AQUATIC INVERTEBRATES AND HABITAT AT A FIXED STATION ON THE WHITEFISH RIVER, FLATHEAD COUNTY, MONTANA

August 7, 2001

A report to
the Montana Department of Environmental Quality
Helena, Montana

by
Wease Bollman
Rhithron Associates, Inc.
Missoula, Montana
May 2002

INTRODUCTION

This report is one of 38 brief interpretive summaries of data assembled as part of a statewide, multi-year study conducted by the Montana Department of Environmental Quality (MT DEQ). Each report discusses information generated from a single benthic invertebrate sample collection and habitat evaluation at a fixed station established on a gauged river or high-order tributary. The present treatise focuses on the aquatic community sampled on the Whitefish River near Kalispell, Montana on August 7, 2001. The sample site was located by GPS reading at 48° 19' 14" N, 114° 16' 43" W, lying within the Montana Valley and Foothill Prairie Ecoregion (Woods et al. 1998). The sample was collected by personnel of MT DEQ. Sampling effort consisted of either a composite of four Hess samples, or a one-minute kicknet collection (Bukantis 1998). Habitat parameters were evaluated using the MT DEQ Macroinvertebrate Habitat Assessment Field Form for streams with riffle/run prevalence. Invertebrate samples were processed and animals identified by Rhithron Associates, Inc. Analysis of invertebrate assemblages was accomplished by applying the revised method (Bollman 1998) for streams of Western Montana's ecoregions. The method uses a multimetric battery to evaluate disturbance to biotic integrity.

The revised bioassessment metric battery and its scoring criteria have not been evaluated for application to higher-order streams and rivers; to date, no bioassessment method has been contrived for these waterways in Montana. Thus, the method used here is likely to have limitations in its applicability to the sites in this study. For example, 21 of the riverine or high-order waterways sampled for the fixed station study were located within the Montana Valley and Foothill Prairies Ecoregion (MVFP) and were sampled between July 23 and August 25, 2001. Mean water temperature for these sites at the time of sampling was 19.8°C (median = 19.4°). Temperatures ranged from 15.5°C (Kootenai River near Libby) to 25.3°C (Jefferson River near Three Forks). Ninety-eight sites from the MVFP were used to assemble the revised metric battery and to test it for sensitivity in detecting impairment, to establish scoring criteria, and to improve robustness of bioassessment. These 98 sites were mainly second and third order streams; the sampling season roughly corresponded to that of the fixed-station study. Mean water temperature for these sites at the time of sampling was 15°C (median = 14°C). Natural variations in benthic community composition and structure along longitudinal and thermal gradients are well known phenomena. Thus, scores and classifications were established for much smaller systems with significantly lower water temperatures; impairment classifications and use support designations in this study must be interpreted with care. Results from the application of other metric batteries may be found in the Appendix.

RESULTS AND DISCUSSION

Table 1 itemizes the nine evaluated habitat parameters and shows the assigned scores for each, as well as the integrated score and condition category.

Overall habitat conditions were nearly optimal at this site on the Whitefish River; but some instream parameters exhibited limitations. Riffle area was perceived to be reduced relative to channel dimensions, and the benthic substrate was judged less diverse than expected. Some embeddedness of larger substrate particles was noted, though significant deposition of fine sediments was not observed. Streambanks were judged

moderately stable. The riparian zone was moderately abbreviated along one side of the channel.

Bioassessment results are given in Table 2. When this bioassessment method is applied to these data, scores indicate that this site on the Whitefish River is slightly impaired and only partially supports designated uses.

Although the mayfly taxa richness was high, mayflies were not abundant in this sample, comprising only 5% of organisms collected. Still, the community as a whole scored well on the biotic index (3.53), suggesting that water quality was good at this site.

Table 1. Stream and riparian habitat assessment for a fixed station on the Whitefish River. August 2001.

Max possible score	**Parameter**	Whitefish River near Kalispell
10	Riffle development	5
10	Benthic substrate	6
20	Embeddedness	14
20	Channel alteration	19
20	Sediment deposition	17
20	Channel flow status	16
20	Bank stability: left / right	8 / 8
20	Bank vegetation: left / right	9 / 10
20	Vegetated zone: left / right	5 / 7
160	Total	124
	Percent of maximum	**77.5**
	CONDITION*	**SUB-OPTIMAL**

*Condition categories: Optimal > 80% of maximum score; Sub-optimal 75 - 56%; Marginal 49 - 29%; Poor <23%. Adapted from Plafkin et al. 1998.

Table 2. Metric values, scores, and bioassessment for a fixed station on the Whitefish River. The revised bioassessment metric battery (Bollman 1998) was used for the evaluation. August 2001.

