AQUATIC INVERTEBRATE ASSEMBLAGES AND BIOLOGICAL ASSESSMENT OF STREAM SITES IN THE CITY OF BELLEVUE, WASHINGTON: 2016

Report to the City of Bellevue, Washington
Utilities Department
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INTRODUCTION

This report summarizes and interprets aquatic macroinvertebrate data collected in August 2016 at stream sites in the City of Bellevue, King County, Washington. Similar to 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.

Site-specific narrative summaries provide additional information on the probable stressors that may account for diminished stream health. 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 instream 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 6 sites. Two replicate samples were collected at Lewis Creek Ravine. Single collections were made at the other 5 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 December 2016 and January 2017), 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 to organic pollution. 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, pollution-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 stability and complexity of streamside 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 95.43%. PDE was (0.40%), PTD (1.80%), and Bray-Curtis similarity was 98.59%. 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 1.2 to 52.7 for City of Bellevue in 2016 (Table 1, Figure 1). These scores indicated "very poor" conditions for 4 sites (Coal Creek Above I-405 Weirs, Newport Tributary, Newport Tributary Above Pedestrian Bridge, and Yarrow East Tributary), "poor" conditions for one site (Coal Creek Below Parkway) and "fair" conditions for one site (Lewis Creek Ravine). The site score for Lewis Creek Ravine was determined by scoring a composite sample made by combining the 2 replicates. Individual replicates for Lewis Creek Ravine scored "poor" and "fair."

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 Lewis Creek Ravine site, from which 2 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 Above I-405 Weirs	CoalBelRM0.8	CoalBelRM0.8_2016R1	**14.4**		**0.72**	
Coal Creek Below Parkway	CoalBelRM1.8	CoalBelRM1.8_2016R1	**36.3**		**0.80**	
Lewis Creek Ravine Rep 1	LewisBelRM1.8	LewisBelRM1.8_2016R1	**40.7**	**52.7**	**0.76**	**0.84**
Lewis Creek Ravine Rep 2	LewisBelRM1.8	LewisBelRM1.8_2016R2	**34.3**		**0.76**	
Newport Tributary	NewpBelRM0.0	NewpBelRM0.0_2016R1	**18.5**		**0.56**	
Newport Tributary Above Pedestrian Bridge	NewpBelRM0.25	NewpBelRM0.25_2016R1	**8.5**		**0.64**	
Yarrow East Tributary	YarrowEastTribBelRM0.3	YarrowEastTribBelRM0.3_2016R1	**1.2**		**0.40**	

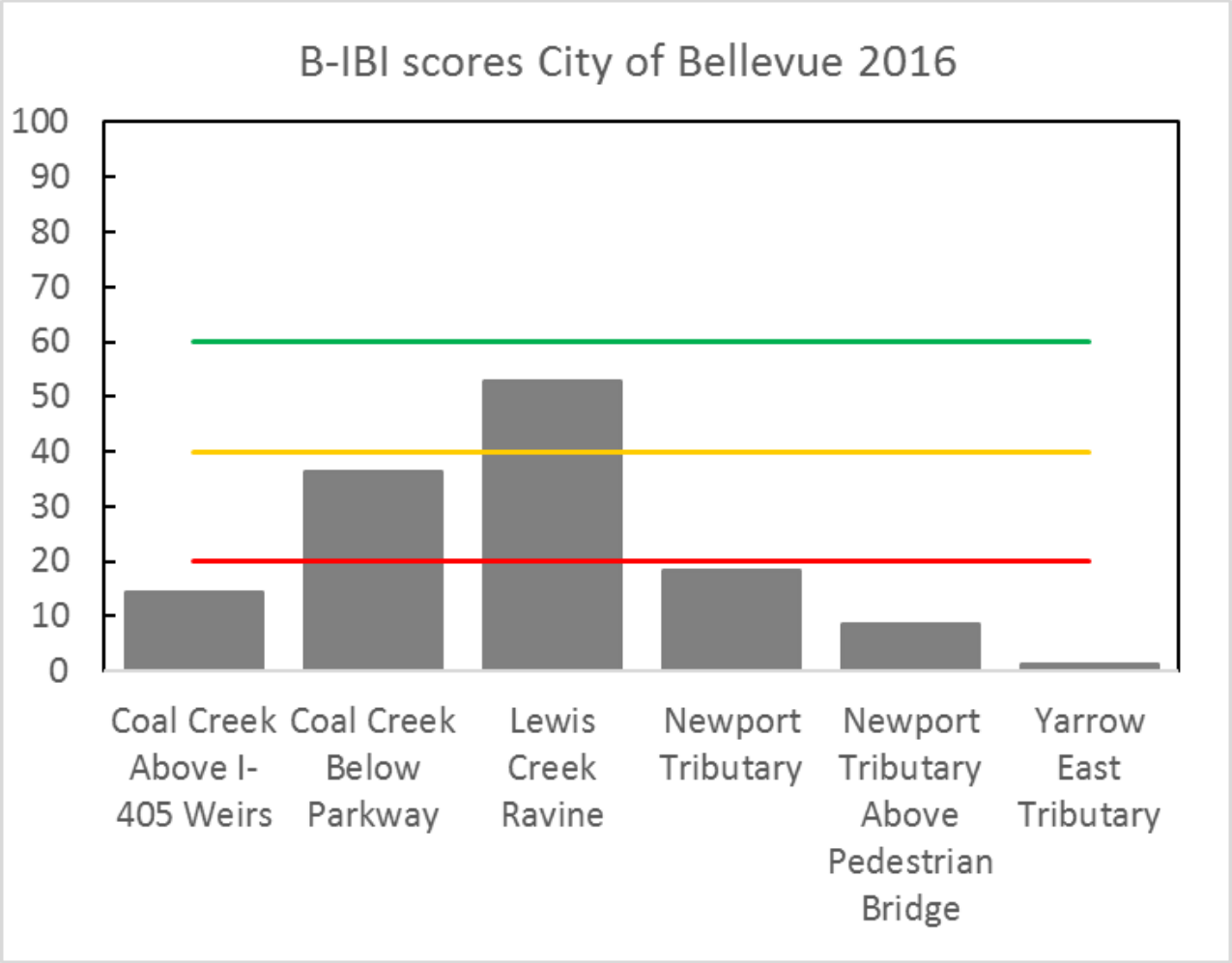

Figure 1. B-IBI site scores for stream sites in the City of Bellevue, 2016. The green line indicates the threshold (B-IBI = 60) for "good" conditions, as described on the Puget Sound Stream Benthos website (pugetsoundstreambenthos.org, accessed May 2016) for scoring using a 0-100 continuous scale. Scores 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 0.40 to 0.84 (Table 1, Figure 2). These scores indicated "impaired" biological conditions in 2016 for 4 of the 6 sites. RIVPACS scores of Coal Creek Below Parkway and Lewis Creek Ravine indicated "unimpaired" conditions. The RIVPACS site score at Lewis Creek Ravine was obtained by scoring the composite of the two replicate samples. Individual replicate scores for Lewis Creek Ravine also indicated "unimpaired" conditions.

B-IBI site scores and RIVPACS site scores for the 6 locations in this study were significantly correlated with each other ($r = 0.8374$, $p = 0.0375$). Figure 3 illustrates this relationship.

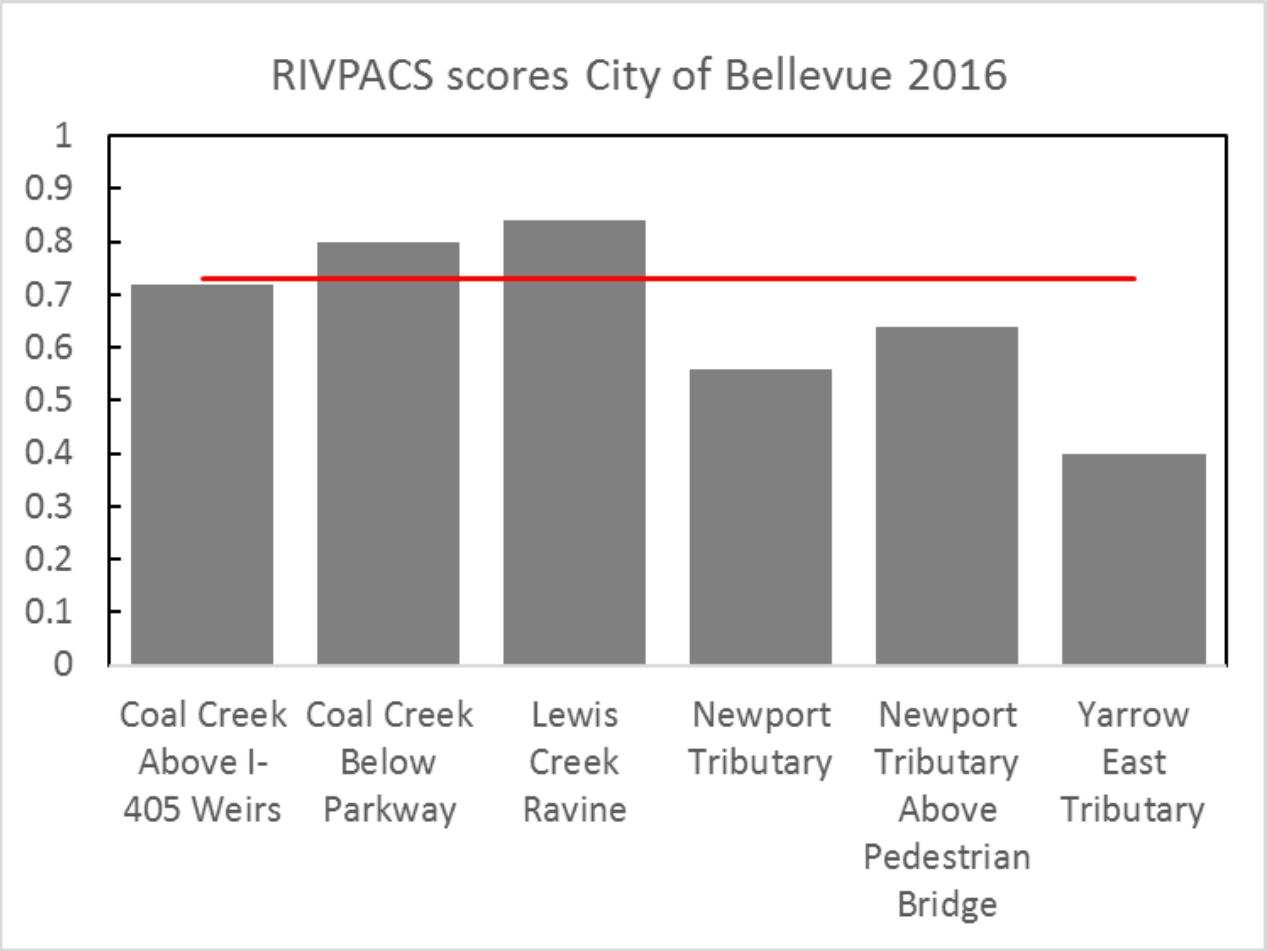

Figure 2. RIVPACS site scores for stream sites in the City of Bellevue, 2016. The red line indicates the threshold (RIVPACS = 0.73) for "unimpaired" conditions, set by WDOE. Scores below the threshold indicate impaired conditions.

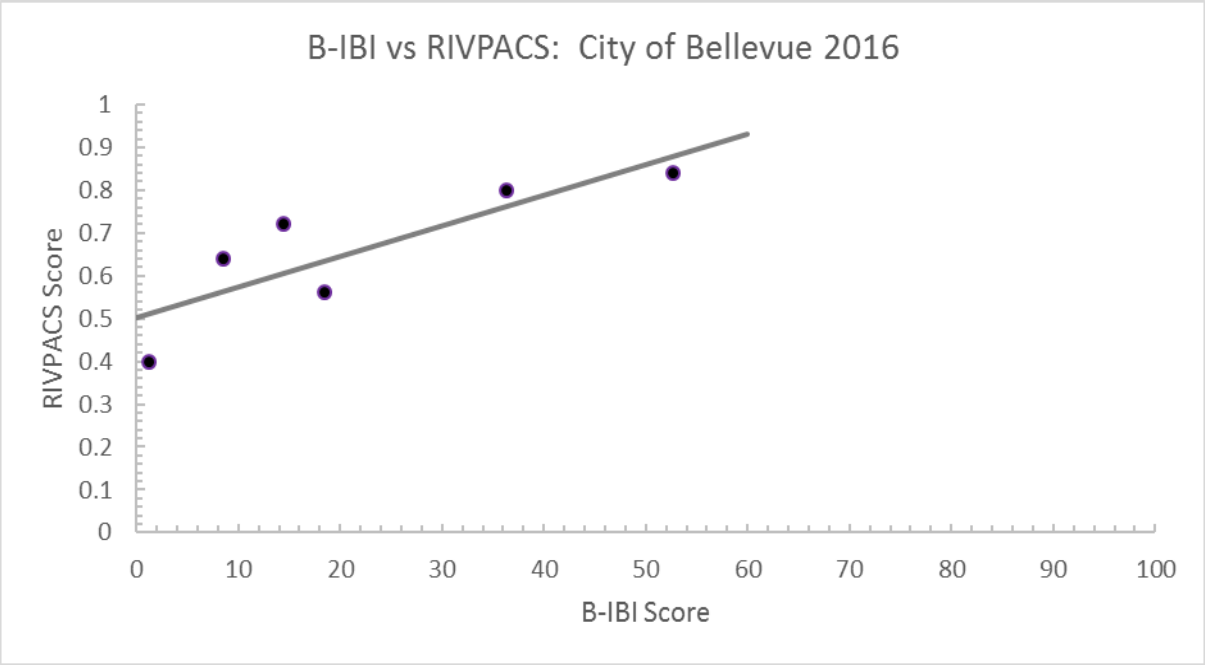

Figure 3. Correlation between B-IBI site scores and RIVPACS site scores for locations in the City of Bellevue, 2016. The relationship was significant (r= 0.8374, p = 0.0375).

Characteristics of the aquatic invertebrate assemblages

Coal Creek Above I-405 Weirs

Bioassessment scores: 2016

The B-IBI site score (14.4) indicated "very poor" biological condition. The RIVPACS score (0.72) also indicated "impaired" conditions.

