AQUATIC MACROINVERTEBRATE SURVEY

STREAMS OF THE PLAINS ECOREGIONS OF MONTANA

1995

Prepared for the

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INTRODUCTION

Benthic macroinvertebrate populations are known to be key indicators of stream ecosystem health (Hynes 1960). Life spans for some of these creatures are as long as three years, and their complex life cycles and limited mobility mean that there is ample time for the community to respond to cumulative effects of environmental perturbations. The analysis of macroinvertebrate communities can thus be related to a stream's biological health, or integrity, defined by Karr and Dudley (1981) as "the capability of supporting and maintaining a balanced, integrated, adaptive community of organisms having a species composition, diversity and functional organization comparable to that of natural habitat of the region."

The multimetric approach to bioassessment using benthic macroinvertebrates uses attributes of the assemblage in an integrated way to reflect overall biotic condition. Community attributes which can contribute meaningfully to bioassessment include assemblage structure, sensitivity of community members to stress or pollution, and functional traits. Each metric component contributes an independent measure of the biotic integrity of a stream site; combining components into an overall score reduces variance and increases precision of the assessment (Fore et al. 1995).

This report presents multimetric bioassessment data from four streams of the Plains Ecoregions of north-central Montana. The streams were sampled for the first time in 1995 in an attempt to form a baseline against which to compare the data resulting from future collections.

METHODS

Aquatic macroinvertebrates were sampled by personnel of the Montana Department of Environmental Quality (DEQ) from four Plains Ecoregions streams on July 19 and 20, 1995. The traveling kick-net method described by Bukantis (1997) was utilized. Single samples from six reaches were collected; the resulting samples are described and dated as follows:

1. Corral Creek, near mouth. July 19, 1995.
2. Corral Creek, at mouth of headwaters. July 19, 1995.
3. Marias River, upstream of Dead Indian Coulee. July, 19, 1995.
4. Pondera Coulee, south of Cheek's bridge. July 20, 1995.
5. Pondera Coulee, ½ mile from Marias River. July 20, 1995.
6. Sage Creek, near headwaters. July 20, 1995.

Macroinvertebrate Sample Processing and Identification

Laboratory and data analyses were contracted to BlueStem Incorporated. Benthic macroinvertebrate samples were processed by BlueStem Incorporated personnel using the U.S. Environmental Protection Agency's techniques for RBP III (Plafkin et al. 1989). Taxonomic identification of benthic macroinvertebrates was subcontracted by BlueStem Incorporated to EcoAnalysts, Incorporated. Chironomidae and Oligochaeta identifications were subcontracted to Michael J. Mcbride.

Sample processing consisted of obtaining approximately a 300-organism subsample and was consistent with RBP III (Plafkin et al.1989). Organisms were enumerated and identified whenever possible to the taxonomic level specified in the Montana DEQ SOP (Bukantis, 1996).

The SOP requirements for subsampling and taxonomic resolution were strictly adhered to, deviating only when the quality of the specimen was lacking due to missing body parts needed for identification. When organisms were too immature to confidently take to the taxonomic level outlined in the SOP, they were more conservatively identified.

Following is a description of the subsampling procedure: Each sample was rinsed in a 0.5 mm sieve to remove preservative. The washed sample was then transferred to an appropriate size invertebrate sorting tray marked into square quadrants. Water was added to the tray to allow complete dispersion of the sample and even distribution of the organisms. Quadrants were randomly selected and organisms removed from each quadrant until the total number of organisms fell within the range of 270 to 330 (±10% of 300 organisms), or until there were no more invertebrates to remove, whichever occurred first. Any organism lying over a line separated by two quadrants was considered to be in the quadrant containing its head.

Data Analysis

Community structure, function and sensitivity to impact were characterized for each subsample using a battery of metrics developed by Montana DEQ for streams in the Plains Ecoregions of the state (Bukantis 1997). Two approaches were employed in the analysis of data for this report. The first approach relied on an ecoregional reference and scoring criteria; metric values were compared to the established Plains Ecoregions reference values (Table 1). Values and scoring criteria were derived from data from the Plains ecoregions and revised by McGuire in his review of 1995. All metrics used by McGuire were used in this analysis. The ecoregional reference approach allows comparison of these sites to plains sites elsewhere in the state.

In the second analysis, an internal reference (Table 2) was established for these streams; a reference value for each metric was established for all sites based on the performance of that metric at all sites studied. The best value, if appropriate for the analysis, was chosen as the point of comparison for each metric used. Tentative scoring criteria for the internal reference were devised from an analysis of the ranges of metric values over a data set gleaned from other sources. Data from 1992, 1993 and 1994 surveys of Plains Ecoregions reference streams (McGuire 1994a, 1994b, 1995) provided fifteen cases, while data from a 1995 survey conducted by Montana DEQ, as yet unpublished, provided nine more cases. The total of twenty-four cases is not a large database from which to establish scoring criteria for streams throughout the Plains Ecoregions; however, a wide range of biotic health was manifest in the twenty-four sites, and it was considered a useful starting point for the establishment of tentative scoring criteria for internal references for bioassessments of plains streams. Enlargement of the Plains Ecoregions database, a process already underway, will add reliability to this effort.

