

OCTOBER 2013

BIOLOGICAL ASSESSMENT of SITES on the
SOUTH FORK OF THE WEST FORK GALLATIN RIVER,
GALLATIN COUNTY, MONTANA:

MACROINVERTEBRATE ASSEMBLAGES

A REPORT TO
THE BLUE WATER TASK FORCE



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INTRODUCTION

With increased development in the watershed, the integrity of the Gallatin River and its tributaries may be threatened by impacts to channel structure and riparian zones as well as by degradation of water quality. Monitoring and assessment of biological assemblages can help to detect whether impacts and degradation are in fact occurring. For the past several years, the Blue Water Task Force (BWTF) has sampled benthic macroinvertebrates for monitoring and assessment of the waters of the Gallatin River drainage. The taxonomic and functional composition of benthic macroinvertebrate assemblages are known to respond to the effects of stressors that may be associated with accelerating human influences. Such stressors may include pollutants, sediment, thermal impacts and hydrologic alterations, and changes to the natural morphology of river channels and riparian zones.

In mid-August 2013, 4 sites in the Gallatin River watershed were sampled for benthic macroinvertebrates: single, 2 replicates were collected at each site.

This report begins by describing the methods for processing and identifying these 4 samples. Data resulting from that work were translated into a multimetric index, and scores were calculated. Scores were used to assign impairment classes to the sites. Narrative interpretations of the ecological condition of the macroinvertebrate assemblages are also reported. These narratives use the taxonomic and functional composition, tolerance and sensitivity characteristics, and habits of the benthic invertebrates to describe probable water quality and habitat influences on the assemblages. Interpretations maximize the information available in the data: they do not rely solely on a single cumulative index score which may mask the effects of stressors on the biota. For this analysis, data from replicate samples is combined into a composite result.

METHODS

Sample processing

Eight macroinvertebrate samples, collected at 4 sites on the South Fork of the West Fork Gallatin River drainage in August 2012, were delivered to Rhithron's laboratory facility in Missoula, Montana. Each site was represented by 2 replicate samples. All samples arrived in good condition. Table 1 gives site names, identifiers, and other metadata for the samples.

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. If a sample contained fewer than 300 organisms, it was entirely sorted.

SFWF Site identifier	Site name	Date sampled	Latitude (degrees North)	Longitude
Ousel Bridge	Ousel	8/13/2013	45.2418	-111.3349
Aspen Bridge	Aspen	8/13/2013	45.2545	-111.3052
American Bank	American	9/13/2012	45.2657	-111.2887
Knaubs	Knaubs	9/13/2012	45.2666	-111.2803

Table 1. Sites on the South Fork of the West Fork Gallatin River, and sample information.

Organisms were individually examined using 10x – 80x dissecting scopes (Leica S8E and S6E) and identified to the lowest practical level consistent with MDEQ (MDEQ 2006) data requirements, using appropriate 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 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 along with the other identified invertebrates.

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 25% 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 assurance procedures for taxonomic determinations of invertebrates involved checking accuracy, precision and enumeration. One sample (12.5% of samples) was randomly selected and all organisms re-identified and counted by an independent taxonomist. Taxa lists and enumerations were compared by calculating the Percent

Taxonomic Difference (PTD), the Percent Disagreement in Enumeration (PDE) (Stribling et al. 2003), and a Bray-Curtis similarity statistic (Bray and Curtis 1957) for the selected sample. Rhithron's internal minimum data quality standards require less than 10% PTD, less than 5% PDE, and 95% similarity as measured by the Bray-Curtis statistic.

Data analysis

Taxa and counts for each sample were entered into Rhithron's database application (RAILIS v.2.1). 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 3 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.

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).

RESULTS

Quality Control Procedures

Results of quality control procedures for subsampling and taxonomy are given in Table 2. Sorting efficiency averaged 97.92% for all samples, and all 3 quality control parameters for taxonomy and enumeration fell well within internal and accepted industry standards.

Bioassessment

Table 3 summarizes values and scores for metrics in the MVFP bioassessment index (Bollman 1998), which was used to evaluate the aquatic invertebrate assemblages. Results for each sample replicate are reported, and impairment classifications are assigned. Bioassessment scores for each replicate sample are graphed in Figure 1 as percent of maximum possible score.

Table 2. Results of quality control procedures for subsampling and taxonomy.

RAI sample identifier (replicates)	Site name	Sorting efficiency (%)	PDE	PTD	Bray-Curtis similarity for taxonomy and enumeration (%)
BWTF13GR2001	Ousel	100			
BWTF13GR2002	Ousel	100			
BWTF13GR2003	Aspen Bridge	98.02	0.74	2.98	96.31
BWTF13GR2004	Aspen Bridge	100			
BWTF13GR2005	American Bank	97.58			
BWTF13GR2006	American Bank	93.77			
BWTF13GR2007	Knaubs	100			
BWTF13GR2008	Knaubs	93.96			

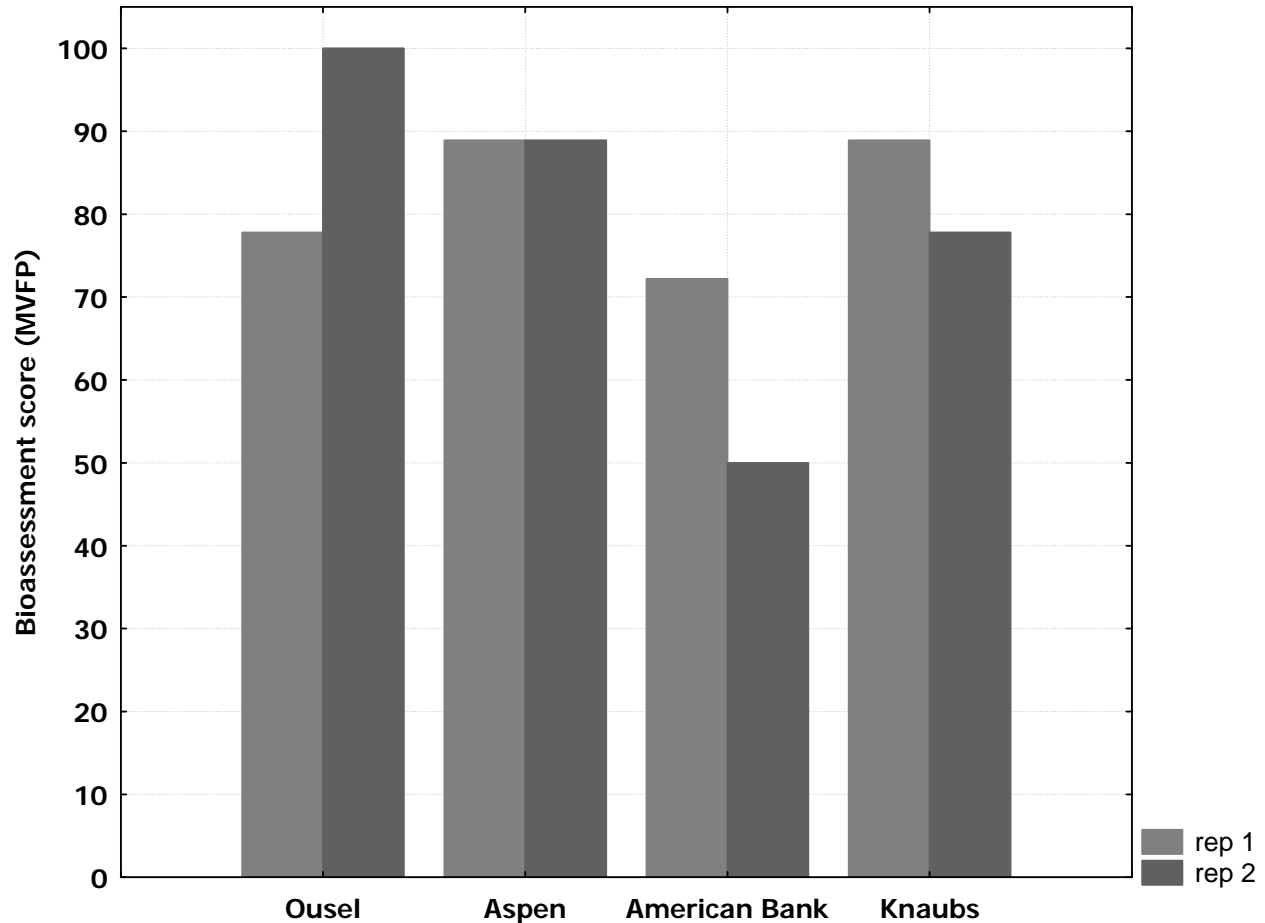


Figure 1. Bioassessment scores (MVFP: Bollman 1998) for replicate samples collected at sites on the South Fork of the West Fork Gallatin River drainage. Samples were collected in August 2013. Scores are given as percent of maximum score.

