AQUATIC INVERTEBRATE ASSEMBLAGES AND BIOLOGICAL ASSESSMENT OF STREAM SITES IN THE CITY OF BELLEVUE, WASHINGTON:

2015

Report to the City of Bellevue, Washington
Utilities Department
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INTRODUCTION

This report summarizes and interprets aquatic macroinvertebrate data collected in July and August 2015 at stream sites in the City of Bellevue, King County, Washington. As with the projects completed in prior years, the objectives of this study include using the invertebrate biota to detect impairment to biological health, using 2 assessment tools: a multimetric index (B-IBI – the Benthic Index of Biological Integrity) and a predictive model (RIVPACS – the River InVertebrate Prediction and Classification System). The 10 B-IBI metrics and index scores were calibrated for streams of the Pacific Northwest and obtained from the Puget Sound Stream Benthos website (pugetsoundstreambenthos.org), using the revised version based on continuous scoring (0-100). The RIVPACS model was developed by the Washington Department of Ecology (WDOE). RIVPACS compares the occurrence of taxa at a site with the taxa expected at a similar site with minimal human influence, and yields a score that summarizes the comparison. These assessment tools provide a summary score of biological condition, and the B-IBI can be translated into biological health condition classes (i.e., excellent, good, fair, poor, and very poor) based on ranking criteria used by King County and other agencies and organizations in the Puget Sound region.

In addition, this report identifies probable stressors that may account for diminished stream health in site-specific narrative summaries. These summaries are based on the demonstrated and expected associations between patterns of response of B-IBI metrics and other metric expressions, as well as the taxonomic and functional composition of the benthic assemblages. The analysis examines common stressors associated with urbanization: water quality degradation (including metals contamination), changes to natural thermal regimes, loss and impairment of instream habitats due to sediment deposition and altered flow regimes, and disturbance to reach-scale and in-stream habitat features such as stream banks, channel morphology, and riparian zone integrity.

METHODS

Sampling

The City of Bellevue provided oversight for the collection of 7 aquatic invertebrate samples from 5 sites. Three replicate samples were collected at Coal Creek Metro Access. Single collections were made at the other 4 sites. Samples were processed and invertebrates identified by Rhithron Associates, Missoula, Montana.

Sample processing

In the laboratory, standard sorting protocols were applied to achieve representative subsamples of aquatic 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 10x30x magnification. A minimum of 500 organisms were sorted from the substrate: all aquatic invertebrates from each selected grid were sorted, and placed in ethanol for subsequent identification. The final selected 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 target taxonomic levels consistent with protocols for Puget Sound Lowlands streams, using appropriate published taxonomic references and keys. Midges (Diptera: Chironomidae) were identified to genus/species group/species and Oligochaetes were identified to genus/species. 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 and worms 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 with Hoffman contrast. Slide mounted organisms were archived at the Rhithron laboratory.

Quality assurance (QA)/ quality control (QC) procedures

Quality control procedures for initial sample processing and subsampling involved checking sorting efficiency (*SE*). An independent observer microscopically re-examined 100% of the sorted substrate from a randomly selected sample, representing 14.3% of total samples. 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:

$$SE = [n_1/(n_1 + n_2)] \; X \; 100$$

where: *SE* is the sorting efficiency, expressed as a percentage, n_1 is the total number of specimens in the first sort, and n_2 is the total number of specimens in the second sort. Target efficiency for these samples was 90%.

Quality assurance 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 the Percent Taxonomic Difference (PTD), the Percent Difference in Enumeration (PDE), and a Bray-Curtis similarity statistic (Bray and Curtis 1957) for each selected

sample. Internal data quality targets for these parameters are: PTD ≤5%, PDE ≤5%, and Bray-Curtis similarity X 100 ≥95%. 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

B-IBI metrics and scores were obtained from the Puget Sound Stream Benthos (PSSB) website, using the updated version (accessed in May 2016), scaled continuously between 0 and 100. RIVPACS scores were obtained by entering data into a web-based application maintained by the Utah State University's Western Center for Monitoring and Assessment of Freshwater Ecosystems. Related applications on this website produce a taxa list from each sample by a random re-sampling routine that standardizes sample sizes. Some taxa are excluded from the analysis. Output from the RIVPACS applications provide a RIVPACS score for each replicate.

Metric and taxonomic signals for water quality (including the presence of possible metals contamination), thermal condition, sediment deposition and habitat indicators were investigated and described in narrative interpretations. These interpretations of the taxonomic and functional composition of 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 and professional judgment, and those of other expert sources (e.g. Wisseman 1998). Often canonical procedures are used for stressor identification; however, the substantial data required for such procedures (e.g., surveys of habitat, historical and current data related to water quality, land use, point and non-point source influences, soils, hydrology, geology) 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. To arrive at impairment hypotheses, attributes are considered individually, so information is maximized by not relying on a single cumulative score, which may mask stress on the biota. When replicate samples were collected, data were combined for the narrative analyses.

Mayfly taxa richness, the Hilsenhoff Biotic Index (HBI) value (Hilsenhoff 1987), the richness and abundance of hemoglobin-bearing taxa and the richness of sensitive taxa are often used as indicators of water quality. 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 HBI has a long history of use and validation (Cairns and Pratt 1993, Smith and Tran 2010, Johnson and Ringler 2014). The index uses the relative abundance of taxa and the tolerance values associated with them to calculate a score

representative of the tolerance of a benthic invertebrate assemblage. Higher HBI scores indicate more tolerant assemblages. In one study, the HBI was demonstrated to be significantly associated with conductivity, pH, water temperature, sediment deposition, and the presence of filamentous algae (Bollman 1998). Nutrient enrichment often results in large crops of filamentous algae (Watson 1988). Thus in these samples, when macroinvertebrates associated or dependent on filamentous algae (e.g. LeSage and Harrison 1980, Anderson 1976) are abundant, the presence of filamentous algae and nutrient enrichment are also suspected. In addition, low oxygen concentrations are often a result of nutrient enrichment in situations where enrichment has encouraged excessive plant growth; nocturnal respiration by these plants creates hypoxic conditions. Hemoglobin-bearing taxa are very tolerant of environments with low oxygen concentrations, because the hemoglobin in their circulating fluids enables them to carry more oxygen than organisms without it. Finally, sensitive taxa exhibit intolerance to a wide range of stressors (e.g. Wisseman 1996, Hellawell 1986, Barbour et al. 1999), including nutrient enrichment, acidification, thermal stress, sediment deposition, habitat disruption, and other causes of degraded ecosystem health. These taxa are expected to be present in predictable numbers in well-functioning streams.

The absence of invertebrate groups known to be sensitive to metals and the Metals Tolerance Index (MTI, McGuire 1998) are considered signals of possible metals contamination. Metals sensitivity for some groups, especially the heptageniid mayflies, is well-known (e.g. Kiffney and Clements 1994, Clements 1999, Clements 2004, Montz et al. 2010, Iwasaki et al. 2013). In the present approach, the absence of these groups in environs where they are typically expected to occur is considered a signal of possible metals contamination, especially when these signals are combined with a measure of overall assemblage tolerance of metals. The MTI ranks taxa according to their sensitivity to metals. Weighting taxa by their abundance in a sample, assemblage tolerance is estimated by averaging the tolerance of all sampled individuals. Higher values for the MTI indicate assemblages with greater tolerance to metals contamination.

Thermal characteristics of the sampled site are predicted by the richness and abundance of cold stenotherm taxa (Clark 1997), which require low water temperatures, and by calculation of the predicted temperature preference of the macroinvertebrate assemblage (Brandt 2001). Hemoglobin-bearing taxa are also indicators of warm water temperatures (Walshe 1947), because dissolved oxygen is directly associated with water temperature (colder water can hold more dissolved oxygen); 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.

Stress from sediment is evaluated by caddisfly richness and by “clinger” richness (Kleindl 1995, Bollman 1998, Karr and Chu 1999, Wagenhoff et al. 2012, Leitner et al. 2015). The Fine Sediment Biotic Index (FSBI) (Relyea et al. 2001) is also used. Similar to the HBI, tolerance values are assigned to taxa based on the substrate particle sizes with which the taxa are most frequently associated. Scores are determined by weighting these tolerance values by the relative abundance of taxa in a sample. Higher values of the FSBI indicate assemblages with greater fine

sediment sensitivity. However, it appears that FSBI values may be influenced by the presence of other deposited material, such as large organic material, including leaves and woody debris.

Functional characteristics of the macroinvertebrate assemblages may also reveal the condition of instream and streamside habitats. Alterations from predicted patterns of the functional characteristics may be interpreted as evidence of water quality or habitat disruption. Predicted patterns 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. For example, the abundance of stonefly predators is likely to be related to the diversity of invertebrate prey species, and thus the complexity of instream habitats. Sites with fewer than expected stonefly species are likely to have reduced habitat complexity. Also, the absence of long-lived species (those that take 2 years to mature in the stream) is likely related to catastrophes like periodic scour, thermal stress or toxic pollutants that could interrupt long life cycles. In addition, shredders and the microbes they depend on are sensitive to modifications of the riparian zone vegetation (Plafkin et al. 1989).

RESULTS

Quality Control Procedures

Sorting efficiency for the randomly-selected quality control samples was 99.63%. PDE was (0.10%), PTD (0.41%), and Bray-Curtis similarity was 99.70%. All QC parameters met Rhithron's internal quality criteria (Rhithron Associates 2013), and were all well within industry standards for sorting and taxonomic data quality (Stribling et al. 2003).

Data analysis

Taxa lists and counts, and values and scores for standard bioassessment metrics for composited replicate samples are given in the Appendix. Table 1 summarizes B-IBI and RIVPACS scores for sites and for sample replicates.

Site B-IBI scores varied from 12.5 to 43.6 for City of Bellevue samples collected in 2015. These scores indicated "very poor" conditions for 3 sites (West Trib (Kelsey Farm, Restored Reach), Kelsey Trestle and Kelsey Glendale "Wooded"), "poor" conditions for one site (Coal Creek Metro Access) and "fair" conditions for one site (Coal Creek Cindermines). B-IBI site scores are graphed in Figure 1. The site score for one site, Coal Creek Metro Access, was determined by scoring the composite sample, which was made by combining the 3 replicates.

Table 1. B-IBI scores and RIVPACS scores for replicates and for sites. The B-IBI site score and the RIVPACs site score for the Coal Creek Metro Access site, from which 3 replicates were collected, were obtained by scoring the composited replicates. All B-IBI scores were calculated by the PSSB website database application. City of Bellevue, 2016.

Station name	Bellevue site ID	PSSB site ID	B-IBI Scores		RIVPACS Scores	
			Replicate	Site (composite)	Replicate	Site (composite)
Coal Creek Cindermines	CoalBelRM4.0	CoalBelRM4.0_2015R1	**43.6**		**0.79**	
Coal Creek Metro Access Rep 1	CoalBelRM1.8	CoalBelRM1.8_2015R1	**10.8**	**26.5**	**0.78**	**0.86**
Coal Creek Metro Access Rep 2	CoalBelRM1.8	CoalBelRM1.8_2015R2	**15.5**		**1.02**	
Coal Creek Metro Access Rep 3	CoalBelRM1.8	CoalBelRM1.8_2015R3	**19.0**		**0.78**	
West Trib (Kelsey Farm, Restored Reach)	WestTribFarmRM0.4	WestTribFarmRM0.4_2015R1	**14.6**		**0.55**	
Kelsey Trestle	KelBelRM0.2	KelBelRM0.2_2015R1	**17.3**		**0.56**	
Kelsey Glendale "Wooded"	KelBelRM1.8	KelBelRM1.8_2015R1	**12.5**		**0.55**	

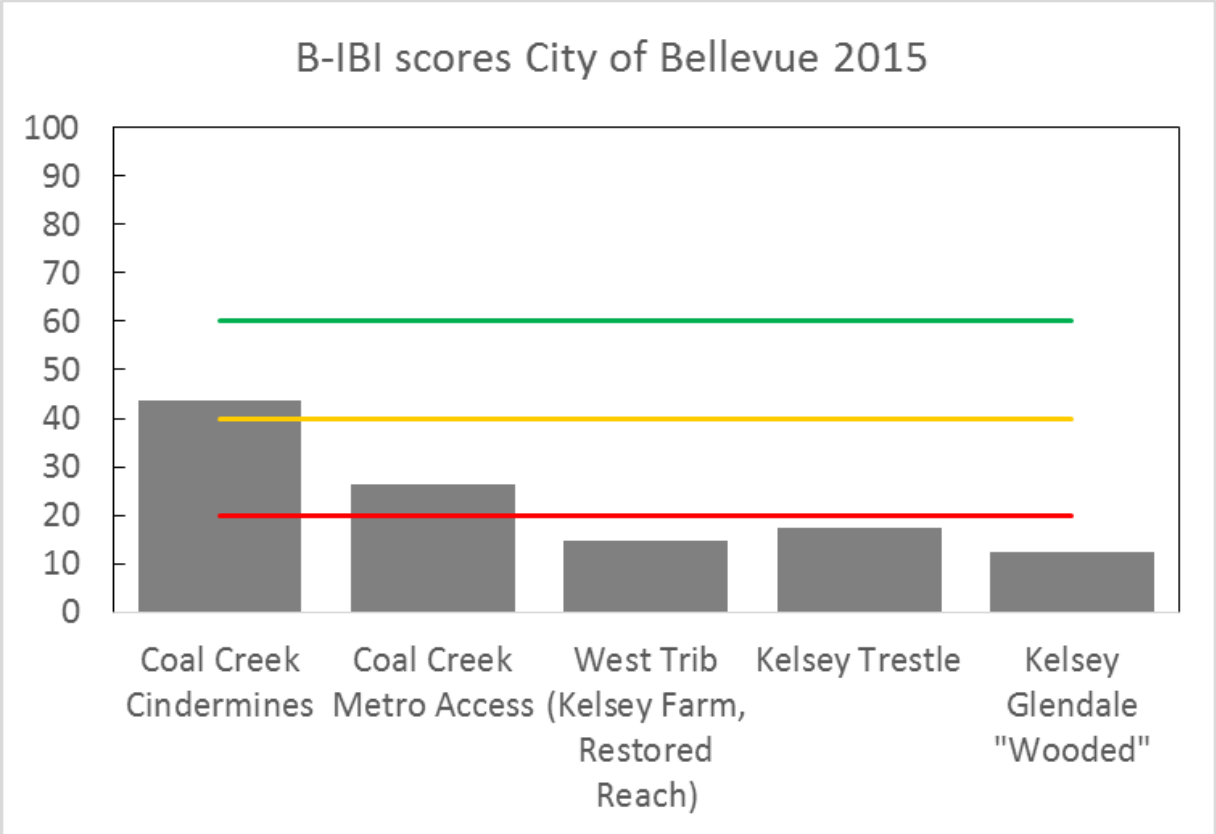


Figure 1. B-IBI site scores for stream sites in the City of Bellevue, 2015. The green line indicates the threshold (B-IBI = 60) for "good" conditions, as described on the Puget Sound Stream Benthos website (pugetsoundstreambenthos.org, accessed May 2016) for scoring using a 0-100 continuous scale. Scores below the threshold indicate impaired conditions. The yellow line is the threshold (B-IBI = 40) for "fair" conditions; scores falling below the threshold indicate "poor" conditions. Scores falling below the red line (B-IBI = 20) indicate "very poor" conditions.

