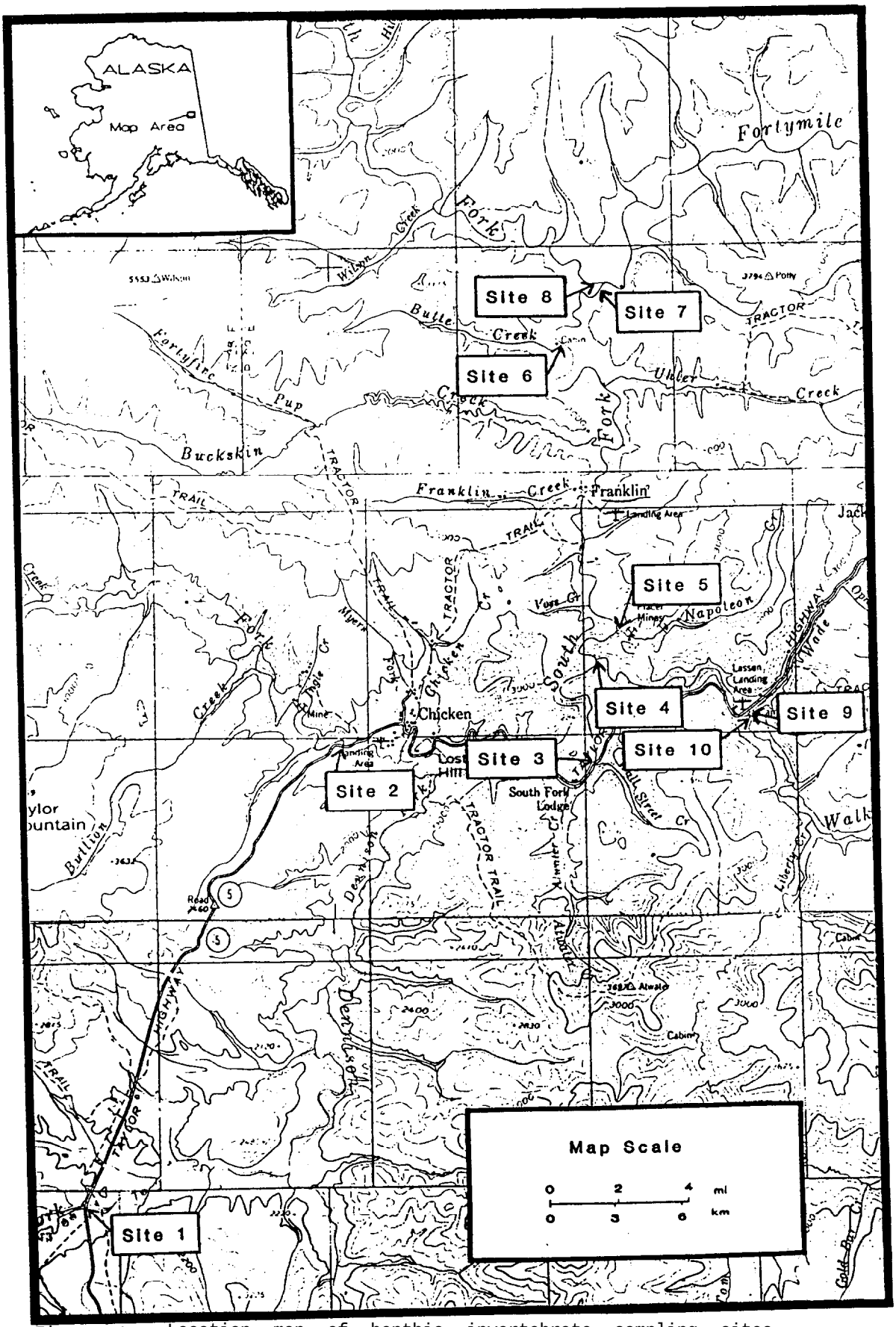

Figure 1. Location map of benthic invertebrate sampling sites, Fortymile River drainage, Alaska.

Appendix. Quantitative benthos samples were collected with a 0.1 meter² wide, 30 cm high cylindrical sampler, enclosed by 300-micron mesh NITEX netting. A 500-micron mesh drift net was used for the ten minute kick sample. Invertebrates were transferred from the net to whirlpak bags which contained 70 percent ethyl alcohol. Rose bengal bacteriological stain was added to the alcohol solution to facilitate later sorting. Invertebrates were identified to the most practical taxonomic level using keys by Edmunds and others (1976), Baumann and others (1977), Wiggins (1977), Pennak (1978), Merritt and Cummins (1978), and Agriculture Canada (1981). The number of taxa *at* a site is based on the number of insect families and other major invertebrate groups present. An index of similarity was calculated among sites using the number of taxa in kick samples. Since invertebrates were identified to different taxonomic levels the similarity index $S = \frac{2w}{a + b} \times 100$ was used, where a = number of taxa from site A; b = number of taxa from site B, and w = number of taxa in common (Erman, 1981).

Results and Discussion. The density (number of invertebrates per 0.1 meter²) and number of taxa collected in benthos samples varied among sites (Table 2). Based on mean benthic invertebrate density, sites fall into four groups: density averaging 984 organisms per 0.1m² (site 10), densities averaging 238 to 478 organisms per 0.1m² (sites 1, 2, 8, and 10), densities averaging 73 to 76 organisms per 0.1m² (sites 3 and 7), and densities averaging 26 to 28 organisms per 0.1m² (sites 5, 6, 4, and 9) (Table 3). Generally, the higher densities occur in streams that have no or low mining activity while the lower densities occur in streams that have moderate or high mining activity. There are two exceptions to this trend. Site 10, which has had a moderate to high amount of mining activity upstream has the highest mean

density and relatively high number of taxa. Site 6, a very small tributary stream of the South Fork Fortymile River, is unmined and has low density and the fewest taxa. However, for sites on streams of comparable size, sites 1, 2, and 3, and sites 7 and 8, there appears to be a moderate impact from placer mining on benthic invertebrate density at sites 3 and 7.

The relationship between invertebrate density and mining activity in Walker Fork Fortymile River is difficult to interpret. All three sites (4, 9, and 10) have high or moderate upstream mining activity. Yet densities at site 10 are very high. Also, it is unclear whether low densities at site 4 are the result of the boulder substrate type (Table 1) or upstream mining. Nevertheless, invertebrate density at sites 4 and 9 is substantially lower than site 10 and the majority of other sites, which may indicate mining impact.

Sites 5 and 6 have similarly low densities. These streams are very small and appear to have very high streamflow at times. The fact that site 6 is located in an unmined stream suggests that low density is characteristic of these small streams. Based on this interpretation, there appears to be no significant placer mining impact on benthic invertebrate densities at site 5.

The following discussion of taxa richness, which refers to the number and kind of benthic invertebrate taxa, is based on kick sample results (Table 4) because the two benthic samples underestimate the number of taxa present. Generally there was no significant difference in number of taxa among sites in streams of comparable size. Sites 4 and 9 had slightly fewer taxa than the other sites, but the difference is not significant. The small stream sites

(site 5, mined and site 6, unmined) had a lower number of taxa than the large river sites.

Benthic invertebrate community structure was also similar among sites. The overall similarity index was 71 percent. Site pairs 1 and 3, 3 and 7, and 7 and 8 had 90 percent of their taxa in common. Site 6 had the lowest similarity index because it had far fewer taxa than the other sites.

The most numerous ten taxa, in order of decreasing density, in benthos samples were: Chironomidae, Oligochaeta, Nematoda, Heptageniidae, Chloroperlidae, Hydracarina, Glossosoma sp., Brachycentrus sp., Rhithrogena sp., and Baetis bicaudatus. Chironomids averaged 54 percent of the total density while non-insect invertebrate groups averaged 22 percent.

Data Compilation

Grabacki, S.T. and Babcock, J., 1983, Chapter 3 Aquatic Biology North Fork Fortymile River, Alaska. in: Environmental Baseline Studies Alaska Asbestos Joint Venture, Fortymile River Alaska. Prepared by Dames and Moore, Anchorage, Alaska, pp. 3-l to 3-21.

Analysis

The available benthic invertebrate data in Grabacki and Babcock's 1983 study is summarized in Table 5. They obtained a mean benthic invertebrate density of 8.25 organisms per $0.1m^2$ and a total of 14 taxa at ten sites. Our study in the South Fork Fortymile River drainage produced a mean density of 230 organisms per $0.1m^2$ and a total of 30 taxa. The difference in density and number of taxa between the two studies is significant which illustrates the

difficulty in comparing studies done by different investigators. One possible explanation is that the sampler and net mesh size were different in the two studies.

GOLDSTREAM CREEK

Data Compilation

Ward, D.L., 1972, The significance of selected physical and chemical variables in benthic macroinvertebrate distribution in a small subarctic stream: Master's Thesis, University of Alaska, Fairbanks, Alaska, 62 p.

Clay, J.R., III, 1973, The drift of benthic invertebrates in Goldstream Creek, Alaska: Masters Thesis, University of Alaska, Fairbanks, Alaska, 83 p.

U.S. Forest Service, Institute of Northern Forestry, unpublished data on benthic macroinvertebrates in placer mined streams of Interior Alaska during 1985, available from the Institute of Northern Forestry, Fairbanks, Alaska.

Analysis

The available benthic invertebrate for the Goldstream Creek drainage is summarized in Table 6a through 6f. No unmined streams were sampled; therefore it is not possible to compare mined and unmined streams in the drainage. Invertebrate densities in Goldstream Creek were generally low in quantitative benthos samples (Ward, 1972). Kick samples collected by the Institute of Northern Forestry in Goldstream Creek and its tributaries during 1985 also contained low densities and a low number of taxa. Based on these data, placer mining significantly impacts benthic invertebrate density and number of taxa

in the mainstem Goldstream Creek between Fox and College, Alaska, and in Pedro Creek and Gilmore Creek. There are no benthic data to assess cumulative placer mining impacts in the lower Goldstream Creek drainage.

CHATANIKA RIVER

Data Compilation

Morrow, J.E., 1971, The effects of extreme floods and placer mining on the basic productivity of subarctic streams: Institute of Water Resources, IWR-14, University of Alaska, Fairbanks, Alaska, 8 p.

Nauman, J.W., and Kernodle, D.R., 1974, Aquatic organisms from selected sites along the proposed Trans-Alaska pipeline corridor, September 1970 - September 1972: U.S. Geological Survey Basic-Data Report, 23 p.

Woodward-Clyde Consultants, 1980, Gravel removal studies in arctic and subarctic floodplains in Alaska: Technical Report: Prepared for U.S. Fish and Wildlife Service, Anchorage, Alaska, FWS-OBS-80/08, 403 p.

Wagener, S.M., 1984, Effects of gold placer mining on stream macroinvertebrates of Interior Alaska: Masters Thesis, University of Alaska, Fairbanks, Alaska, 99 p.

U.S. Forest Service, Institute of Northern Forestry, unpublished data on benthic macroinvertebrates in placer mined streams of Interior Alaska during 1985, available from the Institute of Northern Forestry, Fairbanks, Alaska.

Analysis

The benthic invertebrate data for the Chatanika River drainage is summarized in Table 7a through 7p. Invertebrate density and number of taxa in McManus Creek, immediately above Faith Creek, is extremely consistent over time (Table 7d), whereas invertebrate density is considerably lower in 1983 than in 1968 in Faith Creek (Table 7i). Generally, invertebrate densities and the number of taxa are lower at mainstem Chatanika River sites (Table 7j, 7k, 7m, 7n, 7p) than in McManus Creek, the unmined stream. These data indicate placer mining is impacting benthic invertebrate density and taxa in the Chatanika River between the confluence of Faith and McManus Creeks and the Eliott Highway bridge crossing.

TATALINA RIVER

Data Compilation

U.S. Forest Service, Institute of Northern Forestry, unpublished data on benthic macroinvertebrates in placer mined streams of Interior Alaska during 1985, available from the Institute of Northern Forestry, Fairbanks, Alaska.

Analysis

Benthic invertebrate data for the Tatalina River is summarized in Table 8. Invertebrate densities and number of taxa are comparable to the mainstem Chatanika River. However, benthic invertebrate data coverage is inadequate to assess placer mining impacts in the drainage.

TOLOVANA RIVER

Data Compilation

U.S. Department of Interior, 1969, Effects of placer mining on water quality in Alaska: LJSDI Federal Water Pollution Control Administration, Northwest Region, Alaska Water Laboratory, College, Alaska, 83 p.

Nauman, J.W., and Kernodle, D.R., 1974, Aquatic organisms from selected sites along the proposed Trans-Alaska pipeline corridor, September 1970 - September 1972: U.S. Geological Survey Basic-Data Report, 23 p.

Nauman, J.W., and Kernodle, D.R., 1977, Aquatic organisms from selected sites along the proposed Trans-Alaska pipeline corridor, September 1970 - September 1972: U.S. Geological Survey Open-File Report 77-634, 55 p.

U.S. Forest Service, Institute of Northern Forestry, unpublished data on benthic macroinvertebrates in placer mined streams of Interior Alaska during 1985, available from the Institute of Northern Forestry, Fairbanks, Alaska.

Analysis

Benthic invertebrate data for the Tolovana River drainage is summarized in Table 9a through 9f. Benthic invertebrate density *was* significantly reduced immediately downstream of mining in Livengood Creek in 1968 (Table 9c, 9e). Taxa richness was still relatively low in Livengood Creek in 1985 (Table 9d). Generally, invertebrate density and number of taxa at the West Fork Tolovana River site (Table 9f) and the mainstem Tolovana River site (Table 9a)

are similar. The absence of quantitative data precludes the assessment of placer mining impacts on benthic invertebrates in the mainstem Tolovana River.

BIRCH CREEK

Data Compilation

Alaska Department of Fish and Game, unpublished data on aquatic invertebrates from the Birch Creek drainage during 1984, available from Alaska Department of Fish and Game, Division of Habitat, Fairbanks, Alaska.

Wagener, S.M., 1984, Effects of gold placer mining on stream macroinvertebrates of Interior Alaska: Master's Thesis, University of Alaska, Fairbanks, Alaska, 99 p.

U.S. Forest Service, Institute of Northern Forestry, unpublished data on benthic macroinvertebrates in placer mined streams of Interior Alaska during 1985, available from the Institute of Northern Forestry, Fairbanks, Alaska.

Weber, P.K., 1986, Downstream effects of placer mining in the Birch Creek basin, Alaska: Alaska Department of Fish and Game, Division of Habitat, Juneau, Alaska, Technical Report No. 86-7, 21 p.