Aquatic invertebrate assemblages

Ousel

Metric indicators of water quality suggest unpolluted conditions at this site. The site supported at least 14 distinct mayfly taxa, and the biotic index value (1.85) was similar to expectations for a montane stream. Nine sensitive taxa were collected, and cold stenotherms, which comprised 18% of sampled animals, included the mayfly *Drunella doddsii* and the stonefly *Megarcys* sp. Both of these taxa were common in the samples. The presence of several specimens of the turbellarian *Polycelis* sp. suggests that groundwater augmented surface flow in this reach. The thermal preference calculated for the assemblage was 11.5°C. Cold, clean water is implied by these findings.

Both “clingers” (26 taxa) and caddisflies (9 taxa) were well-represented, suggesting that stony substrates were not contaminated with fine sediment deposition. The FSBI value (5.93) indicated a sediment-sensitive fauna. Overall taxa richness (47)

Table 3. Bioassessment index (MVFP: Bollman 1998) and individual metrics and scores for samples collected at sites on the South Fork of the West Fork Gallatin River watershed, August 2013.

	Ousel		Aspen		American Bank		Knaubs	
METRICS	Rep. 1	Rep. 2	Rep. 1	Rep. 2	Rep. 1	Rep. 2	Rep. 1	Rep. 2
Ephemeroptera richness	6	14	12	10	3	4	8	6
Plecoptera richness	4	6	3	5	2	0	4	1
Trichoptera richness	2	8	3	4	3	0	4	3
Number of sensitive taxa	1	9	4	2	3	1	5	2
Percent filterers	0.00%	0.63%	1.55%	0.98%	2.79%	1.11%	9.60%	3.65%
Percent tolerant taxa	0.32%	0.00%	0.00%	0.00%	0.31%	0.00%	0.31%	0.33%
Ephemeroptera richness	3	3	3	3	1	2	3	3
Plecoptera richness	3	3	2	3	2	0	3	1
Trichoptera richness	1	3	2	2	2	0	2	2
Number of sensitive taxa	1	3	3	2	2	1	3	2
Percent filterers	3	3	3	3	3	3	2	3
Percent tolerant taxa	3	3	3	3	3	3	3	3
TOTAL SCORE (max.= 18)	14	18	16	16	13	9	16	14
PERCENT OF MAX.	77.78%	100.00%	88.89%	88.89%	72.22%	50.00%	88.89%	77.78%
Impairment classification*	SLI	NON	NON	NON	SLI	MOD	NON	SLI

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

was high: instream habitats were probably diverse and intact. High stonefly taxa richness (6) may be related to stable streambanks, natural channel morphology, and functional riparian zones. Although 4 semivoltine taxa were counted in the samples, none of these were abundant. Periodic dewatering or sediment scour cannot be ruled out. Scrapers dominated the functional composition of the assemblage, suggesting limited riparian shading. Shredders were notably rare. Riparian inputs of organic material may have been limited, or hydrologic conditions may not have favored retention of such material.

Aspen

High mayfly taxa richness (12) suggests good water quality at this site, but the biotic index value (3.27) was somewhat higher than expected for an unimpaired stream in the Middle Rockies ecoregion. The elevated value was driven by the abundance of the aquatic mite *Torrenticola* sp., which is considered a relatively tolerant animal. Although they were not abundant, the presence of 2 hemoglobin-bearing taxa (*Polypedilum* sp. and *Tribelos* sp.) suggests some areas of hypoxic sediments. Some mild nutrient enrichment cannot be ruled out in this reach. The site did support at least 5 sensitive cold-stenotherm taxa, including the caddisfly *Apatania* sp., and the mayfly *Drunella doddsii*, suggesting that any pollutant effect was probably minimal. The thermal preference of the benthic assemblage was calculated at 12.8°C.

Five caddisfly taxa and 22 "clinger" taxa were counted, suggesting that colonization of stony substrate habitats was not limited by sediment deposition. The FSBI value (5.96) indicated a sediment-sensitive assemblage. High overall taxa richness (53) may have been related to diverse and intact benthic habitats. At least 6 stonefly taxa were supported at the site. Richness in this group may be related to the condition of reach-scale habitat features, such as streambank stability, riparian zone and channel integrity. Four semivoltine taxa were collected: although none were abundant, the group was somewhat more common at this site than at the Ousel Bridge site. Still, periodic dewatering, thermal extremes, or scour cannot be ruled out. All expected functional groups were represented here, but shredders were rare. This finding suggests that riparian inputs of organic material may have been limited, or that hydrologic conditions did not favor retention of such material. Gatherers dominated the feeding groups.

American Bank

Mayfly taxa richness (4) at this site was lower than expected, and the biotic index value (5.89) indicated a relatively tolerant benthic assemblage. Midges, especially *Orthocladus* spp. and *Rheocricotopus* spp. dominated the samples, and accounted for 61% of sampled animals. Aquatic mites, especially *Torrenticola* sp., were also abundant. Some species in the genus *Orthocladus* are associated with filamentous algae. The site also supported significant numbers of hemoglobin-bearing taxa (*Tribelos* sp. and *Polypedilum* sp.), which accounted for 2.4% of specimens in the samples. These findings suggest that nutrient enrichment may influence the invertebrate assemblage at this site. Warmer-than-expected water temperatures may also be influential: cold-stenotherm taxa were uncommon here, and the thermal preference of the assemblage was calculated at 14.8°C.

Neither "clingers" (10 taxa) nor caddisflies (3 taxa) were as diverse as expected. This finding suggests that sediment deposition may have limited colonization of stony substrate habitats in the reach. However, the FSBI value (5.00) indicated a sediment-

sensitive assemblage. Overall taxa richness (41) was lower at this site than at the other South Fork of the West Fork sites. Instream habitats may have been relatively limited or monotonous. Two stonefly taxa were counted, and each was represented by a single individual. Low richness and abundance in this group may be related to altered channel morphology, disrupted riparian zones, or unstable streambanks. Semivoltine taxa were poorly represented: only a few specimens in 3 taxa were collected. Periodic dewatering, scouring sediment pulses, thermal extremes or other catastrophes cannot be ruled out here. Gatherers overwhelmed the functional composition of the sampled assemblages: this pattern is sometimes interpreted as evidence of water quality impairment. Shredders were rare and scrapers were uncommon.

Knaubs

This site supported at least 8 mayfly taxa, but the biotic index value (5.67) was higher than expected for a montane stream in the Middle Rockies ecoregion. The invertebrate assemblage was dominated by midges, aquatic mites, and oligochaetes. The dominant midges were *Orthocladius* spp. and *Tvetenia bavarica*, both of which are often associated with filamentous algae. Some nutrient enrichment cannot be ruled out in this reach. The thermal preference of the assemblage was calculated at 13.4°C.

