Cottonwood Creek: 2023 CABIN Monitoring Summary Report

**In support of the Columbia Basin Water Monitoring Framework
through Living Lakes Canada**

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Background information

Site

Cottonwood Creek watershed is located in the west Kootenay region, running through the City of Nelson, British Columbia. Cottonwood Creek is comprised of three sub-watersheds; Gold creek, Selous Creek and Giveout Creek, each draining into the mainstem of Cottonwood Creek. The confluence of Cottonwood Creek drains into the west arm of Kootenay Lake. With a drainage area of 63.75 km^2, disturbances in the catchment include: forestry (public and private properties), mining, urban (residential, commercial, industrial) activities. In the upstream and mid-sections of the drainage area, the main anthropogenic disturbances are forestry and mining, with discontinuous riparian buffers bordering stream segments throughout these reaches. The lower section of the system is dominated by urban activities and rural private property development. Highway 6 runs parallel to the mainstem of Cottonwood Creek, following the highway from the watershed boundary west of Nelson Nordic Ski Club and following it downstream to Nelson before it drains into Kootenay Lake.

CABIN

The goal of using ECCC's Canadian Aquatic Biomonitoring Network (CABIN) protocols is to understand the health of streams. CABIN uses standardized protocols to collect benthic macroinvertebrate samples which act as indicators of aquatic ecosystem health (Environment Canada 2012). Benthic macroinvertebrates (BMI) are bottom dwelling organisms that are found in all freshwater ecosystems. With a lifespan from 1-3 years, these organisms are exposed and respond differently to pollutants and disturbances.   The presence and abundance of benthic macroinvertebrate species varies depending on exposure to pollutants and thus, are used to understand the cumulative effects of pollutants on aquatic ecosystem health.

The CABIN protocol uses a reference condition approach (RCA) to compare test sites to a group of reference sites. Descriptor data for land cover, climate, topography and hydrology are extracted for each test site watershed area using GIS tools and field data is collected on the physical, biological, chemical and hydrological characteristics of a stream and its channel to assess the stream health/condition. When a reference model has been developed for an area of interest then the RCA approach can be applied. A BEAST analysis uses the derived habitat variables to determine which groups of reference sites is most appropriate to compare the test site to, and then categorizes the test site to the most similar group of reference sites.   The RIVPACS analysis then assesses a test site's observed benthic macroinvertebrate community compared to the expected BMI community for a group of reference sites. The Brays-Curtis analysis then assesses the degree of similarity between the test site and the median of the predicted reference sites. The deviation of the test site BMI community from the reference group expected BMI community results in the test site being assigned to one of four bands (confidence intervals/ellipses) of stream condition: reference, mildly divergent, divergent, and extremely divergent from reference condition. Ecological metrics for richness, abundance and diversity can be calculated from the BMI sample and are used to further understand and evaluate the condition of the site.

Benthic Macroinvertebrates

Richness metrics measure the *number of different species* present in the sample. This can be measured as the total number of species at a site or within a taxon(s). Species richness does not take into account the number of individuals of each species present. Rather it gives as much weight to those species represented by very few individuals as to those represented by many individuals. Richness of a stream can decline with degradation of the water quality or with disturbance to the channel or alteration of flow regime with sensitive species being replaced by more tolerant taxa.

Unlike richness, **abundance** is a measurement of the *sum of all organisms present in a sample at a selected taxonomic level or within a specified group* (ex. # of individuals per Family). The composition of the taxa within the sample population can be expressed numerically or as a percentage of the population also referred to as proportion. Shifts within the population's abundance, with certain species increasing or decreasing, can act as indicators of water quality and stream health. The abundance and compositional measures presented include:

%EPT: ∑EPT individuals / ∑sum of all individuals * 100
Where: the %EPT is expected to decrease with degradation

%Ephemeroptera that are Baetidae: ∑ Baetidae ind. / ∑ Ephemeroptera individuals * 100
Where: Baetidae are more tolerant of degraded conditions and expected to increase with degradation

%Trichoptera that are Hydropsychida: ∑ Hydropsychida ind. / ∑ Trichoptera individuals * 100
Where: Hydropsychida are more tolerant of degraded conditions, increasing with degradation

% Coleoptera: ∑ Coleoptera ind. / ∑ all individuals * 100
Where: Coleoptera are expected to decrease with disturbance and degraded conditions

#EPT individuals/Chironomidae + EPT individuals * 100
Where the ratio is expected to decrease with disturbance

% Chironomidae: ∑ Chironomidae ind. / ∑ all individuals * 100
Where: Chironomidae are generally more tolerant of pollution

Evenness is a richness metric that measures the *distribution of the relative abundance of various taxa across all taxa* in a community. When all species in a sample have the same abundance of individuals then evenness is highest. If the relative abundances vary between the taxa in a community, evenness gets closer to zero. Evenness can be applied as an indicator of water quality, with evenness decreasing in response to disturbances and decreased water quality. Species evenness can be described using metrics including **Pielou's Evenness** or **Simpson's Evenness**.