Indicators of ecological condition: 2016

a. Water quality

Water quality appears to be impaired at Coal Creek-Above I-405 Weirs in 2016. The ubiquitous *Baetis tricaudatus* complex (25.9%), although very abundant, was the only mayfly taxon collected. The HBI (5.27) was elevated above expectations for a Puget Sound Lowlands stream indicating an assemblage that was tolerant of organic pollution. The functional composition of the assemblage was strongly dominated by collector-filterers (44.5%), primarily the filtering blackfly *Simulium* sp. (27.6%), the dominant taxon in the sample, and the filtering caddisfly *Hydropsyche* sp. (13.4%). In addition, caddisflies in the family Hydroptilidae (4.8%) were common. These caddisflies are often thought to be associated with filamentous algae, large crops of which are suggestive of nutrient enrichment. Hemoglobin-bearing organisms (3.5%), primarily the midge *Phaenopsectra* sp. (2.9%), were common suggesting that sediments may be hypoxic. All of these characteristics seem to indicate that water quality was impaired through nutrient enrichment. No pollution-sensitive taxa were collected; however, pollution-tolerant organisms accounted for only 2.9% of the fauna. Several specimens in the flatworm class Trepaxonemata were collected suggesting that ground water inputs occur in this reach. The MTI value (4.60) was lower than the biotic index value, thus there was little evidence for metals contamination.

b. Thermal condition

No cold-stenotherm taxa were detected in this sample. The thermal preference estimated for the assemblage was 14.7°C.

c. Sediment deposition

At least 3 caddisfly and 13 "clinger" taxa were reported from this site, both below expectations. Two of the caddisfly taxa were common; however, limitation of invertebrate colonization by fine sediment cannot be ruled out here. An FSBI value of 4.23 indicated a moderately sediment-tolerant assemblage.

d. Habitat diversity and integrity

Low taxa richness (31) at this site suggests that instream habitats were disturbed or monotonous. The stonefly fauna was represented by at least 3 taxa: *Zapada cinctipes* (1.7%) was common, whereas *Skwala* sp. (0.4%) and *Malenka* sp. (0.9%) were less common. Reach-scale habitat features such as riparian zones, channel morphology and stream banks may

have been disrupted. Only 2 semivoltine taxa (the elmids *Heterlimnius corpulentus* (6.8%) and *Narpus concolor* (0.9%)) were reported making it likely that this site may have been subjected to thermal stress, toxic pollutants or other catastrophes that would interrupt long life cycles. Collectors (84.1%) overwhelmed the functional mix indicating the importance of fine particulate organic matter to the food web in this reach. Scrapers (2.9%) and shredders (3.1%) were not well represented, thus both autochthonous production from algae and Inputs from stream-side vegetation were probably not as important to the food web as the fine particulate matter.

Coal Creek Below Parkway

Bioassessment scores: 2016

The B-IBI site score for this site was 36.3, indicating "poor" conditions. The RIVPACS result (0.80) indicated “unimpaired” conditions.

Indicators of ecological condition: 2016

a. Water quality

A single mayfly taxon, the widespread and common *Baetis tricaudatus* (9.0%), was reported from this site. The biotic index value (4.27) was elevated above expectations indicating an assemblage that was moderately tolerant of organic pollution. Although the percentage of hemoglobin-bearing organisms in the sample was low (0.2%) suggesting that sediments were not hypoxic, caddisflies in the family Hydroptilidae were abundant (14.3%). Similar to the upstream site Coal Creek - Above I-405 Weirs, this suggests abundant filamentous algae that is often thought to indicate nutrient enrichment. This hypothesis is supported by the fact that collector-filterers (26.9%) were abundant. This is to be expected given that the dominant organisms in the sample were the filtering dipteran *Simulium* sp. (14.1%) and the filtering caddisfly *Hydropsyche* sp. (12.2%). The combination of low mayfly taxa richness, an elevated biotic index, abundant hydroptilid caddisflies, and dominance of collector-filterers suggest that water quality was impaired by nutrient enrichment. No pollution-sensitive taxa were collected, but the abundance of pollution-tolerant organisms (3.2%) was low. Similar to Coal Creek - Above I-405 Weirs, several specimens in the flatworm class Trepaxonemata were collected suggesting some inputs of ground water in this reach. The MTI (3.92) was lower than the HBI, thus there was no indication of contamination by metals.

b. Thermal condition

The temperature preference of the assemblage was 15.1 °C. No cold-stenotherm taxa were recorded in this sample.

c. Sediment deposition

Caddisflies were represented by at least 6 taxa many of which were common. Thirteen “clinger” taxa were collected. These findings suggest that the deposition of fine sediment did not limit colonization in this reach. The FSBI (4.09) indicated a moderately sediment-tolerant assemblage.

d. Habitat diversity and integrity

Taxa richness (34) was somewhat lower than expected at this site suggesting that some disturbance to instream habitats cannot be ruled out here. At least 4 stonefly taxa were recorded from this site including *Zapada cinctipes* (4.7%) and *Malenka* sp. (6.0%) that were common: riparian zones, channel morphology and stream banks were probably in good condition. Similar to Coal Creek - Above I-405 Weirs, the elmids *Heterlimnius corpulentus* (10.3%) and *Narpus concolor* (0.8%) were the only long-lived taxa collected, suggesting that some catastrophic conditions may have disrupted the life cycles of long-lived taxa. All functional feeding groups, except scrapers (3.4%), were well represented with the dominant groups being the gatherers (32.7%) and the filterers (26.9%) suggesting the importance of fine particulate organic matter to the energy flow of the system. In addition, shredders, dominated by individuals in the stonefly family Nemouridae, were abundant (12.4%) suggesting ample inputs of streamside vegetation.

Lewis Creek Ravine

Bioassessment scores: 2016

Two replicate samples were collected at Lewis Creek Ravine in 2016 and this analysis is based on scores calculated from the composited replicates. The B-IBI score was 52.7 indicating "fair" biological condition. The RIVPACS score (0.84) indicated "unimpaired" biological condition.

Indicators of ecological condition: 2016

Discussion of the indicators of ecological condition are based on a composite of the 2 replicate samples that were collected at this site in 2016. In most cases, the results of richness metrics cannot be compared directly to results from sites where only a single sample was collected because this site was represented by a total of 867 invertebrates, a much higher number than the other sites. However, richness metrics can be compared if the numbers are low even with the additional specimens collected in this reach.

a. Water quality

Results of the ecological characteristics that indicate water-quality status was mixed at this site. Only 2 mayfly taxa, the ubiquitous *Baetis tricaudatus* complex (17.4%) and the heptageniid *Cinygma* sp. (1.0%), and only 1 pollution-sensitive taxon (*Cinygma* sp.) were recorded from this reach. Given the greater number of specimens collected in this composite sample compared to the other sites, the low mayfly and sensitive taxa diversities are significant. In addition, the abundance of collector-filterers (18.2%) were somewhat elevated over expectations and hemoglobin-bearing organisms (2.3%) were common. These results suggest that nutrient enrichment could influence the fauna here. However, the HBI (3.91) was within expectations for a Puget Sound Lowlands stream and pollution-tolerant taxa (0.4%) composed only a small percentage of the fauna suggesting unimpaired water quality. Given these combined results, it appears that water quality impairment as the result of nutrient

enrichment cannot be ruled out in this reach. No evidence for metals contamination was found because the MTI was only 3.24 and heptageniid mayflies were found in the sample.

b. Thermal condition

Two cold-stenotherm taxa were encountered in the sample: the aforementioned mayfly *Cinygma* sp. and the limnephilid caddisfly *Psychoglypha* sp., which was represented by only 1 specimen. The temperature preference of the assemblage was 13.5°C.

c. Sediment deposition

Eight caddisfly and 22 "clinger" taxa were collected at this site. The FSBI was 3.98, indicating that the taxa were moderately tolerant of fine sediment. These findings suggest that sediment deposition probably did not limit invertebrate colonization of the stony substrate habitats in this reach.

d. Habitat diversity and integrity

Invertebrate diversity was high as 53 total taxa and 6 stonefly taxa were discovered in this composited sample. Consequently, instream habitats appear to be diverse and reach-scale habitat features, such as riparian zones and stream banks, appear to be undisturbed. Catastrophes like periodic thermal extremes, dewatering, or discharge of toxic pollutants are probably unlikely here as 6 semivoltine taxa were collected some of which were common (i.e., *Parapsyche* sp., 3.9%). Collector-gatherers (45.6%) dominated the functional composition. Indeed, the gathering amphipod *Crangonyx* sp. (17.8%) was the dominant organism in a sample. The dominance of gatherers and filterers indicates that fine organic particulates were an important energy source in this reach. All other functional groups were well represented.

Newport Tributary

Bioassessment scores: 2016

The B-IBI score (18.5) calculated for the sample collected at this site indicated "very poor" conditions; the RIVPACS score (0.56) also indicated impairment.

Indicators of ecological condition: 2016

a. Water quality

As with many of the sites sampled in 2016, a single mayfly taxon, the ubiquitous *Baetis tricaudatus* (3.9%) and no pollution-sensitive taxa were collected from this site. The HBI (4.13) was only slightly elevated above expectations for a for a Puget Sound Lowlands stream. In addition, midges in the genus *Orthocladius* (11.6%) were abundant suggesting that large crops of filamentous algae may be present which is often thought to indicate nutrient enrichment. However, all other indicators suggested that water quality was unimpaired. Pollution-tolerant and hemoglobin-bearing organisms each composed only 0.6% of the fauna. Collector-filterers (5.0%) were only a small component of the food web. Because of the low mayfly diversity, the lack of sensitive taxa in the sample, and the slightly elevated HBI, water

quality impairment cannot be dismissed. There was no evidence of metals contamination (MTI = 3.09).

b. Thermal condition

The temperature preference of the assemblage was only 13.7°C. However, no cold-stenotherm taxa were found in this sample.

c. Sediment deposition

Only 2 caddisfly taxa, composing less than 2.0% of the assemblage, were found in this reach both in the genus *Rhyacophila*. Only 8 "clinger" taxa were recorded. The FSBI value was 2.76 indicating an assemblage that was fine-sediment tolerant. These results indicate that colonization of some insect taxa may be limited by the deposition of fine sediment.

d. Habitat diversity and integrity

Taxa richness (38) was low in this assemblage suggesting that instream habitats were not very diverse and perhaps disturbed. At least 2 stonefly taxa were collected all of which were nemourids: *Malenka* sp. (20.5%) was the dominant organism in the sample and *Zapada cinctipes* (15.4%) was also very abundant. However, the very low stonefly diversity suggests that reach-scale habitat features were very disturbed. Only 1 semivoltine taxon was collected making it likely that disasters such as thermal stress, dewatering and release of toxic pollutants could have significantly interrupted long life cycles. Interestingly, the functional composition of the assemblage was dominated by shredders (46.5%), which is to be expected given the high relative abundance of shredding stoneflies. Collector-gatherers (43.2%) were also extremely abundant, whereas scrapers (0.8%) were rare. These results suggest that both allochthonous coarse particulate and fine particulate organic matter are important components of the energy flow in this system, but autochthonous algal production contributes little to the energy flow in this system.

Newport Tributary Above Pedestrian Bridge

Bioassessment scores: 2016

The B-IBI score (8.5) generated by this sample indicated "very poor" biological condition. Biological condition was also considered "impaired" based on the RIVPACS score (0.64).

Indicators of ecological condition: 2016

a. Water quality

Only 7 specimens of 1 mayfly taxon *Baetis rhodani Gr.* (1.4%) were collected in this reach and the HBI was slightly elevated (4.18). Further, no pollution-sensitive taxa were recorded and collector-filterers (47.4%) dominated the functional mix. Almost all of the collector-filterers were blackflies (*Simulium* sp., 45.8%) the dominant organisms in the assemblage. In contrast, pollution-tolerant (0.2%) and hemoglobin-bearing (0.2%) organisms were only small components of the fauna. However, the low mayfly diversity, slightly elevated HBI, lack of sensitive taxa, and dominance of the food web by collector-filterers all suggest that water

quality was impaired perhaps through nutrient enrichment. A MTI of 4.11 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 12.4 °C.

c. Sediment deposition

Five caddisfly taxa were collected in this reach which is within expectations for a Puget Sound Lowlands stream. However, only 8 "clingers" were recorded. These results suggest that limitation of colonization of some invertebrate species by the deposition of fine sediments cannot be dismissed at this site. The low FSBI (3.01) indicated a sediment-tolerant assemblage, which also supports this contention.

d. Habitat diversity and integrity

The habitat appears to be disturbed at this site. This site had the lowest total taxa richness (19) of any of the sites where samples were taken in 2016, which may indicate disturbed or monotonous instream habitats. The sample also contained only 1 unique stonefly taxon (*Malenka* sp., 6.2%). The low taxa richness of stoneflies suggests streambanks, riparian zones, or channel morphology may have been disturbed. Only 2 semivoltine taxa were 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 collector-filterers because of the abundance of blackflies in the sample. Gatherers (13.4%) and shredders (25.2%) were also abundant. These results suggest that allochthonous fine and coarse particulate matter was the dominant energy producer in this food web.

Yarrow East Tributary

Bioassessment scores: 2016

Biological condition was considered "very poor" based on the B-IBI score (1.2) at Yarrow East Tributary. The RIVPACS score (0.40) also indicated impairment. This sample had both the lowest B-IBI score and the lowest RIVPACS score of any sample in this year's study.

Indicators of ecological condition: 2016

a. Water quality

Similar to several other sites in 2016, the ubiquitous *Baetis tricaudatus* complex was the only mayfly taxon collected although it was abundant (12.0%). The HBI was high (5.50) and no pollution-sensitive taxa were found in the sample. However, pollution-tolerant organisms (1.2%) and hemoglobin-bearing organisms (0.0%) were rare or absent and collector-filterers (2.3%) were not abundant. Interestingly, the assemblage at this site was dominated by non-insects (> 80.0% of the specimens). In particular, the amphipod *Crangonyx* sp. (46.8%) was the dominant organism in the assemblage. In addition, flatworms in the class Trepaxonemata were abundant (14.2%), consequently it appears that inputs of ground water influence the

fauna in this reach. Given these results, water quality impairment as a result of nutrient enrichment cannot be dismissed. The MTI (3.66) suggests no impact from metals contamination.

b. Thermal condition

No cold-stenotherm taxa were collected in this sample. The calculated temperature preference of the assemblage was 15.5°C.

c. Sediment deposition

Only 2 caddisfly taxa (*Hydropsyche* sp. and *Rhyacophila Brunnea/Vemna* Gr.) were recorded in this reach and each was represented by only 1 specimen (0.2%). "Clingers" were equally rare as only 3 taxa were recorded. Clearly, the deposition of fine sediments may have limited the colonization of some invertebrate species. The FSBI (5.11) indicated a moderately sediment-tolerant assemblage.

d. Habitat diversity and integrity

As with Newport Tributary - Above pedestrian bridge, the habitat appears to be extremely disturbed at this site. Only 21 total taxa, 1 stonefly taxon (*Malenka* sp., 1 specimen. 0.2% of the assemblage), and no semivoltine taxa were found here. Instream and reach-scale habitat features seem to be either monotonous or disturbed. Catastrophes such as periodic dewatering, scouring sediment pulses, or intermittent inputs of toxic pollutants may also be common and thus, the life cycles of long-lived organisms are disrupted. The functional composition of the benthic assemblage was strongly dominated by collector-gatherers (77.9%), in particular, the amphipod *Crangonyx* sp. (46.8%). No scrapers were collected and shredders (0.6%) were rare. These results suggest that allochthonous fine particulate matter dominated the food web: autochthonous algal production and leaves and other coarse particulate matter were of little consequence to the food web.