For both analyses, actual metric values were compared to the reference values to obtain metric scores (Table 4 for the ecoregional reference approach and Table 5 for the internal reference approach). Total metric scores were obtained by summing scores for all metrics, and an impairment classification and a use support category for each site was derived from this total score.

RESULTS AND DISCUSSION

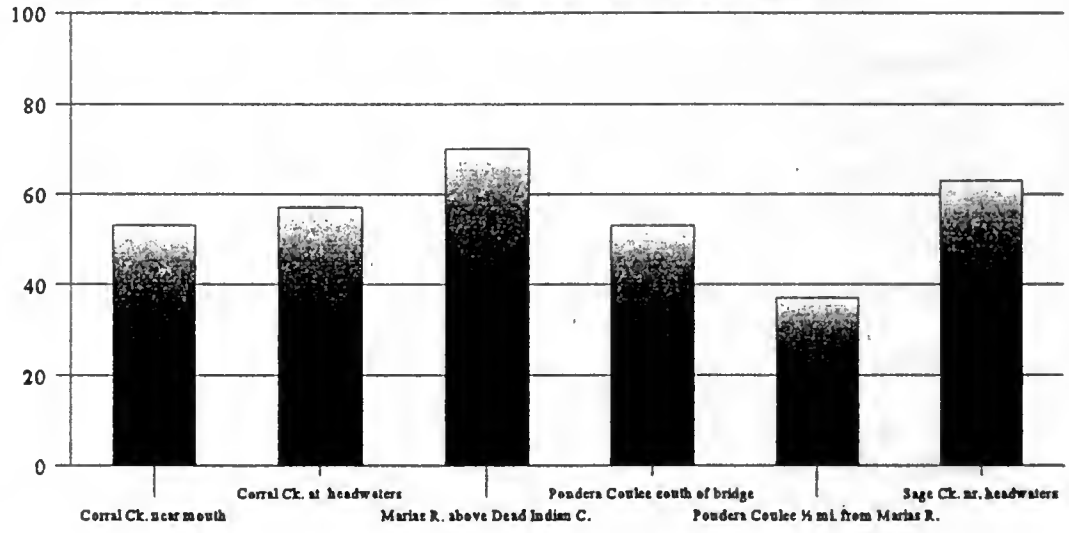
Macroinvertebrate taxa lists, metric results and other information for each sample are given in the Appendix.

Plains Ecoregions reference

Impairment classifications ranged from slight impairment at both Corral Creek sites, the Marias River site and the Sage Creek site, to moderate impairment at a Pondera Coulee site when sites were compared to the Plains Ecoregions reference. The other Pondera Coulee site was rated slight-to-moderately impaired. Figure 1 displays total bioassessment scores, based on the Plains ecoregional reference, for each site.

In this assessment, the highest biointegrity score was assigned to the Marias River site. The biotic index score (3.28) indicated a moderately sensitive community; organic or nutrient enrichment does not seem to be much of a problem at this site. A high proportion of the community, however, is comprised of taxa which tolerate sediment, such as *Tricorythodes* sp., baetid mayflies and the caddisfly *Brachycentrus* sp. Together, these three make up 69% of the sampled assemblage.

Figure 1. Bioassessment scores. Plains ecoregions streams, July 19 and 20, 1995



Slight impairment was also indicated by the data from both Corral Creek sites in this analysis, though biotic conditions differ markedly between the mouth and headwaters sites. At the mouth, a high biotic index score (6.59), and high relative abundances of lymnaeid snails and midges (10% and 73%, respectively, of the sampled community) strongly suggest organic and/or nutrient enrichment here. The midge community is comprised of tolerant forms such as *Corynoneura* sp. and *Cricotopus* spp. Only three EPT taxa occurred here, two mayflies and one caddisfly. Indeed, the total bioassessment score is deceptively high; high diversity scores and lack of dominance of a single taxon or a few taxa may make the biotic health seem better at this site than it really is. Perhaps these indicate diverse habitat, but moderate water quality and/or thermal impairment.

