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

August 11, 2001

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

**by
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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 Flathead River near Perma, Montana on August 11, 2001. The sample site was located by GPS reading at 47° 20' 47" N, 114° 42' 15" W, lying within the Montana Valley and Foothill Prairies Ecoregion (Woods et al. 1998). The sample was collected by personnel of MT DEQ. Sampling effort consisted of a kicknet collection taken near the edge of the river, since deep water and lack of riffles prohibited other methods. Habitat parameters were evaluated using the MT DEQ Macroinvertebrate Habitat Assessment Field Forms for streams with riffle/run prevalence. The habitat evaluation was repeated using the form for streams with glide/pool 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, 24 of the riverine or high-order waterways sampled for the fixed station study were located within Western Montana ecoregions 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 Western Montana 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

Tables 1A and 1B itemize the evaluated habitat parameters and show the assigned scores for each, as well as the integrated score and condition category. Both riffle/run and glide/pool evaluations were provided.

Both evaluations suggest that overall habitat conditions were sub-optimal at this site. When riffle or run characteristics were evaluated, notable limitations to habitat quality were the lack of riffle development, and the marginal riparian zone width. Substrate particle sizes were judged to be somewhat less diverse than expected. Some

Table 1A. Stream and riparian habitat assessment for a fixed station on the Flathead River. Riffle/run prevalence. August 2001.

Max. possible score	Parameter	Flathead River near Perma
10	Riffle development	2
10	Benthic substrate	7
20	Embeddedness	18
20	Channel alteration	16
20	Sediment deposition	15
20	Channel flow status	16
20	Bank stability: left / right	8 / 8
20	Bank vegetation: left / right	8 / 6
20	Vegetated zone: left / right	5 / 5
160	Total	114
	Percent of maximum CONDITION*	71 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 1B. Stream and riparian habitat assessment for a fixed station on the Flathead River. Glide/pool prevalence. August 2001.

Max. possible score	Parameter	Flathead River near Perma
20	Bottom substrate	n.a.
20	Pool substrate char.	18
20	Pool variability	5
20	Channel alteration	16
20	Sediment deposition	17
20	Channel sinuosity	7
20	Channel flow status	16
20	Bank vegetation	8 / 6
20	Bank stability	8 / 8
20	Vegetated zone	5 / 5
180	Total	119
	Percent of maximum CONDITION*	66 SUB-OPTIMAL

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

sediment deposition was noted. When glide or pool characteristics were evaluated, notable limitations to habitat quality were the absence of deep pools and the perception that sinuosity was less pronounced than the ideal condition.

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

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

	Flathead River near Perma	
METRICS	METRIC VALUES	METRIC SCORES
Ephemeroptera richness	4	2
Plecoptera richness	0	0
Trichoptera richness	2	1
Number of sensitive taxa	0	0
Percent filterers	7.4	2
Percent tolerant taxa	82.1	0
	TOTAL SCORE (max.=18)	5
	PERCENT OF MAX.	28
	Impairment classification	MODERATE
	USE SUPPORT	PARTIAL

The high biotic index value (6.13) coupled with the low abundance of mayflies suggests that water quality was impaired at this site. Impairment could have been due to nutrient enrichment, temperature elevation, or both. No cold stenothermic animals were present in the sample; many representatives of taxa that prefer warm water conditions were collected. These included the caddisflies *Chenmatopsyche* sp. and *Mystacides* sp., the aquatic moth *Petrophila* sp., and several taxa of snails. The functional composition of the assemblage was skewed toward scrapers, suggesting that substantial algal films were present on hard substrates. It is possible that nutrient enrichment promoted the growth of algae supporting an abundance of scrapers. Most of the scrapers were snails, which typically prefer warmer, nutrient enriched waters. Excessive algal growth may have compromised hard substrate habitats typically used by “clinger” taxa; only six of these taxa were collected in the sample. Warm, enriched conditions promote oxygen depletion within substrates, and there was evidence of these anoxic conditions. The hemoglobin-bearing midges *Cryptochironomus* sp., *Dicrotendipes* sp., and *Microtendipes* sp. were all present at the site.