RIVPACS site scores varied from 0.55 to 0.86. These scores indicated impaired biological conditions in 2015 for 3 of the 5 sites. RIVPACS scores of 0.86 and 0.79 indicated "unimpaired" conditions at two sites (Coal Creek Cindermines and Coal Creek Metro Access). The RIVPACS site score at Coal Creek Metro Access was obtained by scoring composited replicates. Site scores are graphed in Figure 2.

B-IBI site scores and RIVPACS site scores for the 5 locations in this study were not significantly correlated with each other ($r = 0.7835$, $p = 0.1169$). Figure 3 illustrates this relationship.

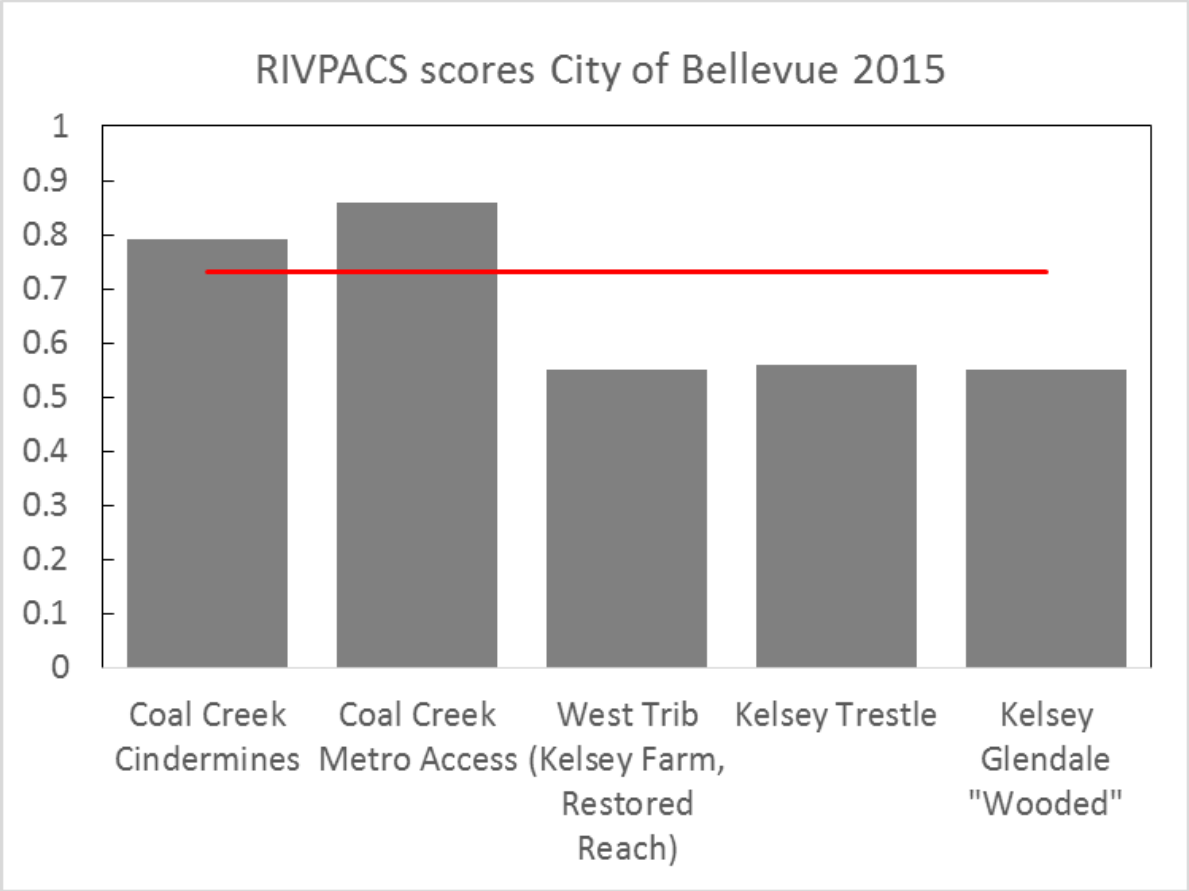


Figure 2. RIVPACS site scores for stream sites in the City of Bellevue, 2015. The red line indicates the threshold (RIVPACS = 0.73) for "unimpaired" conditions, set by WDOE. Scores below the threshold indicate impaired conditions.

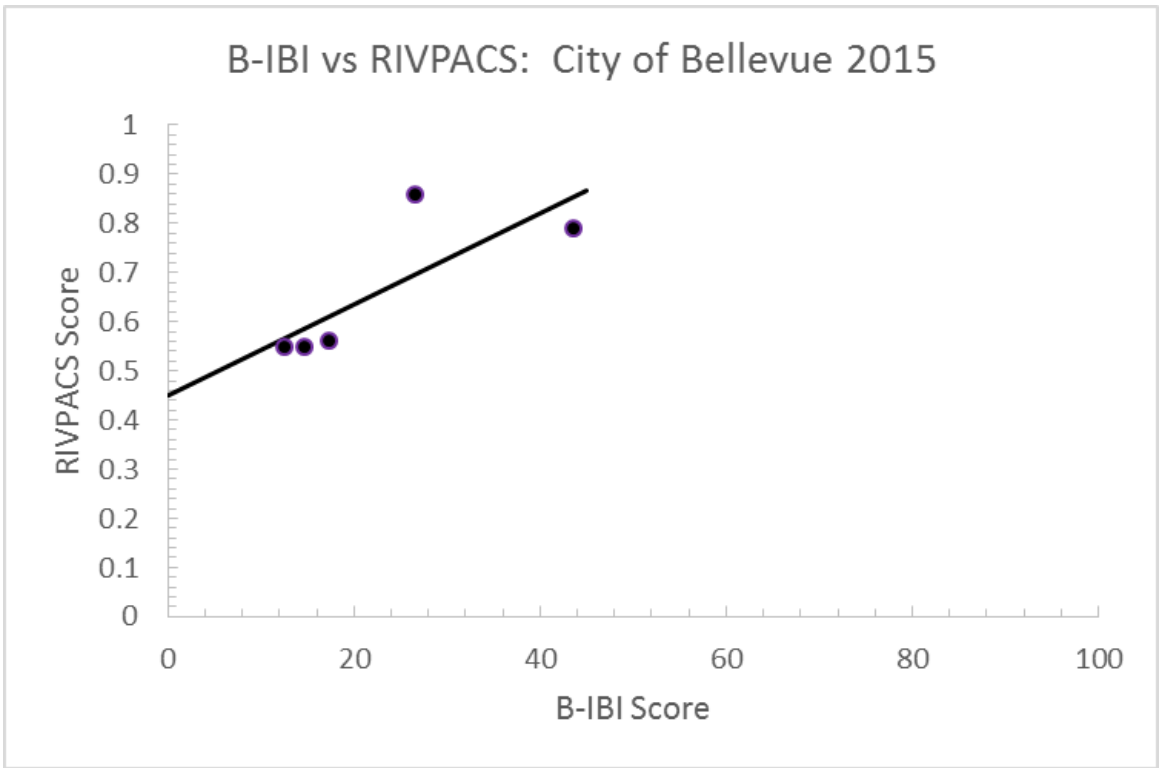


Figure 3. Correlation between B-IBI site scores and RIVPACS site scores for locations in the City of Bellevue, 2015. The relationship was not significant (r= 0.7835, p = 0.1169).

Characteristics of the aquatic invertebrate assemblages

Coal Creek Cindermines

- **Bioassessment scores: 2015**

The B-IBI site score (43.6) indicated "fair" biological condition. The mean RIVPACS score (0.79) indicated unimpaired conditions.

- **Indicators of ecological condition: 2015**

a. Water quality

Four mayfly taxa were found in the sample *(Baetis tricaudatus* complex, *Diphetor hageni*, *Cinygma* sp., and *Paraleptophlebia* sp.). Only *B. tricaudatus* (1.8%) and *D. hageni* (3.9%) were common and the other two taxa were represented by only 4 specimens. The biotic index value (4.19) was the lowest of any site sampled in 2015, but it was elevated above expectations for a Puget Sound Lowlands stream indicating an assemblage that was somewhat tolerant of organic pollution. The functional composition of the assemblage was strongly dominated by collector filterers (52.2%), primarily the filtering caddisfly *Hydropsyche* sp. (50.9%), the dominant organism in the sample. In addition, the hemoglobin-bearing midge, *Polypedilum* sp. (1.3%), was common perhaps indicating hypoxic sediments. This pattern is sometimes interpreted as evidence of water quality impairment perhaps through nutrient enrichment. Although pollution tolerant organisms accounted for only 0.2% of the fauna, only 2 pollution-sensitive taxa were collected (the mayfly *Cinygma* sp. and the stonefly Leuctridae) and they were represented by only 3 individuals. The MTI value (3.83) was lower than the biotic index value, thus there was little evidence for metals contamination. Most characteristics suggest that slight water quality impairment cannot be ruled out here.

b. Thermal condition

Two cold stenotherm taxa (*Cinygma sp.* and Leuctridae)*,* were detected in the samples, but they accounted for only 0.6% of the sampled individuals. The thermal preference estimated for the assemblage was 14.3°C.

c. Sediment deposition

Twenty "clinger" and 4 caddisfly taxa were collected in these samples, thus it seems likely that colonization was not appreciably limited by fine sediment. An FSBI value of 4.68 indicated a moderately sediment-tolerant assemblage.

d. Habitat diversity and integrity

Taxa richness (41) was high suggesting that habitats were diverse and fairly well intact. There were 5 stonefly taxa collected, 2 of which were common (*Zapada cinctipes* (7.0%) and *Skwala* sp. (1.7%)), thus reach-scale habitat features were probably undisrupted. The collection of 6 semi-voltine taxa makes it seems likely that this site was not subjected to thermal stress, toxic pollutants or other catastrophes that would interrupt long life cycles. All the functional-feeding groups were well represented and gatherers (22.7%) and filterers (52.2%) dominated the functional mix indicating the importance of fine particulate organic matter to the food web in this reach. Inputs from stream-side vegetation were probably important to the food web as well because shredders (11.2%), including the nemourid *Z. cinctipes* (7.0%), were also abundant.

Coal Creek Metro Access (replicates)

- **Bioassessment scores: 2015**

Three replicate samples were collected at this site in 2015 and this analysis is based on scores calculated from composited replicates. The B-IBI site score for this site was 26.5, indicating "poor" conditions. The mean RIVPACS result over the 3 replicates (0.86) indicated “unimpaired” conditions.

- **Indicators of ecological condition: 2015**

Discussion of the indicators of ecological condition are based on a composite of the 3 replicate samples that were collected at this site in 2015. Since a total of 1570 invertebrates were represented, the results of richness metrics usually cannot be compared directly to results from sites where only a single sample was collected. Only in the cases where richness metrics were particularly low (e.g., mayflies, see below) are the comparisons with other sites meaningful.

a. Water quality

A single mayfly taxon, the ubiquitous *Baetis tricaudatus*, was very abundant at this site (358 specimens and 22.8% of the fauna). This low species richness is particularly telling because the composite sample contained over 1500 individuals. The biotic index value (4.97) was elevated above expectations indicating an assemblage that was moderately tolerant of organic pollution. Collector-filterers (55.1%) dominated the functional mix and were represented by the dominant organism in the sample, *Simulium* sp. (37.8%) and the caddisfly *Hydropsyche* sp. (17.2%). The combination of low mayfly taxa richness, an elevated biotic index, and dominance of collector-filterers suggest that water quality was impaired, perhaps by nutrient enrichment. No pollution sensitive taxa were collected, but pollution tolerant taxa (0.6%) were not common. The MTI (4.65) was lower than the HBI, thus there was no indication of contamination by metals.

b. *Thermal condition*

Only 1 cold stenotherm taxon was collected here: the limnephilid caddisfly *Psychoglypha* sp., which was represented by only 1 individual (0.06% of the fauna). The temperature preference of the assemblage was 14.3 °C.

c. Sediment deposition

Caddisflies were represented by 7 taxa and "clingers" were represented by 18 taxa. These findings suggest that the deposition of fine sediment did not limit colonization in this reach. The FSBI (4.07) indicated a moderately sediment-tolerant assemblage.

d. Habitat diversity and integrity

Taxa richness (40) was high at this site suggesting that in-stream habitats were diverse and intact, although this may be an overestimate compared to the other sites because this result is based on 3 samples. At least 5 stonefly taxa were recorded from this site, thus riparian zones, channel morphology and stream banks were probably in good condition. Three long-lived taxa were collected, suggesting stable instream conditions. Scour, toxic inputs, and thermal extremes seem unlikely. All functional feeding groups, except scrapers (1.7%), were well represented with the dominant groups being the filterers (55.1%) and the gatherers (31.9%) suggesting the importance of fine particulate organic matter to the energy flow of the system. In addition, shredders, including 2 taxa in the stonefly family Nemouridae, were common (3.3%) suggesting ample inputs of streamside vegetation.

West Trib (Kelsey Farm Restored Reach)

- **Bioassessment scores: 2015**

The B-IBI score for West Trib (Kelsey Farm Restored Reach) was 14.6 indicating "very poor" biological conditions. The RIVPACS score (0.55) also indicated impaired biological condition.