Analysis

The benthic invertebrate data for the Birch Creek drainage is summarized in Table 10a through 10i. Benthic invertebrate density and number of taxa is similar and relatively high in headwater sites (Table 10a, 10b, 10c) and

unmined tributary sites (Table 10e, 10f, 10g, 10h). By comparison, the two mined streams, Birch Creek above Twelvemile Creek (Table 10d) and Birch Creek at the Steese Highway bridge (Table 10i), have low densities and fewer taxa. These data indicate significant placer mining impacts in the benthic invertebrate density and number of taxa in the mainstem of Birch Creek.

CROOKED CREEK

Data Compilation

Alaska Department of Fish and Game, unpublished data on aquatic invertebrates from the Birch Creek drainage during 1984, available from Alaska Department of Fish and Game, Division of Habitat, Fairbanks, Alaska.

Wagener, S.M., 1984, Effects of gold placer mining on stream macroinvertebrates of Interior Alaska: Master's Thesis, University of Alaska, Fairbanks, Alaska, 99 p.

U.S. Forest Service, Institute of Northern Forestry, unpublished data on benthic macroinvertebrates in placer mined streams of Interior Alaska during 1985, available from the Institute of Northern Forestry, Fairbanks, Alaska.

Weber, P.K., and Post, R., 1985, Aquatic habitat assessments in mined and unmined portions of the Birch Creek watershed: Alaska Department of Fish and Game, Division of Habitat, Juneau, Alaska, Technical Report No. 85-2, 65 p.

Weber, P.K., 1986, Downstream effects of placer mining in the Birch Creek basin, Alaska: Alaska Department of Fish and Game, Division of Habitat, Juneau, Alaska, Technical Report No. 86-7, 21 p.

Analysis

Benthic invertebrate data in the Crooked Creek drainage is summarized in Table lla through llx. Porcupine, Bonanza, Mastadon, Miller, Mammoth, Boulder, and Ketchem Creeks (Table lla-llj, llm, llq, llr, llw, llx) have lower benthic invertebrate densities at sites downstream of placer mining compared to sites upstream of mining (see Weber and Post, 1985). Benthic invertebrate densities and number of taxa in the mainstem of Crooked Creek (Table 110, llp, lls, llt) are low and comparable to mainstem Birch Creek sites (Table 10d and 10i). These data indicate a significant and sustained placer mining impact on benthic invertebrate density and number of taxa throughout the Crooked Creek drainage.

BEAVER CREEK

No benthic invertebrate data were found for the Beaver Creek drainage.

CONCLUSIONS

1. The Tolovana River, Tatalina River, and Beaver Creek have insufficient data to assess the degree of placer mining impacts on benthic invertebrates.
2. Based on the results of our study, the benthic invertebrate community in the South Fork Fortymile River drainage is moderately impacted by placer mining. Benthic invertebrate densities were lower downstream of mining activity, but taxa richness was not affected.

3. Placer mining has a significant impact on invertebrate density and taxa richness in Birch Creek, Crooked Creek, Livengood Creek, Goldstream Creek, and the Chatanika River. Birch Creek and Crooked Creek are the only two streams where cumulative impacts have been clearly documented.

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Baumann, R.W., Graufin, A.R., and Surdick, R.F., 1977, The stoneflies (Plecoptera) of the Rocky Mountains: Memoirs of the *American* Entomological Society no. 31, Philadelphia, Pennsylvania, 208 p.

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Edmunds, G.F., Jr., Jensen, S.L., and Berner, L., 1976, The mayflies of North and Central America: University of Minnesota Press, Minneapolis, Minnesota, 330 p.

Erman, D.C., 1981, Stream macroinvertebrate baseline surveys: a comparative analysis from the oil-shale regions of Colorado, USA: Environmental Management 5(6): 531-536.

Grabacki, S.T. and Babcock, J., 1983, Chapter 3 Aquatic Biology North Fork Fortymile River, Alaska. in: Environmental Baseline Studies Alaska Asbestos Joint Venture, Fortymile River, Alaska. Prepared by Dames and Moore, Anchorage, Alaska, pp. 3-l to 3-21.

Merritt, R.W., and Cummins, K.W., eds., 1978, An introduction to the aquatic insects of North American: Kendall/Hunt Publishing Company, Dubuque, Iowa, 441 p.

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Pennak, R.W., 1978, Freshwater invertebrates of the United States, 2nd Edition: Ronald Press Company, New York, New York, 803 p.

U.S. Department of Interior, 1969, Effects of placer mining on water quality in Alaska: USDI Federal Water Pollution Control Administration, Northwest Region, Alaska Water Laboratory, College, Alaska, 83 p.

U.S. Forest Service, Institute of Northern Forestry, unpublished data-1985 Benthic Macroinvertebrate Data, from placer mined streams of Interior Alaska: U.S. Department of Agriculture, Forest Service, Institute of Northern Forestry, Fairbanks, Alaska.

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Table 1. Stream bottom substrates at benthos sites in Fortymile River drainage, August 18-22, 1987.

	Site									
Substrate[1]	1	2	3	4	5	6	7	8	9	10
boulder (%)			10	35						
cobble (%)	65	60	75	35	40	65	60	85	70	65
gravel (%)	25	15	10	30	55	30	30	15	20	30
sand/silt (%)	10	25	5		5	5	10		10	5
water depth (cm) of benthos sampling	51	51	74	61	46	25	71	63	48	63

[1] Scale for bottom substrate classification:
boulder > 30.5 cm (> 12 inches)
cobble 7.6 - 30.5 cm (3 - 12 inches)
gravel 0.5 - 7.6 cm (0.2 - 3 inches)
sand/silt CO.5 cm (< 0.2 inches)

Table 2. Density (numbers/0.1 m^2) and number of taxa of benthic invertebrates collected in benthos samples, Forty Mile River drainage, August 18-22, 1987. (A) and (B) refer to replicate samples.

	SITE																			
	1		2		3		4		5		6		7		8		9		10	
TAXON	A)	(B)	(A)	(B)	(A)	(B)	(A)	(B)	(A)	(B)	(A)	(B)	(A)	(B)	(A)	(B)	(A)	(B)	(A)	(B)
Nematoda	2	2	65	107	4	11	3	1	1	4	N			2	15	9	1	1	23	73
Oligochaeta	5	3	13	29	8	4	3	6	5	2	30	4	2	4	20	8		3	138	168
Ostracoda	10	2	5	6	4									3					1	
Copepoda	8	2	1	2														3		1
Cladocera	19	9		1		1	1						1							
Hydracarina	20	13	1	11	3	2	2						5	4	9	5			27	47
Insecta																				
Collembola		2			2								1					2	1	
Ephemeroptera																				
Unidentifed																				
Heptageniidae	6	3			3	2	2	7			2				5		≤	6	86	47
Rhithrogena sp.	17	23	2	3	6	3									3					
Cinygmula sp.	1										4	2					1	1		1
Heptagenia sp.													7	3	16	8				
Cinygma sp.															5	1				
Baetis bicaudatus	8	9	2	1				1	14	24	1	2						2	2	4
Baetis tricaudatus		3	1	8		2	2	1							3	1		1	3	
Unidentified																				
Ephemerellidae	3			1		1		1					5	7	1				5	27
Unidentified																				
Siphlonuridae	2																			
Plecoptera																				
Unidentified																				
Cholorperlidae	72		5	41			1												9	5
Nemoura sp.											2						2			
Unidentifed																				
Perlodidae						1													1	1
Unidentified Capniidae						1			3					1				1		

Table 2. (continued)

TAXON	SITE 1 (A)	1 (B)	2 (A)	2 (B)	3 (A)	3 (B)	4 (A)	4 (B)	5 (A)	5 (B)	6 (A)	6 (B)	7 (A)	7 (B)	8 (A)	8 (B)	9 (A)	9 (B)	10 (A)	10 (B)
Trichoptera																				
Clossosoma sp.	30	32	4	1	1			1					1				1	3	33	32
Rhyacophila sp.	1	2																		1
Brachycentrus sp.	27	23	1	3		3								3		3			16	33
Micrasema sp.																			1	
Apatania sp.	1	1				1	1						7	9	8	7			5	1
Diptera																				
Dicranota sp.											1	1				1			1	1
Palpomyia sp.																1				
Unidentified Chironomidae	508	37	88	229	40	43	3	4			3	5	55	15	135	210	4	12	252	818
Simulium sp.	2	6						1												
Unidentified Empididae		1	1		2															
Chelifera sp.	6	1	1	2	2										2		1	1	1	4
TOTAL NUMBER OF INVERTEBRATES/0.1m²	749	210	211	456	76	76	18	34	23	31	45	14	85	62	222	254	19	37	605	1364
TOTAL NUMBER OF TAXA (Based on number of insect familfes and other invertebrate groups)	19	18	13	15	10	13	9	9	4	4	7	5	10	11	9	10	7	11	16	16

Table 3. Benthjc invertebrate mean density (number/0.1 meter*), number of taxa, and mining activity at sites in Fortymile River drainage, August 18-22, 1987. Sites are grouped by relative densities.

Site	Mean Density (0 1 m^2)	Number of Taxa Benthos	Kick	Mining Activity
10	984	16	15	past-high; present-moderate
1	478	19	19	none, past or present
2	333	15	15	low, past and present
8	238	10	15	very low, past and present
3	76	13	16	past-high; present-moderate
7	73	11	15	moderate, past and present
9	28	11	14	past-high; present-low
4	26	9	12	past-high; present-moderate
5	26	4	11	moderate, past and present
6	28	7	6	none, past or present

Table 4. Faunal composition and number of taxa collected in kick samples from the Forty Mile River Drainage August 18-22, 1987.

TAXON	Site 1	2	3	4	5	6	7	8	9	10
Nematoda	X	X	X	X	X		X	X	X	X
Oligochaeta	X	X	X	X	X	X	X	X		X
Ostracoda		X	X				X	X		
Copepoda					X					
Hydracarina	X	X	X	X	X		X	X	X	X
Gastropoda	X									
Ephemeroptera										
Baetis bicaudatus	X	X		X	X	X			X	X
Baetis tricaudatus	X	X	X	X			X	X	X	X
Unidentified Heptageniidae				X	X		X		X	X
Heptagenia sp.		X	X				X	X		
Cinygmula sp.	X			X	X	X		X	X	X
Cinygma sp.			X					X		
Rhithrogena sp.	X	X	X	X			X			X
Unidentified Ephemerellidae	X	X	X	X			X	X		X
Unidentified Metretopodidae	X		X							
Plecoptera										X
Unidentified Chloroperlidae	X	X	X	X			X			X
Unidentified Perlodidae	X	X	X				X	X	X	X
Unidentified Capniidae										
Unidentified Nemouridae						X				
Nemoura sp.						X		X	X	X
Coleoptera										
Unidentified Hydrophilidae				X						

Table 4. (continued).

TAXON	Site 1	2	3	4	5	6	7	8	9	10
Trichoptera			×							
Brachycentrus sp.	×	×	×	×			×	×	×	X
Micrasema sp.	×		×							X
Glossosoma sp.	×	×							×	X
Rhyacophila sp.	×								×	
Unidentified Limnephilidae			X							
Apatania sp.	×	×	X				×	X		X
Dicosmoecus sp.									X	
Ceraclea sp.			X							
Diptera										
Tipula sp.	×		X	×	×					X
Dicranota sp.	×			×	×	X	X	×	×	X
Rhabdomastix sp.									×	
Palpomyia sp.		×								
Simulium sp.	×									
Unidentified Chironomidae	×	×	×	×	×	×	×	×	×	X
Deuterophlebia sp.									×	
Unidentified Dolichopodidae	×						×	×		
Unidentified Empididae		×	×					×		
Chelifera sp.	×	×	×	×			×	×	×	X
Clinocera sp.					×		×	×		
TOTAL NUMBER OF TAXA (based on number of insect families and other invertebrate groups)	9	5	6	2	1	6	5	5	4	5

Table 5. Fortymile River drainage.

Date	Density (0.1 m²)	Number of samples	Number of taxa*	Habitat	Reference	Method
Slate Creek at Cold Run						
7/19-7/21/82	6.2	3	4[1]	riffle	Crabacki and Babcock ((1983)	surber, 1111 u mesh
Slate Creek at Bryan Creek						
7/19-7/21/82	6.9	3	52	riffle	Crabacki and Babcock ((1983)	surber, 1111 u mesh
Happy New Year Creek						
7/19-7/21/82	7.0	3	5[3]	riffle	Crabacki and Babcock (1983)	surber, 1111 u mesh
Independence Creek						
7/19-7/21/82	10.9	3	5[4]	riffle	Crabacki and Babcock (1983)	surber, 1111 u mesh
Slate Creek at Independence Creek						
7/19-7/21/82	4.4	3	55	riffle	Crabacki and Babcock (1983)	surber, 1111 u mesh
Campi on Creek						
7/19-7/21/82	6.9	3	6[6]	riffle	Crabacki and Babcock (1983)	surber, 1111 u mesh
North Fork Fortymile A. below "Kink"						
7/19-7/21/82	13.0	3	5[7]	riffle	Crabacki and Babcock (1983)	surber, 1111 u mesh
North Fork Fortymile R. at "Kink"						
7/19-7/21/82	3.7	3	7[8]	riffle	Crabacki and Babcock (1983)	surber, 1111 u mesh
Middle Fork Fortymile River						
7/19-7/21/82	9.7	3	99	riffle	Crabacki and Babcock (1983)	surber, 1111 u mesh
Upper North Fork Fortymile River						
7/19-7/21/82	13.8	3	5[10]	riffle	Crabacki and Babcock (1983)	surber, 1111 u mesh

* Based on insect family and invertebrate groups

1 Fauna include Oligochaeta, Baetis, Cinygmula, Epeorus, Chironomidae
2 Fauna include Oligochaeta, Isoperla, Baetis, Cinygmula, Epeorus, Simuliidae
3 Fauna include Oligochaeta, Isoperla, Baetis, Cinygmula, Epeorus, Simuliidae
4 Fauna include Oligochaeta, Cinygmula, Epeorus, Ephemerella, Brachycentrus, Chironomidae
5 Fauna include Cinygmula, Epeorus, Ephemerella, Brachycentrus, Chironomidae, Simuliidae
6 Fauna include Baetis, Cinygmula, Brachycentrus, Chironomidae, Simuliidae, Empididae
7 Fauna include Oligochaeta, Cinygmula, Epeorus, Brachycentrus, Chironomidae, Simuliidae
8 Fauna include Dligochaeta, Nemoura, Baetis, Cinygmula, Epeorus, Brachycentrus, Chironomidae, Simuliidae
9 Fauna include Oligochaeta, Nemoura, Baetis, Cinygmula, Epeorus, Brachycentrus, Limnephilidae, Deuterophlebia, Chironomidae, Simuliidae
10 Fauna include Oligochaeta, Cinygmula, Brachycentrus, Chironomidae, Simuliidae

Table 6. Goldstream Creek drainage.

