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ASSESSMENT OF MACROINVERTEBRATE COMMUNITIES AT TWO SITES ON THE GALLATIN RIVER, GALLATIN COUNTY, MONTANA

A REPORT TO THE
BLUE WATER TASK FORCE

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INTRODUCTION

With increased development in its watershed, the integrity of the Gallatin River warrants monitoring and assessment. Benthic macroinvertebrates are a useful tool for evaluating the effects of potential stressors that may be associated with the accelerating human influences on the River. In this report, the methods for processing and identifying replicated macroinvertebrate samples collected from 2 sites on the Gallatin River are reported. Data resulting from that work were translated into a multimetric index, and scores were calculated. In addition, narrative interpretations of the ecological condition of the macroinvertebrate assemblages were composed. These narratives use the taxonomic and functional composition, tolerance and sensitivity characteristics, and habit of the benthic invertebrates to describe probable water quality and habitat influences on the assemblages. Interpretations maximize information inherent in the fauna by not relying on a single cumulative index score, which may mask stress on the biota.

METHODS

Sample processing

Four macroinvertebrate samples in five jars were delivered to Rhithron's laboratory facility in Missoula, Montana. All samples arrived in good condition. Habitat assessment forms containing sample identification information were provided by Blue Water Task Force (BWTF). Upon arrival, samples were unpacked and examined and checked against the habitat assessment forms. No discrepancies were noted. An inventory spreadsheet was created and sent to the project manager the day after the samples arrived at the Rhithron laboratory. This spreadsheet included project code and internal laboratory identification numbers and was verified by the project manager prior to upload into the Rhithron database.

Subsamples of a minimum of 300 organisms were obtained using methods consistent with Montana Department of Environmental Quality (MDEQ) standard procedures (MDEQ 2006): Caton sub-sampling devices (Caton 1991), divided into 30 grids, each approximately 5 cm by 6 cm were used. Each individual sample was thoroughly mixed in its jar(s), poured out and evenly spread into the Caton tray, and individual grids were randomly selected. Grid contents were examined under stereoscopic microscopes using 10x – 30x magnification. All aquatic invertebrates from each selected grid were sorted from the substrate, and placed in 95% ethanol for subsequent identification. Grid selection, examination, and sorting continued until at least 300 organisms were sorted. The final grid was completely sorted of all organisms. All unsorted sample fractions were retained and stored at the Rhithron laboratory.

Organisms were individually examined using 10x – 80x stereoscopic dissecting scopes (Leica S8E and S6E) and identified to the lowest practical level consistent with MDEQ (MDEQ 2006) data requirements, using appropriate published taxonomic references and keys. Identification, counts, life stages, and information about the condition of specimens were recorded on bench sheets. To obtain accuracy in richness measures, organisms that could not be identified to the target level specified in MDEQ protocols were designated as "not unique" if other specimens from the same group could be taken to target

levels. Organisms designated as "unique" were those that could be definitively distinguished from other organisms in the sample. Identified organisms were preserved in 95% ethanol in labeled vials, and archived at the Rhithron laboratory. Midges were morphotyped using 10x – 80x stereoscopic dissecting microscopes (Leica S8E and S6E) and representative specimens were slide mounted and examined at 200x – 1000x magnification using an Olympus BX 51 compound microscope. Slide mounted organisms were also archived at the Rhithron laboratory.

Quality control procedures

Quality control (QC) procedures for initial sample processing and subsampling involved checking sorting efficiency. These checks were conducted on 100% of the samples by independent observers who microscopically re-examined 20% of sorted substrate from each sample. All organisms that were missed were counted and this number was added to the total number obtained in the original sort. Sorting efficiency was evaluated by applying the following calculation:

$$SE = \frac{n_1}{n_{1+2}} \times 100$$

where: SE is the sorting efficiency, expressed as a percentage, n_1 is the total number of specimens in the first sort, and n_{1+2} is the total number of specimens in the first and second sorts combined.

Quality control procedures for taxonomic determinations of invertebrates involved checking accuracy, precision and enumeration. One sample was randomly selected and all organisms re-identified and counted by an independent taxonomist. Taxa lists and enumerations were compared by calculating a Bray-Curtis similarity statistic (Bray and Curtis 1957) for the selected sample. Routinely, discrepancies between the original identifications and the QC identifications are discussed among the taxonomists, and necessary rectifications to the data are made. Discrepancies that cannot be rectified by discussions are routinely sent out to taxonomic specialists for identification. However, taxonomic certainty for identifications in this project was high, and no external verifications were necessary.

Data analysis

Taxa and counts for each sample were entered into Rhithron's customized database. Life stages, "unique" designations, and the condition of specimens were also entered. Bioassessment metrics were calculated by the database application and a multimetric index developed for montane ecoregions of Montana (Bollman 1998) was calculated and scored.

Narrative interpretations of the taxonomic and functional composition of the aquatic invertebrate assemblages are based on demonstrated associations between assemblage components and habitat and water quality variables gleaned from the published literature, the writer's own research (especially Bollman 1998) and professional judgment, and those of other expert sources (especially Wisseman 1996). These interpretations are not intended to replace canonical procedures for stressor identification, since such procedures require substantial surveys of habitat, and historical and current data related to water quality, land use, point and non-point source influences, soils, hydrology,

geology, and other resources that were not readily available for this study. Instead, attributes of invertebrate taxa that are well-substantiated in diverse literature, published and unpublished research, and that are generally accepted by regional aquatic ecologists, are combined into descriptions of probable water quality and instream and reach-scale habitat conditions.

The approach to this analysis uses some assemblage attributes that are interpreted as evidence of water quality and other attributes that are interpreted as evidence of habitat integrity. Attributes are considered individually, so information is maximized by not relying on a single cumulative score, which may mask stress on the biota.

Water quality variables are estimated by examining mayfly taxa richness and the Hilsenhoff Biotic Index (HBI) value. Other indicators of water quality include the richness and abundance of hemoglobin-bearing taxa and the richness of sensitive taxa. Mayfly taxa richness has been demonstrated to be significantly correlated with chemical measures of dissolved oxygen, pH, and conductivity (e.g. Bollman 1998, Fore et al. 1996, Wisseman 1996). The Hilsenhoff Biotic Index (HBI) (Hilsenhoff 1987) has a long history of use and validation (Cairns and Pratt 1993). In Montana foothills, the HBI was demonstrated to be significantly associated with conductivity, pH, water temperature, sediment deposition, and the presence of filamentous algae (Bollman 1998). The presence of filamentous algae is also suspected when macroinvertebrates associated or dependent on it (e.g. LeSage and Harrison 1980, Anderson 1976) are abundant. Nutrient enrichment in Montana streams often results in large crops of filamentous algae (Watson 1988). Sensitive taxa exhibit intolerance to a wide range of stressors (e.g. Wisseman 1996, Hellawell 1986, Friedrich 1990, Barbour et al. 1999), including nutrient enrichment, acidification, thermal stress, sediment deposition, habitat disruption, and others. These taxa are expected to be present in predictable numbers in functioning montane and foothills streams (e.g. Bollman 1998).