DISCUSSION

The B-IBI indicated "fair" conditions at 1 site (Lewis Creek Ravine), "poor" conditions at 1 site (Coal Creek Below Parkway), and "very poor" conditions at the other 4 sites. The RIVPACS scores of 2 sites (Coal Creek Below Parkway and Lewis Creek Ravine) were considered "unimpaired," whereas all other sites were classified as "Impaired." Multiple sources of stress were suggested by analysis of the ecological condition of the invertebrate assemblages at all but one of the 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, 2016.

Site	water quality degradation	metals	thermal stress	sediment deposition	habitat disruption
Coal Creek Above I-405 Weirs	+			?	+
Coal Creek Below Parkway	+				+
Lewis Creek	?				
Newport Tributary	?			+	+
Newport Tributary Above Pedestrian Bridge	+			?	+
Yarrow East Tributary	?			+	+

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APPENDIX

Taxa lists and metric summaries, City of Bellevue, Washington, 2016

Taxa Listing

Project ID: CB16LDC
RAI No.: CB16LDC001

RAI No.: **CB16LDC001** Sta. Name: **Lewis Creek Ravine - Composite**
Client ID: **LewisBelRM1.8_2016**
Date Coll.: **8/12/2016** No. Jars: STORET ID: **COMPOSITE**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Other Non-Insect							
Hydrozoa							
Hydrozoa	**4**	**0.46%**	**Yes**	**Unknown**		**5**	**PR**
Planariidae							
Polycelis sp.	**5**	**0.58%**	**Yes**	**Unknown**		**1**	**OM**
Trepaxonemata							
Trepaxonemata	**1**	**0.12%**	**Yes**	**Unknown**		**11**	**PR**
Nemata							
Nemata	**3**	**0.35%**	**Yes**	**Unknown**		**5**	**UN**
Enchytraeidae							
Enchytraeus sp.	**2**	**0.23%**	**Yes**	**Unknown**		**4**	**CG**
Fridericia sp.	**2**	**0.23%**	**Yes**	**Unknown**		**11**	**CG**
Naididae							
Nais sp.	**1**	**0.12%**	**Yes**	**Unknown**		**8**	**CG**
Lumbriculidae							
Lumbriculidae	**16**	**1.85%**	**Yes**	**Immature**		**4**	**CG**
Sphaeriidae							
Sphaeriidae	**2**	**0.23%**	**Yes**	**Unknown**		**8**	**CF**
Planorbidae							
Menetus sp.	**2**	**0.23%**	**Yes**	**Unknown**		**6**	**SC**
Crangonyctidae							
Crangonyx sp.	**154**	**17.76%**	**Yes**	**Unknown**		**6**	**CG**
Acari							
Acari	**9**	**1.04%**	**Yes**	**Unknown**		**5**	**PR**
Ephemeroptera							
Baetidae							
Baetis tricaudatus complex	**151**	**17.42%**	**Yes**	**Larva**		**5**	**CG**
Heptageniidae							
Cinygma sp.	**9**	**1.04%**	**Yes**	**Larva**		**0**	**SC**
Plecoptera							
Plecoptera							
Plecoptera	**1**	**0.12%**	**No**	**Larva**	**Early Instar**	**11**	**PR**
Chloroperlidae							
Sweltsa sp.	**3**	**0.35%**	**Yes**	**Larva**		**0**	**PR**
Nemouridae							
Malenka sp.	**94**	**10.84%**	**Yes**	**Larva**		**1**	**SH**
Zapada cinctipes	**8**	**0.92%**	**Yes**	**Larva**		**3**	**SH**
Perlodidae							
Kogotus sp.	**7**	**0.81%**	**Yes**	**Larva**		**1**	**PR**
Skwala sp.	**1**	**0.12%**	**Yes**	**Larva**		**3**	**PR**
Pteronarcyidae							
Pteronarcys sp.	**1**	**0.12%**	**Yes**	**Larva**	**Early Instar**	**2**	**SH**

Taxa Listing

Project ID: CB16LDC
RAI No.: CB16LDC001

RAI No.: **CB16LDC001** Sta. Name: **Lewis Creek Ravine - Composite**
Client ID: **LewisBelRM1.8_2016**
Date Coll.: **8/12/2016** No. Jars: STORET ID: **COMPOSITE**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Trichoptera							
Glossosomatidae							
Glossosoma sp.	**29**	**3.34%**	**Yes**	**Larva**		**0**	**SC**
Glossosomatidae	**19**	**2.19%**	**No**	**Pupa**		**0**	**SC**
Hydropsychidae							
Hydropsyche sp.	**73**	**8.42%**	**Yes**	**Larva**		**5**	**CF**
Hydropsychidae	**2**	**0.23%**	**No**	**Pupa**		**4**	**CF**
Hydropsychidae	**9**	**1.04%**	**No**	**Larva**	**Early Instar**	**4**	**CF**
Parapsyche sp.	**34**	**3.92%**	**Yes**	**Larva**		**0**	**PR**
Lepidostomatidae							
Lepidostoma sp.	**14**	**1.61%**	**Yes**	**Larva**		**1**	**SH**
Limnephilidae							
Psychoglypha sp.	**1**	**0.12%**	**Yes**	**Larva**		**0**	**SH**
Polycentropodidae							
Polycentropodidae	**1**	**0.12%**	**Yes**	**Larva**	**Damaged**	**6**	**CF**
Rhyacophilidae							
Rhyacophila sp.	**5**	**0.58%**	**No**	**Larva**	**Early Instar**	**1**	**PR**
Rhyacophila Betteni Gr.	**2**	**0.23%**	**Yes**	**Larva**		**0**	**PR**
Rhyacophila Brunnea/Vemna Gr.	**9**	**1.04%**	**Yes**	**Larva**		**2**	**PR**
Coleoptera							
Elmidae							
Cleptelmis addenda	**1**	**0.12%**	**Yes**	**Larva**		**4**	**CG**
Elmidae	**2**	**0.23%**	**No**	**Larva**	**Early Instar**	**4**	**CG**
Heterlimnius corpulentus	**1**	**0.12%**	**Yes**	**Adult**		**3**	**CG**
Heterlimnius corpulentus	**2**	**0.23%**	**No**	**Larva**		**3**	**CG**
Lara sp.	**1**	**0.12%**	**Yes**	**Larva**		**1**	**SH**
Narpus concolor	**1**	**0.12%**	**Yes**	**Larva**		**2**	**CG**
Diptera							
Ceratopogonidae							
Forcipomyiinae	**5**	**0.58%**	**Yes**	**Larva**		**6**	**PR**
Dixidae							
Dixa sp.	**2**	**0.23%**	**Yes**	**Larva**		**1**	**CG**
Empididae							
Clinocera sp.	**1**	**0.12%**	**Yes**	**Larva**		**5**	**PR**
Psychodidae							
Maruina sp.	**16**	**1.85%**	**Yes**	**Larva**		**1**	**SC**
Pericoma sp.	**1**	**0.12%**	**Yes**	**Larva**		**4**	**CG**
Psychodidae	**5**	**0.58%**	**No**	**Pupa**		**4**	**CG**
Simuliidae							
Simulium sp.	**12**	**1.38%**	**No**	**Pupa**		**6**	**CF**
Simulium sp.	**47**	**5.42%**	**Yes**	**Larva**		**6**	**CF**
Tipulidae							
Dicranota sp.	**1**	**0.12%**	**Yes**	**Larva**		**3**	**PR**
Tipula sp.	**4**	**0.46%**	**Yes**	**Larva**		**4**	**SH**

Taxa Listing

Project ID: CB16LDC
RAI No.: CB16LDC001

RAI No.: **CB16LDC001** Sta. Name: **Lewis Creek Ravine - Composite**
Client ID: **LewisBelRM1.8_2016**
Date Coll.: **8/12/2016** No. Jars: STORET ID: **COMPOSITE**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Chironomidae							
Chironominae							
Microtendipes sp.	**1**	**0.12%**	**Yes**	**Larva**		**6**	**CF**
Polypedilum sp.	**2**	**0.23%**	**No**	**Pupa**		**6**	**SH**
Polypedilum sp.	**14**	**1.61%**	**Yes**	**Larva**		**6**	**SH**
Chironominae							
Micropsectra sp.	**3**	**0.35%**	**No**	**Pupa**		**4**	**CG**
Micropsectra sp.	**33**	**3.81%**	**Yes**	**Larva**		**4**	**CG**
Rheotanytarsus sp.	**11**	**1.27%**	**Yes**	**Larva**		**6**	**CF**
Stempellinella sp.	**2**	**0.23%**	**Yes**	**Larva**		**4**	**CG**
Orthocladiinae							
Brillia sp.	**9**	**1.04%**	**Yes**	**Larva**		**4**	**SH**
Corynoneura sp.	**1**	**0.12%**	**Yes**	**Pupa**		**7**	**CG**
Eukiefferiella Claripennis Gr.	**1**	**0.12%**	**Yes**	**Larva**		**8**	**CG**
Limnophyes sp.	**3**	**0.35%**	**Yes**	**Larva**		**8**	**CG**
Orthocladius lignicola	**1**	**0.12%**	**Yes**	**Larva**		**11**	**CG**
Parametriocnemus sp.	**1**	**0.12%**	**Yes**	**Larva**		**5**	**CG**
Paraphaenocladius sp.	**1**	**0.12%**	**Yes**	**Larva**		**4**	**CG**
Tvetenia sp.	**1**	**0.12%**	**No**	**Pupa**		**5**	**CG**
Tvetenia Bavarica Gr.	**7**	**0.81%**	**Yes**	**Larva**		**5**	**CG**
Sample Count	867						

Metrics Report

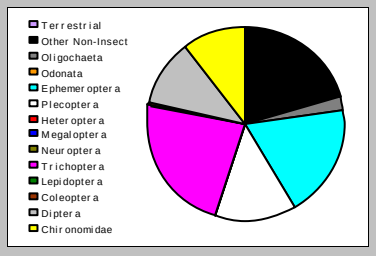
Project ID: CB16LDC
RAI No.: CB16LDC001
Sta. Name: Lewis Creek Ravine - Composite
Client ID: LewisBelRM1.8_2016
STORET ID COMPOSITE
Coll. Date: 8/12/2016
Latitude: 47.5566 **Longitude:** -122.1087

Abundance Measures

Sample Count: 867
Sample Abundance: 867.00 100.00% of sample used
Coll. Procedure: Surber
Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Terrestrial			
Other Non-Insect	8	180	20.76%
Oligochaeta	4	21	2.42%
Odonata			
Ephemeroptera	2	160	18.45%
Plecoptera	6	115	13.26%
Heteroptera			
Megaloptera			
Neuroptera			
Trichoptera	8	198	22.84%
Lepidoptera			
Coleoptera	4	8	0.92%
Diptera	8	94	10.84%
Chironomidae	13	91	10.50%

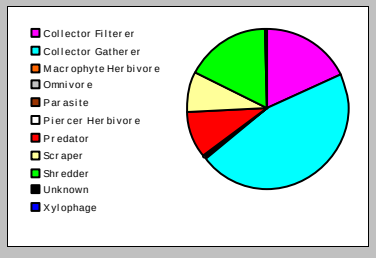


Dominant Taxa

Category	A	PRA
Crangonyx	154	17.76%
Baetis tricaudatus complex	151	17.42%
Malenka	94	10.84%
Hydropsyche	73	8.42%
Simulium	59	6.81%
Micropsectra	36	4.15%
Parapsyche	34	3.92%
Glossosoma	29	3.34%
Glossosomatidae	19	2.19%
Polypedilum	16	1.85%
Maruina	16	1.85%
Lumbriculidae	16	1.85%
Lepidostoma	14	1.61%
Rheotanytarsus	11	1.27%
Hydropsychidae	11	1.27%

Functional Composition

Category	R	A	PRA
Predator	12	83	9.57%
Parasite			
Collector Gatherer	20	395	45.56%
Collector Filterer	6	158	18.22%
Macrophyte Herbivore			
Piercer Herbivore			
Xylophage			
Scraper	4	75	8.65%
Shredder	9	148	17.07%
Omnivore	1	5	0.58%
Unknown	1	3	0.35%

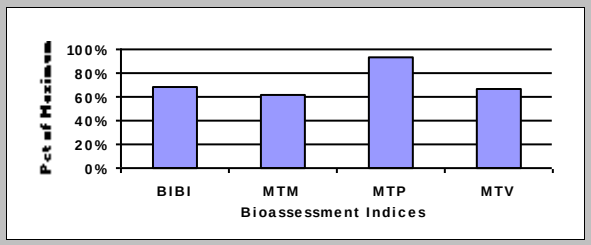


Metric Values and Scores

Metric	Value
Composition	
Taxa Richness	53
E Richness	2
P Richness	6
T Richness	8
EPT Richness	16
EPT Percent	54.56%
All Non-Insect Abundance	201
All Non-Insect Richness	12
All Non-Insect Percent	23.18%
Oligochaeta+Hirudinea Percent	2.42%
Baetidae/Ephemeroptera	0.944
Hydropsychidae/Trichoptera	0.596
Dominance	
Dominant Taxon Percent	17.76%
Dominant Taxa (2) Percent	35.18%
Dominant Taxa (3) Percent	46.02%
Dominant Taxa (10) Percent	76.70%
Diversity	
Shannon H (loge)	2.776
Shannon H (log2)	4.006
Margalef D	7.773
Simpson D	0.104
Evenness	0.052
Function	
Predator Richness	12
Predator Percent	9.57%
Filterer Richness	6
Filterer Percent	18.22%
Collector Percent	63.78%
Scraper+Shredder Percent	25.72%
Scraper/Filterer	0.475
Scraper/Scraper+Filterer	0.322
Habit	
Burrower Richness	4
Burrower Percent	4.04%
Swimmer Richness	2
Swimmer Percent	17.65%
Clinger Richness	22
Clinger Percent	46.37%
Characteristics	
Cold Stenotherm Richness	2
Cold Stenotherm Percent	1.15%
Hemoglobin Bearer Richness	4
Hemoglobin Bearer Percent	2.31%
Air Breather Richness	4
Air Breather Percent	3.11%
Voltinism	
Univoltine Richness	27
Semivoltine Richness	6
Multivoltine Percent	12.00%
Tolerance	
Sediment Tolerant Richness	3
Sediment Tolerant Percent	2.42%
Sediment Sensitive Richness	1
Sediment Sensitive Percent	3.34%
Metals Tolerance Index	3.244
Pollution Sensitive Richness	1
Pollution Tolerant Percent	0.35%
Hilsenhoff Biotic Index	3.912
Intolerant Percent	29.07%
Supertolerant Percent	0.81%
CTQa	77.026

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	34	68.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	28	93.33%	None
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	12	66.67%	Slight
MTM	Montana DEQ Mountains (Bukantis 1998)	13	61.90%	Slight