Date	Density (0.1 m^2)	Number of samples	Number of taxa*	Habitat	Reference	Method
a. Pedro Creek above Cilmore Creek (Mined)						
7/4/85	"1"	1	"1"[1]		Unpubl. INF	kick
8/13/85	"6"	1	"5"[2]		Unpubl . I NF	kick
9/17/85	"5"	4	"7"[3]		Unpubl. INF	kick
b. Cilmore Creek near Nassau Road (Mined)						
7/4/85	"62"	1	"5"[1]		Unpubl. INF	kick
8/13/85	"17"	1	"5"[2]		Unpubl. INF	kick
9/17/85	"2"	4	"5"[3]		Unpubl . I NF	kick
c. Coldstream Creek at Steese Highway bridge at Fox (Mined)						
6/14 & 6/24/71	0	6	-	sand/pebbles	Ward (1973)	surber, mesh unknown
6/14-6/15/71		2	"5"[1]	riffle	Clay (1973)	drift, 345 u mesh
7/4/85	"2"	1	"1"[2]		Unpubl. INF	kick
7/6-7/7/71		4	"5"[3]	riffle	Clay (1973)	drift, 345 u mesh
7/19/71	53[4]	3	-	sand/pebbles	Ward (1972)	surber, mesh unknown
7/29-7/30/71		4	"4"[5]	riffle	Clay (1973)	drift, 345 u mesh
8/4/71	276	5	-	sand/pebbles	Ward (1972)	surber, mesh unknown
8/18-8/19/71		4	"4"[7]	riffle	Clay (7973)	drift, 345 u mesh
8/18/71	6[4]	5		sand/pebbles	Ward (1972)	surber, mesh unknown
8/13/85	"7"	1	"5"[8]		Unpubl. INF	kick
9/6/71	4[6]	5		sand/pebbles	Ward (1972)	surber, mesh unknown
9/17/85	"1"	4	"3"[9]		Unpubl. INF	kick
10/16/71	3[6]	5	-	sand/pebbles	Ward (1972)	surber, mesh unknown
summer 1971	13	29		sand/pebbles	Ward (1972)	surber, mesh unknown
summer 1985	"3"	6	"6"[10]		Unpubl. INF	kick

1 Fauna include Baetis
2 Fauna include Epeorus, Zapada, Isoperla, Limnephilidae, Chironomidae
3 Fauna include Eaetis, Zapada, Ecclisomyia, Chironomidae, Chelifera, Dicranota, Oligochaeta

1 2 Fauna include Baetis, Cinygmula, Ameletus, Perlodidae, Chironomidae
3 Fauna include Baetis, Ameletus, Zapada, Chironomidae, Chelifera
Fauna include Baetis, Taeniopterygidae, Perlodidae, Chironomidae, Dicranota

1 Fauna include Diptera, Oligochaeta, Ephemeroptera, Collembola, Trichoptera (ID to order only)
2 Fauna include Baetis
3 Fauna include Diptera, Ephemeroptera, Oligochaeta, Trichoptera, Plecoptera (ID to order only)
4 5 Fauna include Ephemeroptera (selective sampling)
Fauna include Diptera, Ephemeroptera, Oligochaeta, Trichoptera (insect ID to order only)
6 Fauna include Ephemeroptera and Trichoptera (selective sampling)
7 Fauna include Diptera, Ephemeroptera, Oligochaeta, Plecoptera (insect ID to order only)
8 Fauna include Baetidae, Isoperla, Chironomidae, Dicranota, Oligochaeta
9 Fauna include Baetidae, Chironomidae, Collembola
10 Fauna include Baetidae, Isoperla, Chironomidae, Dicranota, Oligochaeta, Collembola

* Based on insect family and invertebrate groups
" " Not quantitative (kick sample)

Table 6. (continued)

Date	Density (0.1 m²)	Number of samples	Number of taxa*	Habitat	Reference	Method
d. Coldstream Creek at Coldstream Road bridge (between Fox and Engineer Creeks - Mined)						
6/14 & 6/24/71	0	6	-	sand/cobble	Ward (1972)	surber, mesh unknown
7/19/71	51[1]	3	-	sand/cobble	Ward (1972)	surber, mesh unknown
8/4/71	78[2]	5	-	sand/cobble	Ward (1972)	surber, mesh unknown
8/18/71	27[2]	5	-	sand/cobble	Ward (1972)	surber, mesh unknown
9/6/71	15[2]	5	-	sand/cobble	Ward (1972)	surber, mesh unknown
10/16/71	12	5	-	sand/cobble	Ward (1972)	surber, mesh unknown

[1] Fauna include Ephemeroptera (selective sampling)
[2] Fauna include Ephemeroptera and Trichoptera (selective sampling)

e. Coldstream Creek at Ballaine Road Bridge (Mined)						
6/14/71	0	3		sand/silt	Ward (1972)	surber, mesh unknown
6/24/71	6[1]	3	-	sand/silt	Ward (1972)	surber, mesh unknown
7/19/71	63[2]	3		sand/silt	Ward (1972)	surber, mesh unknown
8/4/71	42[2]	5		sand/silt	Ward (1972)	surber, mesh unknown
8/18/71	9[2]	5	-	sand/silt	Ward (1972)	surber, mesh unknown
9/6/71	6[2]	5	-	sand/silt	Ward (1972)	surber, mesh unknown
10/16/71	1[3]	5		sand/silt	Ward (1972)	surber, mesh unknown

[1] Fauna include Ephemeroptera and Trichoptera (selective sampling)
[2] Fauna include Ephemeroptera and Trichoptera (selective sampling)
[3] Fauna include Ephemeroptera

f. Goldstream Creek at Sheep Creek Road Bridge (Mined)						
6/14/71	1'	3		boulders	Ward (1972)	surber, mesh unknown
6/24/71	12	3		boulders	Ward (1972)	surber, mesh unknown
7/4/85	"60"	1	"2"[3]		Unpubl. INF	kick
7/19/71	114	3		boulders	Ward (1972)	surber, mesh unknown
8/4/71	41[4]	5		boulders	Ward (1972)	surber, mesh unknown
8/13/85	"90"	1	"2"[5]	-	Unpubl. INF	kick
8/18/71	17[4]	5		boulders	Ward (1972)	surber, mesh unknown
9/6/71	25[4]	5		boulders	Ward (1972)	surber, mesh unknown
10/16/71	14	5		boulders	Ward (1972)	surber, mesh unknown

[1] Fauna include Trichoptera (selective sampling)
[2] Fauna include Ephetneroptera (selective sampling)
[3] Fauna include Baetis, Ameletus
[4] Fauna include Ephemeroptera and Trichoptera (selective sampling)
[5] Fauna include Baetis, Chironomidae

* Based on insect family and invertebrate groups
" " Not quantitative (kick or drift sample)

Table 7. Chatanika River drainage

Date	Density (0.1 m^2)	Number of samples	Number of taxa*	Habitat	Reference	Method
a. McManus Creek (20 km above Faith Creek above gravel removal site)						
May 1976	15.2	15		riffle	Woodward Clyde Consult. (1980)	surber
b. McManus Creek (400 m below gravel removal site)						
May 1976	4.6	14		riffle	Woodward Clyde Consult. (1980)	surber
c. McManus Creek (800 m below gravel removal site)						
May 1976	27.4	15		riffle	Woodward Clyde Consult. (1980)	surber
d. McManus Creek (immediately above Faith Creek - Unmined)						
6/14/83	64	5	16'	random sampling	Wagener (1984)	0.1m^2 box sampler 350 u mesh
6/24/82	40	5	142	pools,runs, riffles	Wagener (1984)	0.1m^2 box sampler 350 u mesh
7/14/68	47	3	13'3	riffles	Morrow (1971)	surber
7/7/68	154	3	'5'[4]	riffles	Morrow (1971)	surber
7/20/68	47	3	'3'[5]	riffles	Morrow (1971)	surber
7/5/83	71	5	12[6]	random sampling	Wagener (1984)	0.1m^2 box sampler 350 u mesh
7/28/83	76	5	137	random sampling	Wagener (1984)	0.1m^2 box sampler 350 u mesh
7/15/85	"101"	1	"8"[8]		Unpubl. INF	kick
8/5/68	72	3	'5'[9]	riffles	Morrow (1971)	surber
8/11/68	59	3	'5'[10]	riffles	Morrow (1971)	surber
8/19/68	70	3	'4'[11]	riffles	Morrow (1971)	surber
8/11/83	63	5	12[12]	random sampling	Wagener (1984)	0.1m^2 box sampler 350 u mesh
8/8/85	"70"	1	"8"[13]		Unpubl. INF	kick
8/18/82	28	5	12'4	pools,runs, riffles	Wagener (1984)	0.1m^2 box sampler 350 u mesh
8/28/82	54	14	13'5	pools,runs, riffles	Wagener (1984)	0.1m^2 box sampler 350 u mesh
9/2/68	44	3	'4'[16]	riffles	Morrow (1971)	surber
9/10/85	"95"	4	13[17]		Unpubl. INF	kick
9/10/83	21	5	11[18]	random sampling	Wagener (1984)	0.1m^2 box sampler 350 u mesh
summer 1968	71	21	'8'[19]	riffles	Morrow (1971)	surber
summer 1983	68	20	15[20]		Wagener (1984)	0.1m^2 box sampler 350 u mesh

* Based on insect family and invertebrate groups
" " Not quantitative (kick or drift sample)
' ' Some insects ID to order only

Table 7. (continued)

[1] Fauna include Baetis, Epeorus, Cinygmula, Siphlonurus, Ephemerella, Chironomidae, Simuliidae, Empididae, Tipula, Chloroperlidae, Zapada, Brachycentrus, Clossosoma, Apatania, Acarina, Oligochaeta, Nematoda
[2] Fauna include Baetis, Epeorus, Cinygmula, Siphlonurus, Ephemerella, Chironomidae, Simuliidae, Empididae, Tipula, Dicranota, Chloroperlidae, Perlodidae, Zapada, Brachycentrus, Acarina, Oligochaeta
[3] Fauna include Ephemeroptera Plecoptera, Chironomidae
[4] Fauna include Ephemeroptera, Plecoptera, Chironomidae, Simuliidae, other Diptera
[5] Fauna include Ephemeroptera, Plecoptera, Chironomidae
[6] Fauna include Baetis, Epeorus, Cinygmula, Siphlonurus, Ephemerella, Chironomidae, Simuliidae, Empididae, Chloroperlidae, Zapada, Brachycentrus, Acarina, Oligochaeta
[7] Fauna include Eaetis, Epeorus, Cinygmula, Siphlonurus, Ephemerella Chironomidae, Simuliidae, Empididae, Dicranota. Chloroperlidae, Zapada, Apatania, Acarina, Oligochaeta
[8] Fauna include Baetis, Cinygmula, Epeorus, Ephemerella, Alloperla, Suwallia, Chironomidae, Chelifera, Prosimulium, Oligochaeta
[9] Fauna include Ephemeroptera, Trichoptera, Plecoptera, Chironomidae, Tipulidae
[10] Fauna Ephemeroptera, Trichoptera, Plecoptera, Chironomidae, Tipulidae
[11] Fauna include Ephemeroptera, Trichoptera, Plecoptera, Chironomidae
[12] Fauna include Baetis, Epeorus, Cinygmula, Ephemerella, Chironomidae, Empididae, Dicranota, Chloroperlidae, Zapada, Elrachycentrus, Ecclisomyia, Acarina, Oligochaeta
[13] Fauna include Eaetis, Pseudocloeon, Cinygmula, Epeorus, Ephemerella, Zapada, Suwallia, Chironomidae, Dicranota, Oligochaeta
[14] Fauna include Baetis, Cinygmula, Siphlonurus, Ephemerella, Chironomidae, Empididae, Dicranota, Chloroperiidae, Perlodidae, Brachycentrus, Acarina, Oligochaeta
[15] Fauna include Eaetis, Cinygmula, Siphlonurus, Ephemerella, Chironomidae, Empididae, Tipula, Dicranota, Chloroperlidae, Perlodidae, Zapada, Brachycentrus, Acarina, Oligochaeta
[16] Fauna include Annelida, Ephemeroptera, Trichoptera, Chironomidae
[17] Fauna include Pseudocloeon, Cinygmula, Epeorus, Ephemerella, Zapada, Capniidae, Chloroperlidae, Arcynopteryx, Ecclisomyia, Apatania, Chironomidae, Chelifera, Collembola, Oligochaeta, Gastropoda
[18] Fauna include Baetis, Cinygmula, Ephemerella, Chironomidae, Empididae, Tipula, Dicranota, Hexatoma, Chloroperlidae, Zapada, Brachycentrus, Apatania, Ecclisomyia, Oligochaeta
[19] Fauna include Annelida, Ephemeroptera, Trichoptera, Plecoptera, Chironomidae, Simuliidae, Tipul idae, other Diptera
[20] Fauna include Baetis. Cinygmula, Siphlonurus, Ephemerella, Dicranota, Simuliidae, Empididae, Tipula, Chloroperlidae, Zapada, Brachycentrus, Glossosoma, Apatania, Acarina, Oligochaeta, Nematoda

Date	Density (0.1 m²)	Number of samples	Number of taxa*	Habitat	Reference	Method
e. Faith Creek (above mining)						
7/7/68	137	3	'6'[1]	riffle	Morrow (1971)	surber, mesh unknown
7/14/68	87	3	'5'[2]	riffle	Morrow (1971)	surber, mesh unknown
7/20/68	76	3	'6'[3]	riffle	Morrow (1971)	surber, mesh unknown
8/5/68	81	3	'7' 4	riffle	Morrow (1971)	surber, mesh unknown
8/11/68	35	3	'5' 5	riffle	Morrow (1971)	surber, mesh unknown
8/19/68	58	3	'5' 6	riffle	Morrow (1971)	surber, mesh unknown
9/2/68	18	3	'4' 7	riffle	Morrow (1971)	surber, mesh unknown