Thermal characteristics of the sampled site are predicted by the richness and abundance of cold stenotherm taxa (Clark 1997), and by calculation of the temperature preference of the macroinvertebrate assemblage (Brandt 2001). Hemoglobin-bearing taxa are also indicators of warm water temperatures (Walshe 1947), since dissolved oxygen is directly associated with water temperature; oxygen concentrations can also vary with the degree of nutrient enrichment. Increased temperatures and high nutrient concentrations can, alone or in concert, create conditions favorable to hypoxic sediments, habitats preferred by hemoglobin-bearers.

The condition of instream and streamside habitats is estimated by characteristics of the macroinvertebrate assemblages. Stress from sediment is evaluated by caddisfly richness and by “clinger” richness (Kleindl 1996, Bollman 1998, Karr and Chu 1999) A newer tool, the Fine Sediment Biotic Index (FSBI) (Relyea et al. 2000) shows promise when applied to the montane and foothills regions, but its use is limited in plains regions, where taxa characteristic of these sites have not been studied for sediment tolerance.

The functional characteristics of macroinvertebrate assemblages are based on the morphology and behaviors associated with feeding, and are interpreted in terms of the River Continuum Concept (Vannote et al. 1980) in the narratives. Alterations from predicted patterns in montane and foothills streams may be interpreted as evidence of water quality or habitat disruption.

For example, shredders and the microbes they depend on are sensitive to modifications of the riparian zone (Plafkin et al. 1989).

Narrative interpretations include comparisons with data generated by the recent Environmental Monitoring and Assessment Program (EMAP) carried out recently in the Western United States by the US Environmental Protection Agency. EMAP sampling was based on a probability design model (Stoddard et al. 2005) that proportioned sampling effort at randomly selected sites with respect to the known extent of streams and rivers in the State. Thus, the EMAP dataset was expected to provide an accurate representation of the biological condition of aquatic resources. EMAP data for Montana was recently analyzed (Bollman and Bowman, in draft), and ranges of metrics were determined for the State's ecoregions and stream orders. These benchmark data provide useful tools for the comparison of data from other sites in almost all of the ecoregions of the State. The results of habitat assessments are reported. These assessments were made by BWTF personnel using a method recommended by the Montana Department of Environmental Quality (MDEQ 1998). Instream, streambank, and reach-scale parameters were evaluated. The relationship of bioassessment scores and habitat assessment scores is investigated graphically.

RESULTS

Quality Control Procedures

Results of quality control procedures for subsampling and taxonomy are given in Table 1. Sorting efficiency averaged 99.08% for all samples, taxonomic precision for identification and enumeration was 95.91% for the randomly selected sample, and data entry efficiency averaged 100% for the project.

Table 1. Results of quality control procedures for subsampling and taxonomy.

Site name	Site ID	Sorting efficiency	Bray-Curtis similarity for taxonomy and enumeration
Gallatin River above Jack Smith Bridge	Bo Camp A	98.79%	
Gallatin River above Jack Smith Bridge	Bo Camp B	100.00%	
Gallatin River just below Porcupine Bridge	Porc A	99.37%	
Gallatin River just below Porcupine Bridge	Porc B	98.15%	95.91%

Bioassessment

Table 2 summarizes values and scores for metrics in the bioassessment index (Bollman 1998) used to evaluate the aquatic invertebrate assemblages. Total scores and impairment classifications are also given. Each replicate is evaluated separately in the table.

When this index is applied to the Gallatin River invertebrate data, results indicate slight impairment at both sites. Metric scores indicate that the percent of filterers and tolerant taxa were the most influential measures limiting the overall scores.

Table 2. Bioassessment index (Bollman 1998) and individual metrics and scores for replicate samples taken at 2 sites on the Gallatin River, June 2007.

	Bo Camp A	Bo Camp B	Porc A	Porc B
METRICS	**METRIC VALUES**			
Ephemeroptera richness	7	11	10	12
Plecoptera richness	1	5	1	2
Trichoptera richness	3	7	6	6
Number of sensitive taxa	2	4	3	4
Percent filterers	2.99%	10.13%	22.36%	27.04%
Percent tolerant taxa	51.34%	26.27%	16.61%	19.81%
	METRIC SCORES			
Ephemeroptera richness	3	3	3	3
Plecoptera richness	1	3	1	2
Trichoptera richness	2	3	3	3
Number of sensitive taxa	2	3	2	3
Percent filterers	3	1	1	0
Percent tolerant taxa	0	1	1	1
TOTAL SCORE (max.=18)	**11**	**14**	**11**	**12**
PERCENT OF MAX.	**61.11%**	**77.78%**	**61.11%**	**66.67%**
Impairment classification*	**SLI**	**SLI**	**SLI**	**SLI**

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

Aquatic invertebrate assemblages

- Below Porcupine Bridge

Fourteen mayfly taxa were counted in samples from this site, and the biotic index value (4.34) was lower than the median value for high-order rivers in the Middle Rockies ecoregion. These findings suggest that water quality was excellent in this reach. Several cold stenotherm taxa were collected, including the mayflies *Drunella doddsii* and *Caudatella heterocaudata.* The thermal preference for the assemblage was calculated as 14.2°C, colder than the median value for similar riverine sites in the region. Cold, clean water is indicated.

Eight caddisfly taxa and at least 23 "clinger" taxa were present in the samples. Stony substrate habitats were probably free from fine sediment deposition. Stoneflies were represented by only 2 taxa; this group may be associated with reach-scale habitat condition, and some alteration of riparian vegetation, channel morphology, or streambank stability may be associated with the poor representation of these animals. Overall taxa richness (56) was only slightly lower than the median for rivers in the Middle Rockies ecoregion. Semivoltine taxa were well-represented, indicating persistent surface flow. All expected functional groups were appropriately represented.

- Above the Jack Smith Bridge (Bo-camp)

At least 11 unique mayfly taxa were supported at this site and the biotic index value (4.68) for combined replicates was slightly lower than the median

value for high-order sites in the Middle Rockies ecoregion (Bollman and Bowman, in draft). These findings suggest that water quality was good in this reach. The sampled fauna included 5 sensitive cold stenotherm taxa, indicating a thermal regime that is probably appropriate for a riverine site. These taxa included the mayfly *Caudatella heterocaudata* and the stonefly *Cultus* sp. The calculated thermal preference for the invertebrate assemblage was 14.2°C, which is colder than the mean for high-order sites in the region, and identical to the temperature preference calculated for the assemblage at the upstream site. Cold water and unpolluted conditions are implied.

At least 22 "clinger" taxa and 7 caddisfly taxa were supported at the site, suggesting that sediment deposition did not limit colonization of stony substrate habitats. The FSBI value (4.89) was higher than the median value for similar sites, indicating a sediment sensitive assemblage. Overall taxa richness (50) was lower than expected for a riverine site in the Middle Rockies. Instream habitats may have been monotonous. Stonefly richness (5) was high. The diversity among stoneflies may be associated with reach-scale habitat conditions; stable streambanks, intact riparian vegetation, and natural channel morphology are suggested. Semivoltine taxa were well-represented, indicating that surface flow persisted year-round in this reach, and catastrophic thermal stress or toxic pollutants did not influence the benthic fauna. All expected functional components were present, and proportions of each group were probably appropriate for a riverine environment.