Near the headwaters, however, the Corral Creek benthic community, though less diverse,

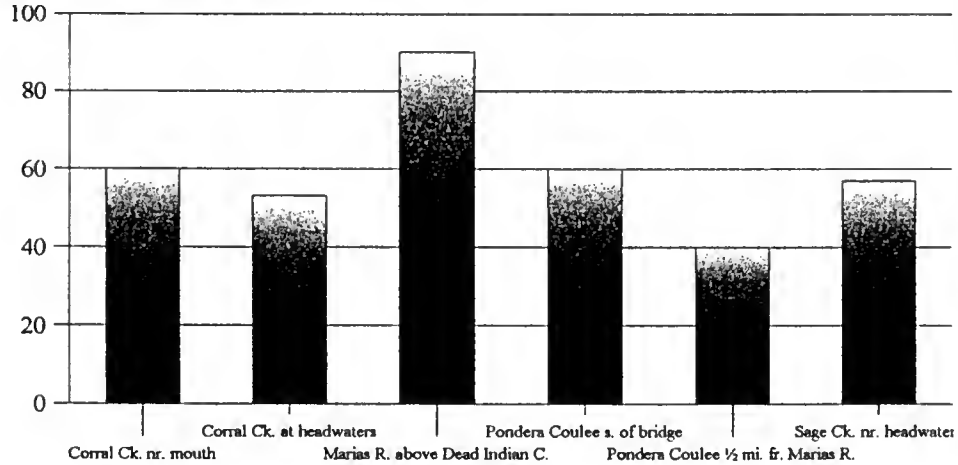
is also less tolerant, suggesting that water quality is not as degraded here as it is farther downstream. Some very sensitive taxa were collected here, including a high abundance of the mayfly *Cinygmula* sp. (17% of the sampled community), as well as *Ameletus* sp. The dominant taxon is the filter-feeding blackfly *Prosimulium* sp.(63% of the sample), though, giving some indication that fine organic particles are suspended in a rapid flow.

Sage Creek near its headwaters had a somewhat higher biotic index score, but, compared to the Plains Ecoregions reference, the site was rated slightly impaired. A high relative abundance of the stonefly *Hesperoperla pacifica* and the caddisfly *Brachycentrus* sp. suggested that water quality was not a major limitation to biotic health here. Sediment impacts, or other habitat limitations, however, can not be ruled out; almost 63% of the sampled community was comprised of midges.

Moderate impairment was indicated at the lower Pondera Coulee site; it received the lowest bioassessment score of any stream in this study (37% of reference). The mayfly *Caenis* sp. dominated the benthic community here, comprising 69% of the sampled assemblage, and indicating that heavy sediment deposition may severely limit the health of this portion of Pondera Coulee. Warm water temperatures are also indicated. Most of the diversity at this site comes from the twelve taxa of highly tolerant midges collected here. A high biotic index score (6.90) suggests that organic and/or nutrient inputs add to the habitat limitations here.

Farther upstream, the Pondera Coulee benthic assemblage indicates slight-to-moderate impairment. Greater diversity was found here than at the downstream site, but the community was still quite tolerant (biotic index = 6.26), with midges, especially *Tanytarsus* sp. and *Cricotopus* spp. making up 65% of the sample. Some sediment impacts are suggested by the composition of the community, but there is probably a stronger impact from organic and/or nutrient inputs; six filter-feeding taxa were collected here, including hydropsychid caddisflies and a fairly high abundance (13%) of the blackfly *Simulium* sp.

Figure 2. Bioassessment scores, compared to an internal reference. Plains ecoregions streams, 1995.



Internal reference

Four of the six sites in this study received similar ratings when compared to an internal reference as they did when the Plains Ecoregions reference was used. Figure 2 displays total bioassessment scores for all sites, based on comparison to the internal reference derived from the 1995 data for these streams reported here. Differences between the sites in terms of their overall biotic health became

more apparent when the internal reference was used.

In this analysis, the Marias River was rated non-impaired. The lowest scoring site, Pondera Coulee ½ mile from its mouth, received less than half of the score of the Marias River site. The other Pondera Coulee site, south of Cheek's bridge was rated slightly impaired in this analysis.

CONCLUSIONS

- Organic and/or nutrient enrichment limited biotic health at four of six of these Plains ecoregions sites. Only the site on the Marias River and the Sage Creek site showed little impact from water quality problems. Though near its headwaters, the upstream site on Corral Creek also had some indication of water quality impairment, even though an abundance of pollution-sensitive taxa were collected there.

- Sediment deposition may limit biotic health at both sites in Pondera Coulee, though data from the downstream site near the Marias River suggested this more strongly than that from the upstream site. Sediment impacts are also indicated at the Marias River site, and in Sage Creek.

- The internal reference derived from the data collected from these streams provided a useful tool for comparison of the streams to each other, and seemed to provide a more discriminating assessment than did the ecoregion reference.

