

MONTANORE PROJECT
Aquatic Biological Monitoring
1991

For:
Noranda Minerals
2501 Catlin Drive, Suite 201
Missoula, MT 59801

By:

Carlene E. Farmer

Western Technology and Engineering, Inc.
P.O. Box 6045
3005 Airport Road
Helena, MT 59604

March, 1992

mayfly, under a
stone flipped over--sacrificed
for comprehension

TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION	1
A. Purpose	1
B. Location of project area	2
C. Acknowledgements and personnel	2
METHODS--MACROINVERTEBRATES	2
A. Sampling	2
B. Identification and analysis	5
METHODS--PERIPHYTON	5
A. Sampling	5
B. Identification and analysis	6
RESULTS	7
A. Description of sampling stations	7
B. Macroinvertebrates	8
1. population composition and density	8
2. functional feeding groups	17
3. diversity/pollution sensitivity values	21
4. comparison of 1989-1991 data	21
5. statistical evaluation of the 1991 data	28
C. Periphyton	28
1. non-diatom algae	28
2. diatom algae	33
DISCUSSION/CONCLUSIONS	39
FUTURE MONITORING NEEDS	44

MACROINVERTEBRATE REFERENCES	44
PERIPHYTON REFERENCES	45

TABLES	<u>Page</u>
1. Physical features at the Montanore Project aquatic sampling stations, 1991	8
2. Aquatic macroinvertebrates collected from the Montanore Project area, 1991	9
3. Seasonal composition of macroinvertebrates from the Montanore Project area	12
4. A comparison of benthic populations at station L9 below the Montanore Project mine on Libby Creek to control, reference and downstream stations	15
5. Seasonal relative abundance of the most common benthic organisms in the Montanore Project area, 1991	18
6. Relative numbers of functional feeding groups of macroinvertebrates in the Montanore Project area, 1991	19
7. A comparison of some parameters from the 1988-1991 aquatic monitoring programs for the Montanore Project	23
8. Seasonal comparison of the percentage of benthic orders present in the Montanore Project area, 1988-1991	26
9. Annual abundance (percentage of total organisms collected) of benthic indicator and/or marker species in the Montanore Project area	27
10. Genera of non-diatom algae identified in periphyton samples collected at monitoring stations in the Montanore Project area, 1991	29
11. Dominant non-diatom algae (common or greater in estimated relative abundance) for monitoring stations in the Montanore Project area, 1991	31
12. Diatom algae (Division Chrysophyta: Sub-phylum Bacillariophyceae) identified in periphyton samples collected at monitoring stations in the Montanore Project area, 1991	34
13. Dominant taxa (percent relative abundance 3.0 or greater) and corresponding PRA values at monitoring stations in the	

Montanore Project area, 1991	35
14. Comparison of diatom community structure parameters for monitoring stations in the Montanore Project area, 1991	36

FIGURES

1. Biological sampling stations in the Montanore Project area, 1991	4
2. Relative abundance of benthos in the Montanore Project area, October 1991	14

APPENDICES

A. Macroinvertebrate station totals, spring 1991	47
B. Macroinvertebrate station totals, summer 1991	56
C. Macroinvertebrate station totals, autumn 1991	65
D. Montanore Project area totals of macroinvertebrates, 1991	74
E. Seasonal estimated relative abundance of periphyton in the Montanore Project area, 1991	76
F. Diatom proportional counts for the Montanore Project area, 1991	83

I. INTRODUCTION

A. Purpose

The Montanore aquatic biological monitoring program was initiated by Noranda Minerals Corp. (Noranda) as part of its requirements for ongoing environmental assessment of the Montanore mining project in northwestern Montana. Environmental studies in the project area began in 1988 with an aquatics baseline inventory for what was then called the Montana Project. A pre-mine macroinvertebrate monitoring program, begun in 1990 by Western Technology and Engineering, Inc (Westech), was expanded to include periphyton monitoring in 1991. This 1991 biological monitoring program addressed the following objectives:

- o document seasonal physical features of each sampling station and watch for any noticeable perturbations during sampling episodes;
- o document the seasonal diversity and relative abundance of macroinvertebrate species and periphyton populations present at each sampling station;
- o document seasonal fluctuations in sediment accumulation at the sampling stations;
- o compare the monitoring data with the applicable previous baseline and monitoring data to depict any significant annual fluctuations;
- o make recommendations for future monitoring needs.

B. Location of the project area

The Montanore Project is located south of Libby in Lincoln and Sanders Counties. Streams sampled for the 1991 monitoring effort included Libby Creek, Ramsey Creek, Pooman Creek, Bear Creek and Little Cherry Creek. A complete description of the project area is contained in the baseline report. A specific description of sites sampled in 1991 appears in a later section of this report.

C. Acknowledgements and personnel

The 1991 Montanore Project biological monitoring program was funded by Noranda, Inc. Doug Parker, Noranda-Missoula, provided input on the program and coordinated inter-agency communication. Dan Meyers administered the contract from the Libby office. Susan Feeback, Noranda-Libby, assisted with field work and provided information on access to sample sites. Erich Weber, Helena, conducted the periphyton analysis and interpretation; portions of his report to Westech are excerpted for this report. Bob Wisseman, Oregon, provided opinion on macroinvertebrate identifications. Patrick Farmer assisted with spring field work and an assessment of fisheries habitat. Kim Rieser assisted with field work and lab analysis. Tom Butts assisted with lab analysis.

II. METHODS--MACROINVERTEBRATES

A. Sampling

The seven stations sampled in 1990 were again sampled in 1991. In

addition, a reference station was added on Bear Creek (Figure 1).

In April one of the Little Cherry Creek samples was lost leaving a total of 39 samples for that period. In August, stream depth at the Little Cherry Creek station was too low to sample with the Hess net and only the kick net sample was collected for a total of 36 samples for that period. In October, five samples were collected at all eight stations giving 40 samples for the fall period. A total of 115 macroinvertebrate samples were collected from the project area in 1991.

At each station, four samples were collected with a Hess stream bottom sampler equipped with a 500 micron mesh net and a Dolphin plankton bucket attached to the end of the net. Much of the substrate of streams in the project area consists of boulders too large to be contained in a Hess net sample. In an effort to sample this excluded portion of the habitat, a fifth sample was collected using a 500 micron mesh kick net. A timed-traveling method of collecting was used for the kick net. The net was placed in the stream and organisms were dislodged from the substrate immediately in front of the net for 20 seconds. This procedure was repeated twice more for a total of 60 seconds of collecting time. Samples were preserved in the field with 10% formalin and transported to the Westech lab for analysis.

During the collecting period physical characteristics including air and water temperature, stream width and depth and sediment deposition were also noted.

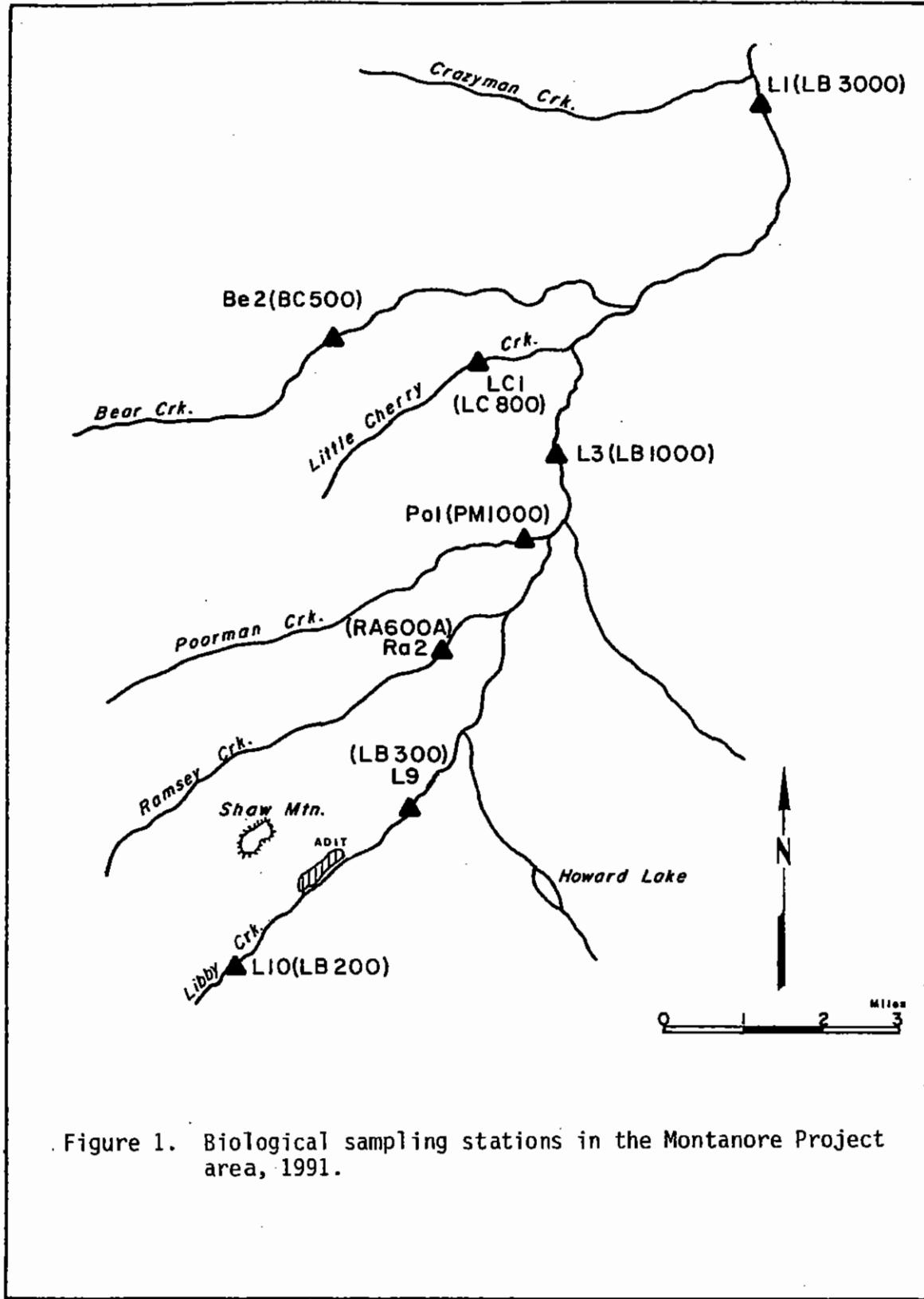


Figure 1. Biological sampling stations in the Montanore Project area, 1991.

B. Identification and analysis

In the lab, samples were poured into a white pan and all organisms, visible to the naked eye and then to an illuminated magnifying (.75x) lens were separated from the debris and stored in 70% ethanol. The organisms were then placed in a watch glass and examined under a Bausch and Lomb StereoZoom 7 dissecting microscope, identified and counted. The entire sample was counted, even for the kick samples which averaged 1024 organisms/sample, so that rare taxa were not overlooked.

Specimens were identified to the lowest practical taxon possible depending on stage of development and physical condition of the organisms. A number of keys, listed in the References, were used in the identification process. Representatives of taxonomically questionable species were sent to Bob Wisseman, Oregon for verification of identifications.

Raw counts of taxa found in each sample were used in a Lotus program for several statistical calculations. Those metrics are presented in worksheets in the appendices and/or tables of this report. The significance of those statistics is the basis for the following results, discussion and conclusions.

III. METHODS--PERIPHYTON

A. Sampling

A composite periphyton sample was collected from each station during

each sampling period. A small pocket knife was used to scrape algae and diatoms from a variety of substrates. An effort was made to sample all forms of periphyton in approximately the same proportion to one another as they appeared to occur at the sampling site. The scrapings were preserved with Lugol's solution and the samples kept cool until analysis. The samples were delivered to Erich Weber, Helena for analysis.

B. Identification and analysis

A subsample of periphyton material was placed in a welled slide and scanned at 100X, 200X, and 400X. All non-diatom algae were identified to genus and the relative abundance of each taxa estimated using the following system:

- R (Rare): Fewer than one cell per microscope field at 200X, on the average.
- C (Common): At least one, but fewer than five cells per field of view.
- VC (Very Common): Between 5 and 25 cells per field of view.
- A (Abundant): Greater than 25 cells per field, but numbers within limits reasonably counted.
- VA (Very Abundant): Number of cells per field too numerous to count.

A sample for diatom analysis was prepared by oxidizing the sample with concentrated sulfuric acid and potassium dichromate. The sample was washed and a subsample of the cleaned material dried onto a cover slip.

A permanent slide was prepared with Hyrax mounting medium.

The mounted diatom sample was scanned at 1000X (oil immersion) and all diatoms identified to species. The percent relative abundance of each diatom species was calculated when possible from a random count of 350-400 frustules. Statistical calculations were made using a Lotus program.

IV. RESULTS

A. Description of sampling stations

Elevation at the sampling stations is approximately 3500'. An average annual precipitation of 80-90 inches in the Cabinet Mountains provides runoff for the streams. Streamside vegetation is relatively dense at all stations and consists mostly of Douglas fir, grand fir, red cedar, lodgepole pine, subalpine fir and western larch with some cottonwood, alder and willow and a dense understory of shrubs and grasses.

With the exception of the Little Cherry Creek station, all sites are characterized by cool, clear water flowing over a boulder/cobble substrate. Physical features for each station during the three sampling periods are presented in Table 1.

The Little Cherry Creek station is located below an abandoned logging operation. Banks are steep and abundant sediment is contributed to the stream from the disturbance. Minimal flow of this little stream serves

Table 1. Physical features at the Montanore Project aquatic sampling stations, 1991.

	Air Temp. ^{°F}	Water Temp. ^{°F}	Width'(Mean')	Depth"(Mean")	Embeddedness
APRIL					
L10	30	39	15-25(20)	4-30(14)	5%
L9	34	42	20-35(20)	2-24(14)	15%
L3	43	42	15-35(25)	2-36(24)	10%
L1	43	43	60-75(68)	4-30(20)	10%
Ra2	52	42	20-35(25)	2-24(12)	7%
Po2	45	40	20-35(25)	4-24(16)	5%
LC1	42	40	6-20(10)	2-20(10)	30%
Be2	46	42	40-70(60)	2-10(6)	12%
AUGUST					
L10	72	50	20-30(25)	7-22(18)	1-5%
L9	70	50	20-30(25)	6-20(15)	1-5%
L3	49	52	20-40(25)	8-30(20)	1-5%
L1	64	58	60-75(65)	6-25(15)	1-5%
Ra2	58	52	20-35(25)	4-20(12)	1-5%
Po1	61	52	20-25(22)	4-20(15)	1-5%
LC1	65	53	2-6(3)	2-12(8)	30%
Be2	58	53	40-65(50)	6-20(12)	1-5%
OCTOBER					
L10	36	41	5-20(12)	3-22(10)	1-5%
L9	37	43	5-28(12)	4-24(14)	5%
L3	30	42	12-25(15)	6-20(15)	1-5%
L1	32	41	12-27(18)	6-18(14)	1-5%
Ra2	38	42	10-30(12)	4-22(15)	5%
Po1	35	41	4-15(9)	3-12(7)	1-5%
LC1	36	41	3-9(5)	2-10(6)	20%
Be2	38	42	8-18(10)	4-18(12)	1-5%

to accentuate the sediment impacts at the Little Cherry Creek station.

B. Macroinvertebrates

1. population composition and density

Table 2 lists the 81 macroinvertebrate taxa collected from the project area in 1991. Ten more taxa were collected in 1991 than in 1990. Total number of macroinvertebrates found at each station is presented in Appendix A for May, Appendix B for August and Appendix C for October.

Table 2. Aquatic macroinvertebrates collected from the Montanore Project area, 1991.

order	family	genus/species
EPHEMEROPTERA	Baetidae	<i>Baetis</i> sp.
	Ephemerellidae	<i>Caudatella hystrix</i> <i>Drunella coloradensis/</i> <i>flavilinea</i> <i>Drunella doddsi</i> <i>Drunella spinifera</i> <i>Ephemerella</i> sp. <i>Serratella</i> sp.
	Heptageniidae	<i>Cinygmulia</i> sp. <i>Epeorus</i> sp. <i>Heptagenia</i> sp. <i>Rhithrogena</i> sp. <i>Paraleptophlebia</i> sp. <i>Ameletus</i> sp.
	Leptophlebiidae	Immature
	Siphlonuridae	<i>Kathroperla perdita</i> <i>Sweltsa/Suwallia</i> sp. <i>Despaxia augusta</i> <i>Paraleuctra</i> sp. <i>Perlomyia utahensis</i> Immature
	Capniidae	<i>Nemoura</i> sp.
	Chloroperlidae	<i>Visoka cataractae</i> <i>Zapada cinctipes</i> <i>Zapada columbiana</i>
	Leuctridae	<i>Yoraperla brevis</i> <i>Doroneuria theodora</i> <i>Hesperoperla pacifica</i> Immature
	Nemouridae	<i>Isoperla</i> sp. <i>Megarcys</i> sp. <i>Setvena bradleyi</i> <i>Skwala</i> sp. Immature
	Peltoperlidae	<i>Taenionema</i> sp.
PLECOPTERA	Perlidae	
	Perlodidae	
	Taeniopterygidae	
	Brachycentridae	<i>Micrasema</i> sp.
	Glossosomatidae	<i>Anagapetus</i> sp. <i>Glossosoma</i> sp.
TRICHOPTERA	Hydropsychidae	<i>Arctopsyche grandis</i> <i>Parapsyche elsis</i>

Table 2. (cont.)

order	family	genus/species
	Hydroptilidae	Immature <i>Agraylea</i> sp. <i>Ochrotrichia</i> sp.
	Lepidostomatidae	<i>Lepidostoma</i> sp.
	Limnophilidae	<i>Ecclisomyia</i> sp. <i>Neothremma alicia</i> <i>Oligophlebodes</i> sp.
	Philopotamidae	Immature
	Rhyacophilidae	<i>Wormaldia</i> sp. <i>Rhyacophila Angelita</i> grp. <i>Rhyacophila Betteni</i> grp. <i>Rhyacophila Bifila/</i> <i>Coloradensis</i> grp. <i>Rhyacophila Brunnea</i> grp. <i>Rhyacophila Hyalinata</i> grp. <i>Rhyacophila Iranda</i> grp. <i>Rhyacophila Sibirica</i> grp. <i>Rhyacophila Vaccua</i> grp. <i>Rhyacophila vepulsa</i> <i>Rhyacophila verrula</i> <i>Rhyacophila</i> sp.
	Pupae	
ANNELIDA		
COLEOPTERA	Elmidae	<i>Heterlimnius</i> sp. <i>Lara</i> sp. <i>Narpus</i> sp. Immature
COLLEMBOLA		
DIPTERA	Blephariceridae	<i>Agathon</i> sp.
	Ceratopogonidae	
	Chironomidae	
	Empididae	<i>Oreogeton</i> sp.
	Simuliidae	
	Tipulidae	<i>Antocha</i> sp. <i>Dicranota</i> sp. <i>Hexatoma</i> sp. <i>Pedicia</i> sp. <i>Tipula</i> sp.
HYDRACARINA		
MOLLUSCA		
NEMATODA		
TURBELLARIA		

Annual totals of taxa for all sampling stations are listed in Appendix D. A total of 49,099 benthic organisms were collected with the 115 samples for a mean number of 427 organisms/sample. This total is about five times the number of organisms collected in 1990. The kick samples accounted for 24,586 (50%) of the organisms collected.

Mayflies (Ephemeroptera) were again the predominant group in the project area and made up 56.2% of the total organisms collected. *Rhithrogena* sp. was the most abundant mayfly (14.0%). Stoneflies (Plecoptera) accounted for 32.9% of the total. *Taenionema* sp. was the most abundant stonefly (20.8%). Caddisflies (Trichoptera) accounted for 6.9% of the total. Immature Hydropsychids were the most frequently found Trichopteran (3.1%). The Other category made up 4.0% of the total; chironomids were the most abundant Other organism and made up 2.1% of the total benthic organisms collected.

Seasonal occurrence of the four major groups of benthic organisms is presented in Table 3. Highest density of macroinvertebrates/station occurred in October at all stations. Mayflies were the dominant group at each station for each sampling period except in October at one Libby Creek station, L9, and at the Poorman, Ramsey and Bear Creek stations where stoneflies were the predominant group. The majority of those stoneflies were the winter stonefly, *Taenionema* sp. This shift in family dominance was most noticeable at the Libby Creek station, L9 where 64.1% of the organisms collected in October were *Taenionema* sp. At the other three stations, *Taenionema* sp. accounted for 46.4%, 31.3%,

Table 3. Seasonal composition of macroinvertebrates from the Montanore Project area, 1991.

Station	Total Organisms	Percent of Total			
		Ephemeroptera	Plecoptera	Trichoptera	Other
SPRING					
L10	823	69.3	14.6	2.8	13.4
L9	190	75.8	15.3	3.2	5.8
L3	669	76.7	14.4	0.6	8.4
L1	873	81.3	8.4	5.4	4.9
LC1*	167	70.7	20.4	4.2	4.8
Pol	669	65.5	25.6	3.3	5.7
Ra2	1261	72.7	15.0	2.7	9.5
Be2	<u>1365</u>	82.3	11.4	3.9	2.4
	6047				
SUMMER					
L10	1967	54.1	23.2	2.9	19.8
L9	1793	79.6	11.5	2.2	6.7
L3	2290	81.8	6.1	5.2	6.9
L1	2037	83.1	6.0	4.0	6.8
LC1*	580	43.8	32.2	15.3	8.6
Pol	2137	83.5	11.1	2.1	3.3
Ra2	1483	71.8	20.0	4.5	3.6
Be2	<u>2439</u>	82.5	12.6	2.4	2.5
	14726				
AUTUMN					
L10	3063	60.9	25.0	10.6	3.5
L9	4458	12.7	73.4	13.1	0.8
L3	3689	61.5	29.7	7.5	1.3
L1	4454	51.5	43.2	4.7	0.7
LC1	893	46.8	25.3	14.9	13.0
Pol	4869	34.0	55.4	9.8	0.9
Ra2	2722	41.2	47.3	9.5	2.0
Be2	<u>4178</u>	40.0	49.7	8.9	1.4
	28326				

*spring = 4 samples, summer = 1 kick sample

and 35.7% respectively of the total organisms collected (Figure 2).

In comparing data from the monitoring stations with the control station on upper Libby Creek (L10) and the reference station on Bear Creek (Be2), some differences and similarities are notable. A downstream increase in density of benthic populations on Libby Creek is to be expected under "normal" conditions. However, in spring and summer 1991 at L9 below the mine, populations were suppressed compared to L10, L3, L1, and Be2 but exceeded the densities at L3 and L1 in the fall (Table 4). Benthic densities at L9 were also suppressed, relative to those of L10 and Be2, during the summer and fall sampling periods in 1988 and during spring sampling, 1990.

The predominant organism in the spring of 1991 was the mayfly *Cinygmulida* sp. at the Libby Creek stations while *Baetis* sp. was the most abundant taxa in Bear Creek. In the summer, total numbers were more similar between the stations but the dominant organism varied from station to station with L3 and L1 being most similar. During the fall, total numbers increased substantially at L9 compared to L10 but were similar to total densities in Bear Creek even though there were half again as many *Taenionema* sp. at L9.

The lower Libby Creek stations and the Little Cherry, Poorman, and Ramsey Creek stations would be expected to, in general, reflect conditions at the reference station on Bear Creek. However, density of organisms was always lowest for the Little Cherry Creek samples.

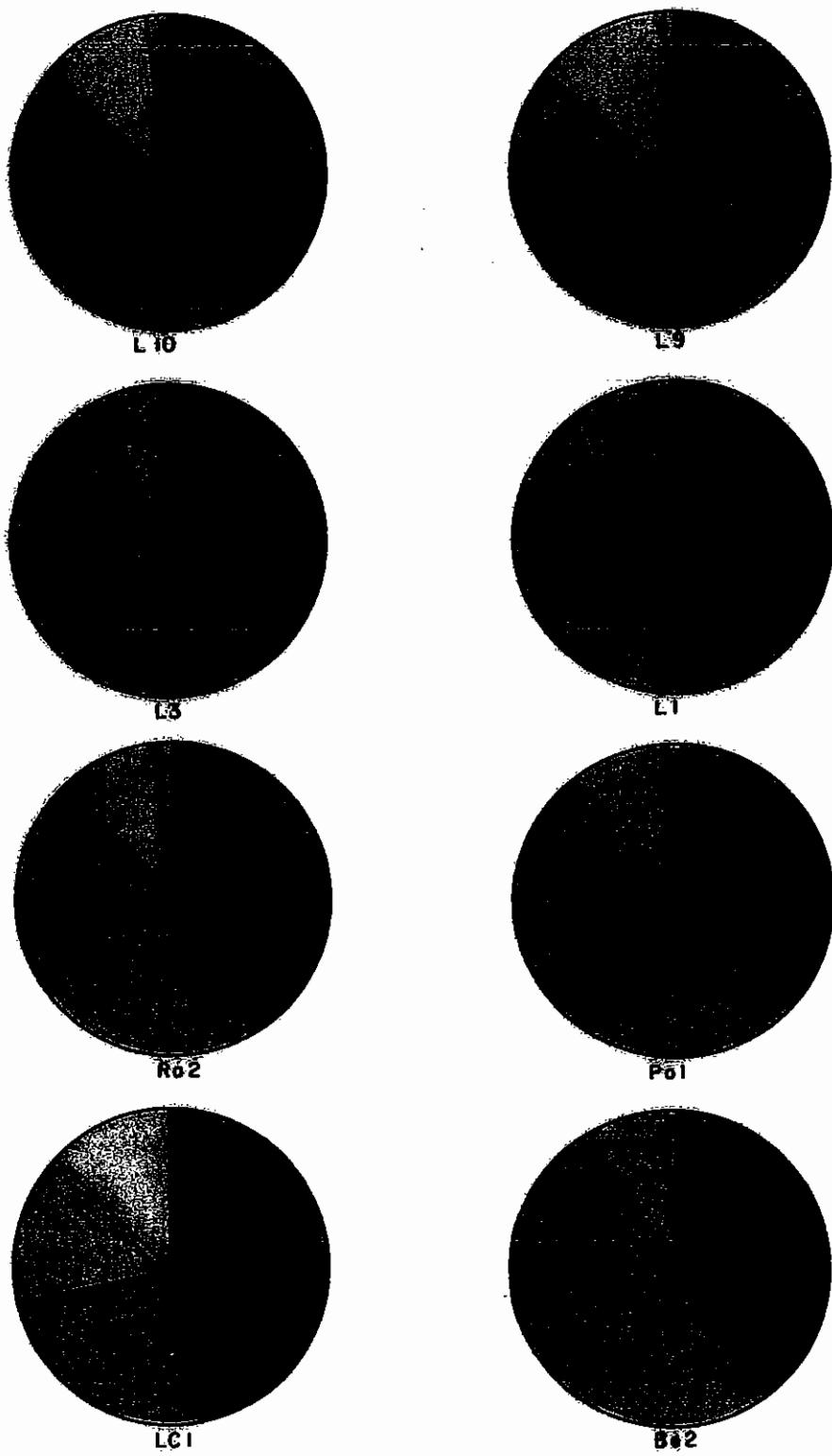


Figure 2. Relative abundance of benthos in the Montanore Project area, October 1991. (pink = Ephemeroptera, blue = Plecoptera, green = Trichoptera, yellow = Other)

Table 4. A comparison of benthic populations at station L9 below the Montanore Project mine on Libby Creek to control, reference and downstream stations.

STATION	PREDOMINANT TAXA	TOTAL NO.	% OF TOTAL
SPRING			
Libby Crk., L10 control station above mine	<i>Cinygmulia</i> sp. <i>Epeorus</i> sp. <i>Baetis</i> sp.	237 188 80	28.8 22.8 9.7
	total organisms =	823	
Libby Crk., L9 below mine	<i>Cinygmulia</i> sp. <i>Baetis</i> sp. <i>Epeorus</i> sp.	48 37 25	25.3 19.5 13.2
	total organisms =	190	
Libby Crk., L3 downstream of L9	<i>Cinygmulia</i> sp. <i>Epeorus</i> sp. <i>Baetis</i> sp.	207 137 72	30.9 20.5 10.8
	total organisms =	669	
Libby Crk., L1 downstream of L3	<i>Cinygmulia</i> sp. <i>Epeorus</i> sp. <i>Baetis</i> sp.	261 187 112	29.9 21.4 12.8
	total organisms =	873	
Bear Crk., Be2 reference station	<i>Baetis</i> sp. <i>Epeorus</i> sp. <i>Cinygmulia</i> sp.	331 310 295	24.2 22.7 21.6
	total organisms =	1365	
SUMMER			
L10	<i>Epeorus</i> sp. <i>Rhithrogena</i> sp. Chironomidae	420 373 284	21.4 19.0 14.4
	total organisms =	1967	
L9	<i>Rhithrogena</i> sp. <i>Epeorus</i> sp. <i>Drunella doddsi</i>	612 327 230	34.1 18.2 12.8
	total organisms =	1793	
L3	<i>Baetis</i> sp. <i>Rhithrogena</i> sp.	810 569	35.4 24.8
	total organisms =	2290	
L1	<i>Baetis</i> sp. <i>Rhithrogena</i> sp.	673 482	33.0 23.7
	total organisms =	2037	

Table 4 (continued)

STATION	PREDOMINANT TAXA	TOTAL NO.	% OF TOTAL
Be2	<i>Drumella doddsi</i>	657	26.9
	<i>Rhithrogena</i> sp.	618	25.3
	<i>Epeorus</i> sp.	591	24.2
total organisms = 2377			
AUTUMN			
L10	<i>Rhithrogena</i> sp.	597	19.5
	<i>Epeorus</i> sp.	455	14.9
	<i>Cinygmulia</i> sp.	451	14.7
	<i>Taenionema</i> sp.	309	10.1
total organisms = 3063			
L9	<i>Taenionema</i> sp.	2856	64.1
	<i>Epeorus</i> sp.	325	7.3
total organisms = 4458			
L3	<i>Cinygmulia</i> sp.	885	24.0
	<i>Taenionema</i> sp.	808	21.9
	<i>Baetis</i> sp.	742	20.1
total organisms = 3689			
L1	<i>Taenionema</i> sp.	1594	35.8
	<i>Cinygmulia</i> sp.	903	20.3
	<i>Baetis</i> sp.	635	14.3
	<i>Rhithrogena</i> sp.	517	11.6
total organisms = 4454			
Be2	<i>Taenionema</i> sp.	1492	35.7
	<i>Rhithrogena</i> sp.	611	14.6
	<i>Cinygmulia</i> sp.	464	11.1
total organisms = 4178			

Ramsey Creek had densities lower than the Bear Creek samples in the summer and fall but had similar densities in the spring. Poorman Creek was the noticeable exception in the spring with fewer organisms than those collected from Bear Creek but was similar to Bear Creek in the summer and fall.

The seasonal relative abundance of the most common benthic organisms collected in 1991 are listed in Table 5. The stonefly *Taenionema* sp. was the single most abundant organism in 1991 but only predominated during the fall sampling period. The mayflies *Rhithrogena* sp., *Baetis* sp., and *Epeorus* sp. were the most ubiquitous taxa appearing in 114, 112, and 103 of the 115 samples. *Cinygmulia* sp. was the most abundant spring organism, *Rhithrogena* sp. was the most frequently collected summer taxa and *Taenionema* sp. was the most abundant autumn species.

2. functional feeding groups

Benthic organisms collected from the project area were designated as one of five possible functional feeding groups: shredders which are large particle detritivores, scrapers which feed on periphyton, filtering collectors which feed on particles in suspension, gathering collectors which feed on deposited detritus and predators which feed upon other invertebrates (Table 6).