Habitat assessment

Table 3 gives the results of habitat assessment at each of the 2 sampled sites. Field notes indicate that there was no significant change at the Porcupine bridge site since the previous sampling event. All instream, streambank, and reach-scale habitat features were judged to be in optimal or sub-optimal condition at this site. Above the Jack Smith bridge, riffle development was judged to be poor, but all other habitat parameters were assessed as optimal or sub-optimal.

Table 3. Stream and riparian habitat assessment. Sites were assessed based upon criteria developed by Montana DEQ for streams with riffle/run prevalence (MDEQ 1998). Gallatin River, June 2007.

Max. possible score	Parameter	**Below Porcupine bridge**	**Above Jack Smith Bridge (Bo-Camp)**
10	Riffle development	10	1
10	Benthic substrate	8	9
20	Embeddedness	18	18
20	Channel alteration	17	20
20	Sediment deposition	18	19
20	Channel flow status	18	17
20	Bank stability	9 / 9	8 / 7
20	Bank vegetation	10 / 10	8 / 9
20	Vegetated zone	7 / 10	9 / 10
160	Total	144	135
	Percent of maximum	**90%**	**84%**
	CONDITION*	**optimal**	**optimal**

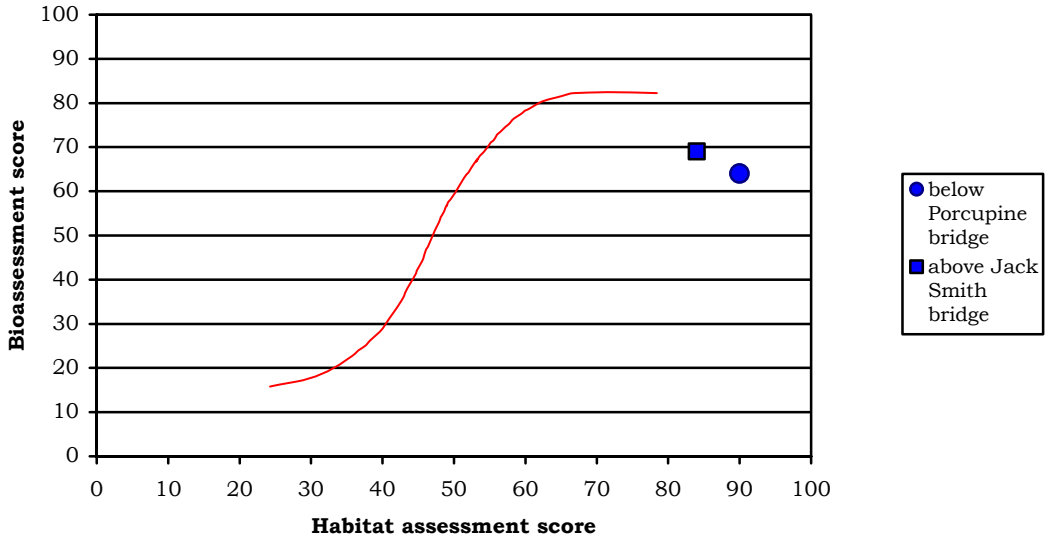
* Condition categories: Optimal > 80% of maximum score; Sub-optimal 75 - 56%; Marginal 49 - 29%; Poor <23%. Plafkin et al. 1989.

Relating bioassessment to habitat assessment

When habitat assessment scores are plotted against bioassessment scores, the resulting figure provides an opportunity to evaluate the hypothetical relationship between habitat integrity and water quality. Both factors are critical and interactive determinants of the composition and functional integrity of aquatic invertebrate assemblages. Presumably, high quality habitat, in the absence of impairments to water quality, supports functional, diverse, and sensitive invertebrate assemblages; these are assemblages that attain high bioassessment scores. Barbour and Stribling (1991) have hypothesized that diminishing habitat quality should produce predictable diminishment of bioassessment scores, when water quality is not a further insult. Figure 1 is a plot of habitat assessment scores against bioassessment scores for the sampled assemblages of the Gallatin River. The red line superimposed on the plot roughly represents the hypothetical relationship between habitat quality and biotic integrity given good water quality. In this model, symbols falling in the upper right area of the graph would represent sites with high scores for both bioassessment and habitat assessment; according to this model, these would be unimpaired sites both in terms of habitat integrity as well as water quality.

In this case, both Gallatin River sites fall somewhat below the red line, in an area that describes sites with high habitat scores, but with bioassessment scores that are lower than expected. This may be interpreted as indicating slight impairment of water quality. However, since this model was developed for lower-order streams, the pattern is probably within expectations for a riverine site.

Figure 1. Average bioassessment scores plotted against habitat assessment scores for sites on the Gallatin River, June 2007. (Barbour and Stribling 1991).



DISCUSSION

Although bioassessment scores suggest that slight impairment may limit the integrity of the invertebrate assemblages at these sites, the narrative interpretations indicate that conditions are probably appropriate for riverine sites in the Middle Rockies ecoregion. The revised assessment tool used for scoring was developed for small-to-medium sized streams in Strahler orders 2 – 4, and may overestimate impairment in higher-linkage systems.

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APPENDIX

Taxa lists and metric summaries

Blue Water Task Force
Gallatin River Watershed

2007

Taxa Listing

Project ID: BWTF07GR
RAI No.: BWTF07GR001

RAI No.: BWTF07GR001 **Sta. Name:** Gallatin River above Jack Smith Bridge
Client ID: Bo Camp A
Date Coll.: 6/22/2007 **No. Jars:** 2 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Non-Insect							
Acari	3	0.90%	Yes	Unknown		5	PR
Enchytraeidae							
Enchytraeidae	1	0.30%	Yes	Unknown		4	CG
Pisidiidae							
Sphaeriidae	1	0.30%	Yes	Unknown		8	CF
Ephemeroptera							
Baetidae							
Baetis tricaudatus	11	3.28%	Yes	Larva		4	CG
Ephemerellidae							
Drunella flavilinea	10	2.99%	Yes	Larva		2	SC
Ephemerella excrucians	20	5.97%	Yes	Larva		4	SH
Serratella tibialis	4	1.19%	Yes	Larva		2	CG
Heptageniidae							
Cinygmula sp.	23	6.87%	Yes	Larva		0	SC
Epeorus albertae	4	1.19%	Yes	Larva		2	SC
Rhithrogena sp.	1	0.30%	Yes	Larva		0	CG
Plecoptera							
Pteronarcyidae							
Pteronarcys californica	2	0.60%	Yes	Larva		2	SH
Trichoptera							
Brachycentridae							
Brachycentrus americanus	1	0.30%	Yes	Larva		1	CF
Hydropsychidae							
Hydropsyche sp.	1	0.30%	Yes	Larva		5	CF
Lepidostomatidae							
Lepidostoma sp.	8	2.39%	No	Pupa		1	SH
Lepidostoma sp.	18	5.37%	Yes	Larva		1	SH
Coleoptera							
Elmidae							
Optioservus sp.	4	1.19%	Yes	Adult		5	SC
Optioservus sp.	18	5.37%	No	Larva		5	SC
Diptera							
Athericidae							
Atherix sp.	11	3.28%	Yes	Larva		5	PR
Empididae							
Wiedemannia sp.	6	1.79%	Yes	Larva		6	PR
Tipulidae							
Antocha sp.	2	0.60%	Yes	Larva		3	CG
Hexatoma sp.	3	0.90%	Yes	Larva		2	PR
Tipula sp.	1	0.30%	Yes	Larva		4	SH

