# *Memorandum*

URS

To: Blue Ledge Mine Project Team

From: Brad Rawls

Date: January 2, 2009

Subject: Summary of aquatic macroinvertebrate sampling

## BACKGROUND

As part of the EE/CA process, URS collected aquatic macroinvertebrates to support the screening-level human health risk assessment and the screening-level ecological risk assessment and to supplement existing baseline data on benthic community composition in the Elliot Creek drainage. The number, distribution, and species composition of aquatic macroinvertebrates have been demonstrated to be reliable indicators of water quality and general stream health (Barbour, et al, 1999). Aquatic macroinvertebrates were collected from four locations in the project area. The sampling locations were designed to allow assessment of benthic community composition in response to water quality parameters, including the presence of metals in runoff from waste rock piles associated with the Blue Ledge Mine site.

## SAMPLING DESIGN

Aquatic macroinvertebrate collection occurred on September 9, 2008. The sites were established to allow paired comparison between benthic communities downstream and upstream of potential mine runoff influences. The four sites sampled are as follows:

1. Elliott Creek downstream from the confluence with Joe Creek.
2. Elliott Creek upstream from the confluence with Joe Creek.
3. Joe Creek downstream of mine runoff contribution.
4. Joe Creek upstream of mine runoff contribution.

Figure 1 shows the sample locations.

Samples were collected in accordance with the EPA's *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition* (Barbour, et al, 1999). Each sample was comprised of the composite of five subsamples (or "kicks"). This method achieves statistical significance by holding uniform the area surveyed and the effort (time) expended per unit area. A 12-inch diameter, 500-micron mesh size D-net was used to collect specimens. Each kick comprised a sample area of one square foot, totaling five square feet representing the sample location. Kicks were collected in suitable riffle, rapid, or cascade stream habitat types. Two kicks each were collected from areas near the right and left streambanks and one subsample was collected from a mid-channel location. The five kicks were combined into a single "composite" sample representing the entire sample location.

Specimen collection consisted of holding the base of the D-net to the stream substrate, facing upstream into the stream current, and gently scrubbing gravels and cobbles with a soft nylon brush in the net opening. Organic matter, such as leaves, twigs, and branches were scrubbed in a similar manner. The surface benthos was then disturbed in the fixed area by gently brushing the substrate towards the net opening. Finally, a small pry bar was used to disturb the benthos by loosening buried benthic material. All material collected in the net was then transferred to a sterile 1-liter Nalgene bottle. The net was carefully cleaned using forceps and/or a squirt bottle to remove attached organisms. All collected specimens were preserved in 90% ethanol.

Samples were shipped to Rhithron Associates, Inc. of Missoula, Montana for analysis. The laboratory typed specimens to the highest taxonomic classification possible and constructed a Benthic Index of Biotic Integrity (B-IBI) to analyze sample locations against each other and expected conditions, based on watershed disturbance. Raw sampling results and the B-IBI are summarized in Appendix B of this report.

## RESULTS

The results of the survey indicate that macroinvertebrate communities in Joe Creek downstream of the waste rock piles are significantly degraded, as compared to the upstream control sample. . Differences in community are largely between species that are susceptible to metals toxicity and water temperature. Because water temperature was similar between sites, the results indicate that metals contamination from the mine site is adversely impacting the macroinvertebrate community in Joe Creek.

Macroinvertebrate communities in Elliott Creek varied slightly between samples collected downstream of the confluence with Joe Creek and the control located upstream. Community response gives no clear indication that assemblages were responding to the presence of metals. While this does not rule out an influence from metals, metrics were not sensitive enough to make such a correlation.

## CONCLUSIONS

The aquatic macroinvertebrate survey clearly indicates that discharges from the mine (i.e., sediment erosion, surface water discharge, and/or groundwater discharge) are impacting aquatic biota assemblages in Joe Creek. Species composition, total numbers of a species, trophic distribution, and diversity of species all show a response to water quality impairment. Impacts to Elliott Creek are uncertain. Variations within Elliott Creek aquatic macroinvertebrate assemblages were not statistically significant; as such, analytical models were unable to discern if aquatic macroinvertebrate assemblages were responding to water quality contributed by Joe Creek.

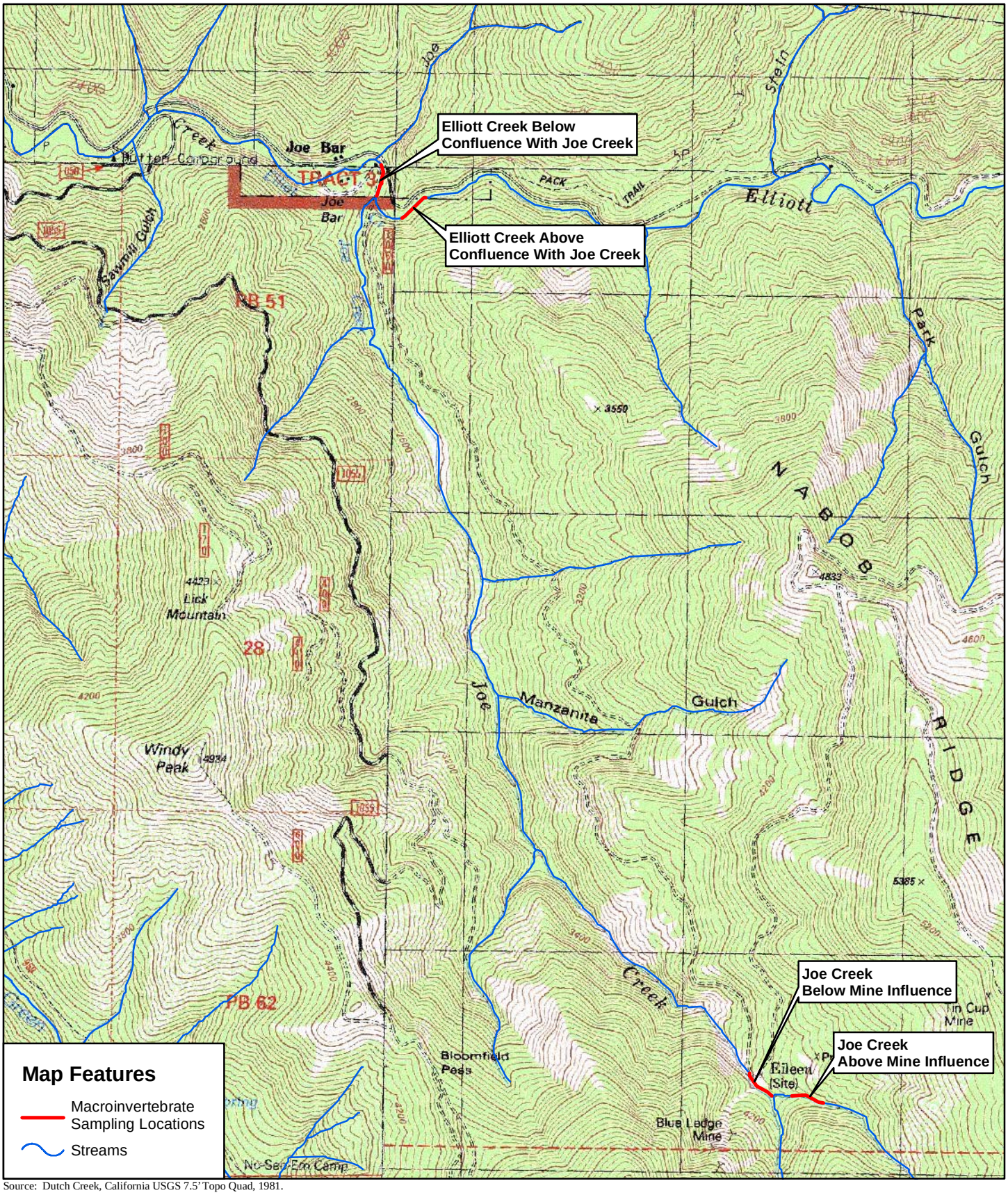
## ATTACHMENTS

Figure 1 - Sampling Locations

Laboratory Report - Rhithron Associates, Biological assessment of sites on Joe Creek and Elliott Creek, Siskiyou County, California

## REFERENCE

Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition. EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water; Washington, D.C.




Source: Dutch Creek, California USGS 7.5' Topo Quad, 1981.
Kangaroo Mountain, California USGS 7.5' Topo Quad, 1981.

0 500 1,000 2,000 Feet

URS

**US FOREST SERVICE: ROGUE-SISKIYOU NATIONAL FOREST**

OCTOBER 2008
25696770

BLUE LEDGE MINE - MACROINVERTEBRATE SAMPLING LOCATIONS
ELLIOTT AND JOE CREEKS

**FIGURE 1**

O:\25696770 Blue Ledge Mine\5000 Technical\GIS\MXD\Fig # Macroinvertebrate Sampling Locations.mxd

**Biological assessment of sites on Joe Creek and Elliott Creek**
**Siskiyou County, California**
**Report to URS Corporation: Brad Rawls, Project Manager**



by
W. Bollman
Rhithron Associates, Inc.
Missoula, Montana

## INTRODUCTION

Spatial comparisons of aquatic invertebrate communities are frequently used to assess the presence and intensity of heavy metals contamination in streams. Invertebrates are well-suited to this type of analysis for several reasons. Field studies and controlled experiments demonstrate that composition and functional characteristics of aquatic invertebrate assemblages are influenced by metals contamination. The effects of copper, lead, and zinc have been well-studied, but community changes associated with exposure to other metals, including aluminum, cadmium, cobalt, nickel and silver are also documented. Because invertebrates are relatively long-lived and are less motile than fish, evidence of water quality impairment is likely to be persistent, unlike the "snapshot" results of chemical tests. Invertebrate assemblages may exhibit both direct and indirect responses to metals contamination; responses include poisoning and death or avoidance and drift. Direct effects are related to metal uptake from the water column by means of diffusion or absorption through gills or integument. Toxicity may also be related to uptake via food in the form of metals bound to sediment particles; recent studies have suggested that food may be the primary route of uptake for some metals (Munger and Hare 2000 and Roy and Hare, 1999). Indirect effects may include disruption of food webs; for example, alteration of predation rates has been demonstrated when concentrations of metals increase in streams (Clements et al. 1989).

Various studies have shown that aquatic invertebrate community responses to metals contamination are predictable and distinctive. Kiffney and Clements (1994, 1996) demonstrated that mayfly abundance, especially abundance in the family Heptageniidae, was a highly sensitive and reliable metric for assessment of metals impact. This result has been confirmed in many studies, and Heptageniid mayfly abundance and richness are among the most frequently used and cited metrics for the assessment of metals impacts. Heptageniid mayflies have several risk factors for susceptibility to metals accumulation; these include external platelike gills (Kiffney and Clements 2003) and reliance on periphyton as their major food source. Periphyton and other biofilms have been shown to have high metals concentrations when contamination is present (Farag et al. 1998).

In addition to the Heptageniids, other mayflies scrape algal biofilms from stony substrates; the scraper feeding group includes taxa among the caddisflies and beetles. An alteration in the functional composition of invertebrate assemblages may result from lower abundance of scrapers when metal contamination is present (Kiffney and Clements 1993).

Other studies suggest that overall taxa richness also diminishes with metals contamination, however, it must be noted that this metric is responsive

to many other stressors as well. Tolerant midges, especially among the sub-family Orthocladiinae, and worms (Oligochaeta) are known to increase in abundance in metals contaminated systems (Mebane 2003), although the mechanisms for this increase are not well-documented.