[1] [2] Fauna include Annelida, Ephemeroptera, Trichoptera, Plecoptera, Chironomidae, Simuliidae
[3] Fauna include Ephemeroptera, Plecoptera, Chironomidae, Simuliidae, Tipulidae
[4] Fauna include Annelida, Ephemeroptera, Plecoptera, Chironomidae, Simuliidae, Tipulidae
[5] Fauna include Annelida, Ephemeroptera, Trichoptera, Plecoptera, Chironomidae, Simuliidae, Tipulidae
[6] Fauna include Annelida, Ephemeroptera, Plecoptera, Chironomidae, Tipulidae
[7] Fauna include Annelida, Ephemeroptera, Plecoptera, Chironomidae, Simuliidae
Fauna include Ephemeroptera, Plecoptera, Chironomidae, Tipulidae

* Based on insect family and invertebrate groups
' ' Some insects ID to order only

Table 7. (continued)

Date	Density (0.1 m^2)	Number of samples	Number of taxa*	Habitat	Reference	Method
f. Faith Creek (350 m below mining)						
7/7/68	110	3	'5'[1]	riffle	Morrow (1971)	surber, mesh unknown
7/14/68	106	3	'6'[2]	riffle	Morrow (1971)	surber, mesh unknown
7/20/68	30	3	'3'[3]	riffle	Morrow (1971)	surber, mesh unknown
8/5/68	24	3	'3'[3]	riffle	Morrow (1971)	surber, mesh unknown
8/11/68	5	3	'1' 4	riffle	Morrow (1971)	surber, mesh unknown
8/19/68	25	3	'2'[5]	riffle	Morrow (1971)	surber, mesh unknown
9/2/68	6	3	'2'[6]	riffle	Morrow (1971)	surber, mesh unknown

1 Fauna include Ephemeroptera, Plecoptera, Chironomidae, Simuliidae, Tipulidae
2 Fauna include Annelida. Eohemerootera. Trichoptera. Plecoptera, Chironomidae, Simuliidae
3 Fauna include Ephemeroptera, Chironomidae, Simuliidae
4 Fauna include Chironomidae
5 Fauna include Chironomidae, Simuliidae
6 Fauna include Ephemeroptera, Chironomidae

g. Faith Creek (3 miles below mining)						
7/7/68	116	3	'5'[1]	riffle	Morrow (1971)	surber, mesh unknown
7/14/68	101	3	'4' 2	riffle	Morrow (1971)	surber, mesh unknown
7/20/68	70	3	'3' 3	riffle	Morrow (1971)	surber, mesh unknown
8/5/68	16	3	'6' 4	riffle	Morrow (1971)	surber, mesh unknown
8/11/68	37	3	'4' 5	riffle	Morrow (1971)	surber, mesh unknown
8/19/68	25	3	'5'[6]	riffle	Morrow (1971)	surber, mesh unknown
9/2/68	25	3	'6'[7]	riffle	Morrow (1971)	surber, mesh unknown

1 Fauna include Annelida, Ephemerella, Chironomidae, Simuliidae, other Diptera
2 Fauna include Annelida, Ephemerella, Plecoptera, Chironomidae
3 Fauna include Ephemeroptera, Chironomidae, Simuliidae
4 Fauna include Annelida, Ephemeroptera, Plecoptera, Chironomidae, Simuliidae, Tipulidae
5 Fauna include Ephemeroptera, Trichoptera, Plecoptera, Chironomidae
6 Fauna include Annelida, Ephemeroptera, Plecoptera, Chironomidae, Simuliidae
7 Fauna include Annelida, Ephemeroptera, Trichoptera, Plecoptera, Chironomidae, Tipulidae

h. Faith Creek (5 miles below mining)						
7/7/68	530	3	'5'[1]	riffle	Morrow (1971)	surber, mesh unknown
7/14/68	62	3	'4'[2]	riffle	Morrow (1971)	surber, mesh unknown
7/20/68	60	3	'4' 3	riffle	Morrow (1971)	surber, mesh unknown
8/5/68	30	3	'6'[4]	riffle	Morrow (1971)	surber, mesh unknown
8/11/68	40	3	'4'[5]	riffle	Morrow (1971)	surber, mesh unknown

1 Fauna include Annelida, Ephemeroptera, Plecoptera, Chironomidae, Simuliidae
2 Fauna include Annelida, Ephemeroptera, Plecoptera, Chironomidae
3 Fauna include Annelida, Ephemeroptera, Chironomidae, Simuliidae
4 Fauna include Annelida, Ephemeroptera, Trichoptera, Plecoptera, Chironomidae, Simuliidae
5 Fauna include Ephemeroptera, Plecoptera, Chironomidae, Simuliidae

* Based on insect family and invertebrate groups
' ' Some insects ID to order only

Table 7. (continued)

Date	Density (0.1 m^2)	Number of samples	Number of taxa*	Habitat	Reference	Method
i. Faith Creek (immediately above McManus Creek)						
6/14/83	4	5	5[1]	random sampling	Wagener (1984)	0.1m^2 box sampler 350 u mesh
7/3-7/5/82	18	10	11[2]	pools, runs, riffles	Wagener (1984)	0.1m^2 box sampler 350 u mesh
7/7/68	55	3	'3'[3]	riffles	Morrow (1971)	surber
7/14/68	77	3	'5'[4]	riffles	Morrow (1971)	surber
7/20/68	88	3	'6'[5]	riffles	Morrow (1971)	surber
7/5/83	18	5	76	random sampling	Wagener (1984)	0.1m^2 box sampler 350 u mesh
7/28/83	21	5	9[7]	random sampling	Wagener (1984)	0.1m^2 box sampler 350 u mesh
7/15/85	"104"	1	"7"[8]		Unpubl. INF	kick
8/5/68	82	3	'6'[5]	riffles	Morrow (1971)	surber
8/11/68	58	3	'5'[9]	riffles	Morrow (1971)	surber
8/8/85	"62"	1	"9"[10]		Unpubl. INF	kick
8/11/83	26	5	10[11]	random sampling	Wagener (1984)	0.1m^2 box sampler 350 u mesh
8/28/82	23	12	11[12]	pools, runs, riffles	Wagener (1984)	0.1m^2 box sampler 350 u mesh
9/10/85	"24"	4	"12"[13]		Unpubl. INF	kick
summer 1968	72	15	'6'[5]	riffles	Morrow (1971)	surber
summer 1983	18	20	11[14]	random sampling	Wagener (1984)	0.1m^2 box sampler 350 u mesh

1 Fauna include Baetis, Epeorus, Cinygmula, Chironomidae, Empididae, Oligochaeta
2 Fauna include Baetis, Epeorus, Cinygmula, Siphlonurus, Ephemerella, Chironomidae, Empididae, Chloroperlidae, Perlodidae, Brachycentrus, Acarina, Oligochaeta
3 Fauna include Ephemeroptera, Chironomidae, Simuliidae
4 Fauna include Annelida, Ephemeroptera, Chironomidae, Simuliidae, Tipulidae
5 Fauna include Annelida, Ephemeroptera, Plecoptera, Chironomidae, Simuliidae, Tipulidae
6 Fauna include Baetis, Epeorus, Cinygmula, Chironomidae, Empididae, Perlodidae, Zapada, Oligochaeta
7 Fauna include Baetis, Epeorus, Cinygmula, Ephemerella, Chironomidae, Empididae, Chloroperlidae, Perlodidae, Apatania, Oligochaeta
8 Fauna include Baetis, Cinygmula, Epeorus, Ameletus, Ephemerella, Zapada, Isoperla, Chironomidae
9 Fauna include Annelida, Ephemeroptera, Plecoptera, Chironomidae, Simuliidae
10 Fauna include Pseudocloeon, Cinygmula, Epeorus, Ephemerella, Zapada, Taeniopterygidae, Perlodidae, Ecclisomyia, Apatania, Clossosoma, Chironomidae
11 Fauna include Baetis, Epeorus, Cinygmula, Ephemerella, Chironomidae, Empididae, Chloroperlidae, Perlodidae, Brachycentrus, Acarina, Oligochaeta
12 Fauna include Baetis, Cinygmula, Ephemerella, Chironomidae, Empididae, Tipula, Chloroperlidae, Perlodidae, Zapada, Brachycentrus, Oligochaeta
13 Fauna include Pseudocloeon, Cinygmula, Ephemerella, Epeorus, Zapada, Capniidae, Acarina, Ecclisomyia, Arcynopteryx, Apatania, Chironomidae, Clossosoma, Chelifera, Dicranota, Tipula
14 Fauna include Baetis, Cinygmula, Ephemerella, Ormosia, Empididae, Chloroperlidae, Zapada, Brachycentrus, Apatania, Acarina, Oligochaeta

* Based on insect family and invertebrate groups
" " Not quantitative (kick or drift sample)
' ' Some insects ID to order only

Table 7. (continued)

Date	Density (0.1 m^2)	Number of samples	Number of taxa*	Habitat	Reference	Method
j. Chatanika River (below Faith Creek)						
6/14/83	30	5	14'	random sampling	Wagener (1984)	0.1m^2 box sampler 350 u mesh
7/5/83	29	4	132	random sampling	Wagener (1984)	0.1m^2 box sampler 350 u mesh
7/15/85	"6"	1	"3" [3]	-	Unpubl. INF	kick
7/28/83	17	5	124	random sampling	Wagener (1984)	0.1m^2 box sampler 350 u mesh
8/11/83	24	5	11[5]	random sampling	Wagener (1984)	0.1m^2 box sampler 350 u mesh
8/8/85	"80"	1	"9"[6]	-	Unpubl. INF	kick
9/10/85	"6"	4	"8"[7]	-	Unpubl. INF	kick
summer 1983	25	19	158	random sampling	Wagener (1984)	0.1m^2 box sampler 350 u mesh

[1] Fauna include Baetis, Epeorus, Cinygmula, Ephemerella, Chironomidae, Simuliidae, Empididae, Tipula, Chloroperlidae, Perlodidae, Zapada, Brachycentrus, Apatania, Acarina, Oligochaeta
[2] Fauna include Baetis, Epeorus, Ephemerella, Chironomidae, Empididae, Tipula, Chloroperlidae, Perlodidae, Zapada, Brachycentrus, Apatania, Acarina, Oligochaeta
[3] Fauna include Baetis, Epeorus, Chironomidae
[4] Fauna include Baetis, Epeorus, Cinygmula, Ephemerella, Chironomidae, Empididae, Dicranota, Chloroperlidae, Perlodidae, Glossosoma, Apatania, Acarina, Oligochaeta
[5] Fauna include Baetis, Epeorus, Cinygmula, Ephemerella, Chironomidae, Empididae, Dicranota, Chloroperlidae, Perlodidae, Brachycentrus, Acarina, Oligochaeta
[6] Fauna include Pseudocloeon, Cinygmula, Epeorus, Ephemerella, Zapada, Perlodidae, Apatania, Chironomidae, Chelifera, Tipula, Dicranota
[7] Fauna include Ephemerella, Alloperla, Ecclisomyia, Apatania, Chironomidae, Chelifera, Dicranota, Collembola, Oligochaeta
[8] Fauna include Baetis, Epeorus, Cinygmula, Ephemerella, Chironomidae, Simuliidae, Empididae, Tipula, Dicranota, Chloroperlidae, Perlodidae, Zapada, Brachycentrus, Glossosoma, Apatania, Acarina, Oligochaeta

k. Chatanika River (at US Camp, Mile 58 Steese Highway)						
7/15/85	"30"	1	"6"[1]		Unpubl. INF	kick
8/8/85	"33"	1	"8"[2]		Unpubl. INF	kick
9/10/85	"33"	4	"13"[3]		Unpubl. INF	kick

[1] Fauna include Baetis, Cinygmula, Epeorus, Ameletus, Ephemerella, Chironomidae, Simulium
[2] Fauna include Baetis, Pseudocloeon, Cinygmula, Epeorus, Ephemerella, Zapada, Taeniopterygidae, Suwallia, Clossosoma, Oligochaeta
[3] Fauna include Pseudocloeon, Cinygmula, Ephemerella, Zapada, Capniidae, Taeniopterygidae, Skwala, Apatania, Chironomidae, Dicranota, Prosimulium, Oligochaeta, Gastropoda

* Based on insect family and invertebrate groups
" " Not quantitative (kick sample)
' ' Some insects ID to order only

Table 7. (continued)

Date	Density (0.1 m^2)	Number of samples	Number of taxa*	Habitat	Reference	Method
1. Long Creek (near mouth)						
7/15/85	"16"	1	"8"[1]		Unpubl. INF	kick
8/8/85	"50"	1	"9"[2]		Unpubl. INF	kick
9/10/85	"19"	4	"12"[3]		Unpubl. INF	kick
m. Chatanika River (at 39 mile camp)						
7/8/85	"36"	1	"8"[1]		Unpubl. INF	kick
7/15/85	"20"	1	"6"[2]		Unpubl. INF	kick
9/10/85	"12"	4	"11"[3]		Unpubl. INF	kick
n. Chatanika River (near Olnes on Steese Highway)						
6/14/71	241	1	'4'[1]		Nauman and Kernodle (1974)	surber
8/10/71	"81"	1	'3'[2]		Nauman and Kernodle (1974	dip net, 216 u mesh
10/14/71	"1216"	1	'5'[3]		Nauman and Kernodle (1971)	dip net, 216 u mesh
10/14/71	"1 752"	1	2[4]		Nauman and Kernodle (1974)	lo-rock, 210 u mesh sieve
9/70 - 9/72			7[5]		Nauman and Kernodle (1977)	

1 Fauna include Cinygmula, Ameletus, Ephemerella, Zapada, Limnephilidae, Chironomidae, Ormosia,
2 Oligochaeta
Fauna include Baetis, Pseudocloeon, Cinygmula, Epeorus, Rhithrogena, Ephemerella, Zapada,
3 Chloroperlidae, Brachycentrus, Glossosoma, Chironomidae, Oligochaeta
Fauna include Pseudocloeon, Heptageniidae, Ameletus, Ephemerella, Zapada, Capniidae, Chloroperlidae, Ecclisomyia, Apatania, Chironomidae, Clinocera, Dicranota, Oligochaeta

1 Fauna include Baetis, Cinygmula, Rhithrogena, Ephemerella, Alloperla, Suwallia, Chironomidae,
2 Chelifera, Dicranota, Oligochaeta
Fauna include Pseudocloeon, Cinygmula, Ameletus, Zapada, Suwallia, Chironomidae
3 Fauna include Baetis, Cinygmula, Ephemerella, Zapada, Capniidae, Taeniopterygidae, Suwallia, Ecclisomyia, Chironomidae, Dicranota, Oligochaeta

1
2
3 Fauna include Chironomidae, Simuliidae, Ephemeroptera, Plecoptera
Fauna include Tipulidae, Ephemeroptera, Plecoptera
4 Fauna include Chironomidae, Simuliidae, Ephemeroptera, Plecoptera, Trichoptera
5 Fauna include Chironomidae, Simuliidae
Fauna include Chironomidae, Simuliidae, Baetidae, Ephemerella, Siphlonurus, Nemouridae, Limnephilidae