Taxa Listing

Project ID: BWTF07GR
RAI No.: BWTF07GR001

RAI No.: BWTF07GR001 **Sta. Name:** Gallatin River above Jack Smith Bridge
Client ID: Bo Camp A
Date Coll.: 6/22/2007 **No. Jars:** 2 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Chironomidae							
Chironomidae							
Chironomidae	8	2.39%	No	Pupa		10	CG
Cladotanytarsus sp.	139	41.49%	Yes	Larva		7	CG
Cricotopus (Nostococladius) sp.	10	2.99%	Yes	Larva		6	SH
Eukiefferiella sp.	2	0.60%	Yes	Larva	Early Instar	8	CG
Eukiefferiella Devonica Gr.	2	0.60%	Yes	Larva		8	CG
Eukiefferiella Gracei Gr.	6	1.79%	Yes	Larva		8	CG
Monodiamesa sp.	1	0.30%	Yes	Larva		7	CG
Orthocladius sp.	1	0.30%	Yes	Larva		6	CG
Pagastia sp.	4	1.19%	Yes	Larva		1	CG
Potthastia Longimana Gr.	2	0.60%	Yes	Larva		2	CG
Rheotanytarsus sp.	3	0.90%	Yes	Larva		6	CF
Sublettea sp.	4	1.19%	Yes	Larva		6	CF
Sample Count	**335**						

Taxa Listing

Project ID: BWTF07GR
RAI No.: BWTF07GR002

RAI No.: BWTF07GR002 **Sta. Name:** Gallatin River above Jack Smith Bridge
Client ID: Bo Camp B
Date Coll.: 6/22/2007 **No. Jars:** 1 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Non-Insect							
Acari	1	0.32%	Yes	Unknown		5	PR
Nematoda	1	0.32%	Yes	Unknown		5	PA
Enchytraeidae							
Enchytraeidae	14	4.43%	Yes	Unknown		4	CG
Naididae							
Naididae	2	0.63%	Yes	Unknown		8	CG
Planariidae							
Polycelis coronata	1	0.32%	Yes	Unknown		1	OM
Ephemeroptera							
Baetidae							
Acentrella sp.	2	0.63%	Yes	Larva		4	CG
Baetis tricaudatus	21	6.65%	Yes	Larva		4	CG
Ephemerellidae							
Caudatella heterocaudata	3	0.95%	Yes	Larva		0	CG
Drunella flavilinea	11	3.48%	Yes	Larva		2	SC
Drunella grandis	2	0.63%	Yes	Larva		2	SC
Ephemerella excrucians	27	8.54%	Yes	Larva		4	SH
Serratella tibialis	3	0.95%	Yes	Larva		2	CG
Heptageniidae							
Cinygmula sp.	23	7.28%	Yes	Larva		0	SC
Epeorus albertae	6	1.90%	Yes	Larva		2	SC
Epeorus longimanus	3	0.95%	Yes	Larva		1	SC
Rhithrogena sp.	4	1.27%	Yes	Larva		0	CG
Plecoptera							
Perlidae							
Doroneuria sp.	1	0.32%	Yes	Larva		0	PR
Hesperoperla pacifica	4	1.27%	Yes	Larva		1	PR
Perlodidae							
Cultus sp.	1	0.32%	Yes	Larva		2	PR
Isoperla sp.	1	0.32%	Yes	Larva		2	PR
Pteronarcyidae							
Pteronarcys sp.	1	0.32%	Yes	Larva	Early Instar	2	SH
Trichoptera							
Brachycentridae							
Amiocentrus aspilus	3	0.95%	Yes	Larva		3	CG
Brachycentrus americanus	2	0.63%	Yes	Larva		1	CF
Brachycentrus occidentalis	16	5.06%	Yes	Larva		2	CF
Glossosomatidae							
Glossosoma sp.	3	0.95%	Yes	Larva		0	SC
Hydropsychidae							
Hydropsyche sp.	8	2.53%	Yes	Larva		5	CF
Lepidostomatidae							
Lepidostoma sp.	7	2.22%	Yes	Larva		1	SH
Uenoidae							
Neophylax occidentis	2	0.63%	Yes	Larva		3	SC

Taxa Listing

Project ID: BWTF07GR
RAI No.: BWTF07GR002

RAI No.: BWTF07GR002 **Sta. Name:** Gallatin River above Jack Smith Bridge
Client ID: Bo Camp B
Date Coll.: 6/22/2007 **No. Jars:** 1 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Coleoptera							
Elmidae							
Optioservus sp.	2	0.63%	Yes	Adult		5	SC
Optioservus sp.	7	2.22%	No	Larva		5	SC
Diptera							
Athericidae							
Atherix sp.	1	0.32%	Yes	Larva		5	PR
Atherix sp.	1	0.32%	No	Pupa		5	PR
Tipulidae							
Antocha sp.	7	2.22%	Yes	Larva		3	CG
Antocha sp.	1	0.32%	No	Pupa		3	CG
Tipula sp.	1	0.32%	Yes	Larva		4	SH
Chironomidae							
Chironomidae							
Chironomidae	5	1.58%	No	Pupa		10	CG
Cladotanytarsus sp.	72	22.78%	Yes	Larva		7	CG
Cricotopus (Nostococladius) sp.	12	3.80%	Yes	Larva		6	SH
Eukiefferiella Brehmi Gr.	6	1.90%	Yes	Larva		8	CG
Eukiefferiella Devonica Gr.	1	0.32%	Yes	Larva		8	CG
Eukiefferiella Gracei Gr.	5	1.58%	Yes	Larva		8	CG
Monodiamesa sp.	1	0.32%	Yes	Larva		7	CG
Orthocladius sp.	7	2.22%	Yes	Larva		6	CG
Pagastia sp.	5	1.58%	Yes	Larva		1	CG
Polypedilum sp.	3	0.95%	Yes	Larva		6	SH
Rheotanytarsus sp.	4	1.27%	Yes	Larva		6	CF
Sublettea sp.	2	0.63%	Yes	Larva		6	CF
Sample Count	**316**						