The metals tolerance index developed by McGuire (MDEQ 1998) provides an indication of overall assemblage tolerance to metals. The index was demonstrated to be useful at metals contaminated sites in western Montana, but it has also been applied successfully elsewhere. Tolerance values were determined for individual taxa, based on their presence or absence from sites with known levels of water and sediment contamination. Those values, weighted by taxon abundances, are averaged to arrive at an assemblage tolerance score. Higher scores indicate higher tolerance to heavy metals.

## METHODS

For this study, sites on 2 streams were sampled for aquatic invertebrates. Samples were collected by URS Corporation personnel. Samples were processed and identified by Rhithron Associates. Laboratory technical procedures and quality assurance protocols applied to this project are described in the Appendix.

The 2 sampled sites on Joe Creek included a "reference" site above the influence of waste rock from a metal mine, and a test site below the mine. On Elliott Creek, a "reference" site above the confluence with Joe Creek was sampled for comparison with a test site below the confluence.

## RESULTS

*Joe Creek*

The sample collected above the waste rock site contained a total of approximately 481 organisms. Below the waste rock site, sampling yielded only about 176 organisms. Assuming that sampling efforts were equivalent between sites, it is apparent that invertebrate density was much lower at the downstream site. Because of the patchy distribution of invertebrates in riffles, some variation in densities is expected, but it is noteworthy that the lower site supported less than half the number of organisms as the "reference" site.

Table 1 summarizes the metals-related compositional, functional, and tolerance measures for the Joe Creek sites. Heptageniid mayflies (*Cinygma* sp., *Cinygmula* sp., *Epeorus grandis*, *Ironodes* sp., and *Rhithrogena* sp.) were common in the sample collected at the "reference" site, but were nearly extirpated below the mine influence. Only 2 taxa persisted at the lower site. Overall mayfly abundance diminished from 162 individuals to 26 individuals.

The precipitous increase in the metals tolerance index value at the downstream site strongly suggests that the assemblage below the mine influence was highly metals-tolerant. The 3 dominant taxa above the mine were all pollution-sensitive taxa: the caddisfly *Anagapetus* sp., the mayfly *Drunella doddsii*, and the stonefly *Yoraperla brevis*. Together, these taxa accounted for 35% of sampled animals at the site. Below the mine however, orthocladine midges (*Orthocladius (Orthocladius)* and *Orthocladius (Euorthocladius)* spp., and *Eukiefferiella gracei*) were dominant, making up 43% of the sampled animals. Midges in all taxa accounted for 63% of animals collected below the mine

influence, while midges accounted for only 13% of animals collected at the "reference" site.

Both sampled sites on Joe Creek supported all expected functional components. However, the sharp decline in scrapers at the downstream site is notable.

Taxa richness decreased by nearly half at the downstream site compared to the "reference" site. There were particularly acute taxa losses among mayflies, stoneflies, and riffle beetles. Oligochaetes were present at the "reference" site, but were not collected below the mine influence; this is not the expected response to metals contamination. However, the worms present above the mine (*Enchytraeus* sp. and *Mesenchytraeus* sp.) are not tolerant taxa. Instead, they are characteristic of cold, unpolluted montane streams; their tolerance of heavy metals is not documented.

**Table 1.** Metals associated metrics, expected responses when contamination is present, and responses at the downstream (below waste rock) site on Joe Creek.

| Metric | Expected response | Response in Joe Creek | Metric values | |
|---|---|---|---|---|
| | | | above waste rock | below waste rock |
| **B-IBI** | decrease | decrease | 44 | 36 |
| **Heptageniid abundance** | decrease | decrease | 15% | 3% |
| **Mayfly abundance** | decrease | decrease | 34% | 15% |
| **Chironomid abundance** | increase | increase | 13% | 63% |
| **Orthocladiinae abundance** | increase | increase | 25 | 99 |
| **Oligochaete abundance** | increase | decrease | 19 | absent |
| **Taxa richness** | decrease | decrease | 63 | 33 |
| **Scraper abundance** | decrease | decrease | 43% | 11% |
| **Metals tolerance index** | increase | increase | 1.49 | 4.15 |

*Elliott Creek*

Invertebrate density at both of the Elliott Creek sites was typical of montane streams; there were between 700 and 900 specimens in each of the samples. Density apparently did not diminish below the confluence with Joe Creek.

Table 2 summarizes the metals-related compositional, functional, and tolerance measures for the Elliott Creek sites. The abundance of heptageniid mayflies (*Cinygmula* sp. and *Rhithrogena* sp.) at the "reference" site was very low; only 6 individuals were collected there. No heptageniid mayflies were collected at the downstream site. The significance of this small shift in taxonomic composition is difficult to assess; sampling variability may account

for the absence of these taxa. However, the influence of metals cannot be ruled out.

There was a shift in dominant taxa between the upstream and downstream site on Elliott Creek. Above the Joe Creek confluence, the 3 most abundant taxa were the caddisfly *Glossosoma* sp. and the tanytarsine midges *Rheotanytarsus* sp. and *Micropsectra* sp. These animals accounted for 30% of organisms in the sample. At the site below the confluence, the orthocladine midges in *Orthocladius (Orthocladius)* spp., the caddisfly *Neophylax occidentalis*, and the elmid beetle *Zaitzevia parvula* were the dominant taxa, accounting for 34% of sampled animals. There was only a slight increase in the overall abundance of midges, but the number of orthocladine midges in the downstream sample was much higher than the sample collected at the upstream site. Taxa richness was slightly higher below the Joe Creek confluence.

The very slight increase in the metals tolerance index at the lower site is within the typical variability of the index. This result provides no evidence that the invertebrate assemblage below the confluence is more metals tolerant than the assemblage collected at the "reference" site.

All expected functional components were present at both Elliott Creek sites. There was a slight shift in shredder abundance, but the contribution of scrapers to the functional mix was only slightly different between the sites.

Oligochaetes in the family Enchytraeidae were collected at both sites on Elliott Creek; however, 3 taxa were collected at the site above the confluence, and only 1 taxon was collected below the confluence. Oligochaetes were not abundant at either site.

**Table 2.** Metals associated metrics, expected responses when contamination is present, and responses at the downstream (below the confluence with Joe Creek) site on Elliott Creek.

| Metric | Expected response | Response in Elliott Creek | Metric values | |
|---|---|---|---|---|
| | | | above confluence | below confluence |
| **B-IBI** | decrease | slight decrease | 44 | 42 |
| **Heptageniid abundance** | decrease | decrease | 1.2% | absent |
| **Mayfly abundance** | decrease | decrease | 12% | 7% |
| **Chironomid abundance** | increase | increase | 30% | 37% |
| **Orthocladiinae abundance** | increase | increase | 47 | 125 |
| **Oligochaete abundance** | increase | decrease | 8 | 4 |
| **Taxa richness** | decrease | slight increase | 60 | 63 |
| **Scraper abundance** | decrease | slight decrease | 30% | 27% |
| **Metals tolerance index** | increase | slight increase | 2.52 | 2.83 |

## DISCUSSION

Other abiotic factors besides metals may have influenced the invertebrate assemblages at the Joe Creek sites; for example, the natural variation in communities along the longitudinal upstream-to-downstream gradient may account for some of the differences in assemblage composition between sites. Stressors and natural gradients interact in complex ways making the detection and diagnosis of probable causes of impairment an inexact exercise. For these reasons, it is very difficult to specifically attribute changes in a benthic community to any particular stressor.

Invertebrate assemblages at Joe Creek site suggest cold water temperatures. More than half of the cold stenotherm taxa collected at the upstream site were not present in the sample collected at the downstream site. Metals contamination could account for the loss of these taxa, since cold stenotherms are often generally pollution-sensitive. But the possibility that water temperatures were warmer at this site cannot be ruled out. "Clinger" taxa were very diverse at the site above the waste rock influence; at least 24 "clinger" taxa were supported here. Below the mine, only 14 "clinger" taxa were collected. Fine sediment deposition could account for the loss of these taxa. Diminished numbers of stonefly taxa at the lower site compared to the "reference" site may be related to reach-scale habitat degradation, such as streambank instability, loss of riparian zone integrity, or channel alteration.

Comparison of metric and community composition responses between upstream and downstream sites on Joe Creek strongly suggests impairment at the site below the mine influence. Responses were generally consistent with the expected invertebrate community responses to metals contamination. Similar comparisons between sites on Elliott Creek yielded less consistent results, with some metric responses either weak or nonexistent. Although metals contamination cannot be ruled out at the downstream site on Elliott Creek, the evidence is not as strong as it is at the downstream site on Joe Creek.

## REFERENCES

Bollman W. 2008. Analysis of biological samples: technical summary. Report to URS Corporation. Brad Rawls, Project Manager. Rhithron Associates, November 2008.

Farag, A.M., D.F. Woodward, J.N. Goldstein, and J.S. Meyer. 1998. Concentrations of metals associated with mining waste in sediments, biofilm, benthic macroinvertebrates, and fish from the Coeur d'Alene River Basin, Idaho. *Archives of Environmental Contamination and Toxicology*. 34: 119-127.

Clements, W.H., D.S. Cherry, and J. Cairns, Jr. 1989. The influence of copper exposure on predator-prey interactions in aquatic insect communities. *Freshwater Biology*. 21: 483-488.

Kiffney, P.M. and W.H.Clements. 1993. Bioaccumulation of heavy metals by benthic invertebrates at the Arkansas River, Colorado. *Environmental Toxicology and Chemistry*. 12: 1507-1517.

Kiffney, P.M. and W.H.Clements. 1994. Effects of heavy metals on a Rocky Mountain stream macroinvertebrate assemblage in experimental microcosms. *Journal of the North American Benthological Society*. 13: 511-524.

Kiffney, P.M. and W.H.Clements. 1996. Effects of metals on stream assemblages from different altitudes. *Ecological Applications*. 6: 472-481.

Kiffney, P.M. and W.H.Clements. 2003. Ecological effects of metals on benthic invertebrates. In: *Biological Response Signatures: Indicator Patterns Using Aquatic Communities*. T.P. Simon, ed. CRC Press. New York.

MDEQ. 1998. Rapid bioassessment macroinvertebrate protocols: sampling and sample analysis standard operating procedures. Montana Department of Environmental Quality. Planning, Prevention, and Assistance. Working Draft. Helena, Montana.

Mebane, C.A. 2003. Effects of metals on freshwater macroinvertebrates: review and case study of the correspondence of multimetric index, toxicity testing, and copper concentrations in sediment and water. In: *Biological Response Signatures: Indicator Patterns Using Aquatic Communities*. T.P. Simon, ed. CRC Press. New York.

Munger, C. and L. Hare. 2000. Influence of ingestion rate and food types on cadmium accumulation by the aquatic insect *Chaoborus*. *Canadian Journal of Fisheries and Aquatic Sciences*. 57: 327-332.

Roy, I. and L. Hare, 1999. Relative importance of water and food as cadmium sources to the predatory insect Sialis velata (Megaloptera). *Canadian Journal of Fisheries and Aquatic Sciences*. 56: 1143-1149.

# Appendix

## Technical summary of methods and quality assurance procedures
## Taxa lists and metric summaries

**Joe Creek**
**Elliott Creek**

**September 2008**

**Analysis of biological samples:**
**Technical summary of methods and quality assurance procedures**

## METHODS

*Sample processing*

Four macroinvertebrate samples were delivered to Rhithron's laboratory facility in Missoula, Montana on October 2, 2008. All samples arrived in good condition. Upon arrival, samples were unpacked and examined, and an inventory containing sample identification information was created. An electronic inventory spreadsheet was then created and sent to the Project Manager. This spreadsheet included project code and internal laboratory identification numbers and was verified by the Project Manager prior to upload into the Rhithron database.