- **Indicators of ecological condition: 2015**

a. Water quality

Low mayfly taxa richness (1, *Baetis tricaudatus* complex, 14.3% of the assemblage) and an elevated biotic index (5.19) suggest that water quality was impaired in this reach. The high biotic index value resulted, in part, because organisms relatively or highly tolerant to organic pollution and thus, having high BI scores, were common. These taxa included the blackfly *Simulium* sp. (10%), several tolerant midge species (e.g., midges in the genus *Eukiefferiella,*

(6.9%)) and the amphipod *Crangonyx* sp. (15.2%). Indeed, the amphipod was the dominant organism in a sample dominated by non-insect taxa (33.9%). Several specimens in the flatworm class Trepaxonemata were collected suggesting that ground water inputs occur in this reach. There were no pollution sensitive taxa collected; however, pollution tolerant taxa only accounted for 0.2% of the fauna. The functional composition of the assemblage was strongly dominated by collector-gatherers (52.5%) and collector-filterers (21.0%). The taxonomic composition of the assemblage suggests impairment due to nutrient enrichment in this reach. No evidence for metals contamination was found (MTI = 3.78).

b. Thermal condition

No cold stenotherm taxa were encountered in the sample. The temperature preference of the assemblage was 15.4°C.

c. Sediment deposition

Only 1 caddisfly taxon, which was represented by only 2 individuals, and 8 "clinger" taxa were present in this sample: both fewer than expected. The FSBI was 3.69, indicating that the taxa were moderately tolerant of fine sediment. These findings suggest that sediment deposition may have limited colonization of the stony substrate habitats in this reach.

d. Habitat diversity and integrity

Only 31 taxa were collected at this site, which may indicate disturbed or monotonous instream habitats. The sample contained only 1 stonefly taxon, the nemourid *Malenka* sp., which was common (7.4%), suggesting that appreciable amounts of leafy and woody material was present. Low stonefly diversity may indicate disturbed reach-scale habitat features. Only one long-lived taxon was present, thus periodic thermal extremes, dewatering, or toxic pollutants cannot be ruled out in this reach. The domination of the assemblage by gatherers and filterers indicates that fine organic particulates were an important energy source in this reach. Scrapers (0.4%) were uncommon, suggesting that autochthonous production by algae was probably limited. Other functional groups were well represented.

Kelsey Trestle

- **Bioassessment scores: 2015**

The B-IBI score (17.3) calculated for the sample collected at this site indicated "very poor" conditions; the RIVPACS score (0.56) also indicated impairment.

- **Indicators of ecological condition: 2015**

a. Water quality

As with many of the sites sampled in 2015, a single mayfly taxon, the ubiquitous *Baetis tricaudatus* (6.5%) was collected from this site. The HBI (5.53) was elevated above expectations for a for a Puget Sound Lowlands stream. The high HBI value suggests that the assemblage consists of many organisms tolerant of organic pollution. In particular, the dominant insect taxon was *Simulium* sp. (blackflies; 42.0%) followed in dominance by *Rheotanytarsus* sp. (midge; 12.0%) and both taxa have a relatively high HBI values. Also, several specimens of non-insect taxa with high HBI values were collected including the invasive New Zealand mud snail, *Potamopyrgus antipodarum*, and the isopod, *Caecidotea* sp. Only one pollution sensitive taxon, the limnephilid caddisfly *Dicosmoecus atripes*, was found in the sample and it was represented by only 1 specimen. Pollution-tolerant organisms composed 2.6% of the fauna. The functional composition of the assemblage was dominated by filterers (55.1%) and gatherers (20.7%). These characteristics are suggestive of water quality impairment and the taxonomic composition of the assemblage suggests nutrient enrichment. There was no evidence of metals contamination (MTI = 4.09).

b. Thermal condition

The assemblage appeared to be dominated by taxa that were relatively tolerant to warm-water conditions as the assemblage temperature preference was 16.1°C. Only 1 cold-stenotherm taxon was collected, *Dicosmoecus atripes,* and as mentioned above it was only represented by 1 specimen.

c. Sediment deposition

Only 3 caddisfly taxa were found in this reach and none of them were very common as all caddisflies represented only 2.2% of the fauna. Thirteen “clinger” taxa were recorded. The FSBI value was 3.20 indicating an assemblage that was fine sediment tolerant. These results suggest that colonization of some insect taxa is probably limited by the deposition of fine sediment.

d. Habitat diversity and integrity

Taxa richness (33) was low in this assemblage suggesting that instream habitats were not very diverse. Only 2 stonefly taxa were collected, *Malenka* sp. (1.9%) and *Zapada cinctipes* (1.1%), although both were relatively common. This very low stonefly diversity suggests that reach-scale habitat features were very disturbed. Four long-lived taxa were collected making it unlikely that disasters such as thermal stress, dewatering and release of toxic pollutants significantly interrupt long life cycles. The functional composition of the assemblage was dominated by filterers and gatherers whose abundance suggests that fine organic particulates were an important energy source in this reach. Other functional groups were well represented.

Kelsey Glendale "Wooded"

- **Bioassessment scores: 2015**

The B-IBI score (12.5) generated by this sample indicated "very poor" biological conditions, and the RIVPACS score (0.55) also indicated impairment. This sample had both the lowest B-IBI score and the lowest RIVPACS score (also shared with West Trib) of any sample in this year's study.

- **Indicators of ecological condition: 2015**

a. Water quality

Baetis rhodani Gr. was the only mayfly taxon collected in this reach and there were only 3 specimens (0.6%) in the sample. The biotic index value (7.35) was very high. The low mayfly richness combined with the elevated biotic index value suggests water quality was impaired at this site, probably though nutrient enrichment. The sample was dominated by the invasive, New Zealand mud snail, *Potamopyrgus antipodarum* (78.9% of the total organisms collected), which has a high biotic index value and thus, drives the high overall HBI. Although not all chironomid midges have high biotic index values, chironomids with high biotic index values were common (3.5%) in this sample, also adding to the high HBI value. Neither pollution tolerant nor pollution sensitive taxa were found in this sample. The assemblage was dominated by scrapers (79.1%) also a result of the dominance of *Potamopyrgus antipodarum*. A MTI of 3.07 suggests little impact from metals contamination.

b. Thermal condition

No cold stenotherm taxa were recorded from this reach. The calculated temperature preference of the assemblage was 15.7 °C.

c. Sediment deposition

Only 2 caddisfly taxa (*Glossosoma* sp. and *Hydropsyche* sp.) were recorded from this reach and each was represented by only 1 individual. Few "clinger" taxa (8) were also collected here. The FSBI (3.57) indicated a moderately sediment tolerant assemblage. Thus, it appears that colonization of the benthic habitat in this reach is probably impaired by the deposition of fine sediments.

d. Habitat diversity and integrity

Very few taxa (21), the lowest in this study in 2015, were collected at this site, which may indicate disturbed or monotonous instream habitats. The sample contained only 1 stonefly taxon (*Malenka* sp.). The low taxa richness of stoneflies suggests that there may be loss of streambank stability, disturbed riparian zones, or altered channel morphology. Only 1 semi-

voltine taxon was recorded, thus catastrophes such as periodic dewatering, scouring sediment pulses, or intermittent inputs of toxic pollutants cannot be ruled out. As mentioned above, the functional composition of the benthic assemblage was dominated by scrapers because of the dominance of the mud snail in the sample. Filterers (5.3%) and gatherers (11.4%) were also common, but the other shredders (0.7%) were uncommon.

DISCUSSION

The B-IBI of all sites indicated "fair" conditions at 1 site (Coal Creek Cindermines), "poor" conditions at 1 site (Coal Creek Metro Access), and "very poor" conditions at the other 3 sites. The RIVPACS scores of 2 sites (Coal Creek Cindermines and Coal Creek Metro Access) were considered unimpaired. Multiple sources of stress were suggested by invertebrate assemblages at 3 sites. Table 2 summarizes the stressors suggested by the analysis of the taxonomic and functional characteristics of the biotic assemblages. Evidence for metals contamination could not be readily identified from the components of the biota at any site.

Table 2. Summary of possible stressors, as suggested by the taxonomic and functional composition of invertebrate assemblages. City of Bellevue, 2015.

Site	water quality degradation	metals	thermal stress	sediment deposition	habitat disruption
Coal Creek Cindermines	?				
Coal Creek Metro Access	+				
West Trib (Kelsey Farm Restored Reach)	+		?	+	+
Kelsey Trestle	+		+	+	+
Kelsey Glendale "Wooded"	+		?	+	+

LITERATURE CITED

Anderson, N. H. 1976. The distribution and biology of the Oregon Trichoptera. Oregon Agricultual Experimentation Station Technical Bulletin No. 134: 1-152.

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, Washington, D.C.

Bollman, W. 1998. Improving Stream Bioassessment Methods for the Montana Valleys and Foothill Prairies Ecoregion. Master's Thesis (MS). University of Montana. Missoula, Montana.

Brandt, D. 2001. Temperature Preferences and Tolerances for 137 Common Idaho Macroinvertebrate Taxa. Report to the Idaho Department of Environmental Quality, Coeur d' Alene, Idaho.

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

Cairns, J., Jr. and J. R. Pratt. 1993. A History of Biological Monitoring Using Benthic Macroinvertebrates. Chapter 2 *in* Rosenberg, D. M. and V. H. Resh, eds. *Freshwater Biomonitoring and Benthic Macroinvertebrates*. Chapman and Hall, New York.

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.

Clark, W.H. 1997. Macroinvertebrate temperature indicators for Idaho. Draft manuscript with citations. Idaho Department of Environmental Quality. Boise, Idaho.

Clements, W. H. 1999. Metal tolerance and predator-prey interactions in benthic stream communities. *Ecological Applications* 9: 1073-1084.

Clements, W. H. 2004. Small-scale experiments support casual relationships between metal contamination and macroinvertebrate community response. *Ecological Applications* 14: 954967.

Fore, L.S. 2003. Biological assessment of mining disturbance on stream invertebrates in mineralized areas of Colorado. Chapter 19 *in* Simon, T.P. ed. *Biological Response Signatures: Indicator Patterns Using Aquatic Communities.*

Fore, L. S., J. R. Karr and R. W. Wisseman. 1996. Assessing invertebrate responses to human activities: evaluating alternative approaches. *Journal of the North American Benthological Society* 15(2): 212-231.

Hellawell, J. M. 1986. *Biological Indicators of Freshwater Pollution and Environmental Management*. Elsevier, London.

Hilsenhoff, W. L. 1987. An improved biotic index of organic stream pollution. *Great Lakes Entomologist.* 20: 31-39.

Iwasaki, Y., P. Cadmus, and W. H. Clements 2013. Comparison of different predictors of exposure for modeling impacts of metal mixtures on macroinvertebrates in stream microcosms. Aquatic Toxicology 132– 133: 151– 156

Johnson, S.L. and N. H. Ringler. 2014. The response of fish and macroinvertebrate assemblages to multiple stressors: A comparative analysis of aquatic communities in a perturbed watershed (Onondaga Lake, NY). Ecological Indicators 41: 198-208.

Karr, J.R. and E.W. Chu. 1999. *Restoring Life in Running Waters: Better Biological Monitoring.* Island Press. Washington D.C.

Kleindl, W.J. 1995. A benthic index of biotic integrity for Puget Sound Lowland Streams, Washington, USA. M.S. Thesis. University of Washington, Seattle, Washington.

LeSage, L. and A. D. Harrison. 1980. The biology of *Cricotopus* (Chironomidae: Orthocladiinae) in an algal-enriched stream. Archiv fur Hydrobiologie Supplement 57: 375-418.

Leitner, P., C. Hauer, T. Ofenböck, F. Pletterbauer, A. Schmidt-Kloiber, and W. Graf. 2015. Fine sediment deposition affects biodiversity and density of benthic macroinvertebrates: A case study in the freshwater pearl mussel river Waldaist (Upper Austria). Limnologica 50: 54-57.

McGuire, D. 1998 cited in Bukantis, R. 1998. Rapid bioassessment macroinvertebrate protocols: Sampling and sample analysis SOP's. Working draft. Montana Department of Environmental Quality. Planning Prevention and Assistance Division. Helena, Montana.

Montz, G. R., J. Hirsch, R. Rezanka, and D. F. Staples. 2010. Impacts of Copper on a Lotic Benthic Invertebrate Community: Response and Recovery. Journal of Freshwater Ecology 25: 575-587.

Plafkin, J. L., M. T. Barbour, K. D. Porter, S. K. Gross and R. M. Hughes. 1989. Rapid Bioassessment Protocols for Use in Streams and Rivers. Benthic Macroinvertebrates and Fish. EPA 440-4-89-001. Office of Water Regulations and Standards, U.S. Environmental Protection Agency, Washington, D.C.

Puget Sound Stream Benthos. http://pugetsoundstreambenthos.org. Accessed May, 2016.

Relyea, C. D., G.W. Minshall, and R.J. Danehy. 2001. Stream insects as bioindicators of fine sediment. *In:* Proceeding Watershed 2000, Water Environment Federation Specialty Conference. Vancouver, BC.

Rhithron Associates. 2013. Laboratory Quality Assurance Plan. Working draft, version 13.2.d. Rhithron Associates, Inc. Missoula, Montana.

Smith, A. J. and C. P. Tran. 2010. A weight-of-evidence approach to define nutrient criteria protective of aquatic life in large rivers. Journal of the North American Benthological Society 29: 875-891.

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.

Vannote, R.L., Minshall, G.W., Cummins, K.W., Sedell, J.R., and C.E. Cushing. 1980. The river continuum concept. *Canadian Journal of Fisheries and Aquatic Sciences* 37:130-137.

Wagenhoff, A. C. R. Townsend, and C. D. Matthaei. 2012. Macroinvertebrate responses along broad stressor gradients of deposited fine sediment and dissolved nutrients: A stream mesocosm experiment. Journal of Applied Ecology 49: 892-902.

Walshe, J. F. 1947. On the function of haemoglobin in *Chironomus* after oxygen lack. *Journal of Experimental Biology* 24: 329-342.

Watson, V. J. 1988. Control of nuisance algae in the Clark Fork River. Report to Montana Department of Health and Environmental Sciences. Helena, Montana.

Wisseman R.W. 1998. Common Pacific Northwest benthic invertebrate taxa: Suggested levels for standard taxonomic effort: Attribute coding and annotated comments. Unpublished draft. Aquatic Biology Associates, Corvallis, Oregon.