Scrapers accounted for 50% of the total organisms collected and predominated the populations at nearly every station each sampling period (Table 6). The exceptions were the prevalence of gathering

Table 5. Seasonal relative abundance of the most common benthic organisms in the Montanore Project area, 1991.

Taxa	Family	No.	% of Total	Samples*
SPRING				
<i>Cinygmulia</i> sp.	E	1499	24.8	39
<i>Epeorus</i> sp.	E	1225	20.3	39
<i>Baetis</i> sp.	E	1097	18.1	38
<i>Drunella colo./flav.</i>	E	325	5.4	28
<i>Sweltsa/Suwallia</i> sp.	P	301	5.0	33
<i>Rhithrogena</i> sp.	E	254	4.2	39
SUMMER				
<i>Rhithrogena</i> sp.	E	3624	24.6	36
<i>Baetis</i> sp.	E	2451	16.6	36
<i>Epeorus</i> sp.	E	2409	16.4	35
<i>Drunella doddsi</i>	E	2027	13.8	35
<i>Sweltsa/Suwallia</i> sp.	P	827	5.6	35
AUTUMN				
<i>Taenionema</i> sp.	P	10182	35.9	39
<i>Cinygmulia</i> sp.	E	3761	13.3	39
<i>Rhithrogena</i> sp.	E	2987	10.5	39
<i>Baetis</i> sp.	E	2693	9.5	38
<i>Epeorus</i> sp.	E	1302	4.6	29
Hydropsychidae	T	1301	4.6	36

*spring = 39 samples, summer = 36 samples, autumn = 40 samples
E = Ephemeroptera, P = Plecoptera, T = Trichoptera

Table 6. Relative numbers of functional feeding groups of macroinvertebrates in the Montanore Project area, 1991.

	STATIONS							
APRIL	L10	L9	L3	L1	LC1	Pol	Ra2	Be2
shredders	44	7	22	37	26	114	119	100
collectors/gatherers	165	70	125	152	42	170	383	392
collectors/filterers	5	0	4	38	5	6	78	16
scrapers	458	87	424	584	80	293	566	765
predators	102	23	45	46	14	70	90	79
others	49	3	49	16	0	16	145	13
totals	823	190	669	873	167	669	1291	1365
SUMMER								
shredders	153	83	47	19	132	114	137	123
collectors/gatherers	563	854	1445	1336	235	960	441	700
collectors/filterers	15	10	64	49	92	15	23	29
scrapers	580	572	456	383	36	841	640	1328
predators	122	170	172	119	79	77	202	211
others	534	104	106	131	9	130	40	48
totals	1967	1793	2290	2037	580	2137	1483	2439
AUTUMN								
shredders	212	265	134	170	84	235	180	310
collectors/gatherers	921	137	1187	1272	224	792	715	1038
collectors/filterers	130	413	90	173	0	349	133	121
scrapers	1264	3326	1946	2643	365	3180	1333	2249
predators	451	312	195	187	189	296	311	428
others	85	5	137	9	27	17	50	141
totals	3063	4458	3689	4454	893	4869	2722	4178

collectors at the three lower Libby Creek, Poorman Creek and Little Cherry Creek stations in summer. The stonefly, *Taenionema* sp., was the most abundant scraper and accounted for 21% of the total organisms collected.

The most abundant scraper in the spring samples was the mayfly *Cinygmulia* sp. except at the Ramsey and Bear Creek stations where the mayfly *Epeorus* sp. was the most abundant scraper.

In the summer samples the mayfly *Rhithrogena* sp. was the most abundant collector gatherer at the Libby Creek (L9) and the Poorman Creek stations. The mayfly *Baetis* sp. was most abundant at the other three stations predominated by collector gatherers. For the stations dominated by scrapers during the summer, the mayfly *Epeorus* sp. was the most prevalent at the upper Libby Creek station while the mayfly *Drunella doddsi* was dominant at the Ramsey and Bear Creek stations.

In the autumn samples, dominated by scrapers, the stonefly *Taenionema* sp. was the most abundant scraper at the Libby Creek stations, L9 and L1, and at the Poorman Creek, Ramsey Creek, and Bear Creek stations. The mayfly *Epeorus* sp. dominated scrapers at the upper Libby Creek station, L10 while the mayfly *Cinygmulia* sp. dominated at L3 and the Little Cherry Creek stations.

The most abundant shredder was the stonefly taxa *Zapada* sp. while *Sweltsa/Swallia* sp. was the most abundant predator. The most

frequently found collector/filterer was the Hydropsychid caddisflies.

3. diversity/pollution sensitivity values

The Shannon-Weaver Diversity Index (SDI) is presented for each station in Appendices A, B, and C. SDI's ranged from 2.2 at L9 in October to 3.8 at LC1 in October. Only five stations, Poorman Creek and Bear Creek in the summer and Libby Creek, L1 and L9 and Poorman Creek in the fall, had SDI's less than three. An SDI of less than three is considered indicative only of organic pollution and on streams larger than those in the project area and can be a deceiving metric on smaller, less nutrient rich streams like those of the project area (Platts, et al., 1983). For example, the high SDI of 3.8 was tabulated for Little Cherry Creek which yielded benthic populations much lower in diversity and density than the other stations in the project area.

The tolerance quotient (TQ) assigned by Winget et al. (1979) is presented with each taxa in the appendices. The number is used to generally classify organisms in the project area according to some degree of pollution intolerance. For example, the most abundant organisms in the project area were scrapers. The predominant scrapers, with TQ's ranging from 4-48, are somewhat more pollution sensitive than the next predominant group, the gathering collectors, many of which have a TQ of 72.

4. comparison of 1989-1991 data

Some minor changes in methodology and location of sampling stations

have occurred in the three years of aquatic monitoring for the Montanore project. Because of the extremely low numbers of organisms collected in 1990, even with the addition of two Hess samples, sampling methods were changed in 1991. Four Hess samples were again collected and the fifth sample was a timed kick sample. The kick net was used to sample substrate excluded by the Hess net and to increase sample size since more substrate/sample is examined with this method. Both net techniques were used because the Hess method is subject somewhat to less sampling variability and thus, may be relatively more quantitative. However, every effort was made to also standardize the kick net method and that data was also treated quantitatively.

A couple of the sampling stations, Libby Creek, L3 and Ramsey Creek, Ra2 were moved slightly in 1991 to avoid conflict with a private landowner. All other stations were sampled in the same places as in the previous years.

Table 7 presents a comparison of the data for the last three years. Seasonal data for 1989 is tabulated for summer and autumn 1988 and spring 1989. Seasonal samples for 1990 and 1991 were collected within the same year.

Though total numbers for the last three years cannot be strictly compared because of changes in collecting methods, the data do illustrate the extreme annual and seasonal variation of benthic populations. A number of differences during the three years are

Table 7. A comparison of some parameters from the 1988-1991 aquatic monitoring programs for the Montanore Project.

	1988-89*	1990	1991
net type/size	Hess 250 microns sieved-600 microns	Hess 500 microns	Hess & kick, 500 microns
samples/station	3	5	4 Hess, 1 kick
sample frequency	three seasons	three seasons	three seasons
annual totals	E = 4410(36%) P = 3669(30%) T = 1288(10%) O = 2990(24%)	E = 6115(64%) P = 2286(24%) T = 439(5%) O = 675(7%)	E = 27,592(56%) P = 16,166(33%) T = 3,383(7%) O = 1,958(4%)
	12,357	9,515	49,099
mean no./sample	spring = 241 summer = 252 autumn = 181 mean = 231	spring = 53 summer = 98 autumn = 142 mean = 100	spring = 155 summer = 409 autumn = 708 mean = 427
seasonal density	spring = 1645 summer = 1939 autumn = 1119	spring = 1602 summer = 2935 autumn = 4978	spring = 6,047 summer = 14,726 autumn = 28,326
seasonal mean no./sample	spring = 240 summer = 250 autumn = 180	spring = 53 summer = 99 autumn = 142	spring = 155 summer = 409 autumn = 708
season mean taxa richness	spring = 28 summer = 29 autumn = 24	spring = 19 summer = 27 autumn = 30	spring = 27 summer = 32 autumn = 36
EPT richness (total taxa)	E = 14 P = 21 T = 33	E = 15 P = 17 T = 22	E = 13 P = 22 T = 26
seasonal mean EPT richness	spring = 15 summer = 16 autumn = 17	spring = 17 summer = 22 autumn = 25	spring = 22 summer = 25 autumn = 30
dominant organism	sp.=Cinygmulia (44%) su.=Rhithrogena (21%) au.=Cinygmulia (55%)	sp.=Epeorus (27%) su.=Rhithrogena (20%) au.=Cinygmulia (31%)	sp.=Cinygmulia (25%) su.=Rhithrogena (25%) au.=Taenionema (35%)
annual EPT/C	L10 = 4.2 L9 = 4.8 L3 = 1.0 L1 = 3.3 LC1 = 2.5 Pol = 2.1 Ra2 = 1.9 Be2 = 4.8	L10 = 44.2 L9 = 32.7 L3 = 60.9 L1 = 20.5 LC1 = 40.1 Pol = 22.8 Ra2 = 48.3 Be2 = ---	L10 = 14.6 L9 = 84.8 L3 = 36.7 L1 = 54.2 LC1 = 47.3 Pol = 101.6 Ra2 = 42.8 Be2 = 104.4
mean Hilsenoff biotic index	2.3	3.1	3.0
mean SDI	3.7	2.8	3.2

*seasonal data was collected in summer and autumn, 1988 and spring 1989.

notable. The mean number of organisms per sample has changed significantly from 1988. Even without the kick samples in 1991, the number of organisms/sample was 269 compared to 100 in 1990 and 230 in 1989. Extreme flow events occurred in the fall of 1989 and spring of 1990. The scouring of the substrate left a minimal resident population of macroinvertebrates in spring 1990 (55 organisms/sample). The 1990 summer density of organisms (84/sample) did not quite double by the fall sampling period (142/sample) but increased this density slightly by spring 1991 (155/sample). This density was more than double by summer 1991 (409/sample) and nearly doubled again by the fall (708/sample). Diversity and abundance reached its peak for the three years in fall 1991 with 36 taxa and 427 organisms/sample being collected.

The trend has been that density and diversity increases throughout the year to peaks in autumn. This pattern occurred in 1990 and 1991 but was disrupted in the 1989 study when spring samples contained more organisms than the fall samples.

The shift in population composition during the three years of study is obvious. The ratio of Ephemeroptera-Plecoptera-Trichoptera to Chironomidae shifted dramatically from 1988 (1.0-4.8) to 1991 (14.6-104.4); very low numbers of chironomids were collected in 1990 and even fewer were collected in comparison to the other three orders in 1991. The Other category, consisting mostly of chironomids, accounted for 24%, 7% and 4% of the total organisms collected each of the three

years.

Table 8 compares seasonal percentages of the four major benthic groups for the last three years. Only twice in the last two years were chironomids noticeably present: in spring 1990 at the lower Libby Creek station, L1 and in summer 1991 at the upper Libby Creek station, L10. In 1991 mayflies were the predominant group at all stations each sampling period except in the fall when stoneflies were the most abundant organism at the Libby Creek station, L9, below the mine, and at the Poorman, Ramsey, and Bear Creek stations. In 1990 mayflies dominated throughout the year except at the Poorman Creek station in the fall. During the 1988-89 sampling year, mayflies were the dominant group at three of the stations in the spring, two of the stations in the summer and four of the stations in the fall. Chironomids dominated the benthic collections only during the baseline study and at four stations in the spring, two stations in the summer and one station in the fall. Caddisflies have never dominated benthic collections.

Table 9 compares the total annual percentage of several indicator (abundant) and/or marker (special notice) species for the three years. In general, as the total number of organisms increased so did the numbers of the individual taxa. Subtle shifts in population dynamics are illustrated by the variation in numbers of each taxa from station to station.

The mayfly *Baetis* sp. increased at all stations the last two years

Table 8. Seasonal comparison of the percentage of benthic orders* present in the Montanore Project area, 1988-1991.

1988-89	SPRING	SUMMER	AUTUMN
L10	36-25-2-37	31-31-16-22	45-40-10-5
L9	55-20-2-23	38-31-7-24	53-35-7-5
L3	39-19-4-38	19-15-6-60	46-32-13-9
L1	61-11-9-19	32-12-13-43	42-38-12-8
LC1	9-21-5-65	18-51-18-13	31-28-7-34
Po1	22-16-3-59	14-44-18-24	34-41-12-13
Ra2	33-15-4-48	22-36-7-35	41-34-20-5
Be2	36-25-3-36	27-29-17-27	28-49-17-6
1990			
L10	79-15-2-4	66-25-2-7	75-15-5-5
L9	68-23-1-8	69-16-4-11	48-37-5-10
L3	--	77-15-3-5	54-38-6-2
L1	48-10-3-39	83-9-4-4	74-18-6-2
LC1	66-19-2-13	--	62-19-10-9
Po1	73-12-2-13	78-13-4-5	31-65-3-1
Ra2	79-12-4-6	63-17-8-12	51-44-3-2
Be2	--	--	--
1991			
L10	69-15-3-13	54-23-3-20	61-25-11-3
L9	76-15-3-6	80-11-2-7	13-73-13-1
L3	77-14-1-8	82-6-5-7	62-30-7-1
L1	81-8-6-5	83-6-4-7	51-43-5-1
LC1	71-20-4-5	44-32-15-9	47-25-15-13
Po1	66-25-3-6	84-11-2-3	34-55-10-1
Ra2	73-15-3-10	72-20-5-4	41-47-10-2
Be2	82-11-4-2	83-13-2-3	40-50-9-1

*Ephemeroptera-Plecoptera-Trichoptera-Other

Table 9. Annual abundance (percentage of total organisms collected) of benthic indicator and/or marker species in the Montanore Project area.*

STATIONS

	L1.0	L9	L3	L1	Ra2	Po1	LC1	Be2
Baetis sp.	8-13-7	2-6-4	5-14-25	3-22-19	8-12-13	4-12-11	3-27-16	5-nn-10
Drunella doddsii	<1-2-3	1-6-5	3-10-5	<1-2-3	2-5-8	<1-9-8	<1-<1-1	2-nn-9
Cinygmulia sp.	16-26-12	20-29-1	8-24-17	20-29-17	11-28-11	8-10-8	10-26-24	11-nn-10
Epeorus sp.	2-9-19	9-6-11	4-3-6	5-5-6	6-8-13	5-18-10	<1-5-1	4-nn-13
Rhithrogena sp.	6-17-18	12-10-12	4-13-15	8-14-14	3-6-17	3-5-14	<1-<1-5	7-nn-16
Sialis/Suwallia sp.	20-12-9	16-8-2	12-9-3	9-5-3	11-8-8	13-3-3	13-7-10	14-nn-5
Doroneuriia theodora	<1-0-<1	1-<1-<1	<1-1-<1	<1-<1-<1	<1-<1-<1	0-<1-1	<1-nn-<1	
Taenionema sp.	0-1-6	3-15-45	1-16-13	<1-6-22	0-19-16	0-24-30	0-1-<1	0-nn-19
Arctopsyche grandis	0-1-0	<1-<1-0	1-<1-<1	<1-2-<1	<1-1-0	0-<1-0	0-2-0	0-nn-0
Rhyacophila sp.	4-1-4	2-3-2	1-<1-<1	<1-1-<1	5-2-2	<1-<1-2	2-2-5	8-nn-2

*First number = 1989, second number = 1990, third number = 1991

#Chloroperlinea in 1989

except at L10 and L9. The percentage of *Drunella doddsi* has changed slightly. The percentage of *Cinygmulia* sp. has decreased at every station after reaching its peak in 1990. The abundance of *Epeorus* sp. has increased at all stations except those on Poorman and Little Cherry Creeks. *Rhithrogena* sp. increased at all stations. The predaceous stonefly, *Sweltsa/Suwallaia* sp., has shown a slight decrease. The rare stonefly, *Doroneuria theodora*, and the rare caddisfly, *Arctopsyche grandis*, have remained about the same in abundance. The relative percentage of the stonefly *Taenionema* sp. has increased noticeably at all stations except for Little Cherry Creek.

5. statistical evaluation of the 1991 data

The mean, standard deviation, coefficient of variation and percent standard error of the mean for each station are presented in the data sheets in the appendices. The percent standard error of the mean, which indicates the variation from the sample mean, was within the recommended 20% for all sample sets. The coefficient of variation, which indicates whether sample variability is within an acceptable range, was under the recommended 50% for all sample sets.

C. Periphyton

1. non-diatom algae

A total of 24 genera of non-diatom algae were identified in periphyton samples collected from the Montanore Project area in 1991 (Table 10). The estimated relative abundance values for all non-diatom genera at the eight monitoring sites in May, August and October are listed in

Table 10. Genera of non-diatom algae identified in periphyton samples collected at monitoring stations in the Montanore Project area, 1991.

Division Chlorophyta	Order Chamaesiphonales
Order Tetrasporales	Family Chamaesiphonaceae
Family Tetrasporaceae	<i>Chamaesiphon</i>
<i>Tetraspora</i>	
Order Chlorococcales	Order Oscillatoriales
Family Chlorococcaceae	Family Oscillatoriaceae
<i>Characium</i>	<i>Oscillatoria</i>
Family Scenedesmaceae	<i>Phormidium</i>
<i>Scenedesmus</i>	
Family Ulotrichales	Order Nostocales
<i>Ulothrix</i>	Family Nostocaceae
Family Microsporaceae	<i>Nostoc</i>
<i>Microspora</i>	Family Scytonemataceae
Family Cylindrocapsaceae	<i>Microchaete</i>
<i>Cylindrocapsa</i>	<i>Tolypothrix</i>
Order Ulvales	Family Rivulariaceae
Family Ulvaceae	<i>Calothrix</i>
<i>Monostroma</i>	
Order Chaetophorales	
Family Chaetophoraceae	
<i>Draparnaldia</i>	
<i>Stigeoclonium</i>	
Order Zygnematales	
Family Zygnemataceae	
<i>Mougeotia</i>	
<i>Spirogyra</i>	
<i>Zygema</i>	
Family Desmidiaceae	
<i>Closterium</i>	
<i>Comarium</i>	
<i>Staurastrum</i>	
Division Chrysophyta	
Order Chromulinales	
Family Hydruraceae	
<i>Hydrurus</i>	
Division Rhodophyta	
Order Nemalionales	
Family Chantransiaceae	
<i>Audouinella</i>	
Division Cyanophyta	
Order Chroococcales	
Family Chroococcaceae	
<i>Aphanocapsa</i>	

Tables 6-11 in Appendix E. The dominant non-diatom algae at each site for the three monitoring periods are listed in Table 11.

In May, no algae were found at the Little Cherry Creek station (LC1), while only one genus was present in significant numbers at each of Libby Creek sites L10 and L3. The single taxon found at L3 was *Hydrurus foetidus*, a form that is typically found in cold mountain streams in the spring of the year. This form was also abundant at the Ramsey Creek (Ra2), Poorman Creek (Po1) and Bear Creek (Be2) locations, but was not found at the other Libby Creek sites in May. Both Ramsey Creek and Poorman Creek enter Libby Creek a short distance upstream of L3, and the tributaries probably had an influence on water quality that favored the growth of *H. foetidus* at that site.

All three of the dominant genera found at site L9 in May were blue-green algae, as was the lone taxon found at L10. The blue-green alga *Oscillatoria*, a cosmopolitan genus with a broad amplitude of environmental preferences, was consistently dominant in both August and October at all sites except L10 and LC1. The green alga *Zygnema* was strongly dominant in August and October at stations L10 and L3, but was conspicuously absent from L9 and L1. This genus is most often found in Montana in cold, nutrient-poor waters, and its absence may reflect the presence of elevated nutrients at sites L9 and L1. The green alga *Ulothrix* responds favorably to elevated nutrient levels and, while present at all Libby Creek sites in October, was strongly dominant only at site L9.

Table 11. Dominant non-diatom algae (common or greater in estimated relative abundance) for monitoring stations in the Montanore Project area, 1991. (C=common; VC=very common; A=abundant; VA=very abundant.)

GENERA	STATION											
	L10			L9			L3			L1		
	MAY	AUG	OCT	MAY	AUG	OCT	MAY	AUG	OCT	MAY	AUG	OCT
<u>Bacillariophyta (diatoms)</u>												
All genera collectively		C		C	C				VC	C	C	VA
<u>Chlorophyta (green algae)</u>												
<i>Cosmarium</i>									C			
<i>Cylindrocapsa</i>							VC					
<i>Draparnaldia</i>										VC		
<i>Monostroma</i>										A		
<i>Hougeotia</i>										C		
<i>Spirogyra</i>										C		
<i>Staurastrum</i>							C			C		
<i>Stigeoclonium</i>											C	VC
<i>Ulothrix</i>	C	C					VA			VC	C	C
<i>Zygnea</i>	A	VA						VA	VA			
<u>Chrysophyta (yellow-green algae)</u>												
<i>Hydrurus</i>		C					A					
<u>Cyanophyta (blue-green algae)</u>												
<i>Aphanocapsa</i>	C	VC		VC	C	C		C			C	
<i>Oscillatoria</i>		VA			VA	VC		VC	VA	VA	VA	VA
<i>Phormidium</i>	C		VA	VC								
<i>Tolyphothrix</i>		C										

	Ra2			Po1			LC1			Be2		
	MAY	AUG	OCT	MAY	AUG	OCT	MAY*	AUG	OCT	MAY	AUG	OCT
<u>Bacillariophyta (diatoms)</u>												
All genera collectively	VC	VC	C	C	C			C	C	VC	VC	VC
<u>Chlorophyta (green algae)</u>												
<i>Draparnaldia</i>			VC									
<i>Nicrospora</i>										A		
<i>Hougeotia</i>										C		
<i>Spirogyra</i>										C		
<i>Tetraspora</i>	A								A			
<i>Ulothrix</i>									C			
<i>Zygnea</i>		A	VC		C							
<u>Chrysophyta (yellow-green algae)</u>												
<i>Hydrurus</i>	A		A						A			
<u>Cyanophyta (blue-green algae)</u>												
<i>Aphanocapsa</i>	C			VC	VC				C	C	C	
<i>Chamaesiphon</i>			VC					VC				A
<i>Microchaete</i>								C				
<i>Oscillatoria</i>	VA	VA		VA	VA					VA	VA	
<i>Phormidium</i>						C						
<i>Tolyphothrix</i>							VC					

*No algae seen after extensive scan of sample.

On any sampling date, the four Libby Creek sites had no more than two dominant non-diatom taxa in common, and any two Libby Creek sites had no more than three taxa in common. Over the three sampling events, only three dominant genera occurred at all Libby Creek locations, with one to seven total taxa found at any one site. The general trend was for an increase in the number of genera of green algae present with increased distance downstream from site L10, along with a corresponding decrease in the number of blue-green genera. The four tributary sites had no dominant non-diatom genera in common on any given date, and no two tributary sites had more than two genera in common. None of the dominant genera were present at all four tributary sites when all three sampling events were considered together, with zero to five total taxa found at any one site. The dominant taxa from Ramsey Creek, Poorman Creek and Little Cherry Creek most closely resembled those of Libby Creek site L3, and to a lesser extent site L10. Bear Creek did not have a single genus of green algae present, but shared blue-green taxa with all of the Libby Creek locations.

The non-diatom floras from streams in the Montanore Project area, while somewhat similar to one another, do reflect differences in water quality and/or physical environment between sites and drainages. These may be due to natural factors (i.e. seasonality, geology, stream order, or stream gradient) as well as anthropogenic impacts such as sedimentation from road building, mining, and logging.

2. diatom algae

The estimated abundance of diatoms (all genera considered collectively) at the eight monitoring sites in May, August, and October are listed in Appendix E. This estimate compares the number of diatom algae relative to non-diatom algae. Diatoms ranked as a "dominant algae" (common or greater in estimated relative abundance) in 17 of the 24 samples (Table 11).

A total of 109 species of diatom algae belonging to 27 genera were identified in periphyton samples collected in the Montanore Project area in 1991 (Table 12). All diatom species present at each of the monitoring locations in May, August and October are listed in tables 12-17 in Appendix F, along with proportional count results and percent relative abundance values for each species. With the exception of sites L10, L3, and LC1 in May, all of the samples had sufficient diatoms present to allow for at least a truncated version of the standard proportional count of 350-400 frustules. The dominant diatom species, defined as those having a relative abundance of 3.0% or greater, are listed in Table 13 for each site and monitoring period. Community structure parameters (species richness, PRA dominant taxon, and Shannon diversity) are listed in Table 14.

In May, diatoms were estimated as common or greater in abundance relative to non-diatom algae at three of four tributary stations, but were common or greater at only one Libby Creek station, site L1 (Table 11). Diatom numbers were too low to count at sites L10, L3 and LC1 in

Table 12. Diatom algae (Division Chrysophyta: Sub-phylum Bacillariophyceae) identified in periphyton samples collected at monitoring stations in the Montanore Project area, 1991.

Order Centrales		
	<u>Aulacoseira alpigena</u>	
Order Pennales		
Family Fragilariaceae		
	<u>Diatoma anceps</u>	<u>Pinnularia divergentissima</u>
	<u>D. mesodon</u>	<u>P. interrupta</u>
	<u>Fragilaria brevistriata</u>	<u>P. microstauron</u>
	<u>F. capucina</u>	<u>P. subcapitata</u>
	<u>F. construens</u>	<u>P. viridis</u>
	<u>F. leptostauron</u>	<u>Stauroneis alpina</u>
	<u>F. ulna</u>	<u>S. anceps</u>
	<u>Hannaea arcus</u>	Family Bacillariaceae
	<u>Meridion circulare</u>	<u>Hantzschia amphioxys</u>
	<u>Tabellaria flocculosa</u>	<u>Nitzschia acidoclinata</u>
Family Eunotiaceae		<u>N. dissipata</u>
	<u>Eunotia arcus</u>	<u>N. graciliformis</u>
	<u>E. bilunaris</u>	<u>N. gracilis</u>
	<u>E. exigua</u>	<u>N. hantzschiana</u>
	<u>E. intermedia</u>	<u>N. inconspicua</u>
	<u>E. minor</u>	<u>N. linearis</u>
	<u>E. musicola</u>	<u>N. palea</u>
	<u>E. paludosa</u>	<u>N. paleacea</u>
	<u>E. praerupta</u>	<u>N. pumila</u>
	<u>E. subarcuatoides</u>	<u>N. pura</u>
Family Achnanthaceae		<u>N. recta</u>
	<u>Achnanthes clevei</u>	<u>N. vermicularis</u>
	<u>A. deflexa</u>	Family Epithemiaceae
	<u>A. lanceolata</u>	<u>Denticula tenuis</u>
	<u>A. lapponica</u>	<u>Epithemia adnata</u>
	<u>A. linearis</u>	
	<u>A. marginulata</u>	
	<u>A. minutissima</u>	
	<u>A. species 1</u>	
	<u>A. species 2</u>	
	<u>A. subatomoides</u>	
	<u>A. subrostrata</u>	
	<u>Coccconeis placentula</u>	
Family Naviculaceae		
	<u>Amphipleura pellucida</u>	
	<u>Amphora pediculus</u>	
	<u>Anomoeoneis vitrea</u>	
	<u>Caloneis bacillum</u>	
	<u>Cymbella affinis</u>	
	<u>C. amphicephala</u>	
	<u>C. cesatii</u>	
	<u>C. cistula</u>	
	<u>C. gracilis</u>	
	<u>C. hebridica</u>	
	<u>C. mesiana</u>	
	<u>C. microcephala</u>	
	<u>C. minuta</u>	
	<u>C. naviculiformis</u>	
	<u>C. reinhardtii</u>	
	<u>C. silesiaca</u>	
	<u>C. sinuata</u>	
	<u>Diatomella balfouriana</u>	
	<u>Didymosphenia geminata</u>	
	<u>Diploneis elliptica</u>	
	<u>Frustulia rhomboides</u>	
	<u>F. vulgaris</u>	
	<u>Gomphonema angustatum</u>	
	<u>G. angustum</u>	
	<u>G. clavatum</u>	
	<u>G. clevei</u>	
	<u>G. minutum</u>	
	<u>G. olivaceum</u>	
	<u>G. parvulum</u>	
	<u>G. subtile</u>	
	<u>Navicula accomoda</u>	
	<u>N. angusta</u>	
	<u>N. arvensis</u>	
	<u>N. atomus</u>	
	<u>N. bacilloides</u>	
	<u>N. bryophilla</u>	
	<u>N. coccconeiformis</u>	
	<u>N. contenta</u>	
	<u>N. cryptocephala</u>	
	<u>N. cryptotenella</u>	
	<u>N. gallica</u>	
	<u>N. gastrum</u>	
	<u>N. heimansi</u>	
	<u>N. minima</u>	
	<u>N. minuscula</u>	
	<u>N. mutica</u>	
	<u>N. radiosa</u>	
	<u>N. recens</u>	
	<u>N. seminulum</u>	
	<u>N. species 1</u>	
	<u>N. species 2</u>	
	<u>N. tenelloides</u>	
	<u>Neidium affine</u>	
	<u>N. bisulcatum</u>	

Table 13. Dominant taxa (percent relative abundance 3.0 or greater) and corresponding PRA values at monitoring stations in the Montanore Project area, 1991.

SPECIES	STATION											
	L10			L9			L3			L1		
	MAY*	AUG	OCT	MAY	AUG	OCT	MAY*	AUG	OCT	MAY	AUG	OCT
<i>Achnanthes deflexa</i>												7.2
<i>A. linearis</i>					4.8	3.9						
<i>A. minutissima</i>	8.3	16.7	16.9	14.8	8.2		81.5	62.3	46.6	79.5	79.5	
<i>A. species 1</i>	3.6	11.6		4.2	4.1							
<i>Cymbella cistula</i>												3.5
<i>C. minuta</i>										7.8	7.3	
<i>C. silesiaca</i>	3.6	3.0				3.3			5.1	5.8		
<i>Diatoma anceps</i>	6.0				4.2							
<i>D. mesodon</i>	40.5	16.7	49.7	33.2	20.4					3.3		
<i>Eunotia minor</i>			9.4			4.1						
<i>E. musicola</i>					3.4	4.1						
<i>E. paludosa</i>	6.0				7.0	9.8						
<i>E. subarcuatooides</i>	7.1	8.9	4.8	10.6	35.9							
<i>Fragilaria capucina</i>	14.3	4.8	7.0	9.5			5.9	10.0		3.3		
<i>F. ulna</i>										8.3		
<i>Gomphonema angustatum</i>										10.0		
<i>G. clavatum</i>				3.2								
<i>G. olivaceum</i>										13.5		
<i>G. parvulum</i>			8.1									
<i>Hannaea arcus</i>									4.3	3.0		
<i>Meridion circulare</i>	3.6	12.6							5.0			

	Ra2			Po1			Lc1			Be2		
	MAY	AUG	OCT	MAY	AUG	OCT	MAY*	AUG	OCT	MAY	AUG	OCT
<i>Achnanthes deflexa</i>										4.5		
<i>A. lanceolata</i>									11.6			
<i>A. minutissima</i>	79.4	22.0	63.1	13.9	76.8	49.4		9.1	10.7	25.4	46.0	57.9
<i>aulacoseira alpigena</i>	7.8	3.9										
<i>Cocconeis placentula</i>								5.0	18.5		12.6	
<i>Cymbella minuta</i>						19.9						
<i>C. silesiaca</i>						4.0				5.9		
<i>C. sinuata</i>					3.2					4.3	3.0	
<i>Diatoma mesodon</i>	13.2	26.4	17.7	75.1	3.2	6.1					12.9	
<i>Eunotia minor</i>	11.7								6.1			
<i>E. musicola</i>	5.4											
<i>E. subarcuatooides</i>	6.0											
<i>Fragilaria capucina</i>	7.8				4.0		8.0	30.7		6.9	3.5	
<i>Gomphonema angustatum</i>									27.4	8.2		
<i>G. angustum</i>							28.1	5.6				
<i>G. minutum</i>							7.5					
<i>G. olivaceum</i>									45.0	4.8		
<i>Hannaea arcus</i>				6.0	7.7	9.8						
<i>Meridion circulare</i>	3.9											
<i>Navicula cryptotenella</i>							4.5					
<i>Nitzschia dissipata</i>							4.5	5.1				
<i>N. paleacea</i>							3.5					

*Extremely sparse sample; diatom frustules too few to count.