Standard sorting protocols were applied to achieve representative subsamples of a minimum of 500 organisms. 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. The contents of each grid 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 500 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 by certified taxonomists, using 10x – 80x stereoscopic dissecting scopes (Leica S8E and S6E) and identified to the lowest possible level, 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 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 carefully 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 archived at the Rhithron laboratory.

*Quality control procedures*

Quality control 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 lists and counts for each sample were constructed. Standard metric calculations for aquatic invertebrate assemblages were made using Rhithron's customized database software.

## RESULTS

*Quality Control Procedures*

Results of quality control procedures for subsampling and taxonomy are given in Table 1. Sorting efficiency averaged 98.56% for macroinvertebrate samples, taxonomic precision for identification and enumeration was 95.81% for the randomly selected QA sample, and data entry efficiency averaged 100% for the project. These similarity statistics fall within acceptable industry criteria (Stribling et al. 2003).

*Data analysis*

Taxa lists and counts, and values and scores for standard bioassessment metrics are given in this Appendix.

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

| RAI Sample ID | Station name | Sorting efficiency | Bray-Curtis similarity for taxonomy and enumeration |
|---|---|---|---|
| URS08BLM001 | Elliott Creek Below Confluence | 100.00% | |
| URS08BLM002 | Elliott Creek Above Confluence | 99.04% | |
| URS08BLM003 | Joe Creek Below Waste Rock Confluence | 97.17% | |
| URS08BLM004 | Joe Creek Above Waste Rock Confluence | 98.03% | 95.81% |

## REFERENCES

Bray, J. R. and J. T. Curtis. 1957. An ordination of upland forest communities of southern Wisconsin. Ecological Monographs 27: 325-349.

Caton, L. W. 1991. Improving subsampling methods for the EPA's "Rapid Bioassessment" benthic protocols. Bulletin of the North American Benthological Society. 8(3): 317-319.

Stribling, J.B., S.R Moulton II and G.T. Lester. 2003. Determining the quality of taxonomic data. J.N. Am. Benthol. Soc. 22(4): 621-631.

# Taxa Listing

**Project ID:** URS08BLM
**RAI No.:** URS08BLM001

**RAI No.:** URS08BLM001 **Sta. Name:** Elliott Creek Below Confluence
**Client ID:**
**Date Coll.:** 9/9/2008 **No. Jars:** 1 **STORET ID:**

| Taxonomic Name | Count | PRA | Unique | Stage | Qualifier | BI | Function |
|---|---|---|---|---|---|---|---|
| **Non-Insect** | | | | | | | |
| Enchytraeidae | | | | | | | |
| *Enchytraeus* sp. | 4 | 0.80% | Yes | Immature | | 4 | CG |
| Planariidae | | | | | | | |
| *Polycelis coronata* | 1 | 0.20% | Yes | Unknown | | 1 | OM |
| **Ephemeroptera** | | | | | | | |
| Ameletidae | | | | | | | |
| *Ameletus* sp. | 1 | 0.20% | Yes | Larva | Damaged | 0 | CG |
| Baetidae | | | | | | | |
| *Acentrella turbida* | 4 | 0.80% | Yes | Larva | | 4 | CG |
| *Baetis* sp. | 1 | 0.20% | Yes | Larva | Damaged | 5 | CG |
| *Baetis tricaudatus* | 23 | 4.60% | Yes | Larva | | 4 | CG |
| Ephemerellidae | | | | | | | |
| *Drunella doddsii* | 1 | 0.20% | Yes | Larva | | 1 | SC |
| *Drunella grandis* | 1 | 0.20% | Yes | Larva | | 2 | PR |
| *Serratella tibialis* | 3 | 0.60% | Yes | Larva | | 2 | CG |
| **Plecoptera** | | | | | | | |
| Chloroperlidae | | | | | | | |
| *Suwallia* sp. | 1 | 0.20% | Yes | Larva | | 1 | PR |
| *Sweltsa* sp. | 2 | 0.40% | Yes | Larva | | 0 | PR |
| Nemouridae | | | | | | | |
| *Malenka* sp. | 7 | 1.40% | Yes | Larva | | 1 | SH |
| Perlidae | | | | | | | |
| *Calineuria californica* | 2 | 0.40% | Yes | Larva | | 2 | PR |
| *Hesperoperla pacifica* | 1 | 0.20% | Yes | Larva | | 1 | PR |
| Perlidae | 3 | 0.60% | No | Larva | Early Instar | 2 | PR |
| Perlodidae | | | | | | | |
| *Perlinodes aurea* | 1 | 0.20% | Yes | Larva | | 1 | PR |
| *Skwala* sp. | 2 | 0.40% | Yes | Larva | | 3 | PR |

# Taxa Listing

**Project ID:** URS08BLM
**RAI No.:** URS08BLM001

**RAI No.:** URS08BLM001 **Sta. Name:** Elliott Creek Below Confluence
**Client ID:**
**Date Coll.:** 9/9/2008 **No. Jars:** 1 **STORET ID:**

| Taxonomic Name | Count | PRA | Unique | Stage | Qualifier | BI | Function |
|---|---|---|---|---|---|---|---|
| **Trichoptera** | | | | | | | |
| Apataniidae | | | | | | | |
| *Apatania* sp. | 1 | 0.20% | Yes | Larva | | 3 | SC |
| Brachycentridae | | | | | | | |
| *Micrasema* sp. | 5 | 1.00% | Yes | Larva | | 1 | SH |
| Calamoceratidae | | | | | | | |
| *Heteroplectron californicum* | 1 | 0.20% | Yes | Larva | | 1 | SH |
| Glossosomatidae | | | | | | | |
| *Agapetus* sp. | 11 | 2.20% | Yes | Larva | | 0 | SC |
| *Glossosoma* sp. | 27 | 5.40% | Yes | Larva | | 0 | SC |
| Glossosomatidae | 19 | 3.80% | No | Pupa | | 0 | SC |
| Hydropsychidae | | | | | | | |
| Hydropsyche Morosa Gr. | 6 | 1.20% | Yes | Larva | Early Instar | 4 | CF |
| Lepidostomatidae | | | | | | | |
| *Lepidostoma* sp. | 9 | 1.80% | Yes | Larva | | 1 | SH |
| Limnephilidae | | | | | | | |
| *Ecclisomyia* sp. | 2 | 0.40% | Yes | Larva | | 4 | CG |
| Rhyacophilidae | | | | | | | |
| *Rhyacophila* sp. | 2 | 0.40% | No | Pupa | | 1 | PR |
| Rhyacophila Angelita Gr. | 4 | 0.80% | Yes | Larva | | 0 | PR |
| Rhyacophila Betteni Gr. | 5 | 1.00% | Yes | Larva | | 0 | PR |
| Rhyacophila Brunnea Gr. | 4 | 0.80% | Yes | Larva | | 2 | PR |
| Rhyacophila Hyalinata Gr. | 1 | 0.20% | Yes | Larva | | 0 | PR |
| Sericostomatidae | | | | | | | |
| *Gumaga* sp. | 1 | 0.20% | Yes | Larva | | 3 | SH |
| Uenoidae | | | | | | | |
| *Neophylax occidentis* | 68 | 13.60% | Yes | Larva | | 3 | SC |
| Uenoidae | 1 | 0.20% | No | Pupa | | 0 | SC |
| **Coleoptera** | | | | | | | |
| Dytiscidae | | | | | | | |
| *Oreodytes obesus* sp. | 1 | 0.20% | Yes | Adult | | 5 | PR |
| Elmidae | | | | | | | |
| *Ampumixis dispar* | 1 | 0.20% | Yes | Adult | | 4 | CG |
| *Ampumixis dispar* | 10 | 2.00% | No | Larva | | 4 | CG |
| *Heterlimnius* sp. | 5 | 1.00% | No | Larva | | 3 | CG |
| *Heterlimnius koebelei* sp. | 1 | 0.20% | Yes | Adult | | 4 | CG |
| *Lara* sp. | 1 | 0.20% | Yes | Larva | | 1 | SH |
| *Optioservus* sp. | 2 | 0.40% | Yes | Larva | | 5 | SC |
| *Ordobrevia nubifera* | 5 | 1.00% | No | Larva | | 4 | CG |
| *Ordobrevia nubifera* | 1 | 0.20% | Yes | Adult | | 4 | CG |
| *Zaitzevia parvulus* | 12 | 2.40% | Yes | Adult | | 4 | CG |
| *Zaitzevia parvulus* | 15 | 3.00% | No | Larva | | 4 | CG |
| Psephenidae | | | | | | | |
| *Eubrianax edwardsi* | 4 | 0.80% | Yes | Larva | | 4 | SC |

# Taxa Listing

**Project ID:** URS08BLM
**RAI No.:** URS08BLM001

**RAI No.:** URS08BLM001 **Sta. Name:** Elliott Creek Below Confluence
**Client ID:**
**Date Coll.:** 9/9/2008 **No. Jars:** 1 **STORET ID:**

| Taxonomic Name | Count | PRA | Unique | Stage | Qualifier | BI | Function |
|---|---|---|---|---|---|---|---|
| **Diptera** | | | | | | | |
| Ceratopogonidae | | | | | | | |
| *Mallochohelea* sp. | 8 | 1.60% | Yes | Larva | | 11 | PR |
| Simuliidae | | | | | | | |
| *Simulium* sp. | 2 | 0.40% | No | Pupa | | 6 | CF |
| *Simulium* sp. | 14 | 2.80% | Yes | Larva | | 6 | CF |
| Tipulidae | | | | | | | |
| *Antocha* sp. | 2 | 0.40% | Yes | Larva | | 3 | CG |
| *Hesperoconopa* sp. | 4 | 0.80% | Yes | Larva | | 1 | CG |
| **Chironomidae** | | | | | | | |
| Chironomidae | | | | | | | |
| *Brillia parva* sp. | 5 | 1.00% | Yes | Larva | | 5 | SH |
| *Cardiocladius obscurus* | 1 | 0.20% | Yes | Larva | | 5 | PR |
| *Cricotopus triannulatus* | 10 | 2.00% | Yes | Larva | | 7 | SH |
| *Eukiefferiella* sp. | 3 | 0.60% | No | Larva | Early Instar | 8 | CG |
| Eukiefferiella Brehmi Gr. | 2 | 0.40% | Yes | Larva | | 8 | CG |
| Eukiefferiella Claripennis Gr. | 3 | 0.60% | Yes | Larva | | 8 | CG |
| Eukiefferiella Pseudomontana Gr. | 1 | 0.20% | Yes | Larva | | 8 | CG |
| *Micropsectra* sp. | 21 | 4.20% | Yes | Larva | | 4 | CG |
| *Micropsectra* sp. | 2 | 0.40% | No | Pupa | | 4 | CG |
| *Orthocladius (Euorthocladius)* sp. | 8 | 1.60% | Yes | Larva | Early Instar | 6 | CG |
| *Orthocladius (Orthocladius)* sp. | 62 | 12.40% | Yes | Larva | Early Instar | 6 | CG |
| *Orthocladius (Orthocladius)* sp. | 14 | 2.80% | No | Pupa | Damaged | 6 | CG |
| *Pagastia orthogonia* | 1 | 0.20% | Yes | Larva | | 1 | CG |
| *Parametriocnemus* sp. | 6 | 1.20% | Yes | Larva | | 5 | CG |
| *Pentaneura inconspicua* sp. | 1 | 0.20% | Yes | Larva | | 6 | PR |
| *Polypedilum aviceps* | 3 | 0.60% | Yes | Larva | | 6 | SH |
| Polypedilum Fallax Gr. | 2 | 0.40% | Yes | Larva | | 6 | CG |
| Polypedilum Scalaenum Gr. | 1 | 0.20% | Yes | Larva | | 6 | SH |
| *Polypedilum tritum* | 1 | 0.20% | No | Pupa | | 6 | CG |
| *Polypedilum tritum* | 1 | 0.20% | Yes | Larva | | 6 | CG |
| Potthastia Gaedii Gr. | 5 | 1.00% | Yes | Larva | | 2 | CG |
| *Rheotanytarsus* sp. | 15 | 3.00% | Yes | Larva | | 6 | CF |
| *Tanytarsus* sp. | 1 | 0.20% | No | Pupa | | 6 | CF |
| *Tanytarsus* sp. | 4 | 0.80% | Yes | Larva | | 6 | CF |
| Thienemannimyia Gr. | 4 | 0.80% | Yes | Larva | Early Instar | 5 | PR |
| Tvetenia Bavarica Gr. | 10 | 2.00% | Yes | Larva | | 5 | CG |
| **Sample Count** | **500** | | | | | | |