Taxa Listing

Project ID: CB16LD
RAI No.: CB16LD001

RAI No.: **CB16LD001**
Client ID: **CoalBelRM1.8_2016R1**
Date Coll.: **8/11/2016** No. Jars: **3**
Sta. Name: **Coal Creek below Parkway -Metro Access Rep 1**
STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Other Non-Insect							
Trepaxonemata							
Trepaxonemata	**6**	**1.13%**	**Yes**	**Unknown**		**11**	**PR**
Lumbriculidae							
Lumbriculidae	**3**	**0.56%**	**Yes**	**Immature**		**4**	**CG**
Sphaeriidae							
Sphaeriidae	**1**	**0.19%**	**Yes**	**Unknown**		**8**	**CF**
Crangonyctidae							
Crangonyx sp.	**12**	**2.26%**	**Yes**	**Unknown**		**6**	**CG**
Ostracoda							
Ostracoda	**5**	**0.94%**	**Yes**	**Unknown**		**8**	**CG**
Acari							
Acari	**12**	**2.26%**	**Yes**	**Unknown**		**5**	**PR**
Ephemeroptera							
Baetidae							
Baetis tricaudatus complex	**48**	**9.02%**	**Yes**	**Larva**		**5**	**CG**
Plecoptera							
Chloroperlidae							
Sweltsa sp.	**2**	**0.38%**	**Yes**	**Larva**		**0**	**PR**
Nemouridae							
Malenka sp.	**32**	**6.02%**	**Yes**	**Larva**		**1**	**SH**
Nemouridae	**6**	**1.13%**	**No**	**Larva**	**Early Instar**	**2**	**SH**
Zapada cinctipes	**25**	**4.70%**	**Yes**	**Larva**		**3**	**SH**
Perlodidae							
Skwala sp.	**1**	**0.19%**	**Yes**	**Larva**		**3**	**PR**
Trichoptera							
Glossosomatidae							
Glossosomatidae	**17**	**3.20%**	**Yes**	**Pupa**		**0**	**SC**
Hydropsychidae							
Hydropsyche sp.	**65**	**12.22%**	**Yes**	**Larva**		**5**	**CF**
Hydroptilidae							
Hydroptila sp.	**17**	**3.20%**	**Yes**	**Larva**		**6**	**PH**
Hydroptilidae	**59**	**11.09%**	**No**	**Pupa**		**4**	**PH**
Limnephilidae							
Dicosmoecus gilvipes	**1**	**0.19%**	**Yes**	**Larva**		**2**	**SC**
Onocosmoecus unicolor	**1**	**0.19%**	**Yes**	**Larva**		**2**	**SH**
Rhyacophilidae							
Rhyacophila Brunnea/Vemna Gr.	**9**	**1.69%**	**Yes**	**Larva**		**2**	**PR**
Coleoptera							
Elmidae							
Elmidae	**2**	**0.38%**	**No**	**Adult**	**Damaged**	**4**	**CG**
Heterlimnius corpulentus	**11**	**2.07%**	**Yes**	**Adult**		**3**	**CG**
Heterlimnius corpulentus	**44**	**8.27%**	**No**	**Larva**		**3**	**CG**
Narpus concolor	**4**	**0.75%**	**Yes**	**Larva**		**2**	**CG**

Taxa Listing

Project ID: CB16LD
RAI No.: CB16LD001

RAI No.: **CB16LD001**
Client ID: **CoalBelRM1.8_2016R1**
Date Coll.: **8/11/2016** No. Jars: **3**
Sta. Name: **Coal Creek below Parkway -Metro Access Rep 1**
STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Diptera							
Simuliidae							
Simulium sp.	**6**	**1.13%**	**No**	**Pupa**		**6**	**CF**
Simulium sp.	**69**	**12.97%**	**Yes**	**Larva**		**6**	**CF**
Tipulidae							
Antocha monticola	**10**	**1.88%**	**Yes**	**Larva**		**3**	**CG**
Antocha monticola	**11**	**2.07%**	**No**	**Pupa**		**3**	**CG**
Dicranota sp.	**5**	**0.94%**	**Yes**	**Larva**		**3**	**PR**
Tipula sp.	**1**	**0.19%**	**Yes**	**Larva**		**4**	**SH**
Chironomidae							
Chironominae							
Polypedilum sp.	**1**	**0.19%**	**Yes**	**Larva**		**6**	**SH**
Chironominae							
Micropsectra sp.	**1**	**0.19%**	**Yes**	**Larva**		**4**	**CG**
Rheotanytarsus sp.	**2**	**0.38%**	**Yes**	**Larva**		**6**	**CF**
Orthocladiinae							
Eukiefferiella sp.	**2**	**0.38%**	**No**	**Pupa**		**8**	**CG**
Eukiefferiella Claripennis Gr.	**12**	**2.26%**	**Yes**	**Larva**		**8**	**CG**
Eukiefferiella Devonica Gr.	**2**	**0.38%**	**Yes**	**Larva**		**8**	**CG**
Orthocladius sp.	**3**	**0.56%**	**Yes**	**Larva**		**6**	**CG**
Parametriocnemus sp.	**2**	**0.38%**	**Yes**	**Larva**		**5**	**CG**
Tvetenia Bavarica Gr.	**2**	**0.38%**	**Yes**	**Larva**		**5**	**CG**
Tanypodinae							
Brundiniella eumorpha	**2**	**0.38%**	**Yes**	**Larva**		**8**	**PR**
Nilotanypus sp.	**2**	**0.38%**	**Yes**	**Larva**		**6**	**PR**
Rheopelopia sp.	**1**	**0.19%**	**Yes**	**Pupa**		**11**	**PR**
Thienemannimyia Gr.	**15**	**2.82%**	**No**	**Larva**	**Early Instar**	**5**	**PR**
Sample Count	532						

Taxa Listing

Project ID: CB16LD
RAI No.: CB16LD007

RAI No.: **CB16LD007** Sta. Name: **Lewis Creek Ravine Rep 1**
Client ID: **LewisBelRM1.8_2016R1**
Date Coll.: **8/12/2016** No. Jars: **2** STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Other Non-Insect							
Hydrozoa							
Hydrozoa	**3**	**0.56%**	**Yes**	**Unknown**		**5**	**PR**
Planariidae							
Polycelis sp.	**5**	**0.93%**	**Yes**	**Unknown**		**1**	**OM**
Trepaxonemata							
Trepaxonemata	**1**	**0.19%**	**Yes**	**Unknown**		**11**	**PR**
Nemata							
Nemata	**2**	**0.37%**	**Yes**	**Unknown**		**5**	**UN**
Lumbriculidae							
Lumbriculidae	**11**	**2.04%**	**Yes**	**Immature**		**4**	**CG**
Sphaeriidae							
Sphaeriidae	**1**	**0.19%**	**Yes**	**Unknown**		**8**	**CF**
Crangonyctidae							
Crangonyx sp.	**69**	**12.78%**	**Yes**	**Unknown**		**6**	**CG**
Acari							
Acari	**2**	**0.37%**	**Yes**	**Unknown**		**5**	**PR**
Ephemeroptera							
Baetidae							
Baetis tricaudatus complex	**108**	**20.00%**	**Yes**	**Larva**		**5**	**CG**
Heptageniidae							
Cinygma sp.	**5**	**0.93%**	**Yes**	**Larva**		**0**	**SC**
Plecoptera							
Plecoptera							
Plecoptera	**1**	**0.19%**	**No**	**Larva**	**Early Instar**	**11**	**PR**
Chloroperlidae							
Sweltsa sp.	**3**	**0.56%**	**Yes**	**Larva**		**0**	**PR**
Nemouridae							
Malenka sp.	**62**	**11.48%**	**Yes**	**Larva**		**1**	**SH**
Perlodidae							
Kogotus sp.	**5**	**0.93%**	**Yes**	**Larva**		**1**	**PR**

Taxa Listing

Project ID: CB16LD
RAI No.: CB16LD007

RAI No.: **CB16LD007** Sta. Name: **Lewis Creek Ravine Rep 1**
Client ID: **LewisBelRM1.8_2016R1**
Date Coll.: **8/12/2016** No. Jars: **2** STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Trichoptera							
Glossosomatidae							
Glossosoma sp.	**19**	**3.52%**	**Yes**	**Larva**		**0**	**SC**
Glossosomatidae	**15**	**2.78%**	**No**	**Pupa**		**0**	**SC**
Hydropsychidae							
Hydropsyche sp.	**53**	**9.81%**	**Yes**	**Larva**		**5**	**CF**
Hydropsychidae	**1**	**0.19%**	**No**	**Pupa**		**4**	**CF**
Parapsyche sp.	**31**	**5.74%**	**Yes**	**Larva**		**0**	**PR**
Lepidostomatidae							
Lepidostoma sp.	**6**	**1.11%**	**Yes**	**Larva**		**1**	**SH**
Limnephilidae							
Psychoglypha sp.	**1**	**0.19%**	**Yes**	**Larva**		**0**	**SH**
Polycentropodidae							
Polycentropodidae	**1**	**0.19%**	**Yes**	**Larva**	**Damaged**	**6**	**CF**
Rhyacophilidae							
Rhyacophila sp.	**4**	**0.74%**	**No**	**Larva**	**Early Instar**	**1**	**PR**
Rhyacophila Betteni Gr.	**1**	**0.19%**	**Yes**	**Larva**		**0**	**PR**
Rhyacophila Brunnea/Vemna Gr.	**6**	**1.11%**	**Yes**	**Larva**		**2**	**PR**
Coleoptera							
Elmidae							
Cleptelmis addenda	**1**	**0.19%**	**Yes**	**Larva**		**4**	**CG**
Elmidae	**2**	**0.37%**	**No**	**Larva**	**Early Instar**	**4**	**CG**
Heterlimnius corpulentus	**1**	**0.19%**	**Yes**	**Adult**		**3**	**CG**
Lara sp.	**1**	**0.19%**	**Yes**	**Larva**		**1**	**SH**
Diptera							
Ceratopogonidae							
Forcipomyiinae	**1**	**0.19%**	**Yes**	**Larva**		**6**	**PR**
Empididae							
Clinocera sp.	**1**	**0.19%**	**Yes**	**Larva**		**5**	**PR**
Psychodidae							
Maruina sp.	**16**	**2.96%**	**Yes**	**Larva**		**1**	**SC**
Pericoma sp.	**1**	**0.19%**	**Yes**	**Larva**		**4**	**CG**
Psychodidae	**5**	**0.93%**	**No**	**Pupa**		**4**	**CG**
Simuliidae							
Simulium sp.	**10**	**1.85%**	**No**	**Pupa**		**6**	**CF**
Simulium sp.	**41**	**7.59%**	**Yes**	**Larva**		**6**	**CF**
Tipulidae							
Dicranota sp.	**1**	**0.19%**	**Yes**	**Larva**		**3**	**PR**
Tipula sp.	**1**	**0.19%**	**Yes**	**Larva**		**4**	**SH**

Taxa Listing

Project ID: CB16LD
RAI No.: CB16LD007

RAI No.: **CB16LD007** Sta. Name: **Lewis Creek Ravine Rep 1**
Client ID: **LewisBelRM1.8_2016R1**
Date Coll.: **8/12/2016** No. Jars: **2** STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Chironomidae							
Chironominae							
Polypedilum sp.	**8**	**1.48%**	**Yes**	**Larva**		**6**	**SH**
Chironominae							
Micropsectra sp.	**16**	**2.96%**	**Yes**	**Larva**		**4**	**CG**
Rheotanytarsus sp.	**4**	**0.74%**	**Yes**	**Larva**		**6**	**CF**
Stempellinella sp.	**2**	**0.37%**	**Yes**	**Larva**		**4**	**CG**
Orthocladiinae							
Brillia sp.	**4**	**0.74%**	**Yes**	**Larva**		**4**	**SH**
Corynoneura sp.	**1**	**0.19%**	**Yes**	**Pupa**		**7**	**CG**
Orthocladius lignicola	**1**	**0.19%**	**Yes**	**Larva**		**11**	**CG**
Paraphaenocladius sp.	**1**	**0.19%**	**Yes**	**Larva**		**4**	**CG**
Tvetenia sp.	**1**	**0.19%**	**No**	**Pupa**		**5**	**CG**
Tvetenia Bavarica Gr.	**4**	**0.74%**	**Yes**	**Larva**		**5**	**CG**
Sample Count	540						

Taxa Listing

Project ID: CB16LD
RAI No.: CB16LD002

RAI No.: **CB16LD002** Sta. Name: **Lewis Creek Ravine Rep 2**
Client ID: **LewisBelRM1.8_2016R2**
Date Coll.: **8/12/2016** No. Jars: **1** STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Other Non-Insect							
Hydrozoa							
Hydrozoa	**1**	**0.31%**	**Yes**	**Unknown**		**5**	**PR**
Nemata							
Nemata	**1**	**0.31%**	**Yes**	**Unknown**		**5**	**UN**
Enchytraeidae							
Enchytraeus sp.	**2**	**0.61%**	**Yes**	**Unknown**		**4**	**CG**
Fridericia sp.	**2**	**0.61%**	**Yes**	**Unknown**		**11**	**CG**
Naididae							
Nais sp.	**1**	**0.31%**	**Yes**	**Unknown**		**8**	**CG**
Lumbriculidae							
Lumbriculidae	**5**	**1.53%**	**Yes**	**Immature**		**4**	**CG**
Sphaeriidae							
Sphaeriidae	**1**	**0.31%**	**Yes**	**Unknown**		**8**	**CF**
Planorbidae							
Menetus sp.	**2**	**0.61%**	**Yes**	**Unknown**		**6**	**SC**
Crangonyctidae							
Crangonyx sp.	**85**	**25.99%**	**Yes**	**Unknown**		**6**	**CG**
Acari							
Acari	**7**	**2.14%**	**Yes**	**Unknown**		**5**	**PR**
Ephemeroptera							
Baetidae							
Baetis tricaudatus complex	**43**	**13.15%**	**Yes**	**Larva**		**5**	**CG**
Heptageniidae							
Cinygma sp.	**4**	**1.22%**	**Yes**	**Larva**		**0**	**SC**
Plecoptera							
Nemouridae							
Malenka sp.	**32**	**9.79%**	**Yes**	**Larva**		**1**	**SH**
Zapada cinctipes	**8**	**2.45%**	**Yes**	**Larva**		**3**	**SH**
Perlodidae							
Kogotus sp.	**2**	**0.61%**	**Yes**	**Larva**		**1**	**PR**
Skwala sp.	**1**	**0.31%**	**Yes**	**Larva**		**3**	**PR**
Pteronarcyidae							
Pteronarcys sp.	**1**	**0.31%**	**Yes**	**Larva**	**Early Instar**	**2**	**SH**