TABLES

Table 1.	**Metrics and scoring criteria for Plains Ecoregions streams (from McGuire 1995).**			
	Scoring Criteria			
metric	3	2	1	0
Taxa richness	>24	24-18	18-12	<12
EPT richness	>8	8-6	5-3	<3
Biotic index	<5	5-6	6-7	>7
% dominant taxon	<30	30-45	45-60	>60
%Collector(g+ff)	<60	60-80	80-95	>95
% EPT	>50	50-30	30-10	<10
Shannon diversity (log2)	>3.0	3.0-2.4	2.4-1.8	<1.8
% Shredders + Scrapers	>30	30-15	15-3	<3
# predator taxa	>5	4-5	3-4	<3
% multivoltine	<40	40-60	60-80	>80

Table 2. **Internal reference values and tentative criteria for assigning scores to metrics based on percent comparability to reference values.**

metric	Plains streams internal reference 1995	Scoring Criteria[2] 3	2	1	0	*
Taxa richness	23	> 85%	85-75%	75-60%	< 60%	a
EPT richness	11	> 80%	80-50%	50-35%	< 35%	a
Biotic index	3.28	> 90%	90-80%	80-70%	< 70%	b
% dominant taxon	22	> 75%	75-60%	60-50%	< 50%	b
%Collector(g+ff)	76	> 90%	90-75%	75-60%	< 60%	b
% EPT	85	> 85%	85-75%	75-40%	< 40%	a
Shannon diversity (log2)	3.56	>90%	90-80%	80-70%	<70%	a
% Scrapers + Shredders	21	>70%	70-50%	50-25%	<25%	a
# predator taxa	3	>60%	60-50%	50-40%	<40%	a
% multivoltine	15	>35%	35-25%	25-15%	<15%	b

[1] 1996 Internal reference values are the "best" appropriate values among those calculated from 1995 plains ecoregions streams in this study.

[2] Scoring criteria are based on an analysis of metric ranges for 33 Plains Ecoregions sites in four years of data collected by the Montana Department of Environmental Quality.

* a = score is ratio of study site to reference x 100.

* b = score is ratio of reference to study site x 100.

Table 3a. Criteria for the assignment of support classifications / standards violation thresholds (from Bukantis, 1997)	
% Comparability to reference	Use support
>75	Full support--standards not violated
25-75	Partial support--moderate impairment--standards violated
<25	Non-support--severe impairment--standards violated
Table 3b. Criteria for the assignment of impairment classifications (from Plafkin et al. 1989).	
% Comparability to reference	Classification
> 83	nonimpaired
54-79	slightly impaired
21-50	moderately impaired
<17	severely impaired

Table 4. Metric values and bioassessments for streams of the Plains Ecoregions, based on the ecoregional reference. July 19 and 20, 1995.

metric	CORRAL CREEK near mouth	CORRAL CREEK at headwaters	MARIAS RIVER above Dead Indian Coulee
Taxa richness	21	14	23
EPT richness	3	9	11
Biotic index	6.59	3.31	3.28
% dominant taxon	34	63	35
% Collector (g+ff)	76	79	83
% EPT	1	30	85
Shannon diversity(log2)	3.17	1.91	2.98
% Scrapers + Shredders	16	21	12
#predator taxa	3	1	3
% multivoltine	55	4	10
metric score			
Taxa richness	2	1	2
EPT richness	1	3	3
Biotic index	1	3	3
% dominant taxon	2	0	2
% Collector (g+ff)	2	2	1
% EPT	0	2	3
Shannon diversity(log2)	3	1	2
% Scrapers + Shredders	2	2	1
#predator taxa	1	0	1
% multivoltine	2	3	3
total score (max.=30)	16	17	21
% reference	53	57	70
classification *	SLI	SLI	SLI
use support†	PART	PART	PART

* classifications: (NON) non-impaired, (SLI) slightly impaired, (MOD) moderately impaired, (SEV) severely impaired.

† See Table 3a.

Table 4 (continued). Metric values and bioassessments streams of the Plains Ecoregions, based on the ecoregional reference. July 19 and 20, 1995.

metric	PONDERA COULEE south of Cheek's Bridge	PONDERA COULEE ½ mile from Marias River	SAGE CREEK near headwaters
Taxa richness	21	18	19
EPT richness	6	1	6
Biotic index	6.26	6.90	4.63
% dominant taxon	22	69	34
% Collector (g+ff)	93	91	76
% EPT	14	69	30
Shannon diversity(log2)	3.56	2.04	3.16
% Scrapers + Shredders	1	<1	4
#predator taxa	3	2	2
% multivoltine	53	15	50
metric score			
Taxa richness	2	2	2
EPT richness	2	0	2
Biotic index	1	1	3
% dominant taxon	3	0	2
% Collector (g+ff)	1	1	2
% EPT	1	3	2
Shannon diversity(log2)	3	1	3
% Scrapers + Shredders	0	0	1
#predator taxa	1	0	0
% multivoltine	2	3	2
total score (max = 30)	16	11	19
% reference	53	37	63
classification *	MOD	MOD	SLI
use support†	PART	PART	PART

* classifications: (NON) non-impaired, (SLI) slightly impaired, (MOD) moderately impaired, (SEV) severely impaired.