Taxa Listing

Project ID: BWTF07GR
RAI No.: BWTF07GR003

RAI No.: BWTF07GR003 **Sta. Name:** Gallatin River just below Porcupine Bridge
Client ID: Porc A
Date Coll.: 6/22/2007 **No. Jars:** 1 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Non-Insect							
Enchytraeidae							
Enchytraeidae	1	0.32%	Yes	Unknown		4	CG
Naididae							
Naididae	8	2.56%	Yes	Unknown		8	CG
Pisidiidae							
Sphaeriidae	5	1.60%	Yes	Unknown		8	CF
Planariidae							
Polycelis coronata	5	1.60%	Yes	Unknown		1	OM
Ephemeroptera							
Ameletidae							
Ameletus sp.	1	0.32%	Yes	Larva		0	CG
Baetidae							
Acentrella sp.	1	0.32%	Yes	Larva		4	CG
Baetis tricaudatus	25	7.99%	Yes	Larva		4	CG
Ephemerellidae							
Caudatella edmundsi	1	0.32%	Yes	Larva		0	SC
Caudatella heterocaudata	4	1.28%	Yes	Larva		0	CG
Drunella flavilinea	6	1.92%	Yes	Larva		2	SC
Ephemerella excrucians	10	3.19%	Yes	Larva		4	SH
Serratella tibialis	11	3.51%	Yes	Larva		2	CG
Heptageniidae							
Cinygmula sp.	2	0.64%	Yes	Larva		0	SC
Epeorus albertae	2	0.64%	Yes	Larva		2	SC
Plecoptera							
Pteronarcyidae							
Pteronarcys sp.	6	1.92%	No	Larva	Early Instar	2	SH
Pteronarcys californica	2	0.64%	Yes	Larva		2	SH
Trichoptera							
Brachycentridae							
Amiocentrus aspilus	3	0.96%	Yes	Larva		3	CG
Brachycentrus americanus	4	1.28%	Yes	Larva		1	CF
Brachycentrus occidentalis	4	1.28%	Yes	Larva		2	CF
Micrasema sp.	3	0.96%	Yes	Larva		1	SH
Hydropsychidae							
Hydropsyche sp.	1	0.32%	Yes	Larva		5	CF
Hydropsychidae	1	0.32%	No	Pupa		4	CF
Lepidostomatidae							
Lepidostoma sp.	2	0.64%	Yes	Larva		1	SH
Coleoptera							
Elmidae							
Optioservus sp.	1	0.32%	Yes	Adult		5	SC
Optioservus sp.	11	3.51%	No	Larva		5	SC

Taxa Listing

Project ID: BWTF07GR
RAI No.: BWTF07GR003

RAI No.: BWTF07GR003 **Sta. Name:** Gallatin River just below Porcupine Bridge
Client ID: Porc A
Date Coll.: 6/22/2007 **No. Jars:** 1 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Diptera							
Athericidae							
Atherix sp.	13	4.15%	Yes	Larva		5	PR
Atherix sp.	1	0.32%	No	Pupa		5	PR
Empididae							
Chelifera sp.	1	0.32%	Yes	Larva		5	PR
Wiedemannia sp.	1	0.32%	Yes	Larva		6	PR
Simuliidae							
Simuliidae	1	0.32%	No	Pupa		6	CF
Simulium sp.	5	1.60%	Yes	Larva		6	CF
Tipulidae							
Antocha sp.	8	2.56%	No	Pupa		3	CG
Antocha sp.	16	5.11%	Yes	Larva		3	CG
Hexatoma sp.	3	0.96%	Yes	Larva		2	PR
Chironomidae							
Chironomidae							
Chironomidae	12	3.83%	No	Pupa		10	CG
Cladotanytarsus sp.	26	8.31%	Yes	Larva		7	CG
Cricotopus (Cricotopus) sp.	1	0.32%	Yes	Larva		7	SH
Cricotopus (Nostococladius) sp.	15	4.79%	Yes	Larva		6	SH
Eukiefferiella Brehmi Gr.	3	0.96%	Yes	Larva		8	CG
Eukiefferiella Devonica Gr.	9	2.88%	Yes	Larva		8	CG
Eukiefferiella Gracei Gr.	2	0.64%	Yes	Larva		8	CG
Monodiamesa sp.	1	0.32%	Yes	Larva		7	CG
Orthocladius sp.	17	5.43%	Yes	Larva		6	CG
Pagastia sp.	1	0.32%	Yes	Larva		1	CG
Polypedilum sp.	1	0.32%	Yes	Larva		6	SH
Rheotanytarsus sp.	39	12.46%	Yes	Larva		6	CF
Stempellinella sp.	1	0.32%	Yes	Larva		4	CG
Sublettea sp.	4	1.28%	Yes	Larva		6	CF
Tanytarsus sp.	6	1.92%	Yes	Larva		6	CF
Thienemanniella sp.	2	0.64%	Yes	Larva		6	CG
Tvetenia Bavarica Gr.	4	1.28%	Yes	Larva		5	CG
Sample Count	**313**						

Taxa Listing

Project ID: BWTF07GR
RAI No.: BWTF07GR004

RAI No.: BWTF07GR004 **Sta. Name:** Gallatin River just below Porcupine Bridge
Client ID: Porc B
Date Coll.: 6/22/2007 **No. Jars:** 1 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Non-Insect							
Enchytraeidae							
Enchytraeidae	1	0.31%	Yes	Unknown		4	CG
Naididae							
Naididae	2	0.63%	Yes	Unknown		8	CG
Pisidiidae							
Sphaeriidae	1	0.31%	Yes	Unknown		8	CF
Ephemeroptera							
Baetidae							
Acentrella sp.	1	0.31%	Yes	Larva		4	CG
Baetis tricaudatus	25	7.86%	Yes	Larva		4	CG
Ephemerellidae							
Caudatella heterocaudata	4	1.26%	Yes	Larva		0	CG
Drunella doddsii	1	0.31%	Yes	Larva		1	PR
Drunella flavilinea	18	5.66%	Yes	Larva		2	SC
Drunella grandis	1	0.31%	Yes	Larva		2	SC
Ephemerella excrucians	10	3.14%	Yes	Larva		4	SH
Serratella tibialis	14	4.40%	Yes	Larva		2	CG
Heptageniidae							
Cinygmula sp.	14	4.40%	Yes	Larva		0	SC
Epeorus albertae	19	5.97%	Yes	Larva		2	SC
Epeorus longimanus	6	1.89%	Yes	Larva		1	SC
Rhithrogena sp.	1	0.31%	Yes	Larva		0	CG
Plecoptera							
Perlidae							
Hesperoperla pacifica	1	0.31%	Yes	Larva		1	PR
Pteronarcyidae							
Pteronarcys sp.	7	2.20%	No	Larva	Early Instar	2	SH
Pteronarcys californica	2	0.63%	Yes	Larva		2	SH
Trichoptera							
Brachycentridae							
Brachycentrus americanus	46	14.47%	Yes	Larva		1	CF
Micrasema sp.	2	0.63%	Yes	Larva		1	SH
Glossosomatidae							
Glossosoma sp.	2	0.63%	Yes	Larva		0	SC
Glossosomatidae	1	0.31%	No	Larva	Damaged	0	SC
Hydropsychidae							
Arctopsyche grandis	1	0.31%	Yes	Larva		2	PR
Hydropsyche sp.	19	5.97%	Yes	Larva		5	CF
Lepidostomatidae							
Lepidostoma sp.	4	1.26%	Yes	Larva		1	SH
Coleoptera							
Elmidae							
Optioservus sp.	2	0.63%	Yes	Larva		5	SC