* Based on insect family and invertebrate groups
" " Not quantitative (kick or drift sample)
' ' Some insects ID to order only

Table 7. (continued)

Date	Density (0.1 m^2)	Number of samples	Number of taxa*	Habitat	Reference	Method
o. Caribou Creek (near Chatanika)						
9/16/70	147	1	"7"[1]	-	Nauman and Kernodle (1974)	surber
11/10/70 - 6/8/71	"2"	1	"1"[2]		Nauman and Kernodle (1974)	multiplate
11/10/70 - 6/8/71	"10"	1	"3"[3]		Nauman and Kernodle (1977)	basket w/o net
6/8/71 - 8/10/71	"14"	1	"3"[4]	-	Nauman and Kernodle (1977)	basket w/o net
8/10/71 - 10/13/71	"69"	1	"4"[5]	-	Nauman and Kernodle (1977)	multiplate
8/10/71 - 10/13/71	"136"	1	"12"[6]	-	Nauman and Kernodle (1977)	basket 216 u net
10/13/71	"478"	1	"8"[7]		Nauman and Kernodle (1974)	IO-rock, 210 u sieve
9/15/70 - 11/10/70	0	1	0	-	Nauman and Kernodle (1974)	basket w/o net
9/70 - 9/72			12[8]		Nauman and Kernodle (1977)	

1 Fauna include Chironomidae, Ostracoda, Tipulidae, Simuliidae, Plecoptera, Trichoptera, Acarina
2 Fauna include Chironomidae
3 Fauna include Chironomidae, Chloroperlidae, Nemoura
4 Fauna include Chironomidae, Heptageniidae, Baetidae
5 Fauna include Chironomidae, Tipulidae, Plecoptera, Acarina
6 Fauna include Nematoda, Amphipoda, Chironomidae, Tipulidae, Psychodidae, Nemoura, Chloroperlidae, Capniidae, Acarina, Collembola, Clossosomatidae, Limnephilidae
7 Fauna include Chironomidae, Simuliidae, Ephemeroptera, Plecoptera, Tipulidae, Trichoptera, Oligochaeta, Collembola
8 Fauna include Chironomidae, Simuliidae, Psychodidae, Empididae, Heptageniidae, Baetidae, Perlodidae, Nemouridae, Collembola, Rhyacophilidae, Limnephilidae, Acarina

p. Chatanika River (at Elliott Hwy. Bridge)						
9/5/85	"19"	4	"10"[1]		Unpubl. INF	kick
10/10/85	"7"	4	"7"[2]		Unpubl. INF	kick

1 Fauna include Baetis, Cinygmula, Ephemerella, Zapada, Taeniopterygidae, Limnephilidae,
2 Chironomidae, Chelifera, Dicranota, Hydracarina
Fauna include Ephemerella, Zapada, Taeniopterygidae, Ecclisomyia, Chironomidae, Dicranota, Oligochaeta

* Based on insect family and invertebrate groups
" " Not quantitative (kick, basket, multiplate, or IO-rock sample)
' ' Some insects ID to order only

Table 8. Tatalina River drainage

Date	Density (0.1 m^2)	Number of samples	Number of taxa*	Habitat	Reference	Method
Tatalina River (at Elliott Highway bridge)						
8/1 /a5	"602"	1	"10"[1]		unpubl. INF	kick
9/5/85	"27"	4	"9"[2]		unpubl. INF	kick
10/10/85	"28"	4	"9"[3]		unpubl. INF	kick

1 Fauna include Baetis, Cinygmula, Serratella, Nemouridae, Capniidae, Chloroperlidae, Chironomidae, Chelifera, Dicranota, Prosimulium, Simulium

2 Fauna include Baetis, Cinygmula, Nemouridae, Suwallia, Chironomidae, Chelifera, Tipula, Prosimulium, Simulium, Oligochaeta

3 Fauna include Baetis, Cinygmula, Nemouridae, Capniidae, Chironomidae, Chelifera, Tipula, Simulium, Oligochaeta

* Based on insect family and invertebrate groups
" " Not quantitative (kick or drift sample)
' ' Some insects ID to order only

Table 9. Tolovana River drainage

Date	Density (0.1 m^2)	Number of samples	Number of taxa*	Habitat	Reference	Method
a. Tolovana River (at Elliott Highway bridge)						
8/1/85	"644"	1	"10"[1]		unpubl. INF	kick
9/70 - 9/72			32		Nauman and Kernodle (1977)	
9/15/70	11	1	'3'[3]		Nauman and Kernodle (1974)	surber
9/15 - 11/11/70	"7"	1	"2"[4]		Nauman and Kernodle (1977)	basket
9/5/85	"18"	4	"1,"[5]		unpubl. INF	kick
10/10/85	"13"	3	"8"[6]		unpubl. INF	kick
b. Livengood Creek (above Amy Creek)						
7/29/68	210	-	7[1]	gravel	FWPCA (1969)	surber 423 u mesh
c. Livengood Creek (below Amy Creek)						
7/29/68	11		1[1]	mud	FWPCA (1969)	surber 423 u mesh
d. Livengood Creek (at bridge crossing in Livengood)						
8/1/85	"120"	1	"7"[1]		unpubl. INF	kick
9/5/85	"1"	4	"2"[2]		unpubl. INF	kick
10/10/85	"23"	4	"5"[3]		unpubl. INF	kick
e. Livengood Creek (1 mile below bridge crossing)						
7/29/68	9	-	5[1]	clay-silt	FWPCA (1969)	surber, 423 u mesh

[1] Fauna include Eaetis, Cinygmula, Serratella, Nemouridae, Chloroperlidae, Brachycentrus, Chironomidae, Chelifera, Prosimulium, Simulium, Oligochaeta
[2] Fauna include Chironomidae, Heptageniidae, Nemouridae
[3] Fauna include Oligochaeta, Ephemeroptera, Chironomidae
[4] Fauna include Chironomidae, Nemouridae
[5] Fauna include Pseudocloeon, Serratella, Cinygmula, Capniidae, Nemouridae, Chironomidae, Chelifera,
[6] Tipula, Dicranota, Simulium, Oligochaeta
Fauna include Cinygmula, Ephemerella,, Nemouridae, Capniidae, Chironomidae, Empididae, Dicranota, Oligochaeta

[1] Fauna include Nemouridae, Baetidae, Limnephilidae, Chironomidae, Simuliidae, Tipulidae, Oligochaeta

[1] Fauna include Chironomidae

[1] Fauna include Baetis, Serratella, Nemouridae, Chironomidae, Tipula, Dicranota, Simulium, Oligochaeta
[2] Fauna include Chironomidae, Dicranota
[3] Fauna include Nemouridae, Capniidae, Taeniopterygidae, Chironomidae, Tipula, Dicranota

[1] Fauna include Baetidae, Chironomidae, Simuliidae, Oligochaeta, Acarina

* Based on insect family and invertebrate groups
" " Not quantitative (kick or basket sample)
' ' Some insects ID to order only

Table 9. (continued)

Date	Density (0.1 m^2)	Number of samples	Number of taxa*	Habitat	Reference	Method
f. West Fork Tolovana River						
8/1/85	"140"	1	"10"[1]		unpubl. INF	kick
9/5/85	"8"	4	"8"[2]		unpubl. INF	kick
10/10/85	"16"	4	"10"[3]		unpubl. INF	kick

[1] Fauna include Baetis, Cinygmula, Serratella, Suwallia, Perlodidae, Clossosoma, Chironomidae, Chelifera, Prosimulium, Simulium, Oligochaeta

[2] Fauna include Baetis, Cinygmula, Ephemerella, Nemouridae, Arcynopteryx, Chironomidae, Simulium, Oligochaeta

[3] Fauna include Cinygmula, Ephemerella, Nemouridae, Capniidae, Taeniopterygidae, Perlodidae, Brachycentrus, Clossosoma, Chironomidae, Oligochaeta

* Based on insect family and invertebrate groups
" " Not quantitative (kick or drift sample)
' ' Some insects ID to order only

Table 10. Birch Creek drainage

Date	Density (0.1 m^2)	Number of samples	Number of taxa*	Habitat	Reference	Method
a. Ptarmigan Creek (Mined - beginning August 1983)						
6/18/83	61	5	10'	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
7/14/83	66	5	11[2]	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
7/31/83	64	5	103	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
8/14/83	52	5	104	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
8/25/83	21	5	6[5]	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
9/25/83	96	3	56	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh

[1] Fauna include Baetis, Epeorus, Cinygmula, Chironomidae, Simuliidae, Empididae, Chloroperlidae, Perlodidae, Acarina, Oligochaeta, Amphipoda

[2] Fauna include Baetis, Epeorus, Cinygmula, Siphlonurus, Chironomidae, Simuliidae, Tipula, Chloroperlidae, Perlodidae, Acarina, Oligochaeta, Amphipoda

[3] Fauna include Baetis, Epeorus, Cinygmula, Chironomidae, Simuliidae, Dicranota, Chloroperlidae, Perlodidae, Acarina, Oligochaeta, Amphipoda

[4] Fauna include Baetis, Epeorus, Cinygmula, Chironomidae, Simuliidae, Tipula, Chloroperlidae, Perlodidae, Zapada, Oligochaeta, Amphipoda

[5] Fauna include Cinygmula, Chironomidae, Chloroperlidae, Perlodidae, Oligochaeta, Amphipoda

[6] Fauna include Chironomidae, Dicranota, Perlodidae, Oligochaeta, Amphipoda

b. Fish Creek (above mouth - Unmined)						
8/22/84	108	5	8[1]	riffle	unpubl. ADFC	0.1 m^2 box sampler, 80 u mesh

[1] Fauna include Cinygmula, Ironodes, Nemoura, Capniidae, Chironomidae, Dicranota, Tipula, Simuliidae, Oligochaeta, Amphipoda

c. Bear Creek (above mouth - Unmined)						
8/15/84	93	5	13'	riffle	unpubl. ADFC	0.1 m^2 box sampler, 80 u mesh

[1] Fauna include Cinygmula, Ironodes, Ephemerella, Baetis, Nemoura, Capniidae, Alloperla, Limnephilidae, Chironomidae, Dicranota, Tipula, Simuliidae, Empididae, Oligochaeta, Amphipoda

* Based on insect family and invertebrate groups
" " Not quantitative (kick or drift sample)
' ' Some insects ID to order only

Table 10. (continued)

Date	Density (0.1 m^2)	Number of samples	Number of taxa*	Habitat	Reference	Method
d. Birch Creek (above Twelvemile Creek - Mined)						
6/18/83	5	5	4[1]	random sampling	Wagener 1984)	0.1 m^2 box sampler, 350 u mesh
7/l 8/82	0.6	5	2[2]	pools, riffles, runs	Wagener 1984)	0.1 m^2 box sampler, 350 u mesh
7/14/83	9	5	4[3]	random sampling	Wagener 1984)	0.1 m^2 box sampler, 350 u mesh
7/l 8/85	"6"	1	"2"[4]		unpubl. INF	kick
7/31/83	12	5	55	random sampling	Wagener 1984)	0.1 m^2 box sampler, 350 u mesh
8/2/82	0	10	0	pools, riffles, runs	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
8/14/83	5	5	5[6]	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
8/22/85	"3"	4	"5"[7]		Unpubl. INF	kick
8/25 and 8/27/82	0.7	35	6[8]	pools, riffles, runs	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
8/26/83	2	5	4[9]	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
9/10/83	1	5	3[10]	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
9/25/85	"1"	4	"5"[11]		unpubl, INF	kick
summer 1983	8	20	10[12]	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
summer 1985	"3"	9	8[13]		unpubl. INF	kick

1 Fauna include Baetis, Epeorus, Cinygmula, Chironomidae, Empididae
2 Fauna include Cinygmula, Chironomidae
3 Fauna include Baetis, Epeorus, Cinygmula, Chironomidae, Amphipoda
4 Fauna include Cinygmula, Amphipoda
5 Fauna include Baetis, Epeorus, Cinygmula, Chironomidae, Simuliidae, Perlodidae
6 Fauna include Baetis, Epeorus; Cinygmula, Chironomidae; Empididae, Chloroperlidae
7 Fauna include Pseudocloeon, Epeorus, Podmosta, Chironomidae, Tipula
8 Fauna include Baetis, Epeorus; Cinygmula, Chironomidae, Acarina, Rhyacophila, Ceratopogonidae
9 Fauna include Chironomidae, Tipula, Perlodidae, Oligochaeta
10 Fauna include Epeorus, Chironomidae, Chloroperlidae
11 Fauna include Ephemerella, Podmosta, Chironomidae, Amphipoda, Oligochaeta
12 Fauna include Baetis, Epeorus, Cinygmula, Chironomidae, Simuliidae, Empididae, Tipula, Chloroperlidae, Perlodidae, Oligochaeta, Amphipoda
13 Fauna include Pseudocloeon, Epeorus, Cinygmula, Podmosta, Chironomidae, Tipula, Oligochaeta, Amphipoda, Ephemerella

* Based on insect family and invertebrate groups
" " Not quantitative (kick or drift sample)
' ' Some insects ID to order only

Table 10. (continued)

Date	Density (0.1 m^2)	Number of samples	Number of taxa*	Habitat	Reference	Method
e. North Fork Birch Creek (upstream site - Unmined)						
8129184	102	5	14'	riffle	unpubl. ADFC	0.1 m^2 box sampler, 80 u mesh
[1] Fauna include Cinygmula, Ironodes, Ephemerella, Siphlonuridae, Nemoura, Capniidae, Alloperla, Limnephilidae, Rhyacophilidae, Glossosoma, Chironomidae, Dicranota, Tipula, Empididae, Oligochaeta, Amphipoda						
f. North Fork Birch Creek (near mouth)						
8/15/84	55	5	12[1]	riffle	unpubl. ADFC	0.1 m^2 box sampler, 80 u mesh
[1] Fauna include Cinygmula, Ironodes, Ephemerella, Baetis, Nemoura, Capniidae, Alloperla, Limnephilidae, Rhyacophilidae, Clossosoma, Chironomidae, Empididae, Oligochaeta						
g. Twelvemile Creek (upstream site - Unmined)						
8/14/84	119	5	15'	riffle	unpubl. ADFC	0.1 m^2 box sampler, 80 u mesh
[1] Fauna include Cinygmula, Ironodes, Ephemerella, Baetis, Siphlonuridae, Nemoura, Capniidae, Limnephilidae, Rhyacophilidae, Clossosoma, Chironomidae, Tipula, Simuliidae, Empididae, Oligochaeta, Amphipoda						