†See Table 3a.

Table 5. Metric values and bioassessments for streams of the Plains Ecoregions, based on comparison with the internal reference. July 19 and 20, 1995.

metric		CORRAL CREEK near mouth	CORRAL CREEK at headwaters	MARIAS RIVER above Dead Indian Coulee
Taxa richness	metric score	3	1	3
EPT richness		0	3	3
Biotic index		0	3	3
% dominant taxon		2	0	2
% Collector (g+ff)		3	3	3
% EPT		0	0	3
Shannon diversity(log2)		2	0	2
% Scrapers + Shredders		3	3	2
#predator taxa		3	0	3
% multivoltine		2	3	3
total score (max.=30)		18	16	27
% reference		60	53	90
classification *		SLI	SLI	SLI
use support†		PART	PART	PART

metric		PONDERA COULEE south of Cheek's Bridge	PONDERA COULEE ½ mile from Marias River	SAGE CREEK near headwaters
Taxa richness	metric score	3	2	2
EPT richness		2	0	2
Biotic index		0	0	1
% dominant taxon		3	0	2
% Collector (g+ff)		2	2	3
% EPT		0	2	0
Shannon diversity(log2)		3	0	2
% Scrapers + Shredders		0	0	0
#predator taxa		3	3	3
% multivoltine		2	3	2
total score (max = 30)		18	12	17
% reference		60	40	57
classification *		SLI	MOD	SLI
use support†		PART	PART	PART

* classifications: (NON) non-impaired, (SLI) slightly impaired, (MOD) moderately impaired, (SEV) severely impaired. †See Table 3a.

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APPENDIX

Streams of the Plains Ecoregions

July 19 and 20, 1995

Macroinvertebrate Taxonomic Data

CORRAL CREEK: near mouth. July 19, 1995.

Taxon	#	%	BI[2]	FFG[1]
Pristina	1	0.37	8	CG
Tubificidae	1	0.37	10	CG
Lymnaeidae	28	10.26	6	SC
Physidae	14	5.13	8	SC
Planorbidae	3	1.10	6	SC
TOTAL: MISC. TAXA	47	17.22		
Sympetrum	3	1.10	10	PR
Archilestes	12	4.40	9	PR
TOTAL: ODONATA	15	5.49		
Callibaetis	1	0.37	9	CG
Siphlonurus	1	0.37	2	CG
TOTAL: EPHEMEROPTERA	2	0.73		
Polycentropus	1	0.37	6	CF
TOTAL: TRICHOPTERA	1	0.37		
Dytiscus	1	0.37	5	PR
TOTAL: COLEOPTERA	1	0.37		
Ephydridae	6	2.20	6	CG
Prosimulium	2	0.73	4	CF
TOTAL: DIPTERA	8	2.93		
Corynoneura	34	12.45	6	CG
Cricotopus	92	33.70	7	CG
Limnophyes†	2	0.73	6	CG
Mieropsectra	16	5.86	4	CG
Orthocladiinae	38	13.92	6	CG
Paratanytarsus	3	1.10	6	UN
Pentaneurini	1	0.37	6	UN
Polypedilum	1	0.37	6	CG
Pseetrocladius	12	4.40	8	CG
TOTAL: CHIRONOMIDAE	199	72.89		
GRAND TOTAL	273	100.00		

1.Functional feeding group designations are given in TABLE A.
2. Biotic index scores for individual taxa, as given in Bukantis, 1997.

†This taxon is not known to occur in Montana.

Aquatic Macroinvertebrate Data: CORRAL CREEK near mouth. July 19,1995.

% of sample used:	35
Subsample size	273
Taxa richness	21
EPT richness	3
Biotic index	6.59
% Dominant taxon	34
% EPT	1
% Collectors (g+f)	76
% Scrapers + Shredders	16
% Hydropsychinae of Trich	0
Metals tolerance index	5.78
Shannon Diversity (log2)	3.17
EPT/Chironomidae	.02
CTQa	99.82
%Baetidae of Ephemeroptera	50
% Coleoptera	<1
% Diptera	3
% Chironomidae	73
% Ephemeroptera	1
% Plecoptera	0
% Trichoptera	<1
% multivoltine	55
% univoltine	43
% semivoltine	1

Functional Feeding Grp.	%RA	# taxa
Filterers	1	2
Collector-Gatherers	75	12
Shredders	0	0
Scrapers	16	3
Predators	6	3

Est. total number of organisms	771
Est. number collected per foot	unknown
Est. number collected per minute	unknown

Macroinvertebrate Taxonomic Data

CORRAL CREEK at mouth of headwaters. July 19, 1995.