Taxa Listing

Project ID: BWTF07GR
RAI No.: BWTF07GR004

RAI No.: BWTF07GR004 **Sta. Name:** Gallatin River just below Porcupine Bridge
Client ID: Porc B
Date Coll.: 6/22/2007 **No. Jars:** 1 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Diptera							
Athericidae							
Atherix sp.	12	3.77%	Yes	Larva		5	PR
Empididae							
Wiedemannia sp.	2	0.63%	Yes	Larva		6	PR
Simuliidae							
Simulium sp.	3	0.94%	Yes	Larva		6	CF
Tipulidae							
Antocha sp.	4	1.26%	Yes	Larva		3	CG
Chironomidae							
Chironomidae							
Cladotanytarsus sp.	49	15.41%	Yes	Larva		7	CG
Cricotopus (Nostococladius) sp.	11	3.46%	Yes	Larva		6	SH
Eukiefferiella Brehmi Gr.	3	0.94%	Yes	Larva		8	CG
Eukiefferiella Devonica Gr.	5	1.57%	Yes	Larva		8	CG
Eukiefferiella Gracei Gr.	1	0.31%	Yes	Larva		8	CG
Orthocladius sp.	5	1.57%	Yes	Larva		6	CG
Polypedilum sp.	1	0.31%	Yes	Larva		6	SH
Rheotanytarsus sp.	14	4.40%	Yes	Larva		6	CF
Sublettea sp.	3	0.94%	Yes	Larva		6	CF
Sample Count	**318**						

Metrics Report

Project ID: BWTF07GR
RAI No.: BWTF07GR001
Sta. Name: Gallatin River above Jack Smith Bridge
Client ID: Bo Camp A
STORET ID:
Coll. Date: 6/22/2007

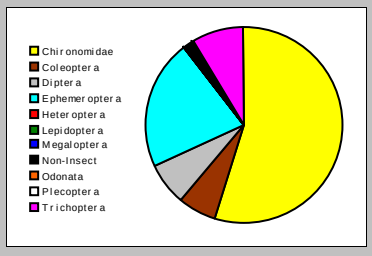
Abundance Measures

Sample Count: 335
Sample Abundance: 4,466.67 7.50% of sample used

Coll. Procedure:
Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Non-Insect	3	5	1.49%
Odonata			
Ephemeroptera	7	73	21.79%
Plecoptera	1	2	0.60%
Heteroptera			
Megaloptera			
Trichoptera	3	28	8.36%
Lepidoptera			
Coleoptera	1	22	6.57%
Diptera	5	23	6.87%
Chironomidae	11	182	54.33%

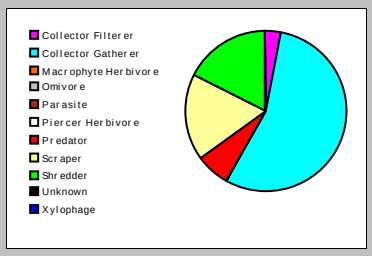


Dominant Taxa

Category	A	PRA
Cladotanytarsus	139	41.49%
Lepidostoma	26	7.76%
Cinygmula	23	6.87%
Optioservus	22	6.57%
Ephemerella excrucians	20	5.97%
Baetis tricaudatus	11	3.28%
Atherix	11	3.28%
Drunella flavilinea	10	2.99%
Cricotopus (Nostococladius)	10	2.99%
Chironomidae	8	2.39%
Wiedemannia	6	1.79%
Eukiefferiella Gracei Gr.	6	1.79%
Sublettea	4	1.19%
Serratella tibialis	4	1.19%
Pagastia	4	1.19%

Functional Composition

Category	R	A	PRA
Predator	4	23	6.87%
Parasite			
Collector Gatherer	13	184	54.93%
Collector Filterer	5	10	2.99%
Macrophyte Herbivore			
Piercer Herbivore			
Xylophage			
Scraper	4	59	17.61%
Shredder	5	59	17.61%
Omivore			
Unknown			

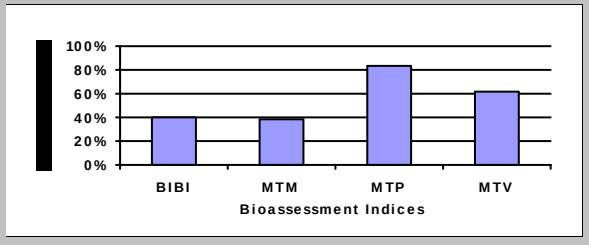


Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
Composition					
Taxa Richness	31	3	3		3
Non-Insect Percent	1.49%				
E Richness	7	3		3	
P Richness	1	1		1	
T Richness	3	1		2	
EPT Richness	11		3		0
EPT Percent	30.75%		2		0
Oligochaeta+Hirudinea Percent	0.30%				
Baetidae/Ephemeroptera	0.151				
Hydropsychidae/Trichoptera	0.036				
Dominance					
Dominant Taxon Percent	41.49%		2		1
Dominant Taxa (2) Percent	49.25%				
Dominant Taxa (3) Percent	56.12%	3			
Dominant Taxa (10) Percent	83.58%				
Diversity					
Shannon H (loge)	2.269				
Shannon H (log2)	3.274		3		
Margalef D	5.257				
Simpson D	0.232				
Evenness	0.066				
Function					
Predator Richness	4		2		
Predator Percent	6.87%	1			
Filterer Richness	5				
Filterer Percent	2.99%			3	
Collector Percent	57.91%		3		3
Scraper+Shredder Percent	35.22%		3		1
Scraper/Filterer	5.900				
Scraper/Scraper+Filterer	0.855				
Habit					
Burrower Richness	2				
Burrower Percent	1.19%				
Swimmer Richness	1				
Swimmer Percent	3.28%				
Clinger Richness	14	3			
Clinger Percent	32.54%				
Characteristics					
Cold Stenotherm Richness	1				
Cold Stenotherm Percent	2.99%				
Hemoglobin Bearer Richness					
Hemoglobin Bearer Percent					
Air Breather Richness	3				
Air Breather Percent	1.79%				
Voltinism					
Univoltine Richness	14				
Semivoltine Richness	4	3			
Multivoltine Percent	58.51%		2		
Tolerance					
Sediment Tolerant Richness	3				
Sediment Tolerant Percent	1.79%				
Sediment Sensitive Richness	1				
Sediment Sensitive Percent	2.99%				
Metals Tolerance Index	2.952				
Pollution Sensitive Richness	2	1		2	
Pollution Tolerant Percent	51.34%	1		0	
Hilsenhoff Biotic Index	5.063		2		0
Intolerant Percent	23.88%				
Supertolerant Percent	5.67%				
CTQa	71.071				

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	20	40.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	25	83.33%	None
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	11	61.11%	Slight
MTM	Montana DEQ Mountains (Bukantis 1998)	8	38.10%	Moderate



Thursday, September 06, 2007

Metrics Report

Project ID: BWTF07GR
RAI No.: BWTF07GR002
Sta. Name: Gallatin River above Jack Smith Bridge
Client ID: Bo Camp B
STORET ID:
Coll. Date: 6/22/2007

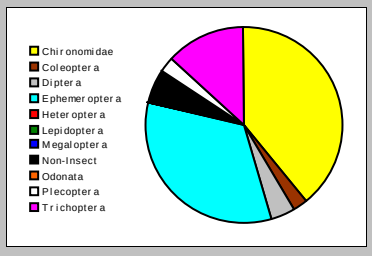
Abundance Measures

Sample Count: 316
Sample Abundance: 2,230.59 14.17% of sample used

Coll. Procedure:
Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Non-Insect	5	19	6.01%
Odonata			
Ephemeroptera	11	105	33.23%
Plecoptera	5	8	2.53%
Heteroptera			
Megaloptera			
Trichoptera	7	41	12.97%
Lepidoptera			
Coleoptera	1	9	2.85%
Diptera	3	11	3.48%
Chironomidae	11	123	38.92%

