Slocan River and Area Water Quality Monitoring Report 2005–2013

A Columbia Basin Water Quality Monitoring Project

Verena Shaw,
Slocan River Streamkeepers
2013

LOTIC ENVIRONMENTAL

Columbia Basin Watershed Network

COLUMBIA BASIN TRUST
a legacy for the people

Acknowledgements

We wish to acknowledge Lotic Environmental Ltd. staff Sherri McPherson, Kathryn Kuchapski, and Ryan MacDonald, who provided substantive technical support throughout the data compilation, analysis, and reporting stages of this project. We also wish to acknowledge GranDuke Geomatics staff Guy Duke, Kevin Grant, and Tom Rutherford for their valuable tools created to aid in water quality guideline presentation and review.

Contact Information

Slocan River Streamkeepers
For general information contact
Jennifer Yeow
passlab@columbiawireless.ca

For CABIN related information contact
Verena Shaw
verenashaw@gmail.com

Columbia Basin Water Quality Monitoring Project Coordinators:
Jim and Laura Duncan
gardenlaura@shaw.ca or jim.duncan9@me.com

Columbia Basin Trust Coordinator
Tim Hicks
thicks@cbt.org

The Water Quality Monitoring Project is part of the Columbia Basin Watershed Network. The Columbia Basin Watershed Network Database is located at: www.cbwn.ca

Suggested Citation

Shaw, V. 2013. Columbia Basin Central. A Columbia Basin Water Quality Monitoring Project. Prepared by the Slocan River Streamkeepers for the Columbia Basin Trust.

Cover photo of the Slocan River basin, taken by: Jennifer Yeow.

Project Highlights

- When comparing the benthic invertebrate community results at test sites to reference sites, all sites were unstressed to potentially stressed except for two sites, which were both on the Slocan River. One of these two sites was just south of Slocan (NJSLO02) and went from potentially stressed to severely stressed the last time it was monitored in 2009 and the other site in Crescent Valley (NJSLO01) was stressed every second year that it was monitored.

- For water quality analysis, several sites had guideline exceedances. NJSLO01 had pH exceedance for portions of 2011 to 2013 and total phosphorus exceedance once in 2009. Wilson Creek (NJWIL01) had pH exceedance in 2010. For NJSLO01 there were exceedances in the water of cadmium and zinc in 2008 and the Winlaw portion of the Slocan River (NJSLO03) had these metal exceedances in 2007. The sediments of NJSLO01 were found to have exceedances of cadmium and zinc in 2010. Bonanza Creek (NJBON01) had sediment exceedances in 2012 of cadmium, iron, manganese, nickel, and zinc.

- A range of thermal conditions was observed at the various sites. Three of these sites were along the Slocan River where the maximum temperature was approximately 23 °C and at the fourth site along Winlaw Creek the maximum temperature was much lower at about 14 °C.

- The stressed invertebrate community rating at NJSLO01 was determined by the CABIN model. The model that determines the overall conditions is complex, and compares multiple metrics between the test and reference sites. Overall the differences between stressed and potentially stressed years at this site were marginal when the vector graphs were reviewed, indicating that the stressed sites were not dramatically different than the potentially stressed sites from year to year. The stressed conditions also did not appear to be the result of water quality exceedances, as the exceedances did not occur during the years identified to be stressed. The exceedances were also marginally higher/lower than the guidelines. Because of this, there was not a high level of concern with the results for this site. Site NJSlO01 had CABIN data collected in 2013 with results planned to be summarized in a subsequent report.

- Similarly, the low effect sediment guideline exceedances at NJBON01 were not evidenced to impact the benthic community assemblages.

- Water quality was not collected at NJSL002 to allow for a review of the cause for the severely stressed rating in 2009. The possibility of impacts from mining and/or lumber processing activities needs to be investigated. However, this was a year in which the maximum and average yearly stream temperatures were cooler. This site also had CABIN data collected in 2013, with results planned to be summarized in a subsequent a report.

Contents

Table of Tables

Table of Figures

Table of Appendices

1 Introduction

Community-based water quality management in the Columbia River basin plays an important role in preserving watershed function for sustainable communities and ecosystems. This fact was brought to everyone's attention in the summer of 2013 when a fuel transport accident on a creek tributary to the Slocan River resulted in an extensive hydrocarbon spill. Thanks to this program, baseline data for invertebrates was available.

It is imperative that current and future water quality and quantity concerns be assessed in the Columbia River basin as environmental change poses substantial risk to ecosystem and societal health. Changes in land use and climate pose the greatest threat to both water quality and water quantity in the Columbia River basin. Current and future reductions in snow accumulation (Barnett *et al*. 2008) and glacial ice (Jost *et al*. 2012) have been shown to result in reduced water supply in the Columbia basin, particularly for the low flow summer periods (Burger *et al*. 2011). Lower streamflow leads to a reduced ability for streams to dilute pollution, potentially resulting in substantial water quality issues. In addition to climate change, the diverse land uses of the Columbia River basin, including: recreational and industrial development, streamflow regulation, municipal and industrial waste water, and non-point source pollution present a challenge for community-based water quality management.

A first step in addressing present and future water quality and quantity issues is developing community awareness and involvement. The Columbia Basin Watershed Network (CBWN) is an environmental stewardship project funded by the Columbia Basin Trust (CBWN 2012). The CBWN provides support to organizations, individuals and local water stewardship groups that undertake activities to conserve and monitor rivers and lakes throughout the Canadian Columbia River basin (CBWN 2009). In response to local support, the CBWN has developed a long-term Water Quality Monitoring Project (WQMP), with the following goals (CBWN 2009):

1. Develop a science-based model for community-based water quality monitoring;
2. Establish online accessibility to water quality data; and,
3. Link the monitoring project with community awareness activities.
4. Provide data to inform environmental management and restoration activities

In order to meet these goals the Slocan River Streamkeepers have been conducting water quality monitoring in the Columbia basin from 2005 to 2013. Monitoring has included benthic macro-invertebrate assessment, water sediment quality assessment and continual temperature monitoring.

1.1 Study location and background

Canadian Aquatic Biomonitoring Network (CABIN) monitoring has been going on in the Slocan River and area region since 2005. Monitoring has been conducted in 11 sample sites in this area. All sites but one (Mill Creek) are part of the Slocan River watershed. Mill Creek flows into Kootenay Lake. A brief background on each of these sites is provided below and also summarized in Table 1:

- Bonanza Creek (NJBON01)
  This creek flows into the northern portion of Slocan Lake. It was monitored from 1994 to 2001 through a Forest Renewal BC program. There has been logging and road building in this creek since 2001. There is still concern about related impacts to the fish population (kokanee and rainbow trout) as well as the flow of the creek through a valuable marsh area. The work was done with the Slocan Lake Stewardship Society and Hills Recreation Society. CABIN data was collected in 2007 and 2012.

- Carpenter Creek (NJCAR01)
  This creek flows through New Denver. Mining upstream of new Denver in Sandon is the key anthropogenic pressure in this system. CABIN data was collected in 2006 and 2008. Lucerne School helped with the field work.

- Goose Creek (NJGOS01)
  This creek is situated in Crescent Valley and was chosen because of residential development pressures along the creek and proximity to Mt. Sentinel School. Biology 11 students helped collect data at this site. CABIN data was collected between 2010 and 2012.

- Koch Creek (NJKOC01)
  This creek is a tributary of the Little Slocan River and was chosen because of potential pressures from an independent power project. Koch Creek flows through Tree Farm License #3. Logging and road building are on-going and represent potential impacts. There are populations of bull trout in this creek. CABIN data was collected in 2008.

- Slocan River (NJSLO01) (NJSLO02) (NJSLO03)
  Site 1 (NJSLO01) is the site located furthest downstream on the river. It is the main station on the Slocan River in Crescent Valley. CABIN data was collected between 2005 and 2009 and again in 2011.

  Site 2 (NJSLO02) is the site furthest upstream and is just south of Slocan at Valhalla Fire Control camp. CABIN data was collected between 2005 and 2009. The Upper Slocan Watershed contains numerous mine sites dating back 100s of years. An inventory of these sites has not been done. Their impact to water quality on surrounding streams which enter Slocan Lake above the test site is unknown. However, an analysis of water collected down slope from the old ore processor on the Springer Creek Forest Service road showed high levels of cadmium, selenium and uranium. Also, a Lumber Mill above NJSLO02 which operated for many years may have engaged in wood treatment processes using organic compounds which may persist in the environment.

  Site 3 (NJSLO03) is the middle site and is in Winlaw. CABIN data was collected in 2005.

- Mill Creek (NJMIL01) is in Harrop and was studied at the request of the Harrop-Proctor Watershed Protection Society. CABIN data was collected for 2008 and 2012.

- Winlaw Creek (NJWIN01) is in Winlaw. The local community wanted the data because the watershed is managed through the community forest. Historically, the Winlaw Watershed has seen very little development. There is one road leading to a decommissioned Silica mine. There may be forestry activities on the south side of the watershed through the Pedro Creek forestry tenure (BC Timber sales). The creek was monitored since 1996 although the program is now suspended. CABIN data was collected in 2006 and in 2010.

- Slocan/Nixon site (NJNIX01) is a side channel on the west side of Slocan Island below Lemon Creek on the Slocan River. CABIN data was collected in 2010. The site is located adjacent to land purchased by the BC Nature Trust and Columbia Basin Fish and Wildlife Compensation Program. The site was monitored because of the ecological importance of this region as refuge habitat for aquatic life and terrestrial wildlife values.

- Wilson Creek (NJWIL01) flows into the northern portion of Slocan Lake. It supplies about one-third of the water in Slocan Lake. There has been development including forestry operations: timber removal and road building in the Wilson Creek Watershed and more activities are planned. CABIN data was collected between 2009 and 2011.

Table 1. Summary of Sites Monitored 2005-2012.

Site Code	Site Name	Development Pressures	Years Monitored			
			CABIN	Water Quality	Sediment Quality	**Temperature
NJBON01	Bonanza Creek	History of recent logging and road building	2007 and 2012	2012	2012	None
NJMIL01	Mill Creek	History of recent logging and road building	2008 and 2012	2008	None	None
NJGOS01	Goose Creek	Residential development in area	2010 to 2012	2012	None	None
NJKOC01	Koch Creek	Forestry Operations and potential independent power project	2008	2008	None	None
NJCAR01	Carpenter Creek	Mining from Sandon	2006 and 2008	None	None	None
NJNIX01	Slocan/Nixon Side Channel	Island recently purchased by Nature Trust for its wildlife values	2010	None	None	None
NJSLO01	Slocan River Site 1	Residential Development and livestock in area	2005-2009, 2011	2008 (3x), 2009 (9x), 2010 (8x), 2011(13x), 2012 (12x), 2013 (4x)	2010-2012	2006-2012
NJSLO02	Slocan River Site 2	Residential Development, Mining and Lumber Mill	2005 to 2009	2007, 2008	None	2005-2009
NJSL003	Slocan River Site 3	Development and livestock in area	2005	2007	None	2005-2009, 2011-2012
NJWIL01	Wilson Creek	Logging	2009 to 2011	2010 (2x)	None	None
NJWIN01	Winlaw Creek	Logging from local community forest	2006, 2010	2010 (2x)	None	2005-2007

Legend:

** continual sampling

2 Objectives

The objectives of this water quality monitoring report are as follows:

1. Present CABIN, water quality, sediment and continual temperature data collected to date in a format that can be used for analysis and ongoing assessment.
2. Analyse biological monitoring data (CABIN). Complete the analysis using the analytical tools in the CABIN database by classifying benthic invertebrate community stress at sampling sites according to the Reference Condition Approach and calculating invertebrate community metrics.
3. Analyse water and sediment quality data to identify if there were any parameters of potential concern in the study area. Complete this review by comparing monitoring results to applicable federal and provincial guidelines for the protection of aquatic life and drinking water, where available.
4. Analyse temperature data obtained from the continual data logger(s).
5. Relate biological results to water/sediment quality and temperature findings.
6. Provide recommendations for future stream health data collection including applicable data to be collected, locations to be sampled and procedures.

3 Methods

3.1 Data collection

CABIN techniques were used to collect data on benthic macro-invertebrates, habitat and water quality. Data were collected following the CABIN Field Procedures for Wadeable Streams (Environment Canada 2012a) and the CBWQMP Operating Procedures (CBWQMP 2012). CABIN sampling was conducted once a year in the fall at sites indicated in Table 1. Invertebrate samples were analysed by EcoAnalysts, Inc. following CABIN laboratory methods (Environment Canada 2012b). All data was entered into the online CABIN database which was used to analyse findings and provide site reports.

In addition to water quality sampling collected during annual CABIN data collection, water quality data was also collected monthly at site NJSLO01 and occasionally at all the other sites (excluding NJCAR01 and NJNIX01) following CBWQMP Operating Procedures (CBWQMP 2012). Water quality parameters measured in the field (*in situ*) included dissolved oxygen. Turbidity, pH, and specific conductivity were measured at Passmore Laboratory Ltd. Parameters analysed in the laboratory included inorganics, nutrients and metals. Sediment chemistry sampling (i.e., metals) was conducted at site NJSLO01 in 2010 through 2012, NJSLO03 in 2007, and NJBON01 in 2012. Maxxam (Burnaby, BC) completed laboratory water and sediment quality analysis.

Hourly stream temperature (°C) was measured at four sites using HOBO Pro V2 temperature loggers. Measurements were taken for the period from 2005 to 2012.

3.2 CABIN analysis

The Reference Condition Approach (RCA) in CABIN was used to determine the condition of the benthic invertebrate community at the test sites by comparing each test site to a group of reference sites with similar environmental characteristics.

Using the Analytical Tools in the CABIN database, three analyses were used to review invertebrate test site data (Steps 1a – 1c in Figure 1): BEnthic Assessment of SedimenT (BEAST), River Invertebrate Prediction and Classification System (RIVPACS), and metrics. Water quality (Step 2) and stream temperature (Step 3) analyses followed to provide an overall understanding of stream condition.

The reference model used in the RCA analysis was the Preliminary Okanagan-Columbia Reference Model (2010) provided in the online CABIN database. Because the model was still considered preliminary, with some potential data gaps, caution was exercised when interpreting RCA results (obtained from Steps 1a to 1c). Furthermore, it was important that all subsequent analyses (Steps 2, and 3) were conducted.

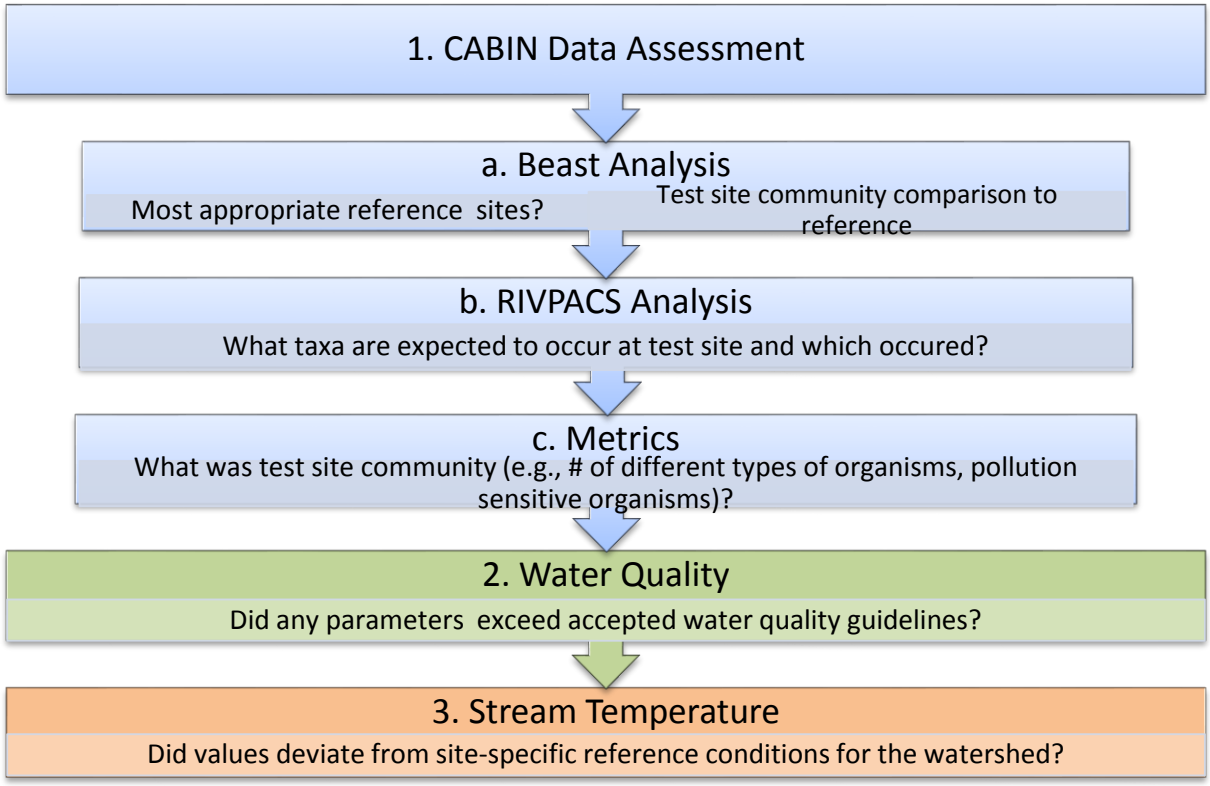


Figure 1. Stream condition analyses - Steps 1a to c review CABIN data using the reference condition approach and Steps 2 and 3 review water quality and continual stream temperature data collected

Reference Condition Approach: BEAST analysis and site assessment

BEAST analysis was used to predict test sites to a reference group from the preliminary Okanagan-Columbia reference model provided by Environment Canada through the CABIN database. BEAST uses a classification analysis that determines the probability of test site membership to a reference group based on habitat variables (Rosenberg *et al.* 1999). Habitat variables used to predict group membership in the Okanagan-Columbia reference model include latitude, longitude, percent area of watershed with a gradient <30%, percent area of watershed with permanent ice cover and average channel depth.

CABIN model hybrid multi-dimensional scaling ordination assessment was then used to evaluate benthic community stress based on divergence from reference condition. This analysis placed test sites into assessment bands corresponding to a stress level ranging from unstressed to severely stressed. In the ordination assessment, sites that are unstressed fall within the 90% confidence ellipse around the cloud of reference sites which means that their communities are similar or equivalent to reference (Rosenberg *et al.* 1999). Potentially stressed, stressed and severely stressed sites fall outside of the 90%, 99% and 99.9% confidence ellipses and indicate mild divergence, divergence, or high divergence of the benthic community from reference condition (Rosenberg *et al.* 1999).

RIVPACS analysis

RIVPACS ratios were calculated in the Analytical Tools section of the CABIN database. RIVPACS analysis relies on presence/absence data for individual taxa. The RIVPACS ratio determines the ratio of observed taxa at test sites to taxa expected to be present at the test site based on their presence at reference sites. A RIVPACS ratio close to 1.00 indicates that a site is in good condition as all taxa expected to be present were found at the test site. A RIVPACS ratio >1.00 can indicate community enrichment while a ratio <1.00 can indicate that a benthic community is in poor condition.

Community composition metrics

Benthic community composition metrics were calculated in the CABIN database using the Metrics section of the Analytical Tools menu. A collection of relevant measures of community richness, abundance, diversity and composition were selected to describe the test site communities. Using metrics, indicator attributes were used to interpret the response to environmental disturbances. Metrics are complimentary to an RCA analysis.

3.3 Water quality analysis

Water quality QA/QC

Raw data were first subjected to a quality control evaluation to assess the accuracy and precision of the laboratory and field methods. For all sediment and water samples analysed, the laboratory assessed accuracy through the use of matrix spike, spiked blank, and method blank samples. As well, the laboratory measured precision through duplicate sample analysis. As per standard practice, all laboratory quality control results were reviewed and confirmed to meet standard criteria prior to proceeding with processing of field samples (Maxxam 2012).

Field duplicates were submitted to the laboratory to measure both field sampling error plus local environmental variance. Duplicate review was based on relative percent difference (RPD) as determined by Equation 1. For duplicate values at or greater than five times the method detection limit MDL, RPD values >20% indicates a possible problem, and > 50% indicates a definite problem, most likely either contamination or lack of sample representativeness (BC MoE 2003). An RPD value greater than or equal to 30% was considered an alert level (Horvath pers. comm.). Where RPD values were greater than 30%, the source of the problem was determined, and the impact upon the sample data ascertained (BC MoE 2003). If data were found to be within acceptable ranges, subsequent analyses included only the first of the duplicate samples.

Equation 1: Duplicate sample quality control

Relative Percent Difference = (Absolute difference of duplicate 1 and 2/average of duplicate 1 and 2)*100

$$RPD = \left(\frac{\text{Duplicate 1} - \text{Duplicate 2}}{(\text{Duplicate 1} + \text{Duplicate 2})/2} \right) \times 100$$

Field blank data were collected to monitor possible contamination prior to receipt at the laboratory. Field blanks were compared using Equation 2. Field blank values that were 2 times greater than the reportable detection limit were considered levels of alert (Maxxam 2012, Horvath pers. comm.). Field blank values that exceeded the alert level were reviewed in more detail to identify the potential source(s) for contamination; as well other data on that day were compared to historical data to identify if there were anomalies possibly related to contamination.

Equation 2: Field Blank sample quality control

$$\text{Blank x difference} = \frac{\text{Field Blank Value}}{\text{Reportable Detection Limit (RDL)}}$$

Guideline review

A guideline is a maximum and/or a minimum value for a characteristic of water, sediment or biota, which in order to prevent specified detrimental effects from occurring, should not be exceeded (Nagpal 2001). Water quality results were compared to the applicable provincial and federal guidelines for the protection of aquatic life and drinking water (Table 2).

Table 2. Provincial and federal guidelines applicable to the protection of aquatic life (sediment and water quality) and drinking water (water quality only).

Document	Sediment Quality – Aquatic Life	Water Quality – Aquatic Life	Water Quality – Drinking Water
Federal			
Canadian Water Quality Guidelines (CCME 1999a)		X	
Guideline for Canadian Drinking water quality (Health Canada 2012)			X
Canadian Sediment Quality Guidelines (CCME 1999b)	X		
Provincial			
Approved Water Quality Guidelines (Government of BC 2013)	X	X	X
Working Water Quality Guidelines for BC (Nagpal et al. 2006)	X	X	X

* CCME - Canadian Council of Ministers of the Environment

When both long-term and short-term exposure guidelines were available, the long-term guideline was used in the review, since sampling was assumed to have occurred under 'normal' conditions. As well, to characterize water and sediment quality, all guideline thresholds were considered in this review. An exceedance of any of the thresholds was flagged to provide an understanding of the potential risks to aquatic organisms.

The transpose add-in tool created by GranDuke Geomatics (2013a) was used to automate the addition of new water quality data from Maxxam into existing CBWN datasets. Using Visual Basic for Applications (VBA) users opened MS Excel files from Maxxam and chose which MS Excel file to append the new data into. The add-in matches parameter names between files and converts units (e.g., between µm and mg), flagging the data cells that were successfully transferred. The Automated Guideline Assessment Tool for High-speed Analysis (AGATHA), also developed by GranDuke Geomatics (2013b) was then used to compare measured water and sediment quality values to the applicable published guidelines. The interface to AGATHA for the CBWQMP was provided through Microsoft Excel. AGATHA highlighted values that were above or below published guidelines and provided links to guidelines where further information could be attained. AGATHA automatically monitors the national and provincial guidelines for changes, ensuring guideline checks are up-to-date into the future.

3.4 Stream temperature analysis

HOBOware was used to process the data and Microsoft Excel was used for the stream temperature analysis. Stream temperature data was analyzed using descriptive statistics (average, maximum, and standard deviation) for each year and each site.

4 Results

4.1 CABIN Results

Reference Condition Approach: BEAST analysis and site assessment

For all the sites, CABIN BEAST analysis determined the highest probability of reference group membership for all sites in all years was to group 4, except for NJGOS01 and NJBON01 in 2012 (probabilities found in Table 3). Reference group 4 includes 21 sites located in the Northern Continental Divide, Columbia Mountains and Highlands and Western Continental Range eco-regions. These eco-regions surround the Slocan River watershed sites and Mill Creek site and are all found in the Columbia Mountains and Highlands region (Demarchi 2011). The mean average channel depth of reference group 4 is 29.3 cm compared to the test sites' average depth range of 9.3-58.6 cm.

NJGOS01 was predicted to group 2 in 2010, 2011, and 2012 with probabilities of 93.0%, 90.9%, and 90.7% respectively. Reference group 2 is comprised of 63 sites which are predominantly located in the Thompson Okanagan Plateau and Columbia Mountains and Highlands eco-regions. The mean average channel depth of group 2 is 19.5 cm and its sites have lower gradient watersheds than group 4 with an average 47.8 percent of the watershed with gradient <30. NJGOS01 was likely predicted to group 2 because it also has a low gradient watershed with 65% gradient <30.

NJBON01 was predicted to Group 4 with 45.5% in 2007 and to Group 1 with 100% in 2012. There was a big change in average channel depth between the two sampling years, which may have caused the change in reference groups (in 2007 it was 50 cm while 2012 showed 192 cm).

All sites were compared with the reference group they were predicted to with the highest probability. Individual test site habitat attributes, as well as site assessment ordination plots are included in the Site Assessment Reports in Appendix A. Note that several sites were missing average channel depth so BEAST analysis was performed with only four variables for determining reference group membership. These sites were NJCAR01 2006, NJSLO02 for 2005 to 2009, NJSLO03 for 2005 and NJWIL01 for 2010.

Table 3. CABIN model assessment of test sites against reference condition as defined by the preliminary Okanagan-Columbia reference model; assessment, prediction of reference group and probability of group membership.

Site Code	2005	2006	2007	2008	2009	2010	2011	2012
NJCAR01		Unstressed Group 4; 61.2%		Pot. Stressed Group 4; 68.0%				
NJGOS01						Unstressed Group 2; 93.0%	Unstressed Group 2; 90.9%	Pot. Stressed Group 2; 90.7%S
NJKOC01				Unstressed Group 4; 79.6%				
NJMIL01				Unstressed Group 4; 69.5%				Unstressed Group 4; 71.5%
NJNIX01						Pot. Stressed Group 4; 83.3%		
NJSLO01	Stressed Group 4 75.6%	Pot. Stressed Group 4 75.6%	Stressed Group 4 73.7%	Pot. Stressed Group 4 77.9%	Stressed Group 4 78.1%		Pot. Stressed Group 4 62.3%	
NJSLO02	Pot. Stressed Group 4 64.1%	Pot. Stressed Group 4 64.1%	Pot. Stressed Group 4 64.1%	Pot. Stressed Group 4 64.1%	Severely Stressed Group 4 64.2%			
NJSLO03	Pot. Stressed Group 4 65.5%							
NJWIL01					Pot. Stressed Group 4 66.1%	Unstressed Group 4 60.2%	Unstressed Group 4 82.4%	
NJWIN01		Unstressed Group 4 70.5%				Unstressed Group 4 69.6 %		
NJBON01			Unstressed Group 4 45.5%					Unstressed Group 1 100%

Using CABIN model assessments to compare the macroinvertebrate communities to reference condition, sites in the Slocan River watershed and Mill Creek were generally assessed as unstressed or potentially stressed over the period from 2005-2012. Exceptions included NJSLO01, which was assessed as stressed in 2005, 2007, and 2009, and NJSLO02, which was assessed as severely stressed in 2009 (Table 3).

RIVPACS analysis

RIVPACS O:E ratios for test sites are summarized in Table 4. For sites where the RIVPACS O:E ratio was less than 0.70, Table 4 also includes a list of the families of organisms that were expected to be present with a probability >0.7 but which were not observed at the sampling site in that year. At these sites the families that were expected but were not observed belonged exclusively to the orders Ephemeroptera (Baetidae, Ephemerellidae, Heptageniidae, Leptophlebiidae), Plecoptera (Capniidae, Chloroperlidae, Nemouridae, Perlidae, Perlodidae, Taeniopterygidae), Trichoptera (Hydropsychidae and Rhyacophilidae) and Trombidiformes (Torrenticolidae).

NJSLO02 had the lowest RIVPAC rating (<0.50), as it consistently had several taxa absent that were expected. Low ratios were also observed at NJSLO03 (0.36) and NJNIX01 (0.53), although these sites were only sampled once.

Table 4. RIVPACS Observed:Expected Ratios of taxa at test sites. Taxa were included in the analysis if their probability of occurrence at reference sites was >70% and are listed if they were not observed at the test site. Macroinvertebrate family abbreviations: BAET-Baetidae, CAPN-Capniidae, CHLO-Chloroperlidae, EPHE-Ephemerellidae, HEPT-Heptageniidae, HYDR-Hydropsychidae, LEPT-Leptophlebiidae, NEMO-Nemouridae, PERLI-Perlidae, PERLO-Perlodidae, RHYA-Rhyacophilidae, TAEN-Taeniopterygidae, TORR-Torrenticolidae

Site	2005	2006	2007	2008	2009	2010	2011	2012
NJCAR01		**0.99** PERLI		**0.89** EPHE, PERLI				
NJGOS01						**0.93** CHLO, PERLI	**0.85** CHLO, PERLI, TORR	**0.76** CHLO,LEPT, PERLI, TORR
NJK0C01				**0.62** CAPN, CHLO, EPHE, PERLI TAEN				
NJMIL01				**0.80** CAPN, EPHE, PERLI				**0.89** HYDR, PERLI
NJNIX01						**0.53** CAPN, CHLO, NEMO, PERLI, TAEN, RHYA		
NJSLO01	**0.71** CAPN, HEPT, NEMO, TAEN	**0.62** CAPN, CHLO, PERLI, RHYA, TAEN	**0.80** CAPN, CHLO, TAEN	**0.97** CAPN	**0.62** CAPN, EPHE, HEPT, NEMO, PERLI		**0.92** CAPN, TAEN	
NJSL002	**0.45** CAPN, HEPT, NEMO, PERLI, PERLO, RHYA, TAEN	**0.45** CAPN, CHLO, HEPT, HYDR, NEMO, PERLI, PERLO	**0.36** BAET, CAPN, CHLO, NEMO, PERLI, PERLO, RHYA, TAEN	**0.27** BAET, CAPN, CHLO, EPHE, HEPT, NEMO, PERLI, RHYA, TAEN	**0.36** BAET, CAPN, CHLO, HEPT, NEMO, PERLI, RHYA, TAEN			
NJSLO03	**0.36** CAPN, CHLO, EPHE, HEPT, NEMO, PERLI, RHYA, TAEN							
NJWIL01					**0.71** HYDR, PERLI, PERLO, RHYA	**0.96** BAET	**1.05**	
NJWIN01		**1.06**				**0.98** CAPN		
NJBON01			**0.85** CAPN, PERLO					**1.14**

Community Composition Metrics

Benthic macroinvertebrate community metrics for measures of percent composition, abundance, and diversity are presented in Table 5. The percent composition of the community as % Chironomidae, % Ephemeroptera, % Plecoptera, % Trichoptera, and % Other are summarized in Figure 2 (NJGOS01), Figure 3 (NJSLO01), Figure 4 (NJSLO02), and Figure 5 (NJWIL01) for sites with three or more years of benthic macroinvertebrate data.

The percent composition of the macroinvertebrate community was similar in 2010 and 2011 at site NJGOS01. However in 2012, the % Chironomidae was 42.25 which is more than double the percentages in 2010 (15.88) and 2011 (18.52). Additionally, the percentage of Ephemeroptera was lower at NJGOS01 in 2012 than in 2010 or 2011.

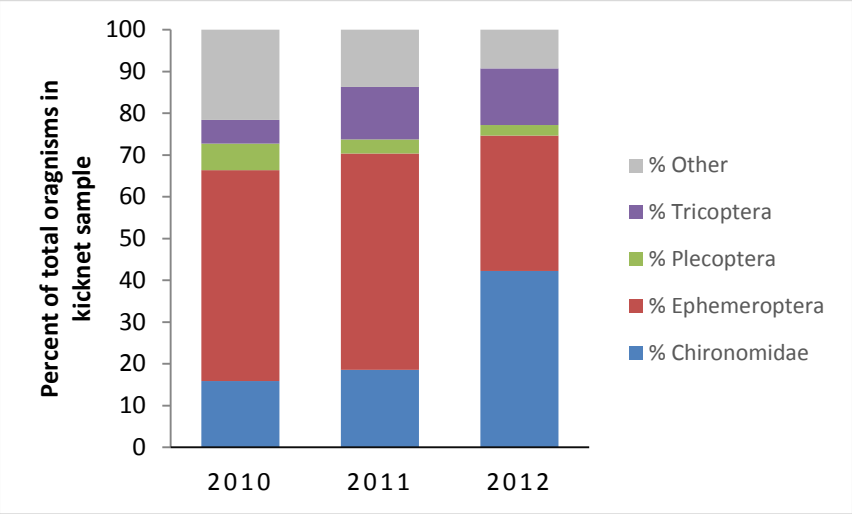


Figure 2. NJGOS01 Sampled Organisms

The percent composition of the benthic community at NJSLO01 varied over the period from 2005 to 2011. Chironomidae proportion went down, while Tricoptera peaked in 2008 but still had a fairly strong presence in 2009 and 2011. Plecoptera families represented the lowest proportion in all years.

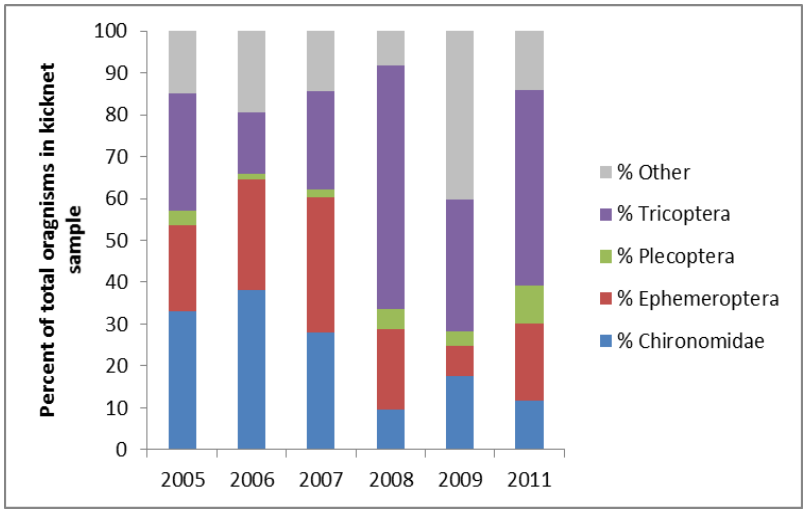


Figure 3. NJSLO01 Sampled Organisms

The benthic community generally shifted from one dominated by Ephemeroptera families in 2006 to one dominated by Trichoptera families and other organisms (mainly Elmidae) by 2009 at site NJSLO02. The exception to this trend was the Chironomidae dominated community in 2005. Additionally, the total abundance of organisms in the kicknet sample at NJSLO02 in 2009 was 1863 organisms, which is approximately three times the number of organisms sampled in any other sampling year.

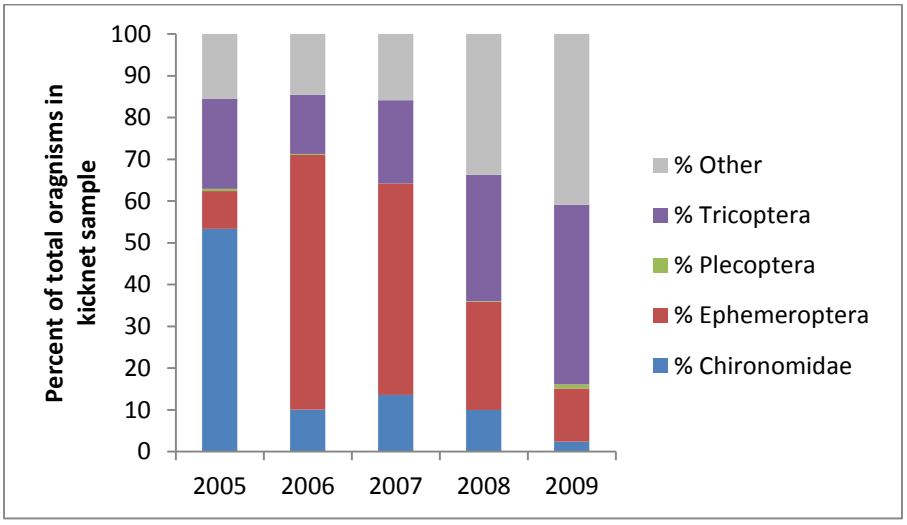


Figure 4. NJSLO02 Sampled Organisms

Ephemeroptera families had the highest proportion of total organisms at NJWIL01 in 2009. Ephemeroptera families decreased in 2010 and 2011, while Plecoptera and Tricoptera families increased. There was also a slight increase in Chironomidae for 2010, and again for 2011.