Taxon	#	%	BI	FFG
Nais simplex	16	5.90	8	CG
TOTAL: MISC. TAXA	16	5.90		
Baetis tricaudatus	5	1.85	4	CG
Diphetor hageni	7	2.58	5	CG
Cinygmula	46	16.97	0	SC
Epeorus longimanus	8	2.95	1	SC
Ameletus	11	4.06	0	CG
TOTAL: EPHEMEROPTERA	77	28.41		
Perlidae	1	0.37	1	PR
Pteronarcella	1	0.37	4	SH
TOTAL: PLECOPTERA	2	0.74		
Lepidostoma	1	0.37	1	SH
Psychoglypha	1	0.37	0	CG
TOTAL: TRICHOPTERA	2	0.74		
Optioservus	1	0.37	5	CG
TOTAL: COLEOPTERA	1	0.37		
Prosimulium	170	62.73	4	CF
Simulium	2	0.74	5	CF
TOTAL: DIPTERA	172	63.47		
Micropsectra	1	0.37	4	CG
TOTAL: CHIRONOMIDAE	1	0.37		
GRAND TOTAL	271	100.00		

Aquatic Macroinvertebrate Data: CORRAL CREEK at mouth of headwaters. July 19, 1995.

% of sample used:	29
Subsample size	271
Taxa richness	14
EPT richness	9
Biotic index	3.31
% Dominant taxon	63
% EPT	30
% Collectors (g+f)	79
% Scrapers + Shredders	21
% Hydropsychinae of Trich	0
Metals tolerance index	1.80
Shannon Diversity (log2)	1.91
EPT/Chironomidae	81.00
CTQa	61.43
%Baetidae of Ephemeroptera	16
% Coleoptera	<1
% Diptera	63
% Chironomidae	<1
% Ephemeroptera	28
% Plecoptera	1
% Trichoptera	1
% multivoltine	4
% univoltine	96
% semivoltine	1

Functional Feeding Grp.	%RA	# taxa
Filterers	63	2
Collector-Gatherers	16	7
Shredders	1	2
Scrapers	20	2
Predators	<1	1

Est. total number of organisms	929
Est. number collected per foot	unknown
Est. number collected per minute	unknown

Macroinvertebrate Taxonomic Data

MARIAS RIVER upstream of Dead Indian Coulee. July 19, 1995.

Taxon	#	%	BI	FFG
Limnodrilus hoffmeisteri	8	3.24	10	CG
Lymnaeidae	1	0.40	6	SC
TOTAL: MISC. TAXA	9	3.64		
Ophiogomphus	3	1.21	5	PR
TOTAL: ODONATA	3	1.21		
Baetidae	16	6.48	4	CG
Acentrella	2	0.81	4	CG
Ephemerella	19	7.69	2	SC
Heptageniidae	3	1.21	4	SC
Stenonema	2	0.81	4	SC
Leucrocuta	4	1.62	1	SC
Tricorythodes	69	27.94	4	CG
TOTAL: EPHEMEROPTERA	115	46.56		
Corixidae	2	0.81	8	PH
TOTAL: HEMIPTERA	2	0.81		
Brachycentrus	86	34.82	1	CF
Hydropsychidae	1	0.40	4	CF
Cheumatopsyche	2	0.81	5	CF
Oecetis	6	2.43	8	PR
TOTAL: TRICHOPTERA	95	38.46		
Heterlimnius	1	0.40	3	CG
Optioservus	6	2.43	5	CG
Hydrophilidae	1	0.40	5	PR
TOTAL: COLEOPTERA	8	3.24		
Simulium	2	0.81	5	CF
TOTAL: DIPTERA	2	0.81		
Ablabesmyia	1	0.40	8	CG
Cladotanytarsus	6	2.43	7	CG
Rheotanytarsus	3	1.21	6	CF
Thienemannimyia	3	1.21	6	CG
TOTAL: CHIRONOMIDAE	13	5.26		
GRAND TOTAL	247	100.00		

Aquatic Macroinvertebrate Data: MARIAS RIVER upstream of Dead Indian Coulee. July 19, 1995.

% of sample used:	71
Subsample size	247
Taxa richness	23
EPT richness	11
Biotic index	3.28
% Dominant taxon	35
% EPT	85
% Collectors (g+f)	83
% Scrapers + Shredders	12
% Hydropsychinae of Trich	3
Metals tolerance index	3.75
Shannon Diversity (log2)	2.98
EPT/Chironomidae	16.15
CTQa	86.52
%Baetidae of Ephemeroptera	16
% Coleoptera	3
% Diptera	1
% Chironomidae	5
% Ephemeroptera	47
% Plecoptera	0
% Trichoptera	38
% multivoltine	10
% univoltine	51
% semivoltine	39

Functional Feeding Grp.	%RA	# taxa
Filterers	38	5
Collector-Gatherers	45	9
Shredders	0	0
Scrapers	12	5
Predators	4	3

Est. total number of organisms	349
Est. number collected per foot	7
Est. number collected per minute	233

Macroinvertebrate Taxonomic Data

PONDERA COULEE south of Check's bridge. July 20, 1995.