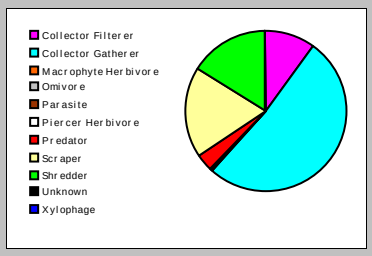


Dominant Taxa

Category	A	PRA
Cladotanytarsus	72	22.78%
Ephemerella excrucians	27	8.54%
Cinygmula	23	7.28%
Baetis tricaudatus	21	6.65%
Brachycentrus occidentalis	16	5.06%
Enchytraeidae	14	4.43%
Cricotopus (Nostococladius)	12	3.80%
Drunella flavilinea	11	3.48%
Optioservus	9	2.85%
Hydropsyche	8	2.53%
Antocha	8	2.53%
Orthocladius	7	2.22%
Lepidostoma	7	2.22%
Eukiefferiella Brehmi Gr.	6	1.90%
Epeorus albertae	6	1.90%

Functional Composition

Category	R	A	PRA
Predator	6	10	3.16%
Parasite	1	1	0.32%
Collector Gatherer	16	162	51.27%
Collector Filterer	5	32	10.13%
Macrophyte Herbivore			
Piercer Herbivore			
Xylophage			
Scraper	8	59	18.67%
Shredder	6	51	16.14%
Omivore	1	1	0.32%
Unknown			

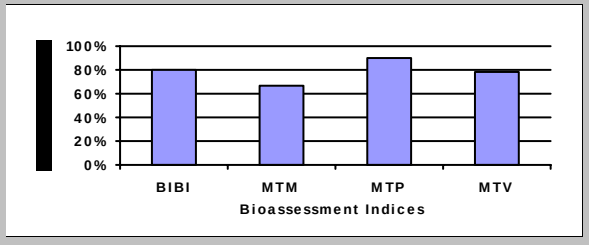


Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
Composition					
Taxa Richness	43	5	3		3
Non-Insect Percent	6.01%				
E Richness	11	5		3	
P Richness	5	3		3	
T Richness	7	3		3	
EPT Richness	23		3		3
EPT Percent	48.73%		2		1
Oligochaeta+Hirudinea Percent	5.06%				
Baetidae/Ephemeroptera	0.219				
Hydropsychidae/Trichoptera	0.195				
Dominance					
Dominant Taxon Percent	22.78%		3		3
Dominant Taxa (2) Percent	31.33%				
Dominant Taxa (3) Percent	38.61%	5			
Dominant Taxa (10) Percent	67.41%				
Diversity					
Shannon H (loge)	3.023				
Shannon H (log2)	4.361		3		
Margalef D	7.355				
Simpson D	0.085				
Evenness	0.046				
Function					
Predator Richness	6		3		
Predator Percent	3.16%	1			
Filterer Richness	5				
Filterer Percent	10.13%			1	
Collector Percent	61.39%		2		2
Scraper+Shredder Percent	34.81%		3		1
Scraper/Filterer	1.844				
Scraper/Scraper+Filterer	0.648				
Habit					
Burrower Richness	1				
Burrower Percent	0.32%				
Swimmer Richness	2				
Swimmer Percent	7.28%				
Clinger Richness	22	5			
Clinger Percent	48.73%				
Characteristics					
Cold Stenotherm Richness	5				
Cold Stenotherm Percent	6.01%				
Hemoglobin Bearer Richness	1				
Hemoglobin Bearer Percent	0.95%				
Air Breather Richness	2				
Air Breather Percent	2.85%				
Voltinism					
Univoltine Richness	20				
Semivoltine Richness	7	5			
Multivoltine Percent	47.15%		2		
Tolerance					
Sediment Tolerant Richness	2				
Sediment Tolerant Percent	2.85%				
Sediment Sensitive Richness	2				
Sediment Sensitive Percent	4.75%				
Metals Tolerance Index	2.870				
Pollution Sensitive Richness	4	5		3	
Pollution Tolerant Percent	26.27%	3		1	
Hilsenhoff Biotic Index	4.269		3		1
Intolerant Percent	30.70%				
Supertolerant Percent	6.01%				
CTQa	59.056				

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	40	80.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	27	90.00%	None
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	14	77.78%	Slight
MTM	Montana DEQ Mountains (Bukantis 1998)	14	66.67%	Slight



Metrics Report

Project ID: BWTF07GR
RAI No.: BWTF07GR003
Sta. Name: Gallatin River just below Porcupine Bridge
Client ID: Porc A
STORET ID:
Coll. Date: 6/22/2007

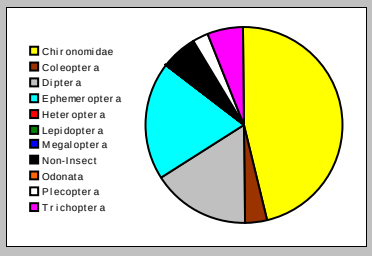
Abundance Measures

Sample Count: 313
Sample Abundance: 3,756.00 8.33% of sample used

Coll. Procedure:
Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Non-Insect	4	19	6.07%
Odonata			
Ephemeroptera	10	63	20.13%
Plecoptera	1	8	2.56%
Heteroptera			
Megaloptera			
Trichoptera	6	18	5.75%
Lepidoptera			
Coleoptera	1	12	3.83%
Diptera	6	49	15.65%
Chironomidae	16	144	46.01%

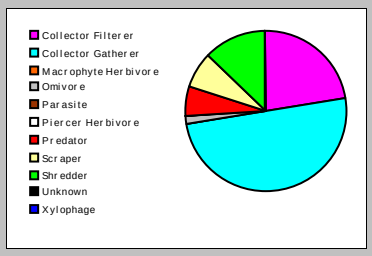


Dominant Taxa

Category	A	PRA
Rheotanytarsus	39	12.46%
Cladotanytarsus	26	8.31%
Baetis tricaudatus	25	7.99%
Antocha	24	7.67%
Orthocladius	17	5.43%
Cricotopus (Nostococladius)	15	4.79%
Atherix	14	4.47%
Optioservus	12	3.83%
Chironomidae	12	3.83%
Serratella tibialis	11	3.51%
Ephemerella excrucians	10	3.19%
Eukiefferiella Devonica Gr.	9	2.88%
Naididae	8	2.56%
Tanytarsus	6	1.92%
Drunella flavilinea	6	1.92%

Functional Composition

Category	R	A	PRA
Predator	4	19	6.07%
Parasite			
Collector Gatherer	19	156	49.84%
Collector Filterer	8	70	22.36%
Macrophyte Herbivore			
Piercer Herbivore			
Xylophage			
Scraper	5	23	7.35%
Shredder	7	40	12.78%
Omivore	1	5	1.60%
Unknown			