Taxa Listing

Project ID: CB16LD
RAI No.: CB16LD002

RAI No.: **CB16LD002** Sta. Name: **Lewis Creek Ravine Rep 2**
Client ID: **LewisBelRM1.8_2016R2**
Date Coll.: **8/12/2016** No. Jars: **1** STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Trichoptera							
Glossosomatidae							
Glossosoma sp.	**10**	**3.06%**	**Yes**	**Larva**		**0**	**SC**
Glossosomatidae	**4**	**1.22%**	**No**	**Pupa**		**0**	**SC**
Hydropsychidae							
Hydropsyche sp.	**20**	**6.12%**	**Yes**	**Larva**		**5**	**CF**
Hydropsychidae	**1**	**0.31%**	**No**	**Pupa**		**4**	**CF**
Hydropsychidae	**9**	**2.75%**	**No**	**Larva**	**Early Instar**	**4**	**CF**
Parapsyche sp.	**3**	**0.92%**	**Yes**	**Larva**		**0**	**PR**
Lepidostomatidae							
Lepidostoma sp.	**8**	**2.45%**	**Yes**	**Larva**		**1**	**SH**
Rhyacophilidae							
Rhyacophila sp.	**1**	**0.31%**	**No**	**Larva**	**Early Instar**	**1**	**PR**
Rhyacophila Betteni Gr.	**1**	**0.31%**	**Yes**	**Larva**		**0**	**PR**
Rhyacophila Brunnea/Vemna Gr.	**3**	**0.92%**	**Yes**	**Larva**		**2**	**PR**
Coleoptera							
Elmidae							
Heterlimnius corpulentus	**2**	**0.61%**	**Yes**	**Larva**		**3**	**CG**
Narpus concolor	**1**	**0.31%**	**Yes**	**Larva**		**2**	**CG**
Diptera							
Ceratopogonidae							
Forcipomyiinae	**4**	**1.22%**	**Yes**	**Larva**		**6**	**PR**
Dixidae							
Dixa sp.	**2**	**0.61%**	**Yes**	**Larva**		**1**	**CG**
Simuliidae							
Simulium sp.	**2**	**0.61%**	**No**	**Pupa**		**6**	**CF**
Simulium sp.	**6**	**1.83%**	**Yes**	**Larva**		**6**	**CF**
Tipulidae							
Tipula sp.	**3**	**0.92%**	**Yes**	**Larva**		**4**	**SH**
Chironomidae							
Chironominae							
Microtendipes sp.	**1**	**0.31%**	**Yes**	**Larva**		**6**	**CF**
Polypedilum sp.	**6**	**1.83%**	**Yes**	**Larva**		**6**	**SH**
Polypedilum sp.	**2**	**0.61%**	**No**	**Pupa**		**6**	**SH**
Chironominae							
Micropsectra sp.	**17**	**5.20%**	**Yes**	**Larva**		**4**	**CG**
Micropsectra sp.	**3**	**0.92%**	**No**	**Pupa**		**4**	**CG**
Rheotanytarsus sp.	**7**	**2.14%**	**Yes**	**Larva**		**6**	**CF**
Orthocladiinae							
Brillia sp.	**5**	**1.53%**	**Yes**	**Larva**		**4**	**SH**
Eukiefferiella Claripennis Gr.	**1**	**0.31%**	**Yes**	**Larva**		**8**	**CG**
Limnophyes sp.	**3**	**0.92%**	**Yes**	**Larva**		**8**	**CG**
Parametriocnemus sp.	**1**	**0.31%**	**Yes**	**Larva**		**5**	**CG**
Tvetenia Bavarica Gr.	**3**	**0.92%**	**Yes**	**Larva**		**5**	**CG**
Sample Count	327						

Taxa Listing

Project ID: CB16LD
RAI No.: CB16LD003

RAI No.: **CB16LD003** Sta. Name: **Newport Tributary Rep 1**
Client ID: **NewpBelRM0.0_2016R1**
Date Coll.: **8/17/2016** No. Jars: **4** STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Other Non-Insect							
Trepaxonemata							
Trepaxonemata	**1**	**0.19%**	**Yes**	**Unknown**		**11**	**PR**
Nemata							
Nemata	**1**	**0.19%**	**Yes**	**Unknown**		**5**	**UN**
Enchytraeidae							
Enchytraeus sp.	**8**	**1.54%**	**Yes**	**Unknown**		**4**	**CG**
Henlea sp.	**1**	**0.19%**	**Yes**	**Unknown**		**11**	**UN**
Mesenchytraeus sp.	**4**	**0.77%**	**Yes**	**Unknown**		**4**	**CG**
Naididae							
Naididae	**1**	**0.19%**	**Yes**	**Immature**		**8**	**CG**
Naididae							
Tubificinae	**5**	**0.97%**	**Yes**	**Immature**		**11**	**CG**
Lumbriculidae							
Lumbriculidae	**17**	**3.28%**	**Yes**	**Immature**		**4**	**CG**
Sphaeriidae							
Sphaeriidae	**11**	**2.12%**	**Yes**	**Unknown**		**8**	**CF**
Physidae							
Physidae	**3**	**0.58%**	**Yes**	**Unknown**		**8**	**SC**
Planorbidae							
Menetus sp.	**1**	**0.19%**	**Yes**	**Unknown**		**6**	**SC**
Amphipoda							
Amphipoda	**1**	**0.19%**	**No**	**Unknown**	**Damaged**	**4**	**CG**
Crangonyctidae							
Crangonyx sp.	**52**	**10.04%**	**Yes**	**Unknown**		**6**	**CG**
Acari							
Acari	**5**	**0.97%**	**Yes**	**Unknown**		**5**	**PR**
Ephemeroptera							
Baetidae							
Baetis sp.	**3**	**0.58%**	**No**	**Larva**	**Early Instar**	**5**	**CG**
Baetis tricaudatus complex	**20**	**3.86%**	**Yes**	**Larva**		**5**	**CG**
Plecoptera							
Nemouridae							
Malenka sp.	**106**	**20.46%**	**Yes**	**Larva**		**1**	**SH**
Nemouridae	**21**	**4.05%**	**No**	**Larva**	**Early Instar**	**2**	**SH**
Zapada cinctipes	**80**	**15.44%**	**Yes**	**Larva**		**3**	**SH**
Trichoptera							
Rhyacophilidae							
Rhyacophila Betteni Gr.	**1**	**0.19%**	**Yes**	**Larva**		**0**	**PR**
Rhyacophila Brunnea/Vemna Gr.	**9**	**1.74%**	**Yes**	**Larva**		**2**	**PR**
Coleoptera							
Elmidae							
Narpus concolor	**1**	**0.19%**	**Yes**	**Larva**		**2**	**CG**

Taxa Listing

Project ID: CB16LD
RAI No.: CB16LD003

RAI No.: **CB16LD003** Sta. Name: **Newport Tributary Rep 1**
Client ID: **NewpBelRM0.0_2016R1**
Date Coll.: **8/17/2016** No. Jars: **4** STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Diptera							
Dixidae							
Dixa sp.	**1**	**0.19%**	**Yes**	**Larva**		**1**	**CG**
Empididae							
Neoplasta sp.	**2**	**0.39%**	**Yes**	**Larva**		**5**	**PR**
Simuliidae							
Simulium sp.	**1**	**0.19%**	**No**	**Pupa**		**6**	**CF**
Simulium sp.	**14**	**2.70%**	**Yes**	**Larva**		**6**	**CF**
Tipulidae							
Antocha monticola	**9**	**1.74%**	**Yes**	**Larva**		**3**	**CG**
Antocha monticola	**3**	**0.58%**	**No**	**Pupa**		**3**	**CG**
Dicranota sp.	**1**	**0.19%**	**Yes**	**Larva**		**3**	**PR**
Molophilus sp.	**1**	**0.19%**	**Yes**	**Larva**		**4**	**SH**
Tipula sp.	**4**	**0.77%**	**Yes**	**Larva**		**4**	**SH**
Chironomidae							
Chironominae							
Polypedilum sp.	**2**	**0.39%**	**Yes**	**Larva**		**6**	**SH**
Orthocladiinae							
Brillia sp.	**11**	**2.12%**	**Yes**	**Larva**		**4**	**SH**
Cricotopus sp.	**2**	**0.39%**	**No**	**Pupa**		**7**	**SH**
Cricotopus (Cricotopus) sp.	**14**	**2.70%**	**Yes**	**Larva**		**7**	**SH**
Eukiefferiella sp.	**5**	**0.97%**	**No**	**Pupa**		**8**	**CG**
Eukiefferiella Claripennis Gr.	**17**	**3.28%**	**Yes**	**Larva**		**8**	**CG**
Eukiefferiella Coerulescens Gr.	**1**	**0.19%**	**Yes**	**Larva**		**8**	**CG**
Eukiefferiella tirolensis	**11**	**2.12%**	**Yes**	**Larva**		**8**	**CG**
Orthocladius sp.	**60**	**11.58%**	**Yes**	**Larva**		**6**	**CG**
Parametriocnemus sp.	**1**	**0.19%**	**Yes**	**Larva**		**5**	**CG**
Thienemanniella sp.	**1**	**0.19%**	**Yes**	**Larva**		**6**	**CG**
Tvetenia Bavarica Gr.	**3**	**0.58%**	**Yes**	**Larva**		**5**	**CG**
Tanypodinae							
Brundiniella eumorpha	**1**	**0.19%**	**Yes**	**Larva**		**8**	**PR**
Thienemannimyia Gr.	**1**	**0.19%**	**Yes**	**Larva**	**Early Instar**	**5**	**PR**
Sample Count	518						

Taxa Listing

Project ID: CB16LD
RAI No.: CB16LD004

RAI No.: **CB16LD004**
Client ID: **NewpBelRM0.25_2016R1**
Date Coll.: **8/22/2016** No. Jars: **5**

Sta. Name: **Newport Tributary - Above pedestrian bridge and new riffle (pre-CIP) Rep 1**
STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Oligochaeta							
Enchytraeidae							
Enchytraeus sp.	**7**	**1.40%**	**Yes**	**Unknown**		**4**	**CG**
Fridericia sp.	**3**	**0.60%**	**Yes**	**Unknown**		**11**	**CG**
Lumbriculidae							
Lumbriculidae	**7**	**1.40%**	**Yes**	**Immature**		**4**	**CG**
Sphaeriidae							
Sphaeriidae	**7**	**1.40%**	**Yes**	**Unknown**		**8**	**CF**
Planorbidae							
Promenetus sp.	**1**	**0.20%**	**Yes**	**Unknown**		**6**	**SC**
Amphipoda							
Amphipoda	**37**	**7.40%**	**Yes**	**Unknown**	**Damaged**	**4**	**CG**
Acari							
Acari	**8**	**1.60%**	**Yes**	**Unknown**		**5**	**PR**
Ephemeroptera							
Baetidae							
Baetis Rhodani Gr.	**7**	**1.40%**	**Yes**	**Larva**	**Damaged**	**11**	**CG**
Plecoptera							
Nemouridae							
Malenka sp.	**31**	**6.20%**	**Yes**	**Larva**		**1**	**SH**
Nemouridae	**61**	**12.20%**	**No**	**Larva**	**Damaged**	**2**	**SH**
Trichoptera							
Glossosomatidae							
Glossosoma sp.	**3**	**0.60%**	**Yes**	**Larva**		**0**	**SC**
Glossosomatidae	**21**	**4.20%**	**No**	**Pupa**		**0**	**SC**
Hydropsychidae							
Hydropsyche sp.	**1**	**0.20%**	**Yes**	**Larva**		**5**	**CF**
Parapsyche sp.	**9**	**1.80%**	**Yes**	**Larva**		**0**	**PR**
Rhyacophilidae							
Rhyacophila sp.	**2**	**0.40%**	**No**	**Larva**	**Damaged**	**1**	**PR**
Rhyacophila Betteni Gr.	**1**	**0.20%**	**Yes**	**Larva**		**0**	**PR**
Rhyacophila Brunnea/Vemna Gr.	**24**	**4.80%**	**Yes**	**Larva**		**2**	**PR**
Diptera							
Empididae							
Neoplasta sp.	**1**	**0.20%**	**Yes**	**Larva**		**5**	**PR**
Simuliidae							
Simulium sp.	**200**	**40.00%**	**Yes**	**Larva**		**6**	**CF**
Simulium sp.	**29**	**5.80%**	**No**	**Pupa**		**6**	**CF**
Tipulidae							
Antocha monticola	**5**	**1.00%**	**Yes**	**Larva**		**3**	**CG**
Chironomidae							
Orthocladiinae							
Brillia sp.	**34**	**6.80%**	**Yes**	**Larva**		**4**	**SH**
Chaetocladius sp.	**1**	**0.20%**	**Yes**	**Larva**		**6**	**CG**
Sample Count	500						

Taxa Listing

Project ID: CB16LD
RAI No.: CB16LD005

RAI No.: **CB16LD005**
Client ID: **CoalBelRM0.8_2016R1**
Date Coll.: **8/23/2016** No. Jars: **4**
Sta. Name: **Coal Creek - Above I-405 Weirs(Sound Transit Mitigation Site) Rep 1**
STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Other Non-Insect							
Trepaxonemata							
Trepaxonemata	**7**	**1.29%**	**Yes**	**Unknown**		**11**	**PR**
Nemata							
Nemata	**1**	**0.18%**	**Yes**	**Unknown**		**5**	**UN**
Lumbriculidae							
Lumbriculidae	**1**	**0.18%**	**Yes**	**Immature**		**4**	**CG**
Crangonyctidae							
Crangonyx sp.	**3**	**0.55%**	**Yes**	**Unknown**		**6**	**CG**
Ostracoda							
Ostracoda	**17**	**3.13%**	**Yes**	**Unknown**		**8**	**CG**
Acari							
Acari	**4**	**0.74%**	**Yes**	**Unknown**		**5**	**PR**
Ephemeroptera							
Baetidae							
Baetis tricaudatus complex	**141**	**25.92%**	**Yes**	**Larva**		**5**	**CG**
Plecoptera							
Nemouridae							
Malenka sp.	**5**	**0.92%**	**Yes**	**Larva**		**1**	**SH**
Nemouridae	**1**	**0.18%**	**No**	**Larva**	**Damaged**	**2**	**SH**
Zapada cinctipes	**9**	**1.65%**	**Yes**	**Larva**		**3**	**SH**
Perlodidae							
Skwala sp.	**2**	**0.37%**	**Yes**	**Larva**		**3**	**PR**
Trichoptera							
Hydropsychidae							
Hydropsyche sp.	**73**	**13.42%**	**Yes**	**Larva**		**5**	**CF**
Hydroptilidae							
Hydroptila sp.	**16**	**2.94%**	**Yes**	**Larva**		**6**	**PH**
Hydroptilidae	**10**	**1.84%**	**No**	**Pupa**		**4**	**PH**
Rhyacophilidae							
Rhyacophila Brunnea/Vemna Gr.	**3**	**0.55%**	**Yes**	**Larva**		**2**	**PR**
Coleoptera							
Elmidae							
Heterlimnius corpulentus	**2**	**0.37%**	**Yes**	**Adult**		**3**	**CG**
Heterlimnius corpulentus	**35**	**6.43%**	**No**	**Larva**		**3**	**CG**
Narpus concolor	**5**	**0.92%**	**Yes**	**Larva**		**2**	**CG**
Diptera							
Empididae							
Chelifera sp.	**1**	**0.18%**	**Yes**	**Larva**		**5**	**PR**
Simuliidae							
Simulium sp.	**136**	**25.00%**	**Yes**	**Larva**		**6**	**CF**
Simulium sp.	**14**	**2.57%**	**No**	**Pupa**		**6**	**CF**
Tipulidae							
Antocha monticola	**3**	**0.55%**	**Yes**	**Larva**		**3**	**CG**
Dicranota sp.	**2**	**0.37%**	**Yes**	**Larva**		**3**	**PR**
Tipula sp.	**1**	**0.18%**	**Yes**	**Larva**		**4**	**SH**