Table 14. Comparison of diatom community structure parameters for monitoring stations in the Montanore Project area, 1991.
(PRA = percent relative abundance.)

	STATION							
	L10	L9	L3	L1	Ra2	Po1	LC1	Be2
MAY								
Species Richness	0	21	0	12	11	9	0	5
PRA Dominant Taxon	-	49.72	-	46.62	79.35	75.12	-	45.02
Shannon Diversity	-	2.66	-	2.57	1.14	1.26	-	1.64
AUGUST								
Species Richness	14	21	15	14	19	15	23	26
PRA Dominant Taxon	40.48	33.24	81.45	79.49	26.42	76.80	28.14	46.01
Shannon Diversity	2.93	3.22	1.30	1.41	3.17	1.47	3.62	3.13
OCTOBER								
Species Richness	17	21	17	14	16	17	31	17
PRA Dominant Taxon	16.67*	35.87	62.29	79.46	63.08	49.37	30.71	57.93
Shannon Diversity	3.39	3.03	2.03	1.36	1.99	2.37	3.49	2.17

* two taxa codominant

May, due to either poor conditions for diatom growth or sampling error. Diatoms at site L9 were rare relative to non-diatom algae. The dominant diatom taxon at site L9 was *Diatoma mesodon*, a species that prefers cold water low in dissolved solids, with low to moderate levels of inorganic nutrients. At site L1, the dominant species in May (as well as in August and October) was *Achnanthes minutissima*, an attached form that is sensitive to organic pollution and suspended sediment. *A. minutissima* is a cosmopolitan species with a broad ecological amplitude, but in general indicates good water quality. Shannon diversity values and PRA of the dominant taxon at L9 and L1 were similar in May (Table 14) and suggest that diatom communities at both sites were under slight stress, possibly related to seasonal factors. Species richness at L9 was nearly twice that seen at L1 (21 vs. 12), indicating much more favorable conditions for diatom growth at L9.

A. minutissima and *D. mesodon* were the dominant species in May at tributary sites Ra2 and Pol, respectively. The dominant species at site Be2 was *Gomphonema olivaceum*, a pollution sensitive form that prefers cool water and low to moderate levels of dissolved solids. Shannon diversity values at sites Ra2, Pol and Be2 were very low, a function of the low species richness and/or high PRA of the dominant taxon at each site. While these metrics seem to indicate degraded water quality at these locations, they are more probably the result of seasonal stress, since the dominant diatom species are forms which are intolerant of pollution.

In August, diatoms were estimated as common or greater in abundance relative to non-diatom algae at two of the four Libby Creek sites and at all four of the tributary sites (Table 11). The dominant diatom taxon at sites L9, L10, and Ra2 was *D. mesodon*, while the dominant taxon at sites L3, L1, Pol, and Be2 was *A. minutissima*. The Shannon diversity values at three of the four sites where *A. minutissima* was the dominant taxon (L3, L1, Pol) were less than 1.50 (Table 14), due to relative abundance values of greater than 75% at those sites. The species richness values were also the lowest at these sites. These community structure parameters indicate that there was some degree of environmental stress that apparently favored the predominance of *A. minutissima*. In contrast, the fourth site where *A. minutissima* was dominant (Be2) had a high Shannon diversity value and a very high species richness. This site apparently was healthier than the other three sites.

The Shannon diversity values in August at the sites where *D. mesodon* was dominant were much higher, ranging from 2.93 to 3.22, due to lower relative abundance values that ranged from 26% to 41%. The species richness values were also generally higher at these sites. The algal communities at sites L10, L9, and Ra2 thus appear to have been under considerably less environmental stress than at sites L3, L1 and Pol. The dominant species at site LC1 in August was *Gomphonema angustum* with a PRA value of 28.14; *G. angustum* is a pollution sensitive form preferring low nutrient levels. The population at this site was quite diverse with a Shannon diversity value of 3.64 and a species richness

value of 23, indicating good quality water.

In October, diatoms were estimated as common or greater in abundance relative to non-diatom algae at all Libby Creek and all tributary sites except site Pol (Table 11). *A. minutissima* was dominant at sites L3, L1, Ra2, Pol, and Be2, and was codominant with *D. mesodon* at site L10 (Table 13). With the exception of site L10, the Shannon diversity values at these sites were relatively low, ranging from 1.36 to 2.37 (Table 5), indicating somewhat degraded water quality. In contrast, site L10 had a very high Shannon diversity value and a relatively high species richness, indicating very good water quality. At site L9, the dominant taxon was *Eunotia subarcuataoides* (Table 13), which is a pollution sensitive form preferring low levels of nutrients and dissolved solids. Shannon diversity and species richness were relatively high, indicating good water quality at site L9. At site LC1, the dominant taxon was *Fragilaria capucina* which is tolerant of moderate levels of nutrients and dissolved solids. A Shannon diversity value of 3.49 and a species richness of 31 (Table 14) at this site indicate a very healthy diatom assemblage.

V. DISCUSSION/CONCLUSIONS

The only irrefutable statement to be made about benthic populations in the Montanore Project area is that they can be extremely variable from year to year, season to season, and station to station. Stream benthos in the Montanore Project area is populated by taxa able to persist

while confronted with a limited food supply and environmental vagaries. Potentially extreme environmental diversity sets the stage for opportunistic responses by biota when abiotic factors such as nutrient loading and stream flows, are less limiting. Density, diversity and imbalance between taxa of benthic populations in the Montanore Project area increased to their highest levels in 1991 and thereby further illustrating the range of annual variation possible in these stream communities.

A number of factors accounted for the greater density and diversity of benthic taxa in 1991. Sampling methods were improved to collect a larger representative portion of the benthos thus elucidating population structure more clearly. The annual flow regime was more "normal" in 1991 with less dramatic scouring events which permitted maintenance of higher resident populations in the spring. In addition, nutrient loading to Libby Creek via mining operations accentuated population shifts. And finally, water levels were lowest in fall 1991 than any other collecting period and at some stations the sampleable area was reduced to nearly half, concentrating abundant populations even more.

Mayflies again dominated the benthic collections in 1991 and even exceeded relative abundance for the two previous years. The most frequently collected mayfly was *Rhithrogena* sp., a fairly pollution intolerant collector/gatherer. The highest density of organisms again occurred in the autumn populations at which time four of the stations

were dominated by stoneflies, in particular *Taenionema* sp., the single most abundant macroinvertebrate in the project area in 1991. This fall shift in family dominance was most noticeable at L9 which had the highest density of organisms compared to all the other stations. Periphyton also increased at L9 providing an abundant food supply for the scraper, *Taenionema* sp. By contrast, L9 showed suppressed benthic populations in the spring and summer of 1991. Similar noticeable diminishment of benthic abundance occurred in spring 1990 and in the summer and fall 1988. Predominant organisms in the spring and summer at the reference and control stations are pollution sensitive (TQ = 4-21) mayflies which seem to have responded negatively to nutrient loads at L9. However, periphyton populations increased and provided an abundant food supply for the more pollution tolerant (TQ = 48) winter stonefly *Taenionema* sp. which has been increasing in abundance in the project area for the three years of study.

Scrapers were again the most abundant feeding group of organisms in the project area in 1991. The most pollution sensitive scraper, *Drunella doddsi* (TQ = 4), occurred 5.7% of the time. Other abundant scrapers included the mayflies (TQ = 21) *Epeorus* sp. (10.1%) and *Cinygmulia* sp. (11.3%) and the stonefly *Taenionema* sp. (TQ = 48, 20.8%). These four taxa accounted for 48% of the organisms collected in 1991.

In addition to the structure of benthic populations heavily in favor of pollution sensitive mayflies, except in the fall, the other noticeable shift from previous years has been in the EPT/C ratio. In relative

comparison to the baseline study, virtually no chironomids were collected in 1991. The periodic flow spates and pristine nature of streams in the project area are not conducive to large, permanent dipteran populations.

Little Cherry Creek was obviously being detrimentally affected by sediment runoff from an abandoned logging operation as evidenced by the low numbers of organisms collected and embeddedness estimates at the time of sampling. That this station had the highest Shannon Diversity Index and high taxa richness in the fall, illustrates the limits of this index on streams in the project area and the initial positive effects sediment loading can have in a nutrient poor system. The low density of benthic organisms at this station suggests tolerance levels by some of the taxa are being reached or exceeded.

The variation in density of indicator and marker species was again documented. Population changes accompanied the expected interannual variation. The most abundant pollution tolerant (TQ =72) organism collected in 1991 was the mayfly *Baetis* sp. which accounted for 12.7% of the total collection. Relative abundance of this cosmopolitan taxa is a reflection of its range of adaptability rather than indication of the presence of detrimental abiotic factors in the aquatic systems. The majority of the rest of the organisms collected were more pollution sensitive with TQ's ranging from 4-48.

For the four Libby Creek sites in 1991, diatom diversity and species

richness were greatest at site L9. In May, diatom algae were either nonexistent or had very low species richness values at all monitoring sites except Libby Creek site L9. Conditions at L9 were apparently enriched and were unusually favorable for diatom growth, probably due to contributions of inorganic nitrogen in water that originated from the Montanore Project exploratory adit. The low species richness at all other Libby Creek and tributary sites in May was probably due to inadequate recovery time following harsh winter and early spring conditions, coupled with naturally low nutrient conditions.

During August and October, diatom community structure indicated the poorest water quality was at sites L1 and L3. Water quality became progressively worse with distance downstream from site L9 over these sampling periods.

Species richness and diversity in the Libby Creek tributaries were highly variable, with the highest values occurring in Little Cherry Creek. In general, the water quality at tributary sites was better than at sites L3 and L1 but poorer than at sites L10 and L9.

Although site L9 appeared to be enriched, it was apparently not adversely impacted by this enrichment, as evidenced by the presence of pollution sensitive diatoms and insects. Dominant benthic taxa found at all monitoring sites were pollution sensitive forms, indicating generally good water quality throughout the project area.

VI. FUTURE MONITORING NEEDS

Noranda is intending to continue aquatic biological monitoring again in 1992 using methods and stations similar to the 1991 study.

VII. MACROINVERTEBRATE REFERENCES

- Chen-Northern, Inc. 1991-92. Personal communication with Pat Hettinger, Terry Grotbo and Tom Grady.
- Cummins, K.W. and M.J. Klug. 1979. Feeding ecology of stream invertebrates. *Ann. Rev. Ecol. Syst.* 10:147-172.
- Farmer, C.E. and P.J. Farmer. 1989. Rock Creek project aquatic macroinvertebrate study, 1988. Westech Tech. Rpt., Helena, Mt.
- Farmer, C.E. 1991. Montanore Project. Aquatic macroinvertebrate monitoring study, 1990. Westech Tech. Rpt., Helena, MT.
- Farmer, C.E. 1992. Montanore Project. An assessment of benthic communities in response to nutrient enrichment due to mining activities. Preliminary report, 1991. Westech Tech. Rpt., Helena, Mt.
- Pennak, R.W. 1978. Fresh-water Invertebrates of the United States. John Wiley and Sons, New York.
- Pennak, R.W. 1989. Fresh-water Invertebrates of the United States. Protozoa to Mollusca. John Wiley and Sons, New York.
- Plafkin, J.L., M.T. Barbour, K.D. Porter, S.K. Gross and R.M. Hughes. 1989. Rapid bioassessment protocols for use in streams and rivers. EPA/444/4-89-001.
- Platts, W.S., W.F. Megahan and G.W. Minshall. 1983. Methods for evaluating stream, riparian, and biotic conditions. USFS Gen. Tech. Rpt. INT-138.
- Resh, V.H. and D.M. Rosenberg. 1984. The Ecology of Aquatic Insects. Praeger Special Studies, New York.
- Stewart, K.W. and B.P. Stark. 1988. Nymphs of North American Stonefly Genera (Plecoptera). Thomas Say Found. Vol. XII.
- Thorp, J.H. and A.P. Covich. 1991. Ecology and Classification of

North American Freshwater Invertebrates. Academic Press, Inc.

U.S. Forest Service, Mont. Dept. State Lands, Mont. Dept. Health and Env. Sci., Mont. Dept. Nat. Res. and Cons. 1990. Draft Environmental Impact Statement, Noranda Minerals Corp., Montanore Project.

U.S. Forest Service, Mont. Dept. State Lands, Mont. Dept. Health and Env. Sci., Mont. Dept. Nat. Res. and Cons. 1991. Supplemental Draft Environmental Impact Statement, Noranda Minerals Corp., Montanore Project.

Ward, J.V. 1992. Aquatic Insect Ecology. 1. Biology and Habitat. J. Wiley and Sons, Inc.

Weber, E.E. 1992. An assessment of the algae associations in the periphyton community from Libby Creek in the vicinity of the Noranda Montanore Project. PhycoLogic Tech. Rpt. to Westech, Helena, Mt.

Weber, E.E. 1992. Noranda Montanore Project 1991 periphyton monitoring. PhycoLogic Tech. Rpt. to Westech, Helena, Mt.

Western Resource Dev. Corp. 1989. Aquatic biology study, Montana project. Boulder, Colo.

Wiggins, G.B. 1978. Larvae of the North American Caddisfly Genera (Trichoptera). University of Toronto Press.

Winget, R.N. and F.A. Mangum. 1979. Biotic condition index: integrated biological, physical, and chemical stream parameters for management. U.S.D.A., For. Serv., Ogden, Utah.

Worf, D.L. 1980. Biological monitoring for environmental effects. Lexington Books, Mass.

VII. PERIPHERYTON REFERENCES

Bahls, L. L. 1979. Benthic diatom diversity as a measure of water quality. Proc. Mont. Acad. Sci. 38:1-6.

Krammer, K. and H. Lange-Bertalot. 1986. Bacillariophyceae.
1. Teil: Naviculaceae. In Süsswasserflora von Mitteleuropa: H. Ettl, J. Gerloff, H. Heyning and D. Mollenhauer, eds. Band 2/1. Gustav Fisher Verlag, Stuttgart.

Krammer, K. and H. Lange-Bertalot. 1988. Bacillariophyceae.
2. Teil: Bacillariaceae, Epithemiaceae, Surirellaceae.
In Süsswasserflora von Mitteleuropa: H. Ettl, J. Gerloff, H.

- Heyning and D. Mollenhauer, eds. Band 2/2. Gustav Fisher Verlag, Stuttgart.
- Krammer, K. and H. Lange-Bertalot. 1991. Bacillariophyceae.
3. Teil: Centrales, Fragilariaeae, Eunotiaceae. In
- Susswasserflora von Mitteleuropa: H. Ettl, J. Gerloff, H. Heyning and D. Mollenhauer, eds. Band 2/2. Gustav Fisher Verlag, Stuttgart.
- Lange-Bertalot, Horst. 1979. Pollution tolerance of diatoms as a criterion for water quality estimation. *Nova Hedwigia* 64:285-304.
- Lowe, R. L. 1989. Environmental requirements and pollution tolerance of freshwater diatoms. EPA-670/4-74-005.
- Patrick, R. and C. W. Reimer. 1966. The Diatoms of the United States. Volume 1: Fragilariaeae, Eunotiaceae, Achnanthaceae, Naviculaceae. Academy of Natural Sciences of Philadelphia, Monograph 13.
- Patrick, R. and C. W. Reimer. 1975. The Diatoms of the United States. Volume 2, Part 1: Entomoneidaceae, Cymbellaceae, Gomphonemaceae, Epithemiaceae. Academy of Natural Sciences of Philadelphia, Monograph 13.
- Prescott, G. W. 1962. Algae of the Western Great Lakes Area. With an Illustrated Key to the Genera of Desmids and Freshwater Diatoms. Otto Koeltz Science Publishers (1982).
- Prescott, G. W. 1970. The Freshwater Algae. Wm. C. Brown Company Publishers, Dubuque, Iowa.

Appendix A. Macroinvertebrate station totals, spring 1991.

Macroinvertebrate Data-Montanore, May 1991
Libby Creek, Li #1

	For Each Taxa		Percent of Total	Major Group		TV	TQ	TRG
	No.	No./sq.m.		Total Number 710	Percent of Total 81.33			
Ephemeroptera								
<i>Baetis</i> sp.	112	242	12.8			4	72	cg
<i>Candatella hyatrix</i>	0	0	0.0			1	nn	cg
<i>Ornella coloradensis/</i> flavilines	73	158	8.4			1	18	sc
<i>Drunella doddsii</i>	30	65	3.4			1	4	sc
<i>Drunella spinifera</i>	0	0	0.0			1	24	sc
<i>Drunella</i> sp.	0	0	0.0			0	48	sc
<i>Ephemerella</i> sp.	12	26	1.4			1	48	sc
<i>Serratella</i> sp.	0	0	0.0			1	24	cg
<i>Cinygula</i> sp.	261	564	29.9			4	21	sc
<i>Epeorus</i> sp.	187	404	21.4			4	21	sc
<i>Heptagenia</i> sp.	0	0	0.0			4	48	sc
<i>Rhithrogena</i> sp.	31	67	3.6			4	21	cg
<i>Paraleptophlebia</i> sp.	0	0	0.0			2	24	cg
<i>Ameletus</i> sp.	4	9	0.5			7	48	cg
73	8.36							
Plecoptera								
<i>Capniidae</i>	0	0	0.0			1	32	sh
<i>Kathroperla pardita</i>	0	0	0.0			1	24	cg
<i>Sauvella/Sauvilia</i> sp.	15	32	1.7			1	24	pr
<i>Deopaxia augusta</i>	7	15	0.8			0	18	sh
<i>Paraleuctra</i> sp.	0	0	0.0			0	18	sh
<i>Perlomyia</i> sp.	0	0	0.0			0	18	sh
<i>Luctridae</i>	0	0	0.0			0	18	sh
<i>Mesocore</i> sp.	24	52	2.7			2	24	sh
<i>Visoke cataractae</i>	0	0	0.0			2	nn	sh
<i>Zapada cinctipes</i>	0	0	0.0			2	16	sh
<i>Zapada columbiana</i>	0	0	0.0			2	16	sh
<i>Semourides</i>	13	28	1.5			2	36	sh
<i>Yoraperla brevis</i>	0	0	0.0			2	110	sh
<i>Acronerura abnormis</i>	0	0	0.0			1	6	pr
<i>Dorconerura theodora</i>	1	2	0.1			1	18	pr
<i>Hesperoperla pacifica</i>	0	0	0.0			1	18	pr
<i>Perlidae</i>	5	11	0.6			1	nn	pr
<i>Isoperla</i> sp.	0	0	0.0			2	48	pr
<i>Megarcys</i> sp.	1	2	0.1			2	24	pr
<i>Setvena bradleyi</i>	0	0	0.0			2	nn	pr
<i>Skwala</i> sp.	0	0	0.0			2	18	pr
<i>Perlodidae</i>	2	4	0.2			2	nn	pr
<i>Taenionema</i> sp.	5	11	0.6			2	48	sc
47	5.38							
Trichoptera								
<i>Nicrasema</i> sp.	0	0	0.0			1	24	sh
<i>Anagapetus</i> sp.	0	0	0.0			0	24	sc
<i>Glossosoma</i> sp.	0	0	0.0			0	24	sc
<i>Arctoplyche grandis</i>	5	11	0.6			4	18	cf
<i>Parapsyche elois</i>	1	2	0.1			4	6	cf
<i>Hydropsychidae</i>	6	13	0.7			4	108	nn
<i>Agraylea</i> sp.	0	0	0.0			4	108	cg
<i>Ochrotrichia</i> sp.	0	0	0.0			4	108	cg
<i>Lepidostoma</i> sp.	0	0	0.0			1	18	sh
<i>Apatania</i> sp.	0	0	0.0			4	18	sc
<i>Ecclesomyia</i> sp.	0	0	0.0			4	24	cg
<i>Hectohemma alicia</i>	0	0	0.0			4	8	sc
<i>Oligophlebodes</i> sp.	16	35	1.8			4	24	sc
<i>Limnephilidae</i>	1	2	0.1			4	108	nn
<i>Normaldia</i> sp.	0	0	0.0			3	24	of
<i>Rhyacophila Angelita</i>	8	17	0.9			0	18	pr
<i>Rhyacophila Battani</i>	0	0	0.0			0	18	pr
<i>Rhyacophila Bifila/Colorado</i>	1	2	0.1			0	18	pr
<i>Rhyacophila Brunnea</i>	0	0	0.0			0	18	pr
<i>Rhyacophila Hyalinata</i>	1	2	0.1			0	18	pr
<i>Rhyacophila Irida</i>	0	0	0.0			0	18	pr
<i>Rhyacophila Sibirica</i>	0	0	0.0			0	18	pr
<i>Rhyacophila Vaccua</i>	0	0	0.0			0	18	pr
<i>Rhyacophila Verrula</i>	0	0	0.0			0	18	pr
<i>Rhyacophila vespula</i>	2	4	0.2			0	18	pr
<i>Rhyacophila</i> sp.	6	13	0.7			0	18	pr
Trichopteran pupae	0	0	0.0			nn	nn	na
43	4.93							
Other								
Annelida	0	0	0.0			5	108	cg
Coleoptera-Elmidae								
<i>Cleptalmis</i> sp.	0	0	0.0			4	108	cg
<i>Heterlimnius</i> sp.	5	11	0.6			4	108	cg
<i>Lara</i> sp.	1	2	0.1			4	108	sh
<i>Narpus</i> sp.	0	0	0.0			4	108	cg
<i>Saitrevia</i> sp.	0	0	0.0			4	108	cg
Elmidae	0	0	0.0			4	108	cg
Collembola	0	0	0.0			nn	nn	na
Diptera								
<i>Agathon</i> sp.	0	0	0.0			0	2	sc
<i>Caratopogonidae</i>	0	0	0.0			6	108	pr
<i>Chironomidae</i>	7	15	0.8			6	108	cg/f
<i>Oreogeton</i> sp.	1	2	0.1			6	nn	pr
<i>Simuliidae</i>	26	56	3.0			6	108	cf
<i>Antocha</i> sp.	0	0	0.0			3	24	cg
<i>Oicranota</i> sp.	2	4	0.2			3	24	pr
<i>Hexatomidae</i>	1	2	0.1			3	36	pr
<i>Pedicia</i> sp.	0	0	0.0			3	36	pr
<i>Tipula</i> sp.	0	0	0.0			3	36	sh
Hydracarina	0	0	0.0			5	108	pr
Mollusca	0	0	0.0			8	108	cg
Nematoda	0	0	0.0			nn	nn	na
Turbellaria	0	0	0.0			4	108	pr
TOTAL NUMBER =	873			830				
TOTAL TAXA =	34			119.57				
STD =	36.8			21.07				
MEAN =	175			SE MEAN = 9.58				
SDI =				3.3				

Macroinvertebrate Data-Montanore, May 1991
Libby Creek, L3 #2

	For Each Taxa		Percent of Total	Major Group		TV	TQ	FG
	No.	No./sq.m.		Total Number	Percent of Total			
Ephemeroptera				513	76.68			
Baetis sp.	72	156	10.8			4	72	cg
Caudatella hystrix	0	0	0.0			1	nn	cg
Drunella coloradensis/ flavilimae	36	78	5.4			1	18	sc
Drunella doddsi	9	19	1.3			1	4	sc
Drunella spinifera	0	0	0.0			1	24	sc
Drunella sp.	0	0	0.0			0	48	sc
Sphemerella sp.	0	0	0.0			1	48	sc
Serratella sp.	0	0	0.0			1	24	cg
Cinygmania sp.	207	447	30.9			4	21	sc
Epeorus sp.	137	296	20.5			4	21	sc
Septemania sp.	0	0	0.0			4	48	sc
Rhithrogena sp.	42	91	6.3			4	21	cg
Paraleptophlebia sp.	1	2	0.1			2	24	cg
Ameletus sp.	9	19	1.3			7	48	cg
Plecoptera				96	14.35			
Capniidae	4	9	0.6			1	32	sh
Kathroperla perdita	0	0	0.0			1	24	cg
Sweltsa/Suwallia sp.	38	82	5.7			1	24	pr
Oospeda augusta	5	11	0.7			0	18	sh
Paraleuctra sp.	0	0	0.0			0	18	sh
Parolvoria sp.	0	0	0.0			0	18	sh
Luctridae	0	0	0.0			0	18	sh
Hemoura sp.	10	22	1.5			2	24	sh
Visoke cataractae	1	2	0.1			2	nn	sh
Rapada cinctipes	0	0	0.0			2	16	sh
Rapada columbiana	0	0	0.0			2	16	sh
Emouridae	1	2	0.1			2	36	sh
Yoraparia brevis	0	0	0.0			2	110	sh
Acroneuria anomalis	0	0	0.0			1	6	pr
Doroneuria theodora	0	0	0.0			1	18	pr
Esperoperla pacifica	0	0	0.0			1	18	pr
Perlidae	2	4	0.3			1	nn	pr
Isoperla sp.	0	0	0.0			2	48	pr
Megarcys sp.	0	0	0.0			2	24	pr
Setevana bradleyi	0	0	0.0			2	nn	pr
Skwala sp.	0	0	0.0			2	18	pr
Perlodidae	0	0	0.0			2	nn	pr
Taenionema sp.	35	76	5.2			2	48	sc
Trichoptera				4	0.60			
Microptera sp.	0	0	0.0			1	24	sh
Anagapetus sp.	0	0	0.0			0	24	sc
Glossosoma sp.	0	0	0.0			0	24	sc
Arctopsyche grandis	0	0	0.0			4	18	cf
Parapsyche elisia	0	0	0.0			4	6	cf
Hydropsychidae	1	2	0.1			4	108	nn
Agraylea sp.	0	0	0.0			4	108	cg
Ochrotrichia sp.	0	0	0.0			4	108	cg
Lepidostome sp.	0	0	0.0			1	18	sh
Apatania sp.	0	0	0.0			4	18	sc
Ecclesomyia sp.	0	0	0.0			4	24	cg
Neothremma alicia	0	0	0.0			4	8	sc
Oligophlebodes sp.	0	0	0.0			4	24	sc
Limnophilidae	2	4	0.3			4	108	nn
Normaldia sp.	0	0	0.0			3	24	cf
Rhyacophila Angelita	0	0	0.0			0	18	pr
Rhyacophila Bettini	0	0	0.0			0	18	pr
Rhyacophila Rifila/Colorado	0	0	0.0			0	18	pr
Rhyacophila Brunnea	0	0	0.0			0	18	pr
Rhyacophila Hyalinata	0	0	0.0			0	18	pr
Rhyacophila Iranda	0	0	0.0			0	18	pr
Rhyacophila Sibirica	1	2	0.1			0	18	pr
Rhyacophila Vacca	0	0	0.0			0	18	pr
Rhyacophila Verrula	0	0	0.0			0	18	pr
Rhyacophila vulgaris	0	0	0.0			0	18	pr
Rhyacophila sp.	0	0	0.0			0	18	pr
Trichopteran pupae	0	0	0.0			nn	nn	na
Other				56	8.37			
Annelida	0	0	0.0			5	108	cg
Coleoptera-Elimidae								
Cleptelmis sp.	0	0	0.0			4	108	cg
Neterlimnius sp.	1	2	0.1			4	108	cg
Lara sp.	0	0	0.0			4	108	sh
Narpus sp.	0	0	0.0			4	108	cg
Naitevria sp.	0	0	0.0			4	108	cg
Elmidae	0	0	0.0			4	108	cg
Collembola	0	0	0.0			nn	nn	na
Diptera								
Agathomyia sp.	0	0	0.0			0	2	sc
Ceratopogonidae	0	0	0.0			6	108	pr
Chironomidae	47	102	7.0			6	108	cg/f
Oreoceton sp.	0	0	0.0			6	nn	pr
Simuliidae	3	6	0.4			6	108	cf
Antocha sp.	0	0	0.0			3	24	cg
Dicranota sp.	1	2	0.1			3	24	pr
Roxatoma sp.	3	6	0.4			3	36	pr
Pedicia sp.	0	0	0.0			3	36	pr
Tipula sp.	1	2	0.1			3	36	sh
Hydracarina	0	0	0.0			5	108	pr
Mollusca	0	0	0.0			8	108	cg
Nematoda	0	0	0.0			nn	nn	na
Turbellaria	0	0	0.0			4	108	pr
TOTAL NUMBER =	669			613				
TOTAL TAXA =	25			13.04				
STD =	28.5			21.30				
MEAN =	134			55 MEAN =				
				9.68				