Diversity takes into account the number of different species (richness) in a community, the abundance of the individuals in a species and how evenly the number of individuals is distributed among those species (evenness). Both richness and abundance measures function separately when calculating diversity. Diverse communities are a function of both high richness and high abundance, offering ecological opportunities and resilience within a community. Diverse communities act as indicators of "good" water quality and stream condition, where diversity is expected to decrease in response to disturbances and

poor water quality (ECCC, 2024). Simpsons diversity and Shannon-Wiener diversity indices are used to assess diversity through the CABIN analysis.

RIVPACS measures the observed taxa found at the test site divided by the taxa predicted to be at the test site for all groups (p=0.70). The RIVPACS analysis uses only the taxa presence/absence data. A RIVPACS value of 1 indicates the site is in good condition with low values often meaning the site is in poor condition (closer to 0); whereas very high values can mean the site is enriched or a biodiversity hotspot.

*The **Bray-Curtis Index** compares the degree of dissimilarity of the test site community to the predicted reference group community. It takes into account the abundance of each taxa observed and compares the test site to the median of the predicted reference community, while not being influenced by the rarity of the species. 0 means there is no difference between the test site and median reference community, whereas a value of 1 means that the test site community is very different from the median of the reference community.

Functional Feeding Groups (FFG) are a classification of benthic macroinvertebrates based on the benthic macroinvertebrate's primary method of obtaining food, and therefore each group can include several different taxa. Comparing FFGs at a site is a way to understand the productivity and inputs to the site in relation to flows and the input of organic matter into the system. The presence of FFGs depends on the type of food available such as; Course Particulate Organic Matter (CPOM), Fine Particulate Organic Matter (FPOM), algae, vascular plants, etc. and these food types vary based on stream characteristics (substrate, flow, depth), photosynthetic active radiation (sunlight) and the inputs from vegetation (organic matter) adjacent to the stream. There are five main FFG (Cummins, 2021):

FFG	Food Source
Shredders	eat leaf litter, rooted aquatic vascular plants, wood or other coarse particulate organic matter (CPOM; >1 mm)
Scrapers/grazers	eat algae and other associated material
Collector/gatherers	eat fine particulate organic matter (FPOM; #1 mm) on or in the stream sediments
Filterers	filter fine particulate organic matter from the water column; and
Predators	prey on other consumers

The River Continuum Concept describes how throughout a river system, from lower to higher stream orders, there are changing physical, chemical and biotic conditions that shift biological communities (ex. benthic macroinvertebrate communities) in response to the changing stream conditions. Variables such as slope, velocity, channel width, and sunlight exposure influence stream conditions and the availability of food sources within the stream, thus influencing FFGs along the stream continuum. The proportion of certain groups with respect to other groups has been shown to be related to stream health. In general, specialists such as shredders, are presumed to be more sensitive and therefore associated with healthy streams; whereas generalists (ex. gatherer and filterer species), with their broader diet, are presumed to be more tolerant to disturbance.

The ***Hilsenhoff Biotic Index*** (**HBI**) is a value that estimates organic pollution using the proportion (abundance) of taxa at the genus/species level. Biotic tolerance values are assigned to each taxa based on their response to organic pollution. Index scores range from 0 to 10 (Table 1).

Sensitive taxa have low scores while tolerant taxa are assigned high scores. Low HBI values reflect a higher abundance of sensitive groups thus, a lower level of pollution. While an increase in the index value suggests decreased water quality due to organic pollution (Hilsenhoff, 1987). The use of the HBI is advantageous for evaluating the general status of organic pollution in streams to assist in decision making around which streams should be studied further (Hilsenholf, 1987).

Table 1. Hilsenhoff Biotic Index (HBI) categories.

Biotic Index	Water Quality	Degree of Organic Pollution
0.00–3.50	Excellent	Organic pollution unlikely
3.51–4.50	Very Good	Possible slight organic pollution
4.51–5.50	Good	Some organic pollution probable
5.51–6.50	Fair	Fairly substantial pollution likely
6.51–7.50	Fairly Poor	Substantial pollution likely
7.51–8.50	Poor	Very substantial pollution likely
8.51–10.00	Very Poor	Severe organic pollution likely

For a complete list of metrics and calculations see Appendix A.

Field Site Visit

On September 14, 2023 a site visit to Cottonwood Creek was conducted by Claire Pollock, PJ Butler and Paul Thomas to collect data using the nationally recognized CABIN protocol. Benthic macroinvertebrate samples were sent to Biologica Consulting for taxonomic analysis. Water quality samples were sent for analysis to Caro Analytical Services in Kelowna, BC.