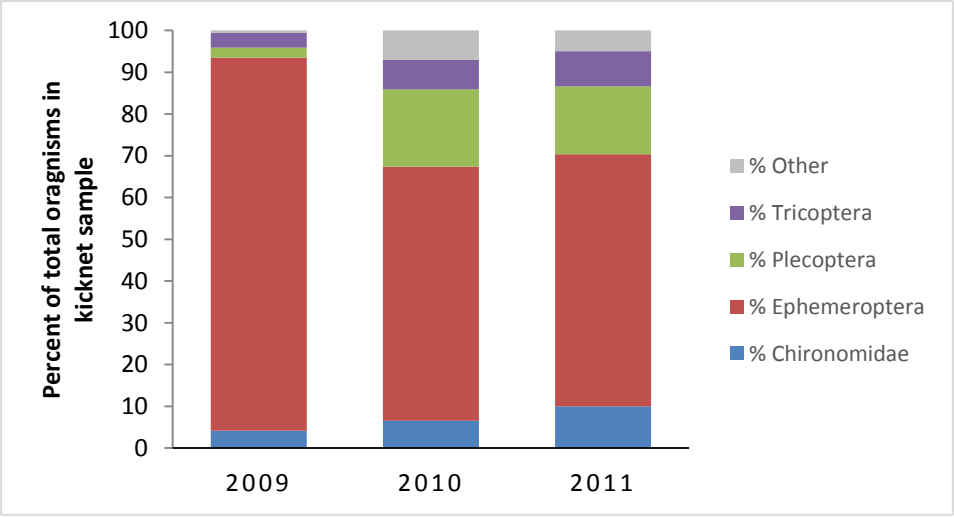


Figure 5. NJWIL01 Sampled Organisms

Table 5. Benthic invertebrate community composition metrics measured in 3 min kicknet samples taken at CABIN sites between 2005 and 2012.

Metric	NJCAR01		NJGOS01			NJKOC01	NJMIL01		NJNIX01	NJWIL01			NJWIN01		NJSLO01						NJSLO02					NJSLO03	NJBON01	
	2006	2008	2010	2011	2012	2008	2008	2012	2010	2009	2010	2011	2006	2010	2005	2006	2007	2008	2009	2011	2005	2006	2007	2008	2009	2005	2007	2012
% Chironomidae	11.53	3.59	15.87	18.52	42.25	27.98	1.88	6.23	4.11	4.17	6.5	9.97	9.74	4.46	33.17	38.11	27.85	9.49	17.53	11.77	53.34	10.03	13.58	9.98	2.35	75.47	14.1	25.3
% Ephemeroptera	11.32	10.05	50.48	51.85	32.39	67.87	78.49	41.83	15.68	89.29	60.8	60.37	75.69	22.52	20.49	26.46	32.49	19.23	7.22	18.24	9.08	61.05	50.68	25.90	12.75	5.03	31.5	22.1
% Ephemeroptera that are Baetidae	20.37	35.71	14.47	67.86	68.70	72.24	71.58	51.16	11.48	75.33	0	47.39	82.81	26.37	81.75	88.07	57.15	62.67	50	75.81	38.60	1.49	0	0	0	93.75	53.2	35.2
% of 2 Dominant Taxa	63.73	66.27	49.84	53.70	64.51	77.01	74.19	49.61	53.99	79.76	59.3	49.87	72.42	28.71	50.41	61.41	46.42	50.26	53.61	35.30	73.89	71.53	66.97	52.42	77.18	83.33	38.6	35
% of Dominant Taxa	38.36	58.85	33.97	35.19	42.25	49.03	56.18	28.21	38.30	67.26	39.7	28.61	62.68	14.85	33.17	38.11	27.85	30	35.05	21.47	53.34	60.14	50.23	26.52	40.27	75.47	21.8	25.3
% Plecoptera	69.81	73.92	6.35	3.33	2.54	0.83	9.41	38.72	0.77	2.38	18.6	16.27	11.15	30.45	3.41	1.21	1.69	4.87	3.61	9.11	0.48	0.23	0	0.16	1.01	2.52	4.7	16.1
% Tricoptera	4.19	11	5.71	12.59	13.52	2.22	5.11	7.59	13.37	3.57	7	8.40	1.93	23.27	27.97	14.81	23.63	58.21	31.44	46.77	21.66	14.12	19.91	30.27	42.95	6.92	35.2	14.6
Ephemeroptera Taxa	3	4	4	4	3	4	5	3	3	4	3	4	5	3	3	3	4	4	2	3	2	2	2	1	1	2	4	3
No. EPT Taxa	14	15	13	11	10	10	16	14	10	11	14	16	16	13	12	9	13	15	11	13	6	9	6	7	5	7	14	14
#EPT/# Chironomids + # EPT	0.88	0.96	0.80	0.79	0.53	0.72	0.98	0.93	0.88	0.96	0.9	0.90	0.90	0.94	0.61	0.53	0.67	0.90	0.71	0.86	0.37	0.88	0.84	0.85	0.96	0.16	0.8	0.7
Plecoptera Taxa	5	6	3	3	2	2	4	6	2	4	6	7	6	5	3	2	3	5	4	5	1	1	0	1	1	1	4	6
Shannon-Wiener Diversity	1.90	1.68	2.32	2.14	1.89	1.34	1.60	2.12	2.13	1.23	2	2.27	1.45	2.71	2.06	1.95	2.30	2.13	1.89	2.26	1.32	1.45	1.48	1.80	1.39	1.02	2.4	2.6
Simpson's Diversity	0.77	0.64	0.84	0.82	0.75	0.66	0.64	0.83	0.80	0.52	0.8	0.84	0.58	0.91	0.82	0.78	0.85	0.83	0.79	0.87	0.65	0.61	0.68	0.79	0.68	0.42	0.9	0.9
Total Abundance	477	418	2423.1	2700	5916.6	361	372	514	1389.2	168	473.7	381	1345	404	615	412	640.5	390	388	829.2	628	439	631.4	641	1862.5	318	662.1	411
Total No. of Taxa	21	19	25	17	18	15	23	22	22	13	18	22	22	25	17	18	21	20	15	18	9	18	12	16	9	12	26	26
Trichoptera Taxa	6	5	6	4	5	4	7	5	5	3	5	5	5	5	6	4	6	6	5	5	3	6	4	5	3	4	6	5

4.2 Water quality results

Water quality QA/QC

All laboratory quality control results were reviewed and confirmed to meet standard criteria (Maxxam 2012) prior to proceeding with processing of field samples (T. Rudkin Pers. Comm.).

Field duplicates and field blanks of water samples were submitted to the laboratory for site NJSLO01 at an annual frequency (Appendix B-1). RPD values from field duplicate comparison indicated only one exceedance of the 30% Alert Criteria. This occurred with turbidity in 2010. Agitation/settling associated with travel could influence laboratory turbidity results. Field blank data revealed the following exceedances to the Alert Criteria (2x detection limit) over the 4 sampling periods: three bicarbonate values, two total alkalinity, one nitrate value, one nitrate plus nitrite value, one conductivity value, and two turbidity values. Two thirds of these alerts occurred on one date, June 27, 2012. These results indicated potential contamination/influence in the blank samples. A review of the regular data for these parameters/days indicated that field values were not elevated relative to other days sampled. All subsequent water quality analyses included only the first of the duplicate samples, typed as “Regular”. All values that had been flagged as being analysed past recommended hold times were considered to be acceptable since they were within the normal range for the parameter in the sampling area.

Guideline review

Non-metal water quality data

Non-metal water quality data were collected at various frequencies between 2007 and 2013 at nine sites: NJBON01, NJGOS01, NJKOC01, NJMIL01, NJSLO01, NJSLO02, NJSLO03, NJWIL01 and NJWIN01 (Appendix B-2). Overall, results indicate few guideline exceedances (Table 6).

In Jan 2009, NJSLO01 exhibited a higher than normal total phosphorus value (30 µg/L) that exceeded both the drinking water guideline of 10 µg/L (Health Canada 2012) and the guideline for the protection of aquatic life, which was estimated to be 4 to 10 µg/L using background levels (CCME 1999a). However, all other values were below the phosphorus guidelines.

Low pH levels were found at NJSLO01 for the latter half of 2011, much of 2012, and 2013. Initial sampling between April 2010 and July 2011 found pH values to average 7.32 pH units (n=16). The average dropped to 6.34 pH units (n=19) from August 2011 to February 2013. The low range of the BC Approved and CCME Guidelines is 6.5 for the protection of aquatic health. One pH measurement at NJWIL01 was also low (6.2). The guidelines recognize that pH levels can naturally be lower than 6.5, but significant anthropogenic or human caused decreases below 6.5 are not permitted (McKean and Nagpal 1991).

Table 6. Summary of guideline exceedances for water and sediment quality data for the protection of aquatic life (aq. life) and drinking water (drinking).

Parameter Type / Site	Years Assessed*	Exceedance (intent, source**):date
Water, non metals		
NJBON01	2012	none
NJGOS01	2012	none
NJKOC01	2008	none
NJWIN01	2010 (2x)	none
NJMIL01	2008	none
NJSLO01	2008 (3x) 2009 (9x) 2010 (8x) 2011 (13x) 2012 (12x) 2013 (4x)	**pH** (aq. life, BC App. and CCME) Aug, Sept, Oct, Nov 2011; Jan, Feb, Apr, May, July, Aug, Oct, Nov 2012; Jan, Feb 2013. **Total phosphorus** (drinking HC, aq. life CCME) Jan 2009
NJSLO02	2007, 2008	none
NJSLO03	2007	none
NJWIL01	2010 (2x)	**pH** (aq. life, BC App.) Oct 2010
Water, metals		
NJSLO01	2008	**Total Cadmium** (aq. life CCME) Sept 2008 **Total Zinc** (aq. life, BC Appr.) Sept 2008
NJSLO03	2007	**Total Cadmium** (aq. life, CCME) Sept 2007 **Total Zinc** (aq. life, BC Appr) Sept 2007
Sediment, metals		
NJSLO01	2010-2012	**Total Cadmium** (aq. life, ISQG, CCME) Sep 2010 **Total Zinc** (aq. life ISQG CCME) Sep 2010
NJBON01	2012	**Total Cadmium** (aq. life, ISQG, CCME) Oct 2012 **Total Iron** (aq. life, BC Work) Oct 2012 **Total Manganese** (aq. life, BC Work) Oct 2012 **Total Nickel** (aq. life, BC Work) Oct 2012 **Total Zinc** (aq. life, ISQG, CCME) Oct 2012

Legend:

*Data collected 1 time per year unless otherwise indicated and data typically collected only 1 time per month.

**Source:

BC Appr. = BC Approved Water Quality Guidelines (Government of BC 2013)
BC Work = BC Working Water Quality Guidelines (Nagpal et al. 2006)
CCME = Canadian Water Quality Guidelines (CCME 1999a)
CCME (ISQG or PEL) = Canadian Sediment Quality Guidelines (CCME 1999b)HC = Drinking Water Quality Guidelines (Health Canada 2012)

Metal water quality data

Metal water quality data were collected once in 2008 at NJSLO01 and once in 2007 at NJSLO03 (Appendix B-3). Cadmium and zinc were the only parameters to exceed guidelines for the protection of aquatic life. No drinking water guidelines were exceeded following the metals review.

The cadmium guideline was determined to be 0.02 µg/L by factoring in water hardness. Measured cadmium values were 0.05 and 0.04 µg/L for NJSLO01 and NJSLO03 respectively. The zinc guideline of 7.5 µg/L was exceeded at NJSLO01 with a measured value of 8 µg/L and NJSLO03 with a measured value of 9 µg/L.

Sediment quality data

Sediment quality data were collected at two sites from 2010 to 2012, NJSLO01 and NJBON01 (Appendix B-4).

In 2010 NJSLO01 exceeded cadmium and zinc guidelines for the protection of aquatic life. In 2012, NJBON01 exceeded cadmium, iron, manganese, nickel and zinc guidelines. All of the exceedances related to the lower effect type guidelines (Table 7). The lower effect guidelines refer to CCME Interim Sediment Quality Guidelines (ISQG) or the low effect BC Working Water quality guidelines. The ISQG is the concentration below which adverse biological effects are expected to rarely occur (i.e., fewer than 25% adverse effects occur below this level) (CCME 2001). Similarly, the lowest effect level has no effect on the majority of the sediment-dwelling organisms, and the sediment is considered clean to marginally polluted (Persuad et al. 1993). Each of these parameters have higher effect guidelines that were not exceeded.

Table 7. Summary sediment quality guidelines exceedances (all values are in µg/L).

Parameter	Low impact guideline (µg/L)	High impact guideline	NJSLO01	NJBON01
Cadmium	0.6	3.5	0.94 in 2010	0.89 in 2012
Iron	21,200	43,776	no exceedance	23,900 in 2012
Manganese	460	1,100	no exceedance	510 in 2012
Nickel	16	75	no exceedance	21.3 in 2012
Zinc	123	315	137 in 2010	139 in 2012

4.3 Stream temperature results

Stream temperature was only collected during portions of the year. The months measured are shown in the tables below.

The average stream temperature for the period of measurement decreased over the years sampled for NJSLO01 and generally decreased for NJSLO03, yet the maximum temperature did not follow a similar pattern (Table 8 and Table 10). In fact, the coldest average temperature for NJSLO01 was also the year with the warmest maximum temperature. No clear increase or decrease in stream temperature was observed in NJSLO02 (Table 9). NJWIN01 (Table 11 and Table 12) was shown to be a much colder stream than the three points monitored on the Slocan River (NJSLO01, NJSLO02, and NJSLO03).

Table 8. Descriptive stream temperature statistics for NJSLO01 from 2006-2012.

	Stream temperature °C						
Statistic	5/12-10/9 2006	7/15-10/29 2007	6/21-10/16 2008	4/1-9/28 2009	4/22-11/9 2010	4/17-10/16 2011	4/10-8/12 2012
Average	15	15.35	15.53	13.19	12.32	12.40	11.35
Maximum	23.63	22.25	22.94	23.33	22.06	20.91	23.79
Standard Deviation	4.36	4.34	2.99	5.02	3.96	4.03	4.18

Table 9. Descriptive stream temperature statistics for NJSLO02 from 2005-2009

	Stream temperature °C				
Statistic	4/30-10/13 2005	5/4-10/5 2006	7/14-10/8 2007	6/4-10/20 2008	4/29-7/27 2009
Average	14.92	15.28	17.16	15.17	11.35
Maximum	22.03	23.28	22.13	22.85	20.60
Standard Deviation	3.64	4.50	2.31	2.92	2.98

Table 10. Descriptive stream temperature statistics for NJSLO03 from 2005-2012

		Stream temperature °C						
Statistic	7/6-10/13 2005	5/11-10/5 2006	7/14-10/8 2007	5/17-10/20 2008	4/29-9/29 2009	2010	4/17-12/1 2011	4/10-10/2 2012
Average	17.02	15.32	16.97	14.31	14.42	none	11.33	12.31
Maximum	21.37	23.47	21.84	22.27	21.91	none	21.01	20.84
Standard Deviation	2.66	4.15	2.75	3.51	4.41	none	4.59	4.51

Table 11. Descriptive stream temperature statistics for NJWIN01 from 2005-2007

	Stream temperature °C		
Statistic	7/6-10/13 2005	5/11-10/5 2006	6/3-10/29 2007
Average	9.62	9.43	9.66
Maximum	12.51	14.43	13.58
Standard Deviation	1.51	2.32	2.51

Table 12. Descriptive stream temperature statistics by year for all sites

2005	Stream temperature °C			
Statistic	**NJSLO01**	**NJSLO02**	**NJSLO03**	**NJWIN01**
Average	none	14.92	17.02	9.62
Maximum	none	22.03	21.37	12.51
Standard Deviation	none	3.62	2.24	1.52
2006	**Stream temperature °C**			
Statistic	**NJSLO01**	**NJSLO02**	**NJSLO03**	**NJWIN01**
Average	15	15.28	15.32	9.43
Maximum	23.63	23.28	23.47	14.43
Standard Deviation	4.36	4.5	4.16	2.36
2007	**Stream temperature °C**			
Statistic	**NJSLO01**	**NJSLO02**	**NJSLO03**	**NJWIN01**
Average	15.35	17.16	16.97	9.66
Maximum	22.25	22.13	21.84	13.58
Standard Deviation	4.34	2.31	2.75	2.51
2008	**Stream temperature °C**			
Statistic	**NJSLO01**	**NJSLO02**	**NJSLO03**	**NJWIN01**
Average	15.53	15.17	14.31	none
Maximum	22.94	22.85	22.27	none
Standard Deviation	2.99	2.92	3.51	none
2009	**Stream temperature °C**			
Statistic	**NJSLO01**	**NJSLO02**	**NJSLO03**	**NJWIN01**
Average	13.19	11.35	14.42	none
Maximum	23.33	21.60	21.91	none
Standard Deviation	5.02	4.07	4.41	none
2010	**Stream temperature °C**			
Statistic	**NJSLO01**	**NJSLO02**	**NJSLO03**	**NJWIN01**
Average	12.32	none	none	none
Maximum	22.06	none	none	none
Standard Deviation	3.96	none	none	none
2011	**Stream temperature °C**			
Statistic	**NJSLO01**	**NJSLO02**	**NJSLO03**	**NJWIN01**
Average	12.40	none	11.33	none
Maximum	20.91	none	21.01	none
Standard Deviation	4.03	none	4.59	none
2012	**Stream temperature °C**			
Statistic	**NJSLO01**	**NJSLO02**	**NJSLO03**	**NJWIN01**
Average	11.35	none	12.31	none
Maximum	23.79	none	20.84	none
Standard Deviation	4.18	none	4.51	none

5 Discussion

CABIN assessments found that sites in the Slocan River and area were generally similar to or only mildly divergent from reference condition. Exceptions included NJSLO01 in 2005, 2007 and 2009 and NJSLO02 in 2009.

NJSLO01 was stressed in some years (2005, 2007, 2009) and potentially stressed in others (2006, 2008, 2011). These ratings were evident through only slight differences in community metrics, such as more pollution tolerant species (% chironomidae) and fewer species sensitive to habitat disturbance (% EPT) that were factored in the CABIN model. Because of this, there was not a high level of concern with the stressed results for this site. Additionally, there were no clear water or sediment quality issues identified for the years that were indicated as stressed. While there were some issues noted with water quality for other years, such as slightly elevated cadmium and zinc levels in 2008 and decreased pH since August 2011, these parameters did not appear to impact the benthic invertebrate community, as the site was only potentially stressed during these years. Cadmium and zinc water quality exceedances which were measured in 2008 did not result in the site being stressed; however, metal data was not available from other years to similarly confirm a null effect. As well, CABIN was not done at this site in 2010 or 2012 so there was no way to identify if the cadmium and zinc sediment quality guideline exceedances (low effect exceedances) during these years had a possible effect on benthic invertebrate assemblages. However, at site NJBON01, located in the upper watershed, similar low effect metal sediment quality guideline exceedances in 2012 did not result in benthic invertebrate community divergence from reference. Water and sediment quality monitoring that coincides with CABIN data collection at the NJSLO01 site may help confirm the cause for the stressed ratings, if they are found to persist.

NJSLO02 went from being potentially stressed from 2005 – 2008 to being severely stressed in 2009. This site generally had the lowest RIVPACS ratios of all sites sampled, indicating that families of invertebrates were absent that would otherwise be expected (in reference conditions). While the community composition in 2009 was not too different from other years, there was a three-fold increase in the abundance of organisms collected in the kick-net sample in 2009. The reason for the change is unknown. Nutrient enrichment is an anthropogenic influence that can cause an increase in aquatic invertebrate abundance. Water quality data, however, was not available to verify this. 2009 was a year in which the maximum stream temperature at this location was about 2 °C cooler than it had been previously recorded and the average yearly temperature was much cooler. Further investigation is warranted.

It is uncertain if the water and sediment quality exceedances found in the Slocan River watershed were indicative of naturally high levels in the watershed or anthropogenic sources. A longer term data set may help confirm this and sites with noted benthic invertebrate concerns should continue to be monitored.

6 Conclusions and Recommendations

The Slocan River is a 5th order river which has a greater wetted width than at 90% of the sites sampled in the Okanagan-Columbia Reference Model and deeper average depth than at 75% of reference model sites. Therefore, habitat attributes at reference model sites may not sufficiently represent those at test sites in the Slocan River (i.e. NJSLO01, NJSLO02, NJSLO03). Because of this, comparing benthic invertebrate community site metrics between the years as well as contrasting results amongst test sites along the Slocan River was important to providing an overall assessment of benthic community health. If additional sampling sites are being considered in the watershed, sites in lower order tributaries of the Slocan River may have habitat attributes that are more comparable to the wadeable streams sampled in the reference model and therefore could provide alternate assessments of benthic community health.

Because some sites have only one or two years of data at this point it is difficult to identify trends in benthic community health for these sites. For the two sites on the Slocan River (NJSLO01 and NJSLO02) that were considered more divergent from reference condition in 2005, 2007, and/or 2009, continued investigation of the composition of the benthic community may help to identify trends in benthic community health. An analyses of sediment for metals at NJSLO02 is also recommended. If it is determined that compounds such as Pentachlorophenol were historically used to treat wood, the sediment may also be checked for polycyclic organic compounds.

Water quality guidelines are general indicators of sediment and water quality conditions and may identify potential concerns. Water hardness would be one such additional water quality parameter to collect since it can have a major influence on toxicity of some metals (e.g., cadmium and zinc) to freshwater organisms, and is used to determine the guidelines for the protection of aquatic life (CCME 1999c, BC MoE 1999). Coinciding CABIN and water and sediment quality data collection would help with interpreting results. A review of historical archives, if available, would also be beneficial to identify reference conditions/trends in the watershed.

Stream temperature analysis suggests there are a range of thermal conditions and monitoring at NJWIN01 should be continued as temperature values at this site are much different than other sites. Given interest and in collaboration with the WInlaw Watershed Committee, year-round monitoring should also be conducted to facilitate more detailed analysis of stream temperature data.

Having long term datasets to work with in small systems is a great way to detect change and provide useful information for what background conditions should look like.

7 References

Barnett, T., D.W. Price., H.G. Hidalgo., C. Bonfils., B.D. Santer., T. Das., G. Bala., A.W. Wood., T. Nozawa., A.A. Mirin., D.R. Cayan., and M.D. Dettinger. (2008) Human-induced changes in the hydrology of the western United States, Science 319: 1080-1803.

BC Ministry of Environment (BC MoE). 1999. Ambient water quality guidelines for zinc. Overview report. Government of British Columbia. Accessed at: http://www.env.gov.bc.ca/wat/wq/BCguidelines/zinc/zinc.html

BC MoE. 2003. Water quality field sampling manual. Government of British Columbia.

Burger, G., J. Schulla., and T. Werner. 2011. Estimates of future flow, including extremes, of the Columbia River headwaters. Water Resources Research, 47: W10520, doi:10.1029/2010WR009716.

CCME (Canadian Council of Ministers of the Environment). 2001. Canadian sediment quality guidelines for the protection of aquatic life: Introduction. Updated. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg.

CCME. 1999a. Canadian Water Quality Guidelines for the Protection of Aquatic Life: Introduction. Updated 2001. Cited in Canadian Environmental Quality Guidelines,1999 (plus updates), Canadian Council of Ministers of the Environment, Winnipeg. Accessed at: http://cegg-rcge.ccme.ca/

CCME. 1999b. Canadian Sediment Quality Guidelines for the Protection of Aquatic Life: In Canadian Environmental Quality Guidelines. 1999 (plus updates). Canadian Council of Ministers of the Environment. Winnipeg. Accessed at: http://cegg-rcge.ccme.ca/

CCME. 1999c. Canadian Water Quality Guidelines for the Protection of Aquatic Life – Cadmium factsheet. Accessed at: http://st-ts.ccme.ca/?chems=20,229&chapters=1

CBWQMP (Columbia Basin Water Quality Monitoring Program). 2012. Operating Procedures

EcoAnalysts Inc. 2012. Standard metric output guidance document. Moscow, Idaho.

Environment Canada. 2012a. Canadian Aquatic Biomonitoring Network: Wadeable Streams Field Manual. Accessed at: http://ec.gc.ca/Publications/default.asp?lang=En&xml=C183563B-CF3E-42E3-9A9E-F7CC856219E1

Environment Canada. 2012b. Canadian Aquatic Biomonitoring Network Laboratory Methods: Processing, Taxonomy and Quality Control of benthic Macroinvertebrate Samples. Accessed at: http://www.ec.gc.ca/Publications/default.asp?lang=En&xml=CDC2A655-A527-41F0-9E61-824BD4288B98

Government of British Columbia. 2013. British Columbia Approved Water Quality Guidelines. Accessed at: http://www.env.gov.bc.ca/wat/wq/wq_guidelines.html

GranDuke Geomatics. 2013a. Microsoft Excel add-in to transpose Maxxam water quality data into CBWN Excel format. Version 1.2 (Beta Release).

Granduke Geomatics 2013b. AGATHA- Automated guideline assessment tool for high speed analysis. Version 0.9.0 (Beta Release).

Health Canada. 2012. Guideline for Canadian Drinking Water Quality. Accessed at: http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/2012-sum_guide-res_recom/index-eng.php.

Jost, G., R.D. Moore., D. Gluns., and R.S. Smith. 2012. Quantifying the contribution of glacier runoff to streamflow in the upper Columbia River basin, Canada. Hydrology and Earth Systems Science 16: 849-860, doi:10.5194/hess-16-1-2012.

Maxxam Analytics. 2012. Environmental QA/QC Interpretation Guide (COR FCD-00097/5).

McKean, C. J. and N. K. Nagpal. 1991. Ambient water quality criteria for pH - Technical Appendix. Ministry of Environment, Province of British Columbia. Accessed at: http://www.env.gov.bc.ca/wat/wq/BCguidelines/phtech.pdf.

Nagpal, N. K., L. W. Pommen and L. G. Swain. 2006. A Compendium of Working Water Quality Guidelines for British Columbia. Environmental Protection Division, Ministry of Environment, Government of BC.

Nagpal, N. K. 2001. Ambient Water Quality Guidelines for Selenium. Water Protection Branch, Ministry of Water, Land and Air Protection, Victoria, BC.

Persaud, D., R. Jaagumagi, and A. Hayton. 1993. Guidelines for the protection and management of aquatic sediment quality in Ontario. Report No. ISBN 0772992487. Ontario Ministry of Environment, Water Resources Branch.

Rosenberg, D.M. and Resh, V.H. 1993. Freshwater Biomonitoring and Benthic Macroinvertebrates. Chapman and Hall, New York. pp.199

Rosenberg, D.M., T.B. Reynoldson and V.H. Resh. 1999. Establishing reference conditions for benthic invertebrate monitoring in the Fraser River Catchment British Columbia, Canada. Fraser River Action Plan, Environment Canada, Vancouver BC Accessed at: http://www.rem. sfu.ca/FRAP/9832.pdf

Rosenberg and Resh. 1984. The Ecology of Aquatic Insects. Praeger, N.Y. 1984

Personal Communications

Horvath, Steve. Senior lab officer. Water and air monitoring & reporting section, BC Ministry of Environment, Surrey.

Appendix A. CABIN data

Site Assessment Report

A. Site Description

CABIN Study Name	CBWN-Slocan River
CABIN Site Code	NJBON01
Sampling Date	Oct 03 2007
Know Your Watershed (KYW) Basin	Slocan
Province / Territory	British Columbia
Terrestrial Ecological Classification	Montane Cordillera Ecozone Columbia Mountains and Highlands Ecoregion
Coordinates (decimal degrees)	50.10000 N, 117.48333 W
Altitude	
Feature Name	Slocan River
Stream Order	5

B. CABIN Assessment Results

REFERENCE MODEL SUMMARY	
Model Name	Columbia-Okanagan Preliminary March 2010
Analysis Date	August 26, 2013
Taxanomic Level	Family
Predictor Variables	Depth-Avg Latitude Longitude Reg-Ice SlopeLT30%

Reference Groups	**1**	**2**	**3**	**4**	**5**
Number of Reference Sites	9	43	17	12	33
Group Error Rate	22.2%	24.5%	22.2%	25.0%	32.4%
Overall Model Error Rate	26.4%				
Probability of Group Membership	27.3%	4.7%	11.9%	45.5%	10.8%
CABIN Assessment of NJBON01 on Oct 03, 2007	Similar to Reference				

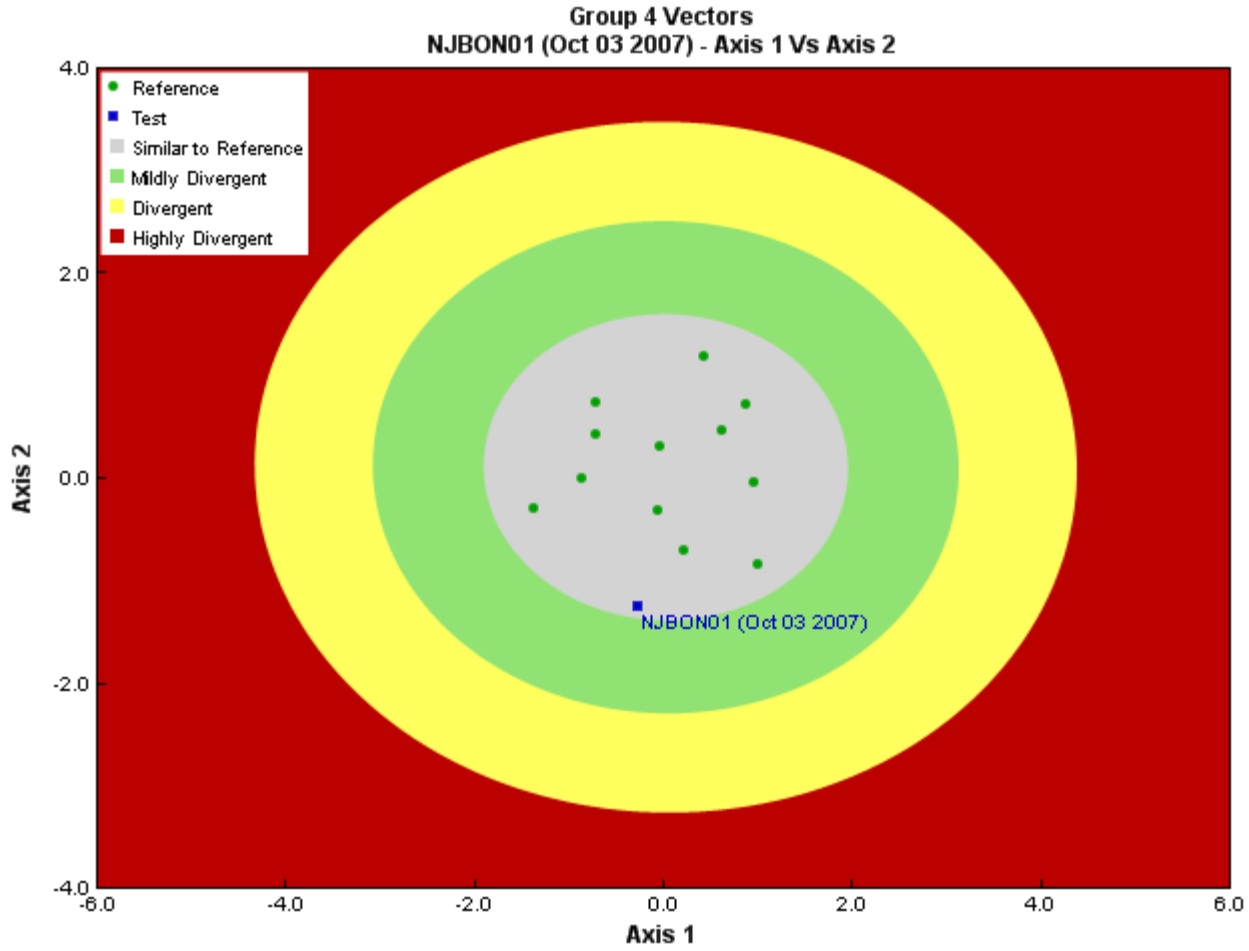


Figure 3. CABIN ordination assessment of the test site with the predicted group of reference sites. Each axis represents the relative abundance of the entire benthic invertebrate community with different organisms weighted differently on each axis.

Sample Information

Sampling Device	Kick Net
Mesh Size	400
Sampling Time	3
Taxonomist	Gary Lester, Ecoanalysts Inc.
Identification Date	March 01, 2008
Subsampling Device	Marchant Box
Proportion Subsampled	45/100

Site Metrics

Metric Name	NJBON01	Predicted Group Reference Mean ±SD
Bray-Curtis Distance	0.56	0.4 ± 0.1
Number Of Individuals		
% Chironomidae	14.1	7.4 ± 6.4
% Ephemeroptera	31.5	51.7 ± 18.7
% Ephemeroptera that are Baetidae	53.2	40.6 ± 30.0
% EPT Individuals	71.5	87.7 ± 7.3
% of 2 dominant taxa	38.6	57.9 ± 14.2
% of dominant taxa	21.8	39.8 ± 14.9
% Plecoptera	4.7	31.4 ± 15.4
% Tricoptera	35.2	4.5 ± 2.8
No. EPT individuals/Chironomids+EPT Individuals	0.8	0.9 ± 0.1
Total Abundance	662.1	587.2 ± 299.2
Richness		
Ephemeroptera taxa	4.0	3.8 ± 0.8

Site Metrics

Metric Name	NJBON01	Predicted Group Reference Mean ±SD
EPT taxa (no)	14.0	13.3 ± 2.7
Plecoptera taxa	4.0	6.3 ± 1.1
Shannon-Wiener Diversity	2.4	1.9 ± 0.4
Simpson's Diversity	0.9	0.8 ± 0.1
Total No. of Taxa	26.0	19.1 ± 3.6
Trichoptera taxa	6.0	3.2 ± 1.4

Frequency and Probability of Taxa Occurence

Reference Model Taxa	Frequency of Occurence in Reference Sites					Probability Of Occurrence at NJBON01
	Group 1	Group 2	Group 3	Group 4	Group 5	
Ameletidae	56%	53%	22%	50%	68%	0.50
Apataniidae	22%	24%	28%	25%	3%	0.22
Athericidae	0%	2%	0%	17%	0%	0.08
Aturidae	0%	8%	0%	0%	0%	0.00
Baetidae	100%	100%	100%	100%	97%	1.00
Blephariceridae	0%	0%	0%	0%	5%	0.01
Brachycentridae	11%	69%	0%	42%	3%	0.25
Capniidae	78%	55%	50%	92%	68%	0.79
Ceratopogonidae	0%	55%	28%	42%	5%	0.25
Chironomidae	100%	100%	100%	100%	95%	0.99
Chloroperlidae	78%	88%	94%	100%	100%	0.93
Corixidae	11%	0%	0%	0%	0%	0.03
Curculionidae	0%	4%	0%	0%	0%	0.00
Deuterophlebiidae	0%	0%	0%	0%	3%	0.00
Dixidae	0%	10%	0%	0%	0%	0.00
Dytiscidae	0%	8%	6%	0%	0%	0.01
Elmidae	0%	86%	50%	50%	5%	0.33
Empididae	67%	55%	50%	67%	57%	0.63
Enchytraeidae	11%	14%	0%	8%	0%	0.07
Ephemerellidae	78%	100%	100%	100%	100%	0.94
Ephydridae	0%	2%	0%	0%	0%	0.00
Glossosomatidae	11%	49%	39%	42%	35%	0.33
Heptageniidae	100%	100%	100%	100%	100%	1.00
Hydraenidae	0%	4%	0%	0%	0%	0.00
Hydrophilidae	11%	2%	0%	0%	0%	0.03
Hydropsychidae	11%	92%	78%	92%	86%	0.68
Hydroptilidae	11%	8%	0%	0%	0%	0.03
Hydrozetidae	0%	10%	17%	8%	16%	0.08
Hydryphantidae	11%	31%	11%	8%	8%	0.10
Hygrobatidae	0%	29%	0%	0%	11%	0.02
Lebertiidae	78%	65%	39%	58%	5%	0.56
Lepidostomatidae	0%	53%	6%	17%	8%	0.12
Leptohyphidae	0%	2%	0%	0%	0%	0.00
Leptophlebiidae	0%	90%	11%	33%	3%	0.21
Leuctridae	22%	43%	56%	67%	54%	0.51
Limnephilidae	22%	31%	6%	25%	41%	0.24
Limnesiidae	0%	2%	0%	0%	0%	0.00
Lumbriculidae	0%	20%	17%	25%	3%	0.15
Mideopsidae	0%	2%	0%	0%	0%	0.00
Naididae	0%	6%	39%	0%	3%	0.05
Nemouridae	100%	100%	100%	100%	100%	1.00
Pelecorhynchidae	0%	22%	6%	0%	0%	0.02
Peltoperlidae	22%	12%	6%	8%	41%	0.15
Perlidae	11%	84%	33%	100%	3%	0.57
Perlodidae	78%	78%	89%	92%	81%	0.86
Philopotamidae	0%	31%	0%	0%	3%	0.02
Pisidiidae	0%	6%	0%	8%	0%	0.04
Planorbidae	0%	0%	0%	0%	3%	0.00
Psychodidae	22%	65%	94%	8%	11%	0.25
Pteronarcyidae	0%	12%	6%	0%	3%	0.02
Rhyacophilidae	100%	92%	100%	100%	95%	0.99

Frequency and Probability of Taxa Occurence

Reference Model Taxa	Frequency of Occurence in Reference Sites					Probability Of Occurrence at NJBON01
	Group 1	Group 2	Group 3	Group 4	Group 5	
Simuliidae	33%	49%	39%	33%	16%	0.33
Sperchontidae	78%	63%	50%	42%	65%	0.56
Stygothrombidiidae	0%	4%	0%	17%	0%	0.08
Taeniopterygidae	89%	49%	100%	92%	97%	0.91
Thaumaleidae	11%	4%	0%	0%	0%	0.03
Tipulidae	56%	55%	28%	67%	43%	0.56
Torrenticolidae	11%	86%	11%	17%	11%	0.17
Tubificidae	0%	4%	0%	0%	0%	0.00
Uenoidae	22%	37%	17%	25%	46%	0.26
Valvatidae	0%	2%	6%	0%	0%	0.01