Caddisfly taxa (4) were less diverse than expected, but 18 "clinger" taxa were counted in the samples. It seems likely that sediment deposition did not appreciably limit colonization of stony substrate habitats. The FSBI value (4.85) indicated a moderately sediment-sensitive fauna. Overall taxa richness (47) was high, suggesting diverse and intact instream habitats. At least 5 stonefly taxa were supported at this site, but none of these were abundant. Unstable streambanks, disrupted riparian zones, or altered channel morphology may have been influential. Similar to other sites in this study, semivoltine taxa were not well-represented: 6 taxa were counted, but each was represented by only a few individuals. Periodic dewatering or sediment scour cannot be ruled out. The functional composition of the sample was dominated by gatherers, and predators, especially the mites) were also abundant. All other expected groups were represented in low numbers.

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APPENDIX

Taxa lists and metric summaries

**Blue Water Task Force
Gallatin River Watershed: South Fork of the West Fork Gallatin River**

August 2013

Taxa Listing

Project ID: BWTF13GR2C
RAI No.: BWTF13GR2C001

RAI No.: BWTF13GR2C001 Sta. Name: SFWF Ousel Bridge Composite
Client ID: Ousel Composite
Date Coll.: 8/13/2013 No. Jars: 1 STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Other Non-Insect							
Planariidae							
<i>Polycelis</i> sp.	6	0.95%	Yes	Unknown		1	OM
Sperchontidae							
<i>Sperchon</i> sp.	2	0.32%	Yes	Adult		11	PR
Oligochaeta							
Enchytraeidae							
<i>Mesenchytraeus</i> sp.	25	3.97%	Yes	Unknown		4	CG
Ephemeroptera							
Ameletidae							
<i>Ameletus</i> sp.	11	1.75%	Yes	Larva		0	SC
Baetidae							
<i>Acentrella insignificans</i>	5	0.79%	Yes	Larva		4	CG
<i>Acentrella turbida</i>	6	0.95%	Yes	Larva		4	CG
<i>Baetis flavistriga</i>	8	1.27%	Yes	Larva		4	CG
<i>Baetis tricaudatus</i>	28	4.45%	Yes	Larva		4	CG
Ephemerellidae							
<i>Drunella</i> sp.	3	0.48%	Yes	Larva	Early Instar	1	SC
<i>Drunella coloradensis</i>	2	0.32%	Yes	Larva		0	SC
<i>Drunella doddsii</i>	20	3.18%	Yes	Larva		1	SC
<i>Ephemerella</i> sp.	1	0.16%	Yes	Larva	Early Instar	1.5	SC
<i>Ephemerella tibialis</i>	50	7.95%	Yes	Larva		2	CG
Heptageniidae							
<i>Cinygmula</i> sp.	82	13.04%	Yes	Larva		0	SC
<i>Epeorus deceptivus</i>	52	8.27%	Yes	Larva		0	SC
<i>Epeorus longimanus</i>	146	23.21%	Yes	Larva		1	SC
<i>Rhithrogena</i> sp.	16	2.54%	Yes	Larva		0	SC
Plecoptera							
Chloroperlidae							
<i>Suwallia</i> sp.	3	0.48%	Yes	Larva		1	PR
<i>Sweltsa</i> sp.	10	1.59%	Yes	Larva		0	PR
Nemouridae							
<i>Zapada columbiana</i>	1	0.16%	Yes	Larva		2	SH
Perlodidae							
<i>Kogotus</i> sp.	7	1.11%	Yes	Larva		1	PR
<i>Megarcys</i> sp.	11	1.75%	Yes	Larva		1	PR
Taeniopterygidae							
Taeniopterygidae	1	0.16%	Yes	Larva	Early Instar	2	SH

Taxa Listing

Project ID: BWTF13GR2C
RAI No.: BWTF13GR2C001

RAI No.: BWTF13GR2C001 Sta. Name: SFWF Ousel Bridge Composite
Client ID: Ousel Composite
Date Coll.: 8/13/2013 No. Jars: 1 STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Trichoptera							
Apataniidae							
<i>Apatania</i> sp.	25	3.97%	Yes	Larva		3	SC
Brachycentridae							
<i>Brachycentrus americanus</i>	2	0.32%	Yes	Larva		1	CF
Glossosomatidae							
<i>Glossosoma</i> sp.	1	0.16%	Yes	Larva		0	SC
Glossosomatidae	1	0.16%	No	Pupa		0	SC
Hydropsychidae							
<i>Arctopsyche grandis</i>	1	0.16%	Yes	Larva		2	PR
Lepidostomatidae							
<i>Lepidostoma</i> sp.	1	0.16%	Yes	Larva		1	SH
Limnephilidae							
<i>Ecclisomyia</i> sp.	1	0.16%	Yes	Larva		4	CG
Rhyacophilidae							
<i>Rhyacophila</i> sp.	3	0.48%	No	Pupa		1	PR
<i>Rhyacophila Brunnea/Vemna</i> Gr.	7	1.11%	Yes	Larva		2	PR
<i>Rhyacophila Vagrita</i> Gr.	2	0.32%	Yes	Larva		0	PR
<i>Rhyacophila Vofixa</i> Gr.	1	0.16%	Yes	Larva		0	PR
Coleoptera							
Elmidae							
<i>Heterlimnius corpulentus</i>	2	0.32%	Yes	Larva		3	CG
<i>Optioservus</i> sp.	1	0.16%	Yes	Adult		5	SC
Diptera							
Ceratopogonidae							
Ceratopogoninae	2	0.32%	Yes	Larva		6	PR
Empididae							
<i>Clinocera</i> sp.	1	0.16%	Yes	Larva		5	PR
Tipulidae							
<i>Hexatoma</i> sp.	7	1.11%	Yes	Larva		2	PR
Chironomidae							
Chironomidae							
Chironomidae	9	1.43%	No	Pupa		10	CG
<i>Diamesa</i> sp.	1	0.16%	Yes	Larva		5	CG
<i>Eukiefferiella</i> sp.	1	0.16%	No	Larva	Early Instar	8	CG
<i>Eukiefferiella Devonica</i> Gr.	1	0.16%	Yes	Larva		8	CG
<i>Eukiefferiella Gracei</i> Gr.	4	0.64%	Yes	Larva		8	CG
<i>Hydrobaenus</i> sp.	8	1.27%	Yes	Larva		8	SC
<i>Micropsectra</i> sp.	3	0.48%	Yes	Larva		4	CG
Orthoclaadiinae	1	0.16%	No	Larva	Early Instar	6	CG
<i>Orthocladius</i> sp.	11	1.75%	Yes	Larva		6	CG
<i>Pagastia</i> sp.	3	0.48%	Yes	Larva		1	CG
<i>Rheocricotopus</i> sp.	14	2.23%	Yes	Larva		4	CG
<i>Stempellinella</i> sp.	15	2.38%	Yes	Larva		4	CG
<i>Tvetenia Bavarica</i> Gr.	4	0.64%	Yes	Larva		5	CG
Sample Count	629						