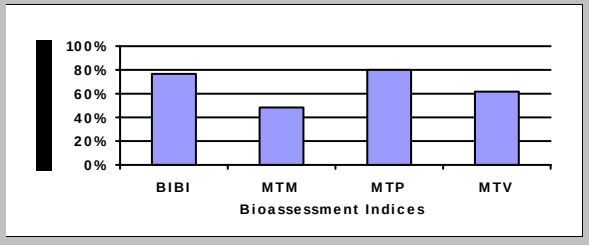


Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
Composition					
Taxa Richness	44	5	3		3
Non-Insect Percent	6.07%				
E Richness	10	5		3	
P Richness	1	1		1	
T Richness	6	3		3	
EPT Richness	17		3		2
EPT Percent	28.43%		1		0
Oligochaeta+Hirudinea Percent	2.88%				
Baetidae/Ephemeroptera	0.413				
Hydropsychidae/Trichoptera	0.111				
Dominance					
Dominant Taxon Percent	12.46%		3		3
Dominant Taxa (2) Percent	20.77%				
Dominant Taxa (3) Percent	28.75%	5			
Dominant Taxa (10) Percent	62.30%				
Diversity					
Shannon H (loge)	3.209				
Shannon H (log2)	4.630		3		
Margalef D	7.666				
Simpson D	0.056				
Evenness	0.040				
Function					
Predator Richness	4		2		
Predator Percent	6.07%	1			
Filterer Richness	8				
Filterer Percent	22.36%			1	
Collector Percent	72.20%		2		1
Scraper+Shredder Percent	20.13%		2		0
Scraper/Filterer	0.329				
Scraper/Scraper+Filterer	0.247				
Habit					
Burrower Richness	2				
Burrower Percent	1.28%				
Swimmer Richness	3				
Swimmer Percent	8.63%				
Clinger Richness	22	5			
Clinger Percent	52.72%				
Characteristics					
Cold Stenotherm Richness	3				
Cold Stenotherm Percent	6.39%				
Hemoglobin Bearer Richness	1				
Hemoglobin Bearer Percent	0.32%				
Air Breather Richness	2				
Air Breather Percent	8.63%				
Voltinism					
Univoltine Richness	20				
Semivoltine Richness	5	5			
Multivoltine Percent	55.91%		2		
Tolerance					
Sediment Tolerant Richness	2				
Sediment Tolerant Percent	8.63%				
Sediment Sensitive Richness	1				
Sediment Sensitive Percent	4.79%				
Metals Tolerance Index	3.355				
Pollution Sensitive Richness	3	3		2	
Pollution Tolerant Percent	16.61%	5		1	
Hilsenhoff Biotic Index	4.978		3		1
Intolerant Percent	18.21%				
Supertolerant Percent	12.46%				
CTQa	73.667				

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	38	76.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	24	80.00%	Slight
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	11	61.11%	Slight
MTM	Montana DEQ Mountains (Bukantis 1998)	10	47.62%	Moderate



Metrics Report

Project ID: BWTF07GR
RAI No.: BWTF07GR004
Sta. Name: Gallatin River just below Porcupine Bridge
Client ID: Porc B
STORET ID:
Coll. Date: 6/22/2007

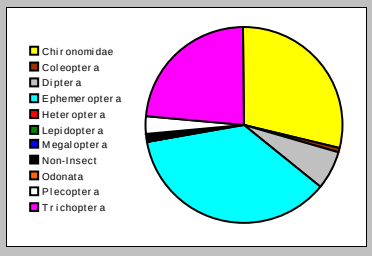
Abundance Measures

Sample Count: 318
Sample Abundance: 1,908.00 16.67% of sample used

Coll. Procedure:
Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Non-Insect	3	4	1.26%
Odonata			
Ephemeroptera	12	114	35.85%
Plecoptera	2	10	3.14%
Heteroptera			
Megaloptera			
Trichoptera	6	75	23.58%
Lepidoptera			
Coleoptera	1	2	0.63%
Diptera	4	21	6.60%
Chironomidae	9	92	28.93%

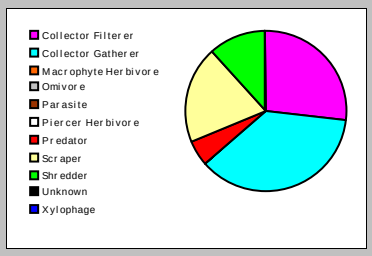


Dominant Taxa

Category	A	PRA
Cladotanytarsus	49	15.41%
Brachycentrus americanus	46	14.47%
Baetis tricaudatus	25	7.86%
Hydropsyche	19	5.97%
Epeorus albertae	19	5.97%
Drunella flavilinea	18	5.66%
Serratella tibialis	14	4.40%
Rheotanytarsus	14	4.40%
Cinygmula	14	4.40%
Atherix	12	3.77%
Cricotopus (Nostococladius)	11	3.46%
Ephemerella excrucians	10	3.14%
Pteronarcys	7	2.20%
Epeorus longimanus	6	1.89%
Orthocladius	5	1.57%

Functional Composition

Category	R	A	PRA
Predator	5	17	5.35%
Parasite			
Collector Gatherer	13	115	36.16%
Collector Filterer	6	86	27.04%
Macrophyte Herbivore			
Piercer Herbivore			
Xylophage			
Scraper	7	63	19.81%
Shredder	6	37	11.64%
Omivore			
Unknown			



Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
Composition					
Taxa Richness	37	3	3		3
Non-Insect Percent	1.26%				
E Richness	12	5		3	
P Richness	2	1		2	
T Richness	6	3		3	
EPT Richness	20		3		3
EPT Percent	62.58%		3		2
Oligochaeta+Hirudinea Percent	0.94%				
Baetidae/Ephemeroptera	0.228				
Hydropsychidae/Trichoptera	0.267				
Dominance					
Dominant Taxon Percent	15.41%		3		3
Dominant Taxa (2) Percent	29.87%				
Dominant Taxa (3) Percent	37.74%	5			
Dominant Taxa (10) Percent	72.33%				
Diversity					
Shannon H (loge)	2.953				
Shannon H (log2)	4.260		3		
Margalef D	6.276				
Simpson D	0.073				
Evenness	0.049				
Function					
Predator Richness	5		2		
Predator Percent	5.35%	1			
Filterer Richness	6				
Filterer Percent	27.04%			0	
Collector Percent	63.21%		2		2
Scraper+Shredder Percent	31.45%		3		1
Scraper/Filterer	0.733				
Scraper/Scraper+Filterer	0.423				
Habit					
Burrower Richness	0				
Burrower Percent	0.00%				
Swimmer Richness	2				
Swimmer Percent	8.18%				
Clinger Richness	23	5			
Clinger Percent	64.47%				
Characteristics					
Cold Stenotherm Richness	3				
Cold Stenotherm Percent	5.03%				
Hemoglobin Bearer Richness	1				
Hemoglobin Bearer Percent	0.31%				
Air Breather Richness	1				
Air Breather Percent	1.26%				
Voltinism					
Univoltine Richness	20				
Semivoltine Richness	6	5			
Multivoltine Percent	37.11%		3		
Tolerance					
Sediment Tolerant Richness	1				
Sediment Tolerant Percent	1.26%				
Sediment Sensitive Richness	3				
Sediment Sensitive Percent	4.40%				
Metals Tolerance Index	2.864				
Pollution Sensitive Richness	4	5		3	
Pollution Tolerant Percent	19.81%	3		1	
Hilsenhoff Biotic Index	3.717		3		2
Intolerant Percent	45.28%				
Supertolerant Percent	3.77%				
CTQa	59.594				

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	36	72.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	28	93.33%	None
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	12	66.67%	Slight
MTM	Montana DEQ Mountains (Bukantis 1998)	16	76.19%	Slight