RIVPACS : Expected taxa P>0.50	13.96
RIVPACS : Observed taxa P>0.50	15.00
RIVPACS : O:E (p > 0.5)	1.07
RIVPACS : Expected taxa P>0.70	9.40
RIVPACS : Observed taxa P>0.70	8.00
RIVPACS : O:E (p > 0.7)	0.85

D. Habitat Description

Variable	NJBON01	Predicted Group Reference Mean ±SD
Channel		
Depth-Avg (cm)	50.0	23.6 ± 11.1
Reach-%CanopyCoverage (PercentRange)	3.00	1.33 ± 0.78
Reach-%Logging (PercentRange)	1	0 ± 0
Reach-Pools (Binary)	0	1 ± 0
Reach-Rapids (Binary)	0	0 ± 0
Reach-Riffles (Binary)	1	1 ± 0
Reach-StraightRun (Binary)	0	1 ± 1
Veg-Coniferous (Binary)	1	1 ± 0
Veg-Deciduous (Binary)	1	1 ± 0
Veg-GrassesFerns (Binary)	0	1 ± 0
Veg-Shrubs (Binary)	1	1 ± 0
Velocity-Avg (m/s)	1.13	0.48 ± 0.22
Velocity-Max (m/s)	1.20	0.76 ± 0.36
Width-Bankfull (m)	9.9	13.4 ± 9.9
Width-Wetted (m)	8.7	8.5 ± 5.8
XSEC-VelMethod (Category (1-3))	3	1 ± 0
Landcover		
Reg-Ice (%)	0.00	0.02 ± 0.06
Substrate Data		
Dominant-1st (Category(0-9))	7	7 ± 1
Dominant-2nd (Category(0-9))	8	7 ± 1
Embeddedness (Category(1-5))	4	5 ± 1
SurroundingMaterial (Category(0-9))	3	4 ± 1
Topography		
SlopeLT30% (%)	28.34	18.88 ± 9.30
Water Chemistry		
General-Alkalinity (mg/L)	61.6000000	71.7000000 ± 53.9231440
General-Hardness (mg/L)	153.9000000	84.2750000 ± 70.6251066
General-pH (pH)	7.6	7.9 ± 0.4
General-SolidsTSS (mg/L)	11.4000000	0.8849836 ± 1.2378575
General-SpCond (uS/cm)	144.0000000	168.9833333 ± 123.7858182
General-TempWater (Degrees Celsius)	7.5000000	7.3183333 ± 2.7240839
General-Turbidity (NTU)	1.4000000	0.2020000
Nitrogen-TN (mg/L)	0.1300000	0.0883333 ± 0.0521943
Phosphorus-TP (mg/L)	0.0170000	0.0045833 ± 0.0049992

Site Assessment Report

A. Site Description

CABIN Study Name	CBWN-Slocan River
CABIN Site Code	NJBON01
Sampling Date	Oct 03 2007
Know Your Watershed (KYW) Basin	Slocan
Province / Territory	British Columbia
Terrestrial Ecological Classification	Montane Cordillera Ecozone Columbia Mountains and Highlands Ecoregion
Coordinates (decimal degrees)	50.10000 N, 117.48333 W
Altitude	
Feature Name	Slocan River
Stream Order	5

B. CABIN Assessment Results

REFERENCE MODEL SUMMARY	
Model Name	Columbia-Okanagan Preliminary March 2010
Analysis Date	August 26, 2013
Taxanomic Level	Family
Predictor Variables	Depth-Avg Latitude Longitude Reg-Ice SlopeLT30%

Reference Groups	**1**	**2**	**3**	**4**	**5**
Number of Reference Sites	9	43	17	12	33
Group Error Rate	22.2%	24.5%	22.2%	25.0%	32.4%
Overall Model Error Rate	26.4%				
Probability of Group Membership	27.3%	4.7%	11.9%	45.5%	10.8%
CABIN Assessment of NJBON01 on Oct 03, 2007	Similar to Reference				

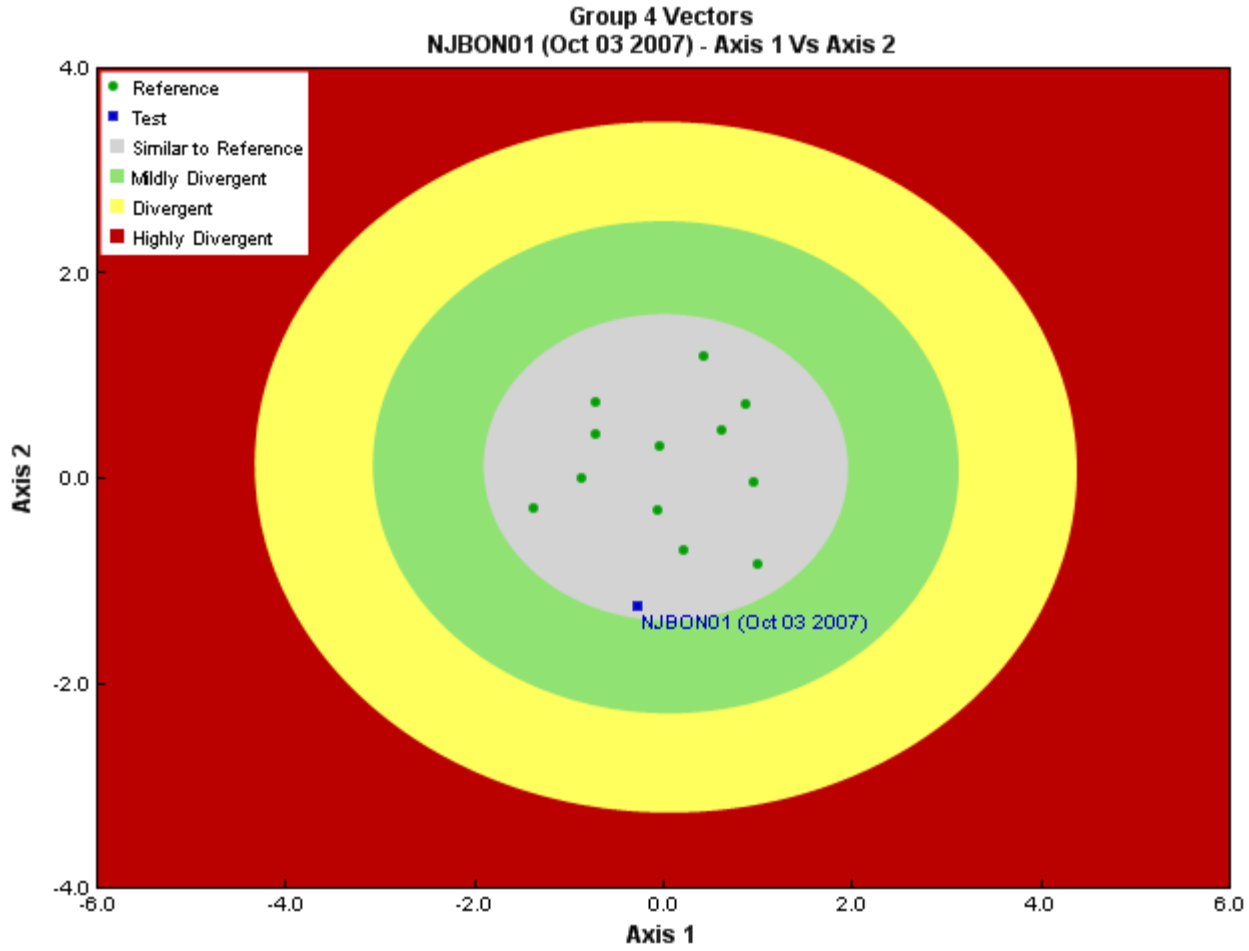


Figure 3. CABIN ordination assessment of the test site with the predicted group of reference sites. Each axis represents the relative abundance of the entire benthic invertebrate community with different organisms weighted differently on each axis.

Sample Information

Sampling Device	Kick Net
Mesh Size	400
Sampling Time	3
Taxonomist	Gary Lester, Ecoanalysts Inc.
Identification Date	March 01, 2008
Subsampling Device	Marchant Box
Proportion Subsampled	45/100

Site Metrics

Metric Name	NJBON01	Predicted Group Reference Mean ±SD
Bray-Curtis Distance	0.56	0.4 ± 0.1
Number Of Individuals		
% Chironomidae	14.1	7.4 ± 6.4
% Ephemeroptera	31.5	51.7 ± 18.7
% Ephemeroptera that are Baetidae	53.2	40.6 ± 30.0
% EPT Individuals	71.5	87.7 ± 7.3
% of 2 dominant taxa	38.6	57.9 ± 14.2
% of dominant taxa	21.8	39.8 ± 14.9
% Plecoptera	4.7	31.4 ± 15.4
% Tricoptera	35.2	4.5 ± 2.8
No. EPT individuals/Chironomids+EPT Individuals	0.8	0.9 ± 0.1
Total Abundance	662.1	587.2 ± 299.2
Richness		
Ephemeroptera taxa	4.0	3.8 ± 0.8

Site Metrics

Metric Name	NJBON01	Predicted Group Reference Mean ±SD
EPT taxa (no)	14.0	13.3 ± 2.7
Plecoptera taxa	4.0	6.3 ± 1.1
Shannon-Wiener Diversity	2.4	1.9 ± 0.4
Simpson's Diversity	0.9	0.8 ± 0.1
Total No. of Taxa	26.0	19.1 ± 3.6
Trichoptera taxa	6.0	3.2 ± 1.4

Frequency and Probability of Taxa Occurence

Reference Model Taxa	Frequency of Occurence in Reference Sites					Probability Of Occurrence at NJBON01
	Group 1	Group 2	Group 3	Group 4	Group 5	
Ameletidae	56%	53%	22%	50%	68%	0.50
Apataniidae	22%	24%	28%	25%	3%	0.22
Athericidae	0%	2%	0%	17%	0%	0.08
Aturidae	0%	8%	0%	0%	0%	0.00
Baetidae	100%	100%	100%	100%	97%	1.00
Blephariceridae	0%	0%	0%	0%	5%	0.01
Brachycentridae	11%	69%	0%	42%	3%	0.25
Capniidae	78%	55%	50%	92%	68%	0.79
Ceratopogonidae	0%	55%	28%	42%	5%	0.25
Chironomidae	100%	100%	100%	100%	95%	0.99
Chloroperlidae	78%	88%	94%	100%	100%	0.93
Corixidae	11%	0%	0%	0%	0%	0.03
Curculionidae	0%	4%	0%	0%	0%	0.00
Deuterophlebiidae	0%	0%	0%	0%	3%	0.00
Dixidae	0%	10%	0%	0%	0%	0.00
Dytiscidae	0%	8%	6%	0%	0%	0.01
Elmidae	0%	86%	50%	50%	5%	0.33
Empididae	67%	55%	50%	67%	57%	0.63
Enchytraeidae	11%	14%	0%	8%	0%	0.07
Ephemerellidae	78%	100%	100%	100%	100%	0.94
Ephydridae	0%	2%	0%	0%	0%	0.00
Glossosomatidae	11%	49%	39%	42%	35%	0.33
Heptageniidae	100%	100%	100%	100%	100%	1.00
Hydraenidae	0%	4%	0%	0%	0%	0.00
Hydrophilidae	11%	2%	0%	0%	0%	0.03
Hydropsychidae	11%	92%	78%	92%	86%	0.68
Hydroptilidae	11%	8%	0%	0%	0%	0.03
Hydrozetidae	0%	10%	17%	8%	16%	0.08
Hydryphantidae	11%	31%	11%	8%	8%	0.10
Hygrobatidae	0%	29%	0%	0%	11%	0.02
Lebertiidae	78%	65%	39%	58%	5%	0.56
Lepidostomatidae	0%	53%	6%	17%	8%	0.12
Leptohyphidae	0%	2%	0%	0%	0%	0.00
Leptophlebiidae	0%	90%	11%	33%	3%	0.21
Leuctridae	22%	43%	56%	67%	54%	0.51
Limnephilidae	22%	31%	6%	25%	41%	0.24
Limnesiidae	0%	2%	0%	0%	0%	0.00
Lumbriculidae	0%	20%	17%	25%	3%	0.15
Mideopsidae	0%	2%	0%	0%	0%	0.00
Naididae	0%	6%	39%	0%	3%	0.05
Nemouridae	100%	100%	100%	100%	100%	1.00
Pelecorhynchidae	0%	22%	6%	0%	0%	0.02
Peltoperlidae	22%	12%	6%	8%	41%	0.15
Perlidae	11%	84%	33%	100%	3%	0.57
Perlodidae	78%	78%	89%	92%	81%	0.86
Philopotamidae	0%	31%	0%	0%	3%	0.02
Pisidiidae	0%	6%	0%	8%	0%	0.04
Planorbidae	0%	0%	0%	0%	3%	0.00
Psychodidae	22%	65%	94%	8%	11%	0.25
Pteronarcyidae	0%	12%	6%	0%	3%	0.02
Rhyacophilidae	100%	92%	100%	100%	95%	0.99

Frequency and Probability of Taxa Occurence

Reference Model Taxa	Frequency of Occurence in Reference Sites					Probability Of Occurrence at NJBON01
	Group 1	Group 2	Group 3	Group 4	Group 5	
Simuliidae	33%	49%	39%	33%	16%	0.33
Sperchontidae	78%	63%	50%	42%	65%	0.56
Stygothrombidiidae	0%	4%	0%	17%	0%	0.08
Taeniopterygidae	89%	49%	100%	92%	97%	0.91
Thaumaleidae	11%	4%	0%	0%	0%	0.03
Tipulidae	56%	55%	28%	67%	43%	0.56
Torrenticolidae	11%	86%	11%	17%	11%	0.17
Tubificidae	0%	4%	0%	0%	0%	0.00
Uenoidae	22%	37%	17%	25%	46%	0.26
Valvatidae	0%	2%	6%	0%	0%	0.01

RIVPACS : Expected taxa P>0.50	13.96
RIVPACS : Observed taxa P>0.50	15.00
RIVPACS : O:E (p > 0.5)	1.07
RIVPACS : Expected taxa P>0.70	9.40
RIVPACS : Observed taxa P>0.70	8.00
RIVPACS : O:E (p > 0.7)	0.85

D. Habitat Description

Variable	NJBON01	Predicted Group Reference Mean ±SD
Channel		
Depth-Avg (cm)	50.0	23.6 ± 11.1
Reach-%CanopyCoverage (PercentRange)	3.00	1.33 ± 0.78
Reach-%Logging (PercentRange)	1	0 ± 0
Reach-Pools (Binary)	0	1 ± 0
Reach-Rapids (Binary)	0	0 ± 0
Reach-Riffles (Binary)	1	1 ± 0
Reach-StraightRun (Binary)	0	1 ± 1
Veg-Coniferous (Binary)	1	1 ± 0
Veg-Deciduous (Binary)	1	1 ± 0
Veg-GrassesFerns (Binary)	0	1 ± 0
Veg-Shrubs (Binary)	1	1 ± 0
Velocity-Avg (m/s)	1.13	0.48 ± 0.22
Velocity-Max (m/s)	1.20	0.76 ± 0.36
Width-Bankfull (m)	9.9	13.4 ± 9.9
Width-Wetted (m)	8.7	8.5 ± 5.8
XSEC-VelMethod (Category (1-3))	3	1 ± 0
Landcover		
Reg-Ice (%)	0.00	0.02 ± 0.06
Substrate Data		
Dominant-1st (Category(0-9))	7	7 ± 1
Dominant-2nd (Category(0-9))	8	7 ± 1
Embeddedness (Category(1-5))	4	5 ± 1
SurroundingMaterial (Category(0-9))	3	4 ± 1
Topography		
SlopeLT30% (%)	28.34	18.88 ± 9.30
Water Chemistry		
General-Alkalinity (mg/L)	61.6000000	71.7000000 ± 53.9231440
General-Hardness (mg/L)	153.9000000	84.2750000 ± 70.6251066
General-pH (pH)	7.6	7.9 ± 0.4
General-SolidsTSS (mg/L)	11.4000000	0.8849836 ± 1.2378575
General-SpCond (uS/cm)	144.0000000	168.9833333 ± 123.7858182
General-TempWater (Degrees Celsius)	7.5000000	7.3183333 ± 2.7240839
General-Turbidity (NTU)	1.4000000	0.2020000
Nitrogen-TN (mg/L)	0.1300000	0.0883333 ± 0.0521943
Phosphorus-TP (mg/L)	0.0170000	0.0045833 ± 0.0049992

Site Assessment Report

A. Site Description

CABIN Study Name	CBWN-Slocan River
CABIN Site Code	NJBON01
Sampling Date	Oct 01 2012
Know Your Watershed (KYW) Basin	Slocan
Province / Territory	British Columbia
Terrestrial Ecological Classification	Montane Cordillera Ecozone Columbia Mountains and Highlands Ecoregion
Coordinates (decimal degrees)	50.10000 N, 117.48333 W
Altitude	
Feature Name	Slocan River
Stream Order	5

B. CABIN Assessment Results

REFERENCE MODEL SUMMARY	
Model Name	Columbia-Okanagan Preliminary March 2010
Analysis Date	August 26, 2013
Taxanomic Level	Family
Predictor Variables	Depth-Avg Latitude Longitude Reg-Ice SlopeLT30%

Reference Groups	**1**	**2**	**3**	**4**	**5**
Number of Reference Sites	9	43	17	12	33
Group Error Rate	22.2%	24.5%	22.2%	25.0%	32.4%
Overall Model Error Rate	26.4%				
Probability of Group Membership	100.0%	0.0%	0.0%	0.0%	0.0%
CABIN Assessment of NJBON01 on Oct 01, 2012	Similar to Reference				

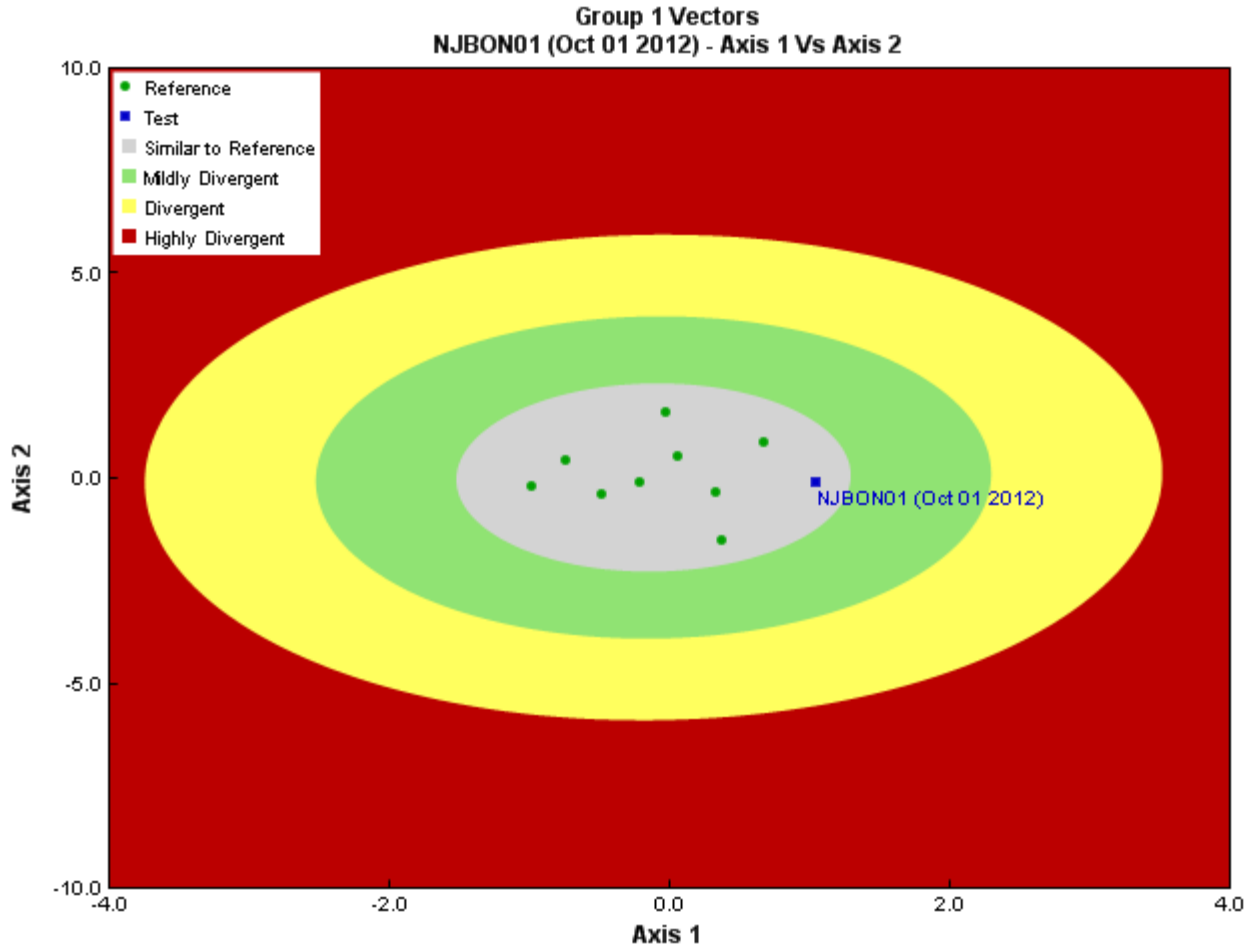


Figure 3. CABIN ordination assessment of the test site with the predicted group of reference sites. Each axis represents the relative abundance of the entire benthic invertebrate community with different organisms weighted differently on each axis.

Sample Information

Sampling Device	Kick Net
Mesh Size	400
Sampling Time	3
Taxonomist	Eco Analsyts, EcoAnalysts
Identification Date	February 09, 2013
Subsampling Device	Marchant Box
Proportion Subsampled	100/100

Site Metrics

Metric Name	NJBON01	Predicted Group Reference Mean ±SD
Bray-Curtis Distance	0.59	0.4 ± 0.2
Number Of Individuals		
% Chironomidae	25.3	8.1 ± 6.9
% Ephemeroptera	22.1	61.6 ± 17.6
% Ephemeroptera that are Baetidae	35.2	50.3 ± 24.0
% EPT Individuals	52.8	88.4 ± 7.5
% of 2 dominant taxa	35.0	59.1 ± 14.4
% of dominant taxa	25.3	41.5 ± 15.1
% Plecoptera	16.1	23.9 ± 14.1
% Tricoptera	14.6	2.8 ± 2.9
No. EPT individuals/Chironomids+EPT Individuals	0.7	0.9 ± 0.1
Total Abundance	411.0	1453.4 ± 1355.1
Richness		
Ephemeroptera taxa	3.0	3.6 ± 0.6

Site Metrics

Metric Name	NJBON01	Predicted Group Reference Mean ±SD
EPT taxa (no)	14.0	11.1 ± 2.1
Plecoptera taxa	6.0	5.1 ± 1.2
Shannon-Wiener Diversity	2.6	1.8 ± 0.4
Simpson's Diversity	0.9	0.7 ± 0.1
Total No. of Taxa	26.0	16.3 ± 3.1
Trichoptera taxa	5.0	2.3 ± 1.3

Frequency and Probability of Taxa Occurence

Reference Model Taxa	Frequency of Occurence in Reference Sites					Probability Of Occurrence at NJBON01
	Group 1	Group 2	Group 3	Group 4	Group 5	
Ameletidae	56%	53%	22%	50%	68%	0.56
Apataniidae	22%	24%	28%	25%	3%	0.22
Athericidae	0%	2%	0%	17%	0%	0.00
Aturidae	0%	8%	0%	0%	0%	0.00
Baetidae	100%	100%	100%	100%	97%	1.00
Blephariceridae	0%	0%	0%	0%	5%	0.00
Brachycentridae	11%	69%	0%	42%	3%	0.11
Capniidae	78%	55%	50%	92%	68%	0.78
Ceratopogonidae	0%	55%	28%	42%	5%	0.00
Chironomidae	100%	100%	100%	100%	95%	1.00
Chloroperlidae	78%	88%	94%	100%	100%	0.78
Corixidae	11%	0%	0%	0%	0%	0.11
Curculionidae	0%	4%	0%	0%	0%	0.00
Deuterophlebiidae	0%	0%	0%	0%	3%	0.00
Dixidae	0%	10%	0%	0%	0%	0.00
Dytiscidae	0%	8%	6%	0%	0%	0.00
Elmidae	0%	86%	50%	50%	5%	0.00
Empididae	67%	55%	50%	67%	57%	0.67
Enchytraeidae	11%	14%	0%	8%	0%	0.11
Ephemerellidae	78%	100%	100%	100%	100%	0.78
Ephydridae	0%	2%	0%	0%	0%	0.00
Glossosomatidae	11%	49%	39%	42%	35%	0.11
Heptageniidae	100%	100%	100%	100%	100%	1.00
Hydraenidae	0%	4%	0%	0%	0%	0.00
Hydrophilidae	11%	2%	0%	0%	0%	0.11
Hydropsychidae	11%	92%	78%	92%	86%	0.11
Hydroptilidae	11%	8%	0%	0%	0%	0.11
Hydrozetidae	0%	10%	17%	8%	16%	0.00
Hydryphantidae	11%	31%	11%	8%	8%	0.11
Hygrobatidae	0%	29%	0%	0%	11%	0.00
Lebertiidae	78%	65%	39%	58%	5%	0.78
Lepidostomatidae	0%	53%	6%	17%	8%	0.00
Leptohyphidae	0%	2%	0%	0%	0%	0.00
Leptophlebiidae	0%	90%	11%	33%	3%	0.00
Leuctridae	22%	43%	56%	67%	54%	0.22
Limnephilidae	22%	31%	6%	25%	41%	0.22
Limnesiidae	0%	2%	0%	0%	0%	0.00
Lumbriculidae	0%	20%	17%	25%	3%	0.00
Mideopsidae	0%	2%	0%	0%	0%	0.00
Naididae	0%	6%	39%	0%	3%	0.00
Nemouridae	100%	100%	100%	100%	100%	1.00
Pelecorhynchidae	0%	22%	6%	0%	0%	0.00
Peltoperlidae	22%	12%	6%	8%	41%	0.22
Perlidae	11%	84%	33%	100%	3%	0.11
Perlodidae	78%	78%	89%	92%	81%	0.78
Philopotamidae	0%	31%	0%	0%	3%	0.00
Pisidiidae	0%	6%	0%	8%	0%	0.00
Planorbidae	0%	0%	0%	0%	3%	0.00
Psychodidae	22%	65%	94%	8%	11%	0.22
Pteronarcyidae	0%	12%	6%	0%	3%	0.00
Rhyacophilidae	100%	92%	100%	100%	95%	1.00

Frequency and Probability of Taxa Occurence

Reference Model Taxa	Frequency of Occurence in Reference Sites					Probability Of Occurrence at NJBON01
	Group 1	Group 2	Group 3	Group 4	Group 5	
Simuliidae	33%	49%	39%	33%	16%	0.33
Sperchontidae	78%	63%	50%	42%	65%	0.78
Stygothrombidiidae	0%	4%	0%	17%	0%	0.00
Taeniopterygidae	89%	49%	100%	92%	97%	0.89
Thaumaleidae	11%	4%	0%	0%	0%	0.11
Tipulidae	56%	55%	28%	67%	43%	0.56
Torrenticolidae	11%	86%	11%	17%	11%	0.11
Tubificidae	0%	4%	0%	0%	0%	0.00
Uenoidae	22%	37%	17%	25%	46%	0.22
Valvatidae	0%	2%	6%	0%	0%	0.00

RIVPACS : Expected taxa P>0.50	12.33
RIVPACS : Observed taxa P>0.50	14.00
RIVPACS : O:E (p > 0.5)	1.14
RIVPACS : Expected taxa P>0.70	10.56
RIVPACS : Observed taxa P>0.70	12.00
RIVPACS : O:E (p > 0.7)	1.14

D. Habitat Description

Variable	NJBON01	Predicted Group Reference Mean ±SD
Channel		
Depth-Avg (cm)	192.0	39.4 ± 23.6
Depth-Max (cm)	255.0	55.6 ± 30.6
Macrophyte (PercentRange)	0	0 ± 0
Reach-%CanopyCoverage (PercentRange)	2.00	0.67 ± 1.00
Reach-Pools (Binary)	1	0 ± 1
Reach-Rapids (Binary)	0	0 ± 0
Reach-Riffles (Binary)	1	1 ± 1
Reach-StraightRun (Binary)	1	1 ± 1
Slope (m/m)	0.096	0.044 ± 0.073
Veg-Coniferous (Binary)	1	1 ± 0
Veg-Deciduous (Binary)	1	1 ± 0
Veg-GrassesFerns (Binary)	0	1 ± 0
Veg-Shrubs (Binary)	1	1 ± 0
Velocity-Avg (m/s)	2.28	0.64 ± 0.31
Velocity-Max (m/s)	4.08	0.81 ± 0.28
Width-Bankfull (m)	20.1	27.7 ± 17.6
Width-Wetted (m)	9.8	17.6 ± 11.6
Landcover		
Reg-Ice (%)	0.00	11.04 ± 12.40
Substrate Data		
%Bedrock (%)	0	1 ± 2
%Boulder (%)	7	1 ± 2
%Cobble (%)	77	55 ± 30
%Gravel (%)	0	2 ± 2
%Pebble (%)	16	40 ± 28
%Sand (%)	0	0 ± 0
%Silt+Clay (%)	0	0 ± 1
D50 (cm)	10.75	8.05 ± 3.69
Dg (cm)	11.0	7.4 ± 3.3
Dominant-1st (Category(0-9))	6	6 ± 2
Dominant-2nd (Category(0-9))	7	6 ± 1
Embeddedness (Category(1-5))	3	4 ± 1
PeriphytonCoverage (Category(1-5))	3	3 ± 1
Topography		
SlopeLT30% (%)	28.34	27.80 ± 15.51
Water Chemistry		
General-Conductivity (uS/cm)	130.4000000	75.3777778 ± 42.7748109
General-DO (mg/L)	11.0000000	11.4277778 ± 1.0113454
General-pH (pH)	6.9	7.6 ± 0.6

D. Habitat Description

Variable	NJBON01	Predicted Group Reference Mean ±SD
General-TempAir (Degrees Celsius)	12.5	4.2
General-TempWater (Degrees Celsius)	7.5000000	5.7844444 ± 2.4754197
General-Turbidity (NTU)	0.2500000	67.5295000 ± 95.4176962

Site Assessment Report

Site Metadata

Site	NJCAR01
Sample Date	Nov 10 2006
Latitude	N 49° 55' 25"
Longitude	W 117° 22' 15"
Feature Name	Carpenter Creek

BEAST Prediction Results

Predictor Variables	Channel Depth - avg,Gradient - <30,Landcover - Ice,Latitude,Longitude				
Predicted Group Number	4				
Group	**1**	**2**	**3**	**4**	**5**
Probability	0.0%	7.4%	14.0%	61.2%	17.4%

Habitat Attributes

Variable	Site	Reference Mean	Standard Deviation
Canopy - % coverage (PercentRange)	2.00	1.70	1.27
General - Alkalinity (mg/L)	38.4000000	77.5983193	51.1024162
General - dissolved oxygen (DO) (mg/L)	11.0000000	10.8754545	0.9089839
General - pH (pH)	7.5	7.8	0.6
Substrate - 2nd dominant size category (Category(0-9))	7	6	1
Substrate - dominant size category (Category(0-9))	6	7	1
Substrate - embeddedness category (Category(1-5))	5	4	1
Substrate - surrounding material size category (Category(0-9))	3	4	2
Velocity (Avg) (m/s)	0.68	0.47	0.29
Velocity (Max) (m/s)	0.91	0.67	0.37
Width - Bankfull (m)	34.4	13.7	13.0

Bray-Curtis Analysis

Description	Value
Bray-Curtis Distance	0.5

RIVPACS Taxa Ratios

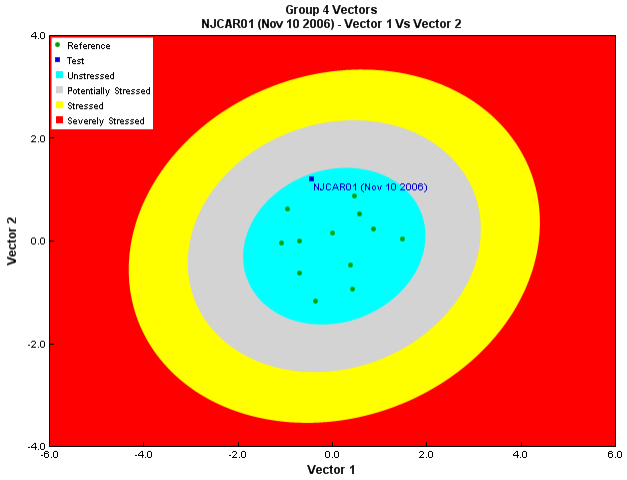
RIVPACS : Expected taxa P>0.50	12.94
RIVPACS : Observed taxa P>0.50	12.00
RIVPACS : O:E (p > 0.5)	0.93
RIVPACS : Expected taxa P>0.70	11.15
RIVPACS : Observed taxa P>0.70	11.00
RIVPACS : O:E (p > 0.7)	0.99

RIVPACS Analysis

Taxa	Probability Of Occurrence	Abundance
Baetidae	1.00	11
Brachycentridae	0.31	2
Capniidae	0.79	1

Chironomidae	0.99	55
Chloroperlidae	0.98	19
Empididae	0.62	5
Ephemerellidae	1.00	15
Glossosomatidae	0.41	3
Heptageniidae	1.00	28
Hydropsychidae	0.89	2
Hydroptilidae	0.01	2
Lebertiidae	0.47	1
Lumbriculidae	0.20	2
Nemouridae	1.00	121
Perlidae	0.73	-
Perlodidae	0.88	9
Rhyacophilidae	0.98	8
Simuliidae	0.32	3
Sperchontidae	0.48	3
Taeniopterygidae	0.91	183
Torrenticolidae	0.20	1
Uenoidae	0.28	3

Site Assessment Graphs



Site Assessment Vector Data

Assessment For The Test Site	
Vector 1 Vs Vector 2	Similar to Reference
Vector 1 Vs Vector 3	N/A
Vector 2 Vs Vector 3	N/A
Overall	Similar to Reference

Site Metrics

Metric Name	Test Site	Reference Mean	Standard Deviation	Significant
% Chironomidae	11.5304	7.3784	6.3725	No
% Ephemeroptera	11.3208	51.6884	18.7502	Yes
% Ephemeroptera that are Baetidae	20.3704	40.5524	29.9979	No

% EPT Individuals	85.3249	87.6509	7.3598	No
% of 2 dominant taxa	63.7317	57.907	14.2204	No
% of dominant taxa	38.3648	39.8013	14.8602	No
% Plecoptera	69.8113	31.4161	15.4308	Yes
% Tricoptera	4.1929	4.5464	2.7593	No
Ephemeroptera taxa	3.0	3.8235	0.809	No
EPT taxa (no)	14.0	13.2941	2.7103	No
No. EPT individuals/Chironomids+EPT Individuals	0.881	0.9224	0.0666	No
Plecoptera taxa	5.0	6.2941	1.1048	No
Shannon-Wiener Diversity	1.9045	1.9417	0.391	No
Simpson's Diversity	0.7676	0.756	0.1245	No
Total Abundance	477.0	587.3953	299.0909	No
Total No. of Taxa	21.0	19.2941	3.721	No
Trichoptera taxa	6.0	3.1765	1.4246	No

Site Assessment Report

Site Metadata

Site	NJCAR01
Sample Date	Oct 15 2008
Latitude	N 49° 58' 0"
Longitude	W 117° 28' 0"
Feature Name	Carpenter Creek

BEAST Prediction Results

Predictor Variables	Channel Depth - avg,Gradient - <30,Landcover - Ice,Latitude,Longitude				
Predicted Group Number	4				
Group	**1**	**2**	**3**	**4**	**5**
Probability	3.4%	3.7%	11.0%	68.0%	13.9%

Habitat Attributes

Variable	Site	Reference Mean	Standard Deviation
Canopy - % coverage (PercentRange)	1.00	1.70	1.27
Channel Depth - avg (cm)	38.4	21.7	11.9
Channel Depth - max (cm)	40.0	30.6	17.6
General - dissolved oxygen (DO) (mg/L)	10.0000000	10.8754545	0.9089839
General - Specific Conductance (@ 25 C) (uS/cm)	191.0000000	162.0405941	105.3178562
Substrate - 2nd dominant size category (Category(0-9))	5	6	1
Substrate - dominant size category (Category(0-9))	6	7	1
Substrate - embeddedness category (Category(1-5))	4	4	1
Substrate - surrounding material size category (Category(0-9))	4	4	2
Velocity (Avg) (m/s)	0.68	0.47	0.29
Velocity (Max) (m/s)	0.91	0.67	0.37
Width - Bankfull (m)	34.4	13.7	13.0