Eighty percent of the animals in the sample were non-insects, and the composition of this fauna suggests that thermal conditions may have been more or less static, muting the temperature triggers essential to aquatic insect life histories.

CONCLUSIONS

- Impairment of water quality by warm temperatures and nutrient enrichment is suggested by the high biotic index value, taxonomic composition, and functional characteristics of the benthic assemblage.

- The impairment classification assigned to this site by the bioassessment method employed seems appropriate, given the taxonomic composition and tolerance characteristics of the benthic assemblage.

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

Flathead River

August 2001

Aquatic Invertebrate Taxonomic Data

Site Name: Flathead River near Perma

Date: 8/11/01

Site ID: C12FLATR01

Approx. percent of sample used: 83

Taxon	Quantity	Percent	HBI	FFG
<i>Prostoma</i> sp.	9	2.68		PR
<i>Dugesia</i> sp.	11	3.27	4	PR
Nematoda	1	0.30	11	PA
<i>Eclipidrilus</i> sp.	1	0.30	8	CG
<i>Helobdella stagnalis</i>	1	0.30	10	PR
<i>Nephelopsis</i> sp.	2	0.60	8	PR
<i>Pisidium</i> sp.	1	0.30	8	CF
<i>Fossaria</i> sp.	123	36.61	6	SC
Physidae	7	2.08	8	SC
<i>Gyraulus</i> sp.	16	4.76	8	SC
<i>Gammarus</i> sp.	18	5.36	4	SH
<i>Hyalella azteca</i>	77	22.92	8	CG
<i>Caecidotea</i> sp.	2	0.60	8	CG
<i>Acar</i>	1	0.30	5	PA
Total Misc. Taxa	270	80.36		
Coenagrionidae-early instar	1	0.30	7	PR
Total Odonata	1	0.30		
<i>Drunella grandis</i>	1	0.30	2	CG
<i>Stenonema</i> sp.	5	1.49	3.5	SC
<i>Paraleptophlebia</i> sp.	2	0.60	1	CG
<i>Paraleptophlebia bicornuta</i>	2	0.60	2	CG
Total Ephemeroptera	10	2.98		
<i>Cheumatopsyche</i> sp.	10	2.98	5	CF
<i>Mystacides</i> sp.	1	0.30	4	CG
Total Trichoptera	11	3.27		
<i>Petrophila</i> sp.	7	2.08	5	SC
Total Lepidoptera	7	2.08		
<i>Dubiraphia</i> sp.	4	1.19	6	CG
<i>Optioservus</i> sp.	10	2.98	5	SC
<i>Haliphus</i> sp.	1	0.30	5	PH
Total Coleoptera	15	4.46		
<i>Cricotopus Trifascia</i> Gr.	2	0.60	7	CG
<i>Cryptochironomus</i> sp.	1	0.30	8	PR
<i>Dicrotendipes</i> sp.	2	0.60	8	CG
<i>Microtendipes</i> sp.	10	2.98	6	CF
<i>Nanocladius</i> sp.	1	0.30	3	CG
<i>Rheotanytarsus</i> sp.	4	1.19	6	CF
<i>Synorthocladius</i> sp.	1	0.30	2	CG
<i>Tvetenia</i> sp.	1	0.30	5	CG
Total Chironomidae	22	6.55		
Grand Total	336	100.00		