Results and Discussion

In 2023 a CABIN monitoring site (49.48190 N, -11729290 W) was selected in the lower reach of Cottonwood Creek, within the confined section of the creek in Nelson, B.C. On September 14, 2023 the site was visited for field data collection following the nationally standardized CABIN protocol. Results from the Reference Condition Approach analysis classified the site (COT01) as mildly divergent (for full report see Appendix B). COT01 was categorized into reference group 1 (Model group D), with a group error rate of 53.8%, and probability of group membership at 32.7%. Model performance for group 1 was noted to be cautionary with the classification success rate lower than the recommended minimum standard for CABIN (ECCC, 2020). Due to the precautionary note for test sites classified into group 1, further assessment of the site's condition was examined through biological metrics describing the benthic macroinvertebrate richness, abundance and diversity.

Reference sites included in group 1 of the model were found to have low abundance with a high proportion of Chironomidae. These sites tended to be steeper, narrower channels in smaller stream orders with smaller substrates and watersheds with low sedimentary rock in the bedrock geology (ECCC, 2020). Cottonwood Creek is a stream order 3 located in a confined channel in an urban setting, with historical upstream hydroelectric damming, forestry and mining activities noted. The dominant substrate type for COT01 was cobble, with large pebbles occupying the interstitial space. The proportion

of EPT was 72.5%, with the more sensitive Heptageniidae being most abundant of the Trichoptera Order. The % of Ephemeroptera that were Baetidae was only 27%. The proportion of EPT within Cottonwood Creek was within the one standard deviation of the mean from the predicted reference group. A low proportion of Chironomidae (5%) was also found at the site. These metrics are indicative of a system that supports sensitive species and is experiencing good water quality.

The RIVPACS Ratio was 1.13, which indicates that the site may be slightly enriched and more biodiverse than expected based on the reference group taxa. The Brays-Curtis distance index for Cottonwood Creek is 0.72, indicating the test site community is moderately different from the reference site community. The Bray-Curtis Distance metric may also be influenced by the probability of group membership, which was 32.7%, indicating a need for a greater number of reference sites to improve the predictability of group one. Simpsons Diversity index was 0.4, indicating moderate diversity at the site.

The Hilsenhoff family Index for Cottonwood Creek was 4.2, indicating a good water quality at the sampling site with the possibility of slight organic pollution. The dominant functional feeding groups included Gatherers (50.2%) and Scrapers (46.2%). The composition of FFG indicates that algae and FPOM were the primary food courses available at the site. Comparison of functional feeding groups and tax richness show that Cottonwood Creek falls within one standard deviation of the reference group mean for most of the metrics calculated in the analysis.

Examination of channel characteristic variables found that the slope and average velocity at the Cottonwood Creek site were slightly lower than the predicted mean group values. Canopy cover was greater at the test site than at the reference sites. The number of shredders found at the test site was also found to be greater than the predicted group reference mean indicating an increase in organic matter deposition from terrestrial sources. Deciduous trees and shrubs may be contributing to external inputs of organic matter to the creek system as a mostly intact riparian buffer exists throughout the mainstem of the creek. The FPOM and algae that support shredders may be influenced by Cottonwood Lake which lies approximately 8km upstream from the test site where sunlight availability may alter the systems productivity.

Overall, water quality and stream condition at COT01 were assessed to be good based on CABIN analysis and ecological metrics assessed for the site. Due to the importance of the stream as a water source for downstream populations, and considering the activities present in the drainage area, it is recommended that long term monitoring and planning be considered to understand the relationship between these disturbances and water quality in the Cottonwood Creek system. Long term monitoring would assist with identifying shifts in species composition, including richness, abundance and diversity, which in turn could be used to assess the stream conditions as land use upstream of the site change over time. These metrics could also be used to assess the relationship between restoration activities and the condition at the site.

Limitations and Recommendations

As noted by the Reference Model for the Columbia Basin document (2020), caution is recommended for any test site that was allocated to group one (Model Group D). This is in part due to the low number of sample sites included in Group D (n=13). Due to the low sample size, it is possible that the reference condition is not adequate adequately described and therefore cannot be well predicted. The ECCC 2020

reference model document for the Columbia Basin suggests that an increased number of reference sites be used to get a more precise description of the natural variation within model group D.

Also, it would be advantageous to compare multiple years of data to further understand the annual variation of the creeks condition. Friends of Kootenay Lake Stewardship Society previously sampled COT01 using the CABIN protocol in 2020 and 2021. Comparison of model outputs, as well as ecological metrics, to previous sampling years would be beneficial to gain an understanding of how the community composition is changing over time. It is recommended that annual monitoring work targeting project objectives are carried out (ex. the routine collection of water quality, flow dynamics, substrate embeddedness and/or BMI) to assess the association between long-term changes in land use, anthropogenic activity and climate on stream condition in Cottonwood Creek.