Bray-Curtis Analysis

Description	Value
Bray-Curtis Distance	0.56

RIVPACS Taxa Ratios

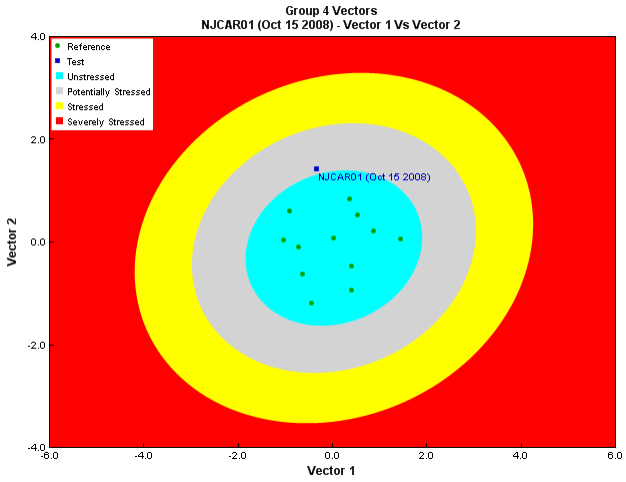
RIVPACS : Expected taxa P>0.50	13.03
RIVPACS : Observed taxa P>0.50	11.00
RIVPACS : O:E (p > 0.5)	0.84
RIVPACS : Expected taxa P>0.70	11.20
RIVPACS : Observed taxa P>0.70	10.00
RIVPACS : O:E (p > 0.7)	0.89

RIVPACS Analysis

Taxa	Probability Of Occurrence	Abundance
Ameletidae	0.50	1
Apataniidae	0.22	2

Baetidae	1.00	15
Brachycentridae	0.32	2
Capniidae	0.82	6
Chironomidae	0.99	15
Chloroperlidae	0.98	21
Empididae	0.63	4
Ephemerellidae	0.99	-
Glossosomatidae	0.40	31
Heptageniidae	1.00	14
Hydropsychidae	0.87	3
Lebertiidae	0.50	1
Nemouridae	1.00	30
Peltoperlidae	0.13	1
Perlidae	0.76	-
Perlodidae	0.89	5
Planariidae	0.19	1
Rhyacophilidae	0.99	8
Taeniopterygidae	0.92	246

Site Assessment Graphs



Site Assessment Vector Data

Assessment For The Test Site	
Vector 1 Vs Vector 2	Mildly Divergent
Vector 1 Vs Vector 3	N/A
Vector 2 Vs Vector 3	N/A
Overall	Mildly Divergent

Site Metrics

Metric Name	Test Site	Reference Mean	Standard Deviation	Significant
% Chironomidae	3.5885	7.3784	6.3725	No
% Ephemeroptera	10.0478	51.6884	18.7502	Yes
% Ephemeroptera that are Baetidae	35.7143	40.5524	29.9979	No
% EPT Individuals	94.9761	87.6509	7.3598	No

% of 2 dominant taxa	66.2679	57.907	14.2204	No
% of dominant taxa	58.8517	39.8013	14.8602	No
% Plecoptera	73.9234	31.4161	15.4308	Yes
% Tricoptera	11.0048	4.5464	2.7593	Yes
Ephemeroptera taxa	4.0	3.8235	0.809	No
EPT taxa (no)	15.0	13.2941	2.7103	No
No. EPT individuals/Chironomids+EPT Individuals	0.9636	0.9224	0.0666	No
Plecoptera taxa	6.0	6.2941	1.1048	No
Shannon-Wiener Diversity	1.6771	1.9417	0.391	No
Simpson's Diversity	0.635	0.756	0.1245	No
Total Abundance	418.0	587.3953	299.0909	No
Total No. of Taxa	19.0	19.2941	3.721	No
Trichoptera taxa	5.0	3.1765	1.4246	No

Site Assessment Report

Site Metadata

Site	NJGOS01
Sample Date	Sep 22 2010
Latitude	N 49° 26' 21.01"
Longitude	W 117° 33' 32.65"
Feature Name	Goose Cr

BEAST Prediction Results

Predictor Variables	Channel Depth - avg,Gradient - <30,Landcover - Ice,Latitude,Longitude				
Predicted Group Number	2				
Group	**1**	**2**	**3**	**4**	**5**
Probability	0.0%	93.0%	3.8%	3.0%	0.1%

Habitat Attributes

Variable	Site	Reference Mean	Standard Deviation
Canopy - % coverage (PercentRange)	1.00	1.70	1.27
Channel Depth - avg (cm)	19.9	21.7	11.9
Channel Depth - max (cm)	30.0	30.6	17.6
General - Alkalinity (mg/L)	20.5000000	77.5983193	51.1024162
General - dissolved oxygen (DO) (mg/L)	11.0000000	10.8754545	0.9089839
General - pH (pH)	7.6	7.8	0.6
Substrate - 2nd dominant size category (Category(0-9))	7	6	1
Substrate - dominant size category (Category(0-9))	6	7	1
Substrate - embeddedness category (Category(1-5))	4	4	1
Substrate - surrounding material size category (Category(0-9))	3	4	2
Velocity (Avg) (m/s)	0.45	0.47	0.29
Velocity (Max) (m/s)	0.66	0.67	0.37
Width - Bankfull (m)	20.7	13.7	13.0
Width - Wetted (m)	15.1	8.4	9.1

Bray-Curtis Analysis

Description	Value
Bray-Curtis Distance	0.49

RIVPACS Taxa Ratios

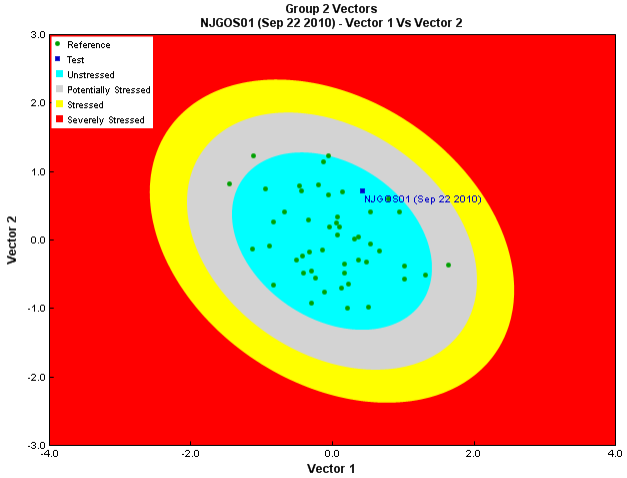
RIVPACS : Expected taxa P>0.50	18.11
RIVPACS : Observed taxa P>0.50	17.00
RIVPACS : O:E (p > 0.5)	0.94
RIVPACS : Expected taxa P>0.70	11.81
RIVPACS : Observed taxa P>0.70	11.00
RIVPACS : O:E (p > 0.7)	0.93

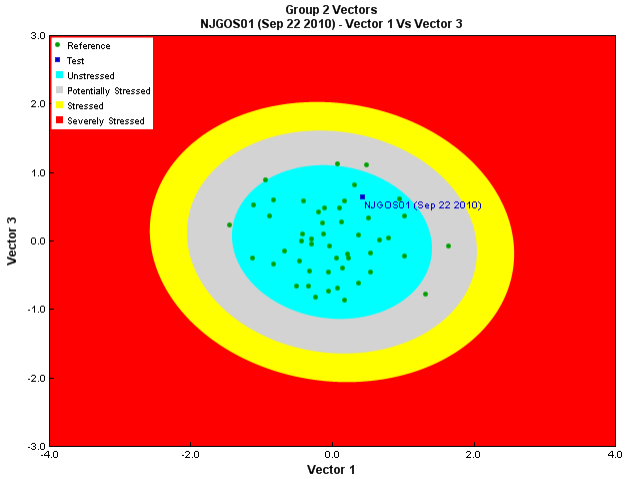
RIVPACS Analysis

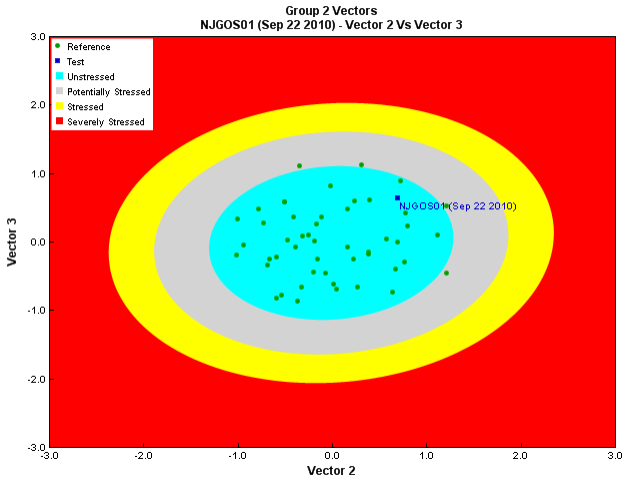
Taxa	Probability Of Occurrence	Abundance

Baetidae	1.00	177
Brachycentridae	0.66	8
Ceratopogonidae	0.54	15
Chironomidae	1.00	385
Chloroperlidae	0.88	-
Elmidae	0.83	138
Empididae	0.55	15
Enchytraeidae	0.14	15
Ephemerellidae	1.00	823
Glossosomatidae	0.48	8
Heptageniidae	1.00	185
Hydropsychidae	0.91	69
Hydroptilidae	0.08	8
Hydryphantidae	0.29	31
Hygrobatidae	0.27	8
Lebertiidae	0.64	46
Lepidostomatidae	0.50	8
Leptophlebiidae	0.85	38
Naididae	0.07	146
Nemouridae	1.00	115
Perlidae	0.82	-
Perlodidae	0.78	23
Pteronarcyidae	0.12	15
Rhyacophilidae	0.92	38
Simuliidae	0.48	8
Tipulidae	0.54	23
Torrenticolidae	0.81	77

Site Assessment Graphs







Site Assessment Vector Data

Assessment For The Test Site	
Vector 1 Vs Vector 2	Similar to Reference
Vector 1 Vs Vector 3	Similar to Reference
Vector 2 Vs Vector 3	Similar to Reference
Overall	Similar to Reference

Site Metrics

Metric Name	Test Site	Reference Mean	Standard Deviation	Significant
% Chironomidae	15.873	8.6676	10.3947	No
% Ephemeroptera	50.4762	45.5693	14.31	No
% Ephemeroptera that are Baetidae	14.4654	44.5389	20.4398	No
% EPT Individuals	62.5397	78.6112	14.0279	No
% of 2 dominant taxa	49.8413	49.2929	10.5626	No
% of dominant taxa	33.9683	30.6428	8.948	No
% Plecoptera	6.3492	23.2487	13.6034	No
% Tricoptera	5.7143	9.7932	7.0599	No
Ephemeroptera taxa	4.0	4.3016	0.6126	No
EPT taxa (no)	13.0	14.0476	2.7205	No
No. EPT individuals/Chironomids+EPT Individuals	0.7976	0.903	0.1111	No

Plecoptera taxa	3.0	5.2698	1.6964	No
Shannon-Wiener Diversity	2.3243	2.1946	0.2915	No
Simpson's Diversity	0.8359	0.8254	0.057	No
Total Abundance	2423.0769	3018.3807	2495.953	No
Total No. of Taxa	25.0	21.8254	4.7503	No
Trichoptera taxa	6.0	4.4762	1.4904	No

Site Assessment Report

Site Metadata

Site	NJGOS01
Sample Date	Oct 14 2011
Latitude	N 49° 26' 21"
Longitude	W 117° 33' 33"
Feature Name	Goose Cr

BEAST Prediction Results

Predictor Variables	Channel Depth - avg,Gradient - <30,Landcover - Ice,Latitude,Longitude				
Predicted Group Number	2				
Group	**1**	**2**	**3**	**4**	**5**
Probability	0.1%	90.9%	4.7%	4.1%	0.2%

Habitat Attributes

Variable	Site	Reference Mean	Standard Deviation
Canopy - % coverage (PercentRange)	2.00	1.70	1.27
Channel Depth - avg (cm)	34.3	21.7	11.9
Channel Depth - max (cm)	46.0	30.6	17.6
General - Alkalinity (mg/L)	37.9000000	77.5983193	51.1024162
General - dissolved oxygen (DO) (mg/L)	10.0000000	10.8754545	0.9089839
General - pH (pH)	6.3	7.8	0.6
General - Specific Conductance (@ 25 C) (uS/cm)	71.5000000	162.0405941	105.3178562
Substrate - 2nd dominant size category (Category(0-9))	7	6	1
Substrate - dominant size category (Category(0-9))	6	7	1
Substrate - embeddedness category (Category(1-5))	4	4	1
Substrate - surrounding material size category (Category(0-9))	2	4	2
Velocity (Avg) (m/s)	0.30	0.47	0.29
Velocity (Max) (m/s)	0.63	0.67	0.37
Width - Bankfull (m)	15.7	13.7	13.0
Width - Wetted (m)	9.9	8.4	9.1

Bray-Curtis Analysis

Description	Value
Bray-Curtis Distance	0.38

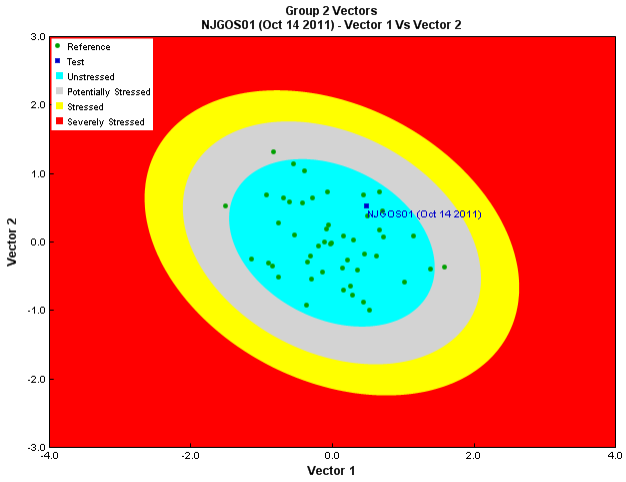
RIVPACS Taxa Ratios

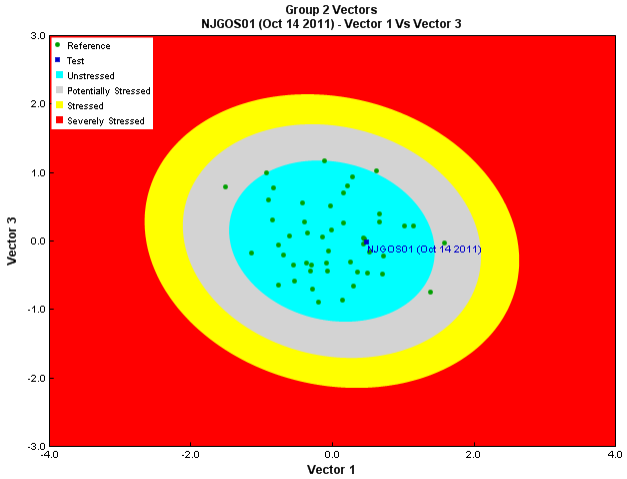
RIVPACS : Expected taxa P>0.50	17.56
RIVPACS : Observed taxa P>0.50	15.00
RIVPACS : O:E (p > 0.5)	0.85
RIVPACS : Expected taxa P>0.70	11.78
RIVPACS : Observed taxa P>0.70	10.00
RIVPACS : O:E (p > 0.7)	0.85

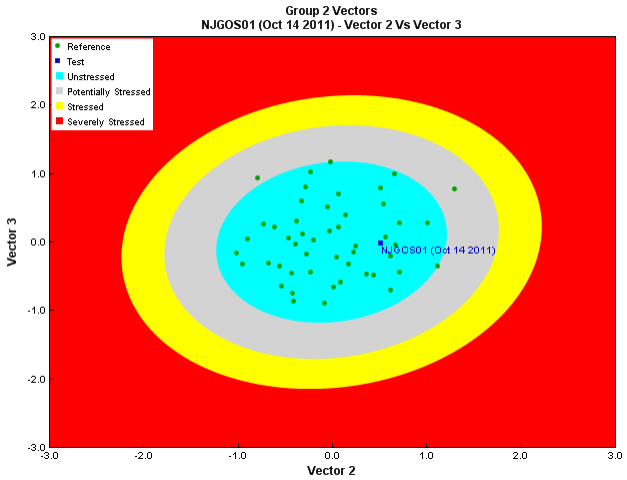
RIVPACS Analysis

Taxa	Probability Of Occurrence	Abundance
Baetidae	1.00	950
Brachycentridae	0.65	10
Ceratopogonidae	0.53	30
Chironomidae	1.00	500
Chloroperlidae	0.89	-
Elmidae	0.82	120
Empididae	0.55	40
Ephemerellidae	1.00	210
Heptageniidae	1.00	220
Hydropsychidae	0.91	120
Hydroptilidae	0.07	70
Leptophlebiidae	0.84	20
Nemouridae	1.00	40
Perlidae	0.82	-
Perlodidae	0.79	40
Rhyacophilidae	0.93	140
Simuliidae	0.48	50
Taeniopterygidae	0.53	10
Tipulidae	0.54	130
Torrenticolidae	0.79	-

Site Assessment Graphs







Site Assessment Vector Data

Assessment For The Test Site	
Vector 1 Vs Vector 2	Similar to Reference
Vector 1 Vs Vector 3	Similar to Reference
Vector 2 Vs Vector 3	Similar to Reference
Overall	Similar to Reference

Site Metrics

Metric Name	Test Site	Reference Mean	Standard Deviation	Significant
% Chironomidae	18.5185	8.6676	10.3947	No
% Ephemeroptera	51.8519	45.5693	14.31	No
% Ephemeroptera that are Baetidae	67.8571	44.5389	20.4398	No
% EPT Individuals	67.7778	78.6112	14.0279	No
% of 2 dominant taxa	53.7037	49.2929	10.5626	No
% of dominant taxa	35.1852	30.6428	8.948	No
% Plecoptera	3.3333	23.2487	13.6034	No
% Tricoptera	12.5926	9.7932	7.0599	No
Ephemeroptera taxa	4.0	4.3016	0.6126	No
EPT taxa (no)	11.0	14.0476	2.7205	No
No. EPT individuals/Chironomids+EPT Individuals	0.7854	0.903	0.1111	No

Plecoptera taxa	3.0	5.2698	1.6964	No
Shannon-Wiener Diversity	2.1426	2.1946	0.2915	No
Simpson's Diversity	0.8184	0.8254	0.057	No
Total Abundance	2700.0	3018.3807	2495.953	No
Total No. of Taxa	17.0	21.8254	4.7503	No
Trichoptera taxa	4.0	4.4762	1.4904	No

Site Assessment Report

Site Metadata

Site	NJGOS01
Sample Date	Oct 11 2012
Latitude	N 49° 26' 23.57"
Longitude	W 117° 33' 39.02"
Feature Name	Goose Cr

BEAST Prediction Results

Predictor Variables	Channel Depth - avg,Gradient - <30,Landcover - Ice,Latitude,Longitude				
Predicted Group Number	2				
Group	**1**	**2**	**3**	**4**	**5**
Probability	0.1%	90.7%	4.8%	4.2%	0.2%

Habitat Attributes

Variable	Site	Reference Mean	Standard Deviation
Canopy - % coverage (PercentRange)	1.00	1.70	1.27
Channel Depth - avg (cm)	35.4	21.7	11.9
Channel Depth - max (cm)	48.5	30.6	17.6
General - Alkalinity (mg/L)	7.0000000	77.5983193	51.1024162
General - dissolved oxygen (DO) (mg/L)	13.0000000	10.8754545	0.9089839
General - pH (pH)	6.0	7.8	0.6
General - Specific Conductance (@ 25 C) (uS/cm)	80.1000000	162.0405941	105.3178562
Substrate - 2nd dominant size category (Category(0-9))	6	6	1
Substrate - dominant size category (Category(0-9))	5	7	1
Substrate - embeddedness category (Category(1-5))	4	4	1
Velocity (Avg) (m/s)	0.41	0.47	0.29
Velocity (Max) (m/s)	0.54	0.67	0.37
Width - Bankfull (m)	18.5	13.7	13.0
Width - Wetted (m)	3.5	8.4	9.1

Bray-Curtis Analysis

Description	Value
Bray-Curtis Distance	0.65

RIVPACS Taxa Ratios

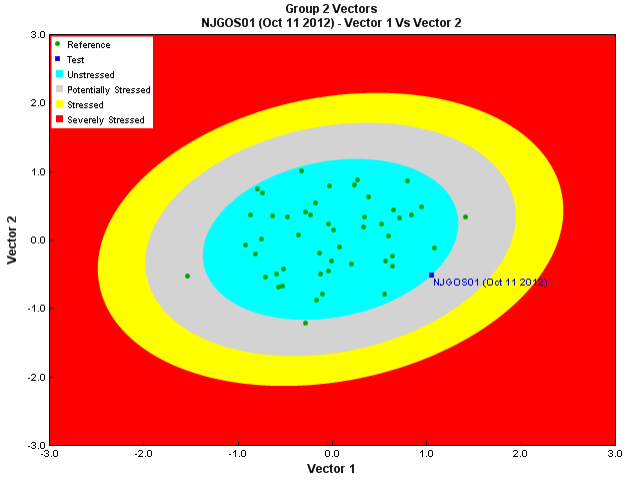
RIVPACS : Expected taxa P>0.50	17.56
RIVPACS : Observed taxa P>0.50	14.00
RIVPACS : O:E (p > 0.5)	0.80
RIVPACS : Expected taxa P>0.70	11.77
RIVPACS : Observed taxa P>0.70	9.00
RIVPACS : O:E (p > 0.7)	0.76

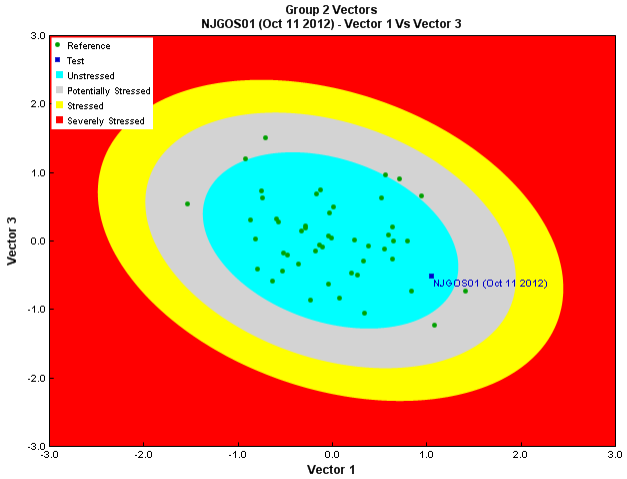
RIVPACS Analysis

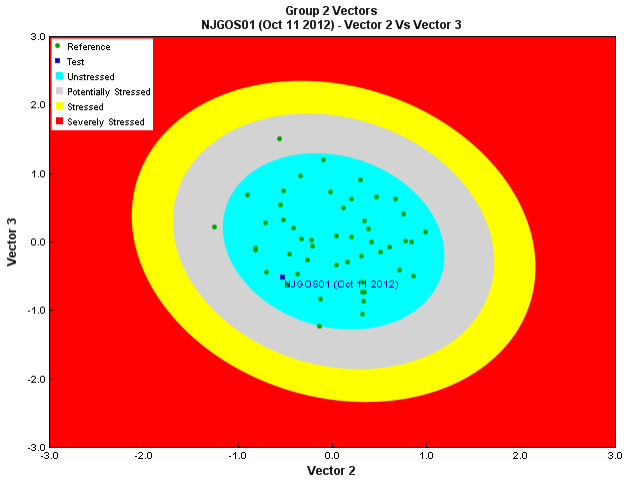
Taxa	Probability Of Occurrence	Abundance

Baetidae	1.00	1317
Ceratopogonidae	0.53	67
Chironomidae	1.00	2500
Chloroperlidae	0.89	-
Elmidae	0.82	67
Empididae	0.55	167
Ephemerellidae	1.00	433
Glossosomatidae	0.48	117
Heptageniidae	1.00	167
Hydropsychidae	0.91	33
Hydroptilidae	0.07	33
Lebertiidae	0.64	83
Lepidostomatidae	0.49	33
Leptophlebiidae	0.83	-
Nemouridae	1.00	83
Perlidae	0.82	-
Perlodidae	0.79	67
Rhyacophilidae	0.93	583
Simuliidae	0.48	67
Sperchontidae	0.62	67
Tipulidae	0.54	33
Torrenticolidae	0.79	-

Site Assessment Graphs







Site Assessment Vector Data

Assessment For The Test Site	
Vector 1 Vs Vector 2	Mildly Divergent
Vector 1 Vs Vector 3	Similar to Reference
Vector 2 Vs Vector 3	Similar to Reference
Overall	Mildly Divergent

Site Metrics

Metric Name	Test Site	Reference Mean	Standard Deviation	Significant
% Chironomidae	42.2541	8.6676	10.3947	Yes
% Ephemeroptera	32.3946	45.5693	14.31	No
% Ephemeroptera that are Baetidae	68.6959	44.5389	20.4398	No
% EPT Individuals	48.4506	78.6112	14.0279	Yes
% of 2 dominant taxa	64.5079	49.2929	10.5626	No
% of dominant taxa	42.2541	30.6428	8.948	No
% Plecoptera	2.5351	23.2487	13.6034	No
% Tricoptera	13.521	9.7932	7.0599	No
Ephemeroptera taxa	3.0	4.3016	0.6126	Yes
EPT taxa (no)	10.0	14.0476	2.7205	No
No. EPT individuals/Chironomids+EPT Individuals	0.5342	0.903	0.1111	Yes

Plecoptera taxa	2.0	5.2698	1.6964	No
Shannon-Wiener Diversity	1.8863	2.1946	0.2915	No
Simpson's Diversity	0.7537	0.8254	0.057	No
Total Abundance	5916.5801	3018.3807	2495.953	No
Total No. of Taxa	18.0	21.8254	4.7503	No
Trichoptera taxa	5.0	4.4762	1.4904	No

Site Assessment Report

Site Metadata

Site	NJK0C01
Sample Date	Sep 15 2008
Latitude	N 49° 36' 0"
Longitude	W 117° 46' 0"
Feature Name	Koch Creek

BEAST Prediction Results

Predictor Variables	Channel Depth - avg,Gradient - <30,Landcover - Ice,Latitude,Longitude				
Predicted Group Number	4				
Group	**1**	**2**	**3**	**4**	**5**
Probability	4.8%	4.7%	5.0%	79.6%	5.9%

Habitat Attributes

Variable	Site	Reference Mean	Standard Deviation
Canopy - % coverage (PercentRange)	1.00	1.70	1.27
Channel Depth - avg (cm)	45.3	21.7	11.9
Channel Depth - max (cm)	54.1	30.6	17.6
General - Alkalinity (mg/L)	20.5000000	77.5983193	51.1024162
General - dissolved oxygen (DO) (mg/L)	11.0000000	10.8754545	0.9089839
General - pH (pH)	7.4	7.8	0.6
General - Specific Conductance (@ 25 C) (uS/cm)	39.5000000	162.0405941	105.3178562
Substrate - 2nd dominant size category (Category(0-9))	7	6	1
Substrate - dominant size category (Category(0-9))	8	7	1
Substrate - embeddedness category (Category(1-5))	4	4	1
Substrate - surrounding material size category (Category(0-9))	2	4	2
Velocity (Avg) (m/s)	0.73	0.47	0.29
Velocity (Max) (m/s)	0.90	0.67	0.37
Width - Bankfull (m)	20.0	13.7	13.0

Bray-Curtis Analysis

Description	Value
Bray-Curtis Distance	0.5

RIVPACS Taxa Ratios

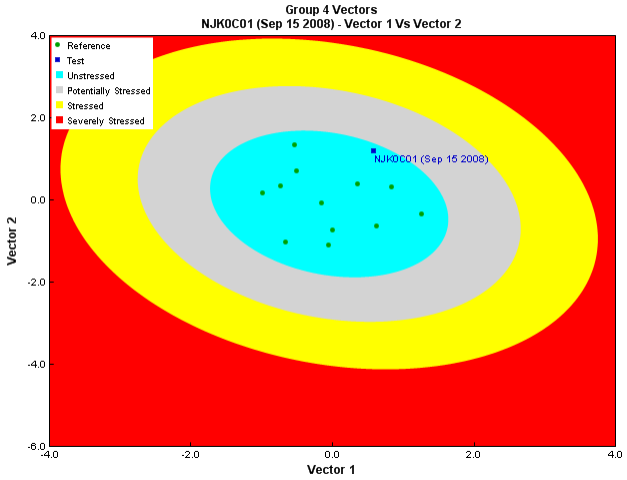
RIVPACS : Expected taxa P>0.50	14.29
RIVPACS : Observed taxa P>0.50	9.00
RIVPACS : O:E (p > 0.5)	0.63
RIVPACS : Expected taxa P>0.70	11.34
RIVPACS : Observed taxa P>0.70	7.00
RIVPACS : O:E (p > 0.7)	0.62

RIVPACS Analysis

Taxa	Probability Of Occurrence	Abundance

Apataniidae	0.24	3
Baetidae	1.00	177
Capniidae	0.86	-
Chironomidae	1.00	101
Chloroperlidae	0.98	-
Elmidae	0.47	1
Empididae	0.65	1
Ephemerellidae	0.99	-
Heptageniidae	1.00	57
Hydropsychidae	0.87	2
Leptophlebiidae	0.31	2
Nemouridae	1.00	2
Perlidae	0.86	1
Perlodidae	0.90	-
Rhyacophilidae	0.99	1
Sperchontidae	0.46	1
Taeniopterygidae	0.90	-
Tipulidae	0.62	1
Uenoidae	0.26	2

Site Assessment Graphs



Site Assessment Vector Data

Assessment For The Test Site	
Vector 1 Vs Vector 2	Similar to Reference
Vector 1 Vs Vector 3	N/A
Vector 2 Vs Vector 3	N/A
Overall	Similar to Reference

Site Metrics

Metric Name	Test Site	Reference Mean	Standard Deviation	Significant
% Chironomidae	27.9778	7.3784	6.3725	Yes
% Ephemeroptera	67.867	51.6884	18.7502	No
% Ephemeroptera that are Baetidae	72.2449	40.5524	29.9979	No

% EPT Individuals	70.9141	87.6509	7.3598	Yes
% of 2 dominant taxa	77.0083	57.907	14.2204	No
% of dominant taxa	49.0305	39.8013	14.8602	No
% Plecoptera	0.831	31.4161	15.4308	No
% Tricoptera	2.2161	4.5464	2.7593	No
Ephemeroptera taxa	4.0	3.8235	0.809	No
EPT taxa (no)	10.0	13.2941	2.7103	No
No. EPT individuals/Chironomids+EPT Individuals	0.7171	0.9224	0.0666	Yes
Plecoptera taxa	2.0	6.2941	1.1048	Yes
Shannon-Wiener Diversity	1.3421	1.9417	0.391	No
Simpson's Diversity	0.6555	0.756	0.1245	No
Total Abundance	361.0	587.3953	299.0909	No
Total No. of Taxa	15.0	19.2941	3.721	No
Trichoptera taxa	4.0	3.1765	1.4246	No

Site Assessment Report

Site Metadata

Site	NJMIL01
Sample Date	Sep 29 2008
Latitude	N 49° 36' 18.8"
Longitude	W 117° 2' 59.2"
Feature Name	Mill Creek

BEAST Prediction Results

Predictor Variables	Channel Depth - avg,Gradient - <30,Landcover - Ice,Latitude,Longitude				
Predicted Group Number	4				
Group	**1**	**2**	**3**	**4**	**5**
Probability	0.0%	6.1%	16.6%	69.5%	7.7%

Habitat Attributes

Variable	Site	Reference Mean	Standard Deviation
Canopy - % coverage (PercentRange)	2.00	1.70	1.27
Channel Depth - avg (cm)	13.7	21.7	11.9
Channel Depth - max (cm)	22.9	30.6	17.6
General - pH (pH)	7.5	7.8	0.6
Substrate - 2nd dominant size category (Category(0-9))	6	6	1
Substrate - dominant size category (Category(0-9))	7	7	1
Substrate - embeddedness category (Category(1-5))	4	4	1
Velocity (Avg) (m/s)	0.41	0.47	0.29
Velocity (Max) (m/s)	0.68	0.67	0.37
Width - Bankfull (m)	9.2	13.7	13.0
Width - Wetted (m)	5.3	8.4	9.1

Bray-Curtis Analysis

Description	Value
Bray-Curtis Distance	0.43

RIVPACS Taxa Ratios

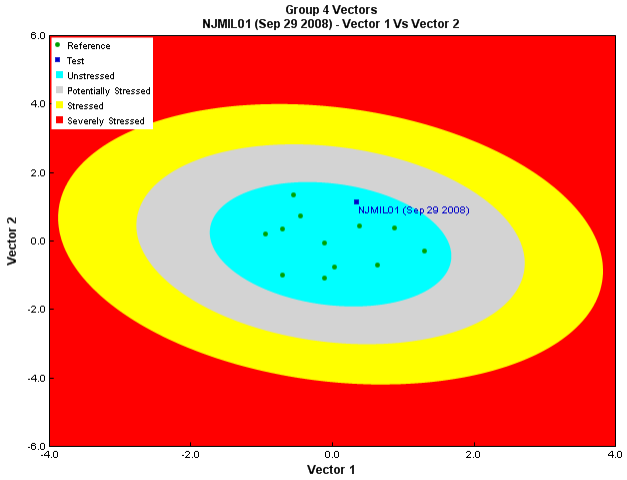
RIVPACS : Expected taxa P>0.50	13.61
RIVPACS : Observed taxa P>0.50	11.00
RIVPACS : O:E (p > 0.5)	0.81
RIVPACS : Expected taxa P>0.70	11.27
RIVPACS : Observed taxa P>0.70	9.00
RIVPACS : O:E (p > 0.7)	0.80

RIVPACS Analysis

Taxa	Probability Of Occurrence	Abundance
Ameletidae	0.47	1
Baetidae	1.00	209
Brachycentridae	0.33	2
Capniidae	0.81	-

Chironomidae	1.00	7
Chloroperlidae	0.98	1
Elmidae	0.49	9
Enchytraeidae	0.07	1
Ephemerellidae	1.00	-
Glossosomatidae	0.41	1
Heptageniidae	1.00	67
Hydropsychidae	0.89	1
Lebertiidae	0.51	1
Leptophlebiidae	0.31	1
Limnephilidae	0.23	1
Nemouridae	1.00	2
Perlidae	0.80	-
Perlodidae	0.90	3
Philopotamidae	0.02	1
Psychodidae	0.26	3
Rhyacophilidae	0.99	5
Sperchontidae	0.46	1
Taeniopterygidae	0.91	29
Tipulidae	0.58	4
Uenoidae	0.26	8

Site Assessment Graphs



Site Assessment Vector Data

Assessment For The Test Site	
Vector 1 Vs Vector 2	Similar to Reference
Vector 1 Vs Vector 3	N/A
Vector 2 Vs Vector 3	N/A
Overall	Similar to Reference

Site Metrics

Metric Name	Test Site	Reference Mean	Standard Deviation	Significant
% Chironomidae	1.8817	7.3784	6.3725	No

% Ephemeroptera	78.4946	51.6884	18.7502	No
% Ephemeroptera that are Baetidae	71.5753	40.5524	29.9979	No
% EPT Individuals	93.0108	87.6509	7.3598	No
% of 2 dominant taxa	74.1935	57.907	14.2204	No
% of dominant taxa	56.1828	39.8013	14.8602	No
% Plecoptera	9.4086	31.4161	15.4308	No
% Tricoptera	5.1075	4.5464	2.7593	No
Ephemeroptera taxa	5.0	3.8235	0.809	No
EPT taxa (no)	16.0	13.2941	2.7103	No
No. EPT individuals/Chironomids+EPT Individuals	0.9802	0.9224	0.0666	No
Plecoptera taxa	4.0	6.2941	1.1048	Yes
Shannon-Wiener Diversity	1.6021	1.9417	0.391	No
Simpson's Diversity	0.6425	0.756	0.1245	No
Total Abundance	372.0	587.3953	299.0909	No
Total No. of Taxa	23.0	19.2941	3.721	No
Trichoptera taxa	7.0	3.1765	1.4246	Yes

Site Assessment Report

Site Metadata

Site	NJMIL01
Sample Date	Sep 18 2012
Latitude	N 49° 36' 3.6"
Longitude	W 117° 3' 0"
Feature Name	Mill Creek

BEAST Prediction Results

Predictor Variables	Channel Depth - avg,Gradient - <30,Landcover - Ice,Latitude,Longitude				
Predicted Group Number	4				
Group	**1**	**2**	**3**	**4**	**5**
Probability	0.1%	5.2%	16.0%	71.5%	7.1%

Habitat Attributes

Variable	Site	Reference Mean	Standard Deviation
Canopy - % coverage (PercentRange)	4.00	1.70	1.27
Channel Depth - avg (cm)	22.0	21.7	11.9
Channel Depth - max (cm)	34.0	30.6	17.6
General - pH (pH)	6.2	7.8	0.6
General - Specific Conductance (@ 25 C) (uS/cm)	112.1000000	162.0405941	105.3178562
Substrate - 2nd dominant size category (Category(0-9))	7	6	1
Substrate - dominant size category (Category(0-9))	6	7	1
Substrate - embeddedness category (Category(1-5))	4	4	1
Velocity (Avg) (m/s)	0.41	0.47	0.29
Velocity (Max) (m/s)	0.60	0.67	0.37
Width - Bankfull (m)	12.2	13.7	13.0
Width - Wetted (m)	5.1	8.4	9.1