Taxa Listing

Project ID: BWTF13GR2C
RAI No.: BWTF13GR2C002

RAI No.: BWTF13GR2C002 Sta. Name: SFWF Aspen Bridge Composite
Client ID: Down Fire Composite
Date Coll.: 8/13/2013 No. Jars: 1 STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Other Non-Insect							
Nemata	2	0.40%	Yes	Unknown		5	UN
Hygrobatidae							
<i>Hygrobat</i> sp.	3	0.60%	Yes	Adult		8	PR
Lebertiidae							
<i>Lebertia</i> sp.	4	0.80%	Yes	Adult		8	PR
Protziidae							
<i>Protzia</i> sp.	1	0.20%	Yes	Adult		11	PR
Sperchontidae							
<i>Sperchon</i> sp.	11	2.20%	Yes	Adult		11	PR
Torrenticolidae							
<i>Torrenticola</i> sp.	37	7.40%	Yes	Adult		8	PR
Oligochaeta							
Enchytraeidae							
<i>Mesenchytraeus</i> sp.	6	1.20%	Yes	Unknown		4	CG
Ephemeroptera							
Ameletidae							
<i>Ameletus</i> sp.	6	1.20%	Yes	Larva		0	SC
Baetidae							
<i>Acentrella turbida</i>	1	0.20%	Yes	Larva		4	CG
<i>Baetis</i> sp.	3	0.60%	No	Larva	Damaged	5	CG
<i>Baetis flavistriga</i>	17	3.40%	Yes	Larva		4	CG
<i>Baetis tricaudatus</i>	22	4.40%	Yes	Larva		4	CG
Ephemerellidae							
<i>Drunella</i> sp.	71	14.20%	Yes	Larva	Early Instar	1	SC
<i>Drunella coloradensis</i>	1	0.20%	Yes	Larva		0	SC
<i>Drunella doddsii</i>	19	3.80%	Yes	Larva		1	SC
<i>Ephemerella</i> sp.	3	0.60%	Yes	Larva	Early Instar	1.5	SC
<i>Ephemerella tibialis</i>	27	5.40%	Yes	Larva		2	CG
Heptageniidae							
<i>Cinygmula</i> sp.	25	5.00%	Yes	Larva		0	SC
<i>Epeorus</i> sp.	17	3.40%	No	Larva	Damaged	2	CG
<i>Epeorus deceptivus</i>	6	1.20%	Yes	Larva		0	SC
<i>Rhithrogena</i> sp.	11	2.20%	Yes	Larva		0	SC
Plecoptera							
Chloroperlidae							
<i>Suwallia</i> sp.	1	0.20%	Yes	Larva		1	PR
<i>Sweltsa</i> sp.	18	3.60%	Yes	Larva		0	PR
Leuctridae							
Leuctridae	1	0.20%	Yes	Larva	Early Instar	0	SH
Perlidae							
<i>Doroneuria</i> sp.	1	0.20%	Yes	Larva		0	PR
Perlodidae							
<i>Kogotus</i> sp.	2	0.40%	Yes	Larva		1	PR
<i>Skwala</i> sp.	2	0.40%	Yes	Larva		3	PR

Taxa Listing

Project ID: BWTF13GR2C
RAI No.: BWTF13GR2C002

RAI No.: BWTF13GR2C002 Sta. Name: SFWF Aspen Bridge Composite
Client ID: Down Fire Composite
Date Coll.: 8/13/2013 No. Jars: 1 STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Trichoptera							
Apataniidae							
<i>Apatania</i> sp.	17	3.40%	Yes	Larva		3	SC
Brachycentridae							
<i>Brachycentrus</i> sp.	1	0.20%	No	Larva	Early Instar	1	CF
<i>Brachycentrus americanus</i>	4	0.80%	Yes	Larva		1	CF
<i>Micrasema</i> sp.	2	0.40%	Yes	Larva		1	SH
Hydropsychidae							
<i>Arctopsyche grandis</i>	2	0.40%	Yes	Larva		2	PR
Hydropsychidae	1	0.20%	No	Larva	Early Instar	4	CF
Rhyacophilidae							
<i>Rhyacophila</i> sp.	2	0.40%	No	Pupa		1	PR
<i>Rhyacophila Brunnea/Vemna</i> Gr.	4	0.80%	Yes	Larva		2	PR
Coleoptera							
Elmidae							
Elmidae	2	0.40%	No	Adult	Damaged	4	CG
<i>Heterlimnius corpulentus</i>	16	3.20%	Yes	Larva		3	CG
Diptera							
Ceratopogonidae							
Ceratopogoninae	5	1.00%	Yes	Larva		6	PR
Empididae							
<i>Chelifera</i> sp.	1	0.20%	Yes	Larva		5	PR
<i>Clinocera</i> sp.	1	0.20%	Yes	Larva		5	PR
Tipulidae							
<i>Hexatoma</i> sp.	4	0.80%	Yes	Larva		2	PR
<i>Limnophila</i> sp.	1	0.20%	Yes	Larva		3	PR
Chironomidae							
Chironomidae							
Chironomidae	1	0.20%	No	Pupa		10	CG
<i>Cricotopus (Cricotopus)</i> sp.	3	0.60%	Yes	Larva		7	SH
<i>Cricotopus trifascia</i>	1	0.20%	Yes	Larva		7	SH
<i>Diamesa</i> sp.	3	0.60%	Yes	Larva		5	CG
<i>Eukiefferiella</i> sp.	3	0.60%	No	Larva	Early Instar	8	CG
<i>Eukiefferiella Brehmi</i> Gr.	1	0.20%	Yes	Larva		8	CG
<i>Eukiefferiella Devonica</i> Gr.	5	1.00%	Yes	Larva		8	CG
<i>Eukiefferiella Gracei</i> Gr.	15	3.00%	Yes	Larva		8	CG
<i>Hydrobaenus</i> sp.	5	1.00%	Yes	Larva		8	SC
<i>Micropsectra</i> sp.	3	0.60%	Yes	Larva		4	CG
<i>Orthocladius</i> sp.	25	5.00%	Yes	Larva		6	CG
<i>Pagastia</i> sp.	17	3.40%	Yes	Larva		1	CG
<i>Parorthocladius</i> sp.	1	0.20%	Yes	Larva		6	CG
<i>Platysmittia</i> sp.	1	0.20%	Yes	Larva		6	CG
<i>Polypedilum</i> sp.	1	0.20%	Yes	Larva		6	SH
<i>Rheocricotopus</i> sp.	13	2.60%	Yes	Larva		4	CG
<i>Stempellinella</i> sp.	8	1.60%	Yes	Larva		4	CG
<i>Tribelos</i> sp.	6	1.20%	Yes	Larva		10	CG
<i>Tvetenia Bavarica</i> Gr.	7	1.40%	Yes	Larva		5	CG

Taxa Listing

Project ID: BWTF13GR2C
RAI No.: BWTF13GR2C002

RAI No.: BWTF13GR2C002 Sta. Name: SFWF Aspen Bridge Composite
Client ID: Down Fire Composite
Date Coll.: 8/13/2013 No. Jars: 1 STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Sample Count	500						

Taxa Listing

Project ID: BWTF13GR2C
RAI No.: BWTF13GR2C003

RAI No.: BWTF13GR2C003 Sta. Name: SFWF American Bank Composite
Client ID: Down Golf Composite
Date Coll.: 8/13/2013 No. Jars: 1 STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Other Non-Insect							
Nemata	2	0.34%	Yes	Unknown		5	UN
Lebertiidae							
<i>Lebertia</i> sp.	3	0.51%	Yes	Adult		8	PR
Sperchontidae							
<i>Sperchon</i> sp.	7	1.18%	Yes	Adult		11	PR
Torrenticolidae							
<i>Torrenticola</i> sp.	150	25.30%	Yes	Adult		8	PR
Oligochaeta							
Enchytraeidae							
<i>Mesenchytraeus</i> sp.	12	2.02%	Yes	Unknown		4	CG
Naididae							
<i>Nais</i> sp.	6	1.01%	Yes	Unknown		8	CG
Ephemeroptera							
Baetidae							
<i>Baetis</i> sp.	6	1.01%	No	Larva	Damaged	5	CG
<i>Baetis flavistriga</i>	4	0.67%	Yes	Larva		4	CG
<i>Baetis tricaudatus</i>	1	0.17%	Yes	Larva		4	CG
Ephemerellidae							
<i>Drunella</i> sp.	8	1.35%	Yes	Larva	Early Instar	1	SC
<i>Ephemerella</i> sp.	10	1.69%	No	Larva	Early Instar	1.5	SC
<i>Ephemerella tibialis</i>	1	0.17%	Yes	Larva		2	CG
Plecoptera							
Chloroperlidae							
<i>Suwallia</i> sp.	1	0.17%	Yes	Larva		1	PR
Perlodidae							
Perlodidae	1	0.17%	Yes	Larva	Damaged	2	PR
Trichoptera							
Apataniidae							
<i>Apatania</i> sp.	1	0.17%	Yes	Larva		3	SC
Brachycentridae							
<i>Brachycentrus</i> sp.	2	0.34%	No	Larva	Early Instar	1	CF
<i>Brachycentrus americanus</i>	1	0.17%	Yes	Larva		1	CF
Hydropsychidae							
<i>Arctopsyche grandis</i>	2	0.34%	Yes	Larva		2	PR
Coleoptera							
Dytiscidae							
<i>Stictotarsus</i> sp.	1	0.17%	Yes	Adult		5	PR