APPENDIX

Taxa lists and metric summaries

City of Bellevue, Washington

2015

Taxa Listing

Project ID: CB15LD
RAI No.: CB15LD001

RAI No.: **CB15LD001** Sta. Name: **Coal Creek Cindermines Rep 1**
Client ID: **CoalBelRM4.0_2015R1**
Date Coll.: **7/28/2015** No. Jars: **4** STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Oligochaeta							
Naididae							
Nais sp.	**2**	**0.37%**	**Yes**	**Unknown**		**8**	**CG**
Lumbriculidae							
Lumbriculidae	**24**	**4.40%**	**No**	**Immature**		**4**	**CG**
Lumbriculidae							
Stylodrilus sp.	**2**	**0.37%**	**Yes**	**Unknown**		**4**	**CG**
Crangonyctidae							
Crangonyx sp.	**3**	**0.55%**	**Yes**	**Unknown**		**6**	**CG**
Acari							
Acari	**7**	**1.28%**	**Yes**	**Unknown**		**5**	**PR**
Ephemeroptera							
Baetidae							
Baetis tricaudatus complex	**10**	**1.83%**	**Yes**	**Larva**		**5**	**CG**
Diphetor hageni	**21**	**3.85%**	**Yes**	**Larva**		**5**	**CG**
Heptageniidae							
Cinygma sp.	**1**	**0.18%**	**Yes**	**Larva**		**0**	**SC**
Leptophlebiidae							
Paraleptophlebia sp.	**3**	**0.55%**	**Yes**	**Larva**		**1**	**CG**
Plecoptera							
Chloroperlidae							
Sweltsa sp.	**5**	**0.92%**	**Yes**	**Larva**		**0**	**PR**
Leuctridae							
Leuctridae	**2**	**0.37%**	**Yes**	**Larva**	**Early Instar**	**0**	**SH**
Nemouridae							
Malenka sp.	**4**	**0.73%**	**Yes**	**Larva**		**1**	**SH**
Zapada cinctipes	**38**	**6.96%**	**Yes**	**Larva**		**3**	**SH**
Perlodidae							
Skwala sp.	**9**	**1.65%**	**Yes**	**Larva**		**3**	**PR**
Trichoptera							
Glossosomatidae							
Glossosoma sp.	**8**	**1.47%**	**Yes**	**Larva**		**0**	**SC**
Glossosomatidae	**9**	**1.65%**	**No**	**Pupa**		**0**	**SC**
Hydropsychidae							
Hydropsyche sp.	**278**	**50.92%**	**Yes**	**Larva**		**5**	**CF**
Parapsyche sp.	**2**	**0.37%**	**Yes**	**Larva**		**0**	**PR**
Rhyacophilidae							
Rhyacophila sp.	**6**	**1.10%**	**No**	**Larva**	**Early Instar**	**1**	**PR**
Rhyacophila Betteni Gr.	**7**	**1.28%**	**Yes**	**Larva**		**0**	**PR**

Taxa Listing

Project ID: CB15LD
RAI No.: CB15LD001

RAI No.: **CB15LD001** Sta. Name: **Coal Creek Cindermines Rep 1**
Client ID: **CoalBelRM4.0_2015R1**
Date Coll.: **7/28/2015** No. Jars: **4** STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Coleoptera							
Elmidae							
Cleptelmis addenda	**2**	**0.37%**	**Yes**	**Adult**		**4**	**CG**
Heterlimnius corpulentus	**1**	**0.18%**	**No**	**Larva**		**3**	**CG**
Heterlimnius corpulentus	**6**	**1.10%**	**Yes**	**Adult**		**3**	**CG**
Lara sp.	**2**	**0.37%**	**Yes**	**Larva**		**1**	**SH**
Narpus concolor	**3**	**0.55%**	**Yes**	**Adult**		**2**	**CG**
Narpus concolor	**6**	**1.10%**	**No**	**Larva**		**2**	**CG**
Zaitzevia sp.	**1**	**0.18%**	**Yes**	**Larva**		**5**	**CG**
Diptera							
Ceratopogonidae							
Ceratopogoninae	**4**	**0.73%**	**Yes**	**Larva**		**6**	**PR**
Forcipomyiinae	**1**	**0.18%**	**Yes**	**Larva**		**6**	**PR**
Dixidae							
Dixa sp.	**1**	**0.18%**	**Yes**	**Larva**		**1**	**CG**
Psychodidae							
Maruina sp.	**13**	**2.38%**	**Yes**	**Larva**		**1**	**SC**
Psychodidae	**2**	**0.37%**	**No**	**Pupa**		**4**	**CG**
Simuliidae							
Simulium sp.	**1**	**0.18%**	**No**	**Pupa**		**6**	**CF**
Simulium sp.	**1**	**0.18%**	**Yes**	**Larva**		**6**	**CF**
Thaumaleidae							
Thaumaleidae	**1**	**0.18%**	**Yes**	**Larva**		**11**	**SC**
Tipulidae							
Molophilus sp.	**1**	**0.18%**	**Yes**	**Larva**		**4**	**SH**
Chironomidae							
Chironominae							
Polypedilum sp.	**7**	**1.28%**	**Yes**	**Larva**		**6**	**SH**
Chironominae							
Micropsectra sp.	**22**	**4.03%**	**Yes**	**Larva**		**4**	**CG**
Rheotanytarsus sp.	**2**	**0.37%**	**Yes**	**Larva**		**6**	**CF**
Stempellinella sp.	**1**	**0.18%**	**Yes**	**Larva**		**4**	**CG**
Tanytarsini	**3**	**0.55%**	**No**	**Larva**	**Early Instar**	**6**	**CF**
Orthocladiinae							
Brillia sp.	**5**	**0.92%**	**Yes**	**Larva**		**4**	**SH**
Bryophaenocladius sp.	**1**	**0.18%**	**Yes**	**Larva**		**11**	**UN**
Cricotopus (Cricotopus) sp.	**2**	**0.37%**	**Yes**	**Larva**		**7**	**SH**
Eukiefferiella Claripennis Gr.	**1**	**0.18%**	**Yes**	**Larva**		**8**	**CG**
Orthocladiinae	**2**	**0.37%**	**No**	**Larva**	**Early Instar**	**6**	**CG**
Orthocladius sp.	**1**	**0.18%**	**Yes**	**Larva**		**6**	**CG**
Orthocladius lignicola	**1**	**0.18%**	**Yes**	**Larva**		**11**	**CG**
Parametriocnemus sp.	**9**	**1.65%**	**Yes**	**Larva**		**5**	**CG**
Tanypodinae							
Thienemannimyia Gr.	**2**	**0.37%**	**Yes**	**Larva**	**Early Instar**	**5**	**PR**
Sample Count	546						

Taxa Listing

Project ID: CB15LD
RAI No.: CB15LD002

RAI No.: **CB15LD002** Sta. Name: **Coal Creek Metro Access Rep 1**
Client ID: **CoalBelRM1.8_2015R1**
Date Coll.: **7/29/2015** No. Jars: **2** STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Oligochaeta							
Lumbriculidae							
Lumbriculidae	**1**	**0.19%**	**Yes**	**Immature**		**4**	**CG**
Crangonyctidae							
Crangonyx sp.	**2**	**0.38%**	**Yes**	**Unknown**		**6**	**CG**
Acari							
Acari	**6**	**1.14%**	**Yes**	**Unknown**		**5**	**PR**
Ephemeroptera							
Baetidae							
Baetis tricaudatus complex	**138**	**26.24%**	**Yes**	**Larva**		**5**	**CG**
Plecoptera							
Chloroperlidae							
Sweltsa sp.	**1**	**0.19%**	**Yes**	**Larva**		**0**	**PR**
Nemouridae							
Malenka sp.	**2**	**0.38%**	**Yes**	**Larva**		**1**	**SH**
Zapada cinctipes	**3**	**0.57%**	**Yes**	**Larva**		**3**	**SH**
Trichoptera							
Glossosomatidae							
Glossosoma sp.	**4**	**0.76%**	**Yes**	**Larva**		**0**	**SC**
Glossosomatidae	**4**	**0.76%**	**No**	**Pupa**		**0**	**SC**
Hydropsychidae							
Hydropsyche sp.	**97**	**18.44%**	**Yes**	**Larva**		**5**	**CF**
Rhyacophilidae							
Rhyacophila sp.	**1**	**0.19%**	**No**	**Larva**	**Early Instar**	**1**	**PR**
Rhyacophila Betteni Gr.	**2**	**0.38%**	**Yes**	**Larva**		**0**	**PR**
Rhyacophila Brunnea/Vemna Gr.	**10**	**1.90%**	**Yes**	**Larva**		**2**	**PR**
Coleoptera							
Elmidae							
Heterlimnius corpulentus	**14**	**2.66%**	**Yes**	**Larva**		**3**	**CG**
Narpus concolor	**3**	**0.57%**	**Yes**	**Larva**		**2**	**CG**
Diptera							
Ceratopogonidae							
Ceratopogoninae	**1**	**0.19%**	**Yes**	**Larva**		**6**	**PR**
Empididae							
Neoplasta sp.	**1**	**0.19%**	**Yes**	**Larva**		**5**	**PR**
Psychodidae							
Maruina sp.	**2**	**0.38%**	**Yes**	**Larva**		**1**	**SC**
Simuliidae							
Simulium sp.	**184**	**34.98%**	**Yes**	**Larva**		**6**	**CF**
Simulium sp.	**40**	**7.60%**	**No**	**Pupa**		**6**	**CF**
Tipulidae							
Antocha monticola	**1**	**0.19%**	**Yes**	**Larva**		**3**	**CG**

Taxa Listing

Project ID: CB15LD
RAI No.: CB15LD002

RAI No.: **CB15LD002** Sta. Name: **Coal Creek Metro Access Rep 1**
Client ID: **CoalBelRM1.8_2015R1**
Date Coll.: **7/29/2015** No. Jars: **2** STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Chironomidae							
Chironominae							
Phaenopsectra sp.	**1**	**0.19%**	**Yes**	**Larva**		**7**	**SC**
Orthocladiinae							
Brillia sp.	**4**	**0.76%**	**Yes**	**Larva**		**4**	**SH**
Parametriocnemus sp.	**1**	**0.19%**	**Yes**	**Larva**		**5**	**CG**
Tanypodinae							
Thienemannimyia Gr.	**3**	**0.57%**	**Yes**	**Larva**	**Early Instar**	**5**	**PR**
Sample Count	526						

Taxa Listing

Project ID: CB15LD
RAI No.: CB15LD003

RAI No.: **CB15LD003** Sta. Name: **Coal Creek Metro Access Rep 2**
Client ID: **CoalBelRM1.8_2015R2**
Date Coll.: **7/29/2015** No. Jars: **2** STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Other Non-Insect							
Nemata							
Nemata	**1**	**0.20%**	**Yes**	**Unknown**		**5**	**UN**
Lumbriculidae							
Lumbriculidae	**1**	**0.20%**	**Yes**	**Immature**		**4**	**CG**
Crangonyctidae							
Crangonyx sp.	**3**	**0.61%**	**Yes**	**Unknown**		**6**	**CG**
Acari							
Acari	**27**	**5.45%**	**Yes**	**Unknown**		**5**	**PR**
Ephemeroptera							
Baetidae							
Baetis tricaudatus complex	**93**	**18.79%**	**Yes**	**Larva**		**5**	**CG**
Plecoptera							
Chloroperlidae							
Sweltsa sp.	**3**	**0.61%**	**Yes**	**Larva**		**0**	**PR**
Nemouridae							
Malenka sp.	**5**	**1.01%**	**Yes**	**Larva**		**1**	**SH**
Nemouridae	**2**	**0.40%**	**No**	**Larva**	**Damaged**	**2**	**SH**
Zapada cinctipes	**1**	**0.20%**	**Yes**	**Larva**		**3**	**SH**
Perlodidae							
Kogotus sp.	**1**	**0.20%**	**Yes**	**Larva**		**1**	**PR**
Skwala sp.	**3**	**0.61%**	**Yes**	**Larva**		**3**	**PR**
Trichoptera							
Glossosomatidae							
Glossosoma sp.	**1**	**0.20%**	**Yes**	**Larva**		**0**	**SC**
Glossosomatidae	**2**	**0.40%**	**No**	**Larva**	**Damaged**	**0**	**SC**
Glossosomatidae	**1**	**0.20%**	**No**	**Pupa**		**0**	**SC**
Hydropsychidae							
Hydropsyche sp.	**51**	**10.30%**	**Yes**	**Larva**		**5**	**CF**
Rhyacophilidae							
Rhyacophila sp.	**1**	**0.20%**	**No**	**Larva**	**Early Instar**	**1**	**PR**
Rhyacophila Betteni Gr.	**2**	**0.40%**	**Yes**	**Larva**		**0**	**PR**
Rhyacophila Brunnea/Vemna Gr.	**5**	**1.01%**	**Yes**	**Larva**		**2**	**PR**
Coleoptera							
Elmidae							
Heterlimnius corpulentus	**5**	**1.01%**	**Yes**	**Adult**		**3**	**CG**
Heterlimnius corpulentus	**36**	**7.27%**	**No**	**Larva**		**3**	**CG**
Narpus concolor	**1**	**0.20%**	**Yes**	**Larva**		**2**	**CG**
Zaitzevia sp.	**1**	**0.20%**	**Yes**	**Larva**		**5**	**CG**

Taxa Listing

Project ID: CB15LD
RAI No.: CB15LD003

RAI No.: **CB15LD003** Sta. Name: **Coal Creek Metro Access Rep 2**
Client ID: **CoalBelRM1.8_2015R2**
Date Coll.: **7/29/2015** No. Jars: **2** STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Diptera							
Ceratopogonidae							
Ceratopogoninae	**1**	**0.20%**	**Yes**	**Larva**		**6**	**PR**
Dixidae							
Dixa sp.	**1**	**0.20%**	**Yes**	**Larva**		**1**	**CG**
Psychodidae							
Maruina sp.	**3**	**0.61%**	**Yes**	**Larva**		**1**	**SC**
Simuliidae							
Simulium sp.	**216**	**43.64%**	**Yes**	**Larva**		**6**	**CF**
Simulium sp.	**17**	**3.43%**	**No**	**Pupa**		**6**	**CF**
Tipulidae							
Antocha monticola	**2**	**0.40%**	**Yes**	**Larva**		**3**	**CG**
Dicranota sp.	**1**	**0.20%**	**Yes**	**Larva**		**3**	**PR**
Chironomidae							
Diamesinae							
Pagastia sp.	**1**	**0.20%**	**Yes**	**Larva**		**1**	**CG**
Orthocladiinae							
Eukiefferiella Claripennis Gr.	**1**	**0.20%**	**Yes**	**Larva**		**8**	**CG**
Tanypodinae							
Thienemannimyia Gr.	**6**	**1.21%**	**Yes**	**Larva**	**Early Instar**	**5**	**PR**
Sample Count	495						