Bray-Curtis Analysis

Description	Value
Bray-Curtis Distance	0.22

RIVPACS Taxa Ratios

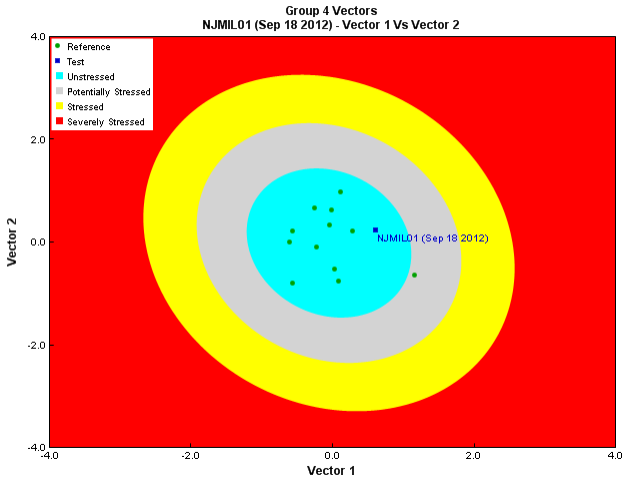
RIVPACS : Expected taxa P>0.50	13.65
RIVPACS : Observed taxa P>0.50	12.00
RIVPACS : O:E (p > 0.5)	0.88
RIVPACS : Expected taxa P>0.70	11.30
RIVPACS : Observed taxa P>0.70	10.00
RIVPACS : O:E (p > 0.7)	0.89

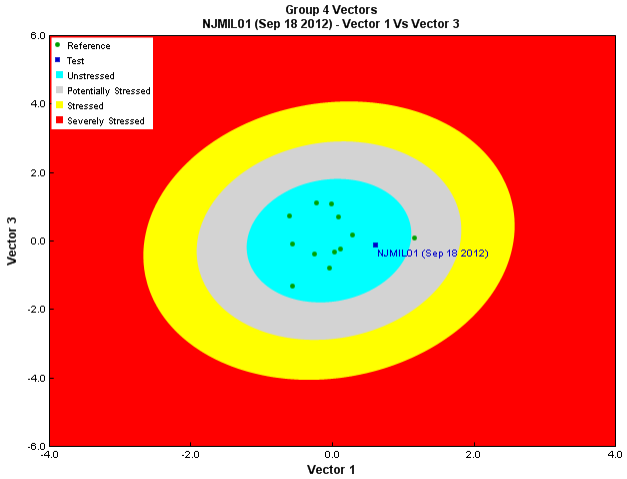
RIVPACS Analysis

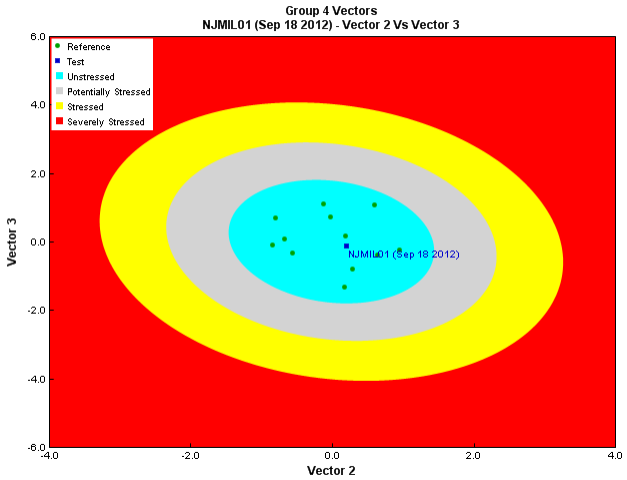
Taxa	Probability Of Occurrence	Abundance
Baetidae	1.00	110

Brachycentridae	0.34	4
Capniidae	0.81	6
Chironomidae	1.00	32
Chloroperlidae	0.98	1
Elmidae	0.49	22
Empididae	0.63	1
Ephemerellidae	1.00	26
Heptageniidae	1.00	79
Hydropsychidae	0.89	-
Hydryphantidae	0.10	1
Lebertiidae	0.52	1
Lepidostomatidae	0.16	7
Nemouridae	1.00	40
Peltoperlidae	0.10	2
Perlidae	0.81	-
Perlodidae	0.90	5
Philopotamidae	0.02	1
Psychodidae	0.25	1
Rhyacophilidae	0.99	26
Sperchontidae	0.46	2
Taeniopterygidae	0.91	145
Torrenticolidae	0.19	1
Uenoidae	0.26	1

Site Assessment Graphs







Site Assessment Vector Data

Assessment For The Test Site	
Vector 1 Vs Vector 2	Similar to Reference
Vector 1 Vs Vector 3	Similar to Reference
Vector 2 Vs Vector 3	Similar to Reference
Overall	Similar to Reference

Site Metrics

Metric Name	Test Site	Reference Mean	Standard Deviation	Significant
% Chironomidae	6.2257	7.3784	6.3725	No
% Ephemeroptera	41.8288	51.6884	18.7502	No
% Ephemeroptera that are Baetidae	51.1628	40.5524	29.9979	No
% EPT Individuals	88.1323	87.6509	7.3598	No
% of 2 dominant taxa	49.6109	57.907	14.2204	No
% of dominant taxa	28.2101	39.8013	14.8602	No
% Plecoptera	38.716	31.4161	15.4308	No
% Tricoptera	7.5875	4.5464	2.7593	No
Ephemeroptera taxa	3.0	3.8235	0.809	No
EPT taxa (no)	14.0	13.2941	2.7103	No
No. EPT individuals/Chironomids+EPT Individuals	0.934	0.9224	0.0666	No

Plecoptera taxa	6.0	6.2941	1.1048	No
Shannon-Wiener Diversity	2.1168	1.9417	0.391	No
Simpson's Diversity	0.8336	0.756	0.1245	No
Total Abundance	514.0	587.3953	299.0909	No
Total No. of Taxa	22.0	19.2941	3.721	No
Trichoptera taxa	5.0	3.1765	1.4246	No

Site Assessment Report

Site Metadata

Site	NJNIX01
Sample Date	Oct 05 2010
Latitude	N 49° 41' 21"
Longitude	W 117° 30' 49"
Feature Name	Slocan

BEAST Prediction Results

Predictor Variables	Channel Depth - avg,Gradient - <30,Landcover - Ice,Latitude,Longitude				
Predicted Group Number	4				
Group	**1**	**2**	**3**	**4**	**5**
Probability	3.2%	0.7%	3.8%	83.3%	8.9%

Habitat Attributes

Variable	Site	Reference Mean	Standard Deviation
Canopy - % coverage (PercentRange)	0.00	1.70	1.27
Channel Depth - avg (cm)	43.9	21.7	11.9
Channel Depth - max (cm)	63.0	30.6	17.6
General - Alkalinity (mg/L)	41.0000000	77.5983193	51.1024162
General - dissolved oxygen (DO) (mg/L)	11.0000000	10.8754545	0.9089839
General - pH (pH)	7.0	7.8	0.6
General - Specific Conductance (@ 25 C) (uS/cm)	82.6000000	162.0405941	105.3178562
Substrate - 2nd dominant size category (Category(0-9))	6	6	1
Substrate - dominant size category (Category(0-9))	7	7	1
Substrate - embeddedness category (Category(1-5))	3	4	1
Substrate - surrounding material size category (Category(0-9))	2	4	2
Velocity (Avg) (m/s)	2.73	0.47	0.29
Velocity (Max) (m/s)	3.46	0.67	0.37
Width - Bankfull (m)	47.2	13.7	13.0
Width - Wetted (m)	35.5	8.4	9.1

Bray-Curtis Analysis

Description	Value
Bray-Curtis Distance	0.87

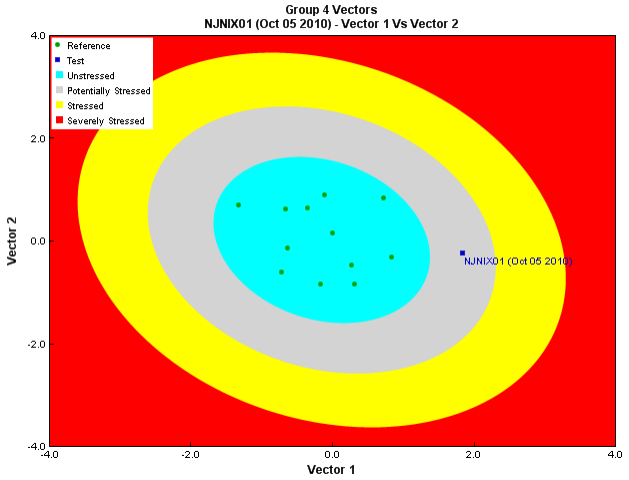
RIVPACS Taxa Ratios

RIVPACS : Expected taxa P>0.50	14.36
RIVPACS : Observed taxa P>0.50	7.00
RIVPACS : O:E (p > 0.5)	0.49
RIVPACS : Expected taxa P>0.70	11.40
RIVPACS : Observed taxa P>0.70	6.00
RIVPACS : O:E (p > 0.7)	0.53

RIVPACS Analysis

Taxa	Probability Of Occurrence	Abundance
Baetidae	1.00	25
Brachycentridae	0.36	29
Capniidae	0.87	-
Chironomidae	1.00	57
Chloroperlidae	0.99	-
Elmidae	0.45	532
Ephemerellidae	0.99	161
Heptageniidae	1.00	32
Hydropsychidae	0.88	125
Hydroptilidae	0.00	4
Hydryphantidae	0.09	4
Hygrobatidae	0.01	14
Lepidostomatidae	0.15	25
Nemouridae	1.00	-
Perlidae	0.86	-
Perlodidae	0.90	4
Pisidiidae	0.07	32
Planorbidae	0.00	7
Pteronarcyidae	0.01	7
Rhyacophilidae	0.99	-
Simuliidae	0.32	39
Taeniopterygidae	0.92	-
Tipulidae	0.63	32
Torrenticolidae	0.16	218

Site Assessment Graphs



Site Assessment Vector Data

Assessment For The Test Site	
Vector 1 Vs Vector 2	Mildly Divergent
Vector 1 Vs Vector 3	N/A
Vector 2 Vs Vector 3	N/A
Overall	Mildly Divergent

Site Metrics

Metric Name	Test Site	Reference Mean	Standard Deviation	Significant
% Chironomidae	4.1131	7.3784	6.3725	No
% Ephemeroptera	15.6815	51.6884	18.7502	No
% Ephemeroptera that are Baetidae	11.4758	40.5524	29.9979	No
% EPT Individuals	29.8203	87.6509	7.3598	Yes
% of 2 dominant taxa	53.9864	57.907	14.2204	No
% of dominant taxa	38.3049	39.8013	14.8602	No
% Plecoptera	0.7709	31.4161	15.4308	No
% Tricoptera	13.3679	4.5464	2.7593	Yes
Ephemeroptera taxa	3.0	3.8235	0.809	No
EPT taxa (no)	10.0	13.2941	2.7103	No
No. EPT individuals/Chironomids+EPT Individuals	0.8788	0.9224	0.0666	No
Plecoptera taxa	2.0	6.2941	1.1048	Yes
Shannon-Wiener Diversity	2.1315	1.9417	0.391	No
Simpson's Diversity	0.8015	0.756	0.1245	No
Total Abundance	1389.22	587.3953	299.0909	Yes
Total No. of Taxa	22.0	19.2941	3.721	No
Trichoptera taxa	5.0	3.1765	1.4246	No

Site Assessment Report

Site Metadata

Site	NJSLO01
Sample Date	Sep 29 2005
Latitude	N 49° 26' 2.02"
Longitude	W 117° 32' 18.61"
Feature Name	Slocan

BEAST Prediction Results

Predictor Variables	Channel Depth - avg,Gradient - <30,Landcover - Ice,Latitude,Longitude				
Predicted Group Number	4				
Group	**1**	**2**	**3**	**4**	**5**
Probability	7.6%	6.5%	7.0%	75.6%	3.4%

Habitat Attributes

Variable	Site	Reference Mean	Standard Deviation
Canopy - % coverage (PercentRange)	1.00	1.70	1.27
Channel Depth - avg (cm)	50.0	21.7	11.9
Channel Depth - max (cm)	50.0	30.6	17.6
General - Alkalinity (mg/L)	55.0000000	77.5983193	51.1024162
General - dissolved oxygen (DO) (mg/L)	10.0000000	10.8754545	0.9089839
General - pH (pH)	7.5	7.8	0.6
General - Specific Conductance (@ 25 C) (uS/cm)	90.0000000	162.0405941	105.3178562
Substrate - 2nd dominant size category (Category(0-9))	6	6	1
Substrate - dominant size category (Category(0-9))	7	7	1
Substrate - embeddedness category (Category(1-5))	4	4	1
Substrate - surrounding material size category (Category(0-9))	3	4	2
Velocity (Avg) (m/s)	1.97	0.47	0.29
Velocity (Max) (m/s)	2.10	0.67	0.37

Bray-Curtis Analysis

Description	Value
Bray-Curtis Distance	0.66

RIVPACS Taxa Ratios

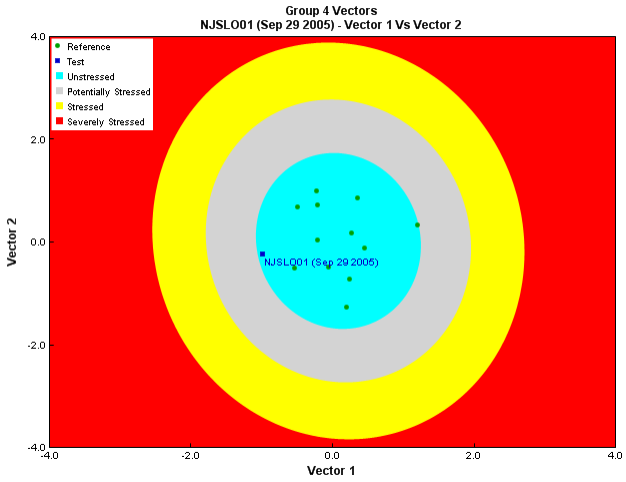
RIVPACS : Expected taxa P>0.50	13.70
RIVPACS : Observed taxa P>0.50	9.00
RIVPACS : O:E (p > 0.5)	0.66
RIVPACS : Expected taxa P>0.70	11.26
RIVPACS : Observed taxa P>0.70	8.00
RIVPACS : O:E (p > 0.7)	0.71

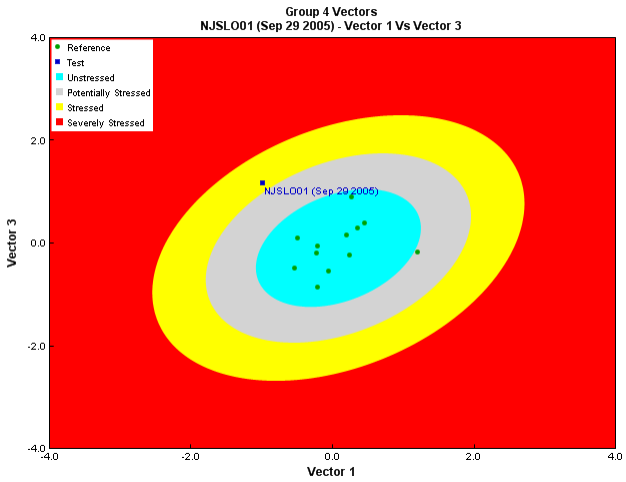
RIVPACS Analysis

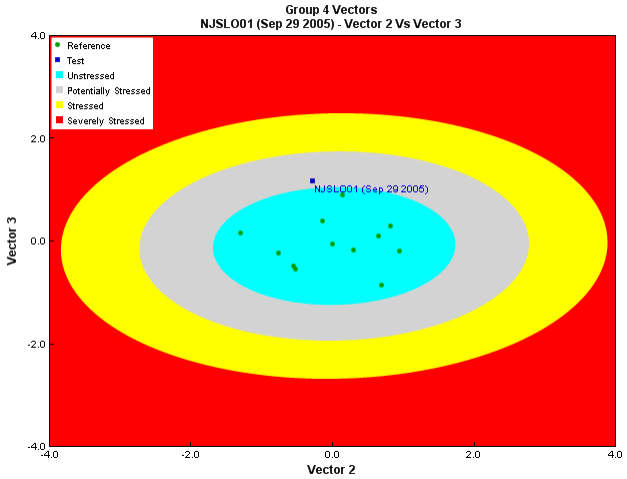
Taxa	Probability Of Occurrence	Abundance
Baetidae	1.00	103

Brachycentridae	0.37	1
Capniidae	0.85	-
Chironomidae	1.00	204
Chloroperlidae	0.97	9
Elmidae	0.47	33
Ephemerellidae	0.98	22
Heptageniidae	1.00	-
Hydropsychidae	0.84	106
Hydroptilidae	0.01	7
Lepidostomatidae	0.17	15
Nemouridae	1.00	-
Perlidae	0.84	1
Perlodidae	0.89	11
Rhyacophilidae	0.99	41
Simuliidae	0.34	26
Taeniopterygidae	0.89	-
Thaumaleidae	0.01	28
Tipulidae	0.62	5

Site Assessment Graphs







Site Assessment Vector Data

Assessment For The Test Site	
Vector 1 Vs Vector 2	Similar to Reference
Vector 1 Vs Vector 3	Divergent
Vector 2 Vs Vector 3	Mildly Divergent
Overall	Divergent

Site Metrics

Metric Name	Test Site	Reference Mean	Standard Deviation	Significant
% Chironomidae	33.1707	7.3784	6.3725	Yes
% Ephemeroptera	20.4878	51.6884	18.7502	No
% Ephemeroptera that are Baetidae	81.746	40.5524	29.9979	No
% EPT Individuals	51.8699	87.6509	7.3598	Yes
% of 2 dominant taxa	50.4065	57.907	14.2204	No
% of dominant taxa	33.1707	39.8013	14.8602	No
% Plecoptera	3.4146	31.4161	15.4308	No
% Tricoptera	27.9675	4.5464	2.7593	Yes
Ephemeroptera taxa	3.0	3.8235	0.809	No
EPT taxa (no)	12.0	13.2941	2.7103	No
No. EPT individuals/Chironomids+EPT Individuals	0.6099	0.9224	0.0666	Yes
Plecoptera taxa	3.0	6.2941	1.1048	Yes
Shannon-Wiener Diversity	2.0638	1.9417	0.391	No
Simpson's Diversity	0.8184	0.756	0.1245	No
Total Abundance	615.0	587.3953	299.0909	No
Total No. of Taxa	17.0	19.2941	3.721	No
Trichoptera taxa	6.0	3.1765	1.4246	No

Site Assessment Report

Site Metadata

Site	NJSLO01
Sample Date	Sep 14 2006
Latitude	N 49° 26' 2.02"
Longitude	W 117° 32' 18.6"
Feature Name	Slocan

BEAST Prediction Results

Predictor Variables	Channel Depth - avg,Gradient - <30,Landcover - Ice,Latitude,Longitude				
Predicted Group Number	4				
Group	**1**	**2**	**3**	**4**	**5**
Probability	7.6%	6.5%	7.0%	75.6%	3.4%

Habitat Attributes

Variable	Site	Reference Mean	Standard Deviation
Canopy - % coverage (PercentRange)	1.00	1.70	1.27
Channel Depth - avg (cm)	50.0	21.7	11.9
General - Alkalinity (mg/L)	47.8000000	77.5983193	51.1024162
General - dissolved oxygen (DO) (mg/L)	10.0000000	10.8754545	0.9089839
General - pH (pH)	7.5	7.8	0.6
Substrate - 2nd dominant size category (Category(0-9))	7	6	1
Substrate - dominant size category (Category(0-9))	6	7	1
Substrate - embeddedness category (Category(1-5))	4	4	1
Substrate - surrounding material size category (Category(0-9))	3	4	2
Velocity (Avg) (m/s)	0.67	0.47	0.29
Velocity (Max) (m/s)	0.77	0.67	0.37

Bray-Curtis Analysis

Description	Value
Bray-Curtis Distance	0.67

RIVPACS Taxa Ratios

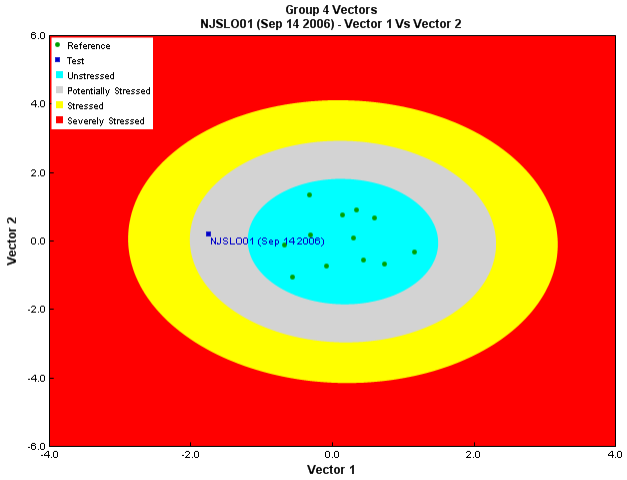
RIVPACS : Expected taxa P>0.50	13.70
RIVPACS : Observed taxa P>0.50	10.00
RIVPACS : O:E (p > 0.5)	0.73
RIVPACS : Expected taxa P>0.70	11.26
RIVPACS : Observed taxa P>0.70	7.00
RIVPACS : O:E (p > 0.7)	0.62

RIVPACS Analysis

Taxa	Probability Of Occurrence	Abundance
Baetidae	1.00	96
Capniidae	0.85	-
Chironomidae	1.00	157

Chloroperlidae	0.97	-
Elmidae	0.47	16
Empididae	0.64	1
Ephemerellidae	0.98	12
Glossosomatidae	0.39	2
Heptageniidae	1.00	1
Hydropsychidae	0.84	17
Hydroptilidae	0.01	13
Hydryphantidae	0.10	1
Lebertiidae	0.57	1
Lepidostomatidae	0.17	29
Nemouridae	1.00	1
Perlidae	0.84	-
Perlodidae	0.89	4
Rhyacophilidae	0.99	-
Simuliidae	0.34	37
Sperchontidae	0.47	9
Taeniopterygidae	0.89	-
Tipulidae	0.62	3
Torrenticolidae	0.20	12

Site Assessment Graphs



Site Assessment Vector Data

Assessment For The Test Site	
Vector 1 Vs Vector 2	Mildly Divergent
Vector 1 Vs Vector 3	N/A
Vector 2 Vs Vector 3	N/A
Overall	Mildly Divergent

Site Metrics

Metric Name	Test Site	Reference Mean	Standard Deviation	Significant
% Chironomidae	38.1068	7.3784	6.3725	Yes
% Ephemeroptera	26.4563	51.6884	18.7502	No

% Ephemeroptera that are Baetidae	88.0734	40.5524	29.9979	No
% EPT Individuals	42.4757	87.6509	7.3598	Yes
% of 2 dominant taxa	61.4078	57.907	14.2204	No
% of dominant taxa	38.1068	39.8013	14.8602	No
% Plecoptera	1.2136	31.4161	15.4308	No
% Tricoptera	14.8058	4.5464	2.7593	Yes
Ephemeroptera taxa	3.0	3.8235	0.809	No
EPT taxa (no)	9.0	13.2941	2.7103	No
No. EPT individuals/Chironomids+EPT Individuals	0.5271	0.9224	0.0666	Yes
Plecoptera taxa	2.0	6.2941	1.1048	Yes
Shannon-Wiener Diversity	1.9463	1.9417	0.391	No
Simpson's Diversity	0.7809	0.756	0.1245	No
Total Abundance	412.0	587.3953	299.0909	No
Total No. of Taxa	18.0	19.2941	3.721	No
Trichoptera taxa	4.0	3.1765	1.4246	No

Site Assessment Report

Site Metadata

Site	NJSLO01
Sample Date	Sep 28 2007
Latitude	N 49° 26' 2.02"
Longitude	W 117° 32' 18.6"
Feature Name	Slocan

BEAST Prediction Results

Predictor Variables	Channel Depth - avg,Gradient - <30,Landcover - Ice,Latitude,Longitude				
Predicted Group Number	4				
Group	**1**	**2**	**3**	**4**	**5**
Probability	10.3%	6.0%	6.7%	73.7%	3.3%

Habitat Attributes

Variable	Site	Reference Mean	Standard Deviation
Canopy - % coverage (PercentRange)	1.00	1.70	1.27
Channel Depth - avg (cm)	52.0	21.7	11.9
General - Alkalinity (mg/L)	54.7000000	77.5983193	51.1024162
General - dissolved oxygen (DO) (mg/L)	10.5000000	10.8754545	0.9089839
General - pH (pH)	6.8	7.8	0.6
General - Specific Conductance (@ 25 C) (uS/cm)	91.4000000	162.0405941	105.3178562
Substrate - 2nd dominant size category (Category(0-9))	7	6	1
Substrate - dominant size category (Category(0-9))	6	7	1
Substrate - embeddedness category (Category(1-5))	4	4	1
Substrate - surrounding material size category (Category(0-9))	2	4	2
Velocity (Avg) (m/s)	0.86	0.47	0.29
Velocity (Max) (m/s)	1.10	0.67	0.37

Bray-Curtis Analysis

Description	Value
Bray-Curtis Distance	0.65

RIVPACS Taxa Ratios

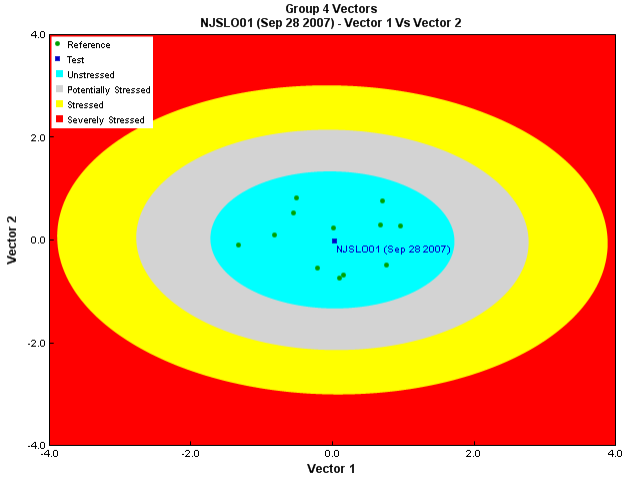
RIVPACS : Expected taxa P>0.50	13.64
RIVPACS : Observed taxa P>0.50	11.00
RIVPACS : O:E (p > 0.5)	0.81
RIVPACS : Expected taxa P>0.70	11.21
RIVPACS : Observed taxa P>0.70	9.00
RIVPACS : O:E (p > 0.7)	0.80

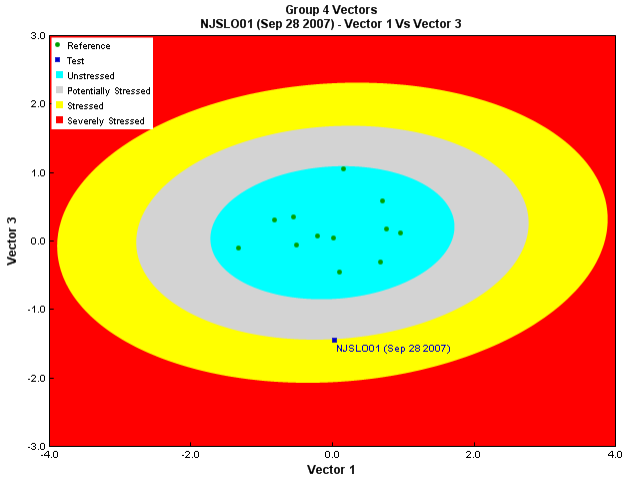
RIVPACS Analysis

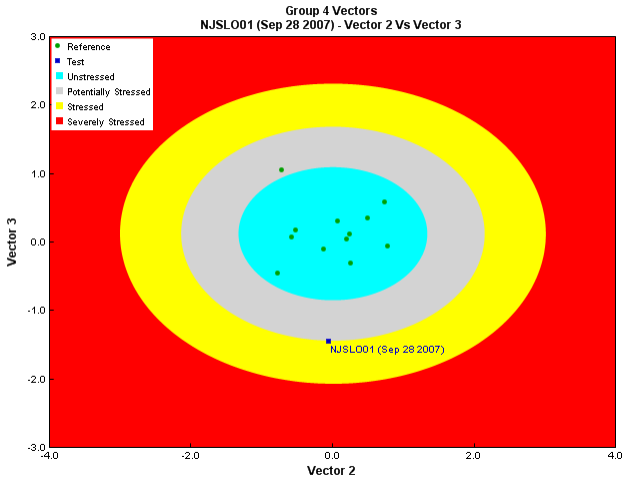
Taxa	Probability Of Occurrence	Abundance
Baetidae	1.00	119
Brachycentridae	0.36	35

Capniidae	0.84	-
Chironomidae	1.00	178
Chloroperlidae	0.97	-
Elmidae	0.46	24
Empididae	0.65	3
Enchytraeidae	0.08	3
Ephemerellidae	0.98	78
Glossosomatidae	0.39	3
Heptageniidae	1.00	8
Hydropsychidae	0.82	46
Hydroptilidae	0.02	32
Lepidostomatidae	0.16	32
Leptophlebiidae	0.31	3
Nemouridae	1.00	3
Perlidae	0.82	3
Perlodidae	0.89	5
Rhyacophilidae	0.99	3
Simuliidae	0.34	27
Sperchontidae	0.48	22
Taeniopterygidae	0.90	-
Tipulidae	0.61	3
Torrenticolidae	0.20	11

Site Assessment Graphs







Site Assessment Vector Data

Assessment For The Test Site	
Vector 1 Vs Vector 2	Similar to Reference
Vector 1 Vs Vector 3	Divergent
Vector 2 Vs Vector 3	Divergent
Overall	Divergent

Site Metrics

Metric Name	Test Site	Reference Mean	Standard Deviation	Significant
% Chironomidae	27.8507	7.3784	6.3725	Yes
% Ephemeroptera	32.4897	51.6884	18.7502	No
% Ephemeroptera that are Baetidae	57.1463	40.5524	29.9979	No
% EPT Individuals	57.8047	87.6509	7.3598	Yes
% of 2 dominant taxa	46.4174	57.907	14.2204	No
% of dominant taxa	27.8507	39.8013	14.8602	No
% Plecoptera	1.6863	31.4161	15.4308	No
% Tricoptera	23.6287	4.5464	2.7593	Yes
Ephemeroptera taxa	4.0	3.8235	0.809	No
EPT taxa (no)	13.0	13.2941	2.7103	No
No. EPT individuals/Chironomids+EPT Individuals	0.6749	0.9224	0.0666	Yes

Plecoptera taxa	3.0	6.2941	1.1048	Yes
Shannon-Wiener Diversity	2.2971	1.9417	0.391	No
Simpson's Diversity	0.8547	0.756	0.1245	No
Total Abundance	640.45	587.3953	299.0909	No
Total No. of Taxa	21.0	19.2941	3.721	No
Trichoptera taxa	6.0	3.1765	1.4246	No

Site Assessment Report

Site Metadata

Site	NJSLO01
Sample Date	Oct 02 2008
Latitude	N 49° 26' 2.02"
Longitude	W 117° 32' 18.6"
Feature Name	Slocan

BEAST Prediction Results

Predictor Variables	Channel Depth - avg,Gradient - <30,Landcover - Ice,Latitude,Longitude				
Predicted Group Number	4				
Group	**1**	**2**	**3**	**4**	**5**
Probability	0.8%	9.2%	8.0%	77.9%	4.1%

Habitat Attributes

Variable	Site	Reference Mean	Standard Deviation
Canopy - % coverage (PercentRange)	1.00	1.70	1.27
Channel Depth - avg (cm)	36.0	21.7	11.9
General - Alkalinity (mg/L)	32.0000000	77.5983193	51.1024162
General - dissolved oxygen (DO) (mg/L)	11.0000000	10.8754545	0.9089839
General - pH (pH)	7.4	7.8	0.6
General - Specific Conductance (@ 25 C) (uS/cm)	76.0000000	162.0405941	105.3178562
Substrate - 2nd dominant size category (Category(0-9))	5	6	1
Substrate - dominant size category (Category(0-9))	6	7	1
Substrate - embeddedness category (Category(1-5))	4	4	1
Substrate - surrounding material size category (Category(0-9))	2	4	2
Velocity (Avg) (m/s)	0.86	0.47	0.29
Velocity (Max) (m/s)	1.10	0.67	0.37

Bray-Curtis Analysis

Description	Value
Bray-Curtis Distance	0.71

RIVPACS Taxa Ratios

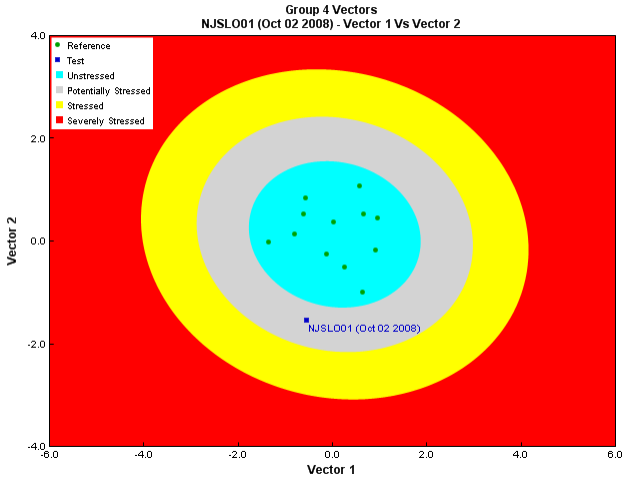
RIVPACS : Expected taxa P>0.50	14.32
RIVPACS : Observed taxa P>0.50	14.00
RIVPACS : O:E (p > 0.5)	0.98
RIVPACS : Expected taxa P>0.70	11.37
RIVPACS : Observed taxa P>0.70	11.00
RIVPACS : O:E (p > 0.7)	0.97

RIVPACS Analysis

Taxa	Probability Of Occurrence	Abundance
Baetidae	1.00	47
Brachycentridae	0.39	2

Capniidae	0.84	-
Chironomidae	1.00	37
Chloroperlidae	0.98	6
Elmidae	0.51	27
Empididae	0.64	2
Ephemerellidae	1.00	16
Glossosomatidae	0.42	25
Heptageniidae	1.00	11
Hydropsychidae	0.90	117
Hydroptilidae	0.01	3
Lepidostomatidae	0.19	79
Leptophlebiidae	0.35	1
Nemouridae	1.00	1
Perlidae	0.88	4
Perlodidae	0.90	7
Rhyacophilidae	0.99	1
Simuliidae	0.35	1
Taeniopterygidae	0.89	1
Tipulidae	0.61	2

Site Assessment Graphs



Site Assessment Vector Data

Assessment For The Test Site	
Vector 1 Vs Vector 2	Mildly Divergent
Vector 1 Vs Vector 3	N/A
Vector 2 Vs Vector 3	N/A
Overall	Mildly Divergent

Site Metrics

Metric Name	Test Site	Reference Mean	Standard Deviation	Significant
% Chironomidae	9.4872	7.3784	6.3725	No
% Ephemeroptera	19.2308	51.6884	18.7502	No
% Ephemeroptera that are Baetidae	62.6667	40.5524	29.9979	No

% EPT Individuals	82.3077	87.6509	7.3598	No
% of 2 dominant taxa	50.2564	57.907	14.2204	No
% of dominant taxa	30.0	39.8013	14.8602	No
% Plecoptera	4.8718	31.4161	15.4308	No
% Tricoptera	58.2051	4.5464	2.7593	Yes
Ephemeroptera taxa	4.0	3.8235	0.809	No
EPT taxa (no)	15.0	13.2941	2.7103	No
No. EPT individuals/Chironomids+EPT Individuals	0.8966	0.9224	0.0666	No
Plecoptera taxa	5.0	6.2941	1.1048	No
Shannon-Wiener Diversity	2.1341	1.9417	0.391	No
Simpson's Diversity	0.8332	0.756	0.1245	No
Total Abundance	390.0	587.3953	299.0909	No
Total No. of Taxa	20.0	19.2941	3.721	No
Trichoptera taxa	6.0	3.1765	1.4246	No

Site Assessment Report

Site Metadata

Site	NJSLO01
Sample Date	Sep 29 2009
Latitude	N 49° 26' 59"
Longitude	W 117° 32' 5"
Feature Name	Slocan

BEAST Prediction Results

Predictor Variables	Channel Depth - avg,Gradient - <30,Landcover - Ice,Latitude,Longitude				
Predicted Group Number	4				
Group	**1**	**2**	**3**	**4**	**5**
Probability	2.2%	7.9%	7.8%	78.1%	4.0%

Habitat Attributes

Variable	Site	Reference Mean	Standard Deviation
Canopy - % coverage (PercentRange)	2.00	1.70	1.27
Channel Depth - avg (cm)	42.0	21.7	11.9
Channel Depth - max (cm)	46.0	30.6	17.6
General - dissolved oxygen (DO) (mg/L)	11.0000000	10.8754545	0.9089839
General - pH (pH)	7.5	7.8	0.6
General - Specific Conductance (@ 25 C) (uS/cm)	188.6000000	162.0405941	105.3178562
Substrate - 2nd dominant size category (Category(0-9))	7	6	1
Substrate - dominant size category (Category(0-9))	6	7	1
Substrate - embeddedness category (Category(1-5))	4	4	1
Substrate - surrounding material size category (Category(0-9))	3	4	2
Velocity (Avg) (m/s)	0.66	0.47	0.29
Velocity (Max) (m/s)	0.89	0.67	0.37
Width - Bankfull (m)	30.0	13.7	13.0
Width - Wetted (m)	25.0	8.4	9.1