Taxa Listing

Project ID: BWTF13GR2C
RAI No.: BWTF13GR2C003

RAI No.: BWTF13GR2C003 Sta. Name: SFWF American Bank Composite
Client ID: Down Golf Composite
Date Coll.: 8/13/2013 No. Jars: 1 STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Diptera							
Athericidae							
<i>Atherix</i> sp.	1	0.17%	Yes	Larva		5	PR
Ceratopogonidae							
Ceratopogoninae	1	0.17%	Yes	Larva		6	PR
Empididae							
<i>Chelifera</i> sp.	1	0.17%	Yes	Larva		5	PR
Empididae sp. (RAI Taxon # 0001)	1	0.17%	Yes	Larva		6	PR
Psychodidae							
<i>Pericoma</i> / <i>Telmatoscopus</i>	1	0.17%	Yes	Larva		4	CG
Psychodidae	1	0.17%	Yes	Larva	Early Instar	4	CG
Simuliidae							
<i>Simulium</i> sp.	4	0.67%	Yes	Larva		6	CF
Tipulidae							
<i>Hexatoma</i> sp.	1	0.17%	Yes	Larva		2	PR
Chironomidae							
Chironomidae							
Chironomidae	10	1.69%	No	Pupa		10	CG
<i>Cricotopus (Nostococladus)</i> sp.	5	0.84%	Yes	Larva		6	SH
<i>Cricotopus bicinctus</i>	1	0.17%	Yes	Larva		7	SH
<i>Cricotopus trifascia</i>	4	0.67%	Yes	Larva		7	SH
<i>Diamesa</i> sp.	4	0.67%	Yes	Larva		5	CG
<i>Eukiefferiella</i> sp.	1	0.17%	No	Larva	Early Instar	8	CG
<i>Eukiefferiella</i> Gracei Gr.	2	0.34%	Yes	Larva		8	CG
<i>Hydrobaenus</i> sp.	11	1.85%	Yes	Larva		8	SC
<i>Micropsectra</i> sp.	11	1.85%	Yes	Larva		4	CG
<i>Orthocladus</i> sp.	152	25.63%	Yes	Larva		6	CG
<i>Pagastia</i> sp.	8	1.35%	Yes	Larva		1	CG
<i>Polypedilum</i> sp.	1	0.17%	Yes	Larva		6	SH
<i>Potthastia</i> Gaedii Gr.	7	1.18%	Yes	Larva		2	CG
<i>Rheocricotopus</i> sp.	57	9.61%	Yes	Larva		4	CG
<i>Stempellinella</i> sp.	48	8.09%	Yes	Larva		4	CG
<i>Sublettea coffmani</i>	1	0.17%	Yes	Larva		4	UN
Tanytarsini	1	0.17%	No	Larva	Damaged	6	CF
<i>Tanytarsus</i> sp.	4	0.67%	Yes	Larva		6	CF
<i>Tribelos</i> sp.	13	2.19%	Yes	Larva		10	CG
<i>Tvetenia Bavarica</i> Gr.	22	3.71%	Yes	Larva		5	CG
	Sample Count	593					

Taxa Listing

Project ID: BWTF13GR2C
RAI No.: BWTF13GR2C004

RAI No.: BWTF13GR2C004 Sta. Name: SFWF Knaubs Rep Composite
Client ID: South Fork Composite
Date Coll.: 8/13/2013 No. Jars: 1 STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Other Non-Insect							
Acari	12	1.92%	No	Larva		5	PR
Nemata	3	0.48%	Yes	Unknown		5	UN
Lebertiidae							
<i>Lebertia</i> sp.	2	0.32%	Yes	Adult		8	PR
Protziidae							
<i>Protzia</i> sp.	1	0.16%	Yes	Adult		11	PR
Sperchontidae							
<i>Sperchon</i> sp.	7	1.12%	Yes	Adult		11	PR
Torrenticolidae							
<i>Torrenticola</i> sp.	169	27.08%	Yes	Adult		8	PR
Oligochaeta							
Enchytraeidae							
<i>Enchytraeus</i> sp.	1	0.16%	Yes	Unknown		4	CG
<i>Mesenchytraeus</i> sp.	61	9.78%	Yes	Unknown		4	CG
Naididae							
<i>Nais</i> sp.	9	1.44%	Yes	Unknown		8	CG
Ephemeroptera							
Ameletidae							
<i>Ameletus</i> sp.	2	0.32%	Yes	Larva		0	SC
Baetidae							
<i>Baetis</i> sp.	24	3.85%	No	Larva	Damaged	5	CG
<i>Baetis tricaudatus</i>	10	1.60%	Yes	Larva		4	CG
Ephemerellidae							
<i>Caudatella</i> sp.	1	0.16%	Yes	Larva	Early Instar	0	CG
<i>Drunella</i> sp.	6	0.96%	Yes	Larva	Early Instar	1	SC
<i>Drunella doddsii</i>	13	2.08%	Yes	Larva		1	SC
<i>Ephemerella tibialis</i>	10	1.60%	Yes	Larva		2	CG
Ephemerellidae	7	1.12%	No	Larva	Early Instar	1	CG
Heptageniidae							
<i>Cinygmula</i> sp.	3	0.48%	Yes	Larva		0	SC
<i>Epeorus</i> sp.	3	0.48%	No	Larva	Damaged	2	CG
<i>Epeorus longimanus</i>	2	0.32%	Yes	Larva		1	SC
Plecoptera							
Chloroperlidae							
<i>Sweltsa</i> sp.	2	0.32%	Yes	Larva		0	PR
Nemouridae							
<i>Zapada cinctipes</i>	1	0.16%	Yes	Larva		3	SH
Perlidae							
<i>Doroneuria</i> sp.	1	0.16%	Yes	Larva		0	PR
<i>Hesperoperla pacifica</i>	1	0.16%	Yes	Larva		1	PR
Pteronarcyidae							
<i>Pteronarcys californica</i>	1	0.16%	Yes	Larva		2	SH