Taxa Listing

Project ID: CB15LD
RAI No.: CB15LD004

RAI No.: **CB15LD004** Sta. Name: **Coal Creek Metro Access Rep 3**
Client ID: **CoalBelRM1.8_2015R3**
Date Coll.: **7/29/2015** No. Jars: **2** STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Other Non-Insect							
Nemata							
Nemata	**1**	**0.18%**	**Yes**	**Unknown**		**5**	**UN**
Enchytraeidae							
Enchytraeus sp.	**1**	**0.18%**	**Yes**	**Unknown**		**4**	**CG**
Fridericia sp.	**1**	**0.18%**	**Yes**	**Unknown**		**11**	**CG**
Naididae							
Nais sp.	**1**	**0.18%**	**Yes**	**Unknown**		**8**	**CG**
Lumbriculidae							
Lumbriculidae	**12**	**2.19%**	**Yes**	**Immature**		**4**	**CG**
Crangonyctidae							
Crangonyx sp.	**5**	**0.91%**	**Yes**	**Unknown**		**6**	**CG**
Acari							
Acari	**17**	**3.10%**	**Yes**	**Unknown**		**5**	**PR**
Ephemeroptera							
Baetidae							
Baetis tricaudatus complex	**127**	**23.13%**	**Yes**	**Larva**		**5**	**CG**
Plecoptera							
Nemouridae							
Malenka sp.	**18**	**3.28%**	**Yes**	**Larva**		**1**	**SH**
Zapada cinctipes	**14**	**2.55%**	**Yes**	**Larva**		**3**	**SH**
Perlodidae							
Skwala sp.	**3**	**0.55%**	**Yes**	**Larva**		**3**	**PR**
Trichoptera							
Glossosomatidae							
Glossosoma sp.	**1**	**0.18%**	**Yes**	**Larva**		**0**	**SC**
Glossosomatidae	**3**	**0.55%**	**No**	**Pupa**		**0**	**SC**
Hydropsychidae							
Hydropsyche sp.	**122**	**22.22%**	**Yes**	**Larva**		**5**	**CF**
Hydroptilidae							
Hydroptila sp.	**8**	**1.46%**	**Yes**	**Larva**		**6**	**PH**
Limnephilidae							
Onocosmoecus unicolor	**1**	**0.18%**	**Yes**	**Larva**		**2**	**SH**
Psychoglypha sp.	**1**	**0.18%**	**Yes**	**Larva**		**0**	**SH**
Rhyacophilidae							
Rhyacophila sp.	**4**	**0.73%**	**No**	**Larva**	**Early Instar**	**1**	**PR**
Rhyacophila Betteni Gr.	**2**	**0.36%**	**Yes**	**Larva**		**0**	**PR**
Rhyacophila Brunnea/Vemna Gr.	**7**	**1.28%**	**Yes**	**Larva**		**2**	**PR**
Coleoptera							
Elmidae							
Heterlimnius corpulentus	**25**	**4.55%**	**No**	**Larva**		**3**	**CG**
Heterlimnius corpulentus	**5**	**0.91%**	**Yes**	**Adult**		**3**	**CG**
Narpus concolor	**5**	**0.91%**	**Yes**	**Larva**		**2**	**CG**

Taxa Listing

Project ID: CB15LD
RAI No.: CB15LD004

RAI No.: **CB15LD004** Sta. Name: **Coal Creek Metro Access Rep 3**
Client ID: **CoalBelRM1.8_2015R3**
Date Coll.: **7/29/2015** No. Jars: **2** STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Diptera							
Ceratopogonidae							
Forcipomyiinae	**1**	**0.18%**	**Yes**	**Larva**		**6**	**PR**
Dixidae							
Dixa sp.	**1**	**0.18%**	**Yes**	**Larva**		**1**	**CG**
Empididae							
Neoplasta sp.	**1**	**0.18%**	**Yes**	**Larva**		**5**	**PR**
Psychodidae							
Maruina sp.	**5**	**0.91%**	**Yes**	**Larva**		**1**	**SC**
Simuliidae							
Simulium sp.	**17**	**3.10%**	**No**	**Pupa**		**6**	**CF**
Simulium sp.	**120**	**21.86%**	**Yes**	**Larva**		**6**	**CF**
Tipulidae							
Antocha monticola	**5**	**0.91%**	**Yes**	**Larva**		**3**	**CG**
Chironomidae							
Chironominae							
Micropsectra sp.	**1**	**0.18%**	**Yes**	**Larva**		**4**	**CG**
Rheotanytarsus sp.	**1**	**0.18%**	**Yes**	**Larva**		**6**	**CF**
Orthocladiinae							
Parametriocnemus sp.	**5**	**0.91%**	**Yes**	**Larva**		**5**	**CG**
Tvetenia Bavarica Gr.	**1**	**0.18%**	**Yes**	**Larva**		**5**	**CG**
Tanypodinae							
Thienemannimyia Gr.	**7**	**1.28%**	**Yes**	**Larva**	**Early Instar**	**5**	**PR**
Sample Count	549						

Taxa Listing

Project ID: CB15LD
RAI No.: CB15LD005

RAI No.: **CB15LD005** Sta. Name: **West Trib (Kelsey Farm, Restored Reach) Rep 1**
Client ID: **WestTribFarmRM0.4_2015R1**
Date Coll.: **7/30/2015** No. Jars: **4** STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Other Non-Insect							
Trepaxonemata							
Trepaxonemata	**26**	**4.71%**	**Yes**	**Unknown**		**11**	**PR**
Nemata							
Nemata	**26**	**4.71%**	**Yes**	**Unknown**		**5**	**UN**
Enchytraeidae							
Enchytraeus sp.	**2**	**0.36%**	**Yes**	**Unknown**		**4**	**CG**
Lumbriculidae							
Lumbriculidae	**13**	**2.36%**	**Yes**	**Immature**		**4**	**CG**
Sphaeriidae							
Sphaeriidae	**4**	**0.72%**	**Yes**	**Unknown**		**8**	**CF**
Crangonyctidae							
Crangonyx sp.	**84**	**15.22%**	**Yes**	**Unknown**		**6**	**CG**
Acari							
Acari	**32**	**5.80%**	**Yes**	**Unknown**		**5**	**PR**
Ephemeroptera							
Baetidae							
Baetis tricaudatus complex	**79**	**14.31%**	**Yes**	**Larva**		**5**	**CG**
Plecoptera							
Nemouridae							
Malenka sp.	**41**	**7.43%**	**Yes**	**Larva**		**1**	**SH**
Trichoptera							
Glossosomatidae							
Glossosoma sp.	**1**	**0.18%**	**Yes**	**Larva**		**0**	**SC**
Glossosomatidae	**1**	**0.18%**	**No**	**Pupa**		**0**	**SC**
Coleoptera							
Elmidae							
Narpus concolor	**3**	**0.54%**	**Yes**	**Larva**		**2**	**CG**
Diptera							
Empididae							
Empididae	**2**	**0.36%**	**Yes**	**Pupa**		**6**	**PR**
Simuliidae							
Simulium sp.	**55**	**9.96%**	**Yes**	**Larva**		**6**	**CF**
Tipulidae							
Antocha monticola	**32**	**5.80%**	**Yes**	**Larva**		**3**	**CG**
Dicranota sp.	**2**	**0.36%**	**Yes**	**Larva**		**3**	**PR**

Taxa Listing

Project ID: CB15LD
RAI No.: CB15LD005

RAI No.: **CB15LD005** Sta. Name: **West Trib (Kelsey Farm, Restored Reach) Rep 1**
Client ID: **WestTribFarmRM0.4_2015R1**
Date Coll.: **7/30/2015** No. Jars: **4** STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Chironomidae							
Chironominae							
Polypedilum sp.	**1**	**0.18%**	**Yes**	**Larva**		**6**	**SH**
Chironominae							
Micropsectra sp.	**6**	**1.09%**	**Yes**	**Larva**		**4**	**CG**
Rheotanytarsus sp.	**44**	**7.97%**	**Yes**	**Larva**		**6**	**CF**
Rheotanytarsus sp.	**12**	**2.17%**	**No**	**Pupa**		**6**	**CF**
Tanytarsus sp.	**1**	**0.18%**	**Yes**	**Larva**		**6**	**CF**
Orthocladiinae							
Brillia sp.	**3**	**0.54%**	**Yes**	**Larva**		**4**	**SH**
Corynoneura sp.	**2**	**0.36%**	**Yes**	**Larva**		**7**	**CG**
Cricotopus sp.	**4**	**0.72%**	**No**	**Pupa**		**7**	**SH**
Cricotopus (Cricotopus) sp.	**2**	**0.36%**	**Yes**	**Larva**		**7**	**SH**
Cricotopus bicinctus	**5**	**0.91%**	**Yes**	**Larva**		**7**	**SH**
Eukiefferiella sp.	**1**	**0.18%**	**No**	**Pupa**		**8**	**CG**
Eukiefferiella sp.	**9**	**1.63%**	**No**	**Larva**	**Early Instar**	**8**	**CG**
Eukiefferiella Claripennis Gr.	**8**	**1.45%**	**Yes**	**Larva**		**8**	**CG**
Eukiefferiella Pseudomontana Gr.	**20**	**3.62%**	**Yes**	**Larva**		**8**	**CG**
Limnophyes sp.	**1**	**0.18%**	**Yes**	**Pupa**		**8**	**CG**
Orthocladiinae	**4**	**0.72%**	**No**	**Larva**	**Early Instar**	**6**	**CG**
Orthocladiinae	**1**	**0.18%**	**No**	**Pupa**	**Damaged**	**6**	**CG**
Orthocladius sp.	**15**	**2.72%**	**Yes**	**Larva**		**6**	**CG**
Orthocladius sp.	**1**	**0.18%**	**No**	**Pupa**		**6**	**CG**
Parametriocnemus sp.	**5**	**0.91%**	**Yes**	**Larva**		**5**	**CG**
Paraphaenocladius sp.	**1**	**0.18%**	**Yes**	**Larva**		**4**	**CG**
Parorthocladius sp.	**1**	**0.18%**	**Yes**	**Larva**		**6**	**CG**
Tvetenia Bavarica Gr.	**2**	**0.36%**	**Yes**	**Larva**		**5**	**CG**
Sample Count	552						

Taxa Listing

Project ID: CB15LD
RAI No.: CB15LD006

RAI No.: **CB15LD006** Sta. Name: **Kelsey Trestle Rep 1**
Client ID: **KelBelRM0.2_2015R1**
Date Coll.: **8/5/2015** No. Jars: **2** STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Other Non-Insect							
Trepaxonemata							
Trepaxonemata	**4**	**0.74%**	**Yes**	**Unknown**		**11**	**PR**
Nemata							
Nemata	**21**	**3.88%**	**Yes**	**Unknown**		**5**	**UN**
Naididae							
Tubificinae	**2**	**0.37%**	**Yes**	**Immature**		**11**	**CG**
Ancylidae							
Ferrissia sp.	**1**	**0.18%**	**Yes**	**Unknown**		**6**	**SC**
Hydrobiidae							
Potamopyrgus antipodarum	**3**	**0.55%**	**Yes**	**Unknown**		**8**	**SC**
Crangonyctidae							
Crangonyx sp.	**32**	**5.91%**	**Yes**	**Unknown**		**6**	**CG**
Asellidae							
Caecidotea sp.	**3**	**0.55%**	**Yes**	**Unknown**		**8**	**CG**
Acari							
Acari	**20**	**3.70%**	**Yes**	**Unknown**		**5**	**PR**
Ephemeroptera							
Baetidae							
Baetis tricaudatus complex	**35**	**6.47%**	**Yes**	**Larva**		**5**	**CG**
Plecoptera							
Nemouridae							
Malenka sp.	**10**	**1.85%**	**Yes**	**Larva**		**1**	**SH**
Zapada cinctipes	**6**	**1.11%**	**Yes**	**Larva**		**3**	**SH**
Trichoptera							
Hydroptilidae							
Hydroptila sp.	**2**	**0.37%**	**Yes**	**Larva**		**6**	**PH**
Hydroptilidae	**1**	**0.18%**	**No**	**Pupa**		**4**	**PH**
Limnephilidae							
Dicosmoecus atripes	**1**	**0.18%**	**Yes**	**Larva**		**1**	**SC**
Rhyacophilidae							
Rhyacophila Brunnea/Vemna Gr.	**8**	**1.48%**	**Yes**	**Larva**		**2**	**PR**
Coleoptera							
Dytiscidae							
Oreodytes sp.	**1**	**0.18%**	**Yes**	**Adult**		**5**	**PR**
Elmidae							
Lara sp.	**1**	**0.18%**	**Yes**	**Larva**		**1**	**SH**
Optioservus sp.	**8**	**1.48%**	**Yes**	**Larva**		**5**	**SC**
Diptera							
Empididae							
Neoplasta sp.	**22**	**4.07%**	**Yes**	**Larva**		**5**	**PR**
Simuliidae							
Simulium sp.	**4**	**0.74%**	**No**	**Pupa**		**6**	**CF**
Simulium sp.	**223**	**41.22%**	**Yes**	**Larva**		**6**	**CF**
Tipulidae							
Antocha monticola	**7**	**1.29%**	**Yes**	**Larva**		**3**	**CG**
Dicranota sp.	**7**	**1.29%**	**Yes**	**Larva**		**3**	**PR**