Macroinvertebrate Data-Montabore, May 1991
Libby Creek, L9 #3

For Each Taxa		Major Group					
No.	No./sq.m.	Percent of Total	Total Number 144	Percent of Total 75.79	TV	TQ	FFG
Ephemeroptera							
Baetis sp.	37	80	19.5		4	72	cg
Caudatella hystrix	0	0	0.0		1	nn	cg
Drunella coloradensis/ flavolineata	6	13	3.2		1	18	sc
Drunella doddi	4	9	2.1		1	4	sc
Drunella spinifera	0	0	0.0		1	24	sc
Drunella sp.	0	0	0.0		0	48	sc
Ephemerella sp.	0	0	0.0		1	48	sc
Serrateella sp.	0	0	0.0		1	24	cg
Cinygma sp.	48	104	25.3		4	21	sc
Epeorus sp.	25	54	13.2		4	21	sc
Heptagonia sp.	0	0	0.0		4	48	sc
Rhithrogena sp.	23	50	12.1		4	21	cg
Paraleptophlebia sp.	0	0	0.0		2	24	cg
Aneletus sp.	1	2	0.5		7	48	cg
Plecoptera			29	15.26			
Capniidae	0	0	0.0		1	32	sh
Kathroperla pardita	0	0	0.0		1	24	cg
Sumtsea/Squalia op.	19	41	10.0		1	24	pr
Deepaxia augusta	0	0	0.0		0	18	sh
Paraleuctra op.	0	0	0.0		0	18	sh
Perlomyia sp.	0	0	0.0		0	18	sh
Leuctridae	1	2	0.5		0	18	sh
Nemoura sp.	0	0	0.0		2	24	sh
Visoka cataractae	0	0	0.0		2	16	sh
Zapada cinctipes	1	2	0.5		2	16	sh
Zapada columbiana	0	0	0.0		2	16	sh
Nemouridae	4	9	2.1		2	36	sh
Yoraspila brevis	2	4	1.1		2	110	sh
Acronemura absormis	0	0	0.0		1	6	pr
Dorconemura theodora	0	0	0.0		1	18	pr
Hesperoperla pacifica	0	0	0.0		1	18	pr
Perlidae	0	0	0.0		1	nn	pr
Isoperla sp.	0	0	0.0		2	48	pr
Megarcya sp.	1	2	0.5		2	24	pr
Setvena bradleyi	0	0	0.0		2	nn	pr
Skwala sp.	0	0	0.0		2	18	pr
Perlodidae	0	0	0.0		2	nn	pr
Taeniochasma sp.	1	2	0.5		2	48	ac
Trichoptera			6	3.16			
Micrasema op.	0	0	0.0		1	24	sh
Anagapetus op.	0	0	0.0		0	24	sc
Glossocoma op.	3	6	1.6		0	24	sc
Arctopsyche grandis	0	0	0.0		4	18	cf
Parapsyche elisia	0	0	0.0		4	6	cf
Hydropsychidae	0	0	0.0		4	108	nn
Agraylea sp.	0	0	0.0		4	108	cg
Ochrotrichia sp.	0	0	0.0		4	108	cg
Lepidocetma sp.	0	0	0.0		1	18	sh
Apatania sp.	0	0	0.0		4	18	ec
Ecciliacomyia sp.	0	0	0.0		4	24	cg
Neothremma alicia	0	0	0.0		4	8	sc
Oligophlebodes sp.	0	0	0.0		4	24	sc
Limnephilidae	0	0	0.0		4	108	nn
Wormaldia sp.	0	0	0.0		3	24	cf
Rhyacophila Angelita	1	2	0.5		0	18	pr
Rhyacophila Bettensi	0	0	0.0		0	18	pr
Rhyacophila bifila/Colorado	0	0	0.0		0	18	pr
Rhyacophila Brunnea	0	0	0.0		0	18	pr
Rhyacophila Hyalinata	0	0	0.0		0	18	pr
Rhyacophila Iranda	0	0	0.0		0	18	pr
Rhyacophila Sibirica	2	4	1.1		0	18	pr
Rhyacophila Vaccua	0	0	0.0		0	18	pr
Rhyacophila Verrula	0	0	0.0		0	18	pr
Rhyacophila vegetalis	0	0	0.0		0	18	pr
Rhyacophila sp.	0	0	0.0		0	18	pr
Trichopteran pupae	0	0	0.0		nn	nn	na
Other			11	5.79			
Annelida	9	19	4.7		5	108	cg
Coleoptera-Elmidae							
Cleptelmis sp.	0	0	0.0		4	108	cg
Heterlimnius sp.	0	0	0.0		4	108	cg
Lara sp.	0	0	0.0		4	108	sh
Narpus sp.	0	0	0.0		4	108	cg
Zaitzevia sp.	0	0	0.0		4	108	cg
Elmidae	0	0	0.0		4	108	cg
Collembola	0	0	0.0		nn	nn	na
Diptera							
Agathon sp.	0	0	0.0		0	2	sc
Caratopogonidae	0	0	0.0		6	108	pr
Chironomidae	2	4	1.1		6	108	cg/f
Oreoceton sp.	0	0	0.0		6	nn	pr
Simuliidae	0	0	0.0		6	108	cf
Antocha sp.	0	0	0.0		3	24	cg
Dicranota sp.	0	0	0.0		3	24	pr
Hexatomidae	0	0	0.0		3	36	pr
Pedicia sp.	0	0	0.0		3	36	pr
Tipula sp.	0	0	0.0		3	36	sh
Hydracarina	0	0	0.0		5	108	pr
Mollusca	0	0	0.0		8	108	cg
Nematoda	0	0	0.0		nn	nn	na
Turbellaria	0	0	0.0		4	108	pr
TOTAL NUMBER =	190	EPT Abund. =	179	SDI =	3.2		
TOTAL TAXA =	19	EPT/CHIRON. =	89.50				
STD =	7.6	CORE. VAR. =	19.95				

Macroinvertebrate Data-Montanore, May 1991
Libby Creek, L10 #4

	For Each Taxa			Major Group			TV	TQ	TFC
	No.	No./sq.m.	Percent of Total	Total Number	Percent of Total				
Ephemeroptera				570	69.26				
Baetis sp.	80	173	9.7				4	72	cg
Caudatella hystrix	0	0	0.0				1	nn	cg
Drunella coloradensis/ flavolineata	23	50	2.8				1	18	sc
Drunella doddsi	6	13	0.7				1	4	sc
Drunella spinifera	0	0	0.0				1	24	sc
Drunella sp.	0	0	0.0				0	48	sc
Sphemerella sp.	0	0	0.0				1	48	sc
Serratella sp.	0	0	0.0				1	24	sc
Cinygma sp.	237	512	28.8				4	21	cg
Epsorus sp.	188	406	22.8				4	21	sc
Septemania sp.	0	0	0.0				4	48	sc
Rhithrogena sp.	28	60	3.4				4	21	og
Paraleptophlebia sp.	0	0	0.0				2	24	cg
Amelitus sp.	8	17	1.0				7	48	cg
Placoptera				120	14.58				
Capniidae	11	24	1.3				1	32	sh
Kathroperla pardita	0	0	0.0				1	24	cg
Sweltsa/Suwallia sp.	70	151	8.5				1	24	pr
Deepaxia augusta	0	0	0.0				0	18	sh
Paraleuctra sp.	0	0	0.0				0	18	sh
Parlomyia sp.	0	0	0.0				0	18	sh
Leuctridae	4	9	0.5				0	18	sh
Mesoura sp.	0	0	0.0				2	24	sh
Visoke cataractae	7	15	0.9				2	nn	sh
Sapada cinctipes	0	0	0.0				2	16	sh
Sapada columbiana	0	0	0.0				2	16	sh
Nemouridae	15	32	1.8				2	36	sh
Yoraperla brevis	6	13	0.7				2	110	sh
Acronerura abnormis	0	0	0.0				1	6	pr
Doroneuria theodora	0	0	0.0				1	18	pr
Hesperoperla pacifica	0	0	0.0				1	18	pr
Perlidae	4	9	0.5				1	nn	pr
Isonycta sp.	0	0	0.0				2	48	pr
Megarcys sp.	3	6	0.4				2	24	pr
Setvena bradleyi	0	0	0.0				2	nn	pr
Skwala sp.	0	0	0.0				2	18	pr
Perlodidae	0	0	0.0				2	nn	pr
Taenionema sp.	0	0	0.0				2	48	sc
Trichoptera				23	2.79				
Micrasema sp.	0	0	0.0				1	24	sh
Anagapetus sp.	2	4	0.2				0	24	sc
Glossocoma sp.	0	0	0.0				0	24	sc
Axetoplyche grandis	0	0	0.0				4	18	cf
Paraplyche elisia	3	5	0.4				4	6	cf
Hydropsychidae	0	0	0.0				4	108	nn
Agraylea sp.	0	0	0.0				4	108	cg
Ochrotrichia sp.	0	0	0.0				4	108	cg
Lepidostoma sp.	0	0	0.0				1	18	sh
Apatania sp.	0	0	0.0				4	18	sc
Ecclesomyia sp.	0	0	0.0				4	24	cg
Neothremma alicia	1	2	0.1				4	8	sc
Oligophlebodes sp.	0	0	0.0				4	24	sc
Limnophilidae	0	0	0.0				4	108	nn
Normaldia sp.	0	0	0.0				3	24	cf
Rhyacophila Angelita	3	6	0.4				0	18	pr
Rhyacophila Bettini	0	0	0.0				0	18	pr
Rhyacophila Riffia/Colorado	0	0	0.0				0	18	pr
Rhyacophila Brunnea	0	0	0.0				0	18	pr
Rhyacophila Hyalinata	1	2	0.1				0	18	pr
Rhyacophila Ircana	0	0	0.0				0	18	pr
Rhyacophila Sibirica	7	15	0.9				0	18	pr
Rhyacophila Vaccua	6	13	0.7				0	18	pr
Rhyacophila Verrula	0	0	0.0				0	18	pr
Rhyacophila vespula	0	0	0.0				0	18	pr
Rhyacophila sp.	0	0	0.0				0	18	pr
Trichopteran pupae	0	0	0.0				nn	nn	na
Other				110	13.37				
Annelida	49	106	6.0				5	108	cg
Coleoptera-Elmidae									
Cleptelmis sp.	0	0	0.0				4	108	cg
Heterlimnius sp.	0	0	0.0				4	108	cg
Lora sp.	0	0	0.0				4	108	sh
Harpus sp.	0	0	0.0				4	108	cg
Zaitzevia sp.	0	0	0.0				4	108	cg
Elmidae	0	0	0.0				4	108	cg
Collembola	0	0	0.0				nn	nn	na
Diptera									
Agathoa sp.	1	2	0.1				0	2	sc
Caratopogonidae	0	0	0.0				6	108	pr
Chironomidae	49	106	6.0				6	108	cg/f
Oreogeton sp.	1	2	0.1				6	nn	pr
Simuliidae	2	4	0.2				6	108	cf
Antocha sp.	0	0	0.0				3	24	cg
Dicranota sp.	7	15	0.9				3	24	pr
Hexatoma sp.	0	0	0.0				3	36	pr
Pedicia sp.	0	0	0.0				3	36	pr
Tipula sp.	1	2	0.1				3	36	sh
Hydracarina	0	0	0.0				5	108	pr
Mollusca	0	0	0.0				8	108	cg
Nematoda	0	0	0.0				nn	nn	na
Turbellaria	0	0	0.0				4	108	pr
TOTAL NUMBER =	823			713					
TOTAL TAXA =	29			14.55					
STD =	34.4			COEF. VAR. =					
MEAN =	165			SD MEAN =					
				9.50					

Macroinvertebrate Data-Montanore, May 1991
Little Cherry Creek, LCI #5

	For Each Taxa		Percent of Total	Major Group		TV	TO	FFG
	No.	No./sq.m.		Total Number	Percent of Total			
Ephemeroptera				118	70.66			
Baetis sp.	24	65	14.4			4	72	cg
Caudatella hystrix	0	0	0.0			1	nn	cg
Drunella coloradensis/ flavilimata	3	8	1.8			1	18	sc
Drunella doddsi	1	3	0.6			1	6	sc
Drunella spinifera	1	3	0.6			1	24	sc
Drunella sp.	0	0	0.0			0	48	sc
Ephemerella sp.	0	0	0.0			1	48	sc
Serratella sp.	0	0	0.0			1	24	cg
Cinygania sp.	53	143	31.7			4	21	sc
Speorus sp.	22	59	13.2			4	21	sc
Neopterygia sp.	0	0	0.0			4	48	sc
Rhithrogena sp.	5	14	3.0			4	21	cg
Paraleptophlebia sp.	1	3	0.6			2	24	cg
Ameletus sp.	8	22	4.8			7	48	cg
Plecoptera				34	20.36			
Capniidae	1	3	0.6			1	32	sh
Kathroperla pardita	0	0	0.0			1	24	cg
Sweltsa/Suwallia sp.	7	19	4.2			1	24	pr
Deepaxia augusta	1	3	0.6			0	18	sh
Paraleuctra sp.	0	0	0.0			0	18	sh
Perlomyia sp.	0	0	0.0			0	18	sh
Luctridae	0	0	0.0			0	18	sh
Nemoura sp.	15	41	9.0			2	24	sh
Visoka cataractae	0	0	0.0			2	nn	sh
Kapda cinotipes	0	0	0.0			2	16	sh
Kapda columbiana	1	3	0.6			2	16	sh
Nemouridae	8	22	4.8			2	36	sh
Xoraperla brevis	0	0	0.0			2	24	sh
Acroneuria abnormis	0	0	0.0			1	6	pr
Doroneuriia theodora	1	3	0.6			1	18	pr
Hesperoperla pacifica	0	0	0.0			1	18	pr
Parlidiae	0	0	0.0			1	nn	pr
Isoperla sp.	0	0	0.0			2	48	pr
Megarcya sp.	0	0	0.0			2	24	pr
Setodes bradleyi	0	0	0.0			2	nn	pr
Skwala sp.	0	0	0.0			2	18	pr
Perlodidae	0	0	0.0			2	nn	pr
Tenionema sp.	0	0	0.0			2	48	sc
Trichoptera				7	4.19			
Micrasema sp.	0	0	0.0			1	24	sh
Anagapetus sp.	0	0	0.0			0	24	sc
Glossosoma sp.	0	0	0.0			0	24	sc
Arctopsyche grandis	0	0	0.0			4	18	cf
Parapsyche elisia	3	8	1.8			4	6	cf
Hydropsychidae	0	0	0.0			4	108	cf
Agraylea sp.	0	0	0.0			4	108	cg
Ochrotrichia sp.	0	0	0.0			4	108	cg
Lepidostoma sp.	0	0	0.0			1	18	sh
Apatania sp.	0	0	0.0			4	18	sc
Ecclesomyia sp.	0	0	0.0			4	24	cg
Neothremma alicia	0	0	0.0			4	8	sc
Oligophlebodes sp.	0	0	0.0			4	24	sc
Limnephilidae	1	3	0.6			4	108	nn
Wormaldia sp.	0	0	0.0			3	24	cf
Rhyacophilidae Angelita	0	0	0.0			0	18	pr
Rhyacophilidae Bettenei	0	0	0.0			0	18	pr
Rhyacophilidae Bifila/Colorado	0	0	0.0			0	18	pr
Rhyacophilidae Brunnea	0	0	0.0			0	18	pr
Rhyacophilidae Byalina	0	0	0.0			0	18	pr
Rhyacophilidae Iranda	0	0	0.0			0	18	pr
Rhyacophilidae Sibirica	0	0	0.0			0	18	pr
Rhyacophilidae Vaccua	2	5	1.2			0	18	pr
Rhyacophilidae Verrula	0	0	0.0			0	18	pr
Rhyacophilidae vespula	0	0	0.0			0	18	pr
Rhyacophilidae sp.	1	3	0.6			0	18	pr
Trichopteran pupae	0	0	0.0			nn	nn	na
Other				5	4.79			
Annelida	3	8	1.8			5	108	cg
Coleoptera-Elimidae								
Cleptelmis sp.	0	0	0.0			4	108	cg
Heterlimnius sp.	0	0	0.0			4	108	cg
Lara sp.	0	0	0.0			4	108	sh
Barpus sp.	0	0	0.0			4	108	cg
Zaitzevia sp.	0	0	0.0			4	108	cg
Elmidae	0	0	0.0			4	108	cg
Collembola	0	0	0.0			nn	nn	na
Diptera								
Agathon sp.	0	0	0.0			0	2	sc
Coratopogonidae	0	0	0.0			6	108	pr
Chironomidae	2	5	1.2			6	108	cg/f
Oreoceten sp.	0	0	0.0			6	nn	pr
Simuliidae	2	5	1.2			6	108	cf
Antocha sp.	0	0	0.0			3	24	cg
Dicranota sp.	0	0	0.0			3	24	pr
Hexatomidae	0	0	0.0			3	36	pr
Pedicia sp.	0	0	0.0			3	36	pr
Tipula sp.	0	0	0.0			3	36	sh
Hydracarina	0	0	0.0			5	108	pr
Mollusca	1	3	0.6			8	108	cg
Nematoda	0	0	0.0			nn	nn	na
Turbellaria	0	0	0.0			4	108	pr
TOTAL NUMBER =	167			159		SDI =	3.4	
TOTAL TAXA =	24			79.50				
STD =	6.8			16.38				
MEAN =	42			8.19				

Macroinvertebrate Data-Montanore, May 1991
Poorman Creek, Pol #6

	For Each Taxa			Major Group			TV	EQ	EFG
	No.	No./sq.m.	Percent of Total	Total Number	Percent of Total				
Sphemeroptera				436	65.47				
Baetis sp.	120	259	17.9				4	72	cg
Caudatella hystrix	0	0	0.0				1	nn	cg
Drunella coloradensis/									
flavilined	8	17	1.2				1	18	sc
Drunella doddsii	16	35	2.4				1	4	sc
Drunella spinifera	0	0	0.0				1	24	sc
Drunella sp.	0	0	0.0				0	48	sc
Sphemerella sp.	0	0	0.0				1	46	sc
Serratella sp.	0	0	0.0				1	24	cg
Cinygmulia sp.	154	333	23.0				4	21	sc
Speorus sp.	106	229	15.8				4	21	sc
Heptagenia sp.	0	0	0.0				4	48	sc
Rhithrogena sp.	26	56	3.9				4	21	cg
Paraleptophlebia sp.	0	0	0.0				2	24	cg
Ameletus sp.	8	17	1.2				7	48	cg
Plecoptera				171	25.56				
Capniidae	13	28	1.9				1	32	sh
Kathroparia pardita	0	0	0.0				1	24	cg
Sweltsa/Suturalia sp.	46	99	6.9				1	24	pr
Coenopaxia augusta	39	84	5.8				0	18	sh
Paraleuctra sp.	0	0	0.0				0	18	sh
Parlomyia sp.	1	2	0.1				0	18	sh
Luctridae	4	9	0.6				0	18	sh
Semouidea sp.	21	45	3.1				2	24	sh
Visoka cataractae	5	11	0.7				2	nn	sh
Rapada cinctipes	0	0	0.0				2	16	sh
Rapada columbiana	0	0	0.0				2	16	sh
Semouridae	31	67	4.6				2	36	sh
Yoraperla brevis	0	0	0.0				2	110	sh
Acroneuria abnormalis	0	0	0.0				1	6	pr
Coroneuria theodora	1	2	0.1				1	18	pr
Heoperperla pacifica	0	0	0.0				1	18	pr
Perlidae	9	19	1.3				1	nn	pr
Isoperla sp.	0	0	0.0				2	48	pr
Megarcys sp.	1	2	0.1				2	24	pr
Setevana bradleyi	0	0	0.0				2	nn	pr
Skwala sp.	0	0	0.0				2	16	pr
Parclodiidae	0	0	0.0				2	nn	pr
Taenionema sp.	0	0	0.0				2	48	sc
Trichoptera				22	3.29				
Micranema sp.	0	0	0.0				1	24	sh
Anagapetus sp.	0	0	0.0				0	24	sc
Glossosoma op.	3	6	0.4				0	24	sc
Arctopsyche grandis	0	0	0.0				4	18	cf
Parapsyche elisia	6	13	0.9				4	6	cf
Hydropsychidae	0	0	0.0				4	108	nn
Agrylea sp.	0	0	0.0				4	108	cg
Ochrotrichia sp.	0	0	0.0				4	108	cg
Lepidoctoma sp.	0	0	0.0				1	18	sh
Apatania sp.	0	0	0.0				4	18	sc
Ecclisomyia sp.	0	0	0.0				4	24	cg
Benthrema alicia	0	0	0.0				4	8	sc
Oligophlebodes sp.	0	0	0.0				4	24	sc
Limnephilidae	0	0	0.0				4	108	nn
Wormaldia sp.	0	0	0.0				3	24	cf
Rhyacophilidae	6	17	1.2				0	18	pr
Rhyacophila Bettani	0	0	0.0				0	18	pr
Rhyacophila Bifila/Colorado	0	0	0.0				0	18	pr
Rhyacophila Brunnea	0	0	0.0				0	18	pr
Rhyacophila Hyalinata	0	0	0.0				0	18	pr
Rhyacophila Irenae	0	0	0.0				0	18	pr
Rhyacophila Sibirica	0	0	0.0				0	18	pr
Rhyacophila Vaccua	5	11	0.7				0	18	pr
Rhyacophila varvula	0	0	0.0				0	18	pr
Rhyacophila vespula	0	0	0.0				0	18	pr
Rhyacophila sp.	0	0	0.0				0	18	pr
Trichopteran pupae	0	0	0.0				nn	nn	na
Other				36	5.68				
Annelida	16	35	2.4				5	108	cg
Coleoptera-Elmidae									
Cleptelmis sp.	0	0	0.0				4	108	cg
Heterlimnius sp.	0	0	0.0				4	108	cg
Lara sp.	0	0	0.0				4	108	sh
Rarpus sp.	0	0	0.0				4	108	cg
Saitzovia sp.	0	0	0.0				4	108	cg
Elmidae	0	0	0.0				4	108	cg
Collembola	0	0	0.0				nn	nn	na
Diptera									
Agathon sp.	6	13	0.9				0	2	sc
Caratopogonidae	0	0	0.0				6	108	pr
Chironomidae	16	35	2.4				6	108	cg/f
Oreocetan sp.	0	0	0.0				6	nn	pr
Simuliidae	0	0	0.0				6	108	cf
Autocha sp.	0	0	0.0				3	24	cg
Dicranota sp.	0	0	0.0				3	24	pr
Hexatoma sp.	0	0	0.0				3	36	pr
Pedicia sp.	0	0	0.0				3	36	pr
Tipula sp.	0	0	0.0				3	36	sh
Hydracarina	0	0	0.0				5	108	pr
Mollusca	0	0	0.0				8	108	cg
Nematoda	0	0	0.0				nn	nn	na
Turbellaria	0	0	0.0				4	108	pr
TOTAL NUMBER =	669	EPT Abund. =	631	SDI =	3.6				
TOTAL TAXA =	25	EPT/Chiron. =	39.44						
STD =	24.4	COEF. VAR. =	18.24						
MEAN =	134	SE MEAN =	8.29						

Macroinvertebrate Data-Montanore, May 1991
Ramsey Creek, Ra2 #7

	For Each Taxa			Major Group			TV	TQ	FFG
	No.	No./sq.m.	Percent of Total	Total Number	Percent of Total				
Ephemeroptera				939	72.73				
Baetis sp.	321	693	24.9				4	72	cg
Caudatella hystrix	0	0	0.0				1	nn	cg
Dranella coloradensis/									
flavilinea	45	97	3.5				1	18	sc
dranella doddsi	17	37	1.3				1	4	sc
Dranella spinifera	0	0	0.0				1	24	sc
Dranella sp.	0	0	0.0				0	48	sc
Sphemarella sp.	0	0	0.0				1	48	sc
Serratella sp.	0	0	0.0				1	24	cg
Cinygivula sp.	244	527	18.9				4	21	sc
Epeorus sp.	250	540	19.4				4	21	sc
Heptagenia sp.	0	0	0.0				4	48	sc
Rhithrogena sp.	51	110	4.0				4	21	cg
Paraleptophlebia op.	0	0	0.0				2	24	cg
Ameletus sp.	11	24	0.9				7	48	cg
Placoptera				194	13.03				
Capniidae	0	0	0.0				1	32	sh
Kathroperla pardita	0	0	0.0				1	24	cg
Sialis/Suaalis sp.	61	132	4.7				1	24	pr
Despaxia augusta	35	76	2.7				0	18	sh
Paraleuctra sp.	3	6	0.2				0	16	sh
Parlimomyia sp.	0	0	0.0				0	16	sh
Leuctridae	0	0	0.0				0	18	sh
Memouridae	16	35	1.2				2	24	sh
Visoke cataractae	0	0	0.0				2	nn	sh
Sapada cinctipes	0	0	0.0				2	16	sh
Sapada columbiana	0	0	0.0				2	16	sh
Nemouridae	62	134	4.8				2	36	sh
Yoraperla brevis	3	6	0.2				2	110	sh
Acronerura abnormalis	0	0	0.0				1	6	pr
Dorconeria theodora	1	2	0.1				1	18	pr
Hesperoperla pacifica	0	0	0.0				1	18	pr
Parlidiae	7	15	0.5				1	nn	pr
Isoperla sp.	0	0	0.0				2	48	pr
Megarcys sp.	1	2	0.1				2	24	pr
Satvena bradleyi	0	0	0.0				2	nn	pr
Skwala sp.	0	0	0.0				2	18	pr
Periodidae	3	11	0.4				2	nn	pr
Taenionema sp.	0	0	0.0				2	48	sc
Trichoptera				35	2.71				
Micrasema sp.	0	0	0.0				1	24	oh
Anagapetus sp.	0	0	0.0				0	24	sc
Glossosoma sp.	7	15	0.5				0	24	sc
Arctopsyche grandis	0	0	0.0				4	18	cf
Parapsyche elisia	9	19	0.7				4	6	cf
Hydropsychidae	7	15	0.5				4	108	nn
Agraylea sp.	0	0	0.0				4	108	cg
Ochrotrichia sp.	0	0	0.0				4	108	cg
Lepidostoma sp.	0	0	0.0				1	18	sh
Apatania sp.	0	0	0.0				4	18	sc
Ecclesomyia sp.	0	0	0.0				4	24	cg
Geothrema alicia	0	0	0.0				4	8	sc
Oligophlebodes sp.	0	0	0.0				4	24	sc
Limnephilidae	0	0	0.0				4	108	nn
Wormaldia sp.	0	0	0.0				3	24	cf
Rhyacophila Angelita	3	6	0.2				0	18	pr
Rhyacophila Bettani	0	0	0.0				0	18	pr
Rhyacophila Bifila/Coloraden	0	0	0.0				0	18	pr
Rhyacophila Brunnea	0	0	0.0				0	18	pr
Rhyacophila Hyalinata	0	0	0.0				0	18	pr
Rhyacophila Krania	0	0	0.0				0	18	pr
Rhyacophila Sibirica	3	6	0.2				0	18	pr
Rhyacophila Vaccua	6	13	0.5				0	18	pr
Rhyacophila Verula	0	0	0.0				0	18	pr
Rhyacophila vespina	0	0	0.0				0	18	pr
Rhyacophila sp.	0	0	0.0				0	18	pr
Trichopteran pupae	0	0	0.0				nn	nn	na
Other				123	9.53				
Annelida	0	0	0.0				5	108	cg
Coleoptera-Elimidae									
Cleptelmis sp.	0	0	0.0				4	108	cg
Heterlimnius sp.	0	0	0.0				4	108	cg
Lara sp.	0	0	0.0				4	108	sh
Narpus sp.	0	0	0.0				4	108	cg
Zaitzevia sp.	0	0	0.0				4	108	cg
Elmidae	0	0	0.0				4	108	cg
Collembola	0	0	0.0				nn	nn	na
Diptera									
Agathom sp.	3	6	0.2				0	2	sc
Ceratopogonidae	0	0	0.0				6	108	pr
Chironomidae	55	119	4.3				6	108	cg/f
Oreogenetan sp.	2	4	0.2				6	nn	pr
Simuliidae	62	134	4.8				6	108	cf
Autocheta sp.	0	0	0.0				3	24	cg
Dicranota sp.	1	2	0.1				3	24	pr
Hexatomidae	0	0	0.0				3	36	pr
Pedicia sp.	0	0	0.0				3	36	pr
Tipula sp.	0	0	0.0				3	36	sh
Hydracarina	0	0	0.0				5	108	pr
Mollusca	0	0	0.0				8	108	cg
Hematoda	0	0	0.0				nn	nn	na
Turbellaria	0	0	0.0				4	108	pr
TOTAL NUMBER =	1291			1168			SDI =	3.3	
TOTAL TAXA =	28			21.24					
STD =	51.4			COEF. VAR. =	19.90				
MEAN =	258			SE MEAN =	9.04				

	For Each Taxa			Major Group			TV	TQ	TFC
	No.	No./sq.m.	Percent of Total	Total Number	Percent of Total				
Ephemeroptera				1124	82.34				
Bastia sp.	331	715	24.2				4	72	cg
Caudatella hystrix	0	0	0.0				1	nn	cg
Drunella coloradensis/									
filavilina	131	283	9.6				1	18	sc
doddii	6	13	0.4				1	4	sc
spinifera	0	0	0.0				1	24	sc
Drunella sp.	0	0	0.0				0	48	sc
Sphemerella sp.	0	0	0.0				1	48	sc
Serratella sp.	0	0	0.0				1	24	cg
Cinygmulia sp.	295	637	21.6				4	21	sc
Epeorus sp.	310	670	22.7				4	21	sc
Heptagenia sp.	0	0	0.0				4	48	sc
Rhithrogena sp.	48	104	3.5				2	24	cg
Paraleptophlebia sp.	0	0	0.0				7	48	cg
Ameletus sp.	3	6	0.2						
Plecoptera				155	11.36				
Capniidae	11	24	0.8				1	32	sh
Kathroperla pardita	0	0	0.0				1	24	cg
Sweltsa/Suwallia sp.	45	97	3.3				1	24	pr
Despaxia angusta	0	0	0.0				0	18	sh
Paraleuctra sp.	0	0	0.0				0	18	sh
Parlomyia sp.	1	2	0.1				0	18	sh
Leuctridae	6	13	0.4				0	18	sh
Nemoura sp.	8	17	0.6				2	24	sh
Visoke cataractae	8	17	0.6				2	nn	sh
Capada cinctipes	0	0	0.0				2	16	sh
Capada columbiana	0	0	0.0				2	16	sh
Nemouridae	53	114	3.9				2	36	sh
Yoraperla brevis	13	28	1.0				2	110	sh
Acroneuria abnormis	0	0	0.0				1	6	pc
Dorconeuria theodora	0	0	0.0				1	18	pr
Hooperperla pacifica	0	0	0.0				1	18	pr
Perlidae	2	4	0.1				1	nn	pc
Isoperla sp.	0	0	0.0				2	48	pc
Megarcys sp.	1	2	0.1				2	24	pr
Setvena bradleyi	0	0	0.0				2	nn	pr
Skwala sp.	0	0	0.0				2	18	pr
Perlodidae	7	15	0.5				2	nn	pr
Taenionema sp.	0	0	0.0				2	48	sc
Trichoptera				53	3.88				
Microptera sp.	0	0	0.0				1	24	sh
Anagapetus sp.	0	0	0.0				0	24	sc
Glossosoma sp.	16	35	1.2				0	24	sc
Arctopycche grandis	0	0	0.0				4	18	cf
Parapycche elisia	10	22	0.7				4	6	cf
Hydropsychidae	1	2	0.1				4	108	nn
Agraylea sp.	0	0	0.0				4	108	cg
Ochrotrichia sp.	0	0	0.0				4	108	cg
Lepidostoma sp.	0	0	0.0				1	18	sh
Apatania sp.	0	0	0.0				4	18	sc
Ecclisomyia sp.	0	0	0.0				4	24	cg
Neothremma alicia	0	0	0.0				4	8	sc
Oligophlebodes sp.	7	15	0.5				4	24	sc
Limnephilidae	0	0	0.0				4	108	nn
Normaldia sp.	0	0	0.0				3	24	cf
Rhyacophila Angelita	9	19	0.7				0	18	pr
Rhyacophila Bettani	0	0	0.0				0	18	pr
Rhyacophila Sifila/Colorado	0	0	0.0				0	18	pr
Rhyacophila Brunnea	2	4	0.1				0	18	pr
Rhyacophila Hyalinata	0	0	0.0				0	18	pr
Rhyacophila Irida	0	0	0.0				0	18	pr
Rhyacophila Sibirica	0	0	0.0				0	18	pr
Rhyacophila Vaccua	7	15	0.5				0	18	pr
Rhyacophila Verrula	0	0	0.0				0	18	pr
Rhyacophila vernalis	0	0	0.0				0	18	pr
Rhyacophila sp.	1	2	0.1				0	18	pr
Trichopteran pupae	0	0	0.0				nn	nn	na
Other				33	2.42				
Annelida	9	19	0.7				5	108	cg
Coleoptera-Klimidae									
Cleptelmia sp.	0	0	0.0				4	108	cg
Heterlimnius sp.	1	2	0.1				4	108	cg
Lara sp.	0	0	0.0				4	108	sh
Sarpus sp.	0	0	0.0				4	108	cg
Zaitzevia sp.	0	0	0.0				4	108	cg
Elmidae	0	0	0.0				4	108	cg
Collembola	0	0	0.0				nn	nn	na
Diptera									
Agathon sp.	0	0	0.0				0	2	sc
Ceratopogonidae	0	0	0.0				6	108	pr
Chironomidae	13	28	1.0				6	108	cg/f
Cnephopteron sp.	0	0	0.0				6	nn	pr
Simuliidae	5	11	0.4				6	108	cf
Antocha sp.	0	0	0.0				3	24	cg
Dicranota sp.	0	0	0.0				3	24	pr
Hexatomidae	0	0	0.0				3	36	pr
Pedicicia sp.	0	0	0.0				3	36	pr
Tipula sp.	0	0	0.0				3	36	sh
Hydracerina	0	0	0.0				5	108	pr
Mollusca	0	0	0.0				8	108	cg
Nematoda	0	0	0.0				nn	nn	na
Turbellaria	5	11	0.4				4	108	pr
TOTAL NUMBER =	1365			1332			SDI =	3.1	
TOTAL TAXA =	31			102.46					
STD =	58.7			COEF. VAR. =	21.52				
MEAN =	273			SE MEAN =	9.78				

Appendix B. Macroinvertebrate station totals, summer 1991.