Taxa Listing

Project ID: BWTF13GR2C
RAI No.: BWTF13GR2C004

RAI No.: BWTF13GR2C004 Sta. Name: SFWF Knaubs Rep Composite
Client ID: South Fork Composite
Date Coll.: 8/13/2013 No. Jars: 1 STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Trichoptera							
Trichoptera	1	0.16%	No	Pupa	Damaged	11	UN
Apataniidae							
<i>Apatania</i> sp.	2	0.32%	Yes	Larva		3	SC
Brachycentridae							
Brachycentridae	1	0.16%	No	Pupa		1	CF
<i>Brachycentrus americanus</i>	5	0.80%	Yes	Larva		1	CF
Hydropsychidae							
<i>Arctopsyche grandis</i>	8	1.28%	Yes	Larva		2	PR
Hydropsychidae	2	0.32%	No	Larva	Early Instar	4	CF
Rhyacophilidae							
<i>Rhyacophila</i> sp.	3	0.48%	Yes	Larva	Early Instar	1	PR
Coleoptera							
Elmidae							
<i>Optioservus</i> sp.	1	0.16%	Yes	Adult		5	SC
<i>Optioservus</i> sp.	1	0.16%	No	Larva		5	SC
Diptera							
Ceratopogonidae							
Ceratopogoninae	1	0.16%	Yes	Larva		6	PR
Empididae							
Empididae sp. (RAI Taxon # 0001)	1	0.16%	Yes	Larva		6	PR
Simuliidae							
<i>Simulium</i> sp.	30	4.81%	Yes	Larva		6	CF
<i>Simulium</i> sp.	4	0.64%	No	Pupa		6	CF
Tipulidae							
<i>Dicranota</i> sp.	1	0.16%	Yes	Larva		3	PR
<i>Hexatoma</i> sp.	3	0.48%	Yes	Larva		2	PR
Chironomidae							
Chironomidae							
<i>Chaetocladius</i> sp.	2	0.32%	Yes	Larva		6	CG
Chironomidae	12	1.92%	No	Pupa		10	CG
<i>Cricotopus (Nostococcladius)</i> sp.	1	0.16%	Yes	Larva		6	SH
<i>Cricotopus trifascia</i>	20	3.21%	Yes	Larva		7	SH
<i>Diamesa</i> sp.	2	0.32%	Yes	Larva		5	CG
Eukiefferiella Devonica Gr.	10	1.60%	Yes	Larva		8	CG
Eukiefferiella Gracei Gr.	19	3.04%	Yes	Larva		8	CG
<i>Hydrobaenus</i> sp.	13	2.08%	Yes	Larva		8	SC
<i>Micropsectra</i> sp.	4	0.64%	Yes	Larva		4	CG
<i>Orthocladus</i> sp.	35	5.61%	Yes	Larva		6	CG
<i>Pagastia</i> sp.	5	0.80%	Yes	Larva		1	CG
Potthastia Gaedii Gr.	3	0.48%	Yes	Larva		2	CG
<i>Rheocricotopus</i> sp.	32	5.13%	Yes	Larva		4	CG
<i>Stempellinella</i> sp.	14	2.24%	Yes	Larva		4	CG
<i>Sublettea coffmani</i>	1	0.16%	Yes	Larva		4	UN
<i>Tribelos</i> sp.	1	0.16%	Yes	Larva		10	CG
Tvetenia Bavarica Gr.	34	5.45%	Yes	Larva		5	CG

Taxa Listing

Project ID: BWTF13GR2C
RAI No.: BWTF13GR2C004

RAI No.: BWTF13GR2C004 Sta. Name: SFWF Knaubs Rep Composite
Client ID: South Fork Composite
Date Coll.: 8/13/2013 No. Jars: 1 STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Sample Count	624						

Metrics Report

Project ID: BWTF13GR2C
 RAI No.: BWTF13GR2C001
 Sta. Name: SFWF Ousel Bridge Composite
 Client ID: Ousel Composite
 STORET ID
 Coll. Date: 8/13/2013

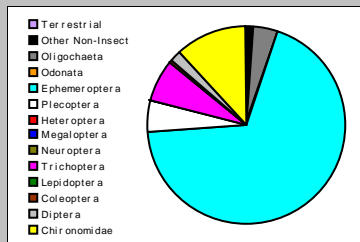
Abundance Measures

Sample Count: 629
 Sample Abundance: 1,715.45 36.67% of sample used

Coll. Procedure: KICK
 Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Terrestrial			
Other Non-Insect	2	8	1.27%
Oligochaeta	1	25	3.97%
Odonata			
Ephemeroptera	14	430	68.36%
Plecoptera	6	33	5.25%
Heteroptera			
Megaloptera			
Neuroptera			
Trichoptera	9	45	7.15%
Lepidoptera			
Coleoptera	2	3	0.48%
Diptera	3	10	1.59%
Chironomidae	10	75	11.92%

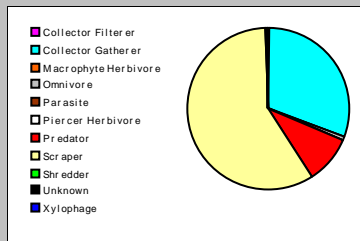


Dominant Taxa

Category	A	PRA
Epeorus longimanus	146	23.21%
Cinyamula	82	13.04%
Epeorus deceptivus	52	8.27%
Ephemerella tibialis	50	7.95%
Baetis tricaudatus	28	4.45%
Mesenchytraeus	25	3.97%
Apatania	25	3.97%
Drunella doddsii	20	3.18%
Rhithrogena	16	2.54%
Stempellinella	15	2.38%
Rheocricotopus	14	2.23%
Orthocladius	11	1.75%
Megarcys	11	1.75%
Ameletus	11	1.75%
Sweltsa	10	1.59%

Functional Composition

Category	R	A	PRA
Predator	12	57	9.06%
Parasite			
Collector Gatherer	17	192	30.52%
Collector Filterer	1	2	0.32%
Macrophyte Herbivore			
Piercer Herbivore			
Xylophage			
Scraper	13	369	58.66%
Shredder	3	3	0.48%
Omnivore	1	6	0.95%
Unknown			

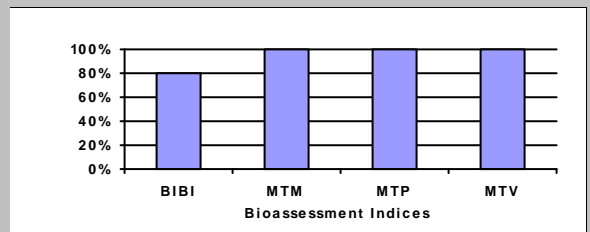


Metric Values and Scores

Metric	Value
<i>Composition</i>	
Taxa Richness	47
E Richness	14
P Richness	6
T Richness	9
EPT Richness	29
EPT Percent	80.76%
All Non-Insect Abundance	33
All Non-Insect Richness	3
All Non-Insect Percent	5.25%
Oligochaeta+Hirudinea Percent	3.97%
Baetidae/Ephemeroptera	0.109
Hydropsychidae/Trichoptera	0.022
<i>Dominance</i>	
Dominant Taxon Percent	23.21%
Dominant Taxa (2) Percent	36.25%
Dominant Taxa (3) Percent	44.52%
Dominant Taxa (10) Percent	72.97%
<i>Diversity</i>	
Shannon H (loge)	2.895
Shannon H (log2)	4.176
Margalef D	7.165
Simpson D	0.097
Evenness	0.049
<i>Function</i>	
Predator Richness	12
Predator Percent	9.06%
Filterer Richness	1
Filterer Percent	0.32%
Collector Percent	30.84%
Scraper+Shredder Percent	59.14%
Scraper/Filterer	184.500
Scraper/Scraper+Filterer	0.995
<i>Habit</i>	
Burrower Richness	1
Burrower Percent	1.11%
Swimmer Richness	5
Swimmer Percent	9.22%
Clinger Richness	26
Clinger Percent	72.02%
<i>Characteristics</i>	
Cold Stenotherm Richness	8
Cold Stenotherm Percent	17.97%
Hemoglobin Bearer Richness	
Hemoglobin Bearer Percent	
Air Breather Richness	1
Air Breather Percent	1.11%
<i>Volturnism</i>	
Univoltine Richness	26
Semivoltine Richness	4
Multivoltine Percent	20.67%
<i>Tolerance</i>	
Sediment Tolerant Richness	1
Sediment Tolerant Percent	1.11%
Sediment Sensitive Richness	2
Sediment Sensitive Percent	0.32%
Metals Tolerance Index	1.127
Pollution Sensitive Richness	9
Pollution Tolerant Percent	0.16%
Hilsenhoff Biotic Index	1.854
Intolerant Percent	71.70%
Supertolerant Percent	3.66%
CTQa	60.667