Taxa Listing

Project ID: CB15LD
RAI No.: CB15LD006

RAI No.: **CB15LD006** Sta. Name: **Kelsey Trestle Rep 1**
Client ID: **KelBelRM0.2_2015R1**
Date Coll.: **8/5/2015** No. Jars: **2** STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Chironomidae							
Chironominae							
Microtendipes sp.	**3**	**0.55%**	**Yes**	**Larva**		**6**	**CF**
Polypedilum sp.	**1**	**0.18%**	**Yes**	**Larva**		**6**	**SH**
Chironominae							
Micropsectra sp.	**10**	**1.85%**	**Yes**	**Larva**		**4**	**CG**
Rheotanytarsus sp.	**4**	**0.74%**	**No**	**Pupa**		**6**	**CF**
Rheotanytarsus sp.	**61**	**11.28%**	**Yes**	**Larva**		**6**	**CF**
Tanytarsini	**2**	**0.37%**	**No**	**Pupa**	**Damaged**	**6**	**CF**
Tanytarsini	**1**	**0.18%**	**No**	**Larva**	**Early Instar**	**6**	**CF**
Orthocladiinae							
Brillia sp.	**1**	**0.18%**	**Yes**	**Larva**		**4**	**SH**
Cricotopus (Cricotopus) sp.	**1**	**0.18%**	**Yes**	**Larva**		**7**	**SH**
Cricotopus bicinctus	**9**	**1.66%**	**Yes**	**Larva**		**7**	**SH**
Eukiefferiella sp.	**1**	**0.18%**	**No**	**Pupa**		**8**	**CG**
Eukiefferiella Claripennis Gr.	**10**	**1.85%**	**Yes**	**Larva**		**8**	**CG**
Orthocladiinae	**2**	**0.37%**	**No**	**Larva**	**Damaged**	**6**	**CG**
Parametriocnemus sp.	**6**	**1.11%**	**Yes**	**Larva**		**5**	**CG**
Parametriocnemus sp.	**1**	**0.18%**	**No**	**Pupa**		**5**	**CG**
Tvetenia sp.	**1**	**0.18%**	**No**	**Pupa**		**5**	**CG**
Tvetenia Bavarica Gr.	**1**	**0.18%**	**Yes**	**Larva**		**5**	**CG**
Prodiamesinae							
Prodiamesa sp.	**1**	**0.18%**	**Yes**	**Larva**		**3**	**CG**
Tanypodinae							
Thienemannimyia Gr.	**3**	**0.55%**	**Yes**	**Larva**	**Early Instar**	**5**	**PR**
Sample Count	541						

Taxa Listing

Project ID: CB15LD
RAI No.: CB15LD007

RAI No.: **CB15LD007** Sta. Name: **Kelsey Glendale "Wooded" Rep 1**
Client ID: **KelBelRM1.8_2015R1**
Date Coll.: **8/10/2015** No. Jars: **5** STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Other Non-Insect							
Trepaxonemata							
Trepaxonemata	**4**	**0.73%**	**Yes**	**Unknown**		**11**	**PR**
Nemata							
Nemata	**5**	**0.92%**	**Yes**	**Unknown**		**5**	**UN**
Lumbriculidae							
Lumbriculidae	**2**	**0.37%**	**Yes**	**Immature**		**4**	**CG**
Hydrobiidae							
Potamopyrgus antipodarum	**431**	**78.94%**	**Yes**	**Unknown**		**8**	**SC**
Acari							
Acari	**3**	**0.55%**	**Yes**	**Unknown**		**5**	**PR**
Ephemeroptera							
Baetidae							
Baetis Rhodani Gr.	**3**	**0.55%**	**Yes**	**Larva**	**Damaged**	**11**	**CG**
Plecoptera							
Nemouridae							
Malenka sp.	**3**	**0.55%**	**Yes**	**Larva**		**1**	**SH**
Trichoptera							
Glossosomatidae							
Glossosoma sp.	**1**	**0.18%**	**Yes**	**Larva**		**0**	**SC**
Hydropsychidae							
Hydropsyche sp.	**1**	**0.18%**	**Yes**	**Larva**		**5**	**CF**
Coleoptera							
Elmidae							
Narpus concolor	**1**	**0.18%**	**Yes**	**Larva**		**2**	**CG**
Diptera							
Empididae							
Neoplasta sp.	**3**	**0.55%**	**Yes**	**Larva**		**5**	**PR**
Simuliidae							
Simulium sp.	**1**	**0.18%**	**Yes**	**Larva**		**6**	**CF**
Tipulidae							
Antocha monticola	**4**	**0.73%**	**No**	**Pupa**		**3**	**CG**
Antocha monticola	**34**	**6.23%**	**Yes**	**Larva**		**3**	**CG**
Chironomidae							
Chironominae							
Rheotanytarsus sp.	**27**	**4.95%**	**Yes**	**Larva**		**6**	**CF**
Orthocladiinae							
Cricotopus (Cricotopus) sp.	**1**	**0.18%**	**Yes**	**Larva**		**7**	**SH**
Eukiefferiella Brehmi Gr.	**1**	**0.18%**	**Yes**	**Larva**		**8**	**CG**
Eukiefferiella Claripennis Gr.	**2**	**0.37%**	**Yes**	**Larva**		**8**	**CG**
Eukiefferiella Devonica Gr.	**1**	**0.18%**	**Yes**	**Larva**		**8**	**CG**
Eukiefferiella Pseudomontana Gr.	**9**	**1.65%**	**Yes**	**Larva**		**8**	**CG**
Orthocladiinae	**1**	**0.18%**	**No**	**Larva**	**Damaged**	**6**	**CG**
Orthocladius sp.	**4**	**0.73%**	**Yes**	**Larva**		**6**	**CG**
Tanypodinae							
Thienemannimyia Gr.	**4**	**0.73%**	**Yes**	**Larva**	**Early Instar**	**5**	**PR**

Taxa Listing

Project ID: CB15LD
RAI No.: CB15LD007

RAI No.: **CB15LD007**
Client ID: **KelBelRM1.8_2015R1**
Date Coll.: **8/10/2015** No. Jars: **5**

Sta. Name: **Kelsey Glendale "Wooded" Rep 1**
STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Sample Count	546						

Metrics Report

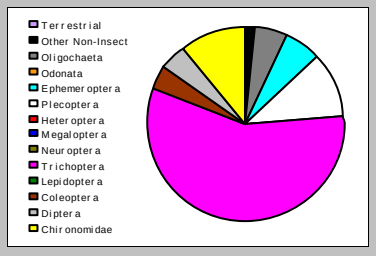
Project ID: CB15LD
RAI No.: CB15LD001
Sta. Name: Coal Creek Cindermines Rep 1
Client ID: CoalBelRM4.0_2015R1
STORET ID
Coll. Date: 7/28/2015
Latitude: 47.5418 **Longitude:** -122.1417

Abundance Measures

Sample Count: 546
Sample Abundance: 4,095.00 13.33% of sample used
Coll. Procedure: Surber
Sample Notes: Individual Jar IDs: CoalBelRM4.0_2015R1_Jar1, CoalBelRM4.0_2015R1_Jar2, CoalBelRM4.0_2015R1_Jar3,

Taxonomic Composition

Category	R	A	PRA
Terrestrial			
Other Non-Insect	2	10	1.83%
Oligochaeta	2	28	5.13%
Odonata			
Ephemeroptera	4	35	6.41%
Plecoptera	5	58	10.62%
Heteroptera			
Megaloptera			
Neuroptera			
Trichoptera	4	310	56.78%
Lepidoptera			
Coleoptera	5	21	3.85%
Diptera	7	25	4.58%
Chironomidae	12	59	10.81%

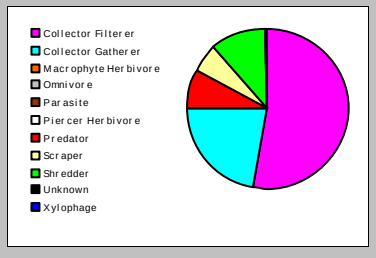


Dominant Taxa

Category	A	PRA
Hydropsyche	278	50.92%
Zapada cinctipes	38	6.96%
Lumbriculidae	24	4.40%
Micropsectra	22	4.03%
Diphetor hageni	21	3.85%
Maruina	13	2.38%
Baetis tricaudatus complex	10	1.83%
Skwala	9	1.65%
Parametriocnemus	9	1.65%
Narpus concolor	9	1.65%
Glossosomatidae	9	1.65%
Glossosoma	8	1.47%
Rhyacophila Betteni Gr.	7	1.28%
Polypedilum	7	1.28%
Acari	7	1.28%

Functional Composition

Category	R	A	PRA
Predator	8	43	7.88%
Parasite			
Collector Gatherer	17	124	22.71%
Collector Filterer	3	285	52.20%
Macrophyte Herbivore			
Piercer Herbivore			
Xylophage			
Scraper	4	32	5.86%
Shredder	8	61	11.17%
Omnivore			
Unknown	1	1	0.18%

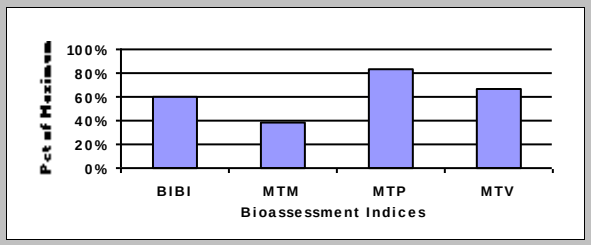


Metric Values and Scores

Metric	Value
Composition	
Taxa Richness	41
E Richness	4
P Richness	5
T Richness	4
EPT Richness	13
EPT Percent	73.81%
All Non-Insect Abundance	38
All Non-Insect Richness	4
All Non-Insect Percent	6.96%
Oligochaeta+Hirudinea Percent	5.13%
Baetidae/Ephemeroptera	0.886
Hydropsychidae/Trichoptera	0.903
Dominance	
Dominant Taxon Percent	50.92%
Dominant Taxa (2) Percent	57.88%
Dominant Taxa (3) Percent	62.27%
Dominant Taxa (10) Percent	79.30%
Diversity	
Shannon H (loge)	2.035
Shannon H (log2)	2.936
Margalef D	6.453
Simpson D	0.331
Evenness	0.060
Function	
Predator Richness	8
Predator Percent	7.88%
Filterer Richness	3
Filterer Percent	52.20%
Collector Percent	74.91%
Scraper+Shredder Percent	17.03%
Scraper/Filterer	0.112
Scraper/Scraper+Filterer	0.101
Habit	
Burrower Richness	2
Burrower Percent	5.86%
Swimmer Richness	4
Swimmer Percent	6.41%
Clinger Richness	20
Clinger Percent	75.09%
Characteristics	
Cold Stenotherm Richness	2
Cold Stenotherm Percent	0.55%
Hemoglobin Bearer Richness	1
Hemoglobin Bearer Percent	1.28%
Air Breather Richness	2
Air Breather Percent	2.93%
Voltinism	
Univoltine Richness	19
Semivoltine Richness	6
Multivoltine Percent	15.57%
Tolerance	
Sediment Tolerant Richness	1
Sediment Tolerant Percent	4.58%
Sediment Sensitive Richness	1
Sediment Sensitive Percent	1.47%
Metals Tolerance Index	3.825
Pollution Sensitive Richness	2
Pollution Tolerant Percent	0.18%
Hilsenhoff Biotic Index	4.186
Intolerant Percent	13.19%
Supertolerant Percent	0.55%
CTQa	79.429

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	30	60.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	25	83.33%	None
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	12	66.67%	Slight
MTM	Montana DEQ Mountains (Bukantis 1998)	8	38.10%	Moderate



Metrics Report

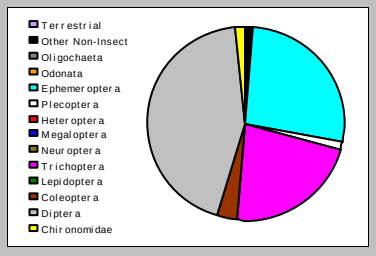
Project ID: CB15LD
RAI No.: CB15LD002
Sta. Name: Coal Creek Metro Access Rep 1
Client ID: CoalBelRM1.8_2015R1
STORET ID
Coll. Date: 7/29/2015
Latitude: 47.5592 **Longitude:** -122.1699

Abundance Measures

Sample Count: 526
Sample Abundance: 2,254.29 23.33% of sample used
Coll. Procedure: Surber
Sample Notes: Individual Jar IDs: CoalBelRM1.8_2015R1_Jar1, CoalBelRM1.8_2015R1_Jar2

Taxonomic Composition

Category	R	A	PRA
Terrestrial			
Other Non-Insect	2	8	1.52%
Oligochaeta	1	1	0.19%
Odonata			
Ephemeroptera	1	138	26.24%
Plecoptera	3	6	1.14%
Heteroptera			
Megaloptera			
Neuroptera			
Trichoptera	4	118	22.43%
Lepidoptera			
Coleoptera	2	17	3.23%
Diptera	5	229	43.54%
Chironomidae	4	9	1.71%

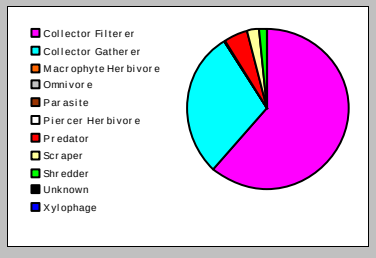


Dominant Taxa

Category	A	PRA
Simulium	224	42.59%
Baetis tricaudatus complex	138	26.24%
Hydropsyche	97	18.44%
Heterlimnius corpulentus	14	2.66%
Rhyacophila Brunnea/Vemna Gr.	10	1.90%
Acari	6	1.14%
Glossosomatidae	4	0.76%
Glossosoma	4	0.76%
Brillia	4	0.76%
Zapada cinctipes	3	0.57%
Thienemannimyia Gr.	3	0.57%
Narpus concolor	3	0.57%
Rhyacophila Betteni Gr.	2	0.38%
Malenka	2	0.38%
Crangonyx	2	0.38%

Functional Composition

Category	R	A	PRA
Predator	7	25	4.75%
Parasite			
Collector Gatherer	7	160	30.42%
Collector Filterer	2	321	61.03%
Macrophyte Herbivore			
Piercer Herbivore			
Xylophage			
Scraper	3	11	2.09%
Shredder	3	9	1.71%
Omnivore			
Unknown			