Macroinvertebrate Data-Montanore, August 1991
Libby Creek, Li #9

	For Each Taxa			Major Group			IV	IQ	IFG
	No.	No./sq.m.	Percent of Total	Total Number	Percent of Total				
Ephemeroptera				1693	83.11				
Baetis sp.	673	1454	33.0				4	72	cg
Candatella hystrix	0	0	0.0				1	nn	cg
Drunella coloradensis/ flavilimna	17	37	0.8				1	18	sc
Drunella doddsi	160	346	7.9				1	4	sc
Drunella spinifera	1	2	0.0				1	24	sc
Drunella sp.	0	0	0.0				0	48	sc
Ephemerella sp.	0	0	0.0				1	48	sc
Serratella sp.	40	86	2.0				1	24	cg
Cinygmulia op.	55	119	2.7				4	21	sc
Epsorus sp.	140	302	6.9				4	21	sc
Septemzia sp.	0	0	0.0				4	48	sc
Rhithrogena sp.	482	1041	23.7				4	21	cg
Paraleptophlebia sp.	80	173	3.9				2	24	cg
Ameletus sp.	45	97	2.2				7	48	cg
				123	6.04				
Plecoptera									
Capniidae	0	0	0.0				1	32	sh
Kathroperla pardita	0	0	0.0				1	24	cg
Sveltia/Sutellia sp.	77	166	3.8				1	24	pr
Despaxia angusta	1	2	0.0				0	18	sh
Paraleuctra sp.	0	0	0.0				0	18	sh
Perlomyia sp.	0	0	0.0				0	18	sh
Leuctridae	0	0	0.0				0	18	sh
Hemoura sp.	0	0	0.0				2	24	sh
Visoke cataractae	6	13	0.3				2	nn	sh
Tepada cinctipes	0	0	0.0				2	16	sh
Tepada columbiana	12	26	0.6				2	16	sh
Hemouridae	0	0	0.0				2	36	sh
Voraperla brevia	0	0	0.0				2	110	sh
Acronemuria abnormis	0	0	0.0				1	6	pr
Dorcasenia theodora	3	6	0.1				1	18	pr
Geoperla pacifica	0	0	0.0				1	18	pr
Perlidae	5	11	0.2				1	nn	pr
Isoperla sp.	0	0	0.0				2	48	pr
Megarcysa sp.	4	9	0.2				2	24	pr
Satwena bradleyi	0	0	0.0				2	nn	pr
Skwala sp.	0	0	0.0				2	18	pr
Parlodidae	5	11	0.2				2	nn	pr
Zaenicnema sp.	10	22	0.5				2	48	sc
				82	4.03				
Trichoptera									
Micropteryx sp.	0	0	0.0				1	24	sh
Anagapetus sp.	0	0	0.0				0	24	sc
Glossosoma sp.	0	0	0.0				0	24	sc
Axocoptycne grandis	0	0	0.0				4	18	cf
Paraptychne elisia	10	22	0.5				4	6	cf
Hydropsychidae	36	78	1.8				4	108	nn
Agraylea sp.	0	0	0.0				4	108	cg
Ochrotrichia sp.	5	11	0.2				4	108	cg
Lepidostome sp.	0	0	0.0				1	18	sh
Apatania sp.	0	0	0.0				4	18	sc
Ecciliscosyia sp.	0	0	0.0				4	24	cg
Ecclotremma alicia	0	0	0.0				4	6	sc
Oligophlebiodes sp.	0	0	0.0				4	24	sc
Limnephilidae	9	19	0.4				4	108	nn
Wormaldia sp.	0	0	0.0				3	24	cf
Rhyacophilidae Angelita	3	6	0.1				0	18	pr
Rhyacophilidae Bettani	0	0	0.0				0	18	pr
Rhyacophilidae Riffle/Colorado	0	0	0.0				0	18	pr
Rhyacophilidae Brunnea	2	4	0.1				0	18	pr
Rhyacophilidae Hyalinata	0	0	0.0				0	18	pr
Rhyacophilidae Irida	0	0	0.0				0	18	pr
Rhyacophilidae Sibirica	0	0	0.0				0	18	pr
Rhyacophilidae Vaccua	13	28	0.6				0	18	pr
Rhyacophilidae Verrula	0	0	0.0				0	18	pr
Rhyacophilidae Vespula	0	0	0.0				0	18	pr
Rhyacophilidae sp.	1	2	0.0				0	18	pr
Trichopteran pupae	3	6	0.1				nn	nn	na
				139	6.82				
Other							5	108	cg
Annelida	3	6	0.1						
Coleoptera-Elmidae									
Cleptelmis sp.	0	0	0.0				4	108	cg
Heterlimnius sp.	7	15	0.3				4	108	cg
Lara sp.	0	0	0.0				4	108	sh
Marpus sp.	1	2	0.0				4	108	cg
Saitzevia sp.	0	0	0.0				4	108	cg
Elmidae	0	0	0.0				4	108	cg
Collembola	0	0	0.0				nn	nn	na
Diptera									
Agathon sp.	0	0	0.0				0	2	sc
ceratopogonidae	0	0	0.0				6	108	pr
Chironomidae	119	257	5.8				6	108	cg/f
Oreoceton sp.	0	0	0.0				6	nn	pr
Simuliidae	3	6	0.1				6	108	cf
Antocha sp.	0	0	0.0				3	24	cg
Cicranota sp.	0	0	0.0				3	24	pr
Hexatomidae	1	2	0.0				3	36	pr
Pedicia sp.	0	0	0.0				3	36	pr
Tipula sp.	0	0	0.0				3	36	sh
Hydracarina	0	0	0.0				5	108	pr
Mollusca	0	0	0.0				8	108	cg
Nematoda	0	0	0.0				nn	nn	na
Turbellaria	5	11	0.2				4	108	pr
TOTAL NUMBER =	2037			1898					
TOTAL TAXA =	35			15.95					
STD =	91.4			22.42					
MEAN =	407			10.19					

Macroinvertebrate Data-Montaukore, August 1991
Libby Creek, LI #10

	For Each Taxa		Major Group		TV	TQ	PRG
	No.	No./sq.m.	Percent of Total	Total Number	Percent of Total		
Ephemeroptera							
Baetis sp.	810	1750	35.4			4	72
Candatella hystrix	0	0	0.0			1	nn
Drusella coloradensis/ flavilines	30	65	1.3			1	16
Drusella doddei	161	348	7.0			1	4
Drusella spinifera	0	0	0.0			1	24
Drusella sp.	0	0	0.0			0	48
Sphemerella sp.	0	0	0.0			1	48
Serratella sp.	23	50	1.0			1	24
Cinygmulia sp.	45	97	2.0			4	21
Speorus sp.	220	475	9.6			4	48
Heptagenia sp.	0	0	0.0			4	48
Rhithrogena sp.	569	1229	24.8			4	21
Paraleptophlebia sp.	13	28	0.6			2	24
Ameletus sp.	2	4	0.1			7	48
Plecoptera				139	6.07		
Capniidae	0	0	0.0			1	32
Kathroperla pardita	1	2	0.0			1	24
Sveltza/Suwallia sp.	51	110	2.2			1	24
Despaxia augusta	0	0	0.0			0	18
Paraleuctra sp.	0	0	0.0			0	18
Parionymia sp.	0	0	0.0			0	18
Leuctridae	0	0	0.0			0	18
Hemocora sp.	0	0	0.0			2	24
Visoka cataractae	2	4	0.1			2	nn
Sapada cinotipes	0	0	0.0			2	16
Sapada columbiana	45	97	2.0			2	16
Hemouridae	0	0	0.0			2	36
Yoraperla brevis	0	0	0.0			2	110
Acronemuria abnormalis	0	0	0.0			1	6
Boremeuria theodora	5	11	0.2			1	18
Hepperopera pacifica	0	0	0.0			1	18
Perlidae	18	39	0.8			1	nn
Inoperla sp.	0	0	0.0			2	48
Megarcys sp.	3	11	0.2			2	24
Setevona bradleyi	0	0	0.0			2	nn
Skwala sp.	0	0	0.0			2	18
Perlodidae	12	26	0.5			2	nn
Taenionema sp.	0	0	0.0			2	48
Trichoptera				120	5.24		
Micrasema sp.	0	0	0.0			1	24
Anagapetus op.	0	0	0.0			0	24
Glossosoma op.	0	0	0.0			0	24
Arctopychya grandis	0	0	0.0			4	18
Parapychya elisia	1	2	0.0			4	6
Hydropsychidae	60	130	2.6			4	108
Agraylea sp.	0	0	0.0			4	108
Ochrotrichia sp.	0	0	0.0			4	108
Lepidoptera sp.	0	0	0.0			1	18
Apatania sp.	0	0	0.0			4	18
Ecclesomyia sp.	0	0	0.0			4	24
Neothremma alicia	0	0	0.0			4	8
Oligophlebiodes sp.	0	0	0.0			4	24
Limnephilidae	4	9	0.2			4	108
Normaldia sp.	0	0	0.0			3	24
Rhyacophila Angelita	1	2	0.0			0	18
Rhyacophila Bettani	0	0	0.0			0	18
Rhyacophila Bifila/Colorado	0	0	0.0			0	18
Rhyacophila Brunnea	5	17	0.3			0	18
Rhyacophila Hyalinata	0	0	0.0			0	18
Rhyacophila Irenda	0	0	0.0			0	18
Rhyacophila Sibirica	1	2	0.0			0	18
Rhyacophila Vacua	40	86	1.7			0	18
Rhyacophila Verrula	0	0	0.0			0	18
Rhyacophila vespula	0	0	0.0			0	18
Rhyacophila sp.	1	2	0.0			0	18
Trichopteran pupae	4	9	0.2			nn	nn
Other				158	6.90		
Annelida	14	30	0.6			5	108
Coleoptera-Elmidae							
Cleptelmis sp.	0	0	0.0			4	108
Heterlimnius sp.	13	28	0.6			4	108
Lara sp.	0	0	0.0			4	108
Barpus sp.	0	0	0.0			4	108
Zaitzovia sp.	0	0	0.0			4	108
Elmidae	0	0	0.0			4	108
Collembola	0	0	0.0			nn	nn
Diptera							
Agathomyia sp.	0	0	0.0			0	2
Caratopogonidae	0	0	0.0			6	108
Chironomidae	98	212	4.3			6	108
Oreogeton sp.	13	28	0.6			6	nn
Simuliidae	3	6	0.1			6	108
Antocha sp.	0	0	0.0			3	24
Dicranota sp.	13	28	0.6			3	24
Hexatomidae	4	9	0.2			3	36
Pedicia sp.	0	0	0.0			3	36
Tipula sp.	0	0	0.0			3	36
Hydracarina	0	0	0.0			5	108
Mollusca	0	0	0.0			8	108
Nematoda	0	0	0.0			nn	nn
Turbellaria	0	0	0.0			4	108
TOTAL NUMBER =	2290		EPT Abund. =	2132		SDI =	3.0
TOTAL TAXA =	33		EPT/Chiron. =	21.76			
STD =	108.8		COEF. VAR. =	23.75			
MEAN =	458		SE MEAN =	10.80			

Macroinvertebrate Data-Montanore, August 1991
Libby Creek, 19 fil

	For Each Taxa		Major Group			TV	TQ	FG
	No.	No./sq.m.	Percent of Total	Total Number	Percent of Total			
Sphingoptera				1428	79.64			
Bastis sp.	210	454	11.7			4	72	cg
Caudatella hystrix	0	0	0.0			1	nn	cg
Drunella coloradensis/								
flavilinae	12	26	0.7			1	18	sc
Drunella doddi	230	497	12.8			1	4	sc
Drunella spinifera	0	0	0.0			1	24	sc
Drunella sp.	0	0	0.0			0	48	sc
Sphingoptera sp.	0	0	0.0			1	48	sc
Serratella sp.	0	0	0.0			1	24	cg
Cinygmaula sp.	32	69	1.8			4	21	sc
Sperorus sp.	327	706	18.2			4	21	sc
Heptagenia sp.	0	0	0.0			4	48	sc
Rhithrogena sp.	612	1322	34.1			4	21	cg
Paraleptophlebia sp.	0	0	0.0			2	24	cg
Amelatus sp.	5	11	0.3			7	48	cg
206	11.49							
Plecoptera								
Capniidae	1	2	0.1			1	32	sh
Kathroperla pardita	3	6	0.2			1	24	cg
Sweltsa/Sweltia sp.	74	160	4.1			1	24	pr
Despaxia augusta	5	11	0.3			0	18	sh
Paraleuctra sp.	0	0	0.0			0	18	sh
Perlomyia sp.	0	0	0.0			0	18	sh
Luctridae	0	0	0.0			0	18	sh
Memoreta sp.	0	0	0.0			2	24	sh
Visoka cataractae	7	15	0.4			2	nn	sh
Epidora cinctipes	0	0	0.0			2	16	sh
Epidora columbiana	63	136	3.5			2	16	sh
Emouridae	0	0	0.0			2	36	sh
Yoraparla brevis	7	15	0.4			2	110	sh
Acroneuria anomalis	0	0	0.0			1	6	pr
Doroneuria theodora	1	2	0.1			1	18	pr
Hesperoperla pacifica	1	2	0.1			1	18	pr
Perlidae	4	9	0.2			1	nn	pr
Isoperla sp.	0	0	0.0			2	48	pr
Megarcys sp.	20	43	1.1			2	24	pc
Setevia bradleyi	0	0	0.0			2	nn	pr
Skwala sp.	0	0	0.0			2	18	pr
Parolidae	20	43	1.1			2	nn	pr
Taenionema sp.	0	0	0.0			2	48	sc
39	2.18							
Trichoptera								
Micrasemina sp.	0	0	0.0			1	24	sh
Anagapetus sp.	0	0	0.0			0	24	ac
Glossosoma sp.	1	2	0.1			0	24	sc
Arctoplyche grandis	0	0	0.0			4	18	cf
Parapsyche elisia	7	15	0.4			4	6	cf
Hydropsychidae	0	0	0.0			4	108	nn
Agraylea sp.	0	0	0.0			4	108	cg
Ochrotrichia sp.	0	0	0.0			4	108	cg
Lepidostoma sp.	0	0	0.0			1	18	sh
Apatania sp.	0	0	0.0			4	18	ac
Ecclesomyia sp.	0	0	0.0			4	24	cg
Neothremma alicia	2	4	0.1			4	8	sc
Oligophlebodes sp.	0	0	0.0			4	24	sc
Limnophilidae	0	0	0.0			4	108	nn
Wormaldia sp.	0	0	0.0			3	24	cf
Rhyacophila Angelita	0	0	0.0			0	18	pr
Rhyacophila Botteni	0	0	0.0			0	18	pr
Rhyacophila Bifila/Colorado	0	0	0.0			0	18	pr
Rhyacophila Brunnea	2	4	0.1			0	18	pr
Rhyacophila Hyalinata	0	0	0.0			0	18	pr
Rhyacophila Iranda	8	17	0.4			0	18	pr
Rhyacophila Sibirica	0	0	0.0			0	18	pr
Rhyacophila Vaccua	4	9	0.2			0	18	pr
Rhyacophila Verrula	0	0	0.0			0	18	pr
Rhyacophila vespuna	0	0	0.0			0	18	pr
Rhyacophila sp.	14	30	0.8			0	18	pr
Trichopteran pupae	1	2	0.1			nn	nn	na
120	6.69							
Other								
Annelida	23	50	1.3			5	108	cg
Coleoptera-Elimidae								
Cleptelmis sp.	0	0	0.0			4	108	cg
Heterlimnius sp.	0	0	0.0			4	108	cg
Lara sp.	0	0	0.0			4	108	sh
Sarpus sp.	0	0	0.0			4	108	cg
Seitzvia sp.	0	0	0.0			4	108	cg
Elmidae	1	2	0.1			4	108	cg
Collembola	0	0	0.0			nn	nn	na
Diptera								
Agathon sp.	0	0	0.0			0	2	sc
Ceratopogonidae	0	0	0.0			6	108	pr
Chironomidae	71	153	4.0			6	108	cg/t
Greogoton sp.	4	9	0.2			6	nn	pr
Simuliidae	3	6	0.2			6	108	cf
Antocha sp.	0	0	0.0			3	24	cg
Dicranota sp.	7	15	0.4			3	24	pr
Hexatomidae	0	0	0.0			3	36	pr
Pedicia sp.	0	0	0.0			3	36	pr
Tipula sp.	0	0	0.0			3	36	sh
Hydrecarina	0	0	0.0			5	108	pr
Mollusca	0	0	0.0			8	108	cg
Rematoda	0	0	0.0			nn	nn	na
Turbellaria	11	24	0.6			4	108	pr
TOTAL NUMBER =	1793	SPT Abund. =	1673	SDI =	3.1			
TOTAL TAXA =	34	SPT/Chiron. =	23.56					
STD =	80.6	COEF. VAR. =	22.48					
MEAN =	359	SE MEAN =	10.22					

Macroinvertebrate Data-Montanore, August 1991
Libby Creek, L10 #12

	For Each Taxa			Major Group			TV	TQ	PRG
	No.	No./sq.m.	Percent of Total	Total Number	Percent of Total				
Sphingoptera									
Baetis sp.	89	192	4.5				4	72	cg
Caudatella hystrix	0	0	0.0				1	nn	cg
Drunella coloradensis/ flavilimna	8	17	0.4				1	18	sc
Drunella doddsi	149	322	7.6				1	4	sc
Drunella spinifera	0	0	0.0				1	24	sc
Drunella sp.	0	0	0.0				0	48	sc
Ephemerella sp.	0	0	0.0				1	48	sc
Serratella sp.	0	0	0.0				1	24	cg
Cinygma sp.	0	0	0.0				4	21	sc
Sperorus sp.	420	907	21.4				4	21	sc
Heptagenia sp.	0	0	0.0				4	48	sc
Rhithrogena sp.	373	805	19.0				4	21	cg
Paraleptophlebia sp.	0	0	0.0				2	24	cg
Ameletus sp.	26	56	1.3				7	48	cg
Plecoptera				457	23.23				
Capniidae	12	26	0.6				1	32	sh
Kathroperla pardita	0	0	0.0				1	24	cg
Sweatsea/Suwallia sp.	238	514	12.1				1	24	pr
Despaxia augusta	26	56	1.3				0	18	sh
Paraleuctra sp.	0	0	0.0				0	18	sh
Parlomyia sp.	0	0	0.0				0	18	sh
Luctridae	0	0	0.0				0	18	sh
Mesoura sp.	2	4	0.1				2	24	sh
Visoka cataractae	24	52	1.2				2	nn	sh
Zapada cinctipes	0	0	0.0				2	16	sh
Zapada columbiana	77	166	3.9				2	16	sh
Hemouridae	0	0	0.0				2	36	sh
Yoraperla brevis	12	26	0.6				2	24	sh
Acroneuria abnormis	0	0	0.0				1	6	pr
Doroneuria theodora	0	0	0.0				1	18	pr
Hesperoperla pacifica	0	0	0.0				1	18	pr
Parlididae	8	17	0.4				1	nn	pr
Isoperla sp.	0	0	0.0				2	48	pr
Megarcys sp.	0	0	0.0				2	24	pr
Setvena bradleyi	0	0	0.0				2	nn	pr
Skwala sp.	0	0	0.0				2	18	pr
Perlodidae	58	125	2.9				2	nn	pr
Taenionema sp.	0	0	0.0				2	48	sc
Trichoptera				56	2.85				
Micrasema sp.	0	0	0.0				1	24	sh
Anagapetus sp.	0	0	0.0				0	24	sc
Glossosoma sp.	3	6	0.2				0	24	sc
Arctopsyche grandis	0	0	0.0				4	18	cf
Parapsyche elisia	10	22	0.5				4	6	cf
Hydropsychidae	0	0	0.0				4	108	nn
Agraylea sp.	0	0	0.0				4	108	cg
Ochrotrichia sp.	0	0	0.0				4	108	cg
Lepidostome sp.	0	0	0.0				1	18	sh
Apatania sp.	0	0	0.0				4	18	sc
Scolicomyia sp.	0	0	0.0				4	24	cg
Neothremma alicia	4	9	0.2				4	8	sc
Oligophlebodes sp.	0	0	0.0				4	24	sc
Limnephilidae	7	15	0.4				4	108	nn
Normaldia sp.	0	0	0.0				3	24	cf
Rhyacophila Angelita	0	0	0.0				0	18	pr
Rhyacophila Bettani	0	0	0.0				0	18	pr
Rhyacophila bifila/Colorado	0	0	0.0				0	18	pr
Rhyacophila Brunnea	0	0	0.0				0	18	pr
Rhyacophila Hyalinata	0	0	0.0				0	18	pr
Rhyacophila Irenda	0	0	0.0				0	18	pr
Rhyacophila Sibirica	0	0	0.0				0	18	pr
Rhyacophila Vaccua	9	19	0.5				0	18	pr
Rhyacophila Verrula	0	0	0.0				0	18	pr
Rhyacophila vespula	0	0	0.0				0	18	pr
Rhyacophila sp.	22	48	1.1				0	18	pr
Trichopteran pupae	1	2	0.1				nn	nn	na
Other				389	19.78				
Annelida	75	162	3.8				5	108	cg
Coleoptera-Elimidae									
Cleptalmis sp.	0	0	0.0				4	108	cg
Heterlimnius sp.	0	0	0.0				4	108	cg
Lara sp.	0	0	0.0				4	108	sh
Harpalus sp.	0	0	0.0				4	108	cg
Saitzevia sp.	0	0	0.0				4	108	cg
Elmidae	0	0	0.0				4	108	cg
Collembola	0	0	0.0				nn	nn	na
Diptera									
Agathox sp.	0	0	0.0				0	2	sc
Ceratopogonidae	0	0	0.0				6	108	pr
Chironomidae	284	613	14.4				6	108	cg/f
Oreoceton sp.	2	4	0.1				6	nn	pr
Simuliidae	5	11	0.3				6	108	cf
Atocha sp.	0	0	0.0				3	24	cg
Dicranota sp.	6	13	0.3				3	24	pr
Hexatomidae	2	4	0.1				3	36	pr
Pedicia sp.	2	4	0.1				3	36	pr
Tipula sp.	0	0	0.0				3	36	sh
Hydracarina	0	0	0.0				5	108	pr
Mollusca	0	0	0.0				8	108	cg
Nematoda	0	0	0.0				nn	nn	na
Turbellaria	13	28	0.7				4	108	pr
TOTAL NUMBER =	1967			1578			SDI =	3.4	
TOTAL TAXA =	30			5.56					
STD =	72.8			COEF. VAR. =	18.91				
MEAN =	393			SE MEAN =	8.42				

Macroinvertebrate Data-Montanore, August 1991
Little Cherry Creek, LCI #13

	For Each Taxa		Percent of Total	Major Group		TV	TQ	PFG
	No.	No./sq.m.		Total Number	Percent of Total			
Sphingoptera				254	43.79			
Baetis sp.	143	1544	24.7			4	72	cg
Candatella hystrix	0	0	0.0			1	nn	cg
Drunella coloradensis/ flavilinea	1	11	0.2			1	18	sc
Drunella doddsi	0	0	0.0			1	4	sc
Drunella spinifera	1	11	0.2			1	24	sc
Drunella sp.	0	0	0.0			0	48	sc
Ephemerella sp.	0	0	0.0			1	48	sc
Serratella sp.	0	0	0.0			1	24	cg
Cinygma sp.	0	0	0.0			4	21	sc
Cinygma sp.	34	367	5.9			4	21	sc
Epeorus sp.	0	0	0.0			4	21	sc
Rhithrogena sp.	60	648	10.3			4	21	cg
Paraleptophlebia sp.	5	54	0.9			2	24	cg
Ameletus sp.	10	108	1.7			7	48	cg
Plecoptera				187	32.24			
Capniidae	0	0	0.0			1	32	sh
Kathroperla pardita	0	0	0.0			1	24	cg
Sweltsa/Suumilia sp.	26	281	4.5			1	24	pr
Despaxia angusta	1	11	0.2			0	18	nh
Paraleuctriidae sp.	0	0	0.0			0	18	sh
Perlomyia sp.	0	0	0.0			0	18	sh
Leuctridae	0	0	0.0			0	18	sh
Nemoura sp.	0	0	0.0			2	24	sh
Vinokura cataractae	0	0	0.0			2	nn	sh
Sapada cinctipes	0	0	0.0			2	16	sh
Sapada columbiana	128	1382	22.1			2	16	sh
Nemouridae	0	0	0.0			2	36	sh
Yoraperla brevis	0	0	0.0			2	24	sh
Acronemuria abnormalis	0	0	0.0			1	6	pr
Doroneuria theodora	8	86	1.4			1	18	pr
Heoperla pacifica	0	0	0.0			1	18	pr
Parlidiae	14	151	2.4			1	nn	pr
Iscopula sp.	0	0	0.0			2	48	pr
Hegarcynia sp.	2	22	0.3			2	24	pr
Setvena bradleyi	0	0	0.0			2	nn	pr
Skwala sp.	0	0	0.0			2	18	pr
Perlodidae	6	86	1.4			2	nn	pr
Taenionema sp.	0	0	0.0			2	48	sc
Trichoptera				89	15.34			
Micrasema sp.	0	0	0.0			1	24	sh
Anagapetus sp.	0	0	0.0			0	24	sc
Glossosoma sp.	0	0	0.0			0	24	sc
Arctopeche grandis	0	0	0.0			4	18	cf
Parapsyche elisia	5	54	0.9			4	6	ct
Hydropsychidae	63	680	10.9			4	108	cf
Agraylea sp.	0	0	0.0			4	108	cg
Ochrotrichia sp.	0	0	0.0			4	108	cg
Lepidocome sp.	3	32	0.5			1	18	sh
Apatania sp.	0	0	0.0			4	18	oo
Ecclesomyia sp.	0	0	0.0			4	24	cg
Neothremma alicia	0	0	0.0			4	8	sc
Oligophlebodes sp.	0	0	0.0			4	24	sc
Limnephilidae	0	0	0.0			4	108	nn
Normaldia sp.	0	0	0.0			3	24	cf
Rhyacophila Angelita	0	0	0.0			0	18	pr
Rhyacophila Bettani	0	0	0.0			0	18	pr
Rhyacophila Riffle/Colorado	0	0	0.0			0	18	pr
Rhyacophila Brunnea	4	43	0.7			0	18	pr
Rhyacophila Byalinata	0	0	0.0			0	18	pr
Rhyacophila Iranda	0	0	0.0			0	18	pr
Rhyacophila Sibirica	0	0	0.0			0	18	pr
Rhyacophila Vacua	14	151	2.4			0	18	pr
Rhyacophila Verrula	0	0	0.0			0	18	pr
Rhyacophila vulgaris	0	0	0.0			0	18	pr
Rhyacophila sp.	0	0	0.0			0	18	pr
Trichopteran pupae	0	0	0.0			nn	nn	na
Other				50	8.62			
Annelida	0	0	0.0			5	108	cg
Coleoptera-Elimidae								
Cleptelmis sp.	0	0	0.0			4	108	cg
Heterlimnium sp.	17	184	2.9			4	108	cg
Lara sp.	0	0	0.0			4	108	sh
Narpus sp.	0	0	0.0			4	108	cg
Saitzevia sp.	0	0	0.0			4	108	cg
Elmidae	0	0	0.0			4	108	cg
Collembola	0	0	0.0			nn	nn	na
Diptera								
Agathon sp.	0	0	0.0			0	2	sc
Caratopogonidae	0	0	0.0			6	108	pr
Chironomidae	6	65	1.0			6	108	cg/f
Oreogeton sp.	2	22	0.3			6	nn	pr
Simuliidae	24	259	4.1			6	108	cf
Antocha sp.	0	0	0.0			3	24	cg
Dicranota sp.	1	11	0.2			3	24	pr
Hexatomidae	0	0	0.0			3	36	pr
Pedicia sp.	0	0	0.0			3	36	pr
Tipula sp.	0	0	0.0			3	36	sh
Hydracarina	0	0	0.0			5	108	pr
Mollusca	0	0	0.0			6	108	cg
Nematoda	0	0	0.0			nn	nn	na
Turbellaria	0	0	0.0			4	108	pr
TOTAL NUMBER =	580	EPT Abund. =	530	SDI =	3.4			
TOTAL TAXA =	24	EPT/Chiron. =	88.33					
STD =	22.6	COEF. VAR. =	3.90					
MEAN =	580	SE MEAN =	3.90					