# Taxa Listing

**Project ID:** URS08BLM
**RAI No.:** URS08BLM002

**RAI No.:** URS08BLM002 **Sta. Name:** Elliott Creek Above Confluence
**Client ID:**
**Date Coll.:** 9/9/2008 **No. Jars:** 1 **STORET ID:**

| Taxonomic Name | Count | PRA | Unique | Stage | Qualifier | BI | Function |
|---|---|---|---|---|---|---|---|
| **Non-Insect** | | | | | | | |
| Enchytraeidae | | | | | | | |
| *Enchytraeus* sp. | 1 | 0.19% | Yes | Immature | | 4 | CG |
| *Fridericia* sp. | 1 | 0.19% | Yes | Immature | | 11 | CG |
| *Mesenchytraeus* sp. | 6 | 1.17% | Yes | Immature | | 4 | CG |
| **Ephemeroptera** | | | | | | | |
| Baetidae | | | | | | | |
| *Acentrella turbida* | 2 | 0.39% | Yes | Larva | | 4 | CG |
| *Baetis tricaudatus* | 46 | 8.93% | Yes | Larva | | 4 | CG |
| Ephemerellidae | | | | | | | |
| *Attenella delantala* | 2 | 0.39% | Yes | Larva | | 3 | CG |
| *Drunella doddsii* | 1 | 0.19% | Yes | Larva | | 1 | SC |
| *Drunella grandis* | 2 | 0.39% | Yes | Larva | | 2 | PR |
| *Serratella tibialis* | 3 | 0.58% | Yes | Larva | | 2 | CG |
| Heptageniidae | | | | | | | |
| *Cinygmula* sp. | 3 | 0.58% | Yes | Larva | | 0 | SC |
| *Rhithrogena* sp. | 3 | 0.58% | Yes | Larva | | 0 | CG |
| **Plecoptera** | | | | | | | |
| Chloroperlidae | | | | | | | |
| *Sweltsa* sp. | 4 | 0.78% | Yes | Larva | | 0 | PR |
| Nemouridae | | | | | | | |
| *Malenka* sp. | 1 | 0.19% | Yes | Larva | | 1 | SH |
| Perlidae | | | | | | | |
| *Calineuria californica* | 7 | 1.36% | Yes | Larva | | 2 | PR |
| *Hesperoperla pacifica* | 5 | 0.97% | Yes | Larva | | 1 | PR |
| Perlodidae | | | | | | | |
| *Perlinodes aurea* | 3 | 0.58% | Yes | Larva | | 1 | PR |
| Perlodidae | 2 | 0.39% | Yes | Larva | Early Instar | 2 | PR |
| *Skwala* sp. | 17 | 3.30% | Yes | Larva | | 3 | PR |

# Taxa Listing

**Project ID:** URS08BLM
**RAI No.:** URS08BLM002

**RAI No.:** URS08BLM002 **Sta. Name:** Elliott Creek Above Confluence
**Client ID:**
**Date Coll.:** 9/9/2008 **No. Jars:** 1 **STORET ID:**

| Taxonomic Name | Count | PRA | Unique | Stage | Qualifier | BI | Function |
|---|---|---|---|---|---|---|---|
| **Trichoptera** | | | | | | | |
| Apataniidae | | | | | | | |
| *Apatania* sp. | 2 | 0.39% | Yes | Larva | | 3 | SC |
| Glossosomatidae | | | | | | | |
| *Agapetus* sp. | 15 | 2.91% | Yes | Larva | | 0 | SC |
| *Glossosoma* sp. | 54 | 10.49% | Yes | Larva | | 0 | SC |
| Glossosomatidae | 46 | 8.93% | No | Pupa | | 0 | SC |
| Hydropsychidae | | | | | | | |
| *Arctopsyche grandis* | 4 | 0.78% | Yes | Larva | | 2 | PR |
| Hydropsyche Morosa Gr. | 16 | 3.11% | Yes | Larva | Early Instar | 4 | CF |
| Lepidostomatidae | | | | | | | |
| *Lepidostoma* sp. | 2 | 0.39% | Yes | Larva | | 1 | SH |
| Rhyacophilidae | | | | | | | |
| *Rhyacophila* sp. | 12 | 2.33% | No | Pupa | | 1 | PR |
| Rhyacophila Angelita Gr. | 1 | 0.19% | Yes | Larva | | 0 | PR |
| Rhyacophila Betteni Gr. | 6 | 1.17% | Yes | Larva | | 0 | PR |
| Rhyacophila Brunnea Gr. | 1 | 0.19% | Yes | Larva | | 2 | PR |
| Uenoidae | | | | | | | |
| *Neophylax occidentis* | 24 | 4.66% | Yes | Larva | | 3 | SC |
| **Coleoptera** | | | | | | | |
| Dytiscidae | | | | | | | |
| *Oreodytes obesus* sp. | 2 | 0.39% | Yes | Adult | | 5 | PR |
| Elmidae | | | | | | | |
| *Ampumixis dispar* | 9 | 1.75% | No | Larva | | 4 | CG |
| *Ampumixis dispar* | 1 | 0.19% | Yes | Adult | | 4 | CG |
| *Heterlimnius* sp. | 2 | 0.39% | Yes | Larva | | 3 | CG |
| *Narpus concolor* | 1 | 0.19% | Yes | Adult | | 2 | CG |
| *Optioservus* sp. | 3 | 0.58% | No | Larva | | 5 | SC |
| *Optioservus seriatus* | 3 | 0.58% | Yes | Adult | | 4 | SC |
| *Zaitzevia parvulus* | 2 | 0.39% | Yes | Larva | | 4 | CG |
| Psephenidae | | | | | | | |
| *Eubrianax edwardsi* | 2 | 0.39% | Yes | Larva | | 4 | SC |

# Taxa Listing

**Project ID:** URS08BLM
**RAI No.:** URS08BLM002

**RAI No.:** URS08BLM002 **Sta. Name:** Elliott Creek Above Confluence
**Client ID:**
**Date Coll.:** 9/9/2008 **No. Jars:** 1 **STORET ID:**

| Taxonomic Name | Count | PRA | Unique | Stage | Qualifier | BI | Function |
|---|---|---|---|---|---|---|---|
| **Diptera** | | | | | | | |
| Ceratopogonidae | | | | | | | |
| *Mallochohelea* sp. | 1 | 0.19% | Yes | Larva | | 11 | PR |
| Empididae | | | | | | | |
| *Clinocera* sp. | 1 | 0.19% | Yes | Larva | | 5 | PR |
| Pelecorhynchidae | | | | | | | |
| *Glutops* sp. | 1 | 0.19% | Yes | Larva | | 1 | PR |
| Simuliidae | | | | | | | |
| *Simulium* sp. | 1 | 0.19% | No | Pupa | | 6 | CF |
| *Simulium* sp. | 10 | 1.94% | Yes | Larva | | 6 | CF |
| Tipulidae | | | | | | | |
| *Antocha* sp. | 5 | 0.97% | Yes | Larva | | 3 | CG |
| *Antocha* sp. | 8 | 1.55% | No | Pupa | | 3 | CG |
| *Cryptolabis* sp. | 2 | 0.39% | Yes | Larva | | 11 | SH |
| *Hesperoconopa* sp. | 10 | 1.94% | Yes | Larva | | 1 | CG |
| *Hexatoma* sp. | 2 | 0.39% | Yes | Larva | | 2 | PR |
| **Chironomidae** | | | | | | | |
| Chironomidae | | | | | | | |
| *Brillia parva* sp. | 4 | 0.78% | Yes | Larva | | 5 | SH |
| Eukiefferiella Brehmi Gr. | 2 | 0.39% | Yes | Larva | | 8 | CG |
| Eukiefferiella Claripennis Gr. | 1 | 0.19% | Yes | Larva | | 8 | CG |
| Eukiefferiella Devonica Gr. | 1 | 0.19% | Yes | Larva | | 8 | CG |
| Eukiefferiella Gracei Gr. | 3 | 0.58% | Yes | Larva | | 8 | CG |
| Eukiefferiella Pseudomontana Gr. | 2 | 0.39% | Yes | Larva | | 8 | CG |
| *Lopescladius* sp. | 1 | 0.19% | Yes | Larva | | 2 | CG |
| *Micropsectra* sp. | 2 | 0.39% | No | Pupa | | 4 | CG |
| *Micropsectra* sp. | 48 | 9.32% | Yes | Larva | | 4 | CG |
| Microtendipes Rydalensis Gr. | 1 | 0.19% | Yes | Larva | | 6 | CF |
| *Orthocladius (Orthocladius)* sp. | 3 | 0.58% | No | Pupa | Damaged | 6 | CG |
| *Orthocladius (Orthocladius)* sp. | 7 | 1.36% | Yes | Larva | Early Instar | 6 | CG |
| *Parametriocnemus* sp. | 1 | 0.19% | Yes | Larva | | 5 | CG |
| *Polypedilum aviceps* | 6 | 1.17% | Yes | Larva | | 6 | SH |
| *Rheotanytarsus* sp. | 4 | 0.78% | No | Pupa | | 6 | CF |
| *Rheotanytarsus* sp. | 46 | 8.93% | Yes | Larva | | 6 | CF |
| *Tanytarsus* sp. | 1 | 0.19% | Yes | Larva | | 6 | CF |
| *Tanytarsus* sp. | 1 | 0.19% | No | Pupa | | 6 | CF |
| *Thienemanniella* sp. | 2 | 0.39% | Yes | Larva | | 6 | CG |
| Thienemannimyia Gr. | 1 | 0.19% | Yes | Larva | Early Instar | 5 | PR |
| *Tvetenia* sp. | 1 | 0.19% | No | Pupa | | 5 | CG |
| Tvetenia Bavarica Gr. | 19 | 3.69% | Yes | Larva | | 5 | CG |
| **Sample Count** | **515** | | | | | | |