	Whitefish River near Kalispell	
METRICS	**METRIC VALUES**	**METRIC SCORES**
Ephemeroptera richness	9	3
Plecoptera richness	4	3
Trichoptera richness	7	3
Number of sensitive taxa	2	2
Percent filterers	28.8	0
Percent tolerant taxa	27.2	1
	TOTAL SCORE (max.=18)	12
	PERCENT OF MAX.	**67**
	Impairment classification	**SLIGHT**
	USE SUPPORT	**PARTIAL**

Only a single individual of a cold stenothermic taxon (*Doroneuria* sp.) was present in the sample. Individuals in taxa preferring warm water were more common, including 3 snail taxa, the aquatic moth *Petrophila* sp., and the caddisflies *Helicopsyche borealis* and *Cheumatopsyche* sp. Water temperature measured at the time of sampling was 21.1°C, which is slightly higher than the mean temperature of the other MVFP sites sampled for this study, but probably within the expectations for a riverine system in this region.

Forty-seven taxa were present in the sampled assemblage and 8 of these were predator taxa; these findings suggest that instream habitats were diverse and abundant. "Clingers" were represented by 19 taxa and 7 caddisfly taxa were collected, implying that hard benthic substrates were unimpaired by excessive fine sediment deposition. All expected functional components of a large-order stream were present in the sample.

CONCLUSIONS

- The unimpaired water quality and minimally disturbed habitat at this site on the Whitefish River supported a diverse and functionally intact benthic assemblage.
- Given the taxonomic composition and tolerance characteristics of the benthic assemblage, the impairment category assigned by the bioassessment method seems somewhat incongruous. The contribution of filter-feeders and tolerant taxa seem appropriate for a riverine environment; thus, the bioassessment score may under-estimate the quality of the fauna. The biotic health of this site appears to be non-impaired.

LITERATURE CITED

Bollman, W. 1998. Improving Stream Bioassessment Methods for the Montana Valleys and Foothill Prairies Ecoregion. Master's (M.S.) Thesis. University of Montana. Missoula, Montana.

Bukantis, R. 1998. Rapid bioassessment macroinvertebrate protocols: Sampling and sample analysis SOP's. Working draft, April 22, 1997. Montana Department of Environmental Quality. Planning Prevention and Assistance Division. Helena, Montana.

Woods, A.J., Omernik, J. M. Nesser, J.A., Shelden, J., and Azevedo, S. H. 1999. Ecoregions of Montana. (Color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia. US Geological Survey.

APPENDIX

Taxonomic data and summaries

Whitefish River near Kalispell

August 2001

Aquatic Invertebrate Taxonomic Data

Site Name: Whitefish River near Kalispell **Date: 8/07/01**

Site ID: C09WHTFR01 Approx. percent of sample used 16

Taxon	Quantity	Percent	HBI	FFG
Prostoma sp.	2	0.55		PR
Nematoda	2	0.55	11	PA
Eisenella tetraedra	3	0.82	8	CG
Sphaerium sp	2	0.55	8	CG
Ferrissia sp	1	0.27	6	SC
Fossaria sp	2	0.55	6	CG
Gyraulus sp.	5	1.37	8	SC
Acari	1	0.27	5	PA
Total Misc. Taxa	**18**	**4.95**		
Octogomphus sp.	2	0.55	4	PR
Total Odonata	**2**	**0.55**		
Baetis tricaudatus	1	0.27	4	CG
Plauditus sp.	2	0.55	4	CG
Diphetor hageni	3	0.82	5	CG
Attenella margarita	3	0.82	2	CG
Ephemerella inermis	2	0.55	4	CG
Epeorus albertae	1	0.27	2	SC
Epeorus longimanus	1	0.27	1	SC
Nixe sp.	5	1.37	4	SC
Tricorythodes minutus	1	0.27	4	CG
Total Ephemeroptera	**19**	**5.22**		
Claassenia sabulosa	1	0.27	3	PR
Doroneuria sp	1	0.27	0	PR
Pteronarcella badia	1	0.27	0	OM
Pteronarcys californica	4	1.10	1	OM
Total Plecoptera	**7**	**1.92**		
Brachycentrus occidentalis	27	7.42	2	OM
Culoptila sp.	6	1.65	1	SC
Glossosoma sp.	15	4.12	0	SC
Helicopsyche borealis	23	6.32	3	SC
Cheumatopsyche sp.	34	9.34	5	CF
Hydropsyche sp.	69	18.96	5	CF
Hydroptila sp	1	0.27	6	PH
Total Trichoptera	**175**	**48.08**		
Petrophila sp.	1	0.27	5	SC
Total Lepidoptera	**1**	**0.27**		
Optioservus sp.	9	2.47	5	SC
Zaitzevia sp.	19	5.22	5	CG
Total Coleoptera	**28**	**7.69**		
Hemerodromia sp.	1	0.27	6	PR
Antocha sp.	4	1.10	3	CG
Total Diptera	**5**	**1.37**		
Corynoneura sp.	1	0.27	7	CG
Cricotopus (Isocladius) Gr.	1	0.27	7	CG
Labrundinia	2	0.55	7	PR
Micropsectra sp	50	13.74	4	CG
Microtendipes sp.	1	0.27	6	CG
Pagastia sp.	2	0.55	1	CG
Parametriocnemus sp.	2	0.55	5	CG
Paratanytarsus sp.	3	0.82	6	UN
Polypedilum sp	10	2.75	6	OM
Rheocricotopus sp	1	0.27	4	OM
Thienemanniinyia Gr.	6	1.65	5	PR
Tvetenia sp.	29	7.97	5	CG
Xenochironomus	1	0.27	0	PR
Total Chironomidae	**109**	**29.95**		
Grand Total	**364**	**100.00**		