Taxa Listing

Project ID: CB16LD
RAI No.: CB16LD005

RAI No.: **CB16LD005**
Client ID: **CoalBelRM0.8_2016R1**
Date Coll.: **8/23/2016** No. Jars: **4**

Sta. Name: **Coal Creek - Above I-405 Weirs(Sound Transit Mitigation Site) Rep 1**
STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Chironomidae							
Chironominae							
Microtendipes sp.	**2**	**0.37%**	**Yes**	**Larva**		**6**	**CF**
Phaenopsectra sp.	**16**	**2.94%**	**Yes**	**Larva**		**7**	**SC**
Chironominae							
Rheotanytarsus sp.	**2**	**0.37%**	**No**	**Pupa**		**6**	**CF**
Rheotanytarsus sp.	**1**	**0.18%**	**Yes**	**Larva**		**6**	**CF**
Tanytarsini	**2**	**0.37%**	**No**	**Pupa**	**Damaged**	**6**	**CF**
Tanytarsus sp.	**12**	**2.21%**	**Yes**	**Larva**		**6**	**CF**
Orthocladiinae							
Brillia sp.	**1**	**0.18%**	**Yes**	**Larva**		**4**	**SH**
Eukiefferiella sp.	**4**	**0.74%**	**No**	**Pupa**		**8**	**CG**
Eukiefferiella Claripennis Gr.	**2**	**0.37%**	**Yes**	**Larva**		**8**	**CG**
Eukiefferiella Devonica Gr.	**5**	**0.92%**	**Yes**	**Larva**		**8**	**CG**
Eukiefferiella tirolensis	**1**	**0.18%**	**Yes**	**Larva**		**8**	**CG**
Tvetenia Bavarica Gr.	**2**	**0.37%**	**Yes**	**Larva**		**5**	**CG**
Tanypodinae							
Radotanypus sp.	**1**	**0.18%**	**Yes**	**Larva**		**7**	**PR**
Thienemannimyia Gr.	**1**	**0.18%**	**Yes**	**Larva**	**Early Instar**	**5**	**PR**
Sample Count	544						

Taxa Listing

Project ID: CB16LD
RAI No.: CB16LD006

RAI No.: **CB16LD006**
Client ID: **YarrowEastTribBelRM0.3_2016R1**
Date Coll.: **8/25/2016** No. Jars: **4**
Sta. Name: **Yarrow East Tributary(leaky dumpster site) Rep 1**
STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Other Non-Insect							
Trepaxonemata							
Trepaxonemata	**69**	**14.23%**	**Yes**	**Unknown**		**11**	**PR**
Nemata							
Nemata	**6**	**1.24%**	**Yes**	**Unknown**		**5**	**UN**
Enchytraeidae							
Enchytraeus sp.	**40**	**8.25%**	**Yes**	**Unknown**		**4**	**CG**
Fridericia sp.	**1**	**0.21%**	**Yes**	**Unknown**		**11**	**CG**
Mesenchytraeus sp.	**1**	**0.21%**	**Yes**	**Unknown**		**4**	**CG**
Naididae							
Naididae	**5**	**1.03%**	**Yes**	**Immature**		**8**	**CG**
Naididae							
Telmatodrilus vejdovskyi	**1**	**0.21%**	**Yes**	**Unknown**		**11**	**CG**
Naididae							
Tubificinae	**1**	**0.21%**	**No**	**Immature**		**11**	**CG**
Lumbriculidae							
Lumbriculidae	**37**	**7.63%**	**Yes**	**Immature**		**4**	**CG**
Sphaeriidae							
Sphaeriidae	**9**	**1.86%**	**Yes**	**Unknown**		**8**	**CF**
Crangonyctidae							
Crangonyx sp.	**227**	**46.80%**	**Yes**	**Unknown**		**6**	**CG**
Acari							
Acari	**10**	**2.06%**	**Yes**	**Unknown**		**5**	**PR**
Ephemeroptera							
Baetidae							
Baetis tricaudatus complex	**58**	**11.96%**	**Yes**	**Larva**		**5**	**CG**
Plecoptera							
Nemouridae							
Malenka sp.	**1**	**0.21%**	**Yes**	**Larva**		**1**	**SH**
Trichoptera							
Hydropsychidae							
Hydropsyche sp.	**1**	**0.21%**	**Yes**	**Larva**		**5**	**CF**
Rhyacophilidae							
Rhyacophila Brunnea/Vemna Gr.	**1**	**0.21%**	**Yes**	**Larva**		**2**	**PR**
Diptera							
Ceratopogonidae							
Forcipomyiinae	**7**	**1.44%**	**Yes**	**Larva**		**6**	**PR**
Psychodidae							
Pericoma sp.	**1**	**0.21%**	**Yes**	**Larva**		**4**	**CG**
Tipulidae							
Limonia sp.	**2**	**0.41%**	**Yes**	**Larva**		**6**	**SH**
Chironomidae							
Chironominae							
Tanytarsus sp.	**1**	**0.21%**	**Yes**	**Larva**		**6**	**CF**
Orthocladiinae							
Limnophyes sp.	**4**	**0.82%**	**Yes**	**Larva**		**8**	**CG**
Orthocladiinae	**2**	**0.41%**	**Yes**	**Larva**	**Early Instar**	**6**	**CG**

Taxa Listing

Project ID: CB16LD
RAI No.: CB16LD006

RAI No.: **CB16LD006**
Client ID: **YarrowEastTribBelRM0.3_2016R1**
Date Coll.: **8/25/2016** No. Jars: **4**

Sta. Name: **Yarrow East Tributary(leaky dumpster site) Rep 1**
STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Sample Count	485						

Metrics Report

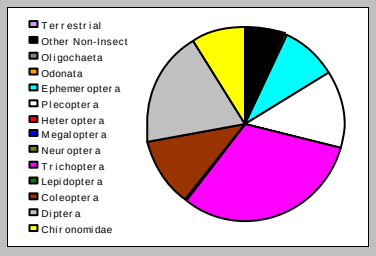
Project ID: CB16LD
RAI No.: CB16LD001
Sta. Name: Coal Creek below Parkway -Metro Access Rep 1
Client ID: CoalBelRM1.8_2016R1
STORET ID
Coll. Date: 8/11/2016
Latitude: 47.5592 **Longitude:** -122.1699

Abundance Measures

Sample Count: 532
Sample Abundance: 1,995.00 26.67% of sample used
Coll. Procedure: Surber
Sample Notes: Individual Jar IDs: CoalBelRM1.8_2016R1_JarA, CoalBelRM1.8_2016R1_JarB, CoalBelRM1.8_2016R1_JarC

Taxonomic Composition

Category	R	A	PRA
Terrestrial			
Other Non-Insect	5	36	6.77%
Oligochaeta	1	3	0.56%
Odonata			
Ephemeroptera	1	48	9.02%
Plecoptera	4	66	12.41%
Heteroptera			
Megaloptera			
Neuroptera			
Trichoptera	6	169	31.77%
Lepidoptera			
Coleoptera	2	61	11.47%
Diptera	4	102	19.17%
Chironomidae	11	47	8.83%

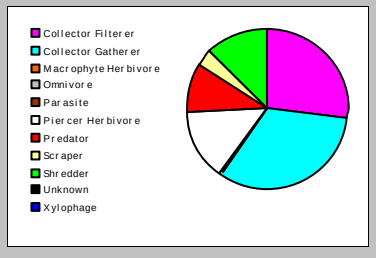


Dominant Taxa

Category	A	PRA
Simulium	75	14.10%
Hydropsyche	65	12.22%
Hydroptilidae	59	11.09%
Heterlimnius corpulentus	55	10.34%
Baetis tricaudatus complex	48	9.02%
Malenka	32	6.02%
Zapada cinctipes	25	4.70%
Antocha monticola	21	3.95%
Hydroptila	17	3.20%
Glossosomatidae	17	3.20%
Thienemannimyia Gr.	15	2.82%
Eukiefferiella Claripennis Gr.	12	2.26%
Crangonyx	12	2.26%
Acari	12	2.26%
Rhyacophila Brunnea/Vemna Gr.	9	1.69%

Functional Composition

Category	R	A	PRA
Predator	9	55	10.34%
Parasite			
Collector Gatherer	13	174	32.71%
Collector Filterer	4	143	26.88%
Macrophyte Herbivore			
Piercer Herbivore	1	76	14.29%
Xylophage			
Scraper	2	18	3.38%
Shredder	5	66	12.41%
Omnivore			
Unknown			

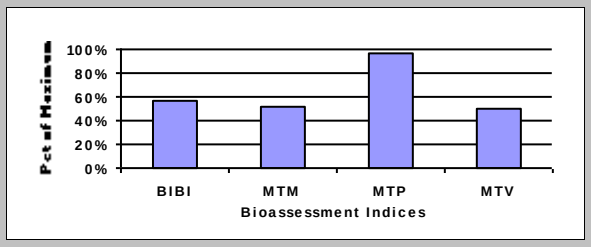


Metric Values and Scores

Metric	Value
Composition	
Taxa Richness	34
E Richness	1
P Richness	4
T Richness	6
EPT Richness	11
EPT Percent	53.20%
All Non-Insect Abundance	39
All Non-Insect Richness	6
All Non-Insect Percent	7.33%
Oligochaeta+Hirudinea Percent	0.56%
Baetidae/Ephemeroptera	1.000
Hydropsychidae/Trichoptera	0.385
Dominance	
Dominant Taxon Percent	14.10%
Dominant Taxa (2) Percent	26.32%
Dominant Taxa (3) Percent	37.41%
Dominant Taxa (10) Percent	77.82%
Diversity	
Shannon H (loge)	2.743
Shannon H (log2)	3.957
Margalef D	5.538
Simpson D	0.094
Evenness	0.057
Function	
Predator Richness	9
Predator Percent	10.34%
Filterer Richness	4
Filterer Percent	26.88%
Collector Percent	59.59%
Scraper+Shredder Percent	15.79%
Scraper/Filterer	0.126
Scraper/Scraper+Filterer	0.112
Habit	
Burrower Richness	2
Burrower Percent	0.75%
Swimmer Richness	1
Swimmer Percent	9.02%
Clinger Richness	13
Clinger Percent	73.68%
Characteristics	
Cold Stenotherm Richness	0
Cold Stenotherm Percent	0.00%
Hemoglobin Bearer Richness	1
Hemoglobin Bearer Percent	0.19%
Air Breather Richness	3
Air Breather Percent	5.08%
Voltinism	
Univoltine Richness	15
Semivoltine Richness	2
Multivoltine Percent	25.75%
Tolerance	
Sediment Tolerant Richness	4
Sediment Tolerant Percent	5.64%
Sediment Sensitive Richness	0
Sediment Sensitive Percent	0.00%
Metals Tolerance Index	3.916
Pollution Sensitive Richness	0
Pollution Tolerant Percent	3.20%
Hilsenhoff Biotic Index	4.272
Intolerant Percent	13.53%
Supertolerant Percent	4.51%
CTQa	73.818

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	28	56.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	29	96.67%	None
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	9	50.00%	Moderate
MTM	Montana DEQ Mountains (Bukantis 1998)	11	52.38%	Moderate



Metrics Report

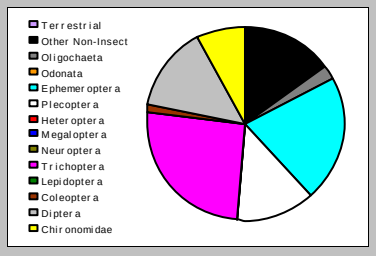
Project ID: CB16LD
RAI No.: CB16LD007
Sta. Name: Lewis Creek Ravine Rep 1
Client ID: LewisBelRM1.8_2016R1
STORET ID
Coll. Date: 8/12/2016
Latitude: 47.5566 **Longitude:** -122.1087

Abundance Measures

Sample Count: 540
Sample Abundance: 1,350.00 40.00% of sample used
Coll. Procedure: Surber
Sample Notes: Individual Jar IDs: LewisBelRM1.8_2016R1_JarA, LewisBelRM1.8_2016R1_JarB

Taxonomic Composition

Category	R	A	PRA
Terrestrial			
Other Non-Insect	7	83	15.37%
Oligochaeta	1	11	2.04%
Odonata			
Ephemeroptera	2	113	20.93%
Plecoptera	3	71	13.15%
Heteroptera			
Megaloptera			
Neuroptera			
Trichoptera	8	138	25.56%
Lepidoptera			
Coleoptera	3	5	0.93%
Diptera	7	77	14.26%
Chironomidae	9	42	7.78%

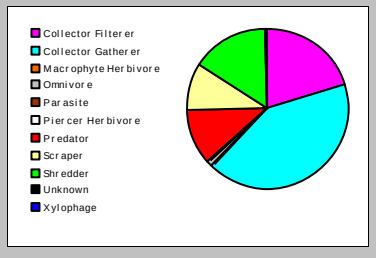


Dominant Taxa

Category	A	PRA
Baetis tricaudatus complex	108	20.00%
Crangonyx	69	12.78%
Malenka	62	11.48%
Hydropsyche	53	9.81%
Simulium	51	9.44%
Parapsyche	31	5.74%
Glossosoma	19	3.52%
Micropsectra	16	2.96%
Maruina	16	2.96%
Glossosomatidae	15	2.78%
Lumbriculidae	11	2.04%
Polypedilum	8	1.48%
Rhyacophila Brunnea/Vemna Gr.	6	1.11%
Lepidostoma	6	1.11%
Polycelis	5	0.93%

Functional Composition

Category	R	A	PRA
Predator	11	60	11.11%
Parasite			
Collector Gatherer	12	224	41.48%
Collector Filterer	5	111	20.56%
Macrophyte Herbivore			
Piercer Herbivore			
Xylophage			
Scraper	3	55	10.19%
Shredder	7	83	15.37%
Omnivore	1	5	0.93%
Unknown	1	2	0.37%