# Taxa Listing

**Project ID:** URS08BLM
**RAI No.:** URS08BLM003

**RAI No.:** URS08BLM003 **Sta. Name:** Joe Creek Below Waste Rock Confluence
**Client ID:**
**Date Coll.:** 9/9/2008 **No. Jars:** 1 **STORET ID:**

| Taxonomic Name | Count | PRA | Unique | Stage | Qualifier | BI | Function |
|---|---|---|---|---|---|---|---|
| **Ephemeroptera** | | | | | | | |
| Baetidae | | | | | | | |
| *Baetis tricaudatus* | 13 | 7.39% | Yes | Larva | | 4 | CG |
| Ephemerellidae | | | | | | | |
| *Drunella coloradensis* | 6 | 3.41% | Yes | Larva | | 0 | SC |
| *Drunella doddsii* | 2 | 1.14% | Yes | Larva | | 1 | SC |
| Heptageniidae | | | | | | | |
| *Epeorus grandis* | 3 | 1.70% | Yes | Larva | | 0 | SC |
| *Ironodes* sp. | 2 | 1.14% | Yes | Larva | | 0 | SC |
| **Plecoptera** | | | | | | | |
| Capniidae | | | | | | | |
| Capniidae | 1 | 0.57% | Yes | Larva | Damaged | 1 | SH |
| Nemouridae | | | | | | | |
| *Malenka* sp. | 1 | 0.57% | Yes | Larva | | 1 | SH |
| Perlidae | | | | | | | |
| *Doroneuria baumanni* | 1 | 0.57% | Yes | Larva | | 1 | PR |
| Perlodidae | | | | | | | |
| *Perlinodes aurea* | 1 | 0.57% | Yes | Larva | | 1 | PR |
| Perlodidae | 1 | 0.57% | Yes | Larva | Early Instar | 2 | PR |
| **Trichoptera** | | | | | | | |
| Glossosomatidae | | | | | | | |
| *Anagapetus* sp. | 7 | 3.98% | Yes | Larva | | 0 | SC |
| Hydropsychidae | | | | | | | |
| Hydropsychidae | 1 | 0.57% | Yes | Larva | Early Instar | 4 | CF |
| Limnephilidae | | | | | | | |
| *Cryptochia* sp. | 2 | 1.14% | Yes | Larva | | 0 | SH |
| Rhyacophilidae | | | | | | | |
| *Rhyacophila* sp. | 10 | 5.68% | No | Pupa | | 1 | PR |
| Rhyacophila Betteni Gr. | 5 | 2.84% | Yes | Larva | | 0 | PR |
| *Rhyacophila grandis* | 1 | 0.57% | Yes | Larva | | 1 | PR |
| Rhyacophila Hyalinata Gr. | 1 | 0.57% | Yes | Larva | | 0 | PR |
| Rhyacophila Vagrita Gr. | 2 | 1.14% | Yes | Larva | | 0 | PR |
| **Coleoptera** | | | | | | | |
| Dytiscidae | | | | | | | |
| Dytiscidae | 1 | 0.57% | Yes | Larva | Early Instar | 5 | PR |
| Elmidae | | | | | | | |
| *Lara* sp. | 1 | 0.57% | Yes | Larva | | 1 | SH |
| **Diptera** | | | | | | | |
| Empididae | | | | | | | |
| *Neoplasta* sp. | 1 | 0.57% | Yes | Larva | | 5 | PR |
| Simuliidae | | | | | | | |
| *Simulium* sp. | 1 | 0.57% | Yes | Pupa | | 6 | CF |
| Tipulidae | | | | | | | |
| *Dicranota* sp. | 1 | 0.57% | Yes | Larva | | 3 | PR |

# Taxa Listing

**Project ID:** URS08BLM
**RAI No.:** URS08BLM003

**RAI No.:** URS08BLM003 **Sta. Name:** Joe Creek Below Waste Rock Confluence
**Client ID:**
**Date Coll.:** 9/9/2008 **No. Jars:** 1 **STORET ID:**

| Taxonomic Name | Count | PRA | Unique | Stage | Qualifier | BI | Function |
|---|---|---|---|---|---|---|---|
| **Chironomidae** | | | | | | | |
| Chironomidae | | | | | | | |
| *Brillia parva* sp. | 6 | 3.41% | Yes | Larva | | 5 | SH |
| Chironomini | 1 | 0.57% | No | Pupa | Damaged | 6 | CG |
| *Cricotopus (Cricotopus)* sp. | 3 | 1.70% | Yes | Larva | Early Instar | 7 | SH |
| *Diamesa* sp. | 1 | 0.57% | Yes | Larva | | 5 | CG |
| Eukiefferiella Gracei Gr. | 25 | 14.20% | Yes | Larva | | 8 | CG |
| Eukiefferiella Pseudomontana Gr. | 2 | 1.14% | Yes | Larva | | 8 | CG |
| *Micropsectra* sp. | 1 | 0.57% | Yes | Larva | | 4 | CG |
| *Orthocladius (Euorthocladius)* sp. | 29 | 16.48% | Yes | Larva | Early Instar | 6 | CG |
| *Orthocladius (Euorthocladius)* sp. | 2 | 1.14% | No | Pupa | Damaged | 6 | CG |
| *Orthocladius (Orthocladius)* sp. | 2 | 1.14% | No | Pupa | Damaged | 6 | CG |
| *Orthocladius (Orthocladius)* sp. | 18 | 10.23% | Yes | Larva | Early Instar | 6 | CG |
| *Pagastia orthogonia* | 9 | 5.11% | Yes | Larva | | 1 | CG |
| *Parorthocladius* sp. | 6 | 3.41% | Yes | Larva | | 6 | CG |
| *Parorthocladius* sp. | 1 | 0.57% | No | Pupa | | 6 | CG |
| Tvetenia Bavarica Gr. | 5 | 2.84% | Yes | Larva | | 5 | CG |
| **Sample Count** | **176** | | | | | | |

# Taxa Listing

**Project ID:** URS08BLM
**RAI No.:** URS08BLM004

**RAI No.:** URS08BLM004 **Sta. Name:** Joe Creek Above Waste Rock Confluence
**Client ID:**
**Date Coll.:** 9/9/2008 **No. Jars:** 1 **STORET ID:**

| Taxonomic Name | Count | PRA | Unique | Stage | Qualifier | BI | Function |
|---|---|---|---|---|---|---|---|
| **Non-Insect** | | | | | | | |
| Enchytraeidae | | | | | | | |
| *Enchytraeus* sp. | 2 | 0.42% | Yes | Immature | | 4 | CG |
| *Mesenchytraeus* sp. | 16 | 3.33% | Yes | Immature | | 4 | CG |
| Haplotaxidae | | | | | | | |
| *Haplotaxis* sp. | 1 | 0.21% | Yes | Immature | | 11 | PR |
| Planariidae | | | | | | | |
| *Polycelis coronata* | 3 | 0.62% | Yes | Unknown | | 1 | OM |
| **Ephemeroptera** | | | | | | | |
| Ameletidae | | | | | | | |
| *Ameletus* sp. | 1 | 0.21% | Yes | Larva | Damaged | 0 | CG |
| Baetidae | | | | | | | |
| *Baetis tricaudatus* | 31 | 6.44% | Yes | Larva | | 4 | CG |
| Ephemerellidae | | | | | | | |
| *Caudatella hystrix* | 3 | 0.62% | Yes | Larva | | 0 | SC |
| *Drunella coloradensis* | 3 | 0.62% | Yes | Larva | | 0 | SC |
| *Drunella doddsii* | 38 | 7.90% | Yes | Larva | | 1 | SC |
| *Drunella spinifera* | 8 | 1.66% | Yes | Larva | | 0 | PR |
| *Ephemerella* sp. | 7 | 1.46% | Yes | Larva | Early Instar | 1.5 | SC |
| Heptageniidae | | | | | | | |
| *Cinygma* sp. | 1 | 0.21% | Yes | Larva | | 0 | SC |
| *Cinygmula* sp. | 18 | 3.74% | Yes | Larva | | 0 | SC |
| *Epeorus grandis* | 30 | 6.24% | Yes | Larva | | 0 | SC |
| *Ironodes* sp. | 6 | 1.25% | Yes | Larva | | 0 | SC |
| *Rhithrogena* sp. | 15 | 3.12% | Yes | Larva | | 0 | CG |
| Leptophlebiidae | | | | | | | |
| Leptophlebiidae | 1 | 0.21% | Yes | Larva | Damaged | 2 | CG |
| **Plecoptera** | | | | | | | |
| Chloroperlidae | | | | | | | |
| *Sweltsa* sp. | 1 | 0.21% | Yes | Larva | | 0 | PR |
| Leuctridae | | | | | | | |
| *Despaxia augusta* | 1 | 0.21% | Yes | Larva | | 0 | SH |
| *Moselia infuscata* | 1 | 0.21% | Yes | Larva | | 0 | SH |
| Nemouridae | | | | | | | |
| *Visoka cataractae* | 17 | 3.53% | Yes | Larva | | 0 | SH |
| *Zapada columbiana* | 6 | 1.25% | Yes | Larva | | 2 | SH |
| Peltoperlidae | | | | | | | |
| *Sierraperla cora* | 9 | 1.87% | Yes | Larva | | 1 | SH |
| *Yoraperla brevis* | 34 | 7.07% | Yes | Larva | | 0 | SH |
| Perlidae | | | | | | | |
| *Doroneuria baumanni* | 7 | 1.46% | Yes | Larva | | 1 | PR |
| Perlodidae | | | | | | | |
| *Megarcys* sp. | 1 | 0.21% | Yes | Larva | | 1 | PR |
| *Salmoperla sylvanica* sp. | 1 | 0.21% | Yes | Larva | | 11 | PR |
| *Skwala* sp. | 1 | 0.21% | Yes | Larva | | 3 | PR |
| Taeniopterygidae | | | | | | | |
| Taeniopterygidae | 4 | 0.83% | Yes | Larva | Early Instar | 2 | SH |

# Taxa Listing

**Project ID:** URS08BLM
**RAI No.:** URS08BLM004

**RAI No.:** URS08BLM004 **Sta. Name:** Joe Creek Above Waste Rock Confluence
**Client ID:**
**Date Coll.:** 9/9/2008 **No. Jars:** 1 **STORET ID:**

| Taxonomic Name | Count | PRA | Unique | Stage | Qualifier | BI | Function |
|---|---|---|---|---|---|---|---|
| **Trichoptera** | | | | | | | |
| Glossosomatidae | | | | | | | |
| *Anagapetus* sp. | 98 | 20.37% | Yes | Larva | | 0 | SC |
| *Glossosoma* sp. | 1 | 0.21% | Yes | Larva | | 0 | SC |
| Hydropsychidae | | | | | | | |
| Hydropsychidae | 2 | 0.42% | No | Larva | Early Instar | 4 | CF |
| *Parapsyche elsis* | 3 | 0.62% | Yes | Larva | | 1 | PR |
| Limnephilidae | | | | | | | |
| *Ecclisomyia* sp. | 9 | 1.87% | Yes | Larva | | 4 | CG |
| Philopotamidae | | | | | | | |
| *Dolophilodes* sp. | 2 | 0.42% | Yes | Larva | | 0 | CF |
| Rhyacophilidae | | | | | | | |
| Rhyacophila Betteni Gr. | 9 | 1.87% | Yes | Larva | | 0 | PR |
| Rhyacophila Hyalinata Gr. | 1 | 0.21% | Yes | Larva | | 0 | PR |
| Rhyacophila Vagrita Gr. | 1 | 0.21% | Yes | Larva | | 0 | PR |
| **Coleoptera** | | | | | | | |
| Elmidae | | | | | | | |
| *Ampumixis dispar* | 1 | 0.21% | Yes | Larva | | 4 | CG |
| *Heterlimnius* sp. | 2 | 0.42% | No | Larva | | 3 | CG |
| *Heterlimnius koebelei* sp. | 3 | 0.62% | Yes | Adult | | 4 | CG |
| *Lara* sp. | 3 | 0.62% | Yes | Larva | | 1 | SH |
| *Zaitzevia parvulus* | 1 | 0.21% | Yes | Larva | | 4 | CG |
| **Diptera** | | | | | | | |
| Ceratopogonidae | | | | | | | |
| *Mallochohelea* sp. | 5 | 1.04% | Yes | Larva | | 11 | PR |
| Dixidae | | | | | | | |
| *Dixa* sp. | 1 | 0.21% | Yes | Larva | | 1 | CG |
| Empididae | | | | | | | |
| *Chelifera* sp. | 1 | 0.21% | Yes | Larva | | 5 | PR |
| Empididae | 1 | 0.21% | No | Pupa | | 6 | PR |
| *Neoplasta* sp. | 1 | 0.21% | Yes | Larva | | 5 | PR |
| Pelecorhynchidae | | | | | | | |
| *Glutops* sp. | 3 | 0.62% | Yes | Larva | | 1 | PR |
| Psychodidae | | | | | | | |
| Pericoma / Telmatoscopus | 3 | 0.62% | Yes | Larva | | 4 | CG |
| Simuliidae | | | | | | | |
| *Simulium* sp. | 1 | 0.21% | Yes | Larva | | 6 | CF |
| *Simulium* sp. | 1 | 0.21% | No | Pupa | | 6 | CF |