Aquatic Invertebrate Summary

Site Name: Whitefish River near Kalispell **Date: 8/07/01**

SAMPLE TOTAL	364
EPT abundance	201
TAXA RICHNESS	47
Number EPT taxa	20
Percent EPT	55 22

Site ID: C09WHTFR01

DOMINANCE

TAXON	ABUNDANCE	PERCENT
Hydropsyche sp	69	18 96
Micropsectra sp	50	13 74
Cheumatopsyche sp	34	9 34
Tvetenia sp	29	7 97
Brachycentrus occidentalis	27	7 42
SUBTOTAL 5 DOMINANTS	209	57 42
Helicopsyche borealis	23	6 32
Zaitzevia sp	19	5 22
Glossosoma sp	15	4 12
Polypedilum sp	10	2 75
Optioservus sp	9	2 47
TOTAL DOMINANTS	285	78 30

SAPROBITY

Hilsenhoff Biotic Index	3 53

DIVERSITY

Shannon H (loge)	3 11
Shannon H (log2)	4 49
Simpson D	0 11

VOLTINISM

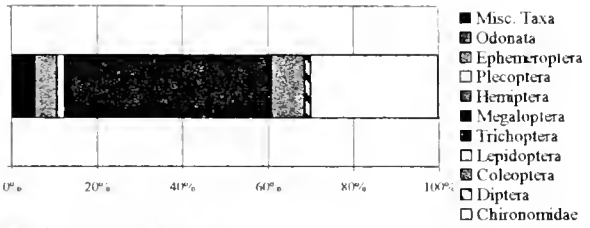
TYPE	ABUNDANCE	PERCENT
Multivoltine	116	31 80
Univoltine	182	50 07
Semivoltine	64	17 58

TAXA CHARACTERS

	#TAXA	ABUNDANCE	PERCENT
Tolerant	12	99	27 20
Intolerant	2	2	0 55
Clinger	19	235	64 56

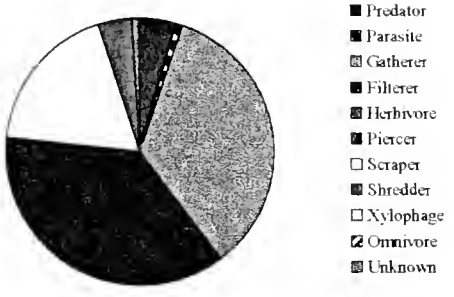
TAXONOMIC COMPOSITION

GROUP	PERCENT	#TAXA	ABUNDANCE
Misc Taxa	4 95	8	18
Odonata	0 55	1	2
Ephemeroptera	5 22	9	19
Plecoptera	1 92	4	7
Hemiptera	0 00	0	0
Megaloptera	0 00	0	0
Trichoptera	48 08	7	175
Lepidoptera	0 27	1	1
Coleoptera	7 69	2	28
Diptera	1 37	2	5
Chironomidae	29 95	13	109



FUNCTIONAL COMPOSITION

GROUP	PERCENT	#TAXA	ABUNDANCE
Predator	4 40	8	16
Parasite	0 82	2	3
Gatherer	34 62	18	126
Filterer	36 54	5	133
Herbivore	0 00	0	0
Piercer	0 27	1	1
Scraper	18 41	9	67
Shredder	4 12	3	15
Xylophage	0 00	0	0
Omnivore	0 00	0	0
Unknown	0 82	1	3



BIOASSESSMENT INDICES

B-IBI (Karr et al)

METRIC	VALUE	SCORE
Taxa richness	47	5
E richness	9	5
P richness	4	3
T richness	7	3
Long-lived	7	5
Sensitive richness	2	1
%tolerant	27 20	3
%predators	4 40	1
Clinger richness	19	3
%dominance (3)	42 03	5
	TOTAL SCORE	34

68 %

MONTANA DEQ METRICS (Bukantis 1998)

METRIC	VALUE	Plains Ecoregions	Valleys and Foothills	Mountain Ecoregions
Taxa richness	47	3	3	3
EPT richness	20	3	3	3
Biotic Index	3 53	3	3	2
%Dominant taxon	18 96	3	3	3
%Collectors	71 15	2	2	1
%EPT	55 22	3	2	2
Shannon Diversity	4 49	3		
%Scrapers +Shredd	22 53	2	2	0
Predator taxa	8	3		
%Multivoltine	31 80	3		
%H of T			3	
TOTAL SCORES		28	21	14
PERCENT OF MAXIMUM		93 33	87 50	66 67
IMPAIRMENT CLASS		NON	NON	SLIGHT

COMMUNITY TOLERANCES

Sediment tolerant taxa	6
Percent sediment tolerant	4 12
Sediment sensitive taxa	1
Percent sediment sensitive	4 12
Metals tolerance index (McGuire)	3 43
Cold stenotherm taxa	1
Percent cold stenotherms	0 27

Montana DEQ metric batteries