Taxon	#	%	BI	FFG
Nais variabilis	3	1.26	10	CG
Sphaeriidae	5	2.10	8	CG
Hyallela azteca	1	0.42	8	CG
TOTAL: MISC. TAXA	9	3.78		
Dromogomphus†	1	0.42	4	PR
TOTAL: ODONATA	1	0.42		
Caeuis	14	5.88	7	CG
TOTAL: EPHEMEROPTERA	14	5.88		
Hydropsychidae	2	0.84	4	CF
Cheumatopsyche	7	2.94	5	CF
Hydropsyche	2	0.84	5	CF
Hydroptila	7	2.94	6	CG
Ithytrichia	2	0.84	4	SC
TOTAL: TRICHOPTERA	20	8.40		
Ceratopogonidae	10	4.20	6	PR
Simulium	30	12.61	5	CF
TOTAL: DIPTERA	40	16.81		
Cladotanytarsus	1	0.42	7	CG
Cricotopus	39	16.39	7	CG
Cricotopus Bicinctus Gr.	27	11.34	7	CG
Cricotopus Trifascia Gr.	16	6.72	6	CG
Cryptochironomus	3	1.26	8	PR
Eukiefferiella	1	0.42	8	CG
Micropsectra	1	0.42	4	CG
Peutanecurini	1	0.42	6	UN
Rheotanytarsus	4	1.68	6	CF
Tanytarsus	52	21.85	6	CF
Thienemanniella	9	3.78	6	CG
TOTAL: CHIRONOMIDAE	154	64.71		
GRAND TOTAL	238	100.00		

† This taxon is not known to occur in Montana.

Aquatic Macroinvertebrate Data: PONDERA COULEE south of Cheek's bridge. July 20, 1995.

% of sample used:	10
Subsample size	238
Taxa richness	21
EPT richness	6
Biotic index	6.26
% Dominant taxon	22
% EPT	14
% Collectors (g+f)	93
% Scrapers + Shredders	1
% Hydropsychinae of Trich	55
Metals tolerance index	5.43
Shannon Diversity (log2)	3.56
EPT/Chironomidae	22
CTQa	106.43
%Baetidae of Ephemeroptera	0
% Coleoptera	0
% Diptera	17
% Chironomidae	65
% Ephemeroptera	6
% Plecoptera	0
% Trichoptera	8
% multivoltine	53
% univoltine	46
% semivoltine	1

Functional Feeding Grp.	%RA	# taxa
Filterers	41	6
Collector-Gatherers	52	12
Shredders	0	0
Scrapers	1	1
Predators	6	3

Est. total number of organisms	2285
Est. number collected per foot	unknown
Est. number collected per minute	unknown

Macroinvertebrate Taxonomic Data

PONDERA COULEE ½ mile from Marias River. July 20, 1995.

Taxon	#	%	BI	FFG
Nais variabilis	3	1.16	10	CG
Tubificidae	7	2.71	10	CG
Physidae	1	0.39	8	SC
TOTAL: MISC. TAXA	11	4.26		
Cacuis	179	69.38	7	CG
TOTAL: EPHEMEROPTERA	179	69.38		
Corixidae	11	4.26	8	PH
TOTAL: HEMIPTERA	11	4.26		
Diptera	1	0.39	11	UN
Ceratopogonidae	3	1.16	6	PR
Simulium	3	1.16	5	CF
TOTAL: DIPTERA	7	2.71		
Cricotopus	3	1.16	7	CG
Cricotopus Bicinctus Gr.	8	3.10	7	CG
Cryptochironomus	6	2.33	8	PR
Micropsectra	11	4.26	4	CG
Parakiefferiella	1	0.39	6	CG
Paralauterborniella	1	0.39	8	CG
Potthastia Longimana Gr.	1	0.39	2	CG
Pseudochironomus	8	3.10	5	CG
Pseudosmittia	1	0.39	6	CG
Rheotanytarsus	1	0.39	6	CF
Tanytarsus	8	3.10	6	CF
Thienemanniinyia	1	0.39	6	CG
TOTAL: CHIRONOMIDAE	50	19.38		
GRAND TOTAL	258	100.00		

Aquatic Macroinvertebrate Data: PONDERA COULEE ½ mile from Marias River. July 20, 1995.