# Taxa Listing

**Project ID:** URS08BLM
**RAI No.:** URS08BLM004

**RAI No.:** URS08BLM004 **Sta. Name:** Joe Creek Above Waste Rock Confluence
**Client ID:**
**Date Coll.:** 9/9/2008 **No. Jars:** 1 **STORET ID:**

| Taxonomic Name | Count | PRA | Unique | Stage | Qualifier | BI | Function |
|---|---|---|---|---|---|---|---|
| **Chironomidae** | | | | | | | |
| Chironomidae | | | | | | | |
| *Boreochlus* sp. | 1 | 0.21% | Yes | Larva | | 1 | CG |
| *Brillia parva* sp. | 1 | 0.21% | Yes | Larva | | 5 | SH |
| *Cricotopus triannulatus* | 1 | 0.21% | Yes | Larva | | 7 | SH |
| *Diamesa* sp. | 2 | 0.42% | Yes | Larva | | 5 | CG |
| Eukiefferiella Brehmi Gr. | 1 | 0.21% | Yes | Larva | | 8 | CG |
| Eukiefferiella Gracei Gr. | 1 | 0.21% | Yes | Larva | | 8 | CG |
| *Limnophyes* sp. | 1 | 0.21% | Yes | Larva | | 8 | CG |
| *Micropsectra* sp. | 1 | 0.21% | No | Pupa | | 4 | CG |
| *Micropsectra* sp. | 31 | 6.44% | Yes | Larva | | 4 | CG |
| *Orthocladius (Euorthocladius)* sp. | 2 | 0.42% | Yes | Larva | Early Instar | 6 | CG |
| *Orthocladius (Orthocladius)* sp. | 1 | 0.21% | Yes | Larva | Early Instar | 6 | CG |
| *Pagastia orthogonia* | 1 | 0.21% | Yes | Larva | | 1 | CG |
| *Parametriocnemus* sp. | 1 | 0.21% | No | Pupa | | 5 | CG |
| *Parametriocnemus* sp. | 7 | 1.46% | Yes | Larva | | 5 | CG |
| *Parorthocladius* sp. | 1 | 0.21% | Yes | Larva | | 6 | CG |
| *Parorthocladius* sp. | 1 | 0.21% | No | Pupa | | 6 | CG |
| *Thienemanniella* sp. | 1 | 0.21% | Yes | Larva | | 6 | CG |
| Tvetenia Bavarica Gr. | 6 | 1.25% | Yes | Larva | | 5 | CG |
| **Sample Count** | **481** | | | | | | |

# Metrics Report

**Project ID:** URS08BLM
**RAI No.:** URS08BLM001
**Sta. Name:** Elliott Creek Below Confluence
**Client ID:**
**STORET ID:**
**Coll. Date:** 9/9/2008

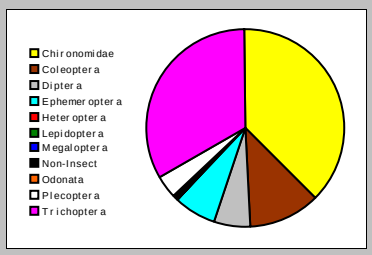
## *Abundance Measures*

**Sample Count:** 500
**Sample Abundance:** 833.33 60.00% of sample used

**Coll. Procedure:**
**Sample Notes:**

## *Taxonomic Composition*

| Category | R | A | PRA |
|---|---|---|---|
| Non-Insect | 2 | 5 | 1.00% |
| Odonata | | | |
| Ephemeroptera | 7 | 34 | 6.80% |
| Plecoptera | 7 | 19 | 3.80% |
| Heteroptera | | | |
| Megaloptera | | | |
| Trichoptera | 14 | 167 | 33.40% |
| Lepidoptera | | | |
| Coleoptera | 8 | 58 | 11.60% |
| Diptera | 4 | 30 | 6.00% |
| Chironomidae | 21 | 187 | 37.40% |

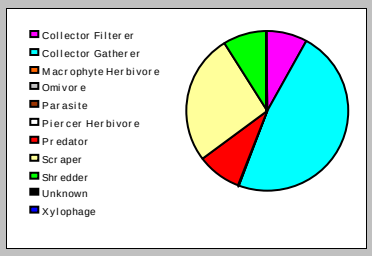



## *Dominant Taxa*

| Category | A | PRA |
|---|---|---|
| Orthocladius (Orthocladius) | 76 | 15.20% |
| Neophylax occidentis | 68 | 13.60% |
| Zaitzevia parvulus | 27 | 5.40% |
| Glossosoma | 27 | 5.40% |
| Micropsectra | 23 | 4.60% |
| Baetis tricaudatus | 23 | 4.60% |
| Glossosomatidae | 19 | 3.80% |
| Simulium | 16 | 3.20% |
| Rheotanytarsus | 15 | 3.00% |
| Ampumixis dispar | 11 | 2.20% |
| Agapetus | 11 | 2.20% |
| Tvetenia Bavarica Gr. | 10 | 2.00% |
| Cricotopus triannulatus | 10 | 2.00% |
| Lepidostoma | 9 | 1.80% |
| Orthocladius (Euorthocladius) | 8 | 1.60% |

## *Functional Composition*

| Category | R | A | PRA |
|---|---|---|---|
| Predator | 16 | 44 | 8.80% |
| Parasite | | | |
| Collector Gatherer | 25 | 236 | 47.20% |
| Collector Filterer | 4 | 42 | 8.40% |
| Macrophyte Herbivore | | | |
| Piercer Herbivore | | | |
| Xylophage | | | |
| Scraper | 7 | 134 | 26.80% |
| Shredder | 10 | 43 | 8.60% |
| Omivore | 1 | 1 | 0.20% |
| Unknown | | | |

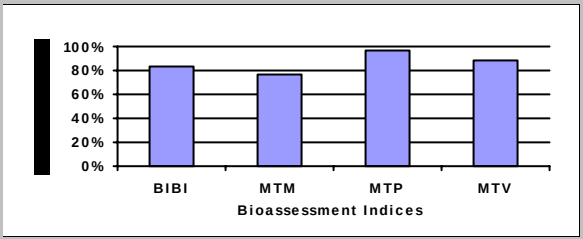



## *Metric Values and Scores*

| Metric | Value | BIBI | MTP | MTV | MTM |
|---|---|---|---|---|---|
| *Composition* | | | | | |
| Taxa Richness | 63 | 5 | 3 | | 3 |
| Non-Insect Percent | 1.00% | | | | |
| E Richness | 7 | 3 | | 3 | |
| P Richness | 7 | 3 | | 3 | |
| T Richness | 14 | 5 | | 3 | |
| EPT Richness | 28 | | 3 | | 3 |
| EPT Percent | 44.00% | | 2 | | 1 |
| Oligochaeta+Hirudinea Percent | 0.80% | | | | |
| Baetidae/Ephemeroptera | 0.824 | | | | |
| Hydropsychidae/Trichoptera | 0.036 | | | | |
| *Dominance* | | | | | |
| Dominant Taxon Percent | 15.20% | | 3 | | 3 |
| Dominant Taxa (2) Percent | 28.80% | | | | |
| Dominant Taxa (3) Percent | 34.20% | 5 | | | |
| Dominant Taxa (10) Percent | 61.00% | | | | |
| *Diversity* | | | | | |
| Shannon H (loge) | 3.315 | | | | |
| Shannon H (log2) | 4.783 | | 3 | | |
| Margalef D | 10.277 | | | | |
| Simpson D | 0.065 | | | | |
| Evenness | 0.037 | | | | |
| *Function* | | | | | |
| Predator Richness | 16 | | 3 | | |
| Predator Percent | 8.80% | 1 | | | |
| Filterer Richness | 4 | | | | |
| Filterer Percent | 8.40% | | | 2 | |
| Collector Percent | 55.60% | | 3 | | 3 |
| Scraper+Shredder Percent | 35.40% | | 3 | | 1 |
| Scraper/Filterer | 3.190 | | | | |
| Scraper/Scraper+Filterer | 0.761 | | | | |
| *Habit* | | | | | |
| Burrower Richness | 2 | | | | |
| Burrower Percent | 2.40% | | | | |
| Swimmer Richness | 4 | | | | |
| Swimmer Percent | 5.80% | | | | |
| Clinger Richness | 25 | 5 | | | |
| Clinger Percent | 50.00% | | | | |
| *Characteristics* | | | | | |
| Cold Stenotherm Richness | 5 | | | | |
| Cold Stenotherm Percent | 15.20% | | | | |
| Hemoglobin Bearer Richness | 2 | | | | |
| Hemoglobin Bearer Percent | 0.80% | | | | |
| Air Breather Richness | 2 | | | | |
| Air Breather Percent | 1.20% | | | | |
| *Voltinism* | | | | | |
| Univoltine Richness | 25 | | | | |
| Semivoltine Richness | 9 | 5 | | | |
| Multivoltine Percent | 38.00% | | 3 | | |
| *Tolerance* | | | | | |
| Sediment Tolerant Richness | 1 | | | | |
| Sediment Tolerant Percent | 0.40% | | | | |
| Sediment Sensitive Richness | 1 | | | | |
| Sediment Sensitive Percent | 5.40% | | | | |
| Metals Tolerance Index | 2.825 | | | | |
| Pollution Sensitive Richness | 6 | 5 | | 3 | |
| Pollution Tolerant Percent | 6.60% | 5 | | 2 | |
| Hilsenhoff Biotic Index | 3.695 | | 3 | | 2 |
| Intolerant Percent | 24.80% | | | | |
| Supertolerant Percent | 1.80% | | | | |
| CTQa | 56.889 | | | | |