Macroinvertebrate Data-Montanore, August 1991
Poorman Creek, Pol #14

	For Each Taxa			Major Group			TV	TQ	FRG
	No.	No./sq.m.	Percent of Total	Total Number	Percent of Total				
Ephemeroptera				1783	83.53				
<i>Baetis</i> sp.	331	715	15.5				4	72	cg
<i>Caudatella hystrix</i>	0	0	0.0				1	nn	cg
<i>Drunella coloradensis/</i> <i>flavilinea</i>	4	9	0.2				1	18	sc
<i>Drunella doddei</i>	357	771	16.7				1	4	sc
<i>Drunella spinifera</i>	0	0	0.0				1	24	sc
<i>Drunella</i> sp.	0	0	0.0				0	48	sc
<i>Ephemerella</i> sp.	0	0	0.0				1	48	sc
<i>Serrateella</i> sp.	4	9	0.2				1	24	cg
<i>Cinygmulia</i> sp.	29	63	1.4				4	21	sc
<i>Speorus</i> sp.	447	966	20.9				4	21	sc
<i>Hoptagenia</i> sp.	0	0	0.0				4	48	sc
<i>Rhithrogena</i> sp.	611	1320	28.6				4	21	cg
<i>Paraleptophlebia</i> sp.	1	2	0.0				2	24	cg
<i>Ameletus</i> sp.	1	2	0.0				7	48	cg
Plecoptera				237	11.09				
<i>Capniidae</i>	2	4	0.1				1	32	sh
<i>Kathroperla pardita</i>	3	6	0.1				1	24	cg
<i>Sialis/Sauvella</i> sp.	82	177	3.8				1	24	pr
<i>Dospania augusta</i>	7	13	0.3				0	18	sh
<i>Paraleuctra</i> sp.	0	0	0.0				0	18	sh
<i>Parlimoia</i> sp.	0	0	0.0				0	18	sh
<i>Leuctridae</i>	0	0	0.0				0	18	sh
<i>Hemonira</i> sp.	0	0	0.0				2	24	sh
<i>Visoka cataractae</i>	7	15	0.3				2	nn	sh
<i>Sepada cinctipes</i>	0	0	0.0				2	16	sh
<i>Sepada columblana</i>	97	210	4.5				2	16	sh
<i>Nemouridae</i>	0	0	0.0				2	36	sh
<i>Voraperla brevicauda</i>	1	2	0.0				2	24	sh
<i>Acronemuria anomalis</i>	0	0	0.0				1	6	pr
<i>Coroneuria thordora</i>	2	4	0.1				1	18	pr
<i>Heoperperla pacifica</i>	0	0	0.0				1	18	pr
<i>Perlidae</i>	11	24	0.5				1	nn	pr
<i>Isoperla</i> sp.	0	0	0.0				2	48	pr
<i>Megarcys</i> sp.	25	54	1.2				2	24	pr
<i>Setodes bradleyi</i>	0	0	0.0				2	nn	pr
<i>Skwala</i> sp.	0	0	0.0				2	18	pr
<i>Parlodiidae</i>	0	0	0.0				2	nn	pr
<i>Taenionema</i> sp.	0	0	0.0				2	48	sc
Trichoptera				45	2.11				
<i>Micrasema</i> sp.	0	0	0.0				1	24	sh
<i>Anagapetus</i> sp.	0	0	0.0				0	24	sc
<i>Glossosoma</i> sp.	0	0	0.0				0	24	sc
<i>Arctopsyche grandis</i>	0	0	0.0				4	18	cf
<i>Parapsyche elisia</i>	13	28	0.6				4	6	cf
<i>Hydropsychidae</i>	0	0	0.0				4	108	nn
<i>Agrylea</i> sp.	0	0	0.0				4	108	cg
<i>Ochrotrichia</i> sp.	0	0	0.0				4	108	cg
<i>Lepidostoma</i> sp.	0	0	0.0				1	18	sh
<i>Apataenia</i> sp.	0	0	0.0				4	18	sc
<i>Ecdyonurilla</i> sp.	0	0	0.0				4	24	cg
<i>Heothremma alicia</i>	0	0	0.0				4	8	sc
<i>Oligophilobodes</i> sp.	0	0	0.0				4	24	sc
<i>Limnephilidae</i>	0	0	0.0				4	108	nn
<i>Wormaldia</i> sp.	0	0	0.0				3	24	cf
<i>Rhyacophila Angelita</i>	0	0	0.0				0	18	pr
<i>Rhyacophila Batteni</i>	10	22	0.5				0	18	pr
<i>Rhyacophila Bifile/Colorado</i>	0	0	0.0				0	18	pr
<i>Rhyacophila Brunnea</i>	2	4	0.1				0	18	pr
<i>Rhyacophila Hyalinata</i>	0	0	0.0				0	18	pr
<i>Rhyacophila Iranda</i>	0	0	0.0				0	18	pr
<i>Rhyacophila Sibirica</i>	0	0	0.0				0	18	pr
<i>Rhyacophila Vacua</i>	1	2	0.0				0	18	pr
<i>Rhyacophila Verrula</i>	0	0	0.0				0	18	pr
<i>Rhyacophila vespula</i>	0	0	0.0				0	18	pr
<i>Rhyacophila</i> sp.	19	41	0.9				0	18	pr
Trichoptera pupae	0	0	0.0				nn	nn	na
Other				70	3.28		5	108	cg
Annelida	0	0	0.0						
Coleoptera-Elimidae									
<i>Cleptalmis</i> sp.	0	0	0.0				4	108	cg
<i>Heterlimnius</i> sp.	9	19	0.4				4	108	cg
<i>Lara</i> sp.	0	0	0.0				4	108	sh
<i>Harpalus</i> sp.	0	0	0.0				4	108	cg
<i>Saitzevia</i> sp.	0	0	0.0				4	108	cg
Elmidae	0	0	0.0				4	108	cg
Collembola	0	0	0.0				nn	nn	na
Diptera									
<i>Agathon</i> sp.	0	0	0.0				0	2	sc
<i>Caratopogonidae</i>	0	0	0.0				6	108	pr
<i>Chironomidae</i>	44	95	2.1				6	108	cg/f
<i>Oreoceton</i> sp.	2	4	0.1				6	nn	pr
<i>Simuliidae</i>	2	4	0.1				6	108	cf
<i>Antocha</i> sp.	0	0	0.0				3	24	cg
<i>Dicranota</i> sp.	4	9	0.2				3	24	pr
<i>Hexatomidae</i>	0	0	0.0				3	36	pr
<i>Pedicia</i> sp.	0	0	0.0				3	36	pr
<i>Tipula</i> sp.	0	0	0.0				3	36	sh
Hydracarina	0	0	0.0				5	108	pr
Mollusca	0	0	0.0				8	108	cg
Nematoda	8	17	0.4				nn	nn	na
Turbellaria	1	2	0.0				4	108	pr
TOTAL NUMBER =	2137			EPT Abund. =	2067		SDI =	2.9	
TOTAL TAXA =	31			EPT/Chiron. =	46.99				
STO =	95.1			COEF. VAR. =	22.25				
MEAN =	427			SE MEAN =	10.11				

Macroinvertebrate Data-Montanore, August 1991
Ramsey Creek, Ra2 #15

	For Each Taxa		Major Group		TV	TO	FRO
	No.	No./sq.m.	Percent of Total	Total Number	Percent of Total		
Ephemeroptera							
Baetis sp.	127	274	8.6			4	72
Caudatella hystrix	0	0	0.0			1	nn
Drunella coloradensis/ flavilimata	4	9	0.3			1	18
Drunella doddi	313	676	21.1			1	4
Drunella spinifera	0	0	0.0			1	24
Drunella sp.	0	0	0.0			0	48
Sphemerella sp.	0	0	0.0			1	48
Serratella sp.	1	2	0.1			1	24
Cinygmulia sp.	50	108	3.4			4	21
Speorus sp.	264	570	17.8			4	21
Heptagenia sp.	0	0	0.0			4	48
Rhithrogena sp.	299	646	20.2			4	21
Paraleptophlebia sp.	0	0	0.0			2	24
Ameletus sp.	7	15	0.5			7	48
Plecoptera				297	20.03		
Capniidae	0	0	0.0			1	32
Kathroperla perdita	0	0	0.0			1	24
Sweltsa/Suturalia sp.	138	298	9.3			1	24
Despaxia augusta	4	9	0.3			0	18
Paraleuctra sp.	0	0	0.0			0	18
Parlomyia sp.	0	0	0.0			0	18
Leuctridae	3	6	0.2			0	18
Hemoura sp.	0	0	0.0			2	24
Viscida cataractae	31	67	2.1			2	nn
Zapada cinctipes	0	0	0.0			2	16
Zapada columbiana	98	212	6.6			2	16
Hamouridae	0	0	0.0			2	36
Yoraperla brevis	1	2	0.1			2	24
Acroneuria abnormis	0	0	0.0			1	6
Doroneuria theodora	0	0	0.0			1	18
Heoperperla pacifica	0	0	0.0			1	18
Perlidae	0	0	0.0			1	nn
Isonopera sp.	0	0	0.0			2	48
Megarcys sp.	20	43	1.3			2	24
Setvena bradleyi	0	0	0.0			2	nn
Skwala sp.	0	0	0.0			2	18
Perlodidae	2	4	0.1			2	nn
Taenionema sp.	0	0	0.0			2	48
Trichoptera				67	4.52		
Micrasema sp.	0	0	0.0			1	24
Anagapetus sp.	0	0	0.0			0	24
Glossocoma sp.	9	19	0.6			0	24
Arctopsyche grandis	0	0	0.0			4	18
Parapsyche elois	9	19	0.6			4	6
Hydropsychidae	11	24	0.7			4	108
Agraylea sp.	0	0	0.0			4	108
Ochotrichia sp.	0	0	0.0			4	108
Lepidostome sp.	0	0	0.0			1	18
Apatania sp.	0	0	0.0			4	18
Ecolicomyia sp.	0	0	0.0			4	24
Neothremma alicia	0	0	0.0			4	8
Oligophlebodes sp.	0	0	0.0			4	24
Limnephilidae	0	0	0.0			4	108
Wormaldia sp.	0	0	0.0			3	24
Rhyacophila Angelita	1	2	0.1			0	18
Rhyacophila Bettani	5	11	0.3			0	18
Rhyacophila Bifila/Colorado	0	0	0.0			0	18
Rhyacophila Brunnea	2	4	0.1			0	18
Rhyacophila Hyalinata	0	0	0.0			0	18
Rhyacophila Iranda	0	0	0.0			0	18
Rhyacophila Sibirica	11	24	0.7			0	18
Rhyacophila Vacca	12	26	0.8			0	18
Rhyacophila Verrula	0	0	0.0			0	18
Rhyacophila vespula	3	6	0.2			0	18
Rhyacophila sp.	0	0	0.0			0	18
Trichopteran pupae	4	9	0.3			nn	nn
Other				54	3.64		
annelida	5	11	0.3			5	108
Coleoptera-Kimidae							
Cleptelmis sp.	0	0	0.0			4	108
Heterlimnia sp.	2	4	0.1			4	108
Lara sp.	0	0	0.0			4	108
Marpus sp.	0	0	0.0			4	108
Zaitzevia sp.	0	0	0.0			4	108
Elmidae	0	0	0.0			4	108
Collembola	0	0	0.0			nn	nn
Diptera							
Agathon sp.	0	0	0.0			0	2
Caratopogonidae	0	0	0.0			6	108
Chironomidae	35	76	2.4			6	108
Creogeton sp.	2	4	0.1			6	nn
Simuliidae	3	6	0.2			6	108
Antocha sp.	0	0	0.0			3	24
Dicranota sp.	5	11	0.3			3	24
Hexatomidae	0	0	0.0			3	36
Pedicia sp.	0	0	0.0			3	36
Tipula sp.	0	0	0.0			3	36
Hydracarina	0	0	0.0			5	108
Mollusca	0	0	0.0			8	108
Nematoda	0	0	0.0			nn	nn
Turbellaria	2	4	0.1			4	108
TOTAL NUMBER =	1483			1429		SDI =	3.3
TOTAL TAXA =	33			40.83			
STD =	57.3			19.31			
MEAN =	297			6.78			

Macrainvertebrate Data-Montanore, August 1991
Bear Creek, Box #16

	For Each Taxa			Major Group			TV	TQ	PRG
	No.	No./sq.m.	Percent of Total	Total Number	Percent of Total				
Ephemeroptera									
Baetis sp.	68	147	2.8				4	72	cg
Caudatella hystrix	0	0	0.0				1	nn	cg
Drunella coloradensis/ flavilinae	16	35	0.7				1	16	sc
Drunella doddsi	657	1419	26.9				1	4	sc
Drunella spinifera	0	0	0.0				1	24	sc
Drunella sp.	0	0	0.0				0	48	sc
Ephemerella sp.	0	0	0.0				1	46	sc
Serratella sp.	6	13	0.2				1	24	cg
Cinygma sp.	54	117	2.2				4	21	sc
Pseudorus sp.	591	1277	24.2				4	21	sc
Heptagenia sp.	0	0	0.0				4	48	sc
Rhithrogena sp.	618	1335	25.3				4	21	cg
Paraleptophlebia sp.	1	2	0.0				2	24	cg
Ameletus sp.	1	2	0.0				7	48	cg
				306	12.55				
Plecoptera									
Capniidae	0	0	0.0				1	32	sh
Kathroperla pardita	0	0	0.0				1	24	cg
Sweltsa/Sialis sp.	141	305	5.8				1	24	pr
Deepaxia augusta	13	32	0.6				0	18	sh
Paraleuctra sp.	0	0	0.0				0	18	sh
Perlomyia sp.	0	0	0.0				0	18	sh
Luctridae	8	17	0.3				0	18	sh
Mesocore sp.	0	0	0.0				2	24	sh
Visoka cataractae	3	6	0.1				2	nn	sh
Napada cinctipes	0	0	0.0				2	16	sh
Napada columbiana	93	201	3.8				2	16	sh
Hemouridae	0	0	0.0				2	36	sh
Xoraparla brevis	4	9	0.2				2	24	sh
Acronemuria anomalis	0	0	0.0				1	6	pr
Dorconemuria theodora	2	4	0.1				1	18	pr
Heoperopera pacifica	0	0	0.0				1	18	pr
Parlidiae	11	24	0.5				1	nn	pr
Isoperla sp.	0	0	0.0				2	48	pr
Megarcys sp.	27	58	1.1				2	24	pr
Setevana bradleyi	0	0	0.0				2	nn	pr
Skwala sp.	0	0	0.0				2	18	pr
Periodidae	2	4	0.1				2	nn	pr
Taeniinema sp.	0	0	0.0				2	48	sc
				59	2.42				
Trichoptera									
Micrasema sp.	0	0	0.0				1	24	sh
Anagapetus sp.	0	0	0.0				0	24	sc
Glossonoma sp.	10	22	0.4				0	24	sc
Arctopsyche grandis	0	0	0.0				4	18	cf
Parapsyche elisia	13	28	0.5				4	6	cf
Hydropsychidae	13	28	0.5				4	108	nn
Agraylea sp.	0	0	0.0				4	108	cg
Ochrotrichia sp.	0	0	0.0				4	108	cg
Lepidocoma sp.	0	0	0.0				1	18	sh
Aptania sp.	0	0	0.0				4	18	sc
Ecclesomyia sp.	0	0	0.0				4	24	cg
Neothremma alicia	0	0	0.0				4	8	sc
Oligophlebiodes sp.	0	0	0.0				4	24	sc
Limnephilidae	0	0	0.0				4	108	nn
Wormaldia sp.	0	0	0.0				3	24	cf
Rhyacophilidae Angelita	1	2	0.0				0	18	pr
Rhyacophilidae Betti	16	35	0.7				0	18	pr
Rhyacophilidae Bifila/Colorado	0	0	0.0				0	18	pr
Rhyacophilidae Brunnea	1	2	0.0				0	18	pr
Rhyacophilidae Hyalinata	1	2	0.0				0	18	pr
Rhyacophilidae Iranda	0	0	0.0				0	18	pr
Rhyacophilidae Sibirica	0	0	0.0				0	18	pr
Rhyacophilidae Vacua	3	6	0.1				0	18	pr
Rhyacophilidae Verrula	0	0	0.0				0	18	pr
Rhyacophilidae vespidea	0	0	0.0				0	18	pr
Rhyacophilidae sp.	0	0	0.0				0	18	pr
Trichopteran pupae	1	2	0.0				nn	nn	na
				62	2.54				
Other									
Annelida	5	11	0.2				5	108	cg
Coleoptera-Elimidae									
Cleptelmis sp.	0	0	0.0				4	108	cg
Heterlimnius sp.	1	2	0.0				4	108	cg
Lara sp.	0	0	0.0				4	108	sh
Narpus sp.	0	0	0.0				4	108	cg
Saitzovia sp.	0	0	0.0				4	108	cg
Elmidae	0	0	0.0				4	108	cg
Collembola	0	0	0.0				nn	nn	na
Diptera									
Agathon sp.	0	0	0.0				0	2	sc
Caratopogonidae	0	0	0.0				6	108	pr
Chironomidae	44	95	1.8				6	108	cg/f
Oreogenet sp.	0	0	0.0				6	nn	pr
Simuliidae	3	6	0.1				6	108	cf
Autocha sp.	0	0	0.0				3	24	cg
Dicranota sp.	1	2	0.0				3	24	pr
Hexatoma sp.	0	0	0.0				3	36	pr
Pedicia sp.	0	0	0.0				3	36	pr
Tipula sp.	0	0	0.0				3	36	sh
Hydracarina	0	0	0.0				5	108	pr
Mollusca	0	0	0.0				8	108	cg
Nematoda	4	9	0.2				nn	nn	na
Turbellaria	4	9	0.2				4	108	pr
TOTAL NUMBER =	2439			EPT Abund. =	2377		SDI =	2.9	
TOTAL TAXA =	35			EPT/Chiron. =	54.02				
STD =	114.8			CONF. VAR. =	23.34				
MEAN =	488			SE MEAN =	10.70				

Appendix C. Macroinvertebrate station totals, autumn 1991.

Macroinvertebrate Data-Montanore, October 1991
Libby Creek, LI #17

	For Each Taxa			Major Group			TV	TQ	PRG
	No.	No./sq.m.	Percent of Total	Total Number	Percent of Total				
Ephemeroptera				2292	51.46				
Baetis sp.	635	1372	14.3				4	72	cg
Caudatella byatrix	8	17	0.2				1	nn	cg
Drunella coloradensis/									
flavilinea	0	0	0.0				1	18	sc
doddsi	49	106	1.1				1	4	sc
spinitifera	0	0	0.0				1	24	sc
sp.	0	0	0.0				0	48	sc
Sphemerella sp.	0	0	0.0				1	48	sc
Serrateilia sp.	65	140	1.5				1	24	cg
Cinygula sp.	903	1950	20.3				4	21	sc
Speorus sp.	87	188	2.0				4	21	sc
Septagenia sp.	0	0	0.0				4	48	sc
Rhithrogena sp.	517	1117	11.6				4	21	cg
Paraleptophlebia sp.	28	60	0.6				2	24	cg
Ameletus sp.	0	0	0.0				7	48	cg
Plecoptera				1924	43.20				
Capniidae	17	37	0.4				1	32	sh
Kathroperla pardita	0	0	0.0				1	24	cg
Sweltsa/tutuilla sp.	106	229	2.4				1	24	pr
Despaxia augusta	2	4	0.0				0	18	sh
Paraleuctra sp.	0	0	0.0				0	18	sh
Perlomyia sp.	0	0	0.0				0	18	sh
Leuctridae	1	2	0.0				0	18	sh
Nemoura sp.	0	0	0.0				2	24	sh
Visoka cataractae	0	0	0.0				2	nn	sh
zapada cinctipes	109	235	2.4				2	16	sh
zapada columbiana	39	84	0.9				2	16	sh
Nemouridae	0	0	0.0				2	36	sh
Xoraperla brevis	1	2	0.0				2	24	sh
Acronemuria abnormis	0	0	0.0				1	6	pr
Dorconemuria theodora	10	22	0.2				1	18	pr
Hesperoperla pacifica	0	0	0.0				1	18	pr
Parlidiae	10	22	0.2				1	nn	pr
Isoperla sp.	22	48	0.5				2	48	pr
Megarcys sp.	10	22	0.2				2	24	pr
Setavena bradleyi	0	0	0.0				2	nn	pr
Skwala sp.	0	0	0.0				2	18	pr
Perlodidae	3	6	0.1				2	nn	pr
Taenionema sp.	1594	3443	35.8				2	48	cc
Trichoptera				207	4.65				
Micrasema sp.	1	2	0.0				1	24	sh
Anagapetus sp.	0	0	0.0				0	24	cc
Glossocoma sp.	2	4	0.0				0	24	cc
Arctopeche grandis	0	0	0.0				4	18	cf
Parapeche elisia	21	45	0.5				4	6	cf
Hydropsychidae	151	326	3.4				4	108	nn
Agraylia sp.	0	0	0.0				4	108	cg
Ochrotrichia sp.	0	0	0.0				4	108	cg
Lepidostome sp.	0	0	0.0				1	18	sh
Apatania sp.	0	0	0.0				4	18	cc
Ecclesomyia sp.	0	0	0.0				4	24	cg
Neothremma alicia	0	0	0.0				4	8	cc
Oligophlebiodes sp.	8	17	0.2				4	24	cc
Limnephilidae	3	6	0.1				4	108	nn
Normaldia sp.	0	0	0.0				3	24	cf
Rhyacophila Angelita	0	0	0.0				0	18	pr
Rhyacophila Bettani	11	24	0.2				0	18	pr
Rhyacophila Bifila/Coloradensis	0	0	0.0				0	18	pr
Rhyacophila Brunnea	8	17	0.2				0	18	pr
Rhyacophila Hyalinata	1	2	0.0				0	18	pr
Rhyacophila Iranda	0	0	0.0				0	18	pr
Rhyacophila Sibirica	0	0	0.0				0	18	pr
Rhyacophila Vaccua	0	0	0.0				0	18	pr
Rhyacophila Verrula	0	0	0.0				0	18	pr
Rhyacophila vespulsa	0	0	0.0				0	18	pr
Rhyacophila sp.	1	2	0.0				0	18	pr
Trichopteran pupae	0	0	0.0				nn	nn	na
Other				31	0.70				
Amelida	7	15	0.2				5	108	cg
Coleoptera-Elmidae									
Cleptelmis sp.	0	0	0.0				4	108	cg
Heterlimnius sp.	8	17	0.2				4	108	cg
Lara sp.	0	0	0.0				4	108	sh
Narpus sp.	0	0	0.0				4	108	cg
Nautes sp.	0	0	0.0				4	108	cg
Elmidae	0	0	0.0				4	108	cg
Collembola	0	0	0.0				nn	nn	na
Diptera									
Agathon sp.	0	0	0.0				0	2	sc
Caratopogonidae	0	0	0.0				6	108	pr
Chironomidae	6	13	0.1				6	108	cg/E
Oreogeton sp.	0	0	0.0				6	nn	pr
Simuliidae	1	2	0.0				6	108	cf
Antocha sp.	4	9	0.1				3	24	cg
Dicranota sp.	0	0	0.0				3	24	pr
Hexatomidae	5	11	0.1				3	36	pr
Pedicia sp.	0	0	0.0				3	36	pr
Tipula sp.	0	0	0.0				3	36	sh
Hydracarina	0	0	0.0				5	108	pr
Mollusca	0	0	0.0				8	108	cg
Nematoda	0	0	0.0				nn	nn	na
Turbellaria	0	0	0.0				4	108	pr
TOTAL NUMBER =	4454			4423					
TOTAL TAXA =	37			737.17					
STD =	211.9			COEF. VAR. =					
MEAN =	891			SE MEAN =					
				10.81					

	For Each Taxa		Percent of Total	Major Group		IV	VQ	FVG
	No.	No./sq.m.		Total Number	Percent of Total			
Ephemeroptera								
Baetis sp.	742	1603	20.1	2269	61.51	4	72	cg
Caudatella hystrix	0	0	0.0			1	nn	cg
Drunella coloradensis/ flavolineata	0	0	0.0			1	18	sc
Drunella doddsi	166	359	4.5			1	4	sc
Drunella spinifera	6	13	0.2			1	24	sc
Drunella sp.	0	0	0.0			0	48	sc
Ephemerella sp.	0	0	0.0			1	48	sc
Serratella sp.	43	93	1.2			1	24	cg
Cinygmaia sp.	865	1912	24.0			4	21	sc
Speorus sp.	57	123	1.5			4	21	sc
Heptagenia sp.	0	0	0.0			4	48	sc
Rhithrogena sp.	354	765	9.6			4	21	cg
Paraleptophlebia sp.	10	22	0.3			2	24	cg
Ameletus sp.	6	13	0.2			7	48	cg
Plecoptera				1096	29.71			
Capniidae	4	9	0.1			1	32	sh
Kathroperla pardita	0	0	0.0			1	24	cg
Sweltsa/Suwallia sp.	116	251	3.1			1	24	pr
Deepaxia angusta	4	9	0.1			0	18	sh
Paraleuctra sp.	0	0	0.0			0	18	sh
Perlomyia sp.	0	0	0.0			0	18	sh
Luctridae	0	0	0.0			0	18	sh
Nemoura sp.	0	0	0.0			2	24	sh
Visoka cataractae	3	6	0.1			2	nn	sh
Rapada cinctipes	87	188	2.4			2	16	sh
Rapada columbiana	26	56	0.7			2	16	sh
Hemoceridae	0	0	0.0			2	36	sh
Yoraperla brevis	0	0	0.0			2	24	ob
Acroneuria abnormalis	0	0	0.0			1	6	pr
Boronaria theodora	3	6	0.1			1	18	pr
Hesperoperla pacifica	0	0	0.0			1	18	pr
Perlidae	26	56	0.7			1	nn	pr
Isoperla sp.	0	0	0.0			2	48	pr
Megarcys sp.	7	15	0.2			2	24	pr
Setodes bradleyi	0	0	0.0			2	nn	pr
Skuala sp.	11	24	0.3			2	18	pr
Perlodidae	1	2	0.0			2	nn	pr
Taenionema sp.	808	1745	21.9			2	48	sc
Trichoptera				276	7.48			
Micrasema sp.	10	22	0.3			1	24	sh
Anagapetus sp.	0	0	0.0			0	24	sc
Glossodema sp.	2	4	0.1			0	24	sc
Arctopsyche grandis	38	82	1.0			4	18	cf
Parapsyche elisia	0	0	0.0			4	6	cf
Hydropsychidae	52	112	1.4			4	108	nn
Agraylea sp.	31	67	0.8			4	108	cg
Ochrotrichia sp.	0	0	0.0			4	108	cg
Lepidoctome sp.	0	0	0.0			1	18	sh
Apatania sp.	0	0	0.0			4	18	sc
Ecdisomyia sp.	0	0	0.0			4	24	cg
Neothremma alicia	0	0	0.0			4	8	sc
Oligophlebodes sp.	22	48	0.6			4	24	sc
Limnephilidae	108	233	2.9			4	108	nn
Normaldia sp.	0	0	0.0			3	24	cf
Rhyacophila Angelita	0	0	0.0			0	18	pr
Rhyacophila Bettani	3	6	0.1			0	18	pr
Rhyacophila Bifila/Coloradensis	0	0	0.0			0	18	pr
Rhyacophila Brunnea	9	19	0.2			0	18	pr
Rhyacophila Hyalinata	0	0	0.0			0	18	pr
Rhyacophila Irida	0	0	0.0			0	18	pr
Rhyacophila Sibirica	0	0	0.0			0	18	pr
Rhyacophila Vaccua	0	0	0.0			0	18	pr
Rhyacophila Verrula	1	2	0.0			0	18	pr
Rhyacophila vegeta	0	0	0.0			0	18	pr
Rhyacophila sp.	0	0	0.0			0	18	pr
Trichopteran pupae	0	0	0.0			nn	nn	na
Other				48	1.30			
Annelida	0	0	0.0			5	108	cg
Coleoptera-Elimidae								
Cleptelmis sp.	0	0	0.0			4	108	cg
Heterlimnius sp.	1	2	0.0			4	108	cg
Lara sp.	0	0	0.0			4	108	sh
Harpalus op.	0	0	0.0			4	108	cg
Saitzevia sp.	0	0	0.0			4	108	cg
Elmidae	0	0	0.0			4	108	cg
Collembola	0	0	0.0			nn	nn	na
Diptera								
Agathon sp.	0	0	0.0			0	2	sc
Ceratopogonidae	1	2	0.0			6	108	pr
Chironomidae	29	63	0.8			6	108	cg/f
Oreogeton sp.	0	0	0.0			6	nn	pr
Simuliidae	0	0	0.0			6	108	cf
Antocha sp.	0	0	0.0			3	24	cg
Vicranota sp.	13	28	0.4			3	24	pr
Hexatomidae	4	9	0.1			3	36	pr
Pedicia sp.	0	0	0.0			3	36	pr
Tipula sp.	0	0	0.0			3	36	sh
Hydracarina	0	0	0.0			5	108	pr
Mollusca	0	0	0.0			8	108	cg
Nematoda	0	0	0.0			nn	nn	na
Turbellaria	0	0	0.0			4	108	pr
TOTAL NUMBER =	3689			3641		SDI =	3.2	
TOTAL TAXA =	36			125.55				
STD =	153.3			20.81				
MEAN =	738			56 MEAN =				
				9.46				

	For Each Taxa		Percent of Total	Major Group		TV	TO	FGO
	No.	No./sq.m.		Total Number	Percent of Total			
Ephemeroptera				568	12.74			
Bastis sp.	18	39	0.4			4	72	cg
Candatella hystrix	0	0	0.0			1	nn	cg
Drunella coloradensis/ flavilinea	0	0	0.0			1	18	sc
Drunella doddoi	56	121	1.3			1	4	sc
Drunella spinifera	0	0	0.0			1	24	sc
Drunella sp.	0	0	0.0			0	48	sc
Ephemerella sp.	0	0	0.0			1	48	sc
Serratella sp.	0	0	0.0			1	24	cg
Cinygma sp.	51	110	1.1			4	21	sc
Epcorus sp.	325	702	7.3			4	21	sc
Heptagenia sp.	0	0	0.0			4	48	sc
Mithrogena sp.	107	231	2.4			4	21	cg
Paraleptophlebia sp.	1	2	0.0			2	24	cg
Ameletus sp.	10	22	0.2			7	48	cg
Plecoptera				3272	73.40			
Capniidae	4	9	0.1			1	32	sh
Kathroperla perdita	0	0	0.0			1	24	cg
Sialta/Suallia sp.	49	106	1.1			1	24	pc
Deepaxia angusta	1	2	0.0			0	18	sh
Paraleuctra sp.	0	0	0.0			0	18	sh
Parlomyia sp.	0	0	0.0			0	18	sh
Luctridae	0	0	0.0			0	18	sh
Hemoura sp.	0	0	0.0			2	24	sh
Visoka cataractae	3	6	0.1			2	nn	sh
Zapada cinctipes	0	0	0.0			2	16	sh
Zapada columbiana	253	546	5.7			2	16	sh
Hemouridae	0	0	0.0			2	36	sh
Yoraperla brevis	4	9	0.1			2	24	sh
Acroneuria abnormis	0	0	0.0			1	6	pr
Dorameuria theodora	0	0	0.0			1	18	pr
Hesperoperla pacifica	0	0	0.0			1	18	pr
Perlidae	18	39	0.4			1	nn	pr
Isoperla sp.	0	0	0.0			2	48	pr
Megarcys sp.	46	99	1.0			2	24	pr
Sotveva bradleyi	0	0	0.0			2	nn	pr
Skuaia sp.	0	0	0.0			2	18	pr
Perlodidae	38	82	0.9			2	nn	pr
Taenionema sp.	2856	6169	64.1			2	48	nc
Trichoptera				582	13.06			
Microptera sp.	0	0	0.0			1	24	sh
Anagapetus sp.	0	0	0.0			0	24	sc
Glossosoma sp.	18	82	0.9			0	24	sc
Arctopsyche grandis	0	0	0.0			4	18	cf
Parapsyche elisia	8	17	0.2			4	6	cf
Hydropsychidae	405	875	9.1			4	108	nn
Agraylea sp.	0	0	0.0			4	108	cg
Ochrotrichia sp.	0	0	0.0			4	108	cg
Lepidoctes sp.	0	0	0.0			1	18	sh
Apatania sp.	0	0	0.0			4	18	sc
Eccidomyia sp.	2	4	0.0			4	24	cg
Neothremma alicia	0	0	0.0			4	8	sc
Oligophlebodes sp.	0	0	0.0			4	24	sc
Limnephilidae	2	4	0.0			4	108	nn
Normaldia sp.	0	0	0.0			3	24	cf
Rhyacophila Angelita	1	2	0.0			0	18	pr
Rhyacophila Bettani	2	4	0.0			0	18	pr
Rhyacophila Bifile/Coloredes	0	0	0.0			0	18	pr
Rhyacophila Brunnea	6	13	0.1			0	18	pr
Rhyacophila Hyalinata	28	60	0.6			0	18	pr
Rhyacophila Irida	0	0	0.0			0	18	pr
Rhyacophila Sibirica	0	0	0.0			0	18	pr
Rhyacophila Vaccua	90	194	2.0			0	18	pr
Rhyacophila Verrula	0	0	0.0			0	18	pr
Rhyacophila vespula	0	0	0.0			0	18	pr
Rhyacophila sp.	0	0	0.0			0	18	pr
Trichopteran pupae	0	0	0.0			nn	nn	na
Other				36	0.81			
Annelida	0	0	0.0			5	108	cg
Coleoptera-Elimidae								
Cleptelmis sp.	0	0	0.0			4	108	cg
Heterlimnius sp.	1	2	0.0			4	108	cg
Lara sp.	0	0	0.0			4	108	sh
Harpalus sp.	0	0	0.0			4	108	cg
Kaitzevia sp.	0	0	0.0			4	108	cg
Elmidae	0	0	0.0			4	108	cg
Collembola	0	0	0.0			nn	nn	na
Diptera								
Agathon sp.	0	0	0.0			0	2	sc
Ceratopogonidae	0	0	0.0			6	108	pr
Chironomidae	1	2	0.0			6	108	cg/f
Oreogenet sp.	4	9	0.1			6	nn	pr
Simuliidae	0	0	0.0			6	108	cf
Antocha sp.	0	0	0.0			3	24	cg
Dicranota sp.	19	41	0.4			3	24	pr
Hexatomidae	0	0	0.0			3	36	pr
Pedicia sp.	0	0	0.0			3	36	pr
Tipula sp.	0	0	0.0			3	36	sh
Hydracarina	0	0	0.0			5	108	pr
Mollusca	0	0	0.0			8	108	cg
Nematoda	0	0	0.0			nn	nn	na
Turbellaria	11	24	0.2			4	108	pr
TOTAL NUMBER =	4458			4422				
TOTAL TAXA =	32			422.00				
SDI =	310.6			CONF. VAR. =	34.83			
MEAN =	892			SB MEAN =	15.83			