Bray-Curtis Analysis

Description	Value
Bray-Curtis Distance	0.86

RIVPACS Taxa Ratios

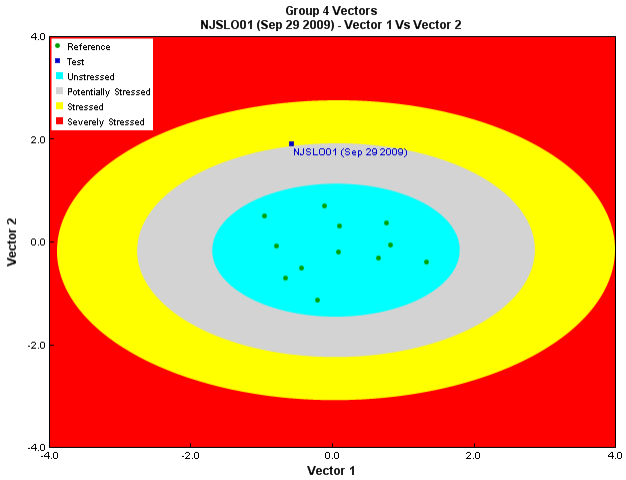
RIVPACS : Expected taxa P>0.50	13.79
RIVPACS : Observed taxa P>0.50	8.00
RIVPACS : O:E (p > 0.5)	0.58
RIVPACS : Expected taxa P>0.70	11.36
RIVPACS : Observed taxa P>0.70	7.00
RIVPACS : O:E (p > 0.7)	0.62

RIVPACS Analysis

Taxa	Probability Of Occurrence	Abundance

Baetidae	1.00	14
Brachycentridae	0.38	2
Capniidae	0.84	-
Chironomidae	1.00	68
Chloroperlidae	0.98	4
Elmidae	0.50	136
Empididae	0.64	2
Ephemerellidae	1.00	-
Heptageniidae	1.00	-
Hydropsychidae	0.89	72
Lepidostomatidae	0.18	44
Nemouridae	1.00	-
Perlidae	0.88	-
Perlodidae	0.90	4
Pteronarcyidae	0.02	2
Rhyacophilidae	0.99	2
Simuliidae	0.34	18
Taeniopterygidae	0.89	4

Site Assessment Graphs



Site Assessment Vector Data

Assessment For The Test Site	
Vector 1 Vs Vector 2	Divergent
Vector 1 Vs Vector 3	N/A
Vector 2 Vs Vector 3	N/A
Overall	Divergent

Site Metrics

Metric Name	Test Site	Reference Mean	Standard Deviation	Significant
% Chironomidae	17.5258	7.3784	6.3725	No
% Ephemeroptera	7.2165	51.6884	18.7502	Yes
% Ephemeroptera that are Baetidae	50.0	40.5524	29.9979	No
% EPT Individuals	42.268	87.6509	7.3598	Yes

% of 2 dominant taxa	53.6082	57.907	14.2204	No
% of dominant taxa	35.0515	39.8013	14.8602	No
% Plecoptera	3.6082	31.4161	15.4308	No
% Tricoptera	31.4433	4.5464	2.7593	Yes
Ephemeroptera taxa	2.0	3.8235	0.809	Yes
EPT taxa (no)	11.0	13.2941	2.7103	No
No. EPT individuals/Chironomids+EPT Individuals	0.7069	0.9224	0.0666	Yes
Plecoptera taxa	4.0	6.2941	1.1048	Yes
Shannon-Wiener Diversity	1.8915	1.9417	0.391	No
Simpson's Diversity	0.7939	0.756	0.1245	No
Total Abundance	388.0	587.3953	299.0909	No
Total No. of Taxa	15.0	19.2941	3.721	No
Trichoptera taxa	5.0	3.1765	1.4246	No

Site Assessment Report

Site Metadata

Site	NJSLO01
Sample Date	Sep 21 2011
Latitude	N 49° 25' 48"
Longitude	W 117° 31' 58.8"
Feature Name	Slocan

BEAST Prediction Results

Predictor Variables	Channel Depth - avg,Gradient - <30,Landcover - Ice,Latitude,Longitude				
Predicted Group Number	4				
Group	**1**	**2**	**3**	**4**	**5**
Probability	25.5%	4.3%	5.4%	62.3%	2.5%

Habitat Attributes

Variable	Site	Reference Mean	Standard Deviation
Canopy - % coverage (PercentRange)	1.00	1.70	1.27
Channel Depth - avg (cm)	58.6	21.7	11.9
Channel Depth - max (cm)	69.0	30.6	17.6
General - Alkalinity (mg/L)	40.5000000	77.5983193	51.1024162
General - dissolved oxygen (DO) (mg/L)	12.0000000	10.8754545	0.9089839
General - pH (pH)	6.1	7.8	0.6
General - Specific Conductance (@ 25 C) (uS/cm)	87.9000000	162.0405941	105.3178562
Substrate - 2nd dominant size category (Category(0-9))	7	6	1
Substrate - dominant size category (Category(0-9))	6	7	1
Substrate - embeddedness category (Category(1-5))	4	4	1
Velocity (Avg) (m/s)	0.66	0.47	0.29
Velocity (Max) (m/s)	1.25	0.67	0.37
Width - Bankfull (m)	30.0	13.7	13.0
Width - Wetted (m)	25.0	8.4	9.1

Bray-Curtis Analysis

Description	Value
Bray-Curtis Distance	0.69

RIVPACS Taxa Ratios

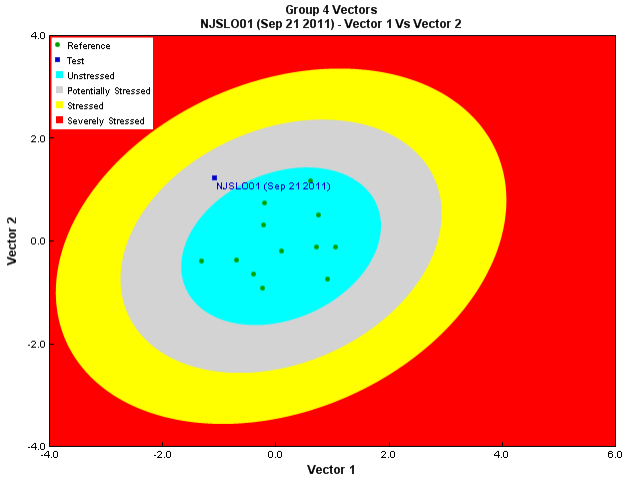
RIVPACS : Expected taxa P>0.50	14.32
RIVPACS : Observed taxa P>0.50	12.00
RIVPACS : O:E (p > 0.5)	0.84
RIVPACS : Expected taxa P>0.70	10.89
RIVPACS : Observed taxa P>0.70	10.00
RIVPACS : O:E (p > 0.7)	0.92

RIVPACS Analysis

Taxa	Probability Of Occurrence	Abundance

Baetidae	1.00	115
Brachycentridae	0.32	5
Capniidae	0.84	-
Chironomidae	1.00	98
Chloroperlidae	0.94	5
Elmidae	0.38	93
Empididae	0.65	10
Ephemerellidae	0.94	32
Glossosomatidae	0.34	93
Heptageniidae	1.00	5
Hydropsychidae	0.70	178
Lepidostomatidae	0.13	107
Nemouridae	1.00	5
Perlidae	0.71	7
Perlodidae	0.87	56
Pteronarcyidae	0.01	2
Rhyacophilidae	1.00	5
Simuliidae	0.34	10
Taeniopterygidae	0.90	-
Tipulidae	0.61	5

Site Assessment Graphs



Site Assessment Vector Data

Assessment For The Test Site	
Vector 1 Vs Vector 2	Mildly Divergent
Vector 1 Vs Vector 3	N/A
Vector 2 Vs Vector 3	N/A
Overall	Mildly Divergent

Site Metrics

Metric Name	Test Site	Reference Mean	Standard Deviation	Significant
% Chironomidae	11.7663	7.3784	6.3725	No
% Ephemeroptera	18.2355	51.6884	18.7502	No

% Ephemeroptera that are Baetidae	75.8135	40.5524	29.9979	No
% EPT Individuals	74.1169	87.6509	7.3598	No
% of 2 dominant taxa	35.2976	57.907	14.2204	No
% of dominant taxa	21.4726	39.8013	14.8602	No
% Plecoptera	9.1142	31.4161	15.4308	No
% Tricoptera	46.7672	4.5464	2.7593	Yes
Ephemeroptera taxa	3.0	3.8235	0.809	No
EPT taxa (no)	13.0	13.2941	2.7103	No
No. EPT individuals/Chironomids+EPT Individuals	0.863	0.9224	0.0666	No
Plecoptera taxa	5.0	6.2941	1.1048	No
Shannon-Wiener Diversity	2.2615	1.9417	0.391	No
Simpson's Diversity	0.8726	0.756	0.1245	No
Total Abundance	829.15	587.3953	299.0909	No
Total No. of Taxa	18.0	19.2941	3.721	No
Trichoptera taxa	5.0	3.1765	1.4246	No

Site Assessment Report

Site Metadata

Site	NJSLO02
Sample Date	Oct 13 2005
Latitude	N 49° 45' 36"
Longitude	W 117° 28' 31"
Feature Name	Slocan

BEAST Prediction Results

Predictor Variables	Channel Depth - avg,Gradient - <30,Landcover - Ice,Latitude,Longitude				
Predicted Group Number	4				
Group	**1**	**2**	**3**	**4**	**5**
Probability	0.0%	12.0%	12.1%	64.1%	11.8%

Habitat Attributes

Variable	Site	Reference Mean	Standard Deviation
Canopy - % coverage (PercentRange)	2.00	1.70	1.27
Channel Depth - max (cm)	50.0	30.6	17.6
Substrate - 2nd dominant size category (Category(0-9))	8	6	1
Substrate - dominant size category (Category(0-9))	7	7	1
Width - Bankfull (m)	65.0	13.7	13.0
Width - Wetted (m)	59.0	8.4	9.1

Bray-Curtis Analysis

Description	Value
Bray-Curtis Distance	0.86

RIVPACS Taxa Ratios

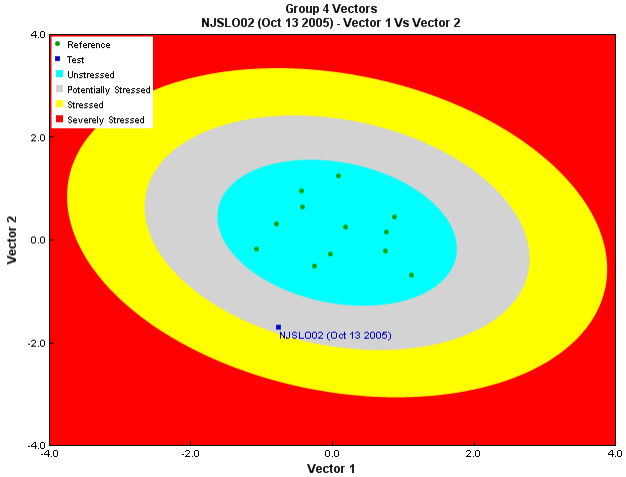
RIVPACS : Expected taxa P>0.50	13.51
RIVPACS : Observed taxa P>0.50	6.00
RIVPACS : O:E (p > 0.5)	0.44
RIVPACS : Expected taxa P>0.70	11.19
RIVPACS : Observed taxa P>0.70	5.00
RIVPACS : O:E (p > 0.7)	0.45

RIVPACS Analysis

Taxa	Probability Of Occurrence	Abundance
Baetidae	1.00	22
Brachycentridae	0.35	3
Capniidae	0.79	-
Chironomidae	0.99	335
Chloroperlidae	0.98	3
Elmidae	0.49	96
Ephemerellidae	1.00	35
Heptageniidae	1.00	-
Hydropsychidae	0.89	129

Hydroptilidae	0.01	4
Nemouridae	1.00	-
Perlidae	0.78	-
Perlodidae	0.88	-
Rhyacophilidae	0.98	-
Taeniopterygidae	0.88	-
Tipulidae	0.58	1

Site Assessment Graphs



Site Assessment Vector Data

Assessment For The Test Site	
Vector 1 Vs Vector 2	Mildly Divergent
Vector 1 Vs Vector 3	N/A
Vector 2 Vs Vector 3	N/A
Overall	Mildly Divergent

Site Metrics

Metric Name	Test Site	Reference Mean	Standard Deviation	Significant
% Chironomidae	53.3439	7.3784	6.3725	Yes
% Ephemeroptera	9.0764	51.6884	18.7502	Yes
% Ephemeroptera that are Baetidae	38.5965	40.5524	29.9979	No
% EPT Individuals	31.2102	87.6509	7.3598	Yes
% of 2 dominant taxa	73.8854	57.907	14.2204	No
% of dominant taxa	53.3439	39.8013	14.8602	No
% Plecoptera	0.4777	31.4161	15.4308	Yes
% Tricoptera	21.6561	4.5464	2.7593	Yes
Ephemeroptera taxa	2.0	3.8235	0.809	Yes
EPT taxa (no)	6.0	13.2941	2.7103	Yes
No. EPT individuals/Chironomids+EPT Individuals	0.3691	0.9224	0.0666	Yes
Plecoptera taxa	1.0	6.2941	1.1048	Yes
Shannon-Wiener Diversity	1.3193	1.9417	0.391	No
Simpson's Diversity	0.6455	0.756	0.1245	No

Total Abundance	628.0	587.3953	299.0909	No
Total No. of Taxa	9.0	19.2941	3.721	Yes
Trichoptera taxa	3.0	3.1765	1.4246	No

Site Assessment Report

Site Metadata

Site	NJSLO02
Sample Date	Oct 06 2006
Latitude	N 49° 45' 36"
Longitude	W 117° 28' 31"
Feature Name	Slocan

BEAST Prediction Results

Predictor Variables	Channel Depth - avg,Gradient - <30,Landcover - Ice,Latitude,Longitude				
Predicted Group Number	4				
Group	**1**	**2**	**3**	**4**	**5**
Probability	0.0%	12.0%	12.1%	64.1%	11.8%

Habitat Attributes

Variable	Site	Reference Mean	Standard Deviation
Canopy - % coverage (PercentRange)	3.00	1.70	1.27
Channel Depth - max (cm)	50.0	30.6	17.6
General - Alkalinity (mg/L)	48.0000000	77.5983193	51.1024162
General - dissolved oxygen (DO) (mg/L)	9.6000000	10.8754545	0.9089839
General - pH (pH)	7.2	7.8	0.6
Substrate - 2nd dominant size category (Category(0-9))	6	6	1
Substrate - dominant size category (Category(0-9))	7	7	1
Substrate - embeddedness category (Category(1-5))	4	4	1
Substrate - surrounding material size category (Category(0-9))	4	4	2
Width - Bankfull (m)	65.0	13.7	13.0
Width - Wetted (m)	59.0	8.4	9.1

Bray-Curtis Analysis

Description	Value
Bray-Curtis Distance	0.87

RIVPACS Taxa Ratios

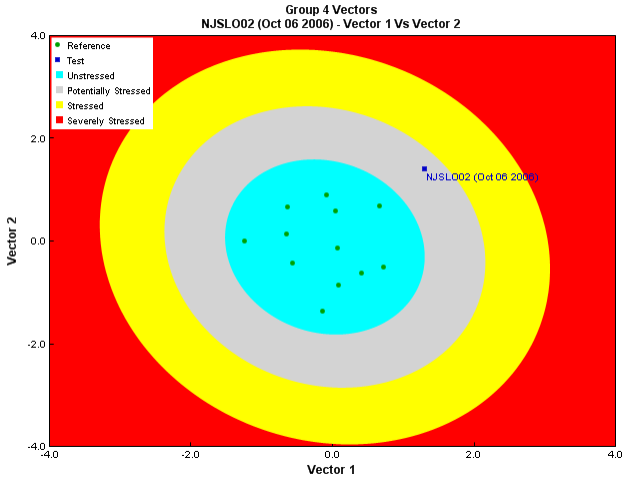
RIVPACS : Expected taxa P>0.50	13.51
RIVPACS : Observed taxa P>0.50	7.00
RIVPACS : O:E (p > 0.5)	0.52
RIVPACS : Expected taxa P>0.70	11.19
RIVPACS : Observed taxa P>0.70	5.00
RIVPACS : O:E (p > 0.7)	0.45

RIVPACS Analysis

Taxa	Probability Of Occurrence	Abundance
Baetidae	1.00	4
Brachycentridae	0.35	3
Capniidae	0.79	-

Chironomidae	0.99	44
Chloroperlidae	0.98	-
Elmidae	0.49	50
Empididae	0.62	2
Ephemerellidae	1.00	264
Glossosomatidae	0.41	37
Heptageniidae	1.00	-
Hydropsychidae	0.89	-
Hydroptilidae	0.01	6
Hydryphantidae	0.11	1
Lepidostomatidae	0.19	1
Nemouridae	1.00	-
Perlidae	0.78	-
Perlodidae	0.88	-
Rhyacophilidae	0.98	1
Simuliidae	0.34	2
Sperchontidae	0.48	2
Taeniopterygidae	0.88	1
Tipulidae	0.58	4
Torrenticolidae	0.24	1

Site Assessment Graphs



Site Assessment Vector Data

Assessment For The Test Site	
Vector 1 Vs Vector 2	Mildly Divergent
Vector 1 Vs Vector 3	N/A
Vector 2 Vs Vector 3	N/A
Overall	Mildly Divergent

Site Metrics

Metric Name	Test Site	Reference Mean	Standard Deviation	Significant
% Chironomidae	10.0228	7.3784	6.3725	No
% Ephemeroptera	61.0478	51.6884	18.7502	No

% Ephemeroptera that are Baetidae	1.4925	40.5524	29.9979	No
% EPT Individuals	75.3986	87.6509	7.3598	No
% of 2 dominant taxa	71.5262	57.907	14.2204	No
% of dominant taxa	60.1367	39.8013	14.8602	No
% Plecoptera	0.2278	31.4161	15.4308	Yes
% Tricoptera	14.123	4.5464	2.7593	Yes
Ephemeroptera taxa	2.0	3.8235	0.809	Yes
EPT taxa (no)	9.0	13.2941	2.7103	No
No. EPT individuals/Chironomids+EPT Individuals	0.8827	0.9224	0.0666	No
Plecoptera taxa	1.0	6.2941	1.1048	Yes
Shannon-Wiener Diversity	1.4481	1.9417	0.391	No
Simpson's Diversity	0.6067	0.756	0.1245	No
Total Abundance	439.0	587.3953	299.0909	No
Total No. of Taxa	18.0	19.2941	3.721	No
Trichoptera taxa	6.0	3.1765	1.4246	No

Site Assessment Report

Site Metadata

Site	NJSLO02
Sample Date	Oct 09 2007
Latitude	N 49° 45' 36"
Longitude	W 117° 28' 31"
Feature Name	Slocan

BEAST Prediction Results

Predictor Variables	Channel Depth - avg,Gradient - <30,Landcover - Ice,Latitude,Longitude				
Predicted Group Number	4				
Group	**1**	**2**	**3**	**4**	**5**
Probability	0.0%	12.0%	12.1%	64.1%	11.8%

Habitat Attributes

Variable	Site	Reference Mean	Standard Deviation
Canopy - % coverage (PercentRange)	1.00	1.70	1.27
Channel Depth - max (cm)	50.0	30.6	17.6
General - Alkalinity (mg/L)	41.0000000	77.5983193	51.1024162
General - dissolved oxygen (DO) (mg/L)	10.0000000	10.8754545	0.9089839
General - pH (pH)	7.2	7.8	0.6
General - Specific Conductance (@ 25 C) (uS/cm)	86.4000000	162.0405941	105.3178562
Substrate - 2nd dominant size category (Category(0-9))	7	6	1
Substrate - dominant size category (Category(0-9))	6	7	1
Substrate - embeddedness category (Category(1-5))	3	4	1
Substrate - surrounding material size category (Category(0-9))	2	4	2
Width - Bankfull (m)	65.0	13.7	13.0
Width - Wetted (m)	59.0	8.4	9.1

Bray-Curtis Analysis

Description	Value
Bray-Curtis Distance	0.89

RIVPACS Taxa Ratios

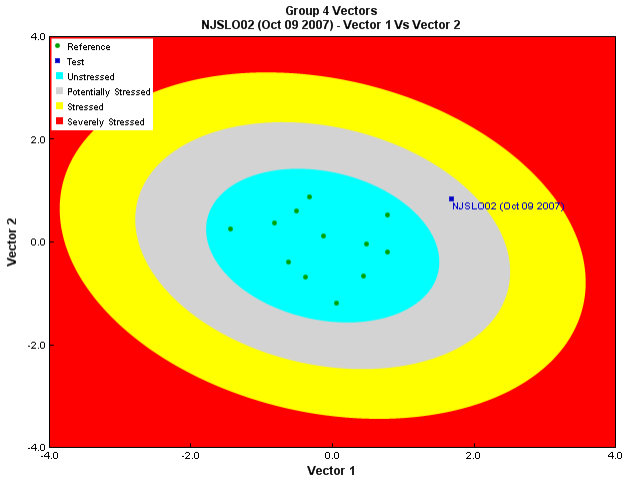
RIVPACS : Expected taxa P>0.50	13.51
RIVPACS : Observed taxa P>0.50	5.00
RIVPACS : O:E (p > 0.5)	0.37
RIVPACS : Expected taxa P>0.70	11.19
RIVPACS : Observed taxa P>0.70	4.00
RIVPACS : O:E (p > 0.7)	0.36

RIVPACS Analysis

Taxa	Probability Of Occurrence	Abundance
Baetidae	1.00	-
Capniidae	0.79	-

Chironomidae	0.99	86
Chloroperlidae	0.98	-
Elmidae	0.49	83
Empididae	0.62	6
Ephemerellidae	1.00	317
Glossosomatidae	0.41	9
Heptageniidae	1.00	3
Hydropsychidae	0.89	106
Hydroptilidae	0.01	3
Hygrobatidae	0.05	6
Nemouridae	1.00	-
Perlidae	0.78	-
Perlodidae	0.88	-
Rhyacophilidae	0.98	-
Simuliidae	0.34	3
Sperchontidae	0.48	3
Taeniopterygidae	0.88	-

Site Assessment Graphs



Site Assessment Vector Data

Assessment For The Test Site	
Vector 1 Vs Vector 2	Mildly Divergent
Vector 1 Vs Vector 3	N/A
Vector 2 Vs Vector 3	N/A
Overall	Mildly Divergent

Site Metrics

Metric Name	Test Site	Reference Mean	Standard Deviation	Significant
% Chironomidae	13.5752	7.3784	6.3725	No
% Ephemeroptera	50.6819	51.6884	18.7502	No
% Ephemeroptera that are Baetidae	0.0	40.5524	29.9979	No
% EPT Individuals	70.5909	87.6509	7.3598	Yes
% of 2 dominant taxa	66.9734	57.907	14.2204	No

% of dominant taxa	50.2305	39.8013	14.8602	No
% Plecoptera	0.0	31.4161	15.4308	Yes
% Tricoptera	19.9091	4.5464	2.7593	Yes
Ephemeroptera taxa	2.0	3.8235	0.809	Yes
EPT taxa (no)	6.0	13.2941	2.7103	Yes
No. EPT individuals/Chironomids+EPT Individuals	0.8387	0.9224	0.0666	No
Plecoptera taxa	0.0	6.2941	1.1048	Yes
Shannon-Wiener Diversity	1.482	1.9417	0.391	No
Simpson's Diversity	0.6834	0.756	0.1245	No
Total Abundance	631.37	587.3953	299.0909	No
Total No. of Taxa	12.0	19.2941	3.721	No
Trichoptera taxa	4.0	3.1765	1.4246	No

Site Assessment Report

Site Metadata

Site	NJSLO02
Sample Date	Oct 23 2008
Latitude	N 49° 45' 36"
Longitude	W 117° 28' 31"
Feature Name	Slocan

BEAST Prediction Results

Predictor Variables	Channel Depth - avg,Gradient - <30,Landcover - Ice,Latitude,Longitude				
Predicted Group Number	4				
Group	**1**	**2**	**3**	**4**	**5**
Probability	0.0%	12.0%	12.1%	64.1%	11.8%

Habitat Attributes

Variable	Site	Reference Mean	Standard Deviation
Canopy - % coverage (PercentRange)	1.00	1.70	1.27
Channel Depth - max (cm)	50.0	30.6	17.6
General - Alkalinity (mg/L)	41.0000000	77.5983193	51.1024162
General - dissolved oxygen (DO) (mg/L)	11.0000000	10.8754545	0.9089839
General - pH (pH)	7.7	7.8	0.6
Substrate - 2nd dominant size category (Category(0-9))	5	6	1
Substrate - dominant size category (Category(0-9))	6	7	1
Substrate - embeddedness category (Category(1-5))	3	4	1
Substrate - surrounding material size category (Category(0-9))	4	4	2
Width - Bankfull (m)	65.0	13.7	13.0
Width - Wetted (m)	59.0	8.4	9.1

Bray-Curtis Analysis

Description	Value
Bray-Curtis Distance	0.92

RIVPACS Taxa Ratios

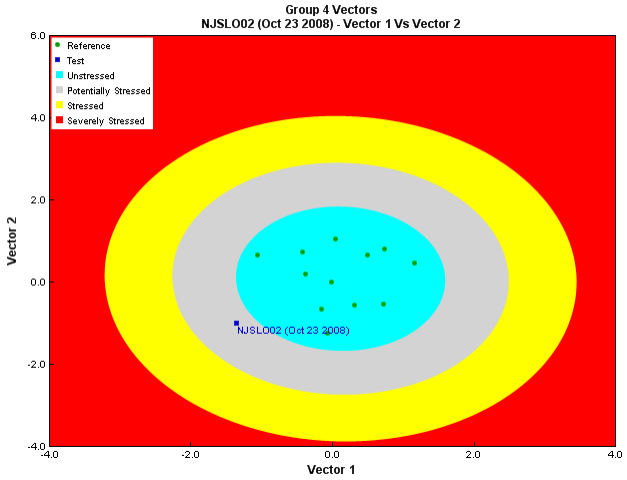
RIVPACS : Expected taxa P>0.50	13.51
RIVPACS : Observed taxa P>0.50	5.00
RIVPACS : O:E (p > 0.5)	0.37
RIVPACS : Expected taxa P>0.70	11.19
RIVPACS : Observed taxa P>0.70	3.00
RIVPACS : O:E (p > 0.7)	0.27

RIVPACS Analysis

Taxa	Probability Of Occurrence	Abundance
Baetidae	1.00	-
Capniidae	0.79	-
Chironomidae	0.99	64

Chloroperlidae	0.98	-
Elmidae	0.49	163
Empididae	0.62	10
Ephemerellidae	1.00	-
Glossosomatidae	0.41	5
Heptageniidae	1.00	-
Hydropsychidae	0.89	170
Hydroptilidae	0.01	4
Hygrobatidae	0.05	6
Lepidostomatidae	0.19	6
Nemouridae	1.00	-
Perlidae	0.78	-
Perlodidae	0.88	1
Pisidiidae	0.06	2
Rhyacophilidae	0.98	-
Simuliidae	0.34	8
Sperchontidae	0.48	4
Taeniopterygidae	0.88	-
Tipulidae	0.58	22
Torrenticolidae	0.24	1

Site Assessment Graphs



Site Assessment Vector Data

Assessment For The Test Site	
Vector 1 Vs Vector 2	Mildly Divergent
Vector 1 Vs Vector 3	N/A
Vector 2 Vs Vector 3	N/A
Overall	Mildly Divergent

Site Metrics

Metric Name	Test Site	Reference Mean	Standard Deviation	Significant
% Chironomidae	9.9844	7.3784	6.3725	No
% Ephemeroptera	25.897	51.6884	18.7502	No

% Ephemeroptera that are Baetidae	0.0	40.5524	29.9979	No
% EPT Individuals	56.3183	87.6509	7.3598	Yes
% of 2 dominant taxa	52.4181	57.907	14.2204	No
% of dominant taxa	26.5211	39.8013	14.8602	No
% Plecoptera	0.156	31.4161	15.4308	Yes
% Tricoptera	30.2652	4.5464	2.7593	Yes
Ephemeroptera taxa	1.0	3.8235	0.809	Yes
EPT taxa (no)	7.0	13.2941	2.7103	Yes
No. EPT individuals/Chironomids+EPT Individuals	0.8494	0.9224	0.0666	No
Plecoptera taxa	1.0	6.2941	1.1048	Yes
Shannon-Wiener Diversity	1.8022	1.9417	0.391	No
Simpson's Diversity	0.7859	0.756	0.1245	No
Total Abundance	641.0	587.3953	299.0909	No
Total No. of Taxa	16.0	19.2941	3.721	No
Trichoptera taxa	5.0	3.1765	1.4246	No

Site Assessment Report

Site Metadata

Site	NJSLO02
Sample Date	Oct 06 2009
Latitude	N 49° 45' 19"
Longitude	W 117° 28' 27"
Feature Name	Slocan

BEAST Prediction Results

Predictor Variables	Channel Depth - avg,Gradient - <30,Landcover - Ice,Latitude,Longitude				
Predicted Group Number	4				
Group	**1**	**2**	**3**	**4**	**5**
Probability	0.0%	12.0%	12.0%	64.2%	11.7%

Habitat Attributes

Variable	Site	Reference Mean	Standard Deviation
Canopy - % coverage (PercentRange)	3.00	1.70	1.27
General - dissolved oxygen (DO) (mg/L)	12.0000000	10.8754545	0.9089839
General - pH (pH)	7.5	7.8	0.6
General - Specific Conductance (@ 25 C) (uS/cm)	37.0000000	162.0405941	105.3178562
Substrate - 2nd dominant size category (Category(0-9))	7	6	1
Substrate - dominant size category (Category(0-9))	6	7	1
Substrate - embeddedness category (Category(1-5))	3	4	1
Substrate - surrounding material size category (Category(0-9))	3	4	2

Bray-Curtis Analysis

Description	Value
Bray-Curtis Distance	0.95

RIVPACS Taxa Ratios

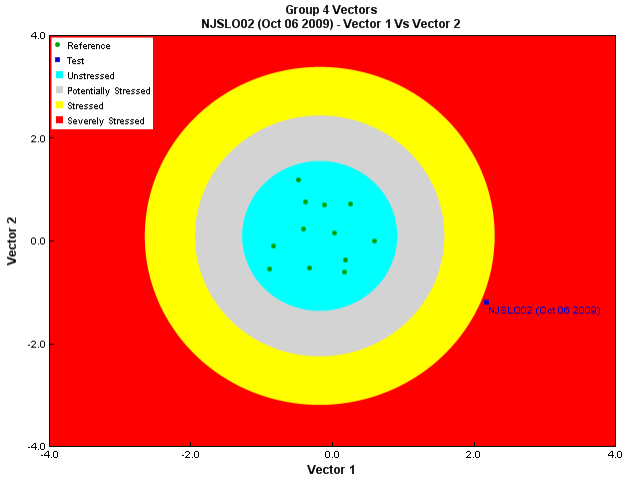
RIVPACS : Expected taxa P>0.50	13.51
RIVPACS : Observed taxa P>0.50	6.00
RIVPACS : O:E (p > 0.5)	0.44
RIVPACS : Expected taxa P>0.70	11.19
RIVPACS : Observed taxa P>0.70	4.00
RIVPACS : O:E (p > 0.7)	0.36

RIVPACS Analysis

Taxa	Probability Of Occurrence	Abundance
Baetidae	1.00	-
Capniidae	0.79	-
Chironomidae	0.99	44
Chloroperlidae	0.98	-
Elmidae	0.49	688
Empididae	0.62	69

Ephemerellidae	1.00	238
Glossosomatidae	0.41	25
Heptageniidae	1.00	-
Hydropsychidae	0.89	750
Nemouridae	1.00	-
Perlidae	0.79	-
Perlodidae	0.88	19
Rhyacophilidae	0.98	-
Taeniopterygidae	0.88	-
Tipulidae	0.58	6

Site Assessment Graphs



Site Assessment Vector Data

Assessment For The Test Site	
Vector 1 Vs Vector 2	Highly Divergent
Vector 1 Vs Vector 3	N/A
Vector 2 Vs Vector 3	N/A
Overall	Highly Divergent

Site Metrics

Metric Name	Test Site	Reference Mean	Standard Deviation	Significant
% Chironomidae	2.349	7.3784	6.3725	No
% Ephemeroptera	12.7517	51.6884	18.7502	Yes
% Ephemeroptera that are Baetidae	0.0	40.5524	29.9979	No
% EPT Individuals	56.7114	87.6509	7.3598	Yes
% of 2 dominant taxa	77.1812	57.907	14.2204	No
% of dominant taxa	40.2685	39.8013	14.8602	No
% Plecoptera	1.0067	31.4161	15.4308	No
% Tricoptera	42.953	4.5464	2.7593	Yes
Ephemeroptera taxa	1.0	3.8235	0.809	Yes
EPT taxa (no)	5.0	13.2941	2.7103	Yes
No. EPT individuals/Chironomids+EPT Individuals	0.9602	0.9224	0.0666	No

Plecoptera taxa	1.0	6.2941	1.1048	Yes
Shannon-Wiener Diversity	1.3878	1.9417	0.391	No
Simpson's Diversity	0.6829	0.756	0.1245	No
Total Abundance	1862.5	587.3953	299.0909	Yes
Total No. of Taxa	9.0	19.2941	3.721	Yes
Trichoptera taxa	3.0	3.1765	1.4246	No

Site Assessment Report

Site Metadata

Site	NJSLO03
Sample Date	Oct 13 2005
Latitude	N 49° 35' 59"
Longitude	W 117° 33' 59"
Feature Name	Slocan

BEAST Prediction Results

Predictor Variables	Channel Depth - avg,Gradient - <30,Landcover - Ice,Latitude,Longitude				
Predicted Group Number	4				
Group	**1**	**2**	**3**	**4**	**5**
Probability	0.0%	16.7%	9.9%	65.5%	7.9%

Habitat Attributes

Variable	Site	Reference Mean	Standard Deviation
Canopy - % coverage (PercentRange)	4.00	1.70	1.27
Substrate - 2nd dominant size category (Category(0-9))	7	6	1
Substrate - dominant size category (Category(0-9))	6	7	1
Velocity (Avg) (m/s)	1.00	0.47	0.29

Bray-Curtis Analysis

Description	Value
Bray-Curtis Distance	0.88

RIVPACS Taxa Ratios

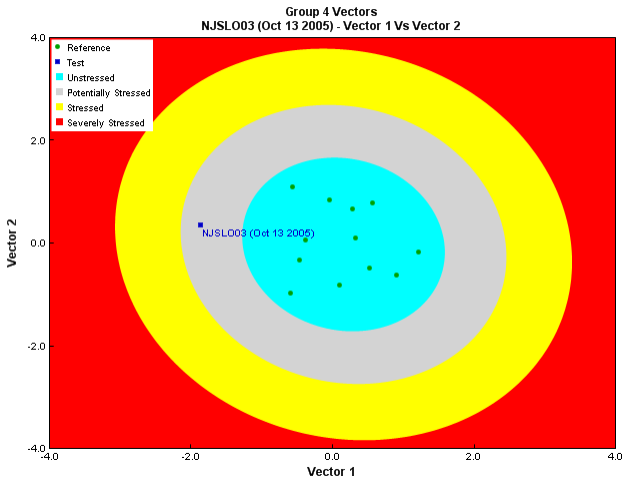
RIVPACS : Expected taxa P>0.50	14.09
RIVPACS : Observed taxa P>0.50	6.00
RIVPACS : O:E (p > 0.5)	0.43
RIVPACS : Expected taxa P>0.70	11.21
RIVPACS : Observed taxa P>0.70	4.00
RIVPACS : O:E (p > 0.7)	0.36

RIVPACS Analysis

Taxa	Probability Of Occurrence	Abundance
Baetidae	1.00	15
Brachycentridae	0.39	2
Capniidae	0.80	-
Chironomidae	1.00	240
Chloroperlidae	0.97	-
Elmidae	0.52	25
Ephemerellidae	1.00	-
Heptageniidae	1.00	-
Hydropsychidae	0.90	1
Hydroptilidae	0.01	16
Leptophlebiidae	0.38	1

Nemouridae	1.00	-
Perlidae	0.83	-
Perlodidae	0.88	8
Rhyacophilidae	0.98	-
Simuliidae	0.35	3
Taeniopterygidae	0.86	-
Thaumaleidae	0.01	1
Tipulidae	0.59	3

Site Assessment Graphs



Site Assessment Vector Data

Assessment For The Test Site	
Vector 1 Vs Vector 2	Mildly Divergent
Vector 1 Vs Vector 3	N/A
Vector 2 Vs Vector 3	N/A
Overall	Mildly Divergent