## *Bioassessment Indices*

| BioIndex | Description | Score | Pct | Rating |
|---|---|---|---|---|
| BIBI | B-IBI (Karr et al.) | 42 | 84.00% | |
| MTP | Montana DEQ Plains (Bukantis 1998) | 29 | 96.67% | None |
| MTV | Montana Revised Valleys/Foothills (Bollman 1998) | 16 | 88.89% | None |
| MTM | Montana DEQ Mountains (Bukantis 1998) | 16 | 76.19% | Slight |



# Metrics Report

**Project ID:** URS08BLM
**RAI No.:** URS08BLM002
**Sta. Name:** Elliott Creek Above Confluence
**Client ID:**
**STORET ID:**
**Coll. Date:** 9/9/2008

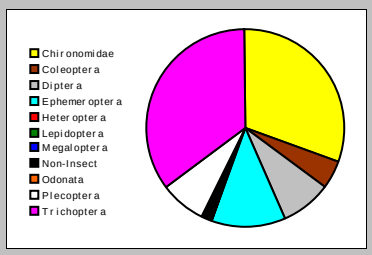
## *Abundance Measures*

**Sample Count:** 515
**Sample Abundance:** 735.71 70.00% of sample used

**Coll. Procedure:**
**Sample Notes:**

## *Taxonomic Composition*

| Category | R | A | PRA |
|---|---|---|---|
| Non-Insect | 3 | 8 | 1.55% |
| Odonata | | | |
| Ephemeroptera | 8 | 62 | 12.04% |
| Plecoptera | 7 | 39 | 7.57% |
| Heteroptera | | | |
| Megaloptera | | | |
| Trichoptera | 10 | 183 | 35.53% |
| Lepidoptera | | | |
| Coleoptera | 7 | 25 | 4.85% |
| Diptera | 8 | 41 | 7.96% |
| Chironomidae | 17 | 157 | 30.49% |

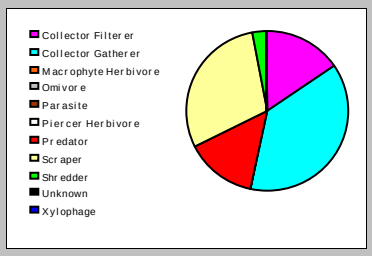



## *Dominant Taxa*

| Category | A | PRA |
|---|---|---|
| Glossosoma | 54 | 10.49% |
| Rheotanytarsus | 50 | 9.71% |
| Micropsectra | 50 | 9.71% |
| Glossosomatidae | 46 | 8.93% |
| Baetis tricaudatus | 46 | 8.93% |
| Neophylax occidentis | 24 | 4.66% |
| Tvetenia Bavarica Gr. | 19 | 3.69% |
| Skwala | 17 | 3.30% |
| Hydropsyche Morosa Gr. | 16 | 3.11% |
| Agapetus | 15 | 2.91% |
| Antocha | 13 | 2.52% |
| Rhyacophila | 12 | 2.33% |
| Simulium | 11 | 2.14% |
| Orthocladius (Orthocladius) | 10 | 1.94% |
| Hesperoconopa | 10 | 1.94% |

## *Functional Composition*

| Category | R | A | PRA |
|---|---|---|---|
| Predator | 17 | 72 | 13.98% |
| Parasite | | | |
| Collector Gatherer | 25 | 195 | 37.86% |
| Collector Filterer | 5 | 80 | 15.53% |
| Macrophyte Herbivore | | | |
| Piercer Herbivore | | | |
| Xylophage | | | |
| Scraper | 8 | 153 | 29.71% |
| Shredder | 5 | 15 | 2.91% |
| Omivore | | | |
| Unknown | | | |

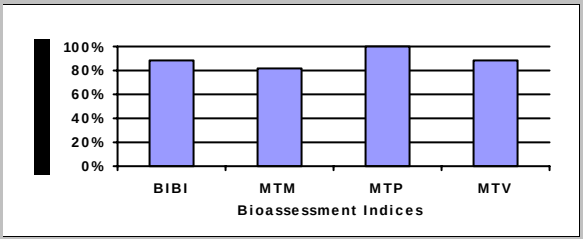



## *Metric Values and Scores*

| Metric | Value | BIBI | MTP | MTV | MTM |
|---|---|---|---|---|---|
| *Composition* | | | | | |
| Taxa Richness | 60 | 5 | 3 | | 3 |
| Non-Insect Percent | 1.55% | | | | |
| E Richness | 8 | 3 | | 3 | |
| P Richness | 7 | 3 | | 3 | |
| T Richness | 10 | 5 | | 3 | |
| EPT Richness | 25 | | 3 | | 3 |
| EPT Percent | 55.15% | | 3 | | 2 |
| Oligochaeta+Hirudinea Percent | 1.55% | | | | |
| Baetidae/Ephemeroptera | 0.774 | | | | |
| Hydropsychidae/Trichoptera | 0.109 | | | | |
| *Dominance* | | | | | |
| Dominant Taxon Percent | 10.49% | | 3 | | 3 |
| Dominant Taxa (2) Percent | 20.19% | | | | |
| Dominant Taxa (3) Percent | 29.90% | 5 | | | |
| Dominant Taxa (10) Percent | 65.44% | | | | |
| *Diversity* | | | | | |
| Shannon H (loge) | 3.234 | | | | |
| Shannon H (log2) | 4.666 | | 3 | | |
| Margalef D | 9.749 | | | | |
| Simpson D | 0.063 | | | | |
| Evenness | 0.039 | | | | |
| *Function* | | | | | |
| Predator Richness | 17 | | 3 | | |
| Predator Percent | 13.98% | 3 | | | |
| Filterer Richness | 5 | | | | |
| Filterer Percent | 15.53% | | | 1 | |
| Collector Percent | 53.40% | | 3 | | 3 |
| Scraper+Shredder Percent | 32.62% | | 3 | | 1 |
| Scraper/Filterer | 1.913 | | | | |
| Scraper/Scraper+Filterer | 0.657 | | | | |
| *Habit* | | | | | |
| Burrower Richness | 5 | | | | |
| Burrower Percent | 3.11% | | | | |
| Swimmer Richness | 2 | | | | |
| Swimmer Percent | 9.32% | | | | |
| Clinger Richness | 27 | 5 | | | |
| Clinger Percent | 56.70% | | | | |
| *Characteristics* | | | | | |
| Cold Stenotherm Richness | 5 | | | | |
| Cold Stenotherm Percent | 7.38% | | | | |
| Hemoglobin Bearer Richness | 1 | | | | |
| Hemoglobin Bearer Percent | 1.17% | | | | |
| Air Breather Richness | 4 | | | | |
| Air Breather Percent | 5.24% | | | | |
| *Voltinism* | | | | | |
| Univoltine Richness | 28 | | | | |
| Semivoltine Richness | 9 | 5 | | | |
| Multivoltine Percent | 37.86% | | 3 | | |
| *Tolerance* | | | | | |
| Sediment Tolerant Richness | 2 | | | | |
| Sediment Tolerant Percent | 2.91% | | | | |
| Sediment Sensitive Richness | 2 | | | | |
| Sediment Sensitive Percent | 11.26% | | | | |
| Metals Tolerance Index | 2.515 | | | | |
| Pollution Sensitive Richness | 5 | 5 | | 3 | |
| Pollution Tolerant Percent | 1.94% | 5 | | 3 | |
| Hilsenhoff Biotic Index | 3.008 | | 3 | | 2 |
| Intolerant Percent | 36.89% | | | | |
| Supertolerant Percent | 1.75% | | | | |
| CTQa | 57.775 | | | | |

## *Bioassessment Indices*

| BioIndex | Description | Score | Pct | Rating |
|---|---|---|---|---|
| BIBI | B-IBI (Karr et al.) | 44 | 88.00% | |
| MTP | Montana DEQ Plains (Bukantis 1998) | 30 | 100.00% | None |
| MTV | Montana Revised Valleys/Foothills (Bollman 1998) | 16 | 88.89% | None |
| MTM | Montana DEQ Mountains (Bukantis 1998) | 17 | 80.95% | Slight |



# Metrics Report

**Project ID:** URS08BLM
**RAI No.:** URS08BLM003
**Sta. Name:** Joe Creek Below Waste Rock Confluence
**Client ID:**
**STORET ID:**
**Coll. Date:** 9/9/2008

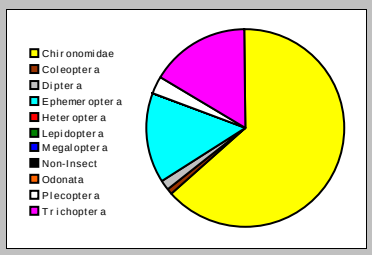
## *Abundance Measures*

**Sample Count:** 176
**Sample Abundance:** 176.00 100.00% of sample used

**Coll. Procedure:**
**Sample Notes:**

## *Taxonomic Composition*

| Category | R | A | PRA |
|---|---|---|---|
| Non-Insect | | | |
| Odonata | | | |
| Ephemeroptera | 5 | 26 | 14.77% |
| Plecoptera | 5 | 5 | 2.84% |
| Heteroptera | | | |
| Megaloptera | | | |
| Trichoptera | 7 | 29 | 16.48% |
| Lepidoptera | | | |
| Coleoptera | 2 | 2 | 1.14% |
| Diptera | 3 | 3 | 1.70% |
| Chironomidae | 11 | 111 | 63.07% |

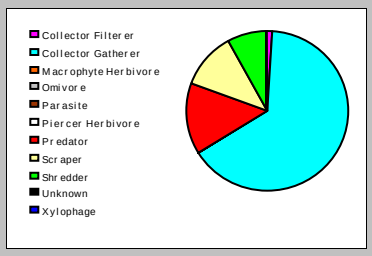



## *Dominant Taxa*

| Category | A | PRA |
|---|---|---|
| Orthocladius (Euorthocladius) | 31 | 17.61% |
| Eukiefferiella Gracei Gr. | 25 | 14.20% |
| Orthocladius (Orthocladius) | 20 | 11.36% |
| Baetis tricaudatus | 13 | 7.39% |
| Rhyacophila | 10 | 5.68% |
| Pagastia orthogonia | 9 | 5.11% |
| Parorthocladius | 7 | 3.98% |
| Anagapetus | 7 | 3.98% |
| Drunella coloradensis | 6 | 3.41% |
| Brillia parva | 6 | 3.41% |
| Tvetenia Bavarica Gr. | 5 | 2.84% |
| Rhyacophila Betteni Gr. | 5 | 2.84% |
| Epeorus grandis | 3 | 1.70% |
| Cricotopus (Cricotopus) | 3 | 1.70% |
| Ironodes | 2 | 1.14% |

## *Functional Composition*

| Category | R | A | PRA |
|---|---|---|---|
| Predator | 10 | 25 | 14.20% |
| Parasite | | | |
| Collector Gatherer | 10 | 115 | 65.34% |
| Collector Filterer | 2 | 2 | 1.14% |
| Macrophyte Herbivore | | | |
| Piercer Herbivore | | | |
| Xylophage | | | |
| Scraper | 5 | 20 | 11.36% |
| Shredder | 6 | 14 | 7.95% |
| Omivore | | | |
| Unknown | | | |