	For Each Taxa		Percent of Total	Major Group		IV	TQ	FRC
	No.	No./sq.m.		Total Number	Percent of Total			
Ephemeroptera				1865	60.89			
Baetis sp.	224	484	7.3			4	72	cg
Caudatella hystrix	0	0	0.0			1	nn	cg
Drunella coloradensis/								
flavilince	0	0	0.0			1	18	sc
doddii	41	89	1.3			1	4	sc
spinifera	2	4	0.1			1	24	sc
Drunella sp.	0	0	0.0			0	48	sc
Ephemerella sp.	0	0	0.0			1	48	sc
Serratella sp.	0	0	0.0			1	24	cg
Cinygmulidae	451	974	14.7			4	21	sc
Ephorus sp.	455	983	14.9			4	48	sc
Hesperagenia sp.	0	0	0.0			4	21	sc
Rhithrogena sp.	597	1290	19.5			4	21	cg
Paraleptophlebia sp.	8	17	0.3			2	24	cg
Ameletus sp.	87	188	2.6			7	48	cg
Plecoptera				766	25.01			
Capniidae	35	76	1.1			1	32	sh
Kathroperla pardita	0	0	0.0			1	24	cg
Geweltia/Gewellia sp.	196	423	6.4			1	24	pr
Despaxia angusta	20	43	0.7			0	18	sh
Paraleuctra sp.	0	0	0.0			0	18	sh
Perlomyia sp.	0	0	0.0			0	18	sh
Leuctridae	5	11	0.2			0	18	sh
Memoreta sp.	0	0	0.0			2	24	sh
Vinoka cataractae	12	26	0.4			2	nn	sh
Zapada cinctipes	0	0	0.0			2	16	sh
Zapada colombiana	107	231	3.5			2	16	sh
Nemocoridae	0	0	0.0			2	36	sh
Yoraperla brevis	33	71	1.1			2	24	sh
Acronerurida abnormis	0	0	0.0			1	6	pr
Doroneuria theodora	1	2	0.0			1	18	pr
Heoperla pacifica	0	0	0.0			1	18	pr
Perlidae	4	9	0.1			1	nn	pr
Isoperla sp.	0	0	0.0			2	48	pr
Megarcys sp.	34	73	1.1			2	24	pr
Satvena bradleyi	1	2	0.0			2	nn	pr
Sialis sp.	0	0	0.0			2	18	pr
Perlodiidae	9	19	0.3			2	nn	pr
Taenionema sp.	309	667	10.1			2	48	sc
Trichoptera				325	10.61			
Micrasemidae	0	0	0.0			1	24	sh
Anagapetus sp.	0	0	0.0			0	24	sc
Glossocoma sp.	5	13	0.2			0	24	sc
Arctopychidae	0	0	0.0			4	18	cf
Parapsyche elnis	28	60	0.9			4	6	cf
Hydropsychidae	102	220	3.3			4	108	nn
Agraylea sp.	0	0	0.0			4	108	cg
Ochrotrichia sp.	2	4	0.1			4	108	cg
Lepidoptoma sp.	0	0	0.0			1	18	sh
Apatania sp.	0	0	0.0			4	18	sc
Ecoiliomyia sp.	0	0	0.0			4	24	cg
Heothrauma alicia	0	0	0.0			4	8	sc
Oligophlebodes sp.	0	0	0.0			4	24	sc
Limnephilidae	1	2	0.0			4	108	nn
Normaldia sp.	0	0	0.0			3	24	cf
Rhyacophilidae	0	0	0.0			0	18	pr
Rhyacophilus Botteni	0	0	0.0			0	18	pr
Rhyacophilus bifila/Coloradensis	0	0	0.0			0	18	pr
Rhyacophilus Brunneus	1	2	0.0			0	18	pr
Rhyacophilus Hyalinata	2	4	0.1			0	18	pr
Rhyacophilus Iranda	4	9	0.1			0	18	pr
Rhyacophilus Sibirica	0	0	0.0			0	18	pr
Rhyacophilus Vaccua	179	387	5.8			0	18	pr
Rhyacophilus Varrula	0	0	0.0			0	18	pr
Rhyacophilus vespula	0	0	0.0			0	18	pr
Rhyacophilus sp.	0	0	0.0			0	18	pr
Trichopteran pupae	0	0	0.0			nn	nn	na
Other				107	3.49			
Amelida	54	117	1.8			3	108	cg
Coleoptera-Elmidae								
Cleptelmis sp.	0	0	0.0			4	108	cg
Heterlimnius sp.	3	6	0.1			4	108	cg
Lara sp.	0	0	0.0			4	108	sh
Narpus sp.	0	0	0.0			4	108	cg
Psilochoris sp.	0	0	0.0			4	108	cg
Elmidae	0	0	0.0			4	108	cg
Collembola	0	0	0.0			nn	nn	na
Diptera								
Agathon sp.	0	0	0.0			0	2	sc
Caratopogonidae	1	2	0.0			6	108	pr
Chironomidae	26	56	0.8			6	108	cg/f
Oreogeton sp.	4	9	0.1			6	nn	pr
Simuliidae	0	0	0.0			6	108	cf
Antocha sp.	0	0	0.0			3	24	cg
Dicranota sp.	12	26	0.4			3	24	pr
Haworthia sp.	0	0	0.0			3	36	pr
Pedicia sp.	0	0	0.0			3	36	pr
Tipula sp.	0	0	0.0			3	36	sh
Hydracarina	1	2	0.0			5	108	pr
Mollusca	0	0	0.0			8	108	cg
Nematoda	4	9	0.1			nn	nn	na
Turbellaria	2	4	0.1			4	108	pr
TOTAL NUMBER =	3063	EPT Abund. =	2956	SDI =	3.7			
TOTAL TAXA =	39	EPT/Chiron. =	113.69					
STD =	103.1	COEF. VAR. =	16.83					
MEAN =	613	SE MEAN =	7.65					

	For Each Taxa		Percent of Total	Major Group		TV	TQ	TFC
	No.	No./sq.m.		Total Number 416	Percent of Total 46.81			
Ephemeroptera								
<i>Baetis</i> sp.	72	156	8.1			4	72	cg
<i>Candatella hystrix</i>	0	0	0.0			1	nn	cg
<i>Drunella coloradensis/</i> <i>flavilinae</i>	0	0	0.0			1	18	sc
<i>Drunella doddoi</i>	16	35	1.8			1	4	sc
<i>Drunella spinifera</i>	7	15	0.8			1	24	sc
<i>Drunella</i> sp.	0	0	0.0			0	48	sc
<i>Sphemerella</i> sp.	0	0	0.0			1	48	sc
<i>Serratella</i> sp.	4	9	0.4			1	24	cg
<i>Cinygmaia</i> sp.	276	596	30.9			4	21	sc
<i>Speorus</i> sp.	3	6	0.3			4	21	sc
<i>Septemania</i> sp.	2	4	0.2			4	48	sc
<i>Rhithrogena</i> sp.	8	17	0.9			4	21	cg
<i>Paraleptophlebia</i> sp.	15	32	1.7			2	24	cg
<i>Ameletus</i> sp.	15	32	1.7			7	48	cg
Plecoptera				226	25.31			
<i>Capniidae</i>	10	22	1.1			1	32	sh
<i>Kathroperla perdita</i>	0	0	0.0			1	24	cg
<i>Sweltsa/Suwallia</i> sp.	116	251	13.0			1	24	pr
<i>Deepaxia augusta</i>	10	22	1.1			0	18	sh
<i>Paraleuctra</i> sp.	0	0	0.0			0	18	sh
<i>Parolvomia</i> sp.	0	0	0.0			0	18	oh
<i>Leuctridae</i>	4	9	0.4			0	18	sh
<i>Memoria</i> sp.	0	0	0.0			2	24	sh
<i>Viscke cataractae</i>	4	9	0.4			2	nn	sh
<i>Capada cinctipes</i>	46	99	5.2			2	16	sh
<i>Capada columbiana</i>	0	0	0.0			2	16	sh
<i>Hemouridae</i>	8	17	0.9			2	36	sh
<i>Yoraperla brevis</i>	1	2	0.1			2	110	sh
<i>Acroleuria abnormis</i>	0	0	0.0			1	6	pr
<i>Doroneuria theodora</i>	6	13	0.7			1	18	pr
<i>Heptoperla pacifica</i>	0	0	0.0			1	18	pr
<i>Perlidae</i>	7	15	0.8			1	nn	pr
<i>Isoperla</i> sp.	0	0	0.0			2	48	pr
<i>Megarcys</i> sp.	0	0	0.0			2	24	pr
<i>Setevna bradleyi</i>	0	0	0.0			2	nn	pr
<i>Skwala</i> sp.	0	0	0.0			2	18	pr
<i>Perlodidae</i>	2	4	0.2			2	nn	pr
<i>Taenionema</i> sp.	12	26	1.3			2	48	sc
Trichoptera				133	14.89			
<i>Micrasema</i> sp.	1	2	0.1			1	24	sh
<i>Anagapetus</i> sp.	0	0	0.0			0	24	sc
<i>Glossosoma</i> sp.	49	106	5.5			0	24	sc
<i>Arctopeyche grandis</i>	0	0	0.0			4	18	cf
<i>Parapseyche elisia</i>	0	0	0.0			4	6	cf
<i>Hydropsychidae</i>	30	65	3.4			4	108	nn
<i>Agrypnus</i> sp.	0	0	0.0			4	108	cg
<i>Ochrotrichia</i> sp.	0	0	0.0			4	108	cg
<i>Lepidostoma</i> sp.	0	0	0.0			1	18	sh
<i>Apatania</i> sp.	0	0	0.0			4	18	sc
<i>Ecolisomyia</i> sp.	0	0	0.0			4	24	cg
<i>Heothremma alicia</i>	0	0	0.0			4	8	sc
<i>Oligophlebodes</i> sp.	0	0	0.0			4	24	sc
<i>Limnephilidae</i>	2	4	0.2			4	108	nn
<i>Wormaldia</i> sp.	4	9	0.4			3	24	cf
<i>Rhyacophila Angelita</i>	0	0	0.0			0	18	pr
<i>Rhyacophila Battani</i>	18	39	2.0			0	18	pr
<i>Rhyacophila bifila/Coloraden</i>	0	0	0.0			0	18	pr
<i>Rhyacophila Brunnea</i>	3	6	0.3			0	18	pr
<i>Rhyacophila Hyalinata</i>	0	0	0.0			0	18	pr
<i>Rhyacophila Iranda</i>	0	0	0.0			0	18	pr
<i>Rhyacophila Sibirica</i>	2	4	0.2			0	18	pr
<i>Rhyacophila Vacua</i>	11	24	1.2			0	18	pr
<i>Rhyacophila Verrula</i>	0	0	0.0			0	18	pr
<i>Rhyacophila vespula</i>	0	0	0.0			0	18	pr
<i>Rhyacophila</i> sp.	13	28	1.5			0	18	pr
<i>Trichopteran pupae</i>	0	0	0.0			nn	nn	na
Other				116	12.99			
annelida	39	84	4.4			5	108	cg
coleoptera-elmidae								
<i>Cleptelmis</i> sp.	0	0	0.0			4	108	cg
<i>Heterlimnius</i> sp.	41	89	4.6			4	108	cg
<i>Lara</i> sp.	0	0	0.0			4	108	nh
<i>Narpus</i> sp.	0	0	0.0			4	108	cg
<i>Saitzevia</i> sp.	0	0	0.0			4	108	cg
<i>Elmidae</i>	0	0	0.0			4	108	cg
Collembola	2	4	0.2			nn	nn	na
Diptera								
<i>Agathomyia</i> sp.	0	0	0.0			0	2	sc
<i>Ceratopogonidae</i>	0	0	0.0			6	108	pr
<i>Chironomidae</i>	23	50	2.6			6	108	cg/f
<i>Oreogenes</i> sp.	8	17	0.9			6	nn	pr
<i>Simuliidae</i>	0	0	0.0			6	108	cf
<i>Antocha</i> sp.	0	0	0.0			3	24	cg
<i>Dicranota</i> sp.	3	6	0.3			3	24	pr
<i>Hexatomidae</i>	0	0	0.0			3	36	pr
<i>Pedicia</i> sp.	0	0	0.0			3	36	pr
<i>Tipula</i> sp.	0	0	0.0			3	36	oh
<i>Hydracarina</i>	0	0	0.0			5	108	pr
<i>Mollusca</i>	0	0	0.0			8	108	cg
<i>Nematoda</i>	0	0	0.0			nn	nn	na
<i>Turbellaria</i>	0	0	0.0			4	108	pr
TOTAL NUMBER =	893			EPT Abund. =	777		SDI =	3.8
TOTAL TAXA =	38			EPT/Chiron. =	33.78			
STD =	33.5			CONF. VAR. =	18.78			
MEAN =	179			SE MEAN =	8.54			

Macroinvertebrate Data-Montanore, October 1991
Poorman Creek, Pol #22

	For Each Taxa		Percent of Total	Major Group		TV	TQ	FFG
	No.	No./sq.m.		Total Number	Percent of Total			
Ephemeroptera				1654	33.97			
Baetis sp.	360	778	7.4			4	72	cg
Caudatella hystrix	0	0	0.0			1	nn	cg
Drunella coloradensis/ flavilinea	0	0	0.0			1	18	sc
Drunella doddsii	222	480	4.6			1	4	sc
Drunella spinifera	1	2	0.0			1	24	sc
Drunella sp.	0	0	0.0			0	48	sc
Ephemerella sp.	0	0	0.0			1	48	sc
Garratella sp.	10	22	0.2			1	24	cg
Cinygmulia sp.	437	944	9.0			4	21	sc
Epsorus sp.	211	456	4.3			4	21	sc
Heptagenia sp.	0	0	0.0			4	48	sc
Rhithrogena sp.	396	855	8.1			4	21	cg
Paraleptophlebia sp.	1	2	0.0			2	24	cg
Amoletus sp.	16	35	0.3			7	48	cg
Plecoptera				2695	55.35			
Capniidae	2	4	0.0			1	32	sh
Kathroperla perdita	0	0	0.0			1	24	cg
Sveltaea/Suvellia sp.	126	272	2.6			1	24	pr
Despaxia augusta	27	58	0.6			0	18	sh
Paraleuctra sp.	0	0	0.0			0	18	sh
Parlomyia sp.	0	0	0.0			0	18	sh
Luctridae	4	9	0.1			0	18	sh
Nemoura sp.	0	0	0.0			2	24	sh
Visoka cataractae	11	24	0.2			2	nn	sh
Iapada cinctipes	0	0	0.0			2	16	sh
Iapada columbiana	188	406	3.9			2	16	sh
Nemouridae	0	0	0.0			2	36	sh
Yoraperla brevis	3	6	0.1			2	110	sh
Acronemuria abnormis	0	0	0.0			1	6	pr
Doroneuria theodora	9	19	0.2			1	18	pr
Hesperoperla pacifica	0	0	0.0			1	18	pr
Perlidae	35	76	0.7			1	nn	pr
Isoperla sp.	1	2	0.0			2	48	pr
Megarcys sp.	25	54	0.5			2	24	pr
Setvena bradleyi	0	0	0.0			2	nn	pr
Skwala sp.	0	0	0.0			2	18	pr
Perlodidae	4	9	0.1			2	nn	pr
Taenionema sp.	2260	4882	46.4			2	48	sc
Trichoptera				475	9.76			
Micrasema sp.	0	0	0.0			1	24	sh
Anagapetus sp.	0	0	0.0			0	24	sc
Glossosoma sp.	49	106	1.0			0	24	sc
Arctopeche grandis	0	0	0.0			4	18	cf
Parapeche elisia	19	41	0.4			4	6	cf
Hydropsychidae	330	713	6.8			4	108	nn
Agraylea sp.	0	0	0.0			4	108	cg
Ochrotrichia sp.	0	0	0.0			4	108	cg
Lepidostome sp.	0	0	0.0			1	18	sh
Apatania sp.	0	0	0.0			4	18	sc
Ecclesomyia sp.	0	0	0.0			4	24	cg
Neothremma alicia	0	0	0.0			4	8	sc
Oligophlebodes sp.	0	0	0.0			4	24	sc
Limnephilidae	2	4	0.0			4	108	nn
Wormaldia sp.	0	0	0.0			3	24	cf
Rhyacophila Angelita	0	0	0.0			0	18	pr
Rhyacophila Batteni	54	117	1.1			0	18	pr
Rhyacophila Bifila/Coloradensis	0	0	0.0			0	18	pr
Rhyacophila Brunnea	8	17	0.2			0	18	pr
Rhyacophila Hyalinata	1	2	0.0			0	18	pr
Rhyacophila Iridanda	2	4	0.0			0	18	pr
Rhyacophila Sibirica	0	0	0.0			0	18	pr
Rhyacophila Vaccua	0	0	0.0			0	18	pr
Rhyacophila Verrula	0	0	0.0			0	18	pr
Rhyacophila vespula	10	22	0.2			0	18	pr
Rhyacophila sp.	0	0	0.0			0	18	pr
Trichopteran pupae	0	0	0.0			nn	nn	na
Other				45	0.92			
Annelida	0	0	0.0			5	108	cg
Coleoptera-Elimidae								
Cleptelmis sp.	0	0	0.0			4	108	cg
Heterlimnius sp.	9	19	0.2			4	108	cg
Lara sp.	0	0	0.0			4	108	ob
Sarpus sp.	0	0	0.0			4	108	cg
Leptrevia sp.	0	0	0.0			4	108	cg
Elmidae	0	0	0.0			4	108	cg
Collembola	0	0	0.0			nn	nn	na
Diptera								
Agathon sp.	0	0	0.0			0	2	sc
Caratopogonidae	0	0	0.0			6	108	pr
Chironomidae	14	30	0.3			6	108	cg/f
Oreogaton sp.	0	0	0.0			6	nn	pr
Simuliidae	0	0	0.0			6	108	cf
Antocha sp.	0	0	0.0			3	24	cg
Dicranota sp.	20	43	0.4			3	24	pr
Hexatomidae	0	0	0.0			3	36	pr
Pedicia sp.	0	0	0.0			3	36	pr
Tipula sp.	0	0	0.0			3	36	ob
Hydracarina	0	0	0.0			5	108	pr
Mollusca	0	0	0.0			8	108	cg
Hemiptoda	1	2	0.0			nn	nn	na
Turbellaria	1	2	0.0			4	108	pr
TOTAL NUMBER =	4869			4924				
TOTAL TAXA =	36			344.57				
STD =	254.6			26.14				
MEAN =	974			11.88				
SDI =				2.9				

Macroinvertebrate Data-Montanore, October 1991
Ramsey Creek, Ra2 #23

	For Each Taxa			Major Group			TV	TQ	FG			
	No.	No./sq.m.	Percent of Total	Total Number	Percent of Total							
				1122	41.22							
Sphemeroptera												
Baetis sp.	259	559	9.5				4	72	cg			
Caudatella hystrix	0	0	0.0				1	nn	cg			
Drunella coloradensis/ flavilines	0	0	0.0				1	18	sc			
Drunella doddsi	101	218	3.7				1	4	sc			
Drunella spinifera	4	9	0.1				1	24	sc			
Drunella sp.	0	0	0.0				0	48	sc			
Sphemerella sp.	0	0	0.0				1	48	sc			
Serratella sp.	4	9	0.1				1	24	cg			
Cinygmaia sp.	294	635	10.8				4	21	sc			
Speorus sp.	20	43	0.7				4	21	sc			
Neptagonia sp.	0	0	0.0				4	48	sc			
Rhithrogena sp.	397	858	14.6				4	21	cg			
Paraleptophlebia sp.	2	4	0.1				2	24	cg			
Ameletus sp.	41	89	1.5				7	48	cg			
Plecoptera				1287	47.28							
Capniidae	22	48	0.8				1	32	sh			
Kathroperla pardita	0	0	0.0				1	24	cg			
Gweltza/Suwallia sp.	216	467	7.9				1	24	pc			
Deepaxia angusta	18	39	0.7				0	18	sh			
Paraleuctra sp.	0	0	0.0				0	18	sh			
Parlomyia sp.	0	0	0.0				0	18	sh			
Leuctridae	8	17	0.3				0	18	sh			
Emocura sp.	0	0	0.0				2	24	sh			
Visoka catacarctae	23	50	0.8				2	nn	sh			
Hapada cinctipes	0	0	0.0				2	16	sh			
Hapada columbiana	105	227	3.9				2	16	sh			
Hemouridae	0	0	0.0				2	36	sh			
Xoroparla brevis	3	6	0.1				2	110	sh			
Acroneuria abnormis	0	0	0.0				1	6	pr			
Doroneuria theodora	2	4	0.1				1	18	pr			
Hesperoperla pacifica	0	0	0.0				1	18	pr			
Perlidae	5	11	0.2				1	nn	pr			
Isoperla sp.	0	0	0.0				2	48	pr			
Megarcys sp.	32	69	1.2				2	24	pr			
Setevana bradleyi	0	0	0.0				2	nn	pr			
Skwala sp.	0	0	0.0				2	16	pr			
Parlodicidae	2	4	0.1				2	nn	pr			
Taenionema sp.	851	1838	31.3				2	48	sc			
Trichoptera				259	9.52							
Micrasema sp.	0	0	0.0				1	24	sh			
Anagapetus sp.	0	0	0.0				0	24	sc			
Glossocoma sp.	63	136	2.3				0	24	sc			
Arctopsyche grandis	0	0	0.0				4	18	cf			
Parapsyche elois	6	13	0.2				4	6	cf			
Hydropsychidae	127	274	4.7				4	108	nn			
Agraylea sp.	0	0	0.0				4	108	cg			
Ochrotrichia sp.	0	0	0.0				4	108	cg			
Lepidoctoma sp.	0	0	0.0				1	18	nh			
Apatania sp.	0	0	0.0				4	18	sc			
Ecclesomyia sp.	0	0	0.0				4	24	cg			
Neothremma alicia	0	0	0.0				4	8	sc			
Oligophlebodes sp.	0	0	0.0				4	24	sc			
Limnephilidae	13	28	0.5				4	108	nn			
Normaldia sp.	0	0	0.0				3	24	cf			
Rhyacophilidae Angelita	1	2	0.0				0	18	pr			
Rhyacophilidae Bettani	40	86	1.5				0	18	pr			
Rhyacophilidae Rifila/Colorado	0	0	0.0				0	18	pr			
Rhyacophilidae Brunnea	8	17	0.3				0	18	pr			
Rhyacophilidae Hyalinata	1	2	0.0				0	18	pr			
Rhyacophilidae Iranda	0	0	0.0				0	18	pr			
Rhyacophilidae Sibirica	0	0	0.0				0	18	pr			
Rhyacophilidae Vaccua	0	0	0.0				0	18	pr			
Rhyacophilidae Verrula	0	0	0.0				0	18	pr			
Rhyacophilidae vulpina	0	0	0.0				0	18	pr			
Rhyacophilidae sp.	0	0	0.0				0	18	pr			
Trichopteran pupae	0	0	0.0				nn	nn	na			
Other				54	1.98							
Amelida	9	19	0.3				5	108	cg			
Coleoptera-Elmidae												
Cleptelmis sp.	0	0	0.0				4	108	cg			
Heterlimnius sp.	7	15	0.3				4	108	cg			
Lora sp.	1	2	0.0				4	108	nh			
Narpus sp.	0	0	0.0				4	108	cg			
Saitzevia sp.	0	0	0.0				4	108	cg			
Elmidae	0	0	0.0				4	108	cg			
Collembola	0	0	0.0				nn	nn	na			
Diptera												
Agathon sp.	0	0	0.0				0	2	sc			
Caratopogonidae	0	0	0.0				6	108	pr			
Chironomidae	33	71	1.2				6	108	cg/f			
Gregegeton sp.	0	0	0.0				6	nn	pr			
Simuliidae	0	0	0.0				6	108	cf			
Antocha sp.	0	0	0.0				3	24	cg			
Dicranota sp.	4	9	0.1				3	24	pr			
Hoxatoma sp.	0	0	0.0				3	36	pr			
Pedicia sp.	0	0	0.0				3	36	pr			
Tipula sp.	0	0	0.0				3	36	sh			
Hydrecarina	0	0	0.0				5	108	pr			
Mollusca	0	0	0.0				8	108	cg			
Nematoda	0	0	0.0				nn	nn	na			
Turbellaria	0	0	0.0				4	108	pr			
TOTAL NUMBER =	2722			EPT Abund. =	2668		SDI =	3.4				
TOTAL TAXA =	34			EPT/Chiron. =	80.85							
STD =	110.2			COEF. VAR. =	20.25							
MEAN =	544			SE MEAN =	9.20							

	For Each Taxa			Major Group			TV	TQ	FFG
	No.	No./sq.m.	Percent of Total	Total Number	Percent of Total				
Ephemeroptera				1673	40.04				
Baetis sp.	383	827	9.2				4	72	cg
Caudatella hystrix	0	0	0.0				1	nn	cg
Drunella coloradensis/									
flavolinea	0	0	0.0				1	18	sc
Drunella doddsi	55	119	1.3				1	4	sc
Drunella spinifera	0	0	0.0				1	24	sc
Drunella sp.	0	0	0.0				0	48	sc
Sphemerella sp.	0	0	0.0				1	48	sc
Serratella sp.	6	13	0.1				1	24	cg
Cinygmulidae sp.	464	1002	11.1				4	21	sc
Epeorus sp.	144	311	3.4				4	21	sc
Heptagenia sp.	0	0	0.0				4	48	sc
Rhithrogena sp.	611	1320	14.6				4	21	cg
Paraleptophlebia sp.	3	6	0.1				2	24	cg
Amelatus sp.	7	15	0.2				7	48	cg
Plecoptera				2076	49.69				
Caenidae	4	9	0.1				1	32	sh
Kathroperla pardita	0	0	0.0				1	24	cg
Sweltsa/Guvelia sp.	172	372	4.1				1	24	pr
Deepaxia augusta	34	73	0.8				0	18	sh
Paraleuctra sp.	0	0	0.0				0	18	sh
Perlomyidae	0	0	0.0				0	18	sh
Luctridae	0	0	0.0				0	18	sh
Hemocra sp.	0	0	0.0				2	24	sh
Visoka cataractae	9	19	0.2				2	nn	sh
Sapada cinctipes	0	0	0.0				2	16	sh
Sapada columbiana	248	536	5.9				2	16	sh
Hemouridae	0	0	0.0				2	36	sh
Xoraperla browni	24	52	0.6				2	24	sh
Acroneuria abnormis	0	0	0.0				1	6	pr
Doroneuria theodora	0	0	0.0				1	18	pr
Hesperoperla pacifica	63	136	1.5				1	18	pr
Parlidiae	0	0	0.0				1	nn	pr
Isoperla sp.	0	0	0.0				2	48	pr
Megarcys sp.	27	58	0.6				2	24	pr
Setevana bradleyi	0	0	0.0				2	nn	pr
Skwala sp.	0	0	0.0				2	18	pr
Perlodidae	3	6	0.1				2	nn	pr
Taenionema sp.	1492	3223	35.7				2	48	sc
Trichoptera				372	8.90				
Micrasema sp.	0	0	0.0				1	24	ob
Anagapetus sp.	0	0	0.0				0	24	sc
Glossosoma sp.	92	199	2.2				0	24	sc
Arctopsyche grandis	0	0	0.0				4	18	cf
Parapsyche elisia	16	35	0.4				4	6	cf
Hydropsychidae	104	225	2.5				4	108	an
Agrayiles sp.	0	0	0.0				4	108	cg
Ochrotrichia sp.	0	0	0.0				4	108	cg
Lepidoptera sp.	0	0	0.0				1	18	sh
Apatania sp.	0	0	0.0				4	18	sc
Ecoliosomia sp.	0	0	0.0				4	24	cg
Neothremma alicia	0	0	0.0				4	8	sc
Oligophlebodes sp.	0	0	0.0				4	24	sc
Limnephilidae	4	9	0.1				4	108	an
Wormaldia sp.	0	0	0.0				3	24	cf
Rhyacophilidae Angelita	7	15	0.2				0	18	pr
Rhyacophilidae Bettani	15	32	0.4				0	18	pr
Rhyacophilidae Bifila/Coloradensis	0	0	0.0				0	18	pr
Rhyacophilidae brunnea	2	4	0.0				0	18	pr
Rhyacophilidae Hyalinata	1	2	0.0				0	18	pr
Rhyacophilidae Yanda	0	0	0.0				0	18	pr
Rhyacophilidae Sibirica	1	2	0.0				0	18	pr
Rhyacophilidae Vaccua	37	80	0.9				0	18	pr
Rhyacophilidae Verrula	92	199	2.2				0	18	pr
Rhyacophilidae vespula	0	0	0.0				0	18	pr
Rhyacophilidae sp.	0	0	0.0				0	18	pr
Trichopteran pupae	1	2	0.0				nn	nn	na
Other				57	1.36		5	108	cg
Annelida	5	11	0.1						
Coleoptera-Elmidae									
Cloptelmis sp.	0	0	0.0				4	108	cg
Heterlimnius sp.	23	50	0.6				4	108	cg
Lara sp.	0	0	0.0				4	108	sh
Marpus sp.	0	0	0.0				4	108	cg
Zaitzevia sp.	0	0	0.0				4	108	cg
Elmidae	0	0	0.0				4	108	cg
Collembola	0	0	0.0				nn	nn	na
Diptera									
Agathon sp.	2	4	0.0				0	2	sc
Ceratopogonidae	0	0	0.0				6	108	pr
Chironomidae	18	39	0.4				6	108	cg/f
Oreogoton sp.	0	0	0.0				6	nn	pr
Simuliidae	1	2	0.0				6	108	cf
Antocha sp.	0	0	0.0				3	24	cg
Dicranota sp.	5	11	0.1				3	24	pr
Hexatoma sp.	0	0	0.0				3	36	pr
Pedicia sp.	0	0	0.0				3	36	pr
Tipula sp.	0	0	0.0				3	36	sh
Hydracarina	0	0	0.0				5	108	pr
Mollusca	0	0	0.0				8	108	cg
Nematoda	0	0	0.0				nn	nn	na
Turbellaria	3	6	0.1				4	108	pr
TOTAL NUMBER =	4176	EPT Abund. =	4121	SDI =	3.2				
TOTAL TAXA =	37	EPT/Chiron. =	228.94						
STD =	184.0	COEF. VAR. =	22.02						
MEAN =	836	SE MEAN =	10.01						