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	40	80.00%	
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



Metrics Report

Project ID: BWTF13GR2C
 RAI No.: BWTF13GR2C002
 Sta. Name: SFWF Aspen Bridge Composite
 Client ID: Down Fire Composite
 STORET ID
 Coll. Date: 8/13/2013

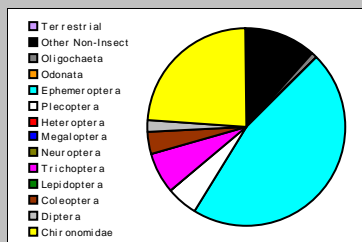
Abundance Measures

Sample Count: 500
 Sample Abundance: 500.00 100.00% of sample used

Coll. Procedure: KICK
 Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Terrestrial			
Other Non-Insect	6	58	11.60%
Oligochaeta	1	6	1.20%
Odonata			
Ephemeroptera	12	229	45.80%
Plecoptera	6	25	5.00%
Heteroptera			
Megaloptera			
Neuroptera			
Trichoptera	5	33	6.60%
Lepidoptera			
Coleoptera	1	18	3.60%
Diptera	5	12	2.40%
Chironomidae	17	119	23.80%

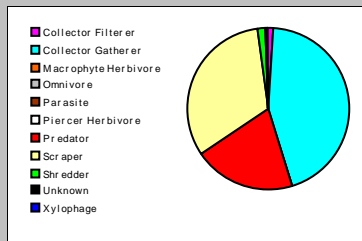


Dominant Taxa

Category	A	PRA
Drunella	71	14.20%
Torrenticola	37	7.40%
Ephemerella tibialis	27	5.40%
Orthocladius	25	5.00%
Cinyamula	25	5.00%
Baetis tricaudatus	22	4.40%
Drunella doddsii	19	3.80%
Sweltsa	18	3.60%
Paqastia	17	3.40%
Epeorus	17	3.40%
Baetis flavistriga	17	3.40%
Apatania	17	3.40%
Heterolimnius corpulentus	16	3.20%
Eukiefferiella Gracei Gr.	15	3.00%
Rheocricotopus	13	2.60%

Functional Composition

Category	R	A	PRA
Predator	17	100	20.00%
Parasite			
Collector Gatherer	19	220	44.00%
Collector Filterer	1	6	1.20%
Macrophyte Herbivore			
Piercer Herbivore			
Xylophage			
Scraper	10	164	32.80%
Shredder	5	8	1.60%
Omnivore			
Unknown	1	2	0.40%

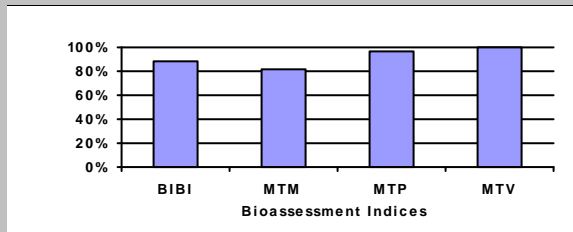


Metric Values and Scores

Metric	Value
<i>Composition</i>	
Taxa Richness	53
E Richness	12
P Richness	6
T Richness	5
EPT Richness	23
EPT Percent	57.40%
All Non-Insect Abundance	64
All Non-Insect Richness	7
All Non-Insect Percent	12.80%
Oligochaeta+Hirudinea Percent	1.20%
Baetidae/Ephemeroptera	0.188
Hydropsychidae/Trichoptera	0.091
<i>Dominance</i>	
Dominant Taxon Percent	14.20%
Dominant Taxa (2) Percent	21.60%
Dominant Taxa (3) Percent	27.00%
Dominant Taxa (10) Percent	55.60%
<i>Diversity</i>	
Shannon H (loge)	3.343
Shannon H (log2)	4.822
Margalef D	8.452
Simpson D	0.051
Evenness	0.035
<i>Function</i>	
Predator Richness	17
Predator Percent	20.00%
Filterer Richness	1
Filterer Percent	1.20%
Collector Percent	45.20%
Scraper+Shredder Percent	34.40%
Scraper/Filterer	27.333
Scraper/Scraper+Filterer	0.965
<i>Habit</i>	
Burrower Richness	3
Burrower Percent	2.20%
Swimmer Richness	4
Swimmer Percent	9.80%
Clinger Richness	22
Clinger Percent	52.40%
<i>Characteristics</i>	
Cold Stenotherm Richness	5
Cold Stenotherm Percent	8.80%
Hemoglobin Bearer Richness	2
Hemoglobin Bearer Percent	1.40%
Air Breather Richness	2
Air Breather Percent	1.00%
<i>Voltinism</i>	
Univoltine Richness	22
Semivoltine Richness	4
Multivoltine Percent	43.80%
<i>Tolerance</i>	
Sediment Tolerant Richness	2
Sediment Tolerant Percent	1.00%
Sediment Sensitive Richness	1
Sediment Sensitive Percent	0.40%
Metals Tolerance Index	2.929
Pollution Sensitive Richness	5
Pollution Tolerant Percent	0.00%
Hilsenhoff Biotic Index	3.272
Intolerant Percent	49.00%
Supertolerant Percent	16.00%
CTQa	70.100

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	44	88.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	29	96.67%	None
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	18	100.00%	None
MTM	Montana DEQ Mountains (Bukantis 1998)	17	80.95%	Slight



Metrics Report

Project ID: BWTF13GR2C
 RAI No.: BWTF13GR2C003
 Sta. Name: SFWF American Bank Composite
 Client ID: Down Golf Composite
 STORET ID
 Coll. Date: 8/13/2013

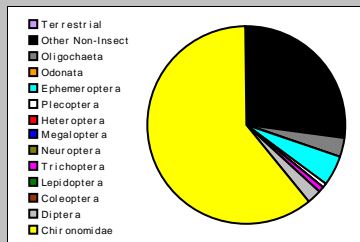
Abundance Measures

Sample Count: 593
 Sample Abundance: 8,895.00 6.67% of sample used

Coll. Procedure: KICK
 Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Terrestrial			
Other Non-Insect	4	162	27.32%
Oligochaeta	2	18	3.04%
Odonata			
Ephemeroptera	4	30	5.06%
Plecoptera	2	2	0.34%
Heteroptera			
Megaloptera			
Neuroptera			
Trichoptera	3	6	1.01%
Lepidoptera			
Coleoptera	1	1	0.17%
Diptera	8	11	1.85%
Chironomidae	17	363	61.21%

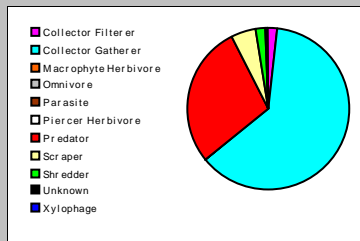


Dominant Taxa

Category	A	PRA
Orthocladius	152	25.63%
Torrenticola	150	25.30%
Rheocricotopus	57	9.61%
Stempellinella	48	8.09%
Tvetenia Bavarica Gr.	22	3.71%
Tribelos	13	2.19%
Mesenchytraeus	12	2.02%
Micropsectra	11	1.85%
Hydrobaenus	11	1.85%
Ephemerella	10	1.69%
Chironomidae	10	1.69%
Paqastia	8	1.35%
Drunella	8	1.35%
Sperchon	7	1.18%
Pothastia Gaedii Gr.	7	1.18%

Functional Composition

Category	R	A	PRA
Predator	12	170	28.67%
Parasite			
Collector Gatherer	17	367	61.89%
Collector Filterer	3	12	2.02%
Macrophyte Herbivore			
Piercer Herbivore			
Xylophage			
Scraper	3	30	5.06%
Shredder	4	11	1.85%
Omnivore			
Unknown	2	3	0.51%