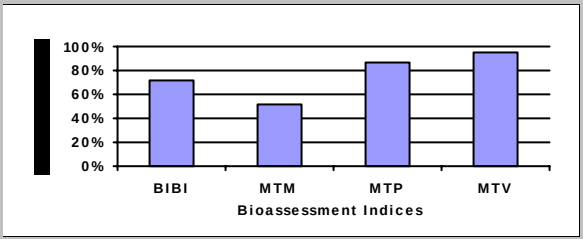



## *Metric Values and Scores*

| Metric | Value | BIBI | MTP | MTV | MTM |
|---|---|---|---|---|---|
| *Composition* | | | | | |
| Taxa Richness | 33 | 3 | 3 | | 3 |
| Non-Insect Percent | 0.00% | | | | |
| E Richness | 5 | 3 | | 2 | |
| P Richness | 5 | 3 | | 3 | |
| T Richness | 7 | 3 | | 3 | |
| EPT Richness | 17 | | 3 | | 2 |
| EPT Percent | 34.09% | | 2 | | 0 |
| Oligochaeta+Hirudinea Percent | | | | | |
| Baetidae/Ephemeroptera | 0.500 | | | | |
| Hydropsychidae/Trichoptera | 0.034 | | | | |
| *Dominance* | | | | | |
| Dominant Taxon Percent | 17.61% | | 3 | | 3 |
| Dominant Taxa (2) Percent | 31.82% | | | | |
| Dominant Taxa (3) Percent | 43.18% | 5 | | | |
| Dominant Taxa (10) Percent | 76.14% | | | | |
| *Diversity* | | | | | |
| Shannon H (loge) | 2.833 | | | | |
| Shannon H (log2) | 4.087 | | 3 | | |
| Margalef D | 6.305 | | | | |
| Simpson D | 0.084 | | | | |
| Evenness | 0.054 | | | | |
| *Function* | | | | | |
| Predator Richness | 10 | | 3 | | |
| Predator Percent | 14.20% | 3 | | | |
| Filterer Richness | 2 | | | | |
| Filterer Percent | 1.14% | | | 3 | |
| Collector Percent | 66.48% | | 2 | | 2 |
| Scraper+Shredder Percent | 19.32% | | 2 | | 0 |
| Scraper/Filterer | 10.000 | | | | |
| Scraper/Scraper+Filterer | 0.909 | | | | |
| *Habit* | | | | | |
| Burrower Richness | 2 | | | | |
| Burrower Percent | 1.70% | | | | |
| Swimmer Richness | 1 | | | | |
| Swimmer Percent | 7.39% | | | | |
| Clinger Richness | 14 | 3 | | | |
| Clinger Percent | 26.14% | | | | |
| *Characteristics* | | | | | |
| Cold Stenotherm Richness | 6 | | | | |
| Cold Stenotherm Percent | 9.66% | | | | |
| Hemoglobin Bearer Richness | | | | | |
| Hemoglobin Bearer Percent | | | | | |
| Air Breather Richness | 2 | | | | |
| Air Breather Percent | 1.14% | | | | |
| *Voltinism* | | | | | |
| Univoltine Richness | 17 | | | | |
| Semivoltine Richness | 4 | 3 | | | |
| Multivoltine Percent | 44.32% | | 2 | | |
| *Tolerance* | | | | | |
| Sediment Tolerant Richness | 1 | | | | |
| Sediment Tolerant Percent | 0.57% | | | | |
| Sediment Sensitive Richness | 1 | | | | |
| Sediment Sensitive Percent | 3.98% | | | | |
| Metals Tolerance Index | 4.149 | | | | |
| Pollution Sensitive Richness | 7 | 5 | | 3 | |
| Pollution Tolerant Percent | 0.57% | 5 | | 3 | |
| Hilsenhoff Biotic Index | 4.313 | | 3 | | 1 |
| Intolerant Percent | 31.82% | | | | |
| Supertolerant Percent | 15.34% | | | | |
| CTQa | 58.900 | | | | |

## *Bioassessment Indices*

| BioIndex | Description | Score | Pct | Rating |
|---|---|---|---|---|
| BIBI | B-IBI (Karr et al.) | 36 | 72.00% | |
| MTP | Montana DEQ Plains (Bukantis 1998) | 26 | 86.67% | None |
| MTV | Montana Revised Valleys/Foothills (Bollman 1998) | 17 | 94.44% | None |
| MTM | Montana DEQ Mountains (Bukantis 1998) | 11 | 52.38% | Moderate |



# Metrics Report

**Project ID:** URS08BLM
**RAI No.:** URS08BLM004
**Sta. Name:** Joe Creek Above Waste Rock Confluence
**Client ID:**
**STORET ID:**
**Coll. Date:** 9/9/2008

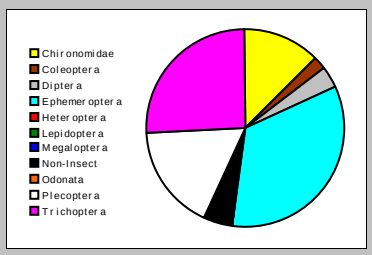
## *Abundance Measures*

**Sample Count:** 481
**Sample Abundance:** 481.00 100.00% of sample used

**Coll. Procedure:**
**Sample Notes:**

## *Taxonomic Composition*

| Category | R | A | PRA |
|---|---|---|---|
| Non-Insect | 4 | 22 | 4.57% |
| Odonata | | | |
| Ephemeroptera | 13 | 162 | 33.68% |
| Plecoptera | 12 | 83 | 17.26% |
| Heteroptera | | | |
| Megaloptera | | | |
| Trichoptera | 8 | 126 | 26.20% |
| Lepidoptera | | | |
| Coleoptera | 4 | 10 | 2.08% |
| Diptera | 7 | 17 | 3.53% |
| Chironomidae | 15 | 61 | 12.68% |

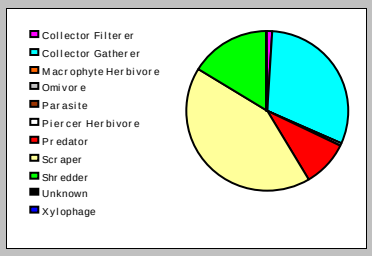



## *Dominant Taxa*

| Category | A | PRA |
|---|---|---|
| Anagapetus | 98 | 20.37% |
| Drunella doddsii | 38 | 7.90% |
| Yoraperla brevis | 34 | 7.07% |
| Micropsectra | 32 | 6.65% |
| Baetis tricaudatus | 31 | 6.44% |
| Epeorus grandis | 30 | 6.24% |
| Cinygmula | 18 | 3.74% |
| Visoka cataractae | 17 | 3.53% |
| Mesenchytraeus | 16 | 3.33% |
| Rhithrogena | 15 | 3.12% |
| Sierraperla cora | 9 | 1.87% |
| Rhyacophila Betteni Gr. | 9 | 1.87% |
| Ecclisomyia | 9 | 1.87% |
| Parametriocnemus | 8 | 1.66% |
| Drunella spinifera | 8 | 1.66% |

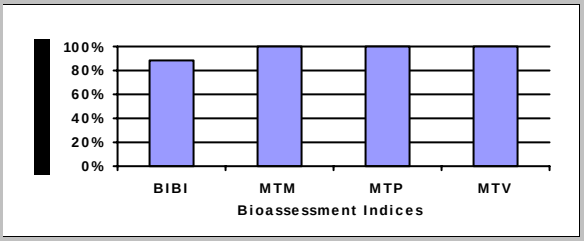
## *Functional Composition*

| Category | R | A | PRA |
|---|---|---|---|
| Predator | 15 | 45 | 9.36% |
| Parasite | | | |
| Collector Gatherer | 25 | 145 | 30.15% |
| Collector Filterer | 2 | 6 | 1.25% |
| Macrophyte Herbivore | | | |
| Piercer Herbivore | | | |
| Xylophage | | | |
| Scraper | 10 | 205 | 42.62% |
| Shredder | 10 | 77 | 16.01% |
| Omivore | 1 | 3 | 0.62% |
| Unknown | | | |




## *Metric Values and Scores*

| Metric | Value | BIBI | MTP | MTV | MTM |
|---|---|---|---|---|---|
| *Composition* | | | | | |
| Taxa Richness | 63 | 5 | 3 | | 3 |
| Non-Insect Percent | 4.57% | | | | |
| E Richness | 13 | 5 | | 3 | |
| P Richness | 12 | 5 | | 3 | |
| T Richness | 8 | 3 | | 3 | |
| EPT Richness | 33 | | 3 | | 3 |
| EPT Percent | 77.13% | | 3 | | 3 |
| Oligochaeta+Hirudinea Percent | 3.95% | | | | |
| Baetidae/Ephemeroptera | 0.191 | | | | |
| Hydropsychidae/Trichoptera | 0.040 | | | | |
| *Dominance* | | | | | |
| Dominant Taxon Percent | 20.37% | | 3 | | 3 |
| Dominant Taxa (2) Percent | 28.27% | | | | |
| Dominant Taxa (3) Percent | 35.34% | 5 | | | |
| Dominant Taxa (10) Percent | 68.40% | | | | |
| *Diversity* | | | | | |
| Shannon H (loge) | 3.186 | | | | |
| Shannon H (log2) | 4.597 | | 3 | | |
| Margalef D | 10.070 | | | | |
| Simpson D | 0.074 | | | | |
| Evenness | 0.039 | | | | |
| *Function* | | | | | |
| Predator Richness | 15 | | 3 | | |
| Predator Percent | 9.36% | 1 | | | |
| Filterer Richness | 2 | | | | |
| Filterer Percent | 1.25% | | | 3 | |
| Collector Percent | 31.39% | | 3 | | 3 |
| Scraper+Shredder Percent | 58.63% | | 3 | | 3 |
| Scraper/Filterer | 34.167 | | | | |
| Scraper/Scraper+Filterer | 0.972 | | | | |
| *Habit* | | | | | |
| Burrower Richness | 4 | | | | |
| Burrower Percent | 2.08% | | | | |
| Swimmer Richness | 3 | | | | |
| Swimmer Percent | 6.86% | | | | |
| Clinger Richness | 24 | 5 | | | |
| Clinger Percent | 62.16% | | | | |
| *Characteristics* | | | | | |
| Cold Stenotherm Richness | 19 | | | | |
| Cold Stenotherm Percent | 56.55% | | | | |
| Hemoglobin Bearer Richness | | | | | |
| Hemoglobin Bearer Percent | | | | | |
| Air Breather Richness | 0 | | | | |
| Air Breather Percent | 0.00% | | | | |
| *Voltinism* | | | | | |
| Univoltine Richness | 36 | | | | |
| Semivoltine Richness | 6 | 5 | | | |
| Multivoltine Percent | 19.75% | | 3 | | |
| *Tolerance* | | | | | |
| Sediment Tolerant Richness | 0 | | | | |
| Sediment Tolerant Percent | 0.00% | | | | |
| Sediment Sensitive Richness | 4 | | | | |
| Sediment Sensitive Percent | 21.62% | | | | |
| Metals Tolerance Index | 1.485 | | | | |
| Pollution Sensitive Richness | 20 | 5 | | 3 | |
| Pollution Tolerant Percent | 0.42% | 5 | | 3 | |
| Hilsenhoff Biotic Index | 1.459 | | 3 | | 3 |
| Intolerant Percent | 70.48% | | | | |
| Supertolerant Percent | 0.62% | | | | |
| CTQa | 60.179 | | | | |

## *Bioassessment Indices*

| BioIndex | Description | Score | Pct | Rating |
|---|---|---|---|---|
| BIBI | B-IBI (Karr et al.) | 44 | 88.00% | |
| MTP | Montana DEQ Plains (Bukantis 1998) | 30 | 100.00% | None |
| MTV | Montana Revised Valleys/Foothills (Bollman 1998) | 18 | 100.00% | None |
| MTM | Montana DEQ Mountains (Bukantis 1998) | 21 | 100.00% | None |