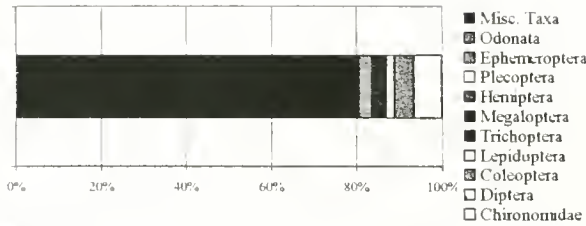
Aquatic Invertebrate Summary

Site Name: Flathead River near Perma Date: 8/11/01
 SAMPLE TOTAL 336

EPT abundance	21
TAXA RICHNESS	33
Number EPT taxa	6
Percent EPT	6.25

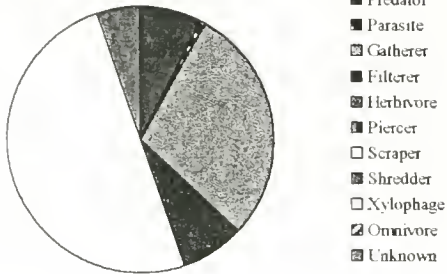
TAXONOMIC COMPOSITION

GROUP	PERCENT	#TAXA	ABUNDANCE
Misc Taxa	80.36	14	270
Odonata	0.30	1	1
Ephemeroptera	2.98	4	10
Plecoptera	0.00	0	0
Hemiptera	0.00	0	0
Megaloptera	0.00	0	0
Trichoptera	3.27	2	11
Lepidoptera	2.08	1	7
Coleoptera	4.46	3	15
Diptera	0.00	0	0
Chironomidae	6.55	8	22



FUNCTIONAL COMPOSITION

GROUP	PERCENT	#TAXA	ABUNDANCE
Predator	7.44	6	25
Parasite	0.60	2	2
Gatherer	28.87	13	97
Filterer	7.44	4	25
Herbivore	0.00	0	0
Piercer	0.30	1	1
Scraper	50.00	6	168
Shredder	5.36	1	18
Xylophage	0.00	0	0
Omnivore	0.00	0	0
Unknown	0.00	0	0



COMMUNITY TOLERANCES

Sediment tolerant taxa	4
Percent sediment tolerant	43.75
Sediment sensitive taxa	0
Percent sediment sensitive	0.00
Metals tolerance index (McGuire)	3.05
Cold stenotherm taxa	0
Percent cold stenotherms	0.00

Site ID: C12FLATR01

DOMINANCE

TAXON	ABUNDANCE	PERCENT
<i>Fissaria</i> sp	123	36.61
<i>Hyalella azteca</i>	77	22.92
<i>Gammarus</i> sp	18	5.36
<i>Gyraulius</i> sp	16	4.76
<i>Dugesia</i> sp	11	3.27
SUBTOTAL 5 DOMINANTS	245	72.92
<i>Cheumatopsyche</i> sp	10	2.98
<i>Optioservus</i> sp	10	2.98
<i>Microtendipes</i> sp	10	2.98
<i>Prostoma</i> sp	9	2.68
Physidae	7	2.08
TOTAL DOMINANTS	291	86.61

SAPROBITY

Hilsenhoff Biotic Index	6.13
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DIVERSITY

Shannon H (log _e)	1.91
Shannon H (log ₂)	2.75
Simpson D	0.17

VOLTINISM

TYPE	ABUNDANCE	PERCENT
Multivoltine	32	9.52
Univoltine	280	83.33
Semivoltine	15	4.46

TAXA CHARACTERS

	#TAXA	ABUNDANCE	PERCENT
Tolerant	13	276	82.14
Intolerant	0	0	0.00
Clinger	6	32	9.52

BIOASSESSMENT INDICES

B-IBI (Karr et al.)

METRIC	VALUE	SCORE
Taxa richness	33	3
E richness	4	1
P richness	0	1
T richness	2	1
Long-lived	3	3
Sensitive richness	0	1
%tolerant	82.14	1
%predators	7.44	1
Clinger richness	6	1
%dominance (3)	64.88	3
TOTAL SCORE	16	32 %

MONTANA DEQ METRICS (Bukantis 1998)

METRIC	VALUE	Plains Ecoregions	Valleys and Foothills	Mountain Ecoregions
Taxa richness	33	3	3	3
EPT richness	6	2	0	0
Biotic Index	6.13	1	0	0
%Dominant taxon	36.61	2	2	1
%Collectors	36.31	3	3	3
%EPT	6.25	0	0	0
Shannon Diversity	2.75	2		
%Scrapers + Shredd	55.36	3	3	3
Predator taxa	6	3		
%Multivoltine	9.52	3		
%H of T	90.9		1	
TOTAL SCORES	22	12	10	
PERCENT OF MAXIMUM	73.33	50.00	47.62	
IMPAIRMENT CLASS	SLIGHT	MODERATE	MODERATE	

Montana DEQ metric batteries