Site Metrics

Metric Name	Test Site	Reference Mean	Standard Deviation	Significant
% Chironomidae	75.4717	7.3784	6.3725	Yes
% Ephemeroptera	5.0314	51.6884	18.7502	Yes
% Ephemeroptera that are Baetidae	93.75	40.5524	29.9979	No
% EPT Individuals	14.4654	87.6509	7.3598	Yes
% of 2 dominant taxa	83.3333	57.907	14.2204	No
% of dominant taxa	75.4717	39.8013	14.8602	Yes
% Plecoptera	2.5157	31.4161	15.4308	No
% Tricoptera	6.9182	4.5464	2.7593	No
Ephemeroptera taxa	2.0	3.8235	0.809	Yes
EPT taxa (no)	7.0	13.2941	2.7103	Yes
No. EPT individuals/Chironomids+EPT Individuals	0.1608	0.9224	0.0666	Yes
Plecoptera taxa	1.0	6.2941	1.1048	Yes
Shannon-Wiener Diversity	1.0177	1.9417	0.391	Yes

Simpson's Diversity	0.4185	0.756	0.1245	Yes
Total Abundance	318.0	587.3953	299.0909	No
Total No. of Taxa	12.0	19.2941	3.721	No
Trichoptera taxa	4.0	3.1765	1.4246	No

Site Assessment Report

Site Metadata

Site	NJWIL01
Sample Date	Oct 16 2009
Latitude	N 50° 1' 45"
Longitude	W 117° 24' 31"
Feature Name	Wilson Cr

BEAST Prediction Results

Predictor Variables	Channel Depth - avg,Gradient - <30,Landcover - Ice,Latitude,Longitude				
Predicted Group Number	4				
Group	**1**	**2**	**3**	**4**	**5**
Probability	0.3%	2.9%	10.9%	66.1%	19.7%

Habitat Attributes

Variable	Site	Reference Mean	Standard Deviation
Canopy - % coverage (PercentRange)	4.00	1.70	1.27
Channel Depth - avg (cm)	23.8	21.7	11.9
Channel Depth - max (cm)	34.0	30.6	17.6
General - dissolved oxygen (DO) (mg/L)	11.0000000	10.8754545	0.9089839
General - pH (pH)	8.2	7.8	0.6
General - Specific Conductance (@ 25 C) (uS/cm)	125.0000000	162.0405941	105.3178562
Substrate - 2nd dominant size category (Category(0-9))	6	6	1
Substrate - dominant size category (Category(0-9))	7	7	1
Substrate - embeddedness category (Category(1-5))	4	4	1
Substrate - surrounding material size category (Category(0-9))	1	4	2
Velocity (Avg) (m/s)	0.48	0.47	0.29
Velocity (Max) (m/s)	0.77	0.67	0.37
Width - Bankfull (m)	40.0	13.7	13.0
Width - Wetted (m)	33.0	8.4	9.1

Bray-Curtis Analysis

Description	Value
Bray-Curtis Distance	0.5

RIVPACS Taxa Ratios

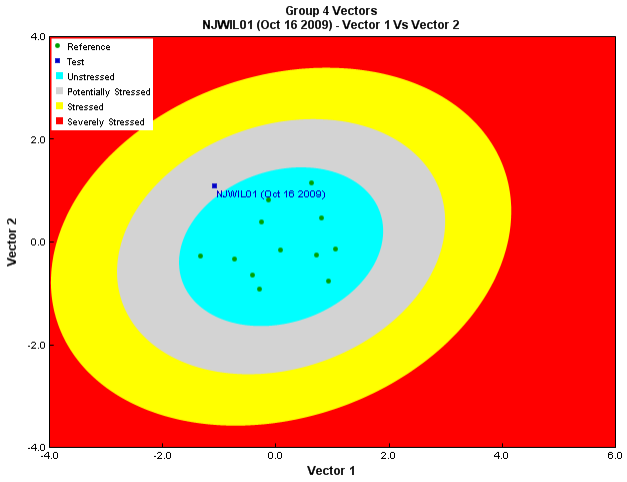
RIVPACS : Expected taxa P>0.50	13.53
RIVPACS : Observed taxa P>0.50	10.00
RIVPACS : O:E (p > 0.5)	0.74
RIVPACS : Expected taxa P>0.70	11.20
RIVPACS : Observed taxa P>0.70	8.00
RIVPACS : O:E (p > 0.7)	0.71

RIVPACS Analysis

Taxa	Probability Of Occurrence	Abundance

Ameletidae	0.51	2
Baetidae	0.99	113
Capniidae	0.81	1
Chironomidae	0.99	7
Chloroperlidae	0.99	1
Ephemerellidae	1.00	14
Glossosomatidae	0.40	3
Heptageniidae	1.00	21
Hydropsychidae	0.89	-
Limnephilidae	0.26	1
Nemouridae	1.00	1
Perlidae	0.73	-
Perlodidae	0.89	-
Rhyacophilidae	0.99	-
Taeniopterygidae	0.92	1
Tipulidae	0.57	1
Uenoidae	0.29	2

Site Assessment Graphs



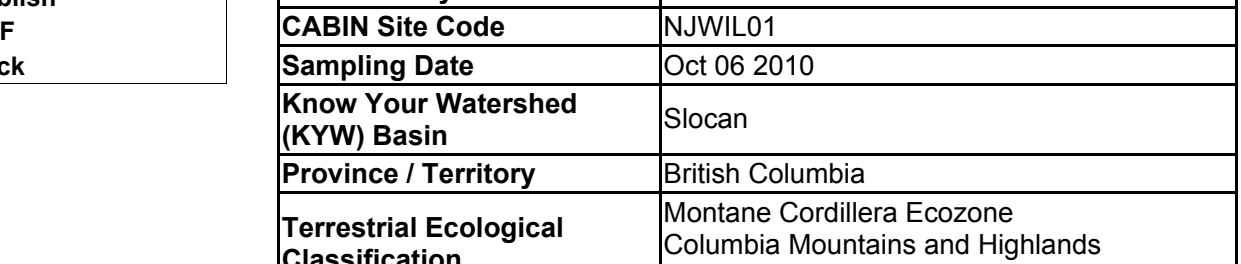
Site Assessment Vector Data

Assessment For The Test Site	
Vector 1 Vs Vector 2	Mildly Divergent
Vector 1 Vs Vector 3	N/A
Vector 2 Vs Vector 3	N/A
Overall	Mildly Divergent

Site Metrics

Metric Name	Test Site	Reference Mean	Standard Deviation	Significant
% Chironomidae	4.1667	7.3784	6.3725	No
% Ephemeroptera	89.2857	51.6884	18.7502	Yes
% Ephemeroptera that are Baetidae	75.3333	40.5524	29.9979	No
% EPT Individuals	95.2381	87.6509	7.3598	No
% of 2 dominant taxa	79.7619	57.907	14.2204	No

% of dominant taxa	67.2619	39.8013	14.8602	No
% Plecoptera	2.381	31.4161	15.4308	No
% Tricoptera	3.5714	4.5464	2.7593	No
Ephemeroptera taxa	4.0	3.8235	0.809	No
EPT taxa (no)	11.0	13.2941	2.7103	No
No. EPT individuals/Chironomids+EPT Individuals	0.9581	0.9224	0.0666	No
Plecoptera taxa	4.0	6.2941	1.1048	Yes
Shannon-Wiener Diversity	1.2265	1.9417	0.391	No
Simpson's Diversity	0.5225	0.756	0.1245	No
Total Abundance	168.0	587.3953	299.0909	No
Total No. of Taxa	13.0	19.2941	3.721	No
Trichoptera taxa	3.0	3.1765	1.4246	No



Return to CABIN data management
Modify
Delete
Publish
PDF
Back

Site Assessment Report

A. Site Description

CABIN Study Name	CBWN-Slocan River
CABIN Site Code	NJWIL01
Sampling Date	Oct 06 2010
Know Your Watershed (KYW) Basin	Slocan
Province / Territory	British Columbia
Terrestrial Ecological Classification	Montane Cordillera Ecozone Columbia Mountains and Highlands Ecoregion
Coordinates (decimal degrees)	50.02933 N, 117.40872 W
Altitude	1824
Feature Name	Wilson Cr
Stream Order	6

B. CABIN Assessment Results

REFERENCE MODEL SUMMARY					
Model Name	Columbia-Okanagan Preliminary March 2010				
Analysis Date	August 29, 2013				
Taxanomic Level	Family				
Predictor Variables	Depth-Avg Latitude Longitude Reg-Ice SlopeLT30%				
Reference Groups	**1**	**2**	**3**	**4**	**5**
Number of Reference Sites	9	43	17	12	33
Group Error Rate	22.2%	24.5%	22.2%	25.0%	32.4%
Overall Model Error Rate	26.4%				
Probability of Group Membership	0.0%	4.6%	11.8%	60.2%	23.4%
CABIN Assessment of NJWIL01 on Oct 06, 2010	Similar to Reference				

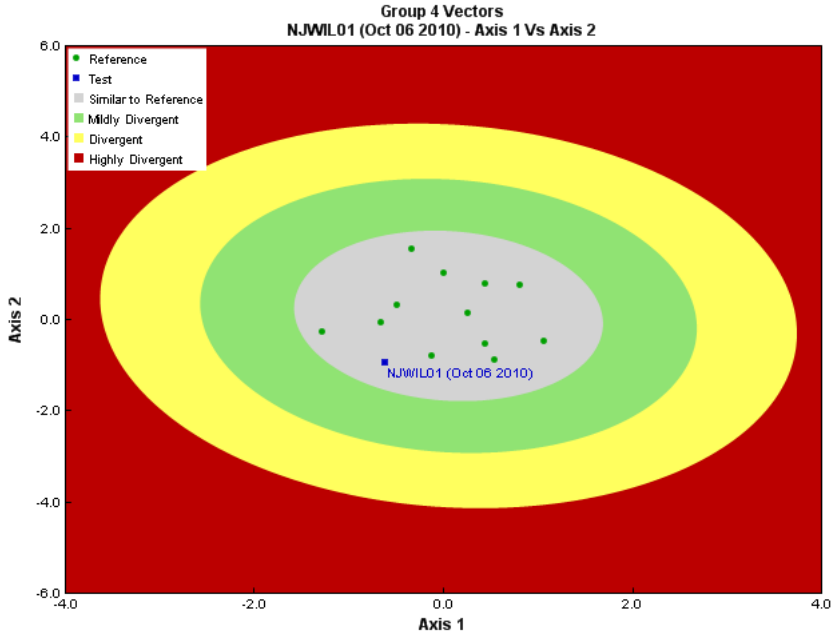


Figure 3. CABIN ordination assessment of the test site with the predicted group of reference sites. Each axis represents the relative abundance of the entire benthic invertebrate community with different organisms weighted differently on each axis.

Sample Information

Sampling Device	Kick Net
Mesh Size	400
Sampling Time	3
Taxonomist	Eco Analsyts, EcoAnalysts
Identification Date	October 06, 2010
Subsampling Device	Marchant Box
Proportion Subsampled	42/100

Community Structure Sample Data

Phylum	Class	Order	Family	Raw Count	Mean Count
Arthropoda	Arachnida			6	14.3
	Insecta	Coleoptera	Elmidae	7	16.7
		Diptera	Chironomidae	13	31.0
			Empididae	6	14.3
			Tipulidae	1	2.4
		Ephemeroptera		140	333.3
			Ephemerellidae	39	92.8
			Heptageniidae	79	188.1
			Leptophlebiidae	3	7.1
		Plecoptera	Capniidae	1	2.4
			Chloroperlidae	3	7.1
			Nemouridae	26	61.9
			Perlidae	5	11.9
			Perlodidae	1	2.4
			Taeniopterygidae	1	2.4
		Trichoptera	Brachycentridae	1	2.4

			Glossosomatidae	6	14.3
			Hydropsychidae	4	9.5
			Philopotamidae	1	2.4
			Rhyacophilidae	2	4.8
			Total	345	821.5

Site Metrics

Metric Name	NJWIL01	Predicted Group Reference Mean ±SD
Bray-Curtis Distance	0.48	0.4 ± 0.1
Number Of Individuals		
% Chironomidae	6.5	7.4 ± 6.4
% Ephemeroptera	60.8	51.7 ± 18.7
% Ephemeroptera that are Baetidae	0.0	40.6 ± 30.0
% EPT Individuals	86.4	87.7 ± 7.3
% of 2 dominant taxa	59.3	57.9 ± 14.2
% of dominant taxa	39.7	39.8 ± 14.9
% Plecoptera	18.6	31.4 ± 15.4
% Tricoptera	7.0	4.5 ± 2.8
No. EPT individuals/Chironomids+EPT Individuals	0.9	0.9 ± 0.1
Total Abundance	473.7	587.2 ± 299.2
Richness		
Ephemeroptera taxa	3.0	3.8 ± 0.8
EPT taxa (no)	14.0	13.3 ± 2.7
Plecoptera taxa	6.0	6.3 ± 1.1
Shannon-Wiener Diversity	2.0	1.9 ± 0.4
Simpson's Diversity	0.8	0.8 ± 0.1
Total No. of Taxa	18.0	19.1 ± 3.6
Trichoptera taxa	5.0	3.2 ± 1.4

Frequency and Probability of Taxa Occurence

Reference Model Taxa	Frequency of Occurence in Reference Sites					Probability Of Occurrence at NJWIL01
	Group 1	Group 2	Group 3	Group 4	Group 5	
Ameletidae	56%	53%	22%	50%	68%	0.51
Apataniidae	22%	24%	28%	25%	3%	0.20
Athericidae	0%	2%	0%	17%	0%	0.10
Aturidae	0%	8%	0%	0%	0%	0.00
Baetidae	100%	100%	100%	100%	97%	0.99
Blephariceridae	0%	0%	0%	0%	5%	0.01
Brachycentridae	11%	69%	0%	42%	3%	0.29
Capniidae	78%	55%	50%	92%	68%	0.79
Ceratopogonidae	0%	55%	28%	42%	5%	0.32
Chironomidae	100%	100%	100%	100%	95%	0.99
Chloroperlidae	78%	88%	94%	100%	100%	0.99
Corixidae	11%	0%	0%	0%	0%	0.00

Curculionidae	0%	4%	0%	0%	0%	0.00
Deuterophlebiidae	0%	0%	0%	0%	3%	0.01
Dixidae	0%	10%	0%	0%	0%	0.00
Dytiscidae	0%	8%	6%	0%	0%	0.01
Elmidae	0%	86%	50%	50%	5%	0.41
Empididae	67%	55%	50%	67%	57%	0.62
Enchytraeidae	11%	14%	0%	8%	0%	0.06
Ephemerellidae	78%	100%	100%	100%	100%	1.00
Ephydridae	0%	2%	0%	0%	0%	0.00
Glossosomatidae	11%	49%	39%	42%	35%	0.40
Heptageniidae	100%	100%	100%	100%	100%	1.00
Hydraenidae	0%	4%	0%	0%	0%	0.00
Hydrophilidae	11%	2%	0%	0%	0%	0.00
Hydropsychidae	11%	92%	78%	92%	86%	0.89
Hydroptilidae	11%	8%	0%	0%	0%	0.00
Hydrozetidae	0%	10%	17%	8%	16%	0.11
Hydryphantidae	11%	31%	11%	8%	8%	0.10
Hygrobatidae	0%	29%	0%	0%	11%	0.04
Lebertiidae	78%	65%	39%	58%	5%	0.44
Lepidostomatidae	0%	53%	6%	17%	8%	0.15
Leptohyphidae	0%	2%	0%	0%	0%	0.00
Leptophlebiidae	0%	90%	11%	33%	3%	0.26
Leuctridae	22%	43%	56%	67%	54%	0.61
Limnephilidae	22%	31%	6%	25%	41%	0.27
Limnesiidae	0%	2%	0%	0%	0%	0.00
Lumbriculidae	0%	20%	17%	25%	3%	0.19
Mideopsidae	0%	2%	0%	0%	0%	0.00
Naididae	0%	6%	39%	0%	3%	0.06
Nemouridae	100%	100%	100%	100%	100%	1.00
Pelecorhynchidae	0%	22%	6%	0%	0%	0.02
Peltoperlidae	22%	12%	6%	8%	41%	0.16
Perlidae	11%	84%	33%	100%	3%	0.69
Perlodidae	78%	78%	89%	92%	81%	0.88
Philopotamidae	0%	31%	0%	0%	3%	0.02
Pisidiidae	0%	6%	0%	8%	0%	0.05
Planorbidae	0%	0%	0%	0%	3%	0.01
Psychodidae	22%	65%	94%	8%	11%	0.22
Pteronarcyidae	0%	12%	6%	0%	3%	0.02
Rhyacophilidae	100%	92%	100%	100%	95%	0.98
Simuliidae	33%	49%	39%	33%	16%	0.31
Sperchontidae	78%	63%	50%	42%	65%	0.49
Stygothrombidiidae	0%	4%	0%	17%	0%	0.10
Taeniopterygidae	89%	49%	100%	92%	97%	0.92
Thaumaleidae	11%	4%	0%	0%	0%	0.00
Tipulidae	56%	55%	28%	67%	43%	0.56
Torrenticolidae	11%	86%	11%	17%	11%	0.18
Tubificidae	0%	4%	0%	0%	0%	0.00

Uenoidae	22%	37%	17%	25%	46%	0.29
Valvatidae	0%	2%	6%	0%	0%	0.01

RIVPACS : Expected taxa P>0.50	13.42
RIVPACS : Observed taxa P>0.50	13.00
RIVPACS : O:E (p > 0.5)	0.97
RIVPACS : Expected taxa P>0.70	10.44
RIVPACS : Observed taxa P>0.70	10.00
RIVPACS : O:E (p > 0.7)	0.96

D. Habitat Description

Variable	NJWIL01	Predicted Group Reference Mean ±SD
Channel		
Macrophyte (PercentRange)	0	0 ± 0
Reach-%CanopyCoverage (PercentRange)	1.00	1.33 ± 0.78
Reach-DomStreamsideVeg (Category (1-4))	2	4 ± 1
Reach-Pools (Binary)	1	1 ± 0
Reach-Rapids (Binary)	1	0 ± 0
Reach-Riffles (Binary)	1	1 ± 0
Reach-StraightRun (Binary)	1	1 ± 1
Veg-Coniferous (Binary)	1	1 ± 0
Veg-Deciduous (Binary)	1	1 ± 0
Veg-GrassesFerns (Binary)	1	1 ± 0
Veg-Shrubs (Binary)	1	1 ± 0
Landcover		
Reg-Ice (%)	0.21	0.02 ± 0.06
Substrate Data		
%Bedrock (%)	0	0 ± 0
%Boulder (%)	15	9 ± 9
%Cobble (%)	81	51 ± 15
%Gravel (%)	0	3 ± 3
%Pebble (%)	4	37 ± 20
%Sand (%)	0	0 ± 0
%Silt+Clay (%)	0	0 ± 0
D50 (cm)	16.00	14.58 ± 14.69
Dg (cm)	15.8	8.2 ± 2.8
Dominant-1st (Category(0-9))	7	7 ± 1
Dominant-2nd (Category(0-9))	6	7 ± 1
Embeddedness (Category(1-5))	4	5 ± 1
PeriphytonCoverage (Category(1-5))	1	1 ± 0
SurroundingMaterial (Category(0-9))	1	4 ± 1
Topography		
SlopeLT30% (%)	16.66	18.88 ± 9.30

Water Chemistry		
General-Alkalinity (mg/L)	38.0000000	71.7000000 ± 53.9231440
General-DO (mg/L)	12.0000000	11.4175000 ± 0.7986708
General-pH (pH)	7.3	7.9 ± 0.4
General-SpCond (uS/cm)	88.0000000	168.9833333 ± 123.7858182
General-TempAir (Degrees Celsius)	7.0	26.0
General-TempWater (Degrees Celsius)	6.0000000	7.3183333 ± 2.7240839
General-Turbidity (NTU)	0.4500000	0.2020000
Nitrogen-NO2+NO3 (mg/L)	0.0700000	0.0690000
Nitrogen-NO3 (mg/L)	0.0700000	0.0546667 ± 0.0498148
Phosphorus-OrthoP (mg/L)	0.0025000	0.0002727 ± 0.0004671

Updated: 21-Dec-11 Important Notices

Site Assessment Report

Site Metadata

Site	NJWIL01
Sample Date	Oct 10 2011
Latitude	N 49° 26' 3.91"
Longitude	W 117° 32' 19.43"
Feature Name	Wilson Cr

BEAST Prediction Results

Predictor Variables	Channel Depth - avg,Gradient - <30,Landcover - Ice,Latitude,Longitude				
Predicted Group Number	4				
Group	**1**	**2**	**3**	**4**	**5**
Probability	0.2%	5.9%	6.4%	82.4%	5.0%

Habitat Attributes

Variable	Site	Reference Mean	Standard Deviation
Canopy - % coverage (PercentRange)	1.00	1.70	1.27
Channel Depth - avg (cm)	28.3	21.7	11.9
Channel Depth - max (cm)	32.0	30.6	17.6
General - Alkalinity (mg/L)	58.9000000	77.5983193	51.1024162
General - dissolved oxygen (DO) (mg/L)	11.0000000	10.8754545	0.9089839
General - pH (pH)	6.2	7.8	0.6
General - Specific Conductance (@ 25 C) (uS/cm)	123.0000000	162.0405941	105.3178562
Substrate - 2nd dominant size category (Category(0-9))	6	6	1
Substrate - dominant size category (Category(0-9))	7	7	1
Substrate - embeddedness category (Category(1-5))	4	4	1
Velocity (Avg) (m/s)	0.54	0.47	0.29
Velocity (Max) (m/s)	0.77	0.67	0.37
Width - Bankfull (m)	33.5	13.7	13.0
Width - Wetted (m)	32.0	8.4	9.1

Bray-Curtis Analysis

Description	Value
Bray-Curtis Distance	0.3

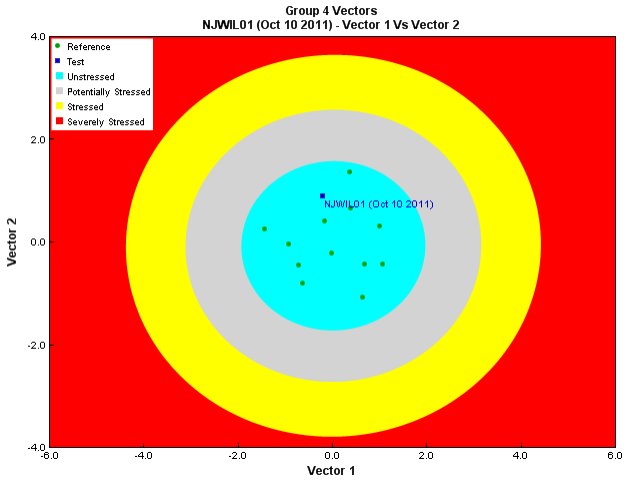
RIVPACS Taxa Ratios

RIVPACS : Expected taxa P>0.50	13.89
RIVPACS : Observed taxa P>0.50	15.00
RIVPACS : O:E (p > 0.5)	1.08
RIVPACS : Expected taxa P>0.70	11.43
RIVPACS : Observed taxa P>0.70	12.00
RIVPACS : O:E (p > 0.7)	1.05

RIVPACS Analysis

Taxa	Probability Of Occurrence	Abundance
Baetidae	1.00	109
Brachycentridae	0.39	2
Capniidae	0.86	3
Ceratopogonidae	0.40	2
Chironomidae	1.00	38
Chloroperlidae	0.99	9
Elmidae	0.50	13
Empididae	0.64	1
Ephemerellidae	1.00	36
Glossosomatidae	0.42	11
Heptageniidae	1.00	81
Hydropsychidae	0.90	12
Leptophlebiidae	0.34	4
Leuctridae	0.64	2
Nemouridae	1.00	27
Perlidae	0.90	6
Perlodidae	0.90	10
Philopotamidae	0.02	5
Rhyacophilidae	0.99	2
Simuliidae	0.34	2
Taeniopterygidae	0.90	5
Tipulidae	0.62	1

Site Assessment Graphs



Site Assessment Vector Data

Assessment For The Test Site	
Vector 1 Vs Vector 2	Similar to Reference
Vector 1 Vs Vector 3	N/A
Vector 2 Vs Vector 3	N/A
Overall	Similar to Reference

Site Metrics

Metric Name	Test	Reference	Standard	

	Site	Mean	Deviation	Significant
% Chironomidae	9.9738	7.3784	6.3725	No
% Ephemeroptera	60.3675	51.6884	18.7502	No
% Ephemeroptera that are Baetidae	47.3913	40.5524	29.9979	No
% EPT Individuals	85.0394	87.6509	7.3598	No
% of 2 dominant taxa	49.8688	57.907	14.2204	No
% of dominant taxa	28.6089	39.8013	14.8602	No
% Plecoptera	16.273	31.4161	15.4308	No
% Tricoptera	8.399	4.5464	2.7593	No
Ephemeroptera taxa	4.0	3.8235	0.809	No
EPT taxa (no)	16.0	13.2941	2.7103	No
No. EPT individuals/Chironomids+EPT Individuals	0.895	0.9224	0.0666	No
Plecoptera taxa	7.0	6.2941	1.1048	No
Shannon-Wiener Diversity	2.2722	1.9417	0.391	No
Simpson's Diversity	0.8439	0.756	0.1245	No
Total Abundance	381.0	587.3953	299.0909	No
Total No. of Taxa	22.0	19.2941	3.721	No
Trichoptera taxa	5.0	3.1765	1.4246	No

Site Assessment Report

Site Metadata

Site	NJWIN01
Sample Date	Nov 07 2006
Latitude	N 49° 36' 18"
Longitude	W 117° 32' 38"
Feature Name	Winlaw Cr

BEAST Prediction Results

Predictor Variables	Channel Depth - avg,Gradient - <30,Landcover - Ice,Latitude,Longitude				
Predicted Group Number	4				
Group	**1**	**2**	**3**	**4**	**5**
Probability	0.0%	12.2%	9.7%	70.5%	7.5%

Habitat Attributes

Variable	Site	Reference Mean	Standard Deviation
Canopy - % coverage (PercentRange)	4.00	1.70	1.27
Channel Depth - avg (cm)	12.3	21.7	11.9
Channel Depth - max (cm)	15.0	30.6	17.6
General - Alkalinity (mg/L)	40.0000000	77.5983193	51.1024162
General - dissolved oxygen (DO) (mg/L)	10.0000000	10.8754545	0.9089839
General - pH (pH)	7.5	7.8	0.6
General - Specific Conductance (@ 25 C) (uS/cm)	82.6000000	162.0405941	105.3178562
Substrate - 2nd dominant size category (Category(0-9))	6	6	1
Substrate - dominant size category (Category(0-9))	7	7	1
Substrate - embeddedness category (Category(1-5))	4	4	1
Substrate - surrounding material size category (Category(0-9))	3	4	2
Velocity (Avg) (m/s)	0.34	0.47	0.29
Velocity (Max) (m/s)	0.40	0.67	0.37
Width - Bankfull (m)	8.0	13.7	13.0
Width - Wetted (m)	5.0	8.4	9.1

Bray-Curtis Analysis

Description	Value
Bray-Curtis Distance	0.55

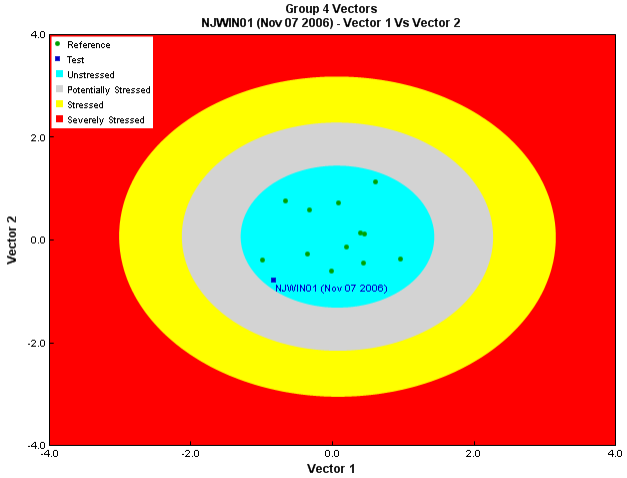
RIVPACS Taxa Ratios

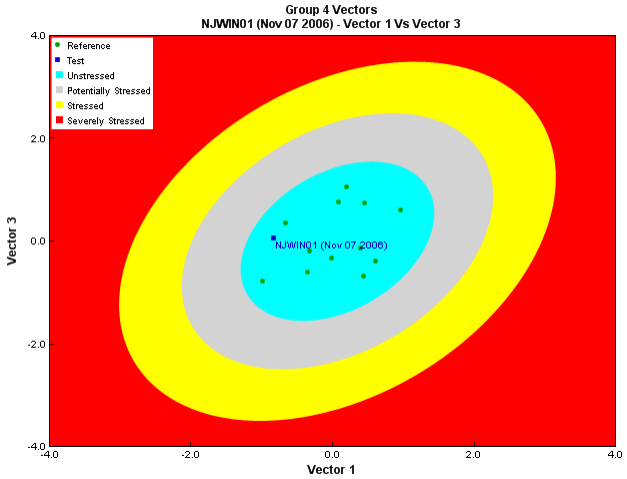
RIVPACS : Expected taxa P>0.50	14.17
RIVPACS : Observed taxa P>0.50	15.00
RIVPACS : O:E (p > 0.5)	1.06
RIVPACS : Expected taxa P>0.70	11.28
RIVPACS : Observed taxa P>0.70	12.00
RIVPACS : O:E (p > 0.7)	1.06

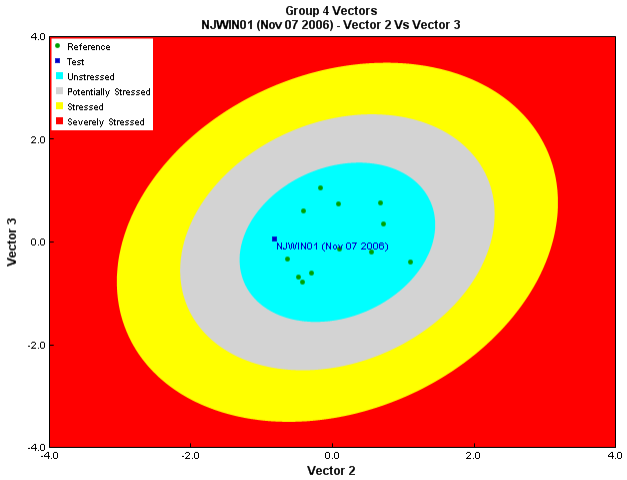
RIVPACS Analysis

Taxa	Probability Of Occurrence	Abundance
Ameletidae	0.49	44
Baetidae	1.00	843
Brachycentridae	0.38	9
Capniidae	0.81	19
Ceratopogonidae	0.39	1
Chironomidae	1.00	131
Chloroperlidae	0.98	10
Elmidae	0.51	13
Empididae	0.63	4
Ephemerellidae	1.00	20
Heptageniidae	1.00	109
Hydropsychidae	0.90	1
Hydroptilidae	0.01	1
Leptophlebiidae	0.36	2
Limnephilidae	0.25	2
Nemouridae	1.00	15
Perlidae	0.84	3
Perlodidae	0.89	2
Psychodidae	0.24	1
Rhyacophilidae	0.99	13
Taeniopterygidae	0.88	101
Tipulidae	0.60	1

Site Assessment Graphs







Site Assessment Vector Data

Assessment For The Test Site	
Vector 1 Vs Vector 2	Similar to Reference
Vector 1 Vs Vector 3	Similar to Reference
Vector 2 Vs Vector 3	Similar to Reference
Overall	Similar to Reference

Site Metrics

Metric Name	Test Site	Reference Mean	Standard Deviation	Significant
% Chironomidae	9.7398	7.3784	6.3725	No
% Ephemeroptera	75.6877	51.6884	18.7502	No
% Ephemeroptera that are Baetidae	82.8094	40.5524	29.9979	No
% EPT Individuals	88.7732	87.6509	7.3598	No
% of 2 dominant taxa	72.4164	57.907	14.2204	No
% of dominant taxa	62.6766	39.8013	14.8602	No
% Plecoptera	11.1524	31.4161	15.4308	No
% Tricoptera	1.9331	4.5464	2.7593	No
Ephemeroptera taxa	5.0	3.8235	0.809	No
EPT taxa (no)	16.0	13.2941	2.7103	No
No. EPT individuals/Chironomids+EPT Individuals	0.9011	0.9224	0.0666	No

Plecoptera taxa	6.0	6.2941	1.1048	No
Shannon-Wiener Diversity	1.4489	1.9417	0.391	No
Simpson's Diversity	0.5835	0.756	0.1245	No
Total Abundance	1345.0	587.3953	299.0909	Yes
Total No. of Taxa	22.0	19.2941	3.721	No
Trichoptera taxa	5.0	3.1765	1.4246	No

Site Assessment Report

Site Metadata

Site	NJWIN01
Sample Date	Sep 16 2010
Latitude	N 49° 36' 18"
Longitude	W 117° 32' 38"
Feature Name	Winlaw Cr

BEAST Prediction Results

Predictor Variables	Channel Depth - avg,Gradient - <30,Landcover - Ice,Latitude,Longitude				
Predicted Group Number	4				
Group	**1**	**2**	**3**	**4**	**5**
Probability	0.0%	12.9%	9.8%	69.6%	7.7%

Habitat Attributes

Variable	Site	Reference Mean	Standard Deviation
Canopy - % coverage (PercentRange)	3.00	1.70	1.27
Channel Depth - avg (cm)	9.3	21.7	11.9
Channel Depth - max (cm)	18.2	30.6	17.6
General - Alkalinity (mg/L)	54.7000000	77.5983193	51.1024162
General - dissolved oxygen (DO) (mg/L)	11.0000000	10.8754545	0.9089839
Substrate - 2nd dominant size category (Category(0-9))	7	6	1
Substrate - dominant size category (Category(0-9))	6	7	1
Substrate - embeddedness category (Category(1-5))	5	4	1
Substrate - surrounding material size category (Category(0-9))	4	4	2
Velocity (Avg) (m/s)	0.45	0.47	0.29
Velocity (Max) (m/s)	0.49	0.67	0.37
Width - Bankfull (m)	8.3	13.7	13.0
Width - Wetted (m)	5.1	8.4	9.1

Bray-Curtis Analysis

Description	Value
Bray-Curtis Distance	0.48

RIVPACS Taxa Ratios

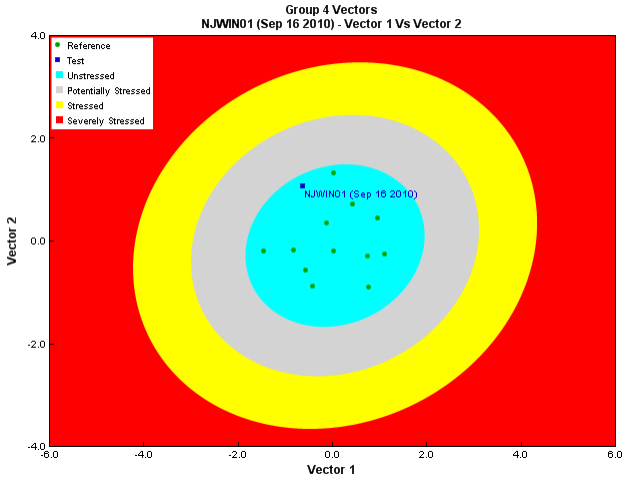
RIVPACS : Expected taxa P>0.50	14.15
RIVPACS : Observed taxa P>0.50	15.00
RIVPACS : O:E (p > 0.5)	1.06
RIVPACS : Expected taxa P>0.70	11.27
RIVPACS : Observed taxa P>0.70	11.00
RIVPACS : O:E (p > 0.7)	0.98

RIVPACS Analysis

Taxa	Probability Of Occurrence	Abundance
Baetidae	1.00	24

Brachycentridae	0.38	13
Capniidae	0.81	-
Ceratopogonidae	0.39	6
Chironomidae	1.00	18
Chloroperlidae	0.98	12
Elmidae	0.51	37
Empididae	0.63	4
Ephemerellidae	1.00	7
Heptageniidae	1.00	60
Hydropsychidae	0.90	18
Hydryphantidae	0.11	1
Hygrobatidae	0.05	3
Lebertiidae	0.53	10
Limnephilidae	0.25	2
Nemouridae	1.00	56
Pelecorhynchidae	0.03	1
Perlidae	0.84	10
Perlodidae	0.89	19
Philopotamidae	0.04	6
Psychodidae	0.24	5
Rhyacophilidae	0.99	55
Simuliidae	0.35	1
Taeniopterygidae	0.87	26
Tipulidae	0.60	1
Torrenticolidae	0.25	9

Site Assessment Graphs



Site Assessment Vector Data

Assessment For The Test Site	
Vector 1 Vs Vector 2	Similar to Reference
Vector 1 Vs Vector 3	N/A
Vector 2 Vs Vector 3	N/A
Overall	Similar to Reference

Site Metrics

Metric Name	Test Site	Reference Mean	Standard Deviation	Significant
% Chironomidae	4.4554	7.3784	6.3725	No
% Ephemeroptera	22.5248	51.6884	18.7502	No
% Ephemeroptera that are Baetidae	26.3736	40.5524	29.9979	No
% EPT Individuals	76.2376	87.6509	7.3598	No
% of 2 dominant taxa	28.7129	57.907	14.2204	Yes
% of dominant taxa	14.8515	39.8013	14.8602	No
% Plecoptera	30.4455	31.4161	15.4308	No
% Tricoptera	23.2673	4.5464	2.7593	Yes
Ephemeroptera taxa	3.0	3.8235	0.809	No
EPT taxa (no)	13.0	13.2941	2.7103	No
No. EPT individuals/Chironomids+EPT Individuals	0.9448	0.9224	0.0666	No
Plecoptera taxa	5.0	6.2941	1.1048	No
Shannon-Wiener Diversity	2.7132	1.9417	0.391	No
Simpson's Diversity	0.9132	0.756	0.1245	No
Total Abundance	404.0	587.3953	299.0909	No
Total No. of Taxa	25.0	19.2941	3.721	No
Trichoptera taxa	5.0	3.1765	1.4246	No

Appendix B. Water quality data

Table B-1. Field blank and duplicate results with corresponding quality control review (red highlighting indicates value outside criteria), Slocan River watershed

Sample Date (dd/mm/yy)	Site Code*	Site Name	Alkalinity (Total as CaCO3)	Alkalinity (PP as CaCO3)	Bicarbonate (HCO3)	Carbonate (CO3)	Hydroxide (OH)	Nitrite (N)	Nitrate (N)	Orthophosphate (P)	Nitrate plus Nitrite (N)	Conductivity	pH	Turbidity
		Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**uS/cm**	**units**	**NTU**
		Reportable Detection Limit (RDL)	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.005**	**0.02**	**0.005**	**0.02**	**1**		**0.1**
25/05/2010	**NJSLO01 LAB**	Slocan R. Site 1	30	<0.5	37	<0.5	<0.5	<0.005	0.07	<0.005	0.07	70	7.7	1.1
25/05/2010	**NJSLO01 REP**	Slocan R. Site 1	31	<0.5	37	<0.5	<0.5	<0.005	0.07	<0.005	0.07	70	7.6	0.8
	Duplicate QC	**Calculated RPD (%)**	-3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	31.6
25/05/2010	**NJSLO01 BLK**	Slocan R. Site 1	1.7	<0.5	2.1	<0.5	<0.5	<0.005	<0.02	<0.005	<0.02	1	6.1	<0.1
	Blank QC	**X times > than RDL**	3.4	1.0	4.2	1.0	1.0	1.0	1.0	1.0	1.0	1.0	n/a	n/a
26/07/2011	**NJSL001 REG**	Slocan R. Site 1	27	<0.5	33	<0.5	<0.5	<0.005	0.04	<0.005	0.04	.	.	.
26/07/2011	**NJSL001 REP**	Slocan R. Site 1	26	<0.5	32	<0.5	<0.5	<0.005	0.04	<0.005	0.04	60	7.57	0.8
	Duplicate QC	**Calculated RPD (%)**	3.8	0.0	3.1	0.0	0.0	0.0	0.0	0.0	0.0	n/a	n/a	n/a
26/07/2011	**NJSL001 BLK**	Slocan R. Site 1	0.8	<0.5	1	<0.5	<0.5	<0.005	<0.02	<0.005	<0.02	1	5.87	<0.1
	Blank QC	**X times > than RDL**	1.6	1.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	n/a	1.0
26/09/2011	**NJSLO01-2**	Slocan R. Site 1	37	<0.5	45	<0.5	<0.5	<0.005	<0.02	<5	<0.02	.	.	.
26/09/2011	**NJSLO01-3**	Slocan R. Site 1	38	<0.5	46	<0.5	<0.5	<0.005	<0.02	<5	<0.02			
	Duplicate QC	**Calculated RPD (%)**	-2.7	0.0	-2.2	0.0	0.0	0.0	0.0	0.0	0.0	n/a	n/a	n/a
27/06/2012	**NJSLO01 REG**	Slocan R. Site 1	25.3	<0.50	30.8	<0.50	<0.50	<0.0050	0.048	<0.0050	0.048	.	.	.
27/06/2012	**NJSLO01 REP**	Slocan R. Site 1	26	<0.50	31.7	<0.50	<0.50	<0.0050	0.047	<0.0050	0.047	58.3	7.44	10.4
	Duplicate QC	**Calculated RPD (%)**	-2.7	0.0	-2.9	0.0	0.0	0.0	2.1	0.0	2.1	n/a	n/a	n/a
27/06/2012	**NJSLO01 BLK**	Slocan R. Site 1	24.6	<0.50	30	<0.50	<0.50	<0.0050	0.048	<0.0050	0.048	65	7.53	13.2
	Blank QC	**X times > than RDL**	49.2	1.0	60.0	1.0	1.0	1.0	2.4	1.0	2.4	65.0	n/a	132.0
25/06/2013	**NJSL001 REG**	**Slocan R. Site 1**	24.9	<0.50	30.4	<0.50	<0.50	<0.0050	0.0	<0.0050	0.0			
25/06/2013	**NJSL001 REP**	**Slocan R. Site 1**	25.6	<0.50	31.2	<0.50	<0.50	<0.0050	0.0	<0.0050	0.0	59.6	7.7	1.4
	Duplicate QC	**Calculated RPD (%)**	-2.8	0.0	-2.6	0.0	0.0	0.0	0.0	0.0	0.0	n/a	n/a	n/a
25/06/2013	**NJSLO01 BLK**	**Slocan R. Site 1**	1.0	<0.50	1.2	<0.50	<0.50	<0.0050	<0.020	<0.0050	<0.020	1.6	5.9	<0.10
	Blank QC	**X times > than RDL**	2.0	1.0	2.4	1.0	1.0	1.0	1.0	1.0	1.0	1.6	n/a	1.0

QA/QC Alert Crieria (Maxxam):

Duplicate (or REP for replicate) review based on relative percent difference (RPD) = Recommended alert if RPD >30% for general chemistry. Relative percent difference limit (RPD)= [(Result 2 - Result 1) / mean] * 100.