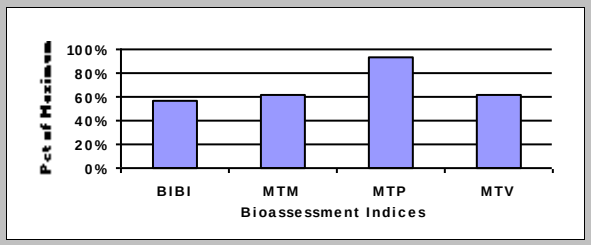


Metric Values and Scores

Metric	Value
Composition	
Taxa Richness	40
E Richness	2
P Richness	3
T Richness	8
EPT Richness	13
EPT Percent	59.63%
All Non-Insect Abundance	94
All Non-Insect Richness	8
All Non-Insect Percent	17.41%
Oligochaeta+Hirudinea Percent	2.04%
Baetidae/Ephemeroptera	0.956
Hydropsychidae/Trichoptera	0.616
Dominance	
Dominant Taxon Percent	20.00%
Dominant Taxa (2) Percent	32.78%
Dominant Taxa (3) Percent	44.26%
Dominant Taxa (10) Percent	81.48%
Diversity	
Shannon H (loge)	2.657
Shannon H (log2)	3.833
Margalef D	6.274
Simpson D	0.106
Evenness	0.058
Function	
Predator Richness	11
Predator Percent	11.11%
Filterer Richness	5
Filterer Percent	20.56%
Collector Percent	62.04%
Scraper+Shredder Percent	25.56%
Scraper/Filterer	0.495
Scraper/Scraper+Filterer	0.331
Habit	
Burrower Richness	4
Burrower Percent	4.07%
Swimmer Richness	1
Swimmer Percent	20.00%
Clinger Richness	17
Clinger Percent	52.41%
Characteristics	
Cold Stenotherm Richness	2
Cold Stenotherm Percent	1.11%
Hemoglobin Bearer Richness	2
Hemoglobin Bearer Percent	1.67%
Air Breather Richness	4
Air Breather Percent	4.44%
Voltinism	
Univoltine Richness	21
Semivoltine Richness	4
Multivoltine Percent	8.89%
Tolerance	
Sediment Tolerant Richness	3
Sediment Tolerant Percent	2.41%
Sediment Sensitive Richness	1
Sediment Sensitive Percent	3.52%
Metals Tolerance Index	3.352
Pollution Sensitive Richness	1
Pollution Tolerant Percent	0.00%
Hilsenhoff Biotic Index	3.698
Intolerant Percent	33.33%
Supertolerant Percent	0.19%
CTQa	76.586

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	28	56.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	28	93.33%	None
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	11	61.11%	Slight
MTM	Montana DEQ Mountains (Bukantis 1998)	13	61.90%	Slight



Thursday, October 06, 2016

Metrics Report

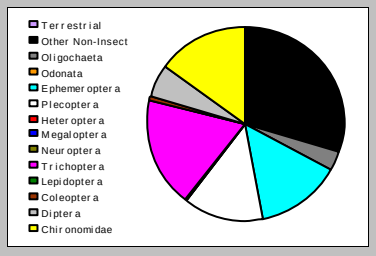
Project ID: CB16LD
RAI No.: CB16LD002
Sta. Name: Lewis Creek Ravine Rep 2
Client ID: LewisBelRM1.8_2016R2
STORET ID
Coll. Date: 8/12/2016
Latitude: 47.5566 **Longitude:** -122.1087

Abundance Measures

Sample Count: 327
Sample Abundance: 327.00 100.00% of sample used
Coll. Procedure: Surber
Sample Notes: Individual Jar ID: LewisBelRM1.8_2016R2_JarA

Taxonomic Composition

Category	R	A	PRA
Terrestrial			
Other Non-Insect	6	97	29.66%
Oligochaeta	4	10	3.06%
Odonata			
Ephemeroptera	2	47	14.37%
Plecoptera	5	44	13.46%
Heteroptera			
Megaloptera			
Neuroptera			
Trichoptera	6	60	18.35%
Lepidoptera			
Coleoptera	2	3	0.92%
Diptera	4	17	5.20%
Chironomidae	9	49	14.98%

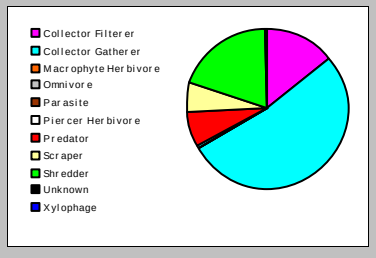


Dominant Taxa

Category	A	PRA
Crangonyx	85	25.99%
Baetis tricaudatus complex	43	13.15%
Malenka	32	9.79%
Micropsectra	20	6.12%
Hydropsyche	20	6.12%
Hydropsychidae	10	3.06%
Glossosoma	10	3.06%
Zapada cinctipes	8	2.45%
Simulium	8	2.45%
Polypedilum	8	2.45%
Lepidostoma	8	2.45%
Rheotanytarsus	7	2.14%
Acari	7	2.14%
Lumbriculidae	5	1.53%
Brillia	5	1.53%

Functional Composition

Category	R	A	PRA
Predator	8	23	7.03%
Parasite			
Collector Gatherer	14	171	52.29%
Collector Filterer	5	47	14.37%
Macrophyte Herbivore			
Piercer Herbivore			
Xylophage			
Scraper	3	20	6.12%
Shredder	7	65	19.88%
Omnivore			
Unknown	1	1	0.31%

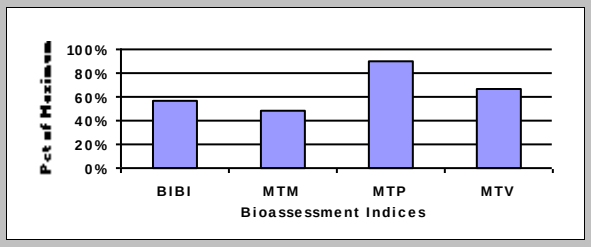


Metric Values and Scores

Metric	Value
Composition	
Taxa Richness	38
E Richness	2
P Richness	5
T Richness	6
EPT Richness	13
EPT Percent	46.18%
All Non-Insect Abundance	107
All Non-Insect Richness	10
All Non-Insect Percent	32.72%
Oligochaeta+Hirudinea Percent	3.06%
Baetidae/Ephemeroptera	0.915
Hydropsychidae/Trichoptera	0.550
Dominance	
Dominant Taxon Percent	25.99%
Dominant Taxa (2) Percent	39.14%
Dominant Taxa (3) Percent	48.93%
Dominant Taxa (10) Percent	74.62%
Diversity	
Shannon H (loge)	2.719
Shannon H (log2)	3.923
Margalef D	6.468
Simpson D	0.119
Evenness	0.057
Function	
Predator Richness	8
Predator Percent	7.03%
Filterer Richness	5
Filterer Percent	14.37%
Collector Percent	66.67%
Scraper+Shredder Percent	25.99%
Scraper/Filterer	0.426
Scraper/Scraper+Filterer	0.299
Habit	
Burrower Richness	3
Burrower Percent	3.98%
Swimmer Richness	2
Swimmer Percent	13.76%
Clinger Richness	16
Clinger Percent	36.39%
Characteristics	
Cold Stenotherm Richness	1
Cold Stenotherm Percent	1.22%
Hemoglobin Bearer Richness	3
Hemoglobin Bearer Percent	3.36%
Air Breather Richness	1
Air Breather Percent	0.92%
Voltinism	
Univoltine Richness	20
Semivoltine Richness	4
Multivoltine Percent	17.13%
Tolerance	
Sediment Tolerant Richness	2
Sediment Tolerant Percent	2.45%
Sediment Sensitive Richness	1
Sediment Sensitive Percent	3.06%
Metals Tolerance Index	3.025
Pollution Sensitive Richness	1
Pollution Tolerant Percent	0.92%
Hilsenhoff Biotic Index	4.265
Intolerant Percent	22.02%
Supertolerant Percent	1.83%
CTQa	80.714

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	28	56.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	27	90.00%	None
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	12	66.67%	Slight
MTM	Montana DEQ Mountains (Bukantis 1998)	10	47.62%	Moderate



Metrics Report

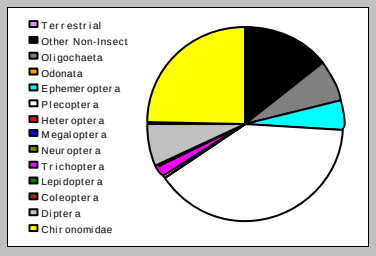
Project ID: CB16LD
RAI No.: CB16LD003
Sta. Name: Newport Tributary Rep 1
Client ID: NewpBelRM0.0_2016R1
STORET ID
Coll. Date: 8/17/2016
Latitude: 47.5662 **Longitude:** -122.1801

Abundance Measures

Sample Count: 518
Sample Abundance: 1,036.00 50.00% of sample used
Coll. Procedure: Surber
Sample Notes: Individual Jar IDs: NewpBelRM0.0_2016R1_JarA, NewpBelRM0.0_2016R1_JarB, NewpBelRM0.0_2016R1_JarC,

Taxonomic Composition

Category	R	A	PRA
Terrestrial			
Other Non-Insect	7	75	14.48%
Oligochaeta	6	36	6.95%
Odonata			
Ephemeroptera	1	23	4.44%
Plecoptera	2	207	39.96%
Heteroptera			
Megaloptera			
Neuroptera			
Trichoptera	2	10	1.93%
Lepidoptera			
Coleoptera	1	1	0.19%
Diptera	7	36	6.95%
Chironomidae	12	130	25.10%

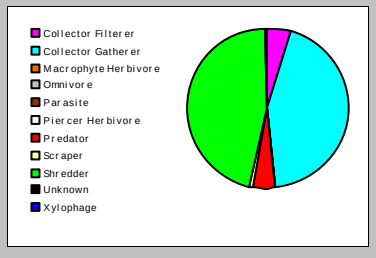


Dominant Taxa

Category	A	PRA
Malenka	106	20.46%
Zapada cinctipes	80	15.44%
Orthocladius	60	11.58%
Crangonyx	52	10.04%
Nemouridae	21	4.05%
Baetis tricaudatus complex	20	3.86%
Lumbriculidae	17	3.28%
Eukiefferiella Claripennis Gr.	17	3.28%
Simulium	15	2.90%
Cricotopus (Cricotopus)	14	2.70%
Antocha monticola	12	2.32%
Sphaeriidae	11	2.12%
Eukiefferiella tirolensis	11	2.12%
Brillia	11	2.12%
Rhyacophila Brunnea/Vemna Gr.	9	1.74%

Functional Composition

Category	R	A	PRA
Predator	8	21	4.05%
Parasite			
Collector Gatherer	17	224	43.24%
Collector Filterer	2	26	5.02%
Macrophyte Herbivore			
Piercer Herbivore			
Xylophage			
Scraper	2	4	0.77%
Shredder	7	241	46.53%
Omnivore			
Unknown	2	2	0.39%

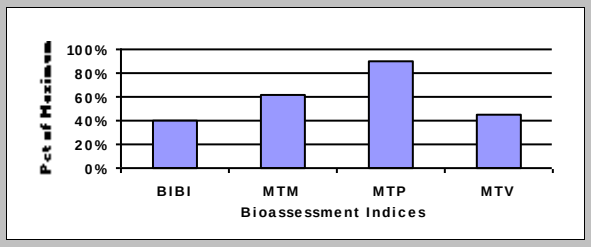


Metric Values and Scores

Metric	Value
Composition	
Taxa Richness	38
E Richness	1
P Richness	2
T Richness	2
EPT Richness	5
EPT Percent	46.33%
All Non-Insect Abundance	111
All Non-Insect Richness	13
All Non-Insect Percent	21.43%
Oligochaeta+Hirudinea Percent	6.95%
Baetidae/Ephemeroptera	1.000
Hydropsychidae/Trichoptera	0.000
Dominance	
Dominant Taxon Percent	20.46%
Dominant Taxa (2) Percent	35.91%
Dominant Taxa (3) Percent	47.49%
Dominant Taxa (10) Percent	77.61%
Diversity	
Shannon H (loge)	2.655
Shannon H (log2)	3.830
Margalef D	5.989
Simpson D	0.110
Evenness	0.059
Function	
Predator Richness	8
Predator Percent	4.05%
Filterer Richness	2
Filterer Percent	5.02%
Collector Percent	48.26%
Scraper+Shredder Percent	47.30%
Scraper/Filterer	0.154
Scraper/Scraper+Filterer	0.133
Habit	
Burrower Richness	5
Burrower Percent	6.76%
Swimmer Richness	2
Swimmer Percent	4.63%
Clinger Richness	8
Clinger Percent	50.39%
Characteristics	
Cold Stenotherm Richness	0
Cold Stenotherm Percent	0.00%
Hemoglobin Bearer Richness	2
Hemoglobin Bearer Percent	0.58%
Air Breather Richness	4
Air Breather Percent	3.47%
Voltinism	
Univoltine Richness	18
Semivoltine Richness	1
Multivoltine Percent	26.45%
Tolerance	
Sediment Tolerant Richness	5
Sediment Tolerant Percent	6.76%
Sediment Sensitive Richness	0
Sediment Sensitive Percent	0.00%
Metals Tolerance Index	3.085
Pollution Sensitive Richness	0
Pollution Tolerant Percent	0.58%
Hilsenhoff Biotic Index	4.129
Intolerant Percent	26.83%
Supertolerant Percent	9.65%
CTQa	86.875

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	20	40.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	27	90.00%	None
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	8	44.44%	Moderate
MTM	Montana DEQ Mountains (Bukantis 1998)	13	61.90%	Slight



Thursday, October 06, 2016

Metrics Report

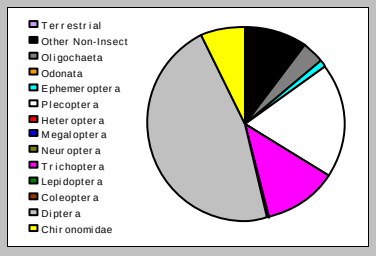
Project ID: CB16LD
RAI No.: CB16LD004
Sta. Name: Newport Tributary - Above pedestrian bridge and new riffle (pre-CIP) Rep 1
Client ID: NewpBelRM0.25_2016R1
STORET ID
Coll. Date: 8/22/2016
Latitude: 47.5657 **Longitude:** -122.1797

Abundance Measures

Sample Count: 500
Sample Abundance: 1,363.64 36.67% of sample used
Coll. Procedure: Surber
Sample Notes: Individual Jar IDs: NewpBelRM0.25_2016R1_JarA, NewpBelRM0.25_2016R1_JarB, NewpBelRM0.25_2016R1_JarC,

Taxonomic Composition

Category	R	A	PRA
Terrestrial			
Other Non-Insect	4	53	10.60%
Oligochaeta	3	17	3.40%
Odonata			
Ephemeroptera	1	7	1.40%
Plecoptera	1	92	18.40%
Heteroptera			
Megaloptera			
Neuroptera			
Trichoptera	5	61	12.20%
Lepidoptera			
Coleoptera			
Diptera	3	235	47.00%
Chironomidae	2	35	7.00%