* Based on insect family and invertebrate groups
" " Not quantitative (kick or drift sample)
' ' Some insects ID to order only

Table 10. (continued)

Date	Density (0.1 m^2)	Number of samples	Number of taxa*	Habitat	Reference	Method
h. Twelvemile Creek (above mouth - Unmined)						
6/18/83	106	5	14[1]	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
7/14/83	48	5	10[2]	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
7/18/85	"46"		"5"[3]		unpubl. INF	kick
7/19/82	49	4	10[4]	pools, riffles, runs	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
7/31/82	a7	12	12[5]	pools, riffles, runs	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
7/31/83	50	5	126	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
8/14/84	33	S	9[7]	riffle	Unpubl. ADFG	0.1 m^2 box sampler, 80 u mesh
8/22/85	"27"	4	"12"[8]		Unpubl. INF	kick
8/26 and 8/28/82	76	29	15[9]	pools. runs, riffles .	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
8/14/83	20	5	10[10]	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
8/26/83	41	5	12"	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
9/25/85	"73"	4	"13"[12]		unpubl. INF	kick
9/10/83	47	5	14[13]	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
summer 1983	56	20	16[14]	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh

1 Fauna include Baetis, Epeorus, Cinygmula, Siphlonurus, Ephemerella, Chironomidae, Simuliidae, Empididae, Tipula, Chloroperlidae, Perlodidae, Zapada, Apatania, Oligochaeta, Amphipoda

2 Fauna include Baetis, Epeorus, Cinygmula, Siphlonurus, Ephemerella, Chironomidae, Empididae, Chloroperlidae, Perlodidae, Apatania, Oligochaeta

3 Fauna include Baetis, Cinygmula, Epeorus, Rhyacophila, Chironomidae, Chelifera

4 Fauna include Baetis, Epeorus, Cinygmula, Siphlonurus, Chironomidae, Simuliidae, Empididae, Tipula, Chloroperlidae, Acarina, Oligochaeta

5 Fauna include Baetis, Epeorus, Cinygmula, Siphlonurus, Ephemerella, Chironomidae, Simuliidae, Empididae, Tipulidae, Dicranota, Chloroperlidae, Acarina, Oligochaeta, Ceratopogonidae

6 Fauna include Baetis, Epeorus, Cinygmula, Siphlonurus, Ephemerella, Chironomidae, Empididae, , Tipula, Dicranota, Chloroperlidae, Perlodidae, Apatania, Acarina, Oligochaeta

7 Fauna include Cinygmula, Ironodes, Ephemerella, Baetis, Nemoura, Chironomidae, Dicranota, Tipula, Simuliidae, Empididae, Oligochaeta

8 Fauna include Baetis, Pseudocloeon, Epeorus, Cinygmula, Ephemerella, Zapada, Capniidae, Chloroperlidae, Perlodidae, Ecclisomyia, Apatania, Chironomidae, Chelifera, Tipula, Oligochaeta

9 Fauna include Baetis, Epeorus, Cinygmula, Siphlonurus, Ephemerella, Chironomidae, Empididae, Tipula, Dicranota, Chloroperlidae, Perlodidae, Zapada, Brachycentrus, Clossosoma, Acarina, Oligochaeta, Cetatopogoni dae

10 Fauna include Baetis, Epeorus, Cinygmula, Ephemerella, Chironomidae, Empididae, Tipula, Chloroperlidae, Perlodidae, Brachycentrus, Acarina

11 Fauna include Baetis, Pseudocloeon, Epeorus, Cinygmula, Siphlonurus, Ephemerella, Chironomidae, Empididae, Tipula, Dicranota, Chloroperlidae, Perlodidae, Zapada, Oligochaeta, Ceratopogonidae

12 Fauna include Baetis, Pseudocloeon, Cinygmula, Epeorus, Ephemerella, Zapada, Podmosta, Capniidae, Arcynopteryx, Chironomidae, Chelifera, Oreogeton, Pericoma, Tipula, Dicranota, Rrosimulium, Collembola, Oligochaeta

13 Fauna include Baetis, Epeorus, Cinygmula, Siphlonurus, Ephemerella, Chironomidae, Simuliidae, Empididae, Tipula, Dicranota, Chloroperlidae, Perlodidae, Acarina, Dligochaeta, Amphipoda, Ceratopogonidae

14 Fauna include Baetis, Pseudocloeon, Epeorus, Cinygmula, Siphlonuridae, Ephemereila, Chironomidae, Simuliidae, Empididae, Tipula, Dicranota, Chloroperlidae, Perlodidae, Zapada, Erachycentrus, Apatania, Acarina, Oligochaeta, Amphipoda

Date	Density ($0.1\ m^2$)	Number of samples	Number of taxa*	Habitat	Reference	Method
i. Birch Creek (at Steese Highway bridge - Mined)						
7/23 - 7/25/85	25	5	6	random sampling	Weber (1986)	$0.1\ m^2$ box sampler, 80 u mesh

* Based on insect family and invertebrate groups
" " Not quantitative (kick or drift sample)
' ' Some insects ID to order only

Table 11. Crooked Creek drainage

Date	Density (0.1 m^2)	Number of samples	Number of taxa*	Habitat	Reference	Method
a. Porcupine Creek (above mining)						
8/8/84	25	5	9[1]	riffle	Unpubl. ADFC	0.1 m^2 box sampler, 80 u mesh
7/23 - 7/25/85	97	5	6	random sampling	Weber (1986)	0.1 m^2 box sampler, n/a
[1] Fauna include Cinygmula, Nemoura, Capniidae, Chironomidae, Dicranota, Simuliidae, Empididae, Oligochaeta, Amphipoda						
b. Porcupine Creek (immediately below mining)						
7/23 - 7/25/85	7	5	3	random sampling	Weber (1986)	0.1 m^2 box sampler, n/a
c. Porcupine Creek (above Bonanza Creek)						
8/8/84	4	4	1'	riffle	Unpubl. ADFC	0.1 m^2 box sampler, 80 u mesh
7/23 - 7/25/85	5	5	2	random sampling	Weber (1986)	0.1 m^2 box sampler, n/a
[1] Fauna include Chironomidae						
d. Porcupine Creek (at mouth)						
7/23 - 7/25/85	32	5	3	random sampling	Weber (1986)	0.1 m^2 box sampler, n/a
e. Bonanza Creek (above present mining)						
	41	5	7[1]	riffle	Unpubl. ADFG	0.1 m^2 box sampler, 80 u mesh
[1] Fauna include Nemoura, Capniidae, Alloperla, Chironomidae, Dicranota, Oligochaeta, Amphipoda						
f. Bonanza Creek (above mouth)						
8/9/84	3	5	2[1]	riffle	Unpubl. ADFC	0.1 m^2 box sampler, 80 u mesh
7/23 - 7/25/85	12	5	3	random sampling	Weber (1986)	0.1 m^2 box sampler, n/a
[1] Fauna include Nemoura, Chironomidae						
g. Mastadon Creek (above present mining)						
8/1/84	64	5	a'	riffle	Unpubl. ADFC	0.1 m^2 box sampler, 80 u mesh
[1] Fauna include Cinygmula, ironodes, Baetis, Nemoura, Capniidae, Chironomidae, Simuliidae, Oligochaeta, Amphipoda						
h. Mastadon Creek (below mining)						
8/1/84	8	5	7[1]	riffle	Unpubl. ADFC	0.1 m^2 box sampler, 80 u mesh
[1] Fauna include Baetis, Siphlonuridae, Nemoura, Chironomidae, Dicranota, Oligochaeta, Amphipoda						

* Based on insect family and invertebrate groups
" " Not quantitative (kick or drift sample)
' ' Some insects ID to order only

Table 11. (continued)

Date	Density (0.1 m^2)	Number of samples	Number of taxa*	Habitat	Reference	Method
i. Miller Creek (above past mining)						
7/30/84	115	5	9'	riffle	Unpubl. ADFC	0.1 m^2 box sampler, 80 u mesh
[1] Fauna include Cinygmula, Ironodes, Baetis, Nemoura, Capniidae, Alloperla, Chironomidae, Simuliidae, Oligochaeta, Amphipoda						
j. Miller Creek (below past mining)						
7/31/84	13	5	7[1]	riffle	Unpubl. ADFG	0.1 m^2 box sampler, 80 u mesh
[1] Fauna include Cinygmula, Ironodes, Baetis, Siphlonuridae, Nemoura, Capniidae, Chironomidae, Empididae						
k. Independence Creek (above present mining)						
8/2/84	15	5	5[1]	riffle	Unpubl. ADFC	0.1 m^2 box sampler, 80 u mesh
[1] Fauna include Baetis, Nemoura, Chironomidae, Oligochaeta, Amphipoda						
1. Independence Creek (below mining)						
8/2/84	10	5	5[1]	riffle	Unpubl. ADFG	0.1 m^2 box sampler, 80 U mesh
[1] Fauna include Cinygmula, Ironodes, Siphlonuridae, Nemoura, Chironomidae, Amphipoda						

* Based on insect family and invertebrate groups
" " Not quantitative (kick or drift sample)
' ' Some insects ID to order only

Table 11. (continued)

Date	Density (0.1 m^2)	Number of samples	Number of taxa*	Habitat	Reference	Method
m. Mammoth Creek (at mouth • Mined)						
6/16/83	3	5	4[1]	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
7/2/83	7	5	6[2]	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
7/18/85	"7"	1	"3"[3]	-	Unpubl. INF	kick
7/30/83	2	5	54	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
8/13/83	1	5	45	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
8/21/84	3	5	76	riffle	Unpubl. ADFC	0.1 m^2 box sampler, 80 u mesh
8/22/85	"6"	4	"3"[7]	-	Unpubl. INF	kick
8/25/83	1	5	58	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
9/25/85	"4"	4	"4"[9]		Unpubl. INF	kick
summer 1983	3	20	9[10]	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
summer 1985	"6"	9	7 "		Unpubl. INF	kick

1
2 Fauna include Cinygmula, Chironomidae, Tipula, Oligochaeta
3 Fauna include Baetis, Cinygmula, Chironomidae, Empididae, Perlodidae, Amphipoda
4 Fauna include Cinygmula, Epeorus, Chironomidae, Cymnopias
5 Fauna include Baetis, Cinygmula, Chironomidae, Empididae, Perlodidae
6 Fauna include Baetis, Chironomidae, Perlodidae, Amphipoda
7 Fauna include Cinygmula, Baetis, Siphlonuridae, Nemoura, Chironomidae, Simuliidae, Empididae
8 Fauna include Baetis, Podmosta, Chironomidae
9 Fauna include Chironomidae, Ormosia, Chloroperlidae, Oligochaeta, Amphipoda
10 Fauna include Podmosta, Chironomidae, Amphipoda, Oligochaeta
11 Fauna include Baetis, Cinygmula, Chironomidae, Empididae, Tipula, Ormosia, Chloroperlidae, Perlodidae, Oligochaeta, Amphipoda
Fauna include Baetis, Cinygmula, Epeorus, Podmosta, Chironomidae, Cymnopias, Amphipoda, Oligochaeta

n. Bedrock Creek (above mouth • Mined)						
7/18/85	"104"	1	"6"[1]		Unpubl. INF	kick
7/25/84	33	5	6[2]	riffle	Unpubl. ADFC	0.1 m^2 box sampler, 80 u mesh
8/22/85	"34"	4	"6"[3]	- '	Unpubl. INF	kick
9/25/85	"80"	4	"6"[4]		Unpubl. INF	kick

1
2 Fauna include Cinygmula, Podmosta, Capniidae, Chironomidae, Dicranota, Simulium, Cymnopias
3 Fauna include Cinygmula, Nemoura, Capniidae, Chironomidae, Simuliidae, Oligochaeta
4 Fauna include Baetis, Cinygmula, Podmosta, Chironomidae, Dicranota, Oligochaeta
Fauna include Podmosta, Chironomidae, Dicranota, Simulium, Cymnopias, Collembola, Oligochaeta

* Based on insect family and invertebrate groups
II " Not quantitative (kick *or* drift sample)
' ' Some insects ID to order only

Table 11. (continued)

Date	Density (0.1 m^2)	Number of samples	Number of taxa*	Habitat	Reference	Method
o. Crooked Creek (below Bedrock Creek - Mined)						
7/23 - 7/25/85	a	5	2	random sampling	Weber (1986)	0.1 m^2 box sampler
p. Crooked Creek (above Boulder Creek - Mined)						
7/18/85	"0"	1	"0"		Unpubl . INF	kick
8/22/85	"3"	4	"6"[1]		Unpubl. INF	kick
9/25/85	"4"	4	"6"[2]		Unpubl . INF	kick

[1] Fauna include Baetis, Heptageniidae, Ephemerella, Podmosta, Chironomidae, Dicranota
[2] Fauna include Raetis, Heptageniidae, Drunella, Podmosta, Chironomidae, Oligochaeta

q. Boulder Creek (above past mining)						
7/25/84	176	5	10'	riffle	Unpubl . ADFC	0.1 m^2 box sampler, 80 u mesh

[1] Fauna include Cinygmula, Ironodes, Baetis, Siphlonurus, Nemoura, Capniidae, Alloperla, Chironomidae, Simuliidae, Oligochaeta, Amphipoda

* Based on insect family and invertebrate groups
" " Not quantitative (kick or drift sample)
' ' Some insects ID to order only

Table 11. (continued)

Date	Density (0.1 m^2)	Number of samples	Number of taxa*	Habitat	Reference	Method
r. Boulder Creek (above mouth)						
6/16/83	32	5	7[1]	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
7/2/83	40	5	9[2]	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
7/18/85	"48"	1	"5"[3]		Unpubl. INF	kick
7/30/83	63	5	10[4]	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
7/26/84	34	5	115	riffle	Unpubl. ADFC	0.1 m^2 box sampler, 80 u mesh
7/23 - 7/25/85	60	5	7	random	Weber (1986)	0.1 m^2 box sampler
8/13/83	12	5	6[6]	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
8/22/85	"68"	4	"7"[7]		Unpubl. INF	kick
8/25/83	21	5	78	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
9/25/83	22	3	3[9]	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
9/25/85	"39"	4	"5"[10]		Unpubl. INF	kick
summer 1983	37	20	11[11]	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh

[1] Fauna include Cinygmula, Chironomidae, Simuliidae, Empididae, Perlodidae, Oligochaeta, Amphipoda
[2] Fauna include Baetis, Cinygmula, Chironomidae, Simuliidae, Empididae, Tipula, Perlodidae, Oligochaeta, Amphipoda
[3] Fauna include Baetis, Podmosta, Dicosmoecus, Chironomidae, Oligochaeta
[4] Fauna include Baetis, Cinygmula, Chironomidae, Simuliidae, Empididae, Tipula, Chloroperlidae, Perlodidae, Oligochaeta, Amphipoda
[5] Fauna include Cinygmula, Baetis, Siphlonuridae, Nemoura, Alloperla, Rhyacophila, Chironomidae, Dicranota, Simuliidae, Empididae, Oligochaeta
[6] Fauna include Baetis, Cinygmula, Siphlonurus, Chironomidae, Perlodidae, Amphipoda
[7] Fauna include Baetis, Cinygmula, Epeorus, Podmosta, Nemoura, Chironomidae, Chelifera, Tipula, Oligochaeta
[8] Fauna include Baetis, Cinygmula, Chironomidae, Tipula, Dicranota, Perlodidae, Oligochaeta, Amphipoda
[9] Fauna include Chironomidae, Perlodidae, Oligochaeta
[10] Fauna include Podmosta, Dicosmoecus, Chironomidae, Dicranota, Oligochaeta
[11] Fauna include Eaetis, Cinygmula, Siphlonuridae, Chironomidae, Simuliidae, Empididae, Tipula, Dicranota, Chloroperlidae, Perlodidae, Oligochaeta, Amphipoda

s. Crooked Creek (below Boulder Creek at Steese Highway Bridge - Mined)						
8/21 /a4	1	5	2[1]	riffle	Unpubl. ADFC	0.1 m^2 box sampler, 80 u mesh
7/23 - 7/25/85	15	5	3	random sampling	Weber (1986)	0.1 m^2 box sampler, 80 u mesh

[1] Fauna include Nemoura, Chironomidae

* Based on insect family and invertebrate groups
" " Not quantitative (kick or drift sample)
' ' Some insects ID to order only

Table 11. (continued)

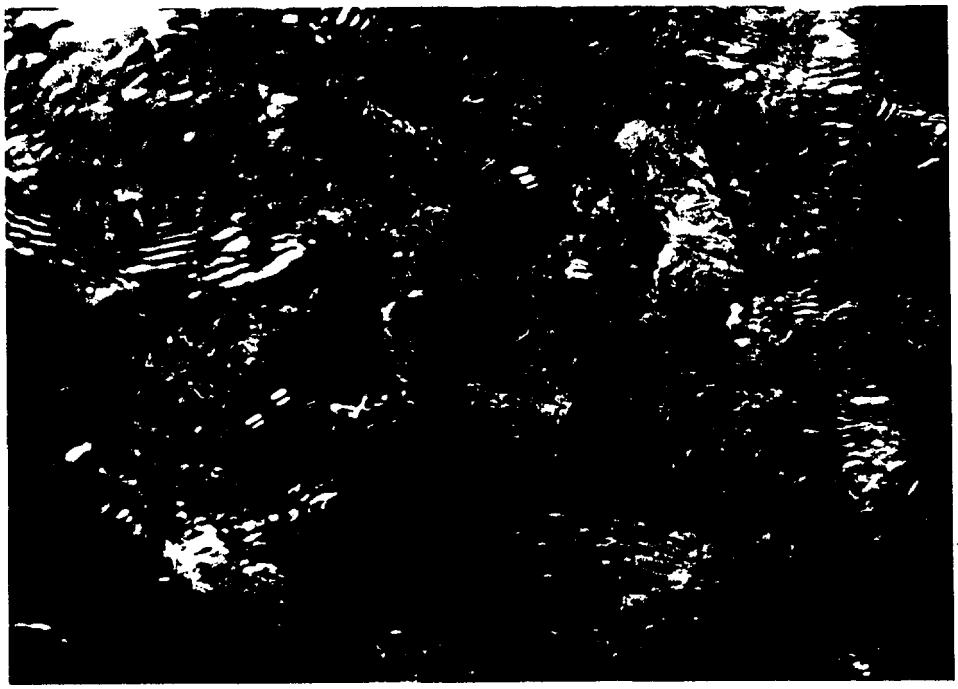
Date	Density (0.1 m^2)	Number of samples	Number of taxa*	Habitat	Reference	Method
t. Crooked Creek (at Central - Mined)						
7/23 - 7/25/85	10	5	4	random	Weber (1986)	0.1 m^2 box sampler
u. Deadwood Creek (above present mining)						
7/24/84	1	4	2'	riffle	Unpubl. ADFC	0.1 m^2 box sampler, 80 u mesh
[1] Fauna include Chironomidae, Simuliidae						
v. Deadwood Creek (below mining)						
7/24/84	3	5	2[1]	riffle	Unpubl. ADFC	0.1 m^2 box sampler, 80 u mesh
[1] Fauna include Chironomidae, Oligochaeta						
w. W. Ketchem Creek (above mining)						
8/29/84	107	5	9'	riffle	Unpubl. ADFC	0.1 m^2 box sampler, 80 u mesh
[1] Fauna include Baetis. Nemoura, Caoniidae. Alloperla, Chironomidae, Tipula, Simuliidae, Oligochaeta, Amphipoda						
x. Ketchem Creek (near mouth, below mining)						
6/16/83	7	5	4[1]	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
7/2/83	13	5	6[2]	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
7/30/83	22	5	9[3]	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
8/13/83	2	5	4[4]	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
8/21/84	22	5	45	riffle	Unpubl. ADFC	0.1 m^2 box sampler, 80 u mesh
8/25/83	8	5	6[6]	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh
summer 1983	11	20	10[7]	random sampling	Wagener (1984)	0.1 m^2 box sampler, 350 u mesh

[1] Fauna include Chironomidae, Tipula, Perlodidae, Oligochaeta
[2] Fauna include Baetis, Epeorus, Cinygmula, Chironomidae, Simuliidae, Tipula, Perlodidae
[3] Fauna include Baetis, Epeorus, Cinygmula, Chironomidae, Dixidae, Simuliidae, Empididae, Tipula, Dicranota, Chloroperlidae, Perlodidae
[4] Fauna include Baetis, Cinygmula, Chironomidae, Chloroperlidae
[5] Fauna include Cinygmula, Ironodes, Nemoura, Chironomidae, Tipula
[6] Fauna include Baetis, Epeorus, Cinygmula, Chironomidae, Empididae, Perlodidae, Oligochaeta
[7] Fauna include Baetis, Epeorus, Cinygmula, Chironomidae, Dixidae, Simuliidae, Empididae, Tipula, Oicranota, Chloroperlidae, Perlodidae, Oligochaeta

* Based on insect family and invertebrate groups
" " Not quantitative (kick or drift sample)
' ' Some insects ID to order only

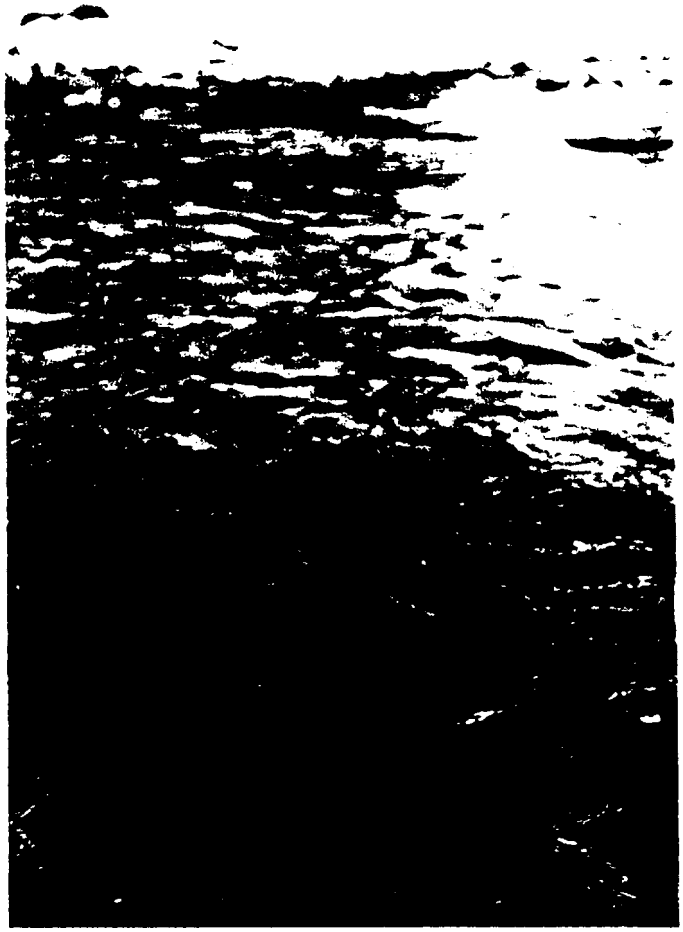
APPENDIX

Site 1, West Fork Dennison Fork at Taylor Highway bridge 8-18-87

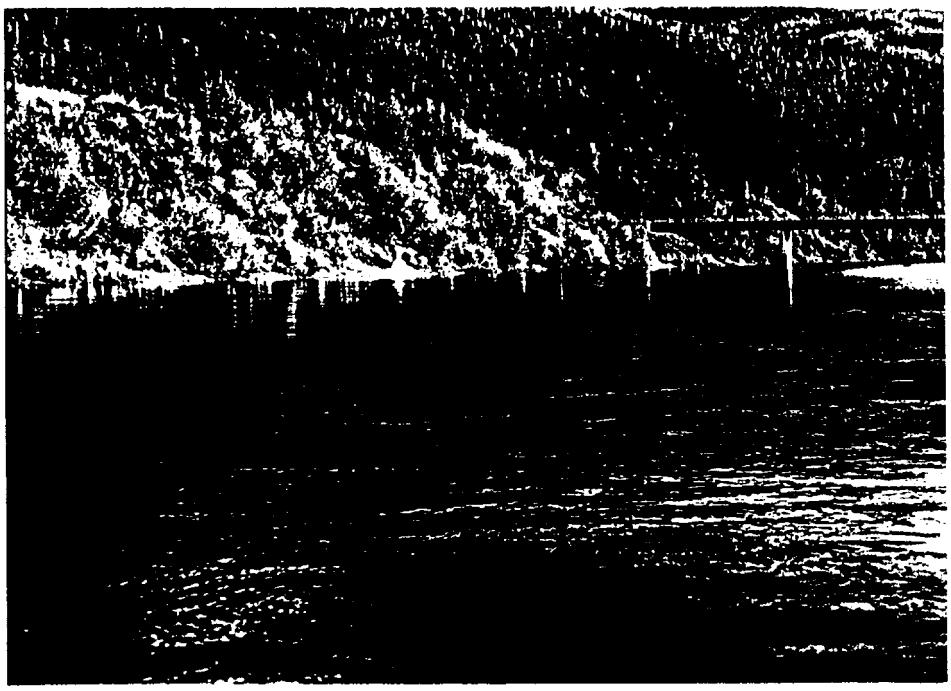


Substrate at site 1

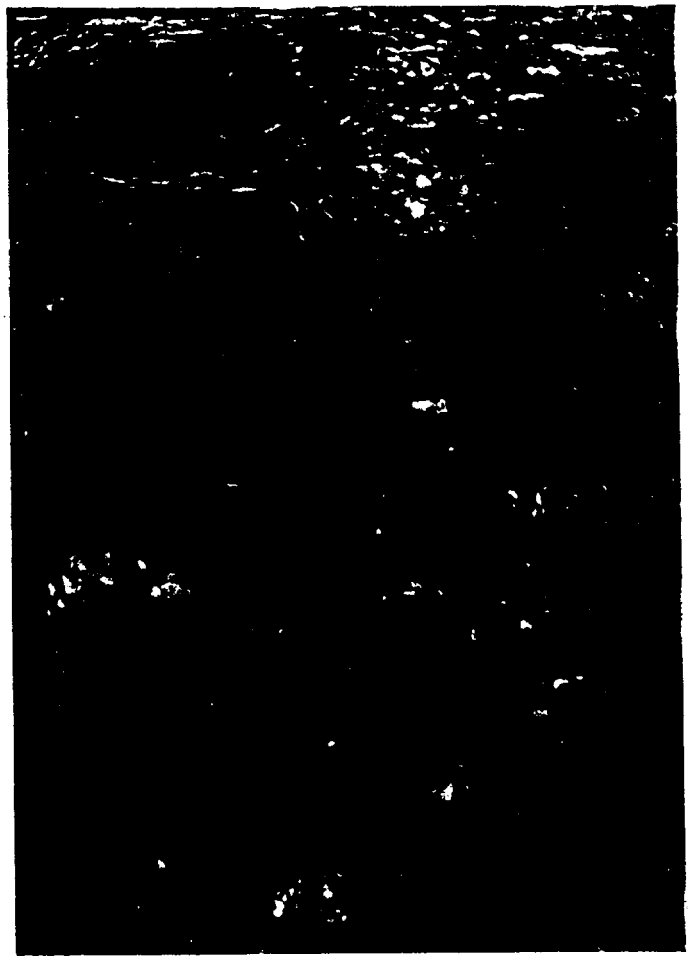
Site 2, Mosquito Fork at Taylor Highway bridge 8-18-87