**Appendix D. Montanore Project area totals of macroinvertebrates,
1991.**

Macroinvertebrate Data-Montmore, 1991
Annual Totals

	For Each Taxa			Major Group			IV	EQ	FFG
	No.	No./sq.m.	Percent of Total	Total Number	Percent of Total				
Ephemeroptera				27592	56.20				
Baetis sp.	6241	13481	12.7				4	72	cg
Caudatella hystrix	8	17	0.0				1	nn	cg
Drunella coloradensis/ flavolineata	417	901	0.8				1	18	sc
Drunella doddsii	2822	6096	5.7				1	4	sc
Drunella spinifera	23	50	0.0				1	24	sc
Drunella sp.	0	0	0.0				0	48	sc
Ephemerella sp.	12	26	0.0				1	48	sc
Serratella sp.	206	445	0.4				1	24	og
Cinygma sp.	5559	12007	11.3				4	21	sc
Speorus sp.	4936	10662	10.1				4	21	sc
Heptagenia sp.	2	4	0.0				4	48	sc
Rhithrogena sp.	6865	14828	14.0				4	21	og
Paraleptophlebia sp.	170	367	0.3				2	24	og
Ameletus sp.	331	715	0.7				7	48	og
Plecoptera				16166	32.93				
Capniidae	153	330	0.3				1	32	sh
Kathroperla perdita	7	15	0.0				1	24	cg
Sueitza/Suumilia sp.	2225	4806	4.5				1	24	pr
Despaxia augusta	262	566	0.5				0	18	sh
Paraleuctra sp.	3	6	0.0				0	18	sh
Perlimnia sp.	2	4	0.0				0	18	sh
Leuctridae	48	104	0.1				0	18	sh
Nemoura sp.	96	207	0.2				2	24	sh
Visoka cataractae	166	359	0.3				2	nn	sh
Napada cinctipes	243	525	0.5				2	16	sh
Napada columbiana	1580	3413	3.2				2	16	sh
Nemouridae	195	421	0.4				2	36	sh
Voraperla brevis	118	255	0.2				2	110	sh
Acroleurula abnormis	0	0	0.0				1	6	pr
Doroneuriella theodora	56	121	0.1				1	18	pr
Hesperoperla pacifica	64	138	0.1				1	18	pr
Perlidae	205	443	0.4				1	nn	pr
Isonychia sp.	23	50	0.0				2	48	pr
Megarcys sp.	292	631	0.6				2	24	pr
Setevia bradleyi	1	2	0.0				2	nn	pr
Skwala sp.	11	24	0.0				2	18	pr
Periodidae	183	393	0.4				2	nn	pr
Taenionema sp.	10233	22103	20.8				2	48	sc
Trichoptera				3383	6.89				
Micrasema op.	12	26	0.0				1	24	sh
Anagapetus op.	2	4	0.0				0	24	sc
Cloeonoma op.	353	762	0.7				0	24	sc
Arctopsyche grandis	43	93	0.1				4	18	cf
Parapsyche elisia	198	428	0.4				4	6	cf
Hydropsychidae	1499	3238	3.1				4	108	cf
Agraylea sp.	31	67	0.1				4	108	cg
Ochrotrichia sp.	7	15	0.0				4	108	cg
Lepidostoma sp.	3	6	0.0				1	18	sh
Apatania sp.	0	0	0.0				4	18	sc
Scclisomyia sp.	2	4	0.0				4	24	cg
Neothremma alicia	7	15	0.0				4	8	sc
Oligophlebodes sp.	53	114	0.1				4	24	sc
Limnephilidae	159	343	0.3				4	108	nn
Normaldia sp.	4	9	0.0				3	24	cf
Rhyacophila Angelita	47	102	0.1				0	18	pr
Rhyacophila Setteni	174	376	0.4				0	18	pr
Rhyacophila Bifila/Colorado	1	2	0.0				0	18	pr
Rhyacophila Brunnea	68	147	0.1				0	18	pr
Rhyacophila Hyalinata	37	80	0.1				0	18	pr
Rhyacophila Iranda	14	30	0.0				0	18	pr
Rhyacophila Sibirica	28	60	0.1				0	18	pr
Rhyacophila Vaccua	439	948	0.9				0	18	pr
Rhyacophila Verrula	93	201	0.2				0	18	pr
Rhyacophila vespulsa	15	32	0.0				0	18	pr
Rhyacophila sp.	79	171	0.2				0	18	pr
Trichopteran pupae	15	32	0.0				nn	nn	na
Other				1958	3.99				
Annelida	325	702	0.7				5	108	cg
Coleoptera-Elimidae									
Cleptelmis sp.	0	0	0.0				4	108	cg
Heterlimnius sp.	149	322	0.3				4	108	cg
Lara sp.	2	4	0.0				4	108	sh
Harpus sp.	1	2	0.0				4	108	cg
Saitzvia sp.	0	0	0.0				4	108	cg
Elmidae	1	2	0.0				4	108	cg
Collembola	2	4	0.0				nn	nn	na
Diptera									
Agathous sp.	12	26	0.0				0	2	sc
Ceratopogonidae	2	4	0.0				6	108	pr
Chironomidae	1042	2251	2.1				6	108	cg/f
Oreogoton sp.	45	97	0.1				6	nn	pr
Simuliidae	148	320	0.3				6	108	cf
Antocha sp.	4	9	0.0				3	24	cg
Dicranota sp.	124	268	0.3				3	24	pr
Hexatoma sp.	20	43	0.0				3	36	pr
Fedicia sp.	2	4	0.0				3	36	pr
Tipula sp.	2	4	0.0				3	36	sh
Hydracarina	1	2	0.0				5	108	pr
Mollusca	1	2	0.0				8	108	cg
Nematoda	17	37	0.0				nn	nn	na
Turbellaria	58	125	0.1				4	108	pr

TOTAL NUMBER = 49099
TOTAL TAXA = 81
MEAN = 427

**Appendix E. Seasonal estimated relative abundance of periphyton in
the Montanore Project area, 1991.**

Table 6. Estimated relative abundance of diatoms and genera of non-diatom algae in periphyton samples collected during 1991 Montanore baseline monitoring. R=rare; C=common; VC=very common; A=abundant; VA=very abundant

Sampling Date:	May 1991			
Stream Name:	Libby Cr.	Libby Cr.	Libby Cr.	Libby Cr.
Site Number:	L10	L9	L3	L1
ID Number:	P004A	P003A	P002A	P001A
<u>Bacillariophyta (diatoms)</u>				
All genera collectively	*	R	R	C
<u>Chlorophyta (green algae)</u>				
<i>Characium</i>			R	
<i>Cylindrocapsa</i>		R		
<i>Monostroma</i>				A
<i>Ulothrix</i>				C
<u>Chrysophyta (yellow-green algae)</u>				
<i>Hydrurus</i>				A
<u>Cyanophyta (blue-green algae)</u>				
<i>Aphanocapsa</i>	C	VC		
<i>Oscillatoria</i>		R		VA
<i>Phormidium</i>		VA		
<i>Tolypothrix</i>		C		

*Extremely sparse sample; no diatom frustules seen after thorough scan.

Table 7. Estimated relative abundance of diatoms and genera of non-diatom algae in periphyton samples collected during 1991 Montanore baseline monitoring. R=rare; C=common; VC=very common; A=abundant; VA=very abundant

Sampling Date:	August 1991			
Stream Name:	Libby Cr.	Libby Cr.	Libby Cr.	Libby Cr.
Site Number:	L10	L9	L3	L1
ID Number:	P004B	P003B	P002B	P001B
<u>Bacillariophyta (diatoms)</u>				
All genera collectively	R	C	R	C
<u>Chlorophyta (green algae)</u>				
<i>Closterium</i>				R
<i>Cosmarium</i>				R
<i>Cylindrocapsa</i>		R		
<i>Draparnaldia</i>				VC
<i>Ulothrix</i>	C	R		R
<i>Zygnema</i>	A			VA
<u>Chrysophyta (yellow-green algae)</u>				
<i>Hydrurus</i>	C			
<u>Cyanophyta (blue-green algae)</u>				
<i>Aphanocapsa</i>		C	C	C
<i>Oscillatoria</i>		VA	VC	VA
<i>Phormidium</i>		VC		

Table 8. Estimated relative abundance of diatoms and genera of non-diatom algae in periphyton samples collected during 1991 Montanore baseline monitoring. R=rare; C=common; VC=very common; A=abundant; VA=very abundant

Sampling Date:	October 1991			
Stream Name:	Libby Cr. L10 P004C	Libby Cr. L9 P003C	Libby Cr. L3 P002C	Libby Cr. L1 P001C
<u>Bacillariophyta (diatoms)</u>				
All genera collectively	C	C	VC	VA
<u>Chlorophyta (green algae)</u>				
<i>Closterium</i>		R		
<i>Cosmarium</i>		R	C	
<i>Cylindrocapsa</i>		VC		
<i>Mougeotia</i>		R	A	
<i>Spirogyra</i>			C	
<i>Staurastrum</i>		C	C	C
<i>Stigeoclonium</i>			R	VC
<i>Ulothrix</i>	C	VA	VC	C
<i>Zygnema</i>	VA		VA	R
<u>Chrysophyta (yellow-green algae)</u>				
<i>Hydrurus</i>			R	
<u>Cyanophyta (blue-green algae)</u>				
<i>Aphanocapsa</i>	R	C		R
<i>Calothrix</i>	R			
<i>Oscillatoria</i>	R	VC	VA	VA
<i>Phormidium</i>	C	R		
<u>Rhodophyta (red algae)</u>				
<i>Audouinella</i>	R			

Moss present at L10 and L9.

Table 9. Estimated relative abundance of diatoms and genera of non-diatom algae in periphyton samples collected during 1991 Montanore baseline monitoring. R=rare; C=common; VC=very common; A=abundant; VA=very abundant

Sampling Date:	May 1991			
Stream Name:	Ramsey Cr.	Poorman Cr.	L. Cherry Cr.	Bear Cr.
Site Number:	Ra2	Po1	LC1*	Be2
ID Number:	P007A	P008A	P005A	P006A
<u>Bacillariophyta (diatoms)</u>				
All genera collectively	VC	C		VC
<u>Chlorophyta (green algae)</u>				
<i>Draparnaldia</i>	VC			
<i>Tetraspora</i>	A			
<i>Zygnema</i>		VC		
<u>Chrysophyta (yellow-green algae)</u>				
<i>Hydrurus</i>	A	A		A
<u>Cyanophyta (blue-green algae)</u>				
<i>Aphanocapsa</i>	C			C
<i>Phormidium</i>	R			R

*Extremely sparse sample; no algae seen during extensive scan.

Table 10. Estimated relative abundance of diatoms and genera of non-diatom algae in periphyton samples collected during 1991 Montanore baseline monitoring. R=rare; C=common; VC=very common; A=abundant; VA=very abundant

Sampling Date:	August 1991			
Stream Name:	Ramsey Cr.	Poorman Cr.	L. Cherry Cr.	Bear Cr.
Site Number:	Ra2	Pol	LC1	Be2
ID Number:	P007B	P008B	P005B	P006B
<u>Bacillariophyta (diatoms)</u>				
All genera collectively	VC	C	C	VC
<u>Chlorophyta (green algae)</u>				
<i>Cosmarium</i>			R	
<i>Tetraspora</i>			A	
<u>Cyanophyta (blue-green algae)</u>				
<i>Aphanocapsa</i>		VC		C
<i>Chamaesiphon</i>	VC			
<i>Microchaete</i>			C	
<i>Nostoc</i>			R	
<i>Oscillatoria</i>	VA	VA		VA
<i>Phormidium</i>				R
<i>Tolypothrix</i>			VC	

Moss present at Ra2.

Table 11. Estimated relative abundance of diatoms and genera of non-diatom algae in periphyton samples collected during 1991 Montanore baseline monitoring. R=rare; C=common; VC=very common; A=abundant; VA=very abundant

Sampling Date: October 1991

Stream Name:	Ramsey Cr.	Poorman Cr.	L. Cherry Cr.	Bear Cr.
Site Number:	Ra2	Po1	LC1	Be2
ID Number:	P007C	P008C	P005C	P006C
<u>Bacillariophyta (diatoms)</u>				
All genera collectively	C	R	C	VC
<u>Chlorophyta (green algae)</u>				
<i>Cosmarium</i>			R	
<i>Microspora</i>			A	
<i>Mougeotia</i>			C	
<i>Spirogyra</i>			C	
<i>Staurastrum</i>			R	
<i>Ulothrix</i>			C	
<i>Zygnema</i>	A	C		
<u>Cyanophyta (blue-green algae)</u>				
<i>Aphanocapsa</i>		VC		C
<i>Chamaesiphon</i>			VC	A
<i>Oscillatoria</i>	VA	VA		VA
<i>Phormidium</i>		C		
<u>Rhodophyta (red algae)</u>				
<i>Audouinella</i>			R	

Moss present at LC1 and Be2.

Appendix F. Diatom proportional counts for the Montanore Project area, 1991.

Table 12. Diatom proportional count data, 1991 Montanore baseline monitoring.
 N= number of frustules counted; PRA= percent relative abundance.
 ("p" indicates species seen during floristic scan but not during count.)

Sampling date: May 1991

Stream name:

Libby Cr.

Site number:

L10*

ID number:

P004A

Libby Cr.

L9

P003A

Libby Cr.

L3*

P002A

Libby Cr.

L1

P001A

SPECIES	N	PRA	N	PRA	N	PRA	N	PRA
<i>Achnanthes lanceolata</i>			2	0.56			1	0.25
<i>A. linearis</i>			17	4.78			1	0.25
<i>A. marginulata</i>			3	0.84			p	
<i>A. minutissima</i>	p		60	16.85			p	
<i>A. species 1</i>			3	0.84			186	46.62
<i>A. subrostrata</i>			1	0.28				
<i>Amphora perpusilla</i>			1	0.28				
<i>Anomoeoneis vitrea</i>			p					
<i>Aulacoseira alpigena</i>			5	1.40			p	
<i>Cocconeis placentula</i>							p	
<i>Cymbella amphicephala</i>			p					
<i>C. minuta</i>							29	7.27
<i>C. silesiaca</i>			1	0.28			23	5.76
<i>C. sinuata</i>							4	1.00
<i>Diatoma anceps</i>			5	1.40				
<i>D. mesodon</i>	p		177	49.72			13	3.26
<i>Eunotia bilunaris</i>			1	0.28				
<i>E. minor</i>			7	1.97				
<i>E. musicola</i>			8	2.25			p	
<i>E. paludosa</i>			3	0.84			p	
<i>E. subarcuoides</i>			17	4.78				
<i>Fragilaria capucina</i>			25	7.02			11	2.76
<i>F. construens</i>			1	0.28				
<i>F. leptostauron</i>							p	
<i>Frustulia rhomboidea</i>			p					
<i>Gomphonema angustatum</i>			1	0.28			40	10.03
<i>G. olivaceum</i>							54	13.53
<i>G. parvulum</i>			8	2.25			p	
<i>Hannaea arcus</i>							17	4.26
<i>Keridion circulare</i>			10	2.81			20	5.01
<i>Navicula gallica</i>			p					
<i>Nitzschia palea</i>			p					
<i>N. paleacea</i>							p	
<i>N. pura</i>							p	
<i>Pinnularia divergentissima</i>			p					
Frustules Counted:	0		356		0			399
Total Species:	2		27		6			20
Species Counted:	0		21		0			12
Shannon Diversity:	---		2.66		---			1.57

*Diatom frustules too few to count despite highly concentrated sample

Table 13. Diatom proportional count data, 1991 Montanore baseline monitoring.

N= number of frustules counted; PRA= percent relative abundance.

("p" indicates species seen during floristic scan but not during count.)

Sampling date: August 1991

Stream name:

Libby Cr.

Site number:

L10

ID number:

P004B

Libby Cr.

L9

P003B

Libby Cr.

L3

P002B

Libby Cr.

L1

P001B

SPECIES	N	PRA	N	PRA	N	PRA	N	PRA
<i>Achnanthes deflexa</i>					1	0.45	3	0.76
<i>A. lanceolata</i>	1	1.19	2	0.56	4	1.81	p	
<i>A. linearis</i>	2	2.38	14	3.91	4	1.81	3	0.76
<i>A. marginulata</i>			2	0.56	1	0.45	p	
<i>A. minutissima</i>	7	8.33	53	14.80	180	81.45	314	79.49
<i>A. species 1</i>	3	3.57	15	4.19				
<i>A. subrostrata</i>			2	0.56	p		p	
<i>Aulacoseira alpigena</i>	p		6	1.68				
<i>Cocconeis placentula</i>							2	0.51
<i>Cymbella amphicephala</i>							p	
<i>C. cesatii</i>			1	0.28	p			
<i>C. minuta</i>	p				3	1.36	10	2.53
<i>C. silesiaca</i>	3	3.57	2	0.56			11	2.78
<i>C. sinuata</i>					1	0.45	9	2.28
<i>Diatoma anceps</i>	5	5.95	15	4.19	1	0.45	p	
<i>D. mesodon</i>	34	40.48	119	33.24	1	0.45	p	
<i>Diatomella balfouriana</i>			p					
<i>Eunotia bilunaris</i>			4	1.12				
<i>E. exigua</i>			3	0.84				
<i>E. minor</i>	p		1	0.28				
<i>E. musicola</i>	1	1.19	12	3.35	1	0.45	p	
<i>E. paludosa</i>	5	5.95	25	6.98	p			
<i>E. subarcuatoidea</i>	6	7.14	38	10.61			p	
<i>Fragilaria capucina</i>	12	14.29	34	9.50	13	5.88	13	3.29
<i>F. pinnata</i>					p			
<i>F. ulna</i>					p		p	
<i>Frustulia rhomboides</i>	p		p					
<i>F. vulgaris</i>							p	
<i>Gomphonema angustatum</i>			1	0.28	2	0.90	5	1.27
<i>G. bipunctatum</i>			p					
<i>G. olivaceum</i>	p				3	1.36	10	2.53
<i>G. parvulum</i>	1	1.19	7	1.96	4	1.81	1	0.25
<i>Hannaea arcus</i>	1	1.19	2	0.56	2	0.90	12	3.04
<i>Meridion circulare</i>	3	3.57	p					
<i>Navicula cryptocephala</i>			p		p			
<i>N. cryptotenella</i>					p		1	0.3
<i>N. gallica</i>								
<i>N. minuscula</i>							1	0.3
<i>N. species 2</i>							p	
<i>N. tenelloides</i>							p	
<i>Hitzschia dissipata</i>							p	
<i>N. hantzschiana</i>							p	
<i>N. linearis</i>					p			
<i>N. palea</i>							p	
<i>N. pura</i>							p	

Table 13 continued

<i>Tabellaria flocculosa</i>	P	P	P	P
Frustules Counted:	84	358	221	395
Total Species:	20	28	23	30
Species Counted:	14	21	15	14
Shannon Diversity:	2.93	3.22	1.30	1.41

Table 14. Diatom proportional count data, 1991 Montanore baseline monitoring.

N= number of frustules counted; PRA= percent relative abundance.

("p" indicates species seen during floristic scan but not during count.)

Sampling date: October 1991

	Libby Cr. L10 P004C	Libby Cr. L9 P003C	Libby Cr. L3 P002C	Libby Cr. L1 P001C
SPECIES	N PRA	N PRA	N PRA	N PRA
<i>Achnanthes deflexa</i>			1 0.24	29 7.18
<i>A. lanceolata</i>				p
<i>A. lapponica</i>			2 0.49	
<i>A. linearis</i>	1 0.27	4 1.09		
<i>A. marginulata</i>		3 0.82	p	
<i>A. minutissima</i>	62 16.67	30 8.15	256 62.29	321 79.46
<i>A. species 1</i>	43 11.56	15 4.08		
<i>A. species 2</i>		4 1.09		
<i>A. subrostrata</i>				2 0.50
<i>Amphora pediculus</i>				p
<i>Aulacoseira alpigena</i>	2 0.54	3 0.82	p	
<i>Cocconeis placentula</i>				2 0.50
<i>Cymbella affinis</i>				7 1.73
<i>C. amphicephala</i>			p	
<i>C. cesatii</i>	7 1.88	p	1 0.24	
<i>C. cistula</i>			1 0.24	14 3.47
<i>C. minuta</i>		1 0.27	32 7.79	2 0.50
<i>C. reinhardtii</i>	p			
<i>C. silesiaca</i>	11 2.96	12 3.26	21 5.11	6 1.49
<i>C. sinuata</i>			1 0.24	2 0.50
<i>Diatoma anceps</i>	2 0.54	p		
<i>D. mesodon</i>	62 16.67	75 20.38	6 1.46	p
<i>Didymosphenia geminata</i>				p
<i>Eunotia exigua</i>		6 1.63		
<i>E. minor</i>	35 9.41	15 4.08	p	
<i>E. musicola</i>	1 0.27	15 4.08		
<i>E. paludosa</i>	5 1.34	36 9.78		
<i>E. subarcuatoidea</i>	33 8.87	132 35.87		
<i>Fragilaria capucina</i>	18 4.84	7 1.90	41 9.98	4 0.99
<i>F. ulna</i>			34 8.27	7 1.73
<i>Frustulia rhomboides</i>		1 0.27		
<i>Gomphonema angustatum</i>		p	2 0.49	p
<i>G. angustum</i>			3 0.73	2 0.50
<i>G. clavatum</i>	12 3.23		1 0.24	p
<i>G. olivaceum</i>			p	p
<i>G. parvulum</i>	30 8.06	5 1.4	1 0.24	2 0.5
<i>Hannaea arcus</i>	1 0.27	1 0.3	6 1.46	4 1
<i>Hantzschia amphioxys</i>	p			
<i>Meridion circulare</i>	47 12.63	1 0.3	p	
<i>Navicula angusta</i>		p		
<i>N. mutica</i>	p	1 0.3	p	
<i>N. species 2</i>				p
<i>Neidium affine</i>		p		
<i>N. bisulcatum</i>		p		
<i>Nitzschia dissipata</i>		1 0.3	p	

Table 14 continued

<i>N. linearis</i>	<i>N. palea</i>	<i>Tabellaria flocculosa</i>	P	P	P	P
					2	0.49
Frustules Counted:		372		368		411
Total Species:		19		30		27
Species Counted:		17		21		17
Shannon Diversity:		3.39		3.03		2.03
						1.36

Table 15. Diatom proportional count data, 1991 Montanore baseline monitoring.
 N= number of frustules counted; PRA= percent relative abundance.
 ("p" indicates species seen during floristic scan but not during count.)

Sampling date: May 1991

Stream name:	Ramsey Cr.	Poorman Cr.	L. Cherry Cr.	Bear Cr.
Site number:	Ra2	Pol	LC1*	Be2
ID number:	P007A	P008A	P005A	P006A

SPECIES	N	PRA	N	PRA	N	PRA	N	PRA
<i>Achnanthes lapponica</i>				p				
<i>A. linearis</i>	2	0.50						
<i>A. marginulata</i>	5	1.24		p				p
<i>A. minutissima</i>	319	79.35	56	13.93			102	25.37
<i>A. species 1</i>	9	2.24						
<i>A. subrostrata</i>				p				
<i>Aulacoseira alpigena</i>	5	1.24						
<i>Cymbella minuta</i>	p		2	0.50				
<i>C. silesiaca</i>	1	0.25	1	0.25				
<i>C. sinuata</i>								
<i>Diatoma anceps</i>	2	0.50	1	0.25				
<i>D. mesodon</i>	53	13.18	302	75.12	p		3	0.75
<i>Eunotia subarcuataoides</i>	2	0.50						
<i>Fragilaria capucina</i>	p		4	1.00			p	
<i>Gomphonema angustatum</i>			11	2.74			110	27.36
<i>G. olivaceum</i>	p				p		181	45.02
<i>G. parvulum</i>	p							
<i>Hannaea arcus</i>	2	0.50	24	5.97			3	0.75
<i>Meridion circulare</i>	2	0.50	1	0.25	p		p	
Frustules Counted:	402		402		0		399	
Total Species:	15		12		3		8	
Species Counted:	11		9		0		5	
Shannon Diversity:	1.14		1.26		---		1.64	

*Diatom frustules too few to count despite highly concentrated sample.

Table 16. Diatom proportional count data, 1991 Montanore baseline monitoring.
 N= number of frustules counted; PRA= percent relative abundance.
 ("p" indicates species seen during floristic scan but not during count.)

Sampling date: August 1991

	Ramsey Cr.	Poorman Cr.	L. Cherry Cr.	Bear Cr.
Stream name:	Ra2	Pol	LCl	Be2
Site number:	P007B	P008B	P005B	P006B
SPECIES	N	PRA	N	PRA
<i>Achnanthes deflexa</i>			p	
<i>A. lanceolata</i>				23 11.56
<i>A. linearis</i>	6	1.55	5 1.33	
<i>A. marginulata</i>	6	1.55	1 0.27	
<i>A. minutissima</i>	85	22.02	288 76.80	
<i>A. species 1</i>	2	0.52		
<i>A. species 2</i>	3	0.78		
<i>A. subrostrata</i>			p	
<i>Amphora pediculus</i>			p	
<i>Aulacoseira alpigena</i>	30	7.77	1 0.27	
<i>Caloneis bacillum</i>				1 0.50
<i>Cocconeis placentula</i>			p	10 5.03
<i>Cymbella cesatii</i>		p		
<i>C. gracilis</i>				p
<i>C. microcephala</i>				1 0.27
<i>C. minuta</i>			4 1.07	
<i>C. reinhardtii</i>				2 0.53
<i>C. silesiaca</i>	7	1.81	p	
<i>C. sinuata</i>			12 3.20	
<i>Denticula tenuis</i>				p
<i>Diatoma anceps</i>	2	0.52		
<i>D. mesodon</i>	102	26.42	12 3.20	
<i>Diploneis elliptica</i>				p
<i>Epithemia adnata</i>				2 1.01
<i>Eunotia arcus</i>			p	
<i>E. bilunaris</i>		p		
<i>E. minor</i>	45	11.66	1 0.27	
<i>E. musicola</i>	21	5.44	1 0.27	
<i>E. paludosa</i>	1	0.26		
<i>E. praerupta</i>		p		
<i>E. subarcuatoidea</i>	23	5.96	1 0.27	
<i>Fragilaria brevistriata</i>		p		
<i>F. capucina</i>	30	7.77	11 2.93	
<i>F. construens</i>				16 8.04
<i>F. leptostauron</i>				
<i>F. ulna</i>				p
<i>Frustulia rhomboides</i>	1	0.26		
<i>Gomphonema angustatum</i>				1 0.50
<i>G. angustum</i>			1 0.27	
<i>G. clavatum</i>				56 28.14
<i>G. minutum</i>				1 0.50
<i>G. olivaceum</i>				15 7.54
<i>G. parvulum</i>	4	1.04	p	
<i>G. subtile</i>		p	6 1.60	
<i>Hannaea arcus</i>		p	29 7.73	
				7 1.86

Table 16 continued

<i>Meridion circulare</i>	15	3.89	2	0.53	7	3.52	3	0.80
<i>Mavicula atomus</i>					1	0.50		p
<i>M. bryophila</i>					4	2.01		
<i>M. cocconeiformis</i>						p		
<i>M. cryptocephala</i>					3	1.51	1	0.27
<i>M. cryptotenella</i>	p				9	4.52	3	0.80
<i>M. gallica</i>		p						p
<i>M. gastrum</i>								p
<i>M. heimansii</i>			p					
<i>M. minima</i>				p				
<i>M. mutica</i>						1	0.50	p
<i>M. radiosa</i>								
<i>M. recens</i>								p
<i>Hitzschia dissipata</i>					9	4.52	p	
<i>H. gracilis</i>							7	1.86
<i>H. inconspicua</i>				p				
<i>H. linearis</i>					2	1.01		
<i>H. palea</i>					p			p
<i>H. paleacea</i>	p				7	3.52	p	
<i>H. recta</i>							1	0.27
<i>Pinnularia interrupta</i>	p							
<i>P. subcapitata</i>	2	0.52						
<i>P. viridis</i>	p							
<i>Stauroneis anceps</i>	p							
<i>Fabellaria flocculosa</i>	1	0.26						
Frustules Counted:		386		375		199		376
Total Species:		32		26		29		41
Species Counted:		19		15		23		26
Shannon Diversity:		3.17		1.47		3.62		3.13

Table 17. Diatom proportional count data, 1991 Montanore baseline monitoring.
 N= number of frustules counted; PRA= percent relative abundance.
 ("p" indicates species seen during floristic scan but not during count.)

Sampling date: October 1991

Stream name:	Ramsey Cr.	Poorman Cr.	L. Cherry Cr.	Bear Cr.
Site number:	Ra2	Pel	LC1	Be2
ID number:	P007C	P008C	P005C	P006C

SPECIES	N	PRA	N	PRA	N	PRA	N	PRA
<i>Achnanthes clevei</i>						p		
<i>A. deflexa</i>			2	0.50			2	0.50
<i>A. lanceolata</i>			p		5	1.27	1	0.25
<i>A. lapponica</i>			p					p
<i>A. linearis</i>	2	0.77	4	1.01	4	1.02		
<i>A. marginulata</i>	2	0.77	2	0.50	p			
<i>A. minutissima</i>	164	63.08	196	49.37	42	10.66	230	57.93
<i>A. species 1</i>	2	0.77						
<i>A. subatomoides</i>						p		
<i>A. subrostrata</i>	p		2	0.50			1	0.25
<i>Ampipleura pellucida</i>						p		
<i>Amphora pediculus</i>						p		
<i>Aulacoseira alpigena</i>	10	3.85						
<i>Cocconeis placentula</i>					73	18.53	50	12.59
<i>Cymbella cistula</i>					3	0.76		
<i>C. gracilis</i>					5	1.27		
<i>C. hebridica</i>	p							
<i>C. mesiana</i>					p		1	0.25
<i>C. minuta</i>	4	1.54	79	19.90	1	0.25		
<i>C. naviculiformis</i>			p					
<i>C. silesiaca</i>	2	0.77	16	4.03	1	0.25	10	2.52
<i>C. sinuata</i>			11	2.77			12	3.02
<i>Diatoma anceps</i>	p				p			
<i>D. mesodon</i>	46	17.69	24	6.05	7	1.78	51	12.85
<i>Epithemia adnata</i>					4	1.02		
<i>Eunotia bilunaris</i>	p				p			
<i>E. intermedia</i>					11	2.79		
<i>E. minor</i>	5	1.92			24	6.09		p
<i>E. musicola</i>			p		11	2.79		
<i>E. praerupta</i>					3	0.76		
<i>E. subarcuatoidea</i>	3	1.15	p					
<i>Fragilaria capucina</i>	6	2.31	16	4.03	121	30.71	14	3.53
<i>F. construens</i>			p					
<i>F. ulna</i>					2	0.51		
<i>Frustulia rhomboidea</i>					3	0.76		p
<i>F. vulgaris</i>					p			
<i>Gomphonema angustatum</i>			1	0.25			1	0.25
<i>G. angustum</i>					22	5.58		
<i>G. clavatum</i>					1	0.25		
<i>G. clevei</i>			p					
<i>G. minutum</i>					1	0.25		
<i>G. olivaceum</i>					1	0.25	8	2.02
<i>G. parvulum</i>	7	2.69	1	0.25	9	2.28	2	0.50
<i>Hannaea arcus</i>	1	0.38	39	9.82			2	0.50
<i>Hantzschia amphioxys</i>	p							

Table 17 continued

<i>Meridion circulare</i>	1	0.38		1	0.25	9	2.27
<i>Navicula accomoda</i>			p				
<i>N. arvensis</i>					p		
<i>N. bacilloides</i>		p			p		
<i>N. contenta</i>					p		
<i>N. cryptocephala</i>					p		
<i>N. cryptotenella</i>				2	0.51	1	0.25
<i>N. heimansii</i>		p		4	1.02		
<i>N. mutica</i>	4	1.54		2	0.51		
<i>N. radiosa</i>				2	0.51		
<i>N. seminulum</i>		p					
<i>Hitzschia acidoclinata</i>			p				
<i>N. dissipata</i>				20	5.08	2	0.50
<i>N. graciliformis</i>			1	0.25			
<i>N. gracilis</i>		p	1	0.25			p
<i>N. hantzschiana</i>					5	1.27	
<i>N. linearis</i>					p		
<i>N. palea</i>					3	0.76	
<i>N. paleacea</i>			p				
<i>N. pumila</i>			1	0.25	1	0.25	
<i>N. recta</i>							p
<i>N. vermicularis</i>			1	0.25	p		
<i>Pinnularia microstauron</i>					p		
<i>P. subcapitata</i>		p					
<i>Stauroneis alpina</i>	1	0.38					
<i>Tabellaria flocculosa</i>		p					
Frustules Counted:		260		397		394	397
Total Species:		28		29		44	25
Species Counted:		16		17		31	17
Shannon Diversity:		1.99		2.37		3.49	2.17