Field Blank (BLK), recommended alert = 2X reporting limit (RDL)

Table B-2. Water chemistry data (non-metal), with comparison to guidelines for the protection of aquatic life and drinking water, Slocan River watershed.

Stewardship Group	Sample Date (dd/mm/yy)	Site Code	Site Name	Nitrite (N)	Nitrate (N)	Alkalinity (Total as CaCO3)	Alkalinity (PP as CaCO3)	Bicarbonate (HCO3)	Carbonate (CO3)	Hydroxide (OH)	Orthophosphate (P)	Nitrate plus Nitrite (N)
			Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**µg/L**	**mg/L**
			Guideline	CCME: 0.060. HC Drinking: 1	3.0 CCME: 3. HC Drinking:	No stream guideline	no guideline	no guideline	no guideline	no guideline	no guideline	no guideline
Slocan	11/10/2007	NJSLO02	Slocan R. Site 2			41						
Slocan	28/10/2008	NJSLO02	Slocan R. Site 2									
Slocan	11/10/2007	NJSLO03	Slocan R. Site 3			54.7						
Slocan	29/09/2008	NJKOC01	Koch Ck. Site									
Slocan	29/09/2008	NJMIL01	Mill Ck. Site									
Slocan	01/10/2012	NJBON01	Bonanza Creek Site	<0.0050	<0.0051	<0.0052	<0.0053	<0.0054	<0.0055	<0.0056	<0.0057	<0.0058
Slocan	01/10/2012	NJG0S01	Goose Creek Site	<0.0050	<0.0051	<0.0052	<0.0053	<0.0054	<0.0055	<0.0056	<0.0057	<0.0058
Slocan	29/09/2008	NJSLO01	Slocan R. Site 1									
Slocan	17/11/2008	NJSLO01	Slocan R. Site 1			32	<0.5	39	<0.5	<0.5		
Slocan	10/12/2008	NJSLO01	Slocan R. Site 1									
Slocan	13/01/2009	NJSLO01	Slocan R. Site 1									
Slocan	09/02/2009	NJSLO01	Slocan R. Site 1			44	<0.5	53	<0.5	<0.5		
Slocan	11/03/2009	NJSLO01	Slocan R. Site 1			44	<0.5	53	<0.5	<0.5		
Slocan	31/03/2009	NJSLO01	Slocan R. Site 1			42	<0.5	52	<0.5	<0.5		
Slocan	12/05/2009	NJSLO01	Slocan R. Site 1			28	<0.5	35	<0.5	<0.5		
Slocan	10/06/2009	NJSLO01	Slocan R. Site 1			31	<0.5	38	<0.5	<0.5		
Slocan	07/07/2009	NJSLO01	Slocan R. Site 1			32	<0.5	39	<0.5	<0.5		
Slocan	11/08/2009	NJSLO01	Slocan R. Site 1			36	<0.5	44	<0.5	<0.5		
Slocan	08/09/2009	NJSLO01	Slocan R. Site 1			35	<0.5	42	<0.5	<0.5		
Slocan	01/04/2010	NJSLO01	Slocan R. Site 1									
Slocan	03/05/2010	NJSLO01	Slocan R. Site 1									
Slocan	25/05/2010	NJSLO01	Slocan R. Site 1	<0.005	0.07	29	<0.5	35	<0.5	<0.5	<5	0.07
Slocan	25/05/2010	NJSLO01	Slocan R. Site 1	<0.005	0.07	30	<0.5	37	<0.5	<0.5	<5	0.07
Slocan	29/06/2010	NJSLO01	Slocan R. Site 1	<0.005	0.03	28	<0.5	34	<0.5	<0.5	<5	0.03
Slocan	26/07/2010	NJSLO01	Slocan R. Site 1	<0.005	0.03	32	<0.5	39	<0.5	<0.5	<5	0.03
Slocan	26/09/2010	NJSLO01	Slocan R. Site 1	<0.005	0.03	33	<0.5	41	<0.5	<0.5	<5	0.03
Slocan	25/10/2010	NJSLO01	Slocan R. Site 1	<0.005	<0.02	35	<0.5	43	<0.5	<0.5	<5	<0.02
Slocan	23/11/2010	NJSLO01	Slocan R. Site 1	<0.005	0.06	36	<0.5	44	<0.5	<0.5	<5	0.06
Slocan	19/01/2011	NJSLO01	Slocan R. Site 1	<0.005	0.08	40	<0.5	48	<0.5	<0.5	<5	0.08
Slocan	28/02/2011	NJSLO01	Slocan R. Site 1	<0.005	0.08	40	<0.5	49	<0.5	<0.5	<5	0.08
Slocan	28/03/2011	NJSLO01	Slocan R. Site 1	<0.005	0.05	45	<0.5	55	<0.5	<0.5	<5	0.05

Table B-2. Water chemistry data (non-metal), with comparison to guidelines for the protection of aquatic life and drinking water, Slocan River watershed.

Stewardship Group	Sample Date (dd/mm/yy)	Site Code	Site Name	Nitrite (N)	Nitrate (N)	Alkalinity (Total as CaCO3)	Alkalinity (PP as CaCO3)	Bicarbonate (HCO3)	Carbonate (CO3)	Hydroxide (OH)	Orthophosphate (P)	Nitrate plus Nitrite (N)
			Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**µg/L**	**mg/L**
			Guideline	CCME: 0.060. HC Drinking: 1	3.0 CCME: 3. HC Drinking:	No stream guideline	no guideline	no guideline	no guideline	no guideline	no guideline	no guideline
Slocan	19/04/2011	NJSLO01	Slocan R. Site 1	<0.005	0.04	38	<0.5	47	<0.5	<0.5	<5	0.04
Slocan	17/05/2011	NJSLO01	Slocan R. Site 1	<0.005	0.11	20	<0.5	25	<0.5	<0.5	<5	0.11
Slocan	21/06/2011	NJSLO01	Slocan R. Site 1	<0.005	0.05	26	<0.5	32	<0.5	<0.5	<5	0.05
Slocan	26/07/2011	NJSLO01	Slocan R. Site 1	<0.005	0.04	27	<0.5	33	<0.5	<0.5	<5	0.04
Slocan	29/08/2011	NJSLO01	Slocan R. Site 1	<0.005	0.03	31	<0.5	37	<0.5	<0.5	<5	0.03
Slocan	20/09/2011	NJSLO01	Slocan R. Site 1									
Slocan	26/09/2011	NJSLO01	Slocan R. Site 1	<0.005	<0.02	38	<0.5	46	<0.5	<0.5	<5	<0.02
Slocan	24/10/2011	NJSLO01	Slocan R. Site 1	<0.005	0.03	38	<0.5	46	<0.5	<0.5	<5	0.03
Slocan	22/11/2011	NJSLO01	Slocan R. Site 1									
Slocan	19/12/2011	NJSLO01	Slocan R. Site 1	<0.005	0.06	40.5	<0.5	49.4	<0.5	<0.5	<5	0.06
Slocan	09/01/2012	NJSLO01	Slocan R. Site 1	<0.005	0.073	41.7	<0.5	50.9	<0.5	<0.5	<5	0.073
Slocan	29/02/2012	NJSLO01	Slocan R. Site 1	<0.005	0.075	41.8	<0.5	51	<0.5	<0.5	<5	0.075
Slocan	27/03/2012	NJSLO01	Slocan R. Site 1	0.006	0.047	41.1	<0.5	50.2	<0.5	<0.5	<5	0.053
Slocan	17/04/2012	NJSLO01	Slocan R. Site 1	<0.005	0.047	33.1	<0.5	40.4	<0.5	<0.5	<5	0.047
Slocan	23/05/2012	NJSLO01	Slocan R. Site 1	<0.0050	0.073	23.4	<0.5	28.5	<0.5	<0.5	<5	0.073
Slocan	27/06/2012	NJSLO01	Slocan R. Site 1	<0.0050	0.048	25.3	<0.5	30.8	<0.5	<0.5	<5	0.048
Slocan	25/07/2012	NJSL001	Slocan R. Site 1	<0.0050	<0.0051	<0.0052	<0.0053	<0.0054	<0.0055	<0.0056	<0.0057	<0.0058
Slocan	29/08/2012	NJSL001	Slocan R. Site 1	<0.0050	<0.0051	<0.0052	<0.0053	<0.0054	<0.0055	<0.0056	<0.0057	<0.0058
Slocan	01/10/2012	NJSL001	Slocan R. Site 1	<0.0050	<0.0051	<0.0052	<0.0053	<0.0054	<0.0055	<0.0056	<0.0057	<0.0058
Slocan	23/10/2012	NJSL001	Slocan R. Site 1	<0.0050	<0.0051	<0.0052	<0.0053	<0.0054	<0.0055	<0.0056	<0.0057	<0.0058
Slocan	26/11/2012	NJSL001	Slocan R. Site 1	<0.0050	<0.0051	<0.0052	<0.0053	<0.0054	<0.0055	<0.0056	<0.0057	<0.0058
Slocan	18/12/2012	NJSL001	Slocan R. Site 1	<0.0050	<0.0051	<0.0052	<0.0053	<0.0054	<0.0055	<0.0056	<0.0057	<0.0058
Slocan	30/01/2013	NJSL001	Slocan R. Site 1	<0.0050	<0.0051	<0.0052	<0.0053	<0.0054	<0.0055	<0.0056	<0.0057	<0.0058
Slocan	28/02/2013	NJSL001	Slocan R. Site 1									
Slocan	25/03/2013	NJSL001	Slocan R. Site 1	<0.0050	0.054	37.8	<0.50	46.2	<0.50	<0.50	<5	0.054
Slocan	25/06/2013	NJSL001	Slocan R. Site 1	<0.0050	0.037	24.9	<0.50	30.4	<0.50	<0.50	<5	0.037
Slocan	22/09/2010	NJWIN01	Winlaw Ck. Site									
Slocan	09/10/2010	NJWIN01	Winlaw Ck. Site	<0.0050	<0.02	60	<0.5	74	<0.5	<0.5	7	<0.02
Slocan	06/10/2010	NJWIL01	Wilson Ck Site	<0.0050	0.07	38	<0.5	46	<0.5	<0.5	<5	0.07
Slocan	11/10/2010	NJWIL01	Wilson Ck Site									
Slocan	20/12/2010	NJWIL01	Wilson Ck Site	<0.0050	0.072	58.9	<0.50	71.8	<0.50	<0.50	<5	0.072

Table B-2. Water chemistry data (non-metal), with comparison to guidelines for the protection of aquatic life and drinking water, Slocan River watershed.

Sample Date (dd/mm/yy)	Site Code	Dissolved Oxygen	Conductivity	pH	Turbidity	Water Temperature	Air Temperature	Total Hardness (CaCO3)	Dissolved Hardness (CaCO3)	Total Phosphorus (P)	Notes	Total Nitrogen (N)
		mg/L	**uS/cm**	**ph units**	**NTU**	**◦C**	**◦C**	**mg/L**	**mg/L**	**µg/L**		**mg/L**
		App: 8 (all stages	no guideline	And CCME:6.5-9.0	no mean guideline	daily 19°C. Max.	no guideline	no guideline	no guideline	trophic range. HC Drinking	CCME: trophic range (based on backgrd values for site).	no guideline
11/10/2007	NJSLO02	10		7.2		12.5				<5	4-10 Oligotrophic	0.1
28/10/2008	NJSLO02								41.9	<5	4-10 Oligotrophic	0.03
11/10/2007	NJSLO03	10.5		6.8		11.5		40.8		<5	4-10 Oligotrophic	0.07
29/09/2008	NJKOC01								17.6	<5	4-10 Oligotrophic	0.02
29/09/2008	NJMIL01								54.7	<5	4-10 Oligotrophic	<0.02
01/10/2012	NJBON01											
01/10/2012	NJG0S01											
29/09/2008	NJSLO01								41.0	<5	4-10 Oligotrophic	0.04
17/11/2008	NJSLO01		7.8							<5	4-10 Oligotrophic	0.07
10/12/2008	NJSLO01									<5	4-10 Oligotrophic	0.09
13/01/2009	NJSLO01		7.7							30	4-10 Oligotrophic	0.17
09/02/2009	NJSLO01								45.5	<5	4-10 Oligotrophic	0.10
11/03/2009	NJSLO01								47.7	10	4-10 Oligotrophic	0.15
31/03/2009	NJSLO01								44.4	<5	4-10 Oligotrophic	0.12
12/05/2009	NJSLO01		7.5						32.0	<5	4-10 Oligotrophic	0.13
10/06/2009	NJSLO01		7.5						33.6	8	4-10 Oligotrophic	0.12
07/07/2009	NJSLO01		7.9						29.8	<5	4-10 Oligotrophic	0.27
11/08/2009	NJSLO01		7.6						41.3	<5	4-10 Oligotrophic	0.11
08/09/2009	NJSLO01		7.5						40.6	<5	4-10 Oligotrophic	0.32
01/04/2010	NJSLO01	**11**	**88.7**	**8**	**1**	**4.8**	**8**					
03/05/2010	NJSLO01	**11**	**72.0**	**7.4**	**2.2**	**8**	**12**					
25/05/2010	NJSLO01	**12**	**67.2**	**7.15**	**0.35**	**8.5**		**18.2**			4-10 Oligotrophic	
25/05/2010	NJSLO01		70.0	7.7	1.1						4-10 Oligotrophic	
29/06/2010	NJSLO01	**11**	**56.3**	**7.2**	**0.35**	**13**		**23.5**			4-10 Oligotrophic	
26/07/2010	NJSLO01	**10**	**70.2**	**7.5**	**0.25**	**18**		**29.5**			4-10 Oligotrophic	
26/09/2010	NJSLO01	**9**	**73.0**	**7.1**	**0.2**	**12**	**16**				4-10 Oligotrophic	
25/10/2010	NJSLO01	**10**	**73.0**	**7.1**	**0.2**	**8**	**7**				4-10 Oligotrophic	
23/11/2010	NJSLO01	**11**	**81.4**	**7.4**	**0.3**	**0**	**-8**				4-10 Oligotrophic	
19/01/2011	NJSLO01		**84.7**	**7.8**	**0.35**						4-10 Oligotrophic	
28/02/2011	NJSLO01		**94.2**	**7.1**	**0.25**						4-10 Oligotrophic	
28/03/2011	NJSLO01		**90.9**	**7.4**	**0.3**						4-10 Oligotrophic	

Table B-2. Water chemistry data (non-metal), with comparison to guidelines for the protection of aquatic life and drinking water, Slocan River watershed.

Sample Date (dd/mm/yy)	Site Code	Dissolved Oxygen	Conductivity	pH	Turbidity	Water Temperature	Air Temperature	Total Hardness (CaCO3)	Dissolved Hardness (CaCO3)	Total Phosphorus (P)	Notes	Total Nitrogen (N)
		mg/L	uS/cm	ph units	NTU	◦C	◦C	mg/L	mg/L	µg/L		mg/L
		App: 8 (all stages	no guideline	And CCME:6.5-9.0	no mean guideline	daily 19°C. Max.	no guideline	no guideline	no guideline	trophic range. HC Drinking	CCME: trophic range (based on backgrd values for site).	no guideline
19/04/2011	NJSLO01	12	90.2	7.1	0.25	4	11				4-10 Oligotrophic	
17/05/2011	NJSLO01	12	55.0	7.05	0.45	5	8				4-10 Oligotrophic	
21/06/2011	NJSLO01	9	58.2	6.85	1.8	8	20				4-10 Oligotrophic	
26/07/2011	NJSLO01	10	61.6	7.2	0.45	14	23				4-10 Oligotrophic	
29/08/2011	NJSLO01	11	79.5	6.1	0.2	18	24				4-10 Oligotrophic	
20/09/2011	NJSLO01		87.9	6.1	0.35							
26/09/2011	NJSLO01	10	62.9	6.3	0.65	14	15				4-10 Oligotrophic	
24/10/2011	NJSLO01	10	87.3	6.2	0.35	8	5				4-10 Oligotrophic	
22/11/2011	NJSLO01	12	96.8	6.4	0.5	1	1					
19/12/2011	NJSLO01	13	52.9	7	0.65	2	-2				4-10 Oligotrophic	
09/01/2012	NJSLO01	11	105.0	6	0.25	0	2				4-10 Oligotrophic	
29/02/2012	NJSLO01	11	103.3	6	0.2	0	0				4-10 Oligotrophic	
27/03/2012	NJSLO01	13	103.0	6.5	0.3	7	3				4-10 Oligotrophic	
17/04/2012	NJSLO01	12	79.0	6.2	0.4	14	6				4-10 Oligotrophic	
23/05/2012	NJSLO01	12	55.8	6.17	2	13	6				4-10 Oligotrophic	
27/06/2012	NJSLO01	10	58.8	7.4	6	13	9				4-10 Oligotrophic	
25/07/2012	NJSL001	10	74.5	5.9	0.5	13	13					
29/08/2012	NJSL001	10	84.0	6.4	0.2	15	13					
01/10/2012	NJSL001		67.0	6.7	0.25							
23/10/2012	NJSL001	9	82.5	6.2	2.2	7	3					
26/11/2012	NJSL001	12	74.6	6.1	0.3	2	1					
18/12/2012	NJSL001	11	79.6	7.1	0.4	1	-3					
30/01/2013	NJSL001	8	86.5	6.1	0.45	2	-1					
28/02/2013	NJSL001	10		6.4		4	5					
25/03/2013	NJSL001											
25/06/2013	NJSL001											
22/09/2010	NJWIN01	11	137.9		0.25	14	9				4-10 Oligotrophic	
09/10/2010	NJWIN01		138		0.25						4-10 Oligotrophic	
06/10/2010	NJWIL01										4-10 Oligotrophic	
11/10/2010	NJWIL01	11	123.0	6.2	0.2	6	10				4-10 Oligotrophic	
20/12/2010	NJWIL01										4-10 Oligotrophic	

Table B-2. Water chemistry data (non-metal), with comparison to guidelines for the protection of aquatic life and drinking water, Slocan River watershed.

Sample Date (dd/mm/yy)	Site Code	Conductivity	Total Suspended Solids	Dissolved Calcium (Ca)	Dissolved Magnesium (Mg)	Acidity	Alkalinity
		uS/cm	mg/L	mg/L	mg/L		
		no guideline	No mean guideline	No stream guideline	no guideline		
11/10/2007	NJSLO02	86.4	1				
28/10/2008	NJSLO02			13.6	1.96		
11/10/2007	NJSLO03	91.4	1.8				
29/09/2008	NJKOC01			5.61	0.86		
29/09/2008	NJMIL01			19.3	1.57		
01/10/2012	NJBON01						
01/10/2012	NJG0S01						
29/09/2008	NJSLO01			13.4	1.87		
17/11/2008	NJSLO01	76	<4				
10/12/2008	NJSLO01						
13/01/2009	NJSLO01	98					
09/02/2009	NJSLO01			14.7	2.13		
11/03/2009	NJSLO01			15.4	2.25		
31/03/2009	NJSLO01			14.2	2.16		
12/05/2009	NJSLO01	68		10.3	1.52		
10/06/2009	NJSLO01	71	<4	10.9	1.54		
07/07/2009	NJSLO01	76	<4	9.76	1.33		
11/08/2009	NJSLO01	84	<4	13.5	1.88		
08/09/2009	NJSLO01	85	<4	13.2	1.82		
01/04/2010	NJSLO01						
03/05/2010	NJSLO01						
25/05/2010	NJSLO01					16	
25/05/2010	NJSLO01						
29/06/2010	NJSLO01					9.1	
26/07/2010	NJSLO01					16	
26/09/2010	NJSLO01						
25/10/2010	NJSLO01						
23/11/2010	NJSLO01						
19/01/2011	NJSLO01						
28/02/2011	NJSLO01						
28/03/2011	NJSLO01						

Table B-2. Water chemistry data (non-metal), with comparison to guidelines for the protection of aquatic life and drinking water, Slocan River watershed.

Sample Date (dd/mm/yy)	Site Code	Conductivity	Total Suspended Solids	Dissolved Calcium (Ca)	Dissolved Magnesium (Mg)	Acidity	Alkalinity
		uS/cm	**mg/L**	**mg/L**	**mg/L**		
		no guideline	No mean guideline	No stream guideline	no guideline		
19/04/2011	NJSLO01					90.2	
17/05/2011	NJSLO01					55	
21/06/2011	NJSLO01					58.2	
26/07/2011	NJSLO01					61.6	
29/08/2011	NJSLO01						
20/09/2011	NJSLO01						
26/09/2011	NJSLO01						
24/10/2011	NJSLO01						
22/11/2011	NJSLO01						
19/12/2011	NJSLO01						
09/01/2012	NJSLO01						
29/02/2012	NJSLO01						
27/03/2012	NJSLO01						
17/04/2012	NJSLO01						
23/05/2012	NJSLO01						
27/06/2012	NJSLO01						
25/07/2012	NJSL001						
29/08/2012	NJSL001						
01/10/2012	NJSL001						
23/10/2012	NJSL001						
26/11/2012	NJSL001						
18/12/2012	NJSL001						
30/01/2013	NJSL001						
28/02/2013	NJSL001						
25/03/2013	NJSL001						
25/06/2013	NJSL001						
22/09/2010	NJWIN01					9.1	54.7
09/10/2010	NJWIN01						
06/10/2010	NJWIL01						
11/10/2010	NJWIL01						
20/12/2010	NJWIL01						

Exceedance Legend

BC Approved Water Quality Guidelines (Government of BC 2013)

BC Working Water Quality Guidelines (Nagpal et al. 2006)

Canadian Water Quality Guidelines (CCME 1999a)

Value — Drinking Water Guidelines (Health Canada (HC) 2012, BC Approved, or BC Working)

*all values in **bold print** were measured in the field

Table B-3. Water chemistry (metals) and comparison to guidelines for the protection of aquatic life and drinking water, Slocan River watershed.

Sample Date (dd/mm/yy)	Site Code	Site Name	pH	Total Hardness (CaCO3)	Total Aluminum (Al)	Total Antimony (Sb)	Total Arsenic (As)	Total Barium (Ba)	Total Beryllium (Be)	Total Bismuth (Bi)
		Units	pH units	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
		Guideline	BC App. And CCME:6.5-9.0		CCME: 100 when pH is > 6.5. HC: 100 (max)	BC Work: 20. HC: 6 (max)	BC App: 5. HC: 10 (max)	BC Work (mean) 1000. HC: 1000 (max)	BC Work: 5.3. BC Work: 4.0 (max)	no guideline
29/09/2008	NJSLO01	Slocan R. Site 1	*6.8*	*40.8*	17	<0.5	0.3	26	<0.1	<1
11/10/2007	NJSLO03	Slocan R. Site 3	6.8	40.8	20	<1	<1	25	<0.0002	<50

BC Approved Water Quality Guidelines (Government of BC 2013)

BC Working Water Quality Guidelines (Nagpal et al. 2006)

Canadian Water Quality Guidelines (CCME 1999a)

Value Drinking Water Guidelines (Health Canada (HC) 2012, BC Approved or BC Working)

Values in *red italic* font were input using results from other dates or sites (e.g., averages)

Table B-3. Water chemistry (metals) and comparison to guidelines for the protection of aquatic life and drinking water, Slocan River watershed.

Sample Date (dd/mm/yy)	Site Code	Total Boron (B)	Total Cadmium (Cd)	Notes	Total Calcium (Ca)	Total Chromium (Cr)	Total Cobalt (Co)	Total Copper (Cu)	Total Iron (Fe)
		µg/L	µg/L		mg/L	µg/L	µg/L	µg/L	µg/L
		BC App: 1200. HC: 5000 (max)	CCME: (10^0.86[log10(Hardness)]-3.2). HC: 5 (max) BC Working Guideline	CCME Guideline Value	no guideline	HC: 50 (max)	BC App: 4.0	BC App: 2.0 µg/L when hardness is ≤50 mg/L; and 0.04*hardness when hardness ≥50 mg/L. BC App. 500 (max) CCME- related to hardness	BC App. 1000. CCME: 300. HC: 300 (aesthetic)
29/09/2008	NJSLO01	<50	0.05	0.02	13.7	<1	<0.5	0.2	41
11/10/2007	NJSLO03	<8	0.04	0.02	13.3	<1	<0.05	0.3	43

Table B-3. Water chemistry (metals) and comparison to guidelines for the protection of aquatic life and drinking water, Slocan River watershed.

Sample Date (dd/mm/yy)	Site Code	Total Lead (Pb)	Notes	Total Lithium (Li)	Total Magnesium (Mg)	Total Manganese (Mn)	Notes	Total Mercury (Hg)	Total Molybdenum (Mo)	Total Nickel (Ni)
		µg/L		µg/L	mg/L	µg/L		µg/L	µg/L	µg/L
		BC App. when hardness ≥8: (3.31 + e(1.273 ln [hardness] - 4.704). HC: 10 (max)	BC App. guideline calculation	BC Work: 14	no guideline	BC App. = (0.0044*hardness+0.605)*1000. HC: 50 (aesthetic)	BC App. guideline calculation	CCME: 0.026	BC App. 1000; CCME 73. BC App: 250 (max)	CCME: $e^{0.76[\ln(\text{hardness})]+1.06}$
29/09/2008	NJSLO01	<0.2	3.6	<5	1.88	4	784.5	<0.02	1	<1
11/10/2007	NJSLO03	<0.5	4.3	<2	1.88	4	784.5	<0.01	<5	<8

Table B-3. Water chemistry (metals) and comparison to guidelines for the protection of aquatic life and drinking water, Slocan River watershed.

Sample Date (dd/mm/yy)	Site Code	Total Phosphorus (P)	Total Potassium (K)	Total Selenium (Se)	Total Silicon (Si)	Total Silver (Ag)	Total Sodium (Na)	Total Strontium (Sr)	Total Sulphur (S)	Total Thallium (Tl)	Total Tin (Sn)
		µg/L	mg/L	µg/L	µg/L	µg/L	mg/L	µg/L	mg/L	µg/L	µg/L
		BC App. 15. BC App. 10 (lake/max)	BC Work: 372-432 mg/L	BC App. 2.0. HC and BC App: 10 (max)	no guideline	BC App. 1.5 if hardness>100, 0.05 if hardness is <100. CCME 0.1.	HC: 200 (aesthetic)	no guideline	no guideline	CCME and BC Work: 0.8. BC Work: 2.0	no guideline
29/09/2008	NJSLO01		0.60	0.4	2710	<0.02	1.27	197	<3	<0.05	<5
11/10/2007	NJSLO03		<1	<1	2870	<0.1	1.37	177	2.2	<0.1	<20

Table B-3. Water chemistry (metals) and comparison to guidelines for the protection of aquatic life and drinking water, Slocan River watershed.

Sample Date (dd/mm/yy)	Site Code	Total Titanium (Ti)	Total Uranium (U)	Total Vanadium (V)	Total Zinc (Zn)	Notes	Total Zirconium (Zr)
		µg/L	µg/L	µg/L	µg/L		µg/L
		BC Work: 2000	CCME: 15. BC Work 300. HC: 20 (max)	BC Work: 6	BC App: 7.5 +0.75 * (hardness - 90). HC:5000 (aesthetic)	BC App. calculated guideline	no guideline
29/09/2008	NJSLO01	<5	0.5	<5	8	7.5	<0.5
11/10/2007	NJSLO03	<3	0.5	<5	9	7.5	<5

Table B-4. Sediment quality and comparison to guidelines for the protection of aquatic life, Slocan River watershed.

Sample Date (dd/mm/yy)	Site code	Site Name	Soluble (2:1) pH	Total Aluminum (Al)	Total Antimony (Sb)	Total Arsenic (As)	Total Barium (Ba)	Total Beryllium (Be)	Total Bismuth (Bi)	Total Cadmium (Cd)
		Units*		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
	Guideline		no guideline	no guideline	no guideline	CCME and BC Working ISQG 5.9, PEL 17	no guideline	no guideline	no guideline	CCME and BC Working ISQG 0.6, PEL 3.5
26/09/2010	NJSL001	Slocan R. Site 1	7.07	3660	<0.1	1.5	44.7	0.2	<0.1	0.94
24/10/2011	NJSL001	Slocan R. Site 1	7.68	2460	<0.1	2.5	22.6	<0.4	<0.1	0.25
01/10/2012	NJSL001	Slocan R. Site 1		3390	<0.10	0.78	26.4	<0.40	<0.10	0.334
01/10/2012	NJBON01	Bonanza Creek		13400	1	5.89	145	<0.40	<0.10	0.891

Guideline exceedance legend for the protection of freshwater aquatic life:

- BC Approved Water Quality Guidelines (Government of BC 2006)
- BC Working Water Quality Guidelines, lowest effect (Nagpal et al. 2006)
- BC Working Water Quality Guidelines, severe effect (Nagpal et al. 2006)
- Canadian Sediment Quality Guidelines - ISQG (CCME 1999b)
- Canadian Sediment Quality Guidelines - PEL (CCME 1999b)

Table B-4. Sediment quality and comparison to guidelines for the protection of aquatic life, Slocan River watershed.

Sample Date (dd/mm/yy)	Site code	Total Calcium (Ca)	Total Chromium (Cr)	Total Cobalt (Co)	Total Copper (Cu)	Total Iron (Fe)	Total Lead (Pb)	Total Lithium (Li)	Total Magnesium (Mg)	Total Manganese (Mn)
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
	Guideline	no guideline	ISQG 37.3, PEL 90	no guideline	ISQG 35.7, PEL 197	BC Work: low 21,200, severe 43,766; BC App. 1000	CCME and BC Working ISQG 35, PEL 91.3	no guideline	no guideline	BC Work: low 460, severe 1100
26/09/2010	NJSL001	2210	9	2.4	8.0	9,960	8.1	10	2060	171
24/10/2011	NJSL001	1110	5	2	2.5	7,540	2.8	6	1330	123
01/10/2012	NJSL001	2070	9.7	2.16	2.94	15,400	3.11	7.2	1900	164
01/10/2012	NJBON01	5380	24.4	9.36	30.4	23,900	12.1	14	8300	510

Table B-4. Sediment quality and comparison to guidelines for the protection of aquatic life, Slocan River watershed.

Sample Date (dd/mm/yy)	Site code	Total Mercury (Hg)	Total Molybdenum (Mo)	Total Nickel (Ni)	Total Phosphorus (P)	Total Potassium (K)	Total Selenium (Se)	Total Silver (Ag)	Total Sodium (Na)	Total Strontium (Sr)	Total Thallium (Tl)
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
	Guideline	CCME 0.016: ISQG 0.17, PEL 0.486	no guideline	BC Work: low 16, severe 75	no guideline	no guideline	BC App. 2	BC Work 0.5	no guideline	no guideline	no guideline
26/09/2010	NJSL001	<0.05	0.4	6.0	667	762	<0.5	<0.05	<100	22.9	0.07
24/10/2011	NJSL001	0.05	0.2	3.9	307	461	<0.5	<0.05	<100	13	<0.05
01/10/2012	NJSL001	<0.050	0.19	5.92	597	656	<0.50	<0.050	<100	14.1	<0.050
01/10/2012	NJBON01	<0.050	1.73	21.3	635	786	0.72	0.152	<100	193	0.091

Table B-4. Sediment quality and comparison to guidelines for the protection of aquatic life, Slocan River watershed.

Sample Date (dd/mm/yy)	Site code	Total Tin (Sn)	Total Titanium (Ti)	Total Uranium (U)	Total Vanadium (V)	Total Zinc (Zn)	Total Zirconium (Zr)
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
	Guideline	no guideline	no guideline	no guideline	no guideline	CCME and BC Working ISQG 123, PEL 315	no guideline
26/09/2010	NJSL001	0.3	336	1.54	19	137	<0.5
24/10/2011	NJSL001	0.1	205	0.83	14	65	<0.5
01/10/2012	NJSL001	0.28	307	1.06	30.5	62.9	0.54
01/10/2012	NJBON01	0.36	902	1.11	46.9	139	1.98