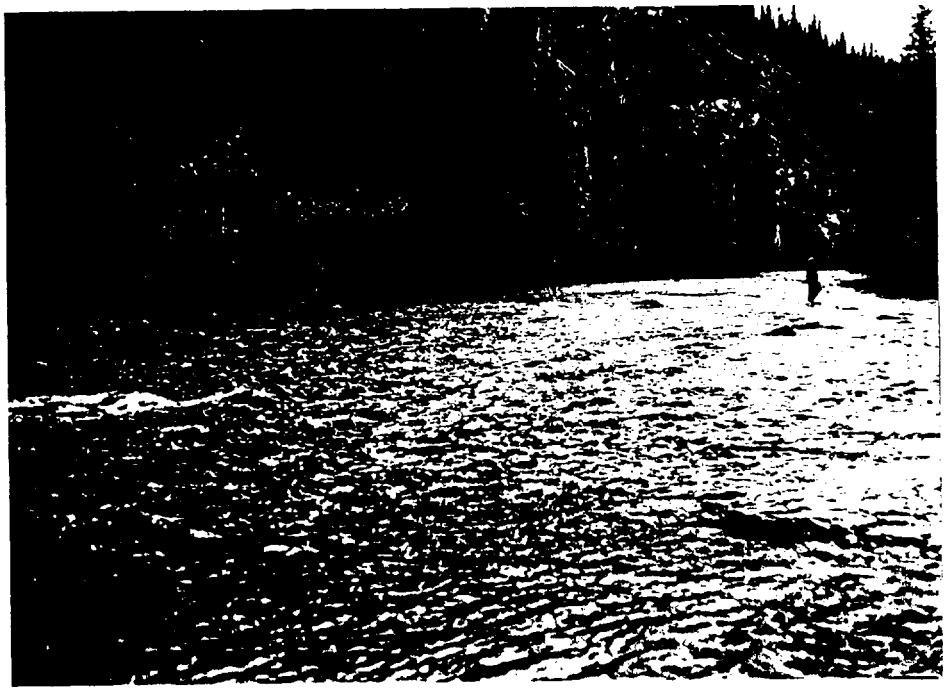
Substrate at site 2



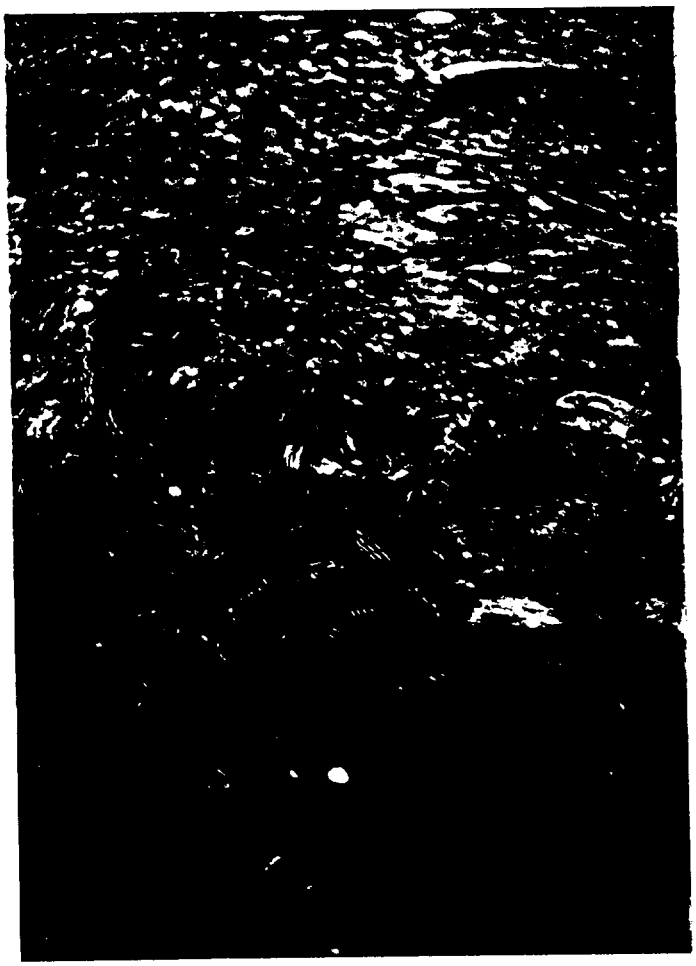
Site 3, South Fork Fortymile River at Taylor Highway bridge 8-18-87



Substrate at site 3

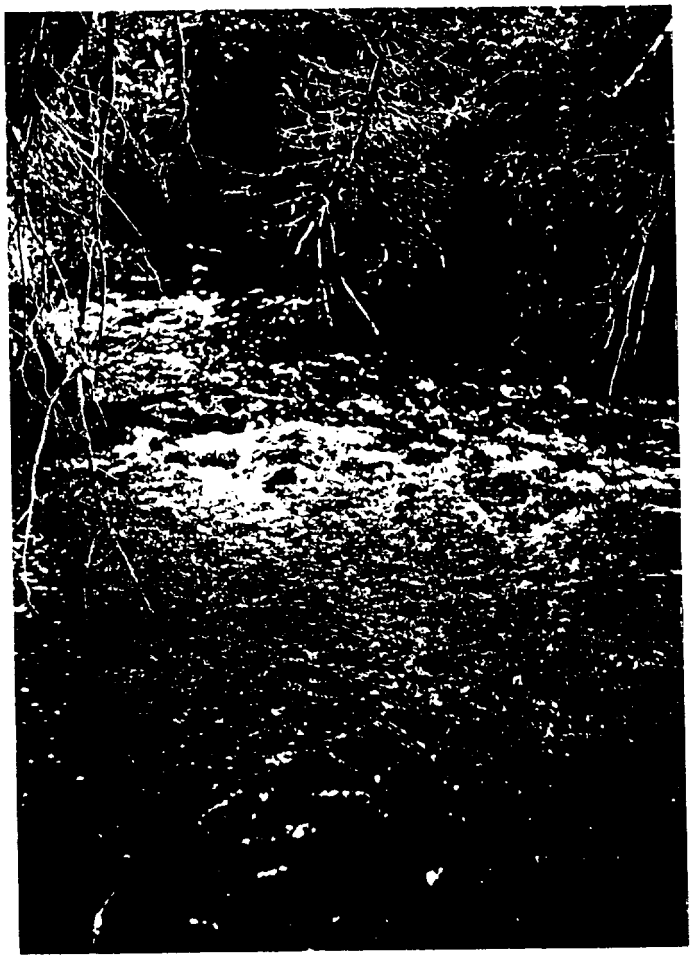


Site 4, Walker Fork Fortymile River near mouth 8-19-87



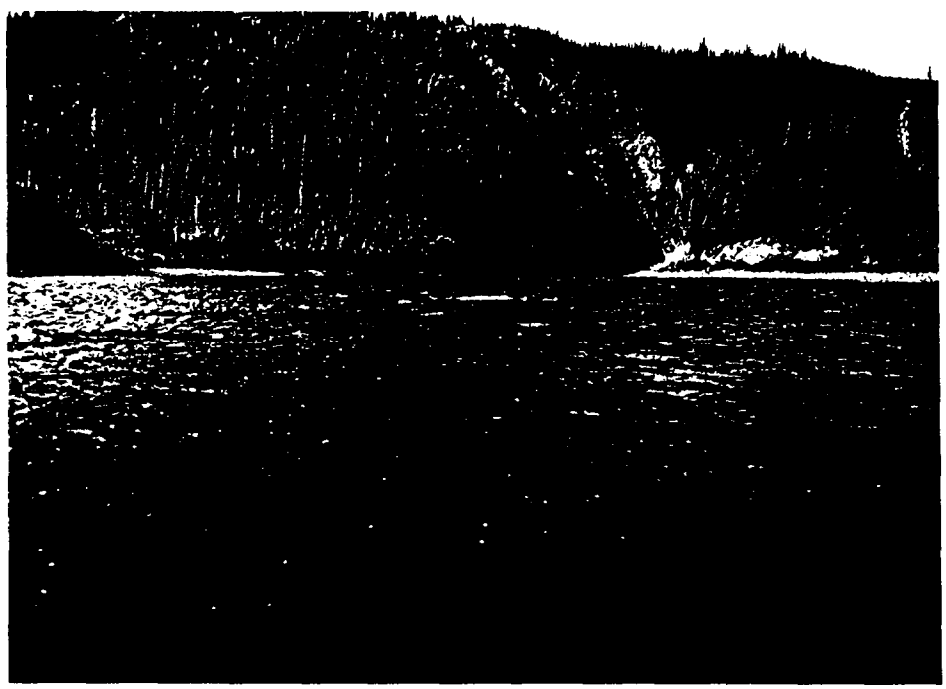
Substrate at site 4

Site 5, Napoleon Creek near mouth **8-19-87**

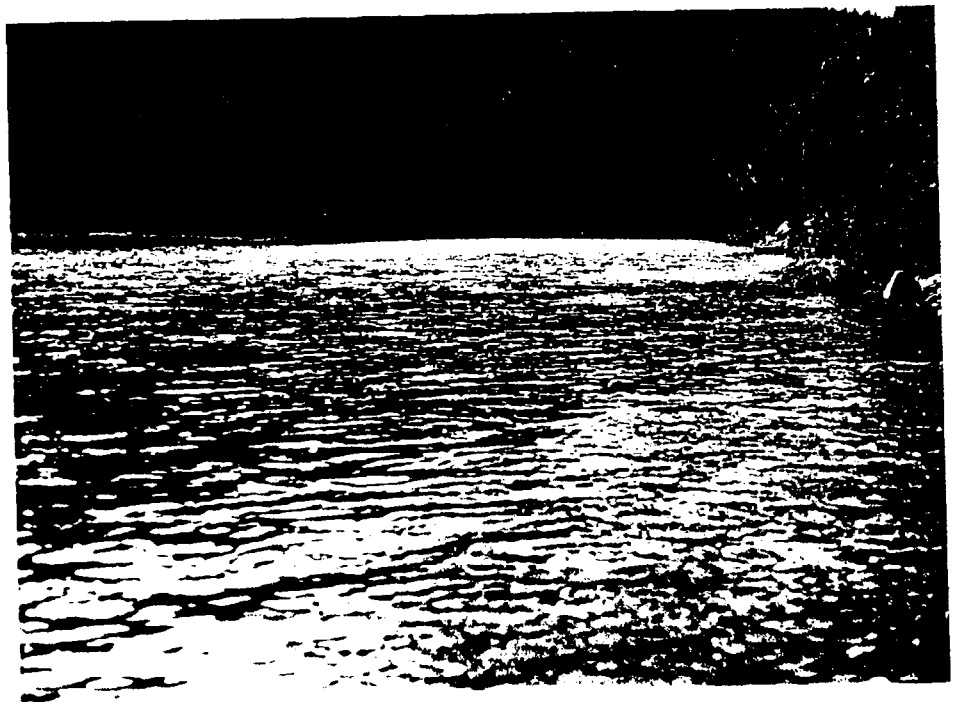


Site **6,** Butte Creek near mouth **8-19-87**

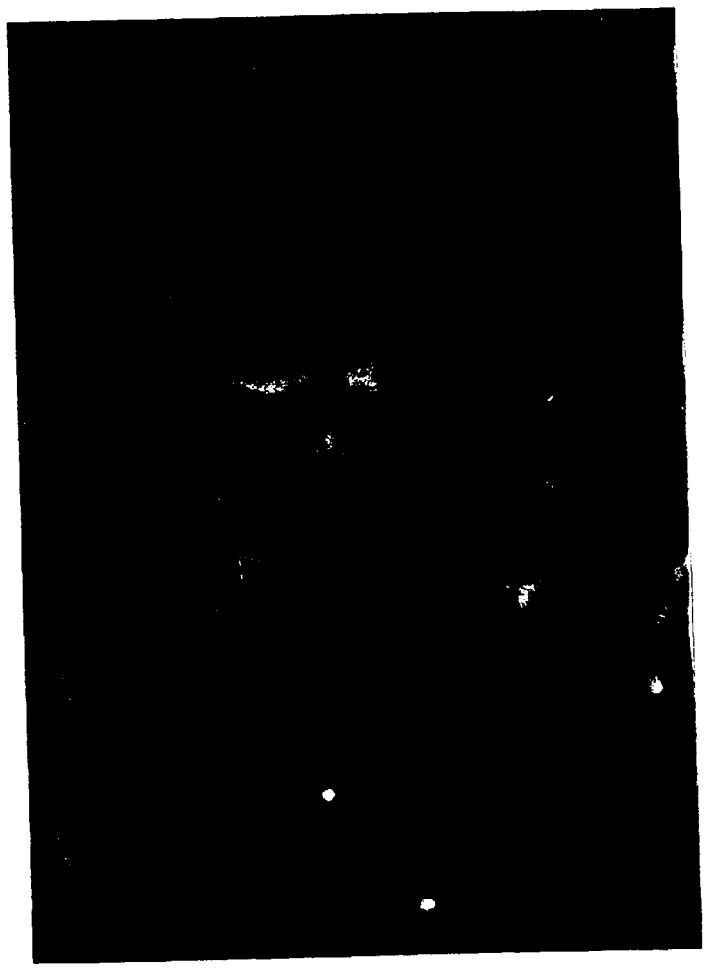
Confluence of North Fork (turbid) and South Fork (clear) Fortymile River 8-19-87, 7:00pm



North Fork Fortymile River at South Fork confluence 8-20-87, 11:30am



Site 7, South Fork Fortymile River 8-20-87



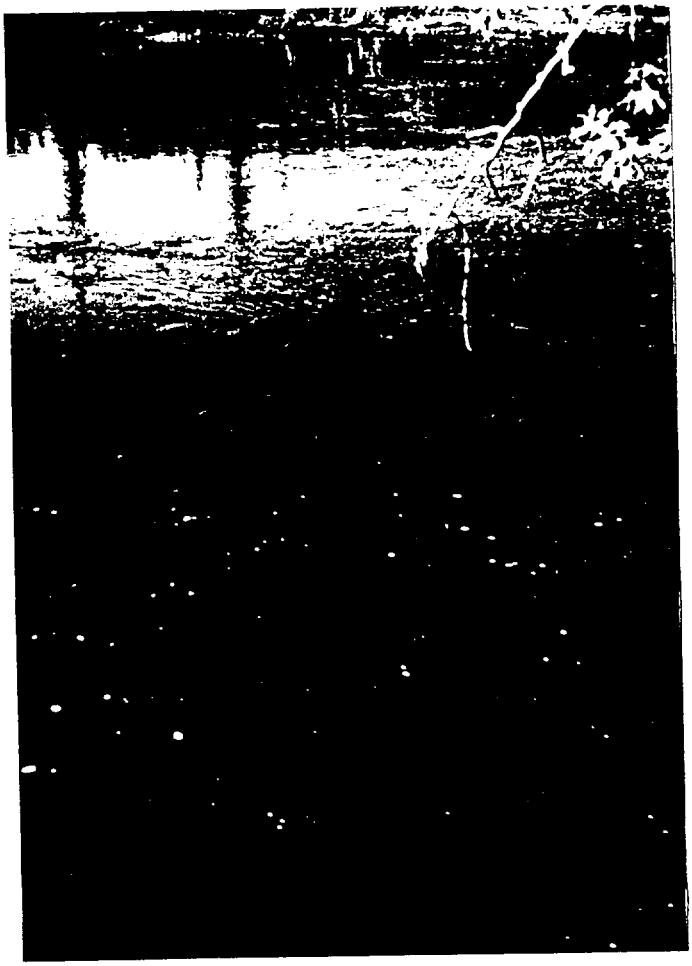
Substrate at site 7

Site 8, North Fork Fortymile River 8-20-87

Substrate at site 8

Site 9, Wade Creek near mouth B-22-87

Substrate at site 9



Site 10, Walker Fork above Wade Creek 8-22-87

Substrate at site 10