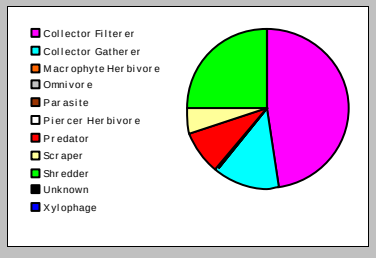


Dominant Taxa

Category	A	PRA
Simulium	229	45.80%
Nemouridae	61	12.20%
Amphipoda	37	7.40%
Brillia	34	6.80%
Malenka	31	6.20%
Rhyacophila Brunnea/Vemna Gr.	24	4.80%
Glossosomatidae	21	4.20%
Parapsyche	9	1.80%
Acari	8	1.60%
Sphaeriidae	7	1.40%
Lumbriculidae	7	1.40%
Enchytraeus	7	1.40%
Baetis Rhodani Gr.	7	1.40%
Antocha monticola	5	1.00%
Fridericia	3	0.60%

Functional Composition

Category	R	A	PRA
Predator	5	45	9.00%
Parasite			
Collector Gatherer	7	67	13.40%
Collector Filterer	3	237	47.40%
Macrophyte Herbivore			
Piercer Herbivore			
Xylophage			
Scraper	2	25	5.00%
Shredder	2	126	25.20%
Omnivore			
Unknown			

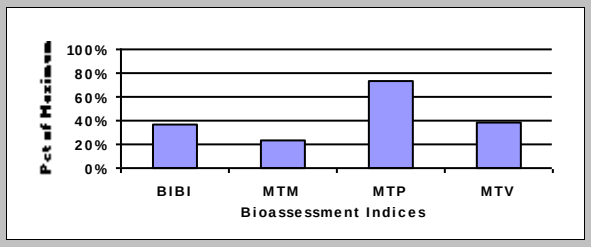


Metric Values and Scores

Metric	Value
Composition	
Taxa Richness	19
E Richness	1
P Richness	1
T Richness	5
EPT Richness	7
EPT Percent	32.00%
All Non-Insect Abundance	70
All Non-Insect Richness	7
All Non-Insect Percent	14.00%
Oligochaeta+Hirudinea Percent	3.40%
Baetidae/Ephemeroptera	1.000
Hydropsychidae/Trichoptera	0.164
Dominance	
Dominant Taxon Percent	45.80%
Dominant Taxa (2) Percent	58.00%
Dominant Taxa (3) Percent	65.40%
Dominant Taxa (10) Percent	92.20%
Diversity	
Shannon H (loge)	1.820
Shannon H (log2)	2.626
Margalef D	3.021
Simpson D	0.295
Evenness	0.086
Function	
Predator Richness	5
Predator Percent	9.00%
Filterer Richness	3
Filterer Percent	47.40%
Collector Percent	60.80%
Scraper+Shredder Percent	30.20%
Scraper/Filterer	0.105
Scraper/Scraper+Filterer	0.095
Habit	
Burrower Richness	3
Burrower Percent	8.40%
Swimmer Richness	1
Swimmer Percent	1.40%
Clinger Richness	8
Clinger Percent	77.40%
Characteristics	
Cold Stenotherm Richness	0
Cold Stenotherm Percent	0.00%
Hemoglobin Bearer Richness	1
Hemoglobin Bearer Percent	0.20%
Air Breather Richness	1
Air Breather Percent	1.00%
Voltinism	
Univoltine Richness	11
Semivoltine Richness	2
Multivoltine Percent	8.60%
Tolerance	
Sediment Tolerant Richness	3
Sediment Tolerant Percent	2.60%
Sediment Sensitive Richness	1
Sediment Sensitive Percent	0.60%
Metals Tolerance Index	4.109
Pollution Sensitive Richness	0
Pollution Tolerant Percent	0.20%
Hilsenhoff Biotic Index	4.184
Intolerant Percent	30.40%
Supertolerant Percent	1.40%
CTQa	81.615

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	18	36.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	22	73.33%	Slight
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	7	38.89%	Moderate
MTM	Montana DEQ Mountains (Bukantis 1998)	5	23.81%	Moderate



Metrics Report

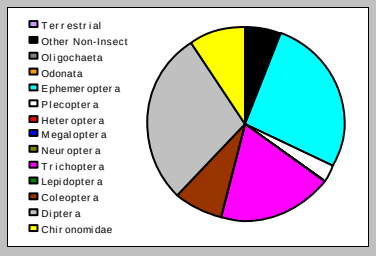
Project ID: CB16LD
RAI No.: CB16LD005
Sta. Name: Coal Creek - Above I-405 Weirs(Sound Transit Mitigation Site) Rep 1
Client ID: CoalBelRM0.8_2016R1
STORET ID
Coll. Date: 8/23/2016
Latitude: 47.566 **Longitude:** -122.1773

Abundance Measures

Sample Count: 544
Sample Abundance: 8,160.00 6.67% of sample used
Coll. Procedure: Surber
Sample Notes: Individual Jar IDs: CoalBelRM0.8_2016R1_JarA, CoalBelRM0.8_2016R1_JarB, CoalBelRM0.8_2016R1_JarC,

Taxonomic Composition

Category	R	A	PRA
Terrestrial			
Other Non-Insect	5	32	5.88%
Oligochaeta	1	1	0.18%
Odonata			
Ephemeroptera	1	141	25.92%
Plecoptera	3	17	3.13%
Heteroptera			
Megaloptera			
Neuroptera			
Trichoptera	3	102	18.75%
Lepidoptera			
Coleoptera	2	42	7.72%
Diptera	5	157	28.86%
Chironomidae	11	52	9.56%

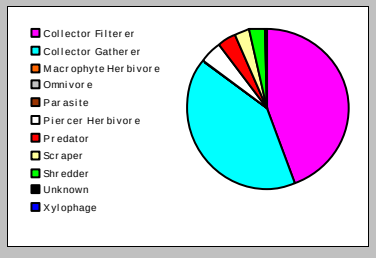


Dominant Taxa

Category	A	PRA
Simulium	150	27.57%
Baetis tricaudatus complex	141	25.92%
Hydropsyche	73	13.42%
Heterlimnius corpulentus	37	6.80%
Ostracoda	17	3.13%
Phaenopsectra	16	2.94%
Hydroptila	16	2.94%
Tanytarsus	12	2.21%
Hydroptilidae	10	1.84%
Zapada cinctipes	9	1.65%
Trepaxonemata	7	1.29%
Narpus concolor	5	0.92%
Malenka	5	0.92%
Eukiefferiella Devonica Gr.	5	0.92%
Acari	4	0.74%

Functional Composition

Category	R	A	PRA
Predator	8	21	3.86%
Parasite			
Collector Gatherer	11	221	40.63%
Collector Filterer	5	242	44.49%
Macrophyte Herbivore			
Piercer Herbivore	1	26	4.78%
Xylophage			
Scraper	1	16	2.94%
Shredder	4	17	3.13%
Omnivore			
Unknown	1	1	0.18%

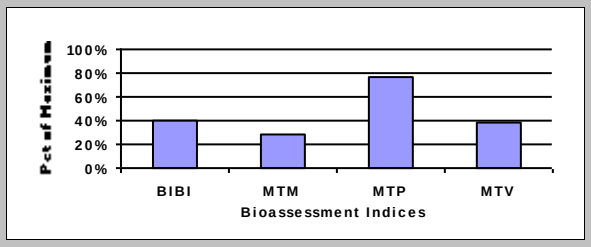


Metric Values and Scores

Metric	Value
Composition	
Taxa Richness	31
E Richness	1
P Richness	3
T Richness	3
EPT Richness	7
EPT Percent	47.79%
All Non-Insect Abundance	33
All Non-Insect Richness	6
All Non-Insect Percent	6.07%
Oligochaeta+Hirudinea Percent	0.18%
Baetidae/Ephemeroptera	1.000
Hydropsychidae/Trichoptera	0.716
Dominance	
Dominant Taxon Percent	27.57%
Dominant Taxa (2) Percent	53.49%
Dominant Taxa (3) Percent	66.91%
Dominant Taxa (10) Percent	88.42%
Diversity	
Shannon H (loge)	2.117
Shannon H (log2)	3.054
Margalef D	4.866
Simpson D	0.197
Evenness	0.079
Function	
Predator Richness	8
Predator Percent	3.86%
Filterer Richness	5
Filterer Percent	44.49%
Collector Percent	85.11%
Scraper+Shredder Percent	6.07%
Scraper/Filterer	0.066
Scraper/Scraper+Filterer	0.062
Habit	
Burrower Richness	3
Burrower Percent	0.55%
Swimmer Richness	1
Swimmer Percent	25.92%
Clinger Richness	13
Clinger Percent	61.58%
Characteristics	
Cold Stenotherm Richness	0
Cold Stenotherm Percent	0.00%
Hemoglobin Bearer Richness	3
Hemoglobin Bearer Percent	3.49%
Air Breather Richness	3
Air Breather Percent	1.10%
Voltinism	
Univoltine Richness	11
Semivoltine Richness	2
Multivoltine Percent	18.20%
Tolerance	
Sediment Tolerant Richness	4
Sediment Tolerant Percent	1.29%
Sediment Sensitive Richness	0
Sediment Sensitive Percent	0.00%
Metals Tolerance Index	4.603
Pollution Sensitive Richness	0
Pollution Tolerant Percent	2.94%
Hilsenhoff Biotic Index	5.266
Intolerant Percent	2.57%
Supertolerant Percent	5.33%
CTQa	82.650

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	20	40.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	23	76.67%	Slight
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	7	38.89%	Moderate
MTM	Montana DEQ Mountains (Bukantis 1998)	6	28.57%	Moderate



Metrics Report

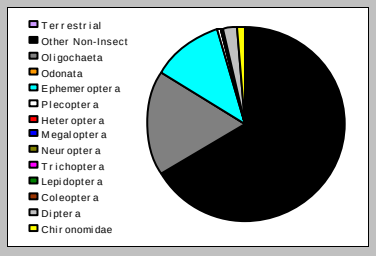
Project ID: CB16LD
RAI No.: CB16LD006
Sta. Name: Yarrow East Tributary(leaky dumpster site) Rep 1
Client ID: YarrowEastTribBelRM0.3_2016R1
STORET ID
Coll. Date: 8/25/2016
Latitude: 47.6371 **Longitude:** -122.1968

Abundance Measures

Sample Count: 485
Sample Abundance: 485.00 100.00% of sample used
Coll. Procedure: Surber
Sample Notes: Individual Jar IDs: YarrowEastTribBelRM0.3_2016R1_JarA, YarrowEastTribBelRM0.3_2016R1_JarB,

Taxonomic Composition

Category	R	A	PRA
Terrestrial			
Other Non-Insect	5	321	66.19%
Oligochaeta	6	86	17.73%
Odonata			
Ephemeroptera	1	58	11.96%
Plecoptera	1	1	0.21%
Heteroptera			
Megaloptera			
Neuroptera			
Trichoptera	2	2	0.41%
Lepidoptera			
Coleoptera			
Diptera	3	10	2.06%
Chironomidae	3	7	1.44%

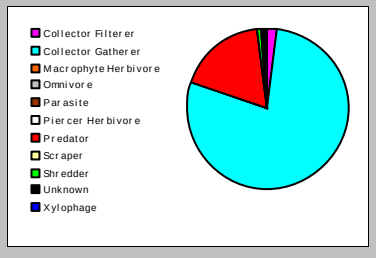


Dominant Taxa

Category	A	PRA
Crangonyx	227	46.80%
Trepaxonemata	69	14.23%
Baetis tricaudatus complex	58	11.96%
Enchytraeus	40	8.25%
Lumbriculidae	37	7.63%
Acari	10	2.06%
Sphaeriidae	9	1.86%
Forcipomyiinae	7	1.44%
Nemata	6	1.24%
Naididae	5	1.03%
Limnophyes	4	0.82%
Orthocladiinae	2	0.41%
Limonia	2	0.41%
Malenka	1	0.21%
Hydropsyche	1	0.21%

Functional Composition

Category	R	A	PRA
Predator	4	87	17.94%
Parasite			
Collector Gatherer	11	378	77.94%
Collector Filterer	3	11	2.27%
Macrophyte Herbivore			
Piercer Herbivore			
Xylophage			
Scraper			
Shredder	2	3	0.62%
Omnivore			
Unknown	1	6	1.24%

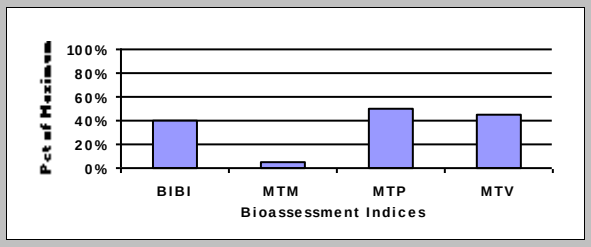


Metric Values and Scores

Metric	Value
Composition	
Taxa Richness	21
E Richness	1
P Richness	1
T Richness	2
EPT Richness	4
EPT Percent	12.58%
All Non-Insect Abundance	407
All Non-Insect Richness	11
All Non-Insect Percent	83.92%
Oligochaeta+Hirudinea Percent	17.73%
Baetidae/Ephemeroptera	1.000
Hydropsychidae/Trichoptera	0.500
Dominance	
Dominant Taxon Percent	46.80%
Dominant Taxa (2) Percent	61.03%
Dominant Taxa (3) Percent	72.99%
Dominant Taxa (10) Percent	96.49%
Diversity	
Shannon H (loge)	1.794
Shannon H (log2)	2.588
Margalef D	3.235
Simpson D	0.267
Evenness	0.090
Function	
Predator Richness	4
Predator Percent	17.94%
Filterer Richness	3
Filterer Percent	2.27%
Collector Percent	80.21%
Scraper+Shredder Percent	0.62%
Scraper/Filterer	0.000
Scraper/Scraper+Filterer	0.000
Habit	
Burrower Richness	3
Burrower Percent	8.25%
Swimmer Richness	1
Swimmer Percent	11.96%
Clinger Richness	3
Clinger Percent	0.62%
Characteristics	
Cold Stenotherm Richness	0
Cold Stenotherm Percent	0.00%
Hemoglobin Bearer Richness	
Hemoglobin Bearer Percent	
Air Breather Richness	2
Air Breather Percent	0.62%
Voltinism	
Univoltine Richness	11
Semivoltine Richness	0
Multivoltine Percent	3.51%
Tolerance	
Sediment Tolerant Richness	2
Sediment Tolerant Percent	8.04%
Sediment Sensitive Richness	0
Sediment Sensitive Percent	0.00%
Metals Tolerance Index	3.659
Pollution Sensitive Richness	0
Pollution Tolerant Percent	1.24%
Hilsenhoff Biotic Index	5.501
Intolerant Percent	0.41%
Supertolerant Percent	3.71%
CTQa	96.000

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	20	40.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	15	50.00%	Moderate
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	8	44.44%	Moderate
MTM	Montana DEQ Mountains (Bukantis 1998)	1	4.76%	Severe



Thursday, October 06, 2016