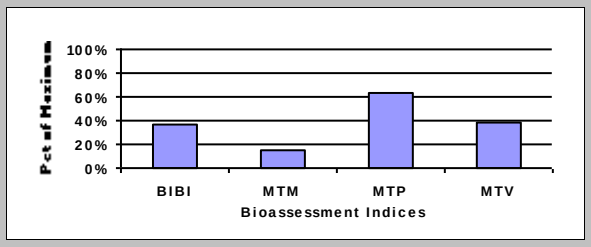


Metric Values and Scores

Metric	Value
Composition	
Taxa Richness	22
E Richness	1
P Richness	3
T Richness	4
EPT Richness	8
EPT Percent	49.81%
All Non-Insect Abundance	9
All Non-Insect Richness	3
All Non-Insect Percent	1.71%
Oligochaeta+Hirudinea Percent	0.19%
Baetidae/Ephemeroptera	1.000
Hydropsychidae/Trichoptera	0.822
Dominance	
Dominant Taxon Percent	42.59%
Dominant Taxa (2) Percent	68.82%
Dominant Taxa (3) Percent	87.26%
Dominant Taxa (10) Percent	95.82%
Diversity	
Shannon H (loge)	1.643
Shannon H (log2)	2.370
Margalef D	3.400
Simpson D	0.270
Evenness	0.102
Function	
Predator Richness	7
Predator Percent	4.75%
Filterer Richness	2
Filterer Percent	61.03%
Collector Percent	91.44%
Scraper+Shredder Percent	3.80%
Scraper/Filterer	0.034
Scraper/Scraper+Filterer	0.033
Habit	
Burrower Richness	3
Burrower Percent	1.14%
Swimmer Richness	1
Swimmer Percent	26.24%
Clinger Richness	13
Clinger Percent	70.15%
Characteristics	
Cold Stenotherm Richness	0
Cold Stenotherm Percent	0.00%
Hemoglobin Bearer Richness	1
Hemoglobin Bearer Percent	0.19%
Air Breather Richness	2
Air Breather Percent	0.57%
Voltinism	
Univoltine Richness	13
Semivoltine Richness	2
Multivoltine Percent	2.85%
Tolerance	
Sediment Tolerant Richness	2
Sediment Tolerant Percent	0.38%
Sediment Sensitive Richness	1
Sediment Sensitive Percent	0.76%
Metals Tolerance Index	4.805
Pollution Sensitive Richness	0
Pollution Tolerant Percent	0.00%
Hilsenhoff Biotic Index	5.141
Intolerant Percent	5.51%
Supertolerant Percent	0.00%
CTQa	73.235

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	18	36.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	19	63.33%	Slight
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	7	38.89%	Moderate
MTM	Montana DEQ Mountains (Bukantis 1998)	3	14.29%	Severe



Metrics Report

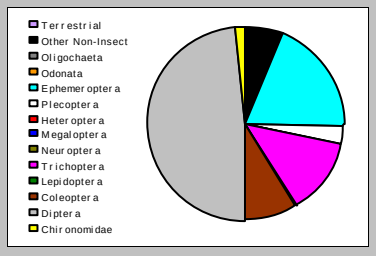
Project ID: CB15LD
RAI No.: CB15LD003
Sta. Name: Coal Creek Metro Access Rep 2
Client ID: CoalBelRM1.8_2015R2
STORET ID
Coll. Date: 7/29/2015
Latitude: 47.5592 **Longitude:** -122.1699

Abundance Measures

Sample Count: 495
Sample Abundance: 495.00 100.00% of sample used
Coll. Procedure: Surber
Sample Notes: Individual Jar IDs: CoalBelRM1.8_2015R2_Jar1, CoalBelRM1.8_2015R2_Jar2

Taxonomic Composition

Category	R	A	PRA
Terrestrial			
Other Non-Insect	3	31	6.26%
Oligochaeta	1	1	0.20%
Odonata			
Ephemeroptera	1	93	18.79%
Plecoptera	5	15	3.03%
Heteroptera			
Megaloptera			
Neuroptera			
Trichoptera	4	63	12.73%
Lepidoptera			
Coleoptera	3	43	8.69%
Diptera	6	241	48.69%
Chironomidae	3	8	1.62%

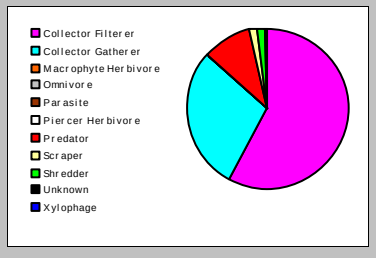


Dominant Taxa

Category	A	PRA
Simulium	233	47.07%
Baetis tricaudatus complex	93	18.79%
Hydropsyche	51	10.30%
Heterlimnius corpulentus	41	8.28%
Acari	27	5.45%
Thienemannimyia Gr.	6	1.21%
Rhyacophila Brunnea/Vemna Gr.	5	1.01%
Malenka	5	1.01%
Sweltsa	3	0.61%
Skwala	3	0.61%
Maruina	3	0.61%
Glossosomatidae	3	0.61%
Crangonyx	3	0.61%
Rhyacophila Betteni Gr.	2	0.40%
Antocha monticola	2	0.40%

Functional Composition

Category	R	A	PRA
Predator	9	50	10.10%
Parasite			
Collector Gatherer	10	145	29.29%
Collector Filterer	2	284	57.37%
Macrophyte Herbivore			
Piercer Herbivore			
Xylophage			
Scraper	2	7	1.41%
Shredder	2	8	1.62%
Omnivore			
Unknown	1	1	0.20%

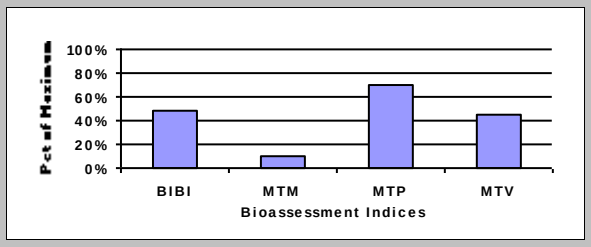


Metric Values and Scores

Metric	Value
Composition	
Taxa Richness	26
E Richness	1
P Richness	5
T Richness	4
EPT Richness	10
EPT Percent	34.55%
All Non-Insect Abundance	32
All Non-Insect Richness	4
All Non-Insect Percent	6.46%
Oligochaeta+Hirudinea Percent	0.20%
Baetidae/Ephemeroptera	1.000
Hydropsychidae/Trichoptera	0.810
Dominance	
Dominant Taxon Percent	47.07%
Dominant Taxa (2) Percent	65.86%
Dominant Taxa (3) Percent	76.16%
Dominant Taxa (10) Percent	94.34%
Diversity	
Shannon H (loge)	1.667
Shannon H (log2)	2.405
Margalef D	4.113
Simpson D	0.308
Evenness	0.088
Function	
Predator Richness	9
Predator Percent	10.10%
Filterer Richness	2
Filterer Percent	57.37%
Collector Percent	86.67%
Scraper+Shredder Percent	3.03%
Scraper/Filterer	0.025
Scraper/Scraper+Filterer	0.024
Habit	
Burrower Richness	1
Burrower Percent	0.20%
Swimmer Richness	2
Swimmer Percent	18.99%
Clinger Richness	15
Clinger Percent	72.53%
Characteristics	
Cold Stenotherm Richness	0
Cold Stenotherm Percent	0.00%
Hemoglobin Bearer Richness	
Hemoglobin Bearer Percent	
Air Breather Richness	3
Air Breather Percent	1.21%
Voltinism	
Univoltine Richness	16
Semivoltine Richness	3
Multivoltine Percent	7.07%
Tolerance	
Sediment Tolerant Richness	3
Sediment Tolerant Percent	0.81%
Sediment Sensitive Richness	1
Sediment Sensitive Percent	0.20%
Metals Tolerance Index	4.695
Pollution Sensitive Richness	0
Pollution Tolerant Percent	0.20%
Hilsenhoff Biotic Index	5.053
Intolerant Percent	5.86%
Supertolerant Percent	0.20%
CTQa	65.700

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	24	48.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	21	70.00%	Slight
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	8	44.44%	Moderate
MTM	Montana DEQ Mountains (Bukantis 1998)	2	9.52%	Severe



Metrics Report

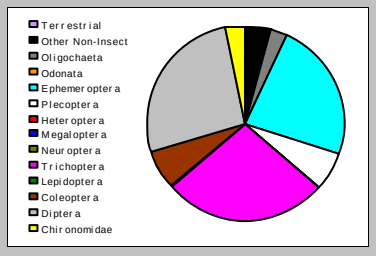
Project ID: CB15LD
RAI No.: CB15LD004
Sta. Name: Coal Creek Metro Access Rep 3
Client ID: CoalBelRM1.8_2015R3
STORET ID
Coll. Date: 7/29/2015
Latitude: 47.5592 **Longitude:** -122.1699

Abundance Measures

Sample Count: 549
Sample Abundance: 915.00 60.00% of sample used
Coll. Procedure: Surber
Sample Notes: Individual Jar IDs: CoalBelRM1.8_2015R3_Jar1, CoalBelRM1.8_2015R3_Jar2

Taxonomic Composition

Category	R	A	PRA
Terrestrial			
Other Non-Insect	3	23	4.19%
Oligochaeta	4	15	2.73%
Odonata			
Ephemeroptera	1	127	23.13%
Plecoptera	3	35	6.38%
Heteroptera			
Megaloptera			
Neuroptera			
Trichoptera	7	149	27.14%
Lepidoptera			
Coleoptera	2	35	6.38%
Diptera	6	150	27.32%
Chironomidae	5	15	2.73%

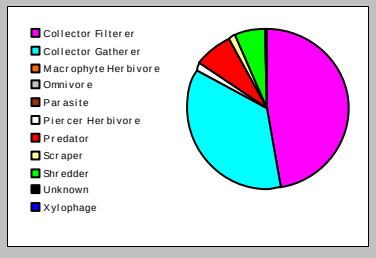


Dominant Taxa

Category	A	PRA
Simulium	137	24.95%
Baetis tricaudatus complex	127	23.13%
Hydropsyche	122	22.22%
Heterlimnius corpulentus	30	5.46%
Malenka	18	3.28%
Acari	17	3.10%
Zapada cinctipes	14	2.55%
Lumbriculidae	12	2.19%
Hydroptila	8	1.46%
Thienemannimyia Gr.	7	1.28%
Rhyacophila Brunnea/Vemna Gr.	7	1.28%
Parametriocnemus	5	0.91%
Narpus concolor	5	0.91%
Maruina	5	0.91%
Antocha monticola	5	0.91%

Functional Composition

Category	R	A	PRA
Predator	7	42	7.65%
Parasite			
Collector Gatherer	13	195	35.52%
Collector Filterer	3	260	47.36%
Macrophyte Herbivore			
Piercer Herbivore	1	8	1.46%
Xylophage			
Scraper	2	9	1.64%
Shredder	4	34	6.19%
Omnivore			
Unknown	1	1	0.18%

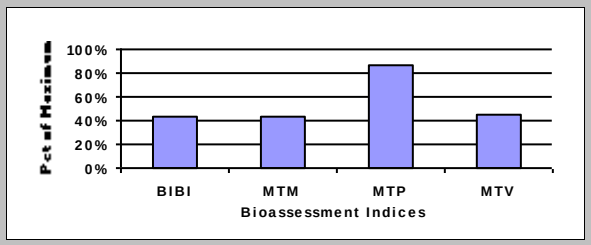


Metric Values and Scores

Metric	Value
Composition	
Taxa Richness	31
E Richness	1
P Richness	3
T Richness	7
EPT Richness	11
EPT Percent	56.65%
All Non-Insect Abundance	38
All Non-Insect Richness	7
All Non-Insect Percent	6.92%
Oligochaeta+Hirudinea Percent	2.73%
Baetidae/Ephemeroptera	1.000
Hydropsychidae/Trichoptera	0.819
Dominance	
Dominant Taxon Percent	24.95%
Dominant Taxa (2) Percent	48.09%
Dominant Taxa (3) Percent	70.31%
Dominant Taxa (10) Percent	89.62%
Diversity	
Shannon H (loge)	2.135
Shannon H (log2)	3.081
Margalef D	4.827
Simpson D	0.185
Evenness	0.080
Function	
Predator Richness	7
Predator Percent	7.65%
Filterer Richness	3
Filterer Percent	47.36%
Collector Percent	82.88%
Scraper+Shredder Percent	7.83%
Scraper/Filterer	0.035
Scraper/Scraper+Filterer	0.033
Habit	
Burrower Richness	2
Burrower Percent	2.37%
Swimmer Richness	2
Swimmer Percent	23.32%
Clinger Richness	14
Clinger Percent	66.48%
Characteristics	
Cold Stenotherm Richness	1
Cold Stenotherm Percent	0.18%
Hemoglobin Bearer Richness	
Hemoglobin Bearer Percent	
Air Breather Richness	2
Air Breather Percent	1.82%
Voltinism	
Univoltine Richness	18
Semivoltine Richness	2
Multivoltine Percent	7.29%
Tolerance	
Sediment Tolerant Richness	2
Sediment Tolerant Percent	3.10%
Sediment Sensitive Richness	1
Sediment Sensitive Percent	0.18%
Metals Tolerance Index	4.447
Pollution Sensitive Richness	0
Pollution Tolerant Percent	1.46%
Hilsenhoff Biotic Index	4.728
Intolerant Percent	8.74%
Supertolerant Percent	0.18%
CTQa	77.160

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	22	44.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	26	86.67%	None
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	8	44.44%	Moderate
MTM	Montana DEQ Mountains (Bukantis 1998)	9	42.86%	Moderate



Metrics Report

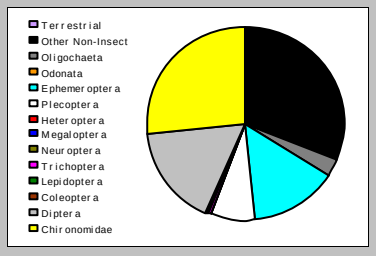
Project ID: CB15LD
RAI No.: CB15LD005
Sta. Name: West Trib (Kelsey Farm, Restored Reach) Rep 1
Client ID: WestTribFarmRM0.4_2015R1
STORET ID
Coll. Date: 7/30/2015
Latitude: 47.6051 **Longitude:** -122.1648

Abundance Measures

Sample Count: 552
Sample Abundance: 1,840.00 30.00% of sample used
Coll. Procedure: Surber
Sample Notes: Individual Jar IDs: WestTribFarmRM0.4_2015R1_Jar1, WestTribFarmRM0.4_2015R1_Jar2, WestTribFarmRM0.4_2015R1_Jar3,

Taxonomic Composition

Category	R	A	PRA
Terrestrial			
Other Non-Insect	5	172	31.16%
Oligochaeta	2	15	2.72%
Odonata			
Ephemeroptera	1	79	14.31%
Plecoptera	1	41	7.43%
Heteroptera			
Megaloptera			
Neuroptera			
Trichoptera	1	2	0.36%
Lepidoptera			
Coleoptera	1	3	0.54%
Diptera	4	91	16.49%
Chironomidae	16	149	26.99%