% of sample used:	79
Subsample size	258
Taxa richness	18
EPT richness	1
Biotic index	6.90
% Dominant taxon	69
% EPT	69
% Collectors (g+f)	91
% Scrapers + Shredders	<1
% Hydropsychinae of Trich	n.a.
Metals tolerance index	3.53
Shannon Diversity (log2)	2.04
EPT/Chironomidae	3.58
CTQa	106.11
%Baetidae of Ephemeroptera	0
% Coleoptera	0
% Diptera	3
% Chironomidae	19
% Ephemeroptera	69
% Plecoptera	0
% Trichoptera	0
% multivoltine	15
% univoltine	85
% semivoltine	0

Functional Feeding Grp.	%RA	# taxa
Filterers	5	3
Collector-Gatherers	87	12
Shredders	0	0
Scrapers	<1	1
Predators	3	2

Est. total number of organisms	326
Est. number collected per foot	unknown
Est. number collected per minute	unknown

Macroinvertebrate Taxonomic Data

SAGE CREEK near headwaters. July 20, 1995.

Taxon	#	%	BI	FFG
Acari	1	0.37	5	PA
TOTAL: MISC. TAXA	1	0.37		
Baetis tricaudatus	8	3.00	4	CG
Diphetor hageni	1	0.37	5	CG
TOTAL: EPHEMEROPTERA	9	3.37		
Amphinemura	3	1.12	2	SH
Hesperoperla pacifica	44	16.48	1	PR
Pteronarcella	5	1.87	4	SH
TOTAL: PLECOPTERA	52	19.48		
Brachycentrus	18	6.74	1	CF
TOTAL: TRICHOPTERA	18	6.74		
Curculionidae	3	1.12	11	SH
Heterlimnius	4	1.50	3	CG
TOTAL: COLEOPTERA	7	2.62		
Pericoma	1	0.37	4	CG
Prosimulium	1	0.37	4	CF
Antocha	3	1.12	3	CG
Dicranota	7	2.62	3	PR
TOTAL: DIPTERA	12	4.49		
Cricotopus	29	10.86	7	CG
Diamesa	15	5.62	5	CG
Eukiefferiella	11	4.12	8	CG
Orthocladiinae	91	34.08	6	CG
Orthocladius	19	7.12	6	CG
Tvetenia	3	1.12	5	CG
TOTAL: CHIRONOMIDAE	158	62.92		
GRAND TOTAL	267	100.00		

Aquatic Macroinvertebrate Data: SAGE CREEK near headwaters. July 20, 1995.

% of sample used:	15
Subsample size	267
Taxa richness	19
EPT richness	6
Biotic index	4.63
% Dominant taxon	34
% EPT	30
% Collectors (g+f)	76
% Scrapers + Shredders	4
% Hydropsychinae of Trich	0
Metals tolerance index	5.31
Shannon Diversity (log2)	3.16
EPT/Chironomidae	.47
CTQa	70.44
%Baetidae of Ephemeroptera	100
% Coleoptera	3
% Diptera	4
% Chironomidae	63
% Ephemeroptera	3
% Plecoptera	19
% Trichoptera	7
% multivoltine	50
% univoltine	25
% semivoltine	25

Functional Feeding Grp.	%RA	# taxa
Filterers	7	2
Collector-Gatherers	69	11
Shredders	4	3
Scrapers	0	0
Predators	19	2

Est. total number of organisms	1831
Est. number collected per foot	unknown
Est. number collected per minute	unknown

TABLE A. Functional Feeding Groups

Abbreviation	Description
CF	Collector - filterer
CG	Collector - gatherer
OM	Omnivore
PA	Parasite
PR	Predator
SC	Scraper
UN	Unknown
SH	Shredder

____Acceptable ___✓___Needs revision ____Reject

Contractor Report Evaluation Form date: 17 Sept 97

Contractor: Blue Stem
Report Title: Streams of Plains Ecoregions 1995
Report Date: Aug 1995
reviewed by: A. Bukantis
QUESTIONS, REVISION REQUIREMENTS:

Figure TR For ~~Marias River~~ Pondera Coulee = 18 reported as 21
why Corixidae only to family? - immatures only?
what happened to below Tiber Dam sample?

Subsampling

1. Did the contractor follow the specified sub-sampling procedures? ✓

2. Are subsamples in the range of 270-330 organisms? ✓

3. Is the proportion of the sample that the contractor subsampled documented? ✓

Taxonomy

3. Is the taxonomic resolution consistent with the SOP's? ✓

Data Analysis

4. Is the correct set of metrics used for impairment rating? ✓

5. Was an appropriate reference used for the analysis? ✓

6. Did the contractor use replicate information in evaluating the level of resolution if appropriate? N/A

7. For reports where time trends are being evaluated: Did the contractor account for any differences in taxonomic resolution between years, etc?

N/A