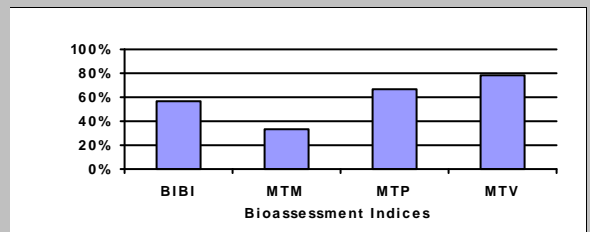


Metric Values and Scores

Metric	Value
<i>Composition</i>	
Taxa Richness	41
E Richness	4
P Richness	2
T Richness	3
EPT Richness	9
EPT Percent	6.41%
All Non-Insect Abundance	180
All Non-Insect Richness	6
All Non-Insect Percent	30.35%
Oligochaeta+Hirudinea Percent	3.04%
Baetidae/Ephemeroptera	0.367
Hydropsychidae/Trichoptera	0.333
<i>Dominance</i>	
Dominant Taxon Percent	25.63%
Dominant Taxa (2) Percent	50.93%
Dominant Taxa (3) Percent	60.54%
Dominant Taxa (10) Percent	81.96%
<i>Diversity</i>	
Shannon H (loge)	2.373
Shannon H (log2)	3.423
Margalef D	6.316
Simpson D	0.164
Evenness	0.067
<i>Function</i>	
Predator Richness	12
Predator Percent	28.67%
Filterer Richness	3
Filterer Percent	2.02%
Collector Percent	63.91%
Scraper+Shredder Percent	6.91%
Scraper/Filterer	2.500
Scraper/Scraper+Filterer	0.714
<i>Habit</i>	
Burrower Richness	5
Burrower Percent	3.54%
Swimmer Richness	3
Swimmer Percent	2.02%
Clinger Richness	10
Clinger Percent	7.76%
<i>Characteristics</i>	
Cold Stenotherm Richness	2
Cold Stenotherm Percent	1.01%
Hemoglobin Bearer Richness	2
Hemoglobin Bearer Percent	2.36%
Air Breather Richness	3
Air Breather Percent	0.51%
<i>Voltinism</i>	
Univoltine Richness	14
Semivoltine Richness	3
Multivoltine Percent	90.39%
<i>Tolerance</i>	
Sediment Tolerant Richness	1
Sediment Tolerant Percent	0.17%
Sediment Sensitive Richness	2
Sediment Sensitive Percent	1.18%
Metals Tolerance Index	4.912
Pollution Sensitive Richness	3
Pollution Tolerant Percent	0.17%
Hilsenhoff Biotic Index	5.894
Intolerant Percent	7.08%
Supertolerant Percent	33.05%
CTQa	87.806

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	28	56.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	20	66.67%	Slight
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	14	77.78%	Slight
MTM	Montana DEQ Mountains (Bukantis 1998)	7	33.33%	Moderate



Metrics Report

Project ID: BWTF13GR2C
 RAI No.: BWTF13GR2C004
 Sta. Name: SFWF Knaubs Rep Composite
 Client ID: South Fork Composite
 STORET ID
 Coll. Date: 8/13/2013

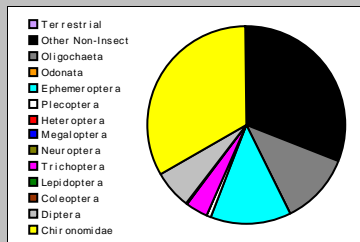
Abundance Measures

Sample Count: 624
 Sample Abundance: 6,240.00 10.00% of sample used

Coll. Procedure: KICK
 Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Terrestrial			
Other Non-Insect	5	194	31.09%
Oligochaeta	3	71	11.38%
Odonata			
Ephemeroptera	8	81	12.98%
Plecoptera	5	6	0.96%
Heteroptera			
Megaloptera			
Neuroptera			
Trichoptera	4	22	3.53%
Lepidoptera			
Coleoptera	1	2	0.32%
Diptera	5	40	6.41%
Chironomidae	16	208	33.33%

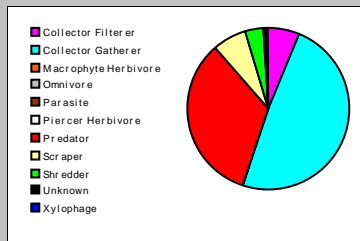


Dominant Taxa

Category	A	PRA
Torrenicola	169	27.08%
Mesenchytraeus	61	9.78%
Orthocladus	35	5.61%
Tvetenia Bavarica Gr.	34	5.45%
Simulium	34	5.45%
Rheocricotopus	32	5.13%
Baetis	24	3.85%
Cricotopus trifascia	20	3.21%
Eukiefferiella Gracei Gr.	19	3.04%
Stempellinella	14	2.24%
Hydrobaenus	13	2.08%
Drunella doddsii	13	2.08%
Chironomidae	12	1.92%
Acari	12	1.92%
Eukiefferiella Devonica Gr.	10	1.60%

Functional Composition

Category	R	A	PRA
Predator	13	212	33.97%
Parasite			
Collector Gatherer	18	299	47.92%
Collector Filterer	2	42	6.73%
Macrophyte Herbivore			
Piercer Herbivore			
Xylophage			
Scraper	8	43	6.89%
Shredder	4	23	3.69%
Omnivore			
Unknown	2	5	0.80%



Metric Values and Scores

Metric	Value
<i>Composition</i>	
Taxa Richness	47
E Richness	8
P Richness	5
T Richness	4
EPT Richness	17
EPT Percent	17.47%
All Non-Insect Abundance	265
All Non-Insect Richness	8
All Non-Insect Percent	42.47%
Oligochaeta+Hirudinea Percent	11.38%
Baetidae/Ephemeroptera	0.420
Hydropsychidae/Trichoptera	0.455
<i>Dominance</i>	
Dominant Taxon Percent	27.08%
Dominant Taxa (2) Percent	36.86%
Dominant Taxa (3) Percent	42.47%
Dominant Taxa (10) Percent	70.83%
<i>Diversity</i>	
Shannon H (loge)	2.782
Shannon H (log2)	4.013
Margalef D	7.276
Simpson D	0.123
Evenness	0.052
<i>Function</i>	
Predator Richness	13
Predator Percent	33.97%
Filterer Richness	2
Filterer Percent	6.73%
Collector Percent	54.65%
Scraper+Shredder Percent	10.58%
Scraper/Filterer	1.024
Scraper/Scraper+Filterer	0.506
<i>Habit</i>	
Burrower Richness	3
Burrower Percent	0.80%
Swimmer Richness	2
Swimmer Percent	5.77%
Clinger Richness	18
Clinger Percent	20.99%
<i>Characteristics</i>	
Cold Stenotherm Richness	5
Cold Stenotherm Percent	2.88%
Hemoglobin Bearer Richness	1
Hemoglobin Bearer Percent	0.16%
Air Breather Richness	2
Air Breather Percent	0.64%
<i>Voltinism</i>	
Univoltine Richness	19
Semivoltine Richness	6
Multivoltine Percent	69.87%
<i>Tolerance</i>	
Sediment Tolerant Richness	2
Sediment Tolerant Percent	0.64%
Sediment Sensitive Richness	2
Sediment Sensitive Percent	1.44%
Metals Tolerance Index	4.170
Pollution Sensitive Richness	6
Pollution Tolerant Percent	0.32%
Hilsenhoff Biotic Index	5.668
Intolerant Percent	12.82%
Supertolerant Percent	37.66%
CTQa	72.500

Bioassessment Indices

BiolIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	40	80.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	23	76.67%	Slight
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	16	88.89%	None
MTM	Montana DEQ Mountains (Bukantis 1998)	10	47.62%	Moderate