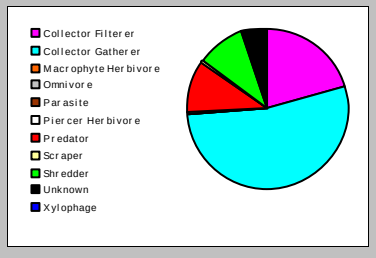


Dominant Taxa

Category	A	PRA
Crangonyx	84	15.22%
Baetis tricaudatus complex	79	14.31%
Rheotanytarsus	56	10.14%
Simulium	55	9.96%
Malenka	41	7.43%
Antocha monticola	32	5.80%
Acari	32	5.80%
Trepaxonemata	26	4.71%
Nemata	26	4.71%
Eukiefferiella Pseudomontana Gr	20	3.62%
Orthocladius	16	2.90%
Lumbriculidae	13	2.36%
Eukiefferiella	10	1.81%
Eukiefferiella Claripennis Gr.	8	1.45%
Micropsectra	6	1.09%

Functional Composition

Category	R	A	PRA
Predator	4	62	11.23%
Parasite			
Collector Gatherer	16	290	52.54%
Collector Filterer	4	116	21.01%
Macrophyte Herbivore			
Piercer Herbivore			
Xylophage			
Scraper	1	2	0.36%
Shredder	5	56	10.14%
Omnivore			
Unknown	1	26	4.71%

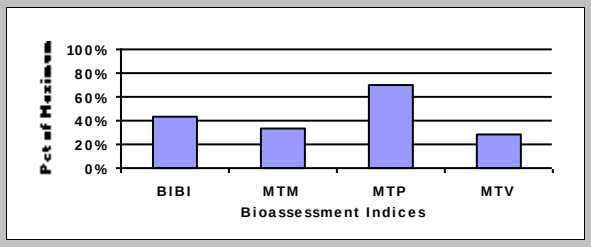


Metric Values and Scores

Metric	Value
Composition	
Taxa Richness	31
E Richness	1
P Richness	1
T Richness	1
EPT Richness	3
EPT Percent	22.10%
All Non-Insect Abundance	187
All Non-Insect Richness	7
All Non-Insect Percent	33.88%
Oligochaeta+Hirudinea Percent	2.72%
Baetidae/Ephemeroptera	1.000
Hydropsychidae/Trichoptera	0.000
Dominance	
Dominant Taxon Percent	15.22%
Dominant Taxa (2) Percent	29.53%
Dominant Taxa (3) Percent	39.67%
Dominant Taxa (10) Percent	81.70%
Diversity	
Shannon H (loge)	2.696
Shannon H (log2)	3.889
Margalef D	4.799
Simpson D	0.089
Evenness	0.058
Function	
Predator Richness	4
Predator Percent	11.23%
Filterer Richness	4
Filterer Percent	21.01%
Collector Percent	73.55%
Scraper+Shredder Percent	10.51%
Scraper/Filterer	0.017
Scraper/Scraper+Filterer	0.017
Habit	
Burrower Richness	2
Burrower Percent	2.90%
Swimmer Richness	1
Swimmer Percent	14.31%
Clinger Richness	8
Clinger Percent	36.23%
Characteristics	
Cold Stenotherm Richness	0
Cold Stenotherm Percent	0.00%
Hemoglobin Bearer Richness	2
Hemoglobin Bearer Percent	0.36%
Air Breather Richness	2
Air Breather Percent	6.16%
Voltinism	
Univoltine Richness	10
Semivoltine Richness	1
Multivoltine Percent	32.79%
Tolerance	
Sediment Tolerant Richness	3
Sediment Tolerant Percent	8.51%
Sediment Sensitive Richness	1
Sediment Sensitive Percent	0.18%
Metals Tolerance Index	3.778
Pollution Sensitive Richness	0
Pollution Tolerant Percent	0.18%
Hilsenhoff Biotic Index	5.190
Intolerant Percent	8.33%
Supertolerant Percent	7.79%
CTQa	93.348

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	22	44.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	21	70.00%	Slight
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	5	27.78%	Moderate
MTM	Montana DEQ Mountains (Bukantis 1998)	7	33.33%	Moderate



Metrics Report

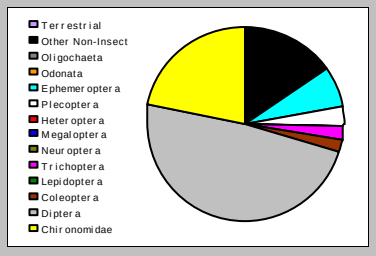
Project ID: CB15LD
RAI No.: CB15LD006
Sta. Name: Kelsey Trestle Rep 1
Client ID: KelBelRM0.2_2015R1
STORET ID
Coll. Date: 8/5/2015
Latitude: 47.603 **Longitude:** -122.1806

Abundance Measures

Sample Count: 541
Sample Abundance: 1,475.45 36.67% of sample used
Coll. Procedure: Surber
Sample Notes: Individual Jar IDs: KelBelRM0.2_2015R1_Jar1A, KelBelRM0.2_2015R1_Jar1B

Taxonomic Composition

Category	R	A	PRA
Terrestrial			
Other Non-Insect	7	84	15.53%
Oligochaeta	1	2	0.37%
Odonata			
Ephemeroptera	1	35	6.47%
Plecoptera	2	16	2.96%
Heteroptera			
Megaloptera			
Neuroptera			
Trichoptera	3	12	2.22%
Lepidoptera			
Coleoptera	3	10	1.85%
Diptera	4	263	48.61%
Chironomidae	12	119	22.00%

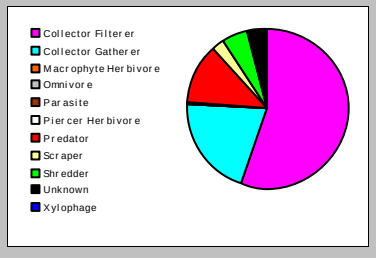


Dominant Taxa

Category	A	PRA
Simulium	227	41.96%
Rheotanytarsus	65	12.01%
Baetis tricaudatus complex	35	6.47%
Crangonyx	32	5.91%
Neoplasta	22	4.07%
Nemata	21	3.88%
Acari	20	3.70%
Micropsectra	10	1.85%
Malenka	10	1.85%
Eukiefferiella Claripennis Gr.	10	1.85%
Cricotopus bicinctus	9	1.66%
Rhyacophila Brunnea/Vemna Gr.	8	1.48%
Optioservus	8	1.48%
Parametriocnemus	7	1.29%
Dicranota	7	1.29%

Functional Composition

Category	R	A	PRA
Predator	7	65	12.01%
Parasite			
Collector Gatherer	10	112	20.70%
Collector Filterer	3	298	55.08%
Macrophyte Herbivore			
Piercer Herbivore	1	3	0.55%
Xylophage			
Scraper	4	13	2.40%
Shredder	7	29	5.36%
Omnivore			
Unknown	1	21	3.88%

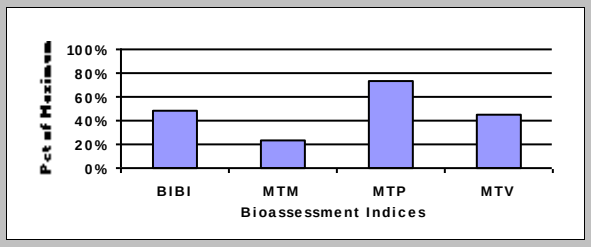


Metric Values and Scores

Metric	Value
Composition	
Taxa Richness	33
E Richness	1
P Richness	2
T Richness	3
EPT Richness	6
EPT Percent	11.65%
All Non-Insect Abundance	86
All Non-Insect Richness	8
All Non-Insect Percent	15.90%
Oligochaeta+Hirudinea Percent	0.37%
Baetidae/Ephemeroptera	1.000
Hydropsychidae/Trichoptera	0.000
Dominance	
Dominant Taxon Percent	41.96%
Dominant Taxa (2) Percent	53.97%
Dominant Taxa (3) Percent	60.44%
Dominant Taxa (10) Percent	83.55%
Diversity	
Shannon H (loge)	2.299
Shannon H (log2)	3.317
Margalef D	5.111
Simpson D	0.209
Evenness	0.067
Function	
Predator Richness	7
Predator Percent	12.01%
Filterer Richness	3
Filterer Percent	55.08%
Collector Percent	75.79%
Scraper+Shredder Percent	7.76%
Scraper/Filterer	0.044
Scraper/Scraper+Filterer	0.042
Habit	
Burrower Richness	2
Burrower Percent	4.25%
Swimmer Richness	2
Swimmer Percent	6.65%
Clinger Richness	13
Clinger Percent	64.51%
Characteristics	
Cold Stenotherm Richness	1
Cold Stenotherm Percent	0.18%
Hemoglobin Bearer Richness	2
Hemoglobin Bearer Percent	0.74%
Air Breather Richness	3
Air Breather Percent	2.77%
Voltinism	
Univoltine Richness	10
Semivoltine Richness	4
Multivoltine Percent	26.25%
Tolerance	
Sediment Tolerant Richness	3
Sediment Tolerant Percent	2.77%
Sediment Sensitive Richness	0
Sediment Sensitive Percent	0.00%
Metals Tolerance Index	4.087
Pollution Sensitive Richness	1
Pollution Tolerant Percent	2.59%
Hilsenhoff Biotic Index	5.525
Intolerant Percent	3.70%
Supertolerant Percent	3.14%
CTQa	89.174

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	24	48.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	22	73.33%	Slight
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	8	44.44%	Moderate
MTM	Montana DEQ Mountains (Bukantis 1998)	5	23.81%	Moderate



Metrics Report

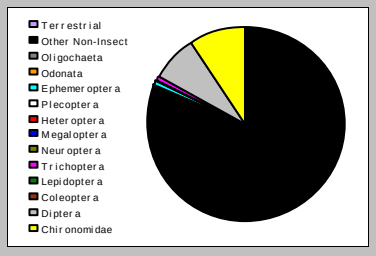
Project ID: CB15LD
RAI No.: CB15LD007
Sta. Name: Kelsey Glendale "Wooded" Rep 1
Client ID: KelBelRM1.8_2015R1
STORET ID
Coll. Date: 8/10/2015
Latitude: 47.6085 **Longitude:** -122.1631

Abundance Measures

Sample Count: 546
Sample Abundance: 4,095.00 13.33% of sample used
Coll. Procedure: Surber
Sample Notes: Individual Jar IDs: KelBelRM1.8_2015R1_Jar1A, KelBelRM1.8_2015R1_Jar1B, KelBelRM1.8_2015R1_Jar1C,

Taxonomic Composition

Category	R	A	PRA
Terrestrial			
Other Non-Insect	4	443	81.14%
Oligochaeta	1	2	0.37%
Odonata			
Ephemeroptera	1	3	0.55%
Plecoptera	1	3	0.55%
Heteroptera			
Megaloptera			
Neuroptera			
Trichoptera	2	2	0.37%
Lepidoptera			
Coleoptera	1	1	0.18%
Diptera	3	42	7.69%
Chironomidae	8	50	9.16%

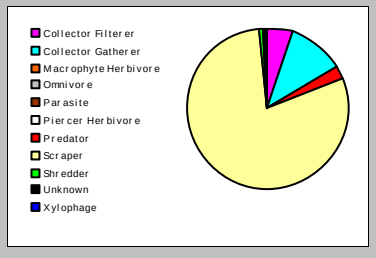


Dominant Taxa

Category	A	PRA
Potamopyrgus antipodarum	431	78.94%
Antocha monticola	38	6.96%
Rheotanytarsus	27	4.95%
Eukiefferiella Pseudomontana Gr	9	1.65%
Nemata	5	0.92%
Trepaxonemata	4	0.73%
Thienemannimyia Gr.	4	0.73%
Orthocladius	4	0.73%
Neoplasta	3	0.55%
Malenka	3	0.55%
Baetis Rhodani Gr.	3	0.55%
Acari	3	0.55%
Lumbriculidae	2	0.37%
Eukiefferiella Claripennis Gr.	2	0.37%
Narpus concolor	1	0.18%

Functional Composition

Category	R	A	PRA
Predator	4	14	2.56%
Parasite			
Collector Gatherer	9	62	11.36%
Collector Filterer	3	29	5.31%
Macrophyte Herbivore			
Piercer Herbivore			
Xylophage			
Scraper	2	432	79.12%
Shredder	2	4	0.73%
Omnivore			
Unknown	1	5	0.92%



Metric Values and Scores

Metric	Value
Composition	
Taxa Richness	21
E Richness	1
P Richness	1
T Richness	2
EPT Richness	4
EPT Percent	1.47%
All Non-Insect Abundance	445
All Non-Insect Richness	5
All Non-Insect Percent	81.50%
Oligochaeta+Hirudinea Percent	0.37%
Baetidae/Ephemeroptera	1.000
Hydropsychidae/Trichoptera	0.500
Dominance	
Dominant Taxon Percent	78.94%
Dominant Taxa (2) Percent	85.90%
Dominant Taxa (3) Percent	90.84%
Dominant Taxa (10) Percent	96.70%
Diversity	
Shannon H (loge)	0.963
Shannon H (log2)	1.389
Margalef D	3.178
Simpson D	0.641
Evenness	0.055
Function	
Predator Richness	4
Predator Percent	2.56%
Filterer Richness	3
Filterer Percent	5.31%
Collector Percent	16.67%
Scraper+Shredder Percent	79.85%
Scraper/Filterer	14.897
Scraper/Scraper+Filterer	0.937
Habit	
Burrower Richness	2
Burrower Percent	0.92%
Swimmer Richness	1
Swimmer Percent	0.55%
Clinger Richness	8
Clinger Percent	13.37%
Characteristics	
Cold Stenotherm Richness	0
Cold Stenotherm Percent	0.00%
Hemoglobin Bearer Richness	
Hemoglobin Bearer Percent	
Air Breather Richness	1
Air Breather Percent	6.96%
Voltinism	
Univoltine Richness	8
Semivoltine Richness	1
Multivoltine Percent	9.71%
Tolerance	
Sediment Tolerant Richness	2
Sediment Tolerant Percent	7.33%
Sediment Sensitive Richness	1
Sediment Sensitive Percent	0.18%
Metals Tolerance Index	3.067
Pollution Sensitive Richness	0
Pollution Tolerant Percent	0.00%
Hilsenhoff Biotic Index	7.354
Intolerant Percent	0.92%
Supertolerant Percent	81.32%
CTQa	88.538

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	16	32.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	14	46.67%	Moderate
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	7	38.89%	Moderate
MTM	Montana DEQ Mountains (Bukantis 1998)	7	33.33%	Moderate