Appendix A

Total number of taxa: number present at a selected taxonomic level.

EPT taxa: number present within each group; high numbers of EPTs generally indicate "good" water quality, as they are sensitive to habitat disturbance.

EPT individuals: the sum of all Ephemeroptera, Plecoptera and Trichoptera taxa which respond to most types of anthropogenic disturbance. A decline in abundance or richness of EPT individuals would suggest an environmental disturbance. These are compared to the Chironomidae taxa, expressed as a ratio using abundance or composition values (see Section 3.3.2. below).

RIVPACS: a ratio of the Observed taxa (O):Expected taxa (E) ratio where; O:E =1 are healthy, O:E ratio <1 are impaired, O:E ratio > 1 are biodiversity hotspots/enriched.

Pielou's Evenness measures between 0-1 with 0 indicating species are unevenly distributed among the community whereas, 1 indicates that the number of individuals withing species is evenly distributed between species.

Diversity/evenness measurements: the richness, abundance and distribution among the taxa present (i.e., Simpson's Diversity/Evenness Index and Shannon-Weiner Index); these measurements provide a summary of the distribution of the taxa. Diverse communities are indicators of "good" water quality.

Shannon-Weiner Index: measures the degree of uncertainty (entropy or degree of surprise) of predicting that a species is present in a random sample. It represents the proportion of different species in a population of a community. Higher values indicate that individuals are occurring in similar numbers between species, while lower values indicate a less even distribution of individuals between species (ECCC,   ).   Diversity is an indicator of good water quality, with values decreasing with degraded water quality and in response to disturbances. The Shannon-Weiner Index is most often calculated as follows:

$$H = \sum_{i=1}^{s} - (P_i * \text{Inverse } P_i)$$	where: P_i is the proportion of individuals that belong to species i S is the number of species in the sample

The Shannon-Weiner value "H" can range from 0.0 indicating a community with a single taxon, to a maximum diversity of 4.0. These values have no real meaning by themselves, but can be used to compare two communities or the same community at different times. A large H value indicates high diversity, and that the odds of choosing the same individual from your community twice is low.

Simpson's Diversity Index (D): is a weighted arithmetic mean of the proportional abundance of species and gives more weight to dominant or common species. It measures the probability that two individuals randomly selected from a sample will belong to the same species. With this index, zero (0) represents infinite diversity and 1 indicates no diversity. Therefore, the higher the value of D, the lower the diversity. Since this is not intuitive, D is often subtracted from 1 to give Simpson's Index of Diversity (1 - D).

Simpson's Diversity Index takes into account the number of species present, as well as the relative abundance of each species in each taxa, giving more weight to more abundant species. As the species richness and evenness increase, the diversity increases (ECCC, 2024). The formula for Simpson's Index is:

$$D = 1 - \sum_{i=1}^{s} (n_i/N)^2$$	where: n = the total number of organisms of a particular species N = the total number of organisms of all species

Appendix B

Site Description

Study Name	BC NGO-Columbia Basin Water Monitoring Framework-LLC
Site	COT01
Sampling Date	Sep 14 2023
Know Your Watershed Basin	Lower Kootenay
Province / Territory	British Columbia
Terrestrial Ecological Classification	Montane Cordillera EcoZone Columbia Mountains and Highlands EcoRegion
Coordinates (decimal degrees)	49.48190 N, 117.29290 W
Altitude	625
Local Basin Name	Cottonwood Creek
	Kootenay River Basin
Stream Order	3

⭐ COT01

Figure 1. Location Map

Across Reach

Down Stream
Field Sheet (No image found)

Substrate

Up Stream

Cabin Assessment Results

Reference Model Summary	
Model	Columbia Basin 2020
Analysis Date	December 04, 2024
Taxonomic Level	Family

Cabin Assessment Results

Predictive Model Variables	Altitude
	Drainage-Area
	Longitude
	Natl-Grassland
	Natl-ShrubLow
	Natl-Water
	Precip10_Oct
	Reach-%CanopyCoverage
	Sedimentary
	Slope
	SlopeMax
	Temp12_DECmin

Reference Groups	1	2	3	4	5	6
Number of Reference Sites	13	24	28	35	32	15
Group Error Rate	53.8%	55.2%	34.1%	52.2%	23.1%	29.4%
Overall Model Error Rate	39.4%					
Probability of Group Membership	32.7%	6.2%	19.3%	19.6%	1.3%	20.9%
CABIN Assessment of COT01 on Sep 14, 2023	Mildly Divergent					

Group 1 Vectors
COT01 (Sep 14 2023) - Vector 1 Vs Vector 2
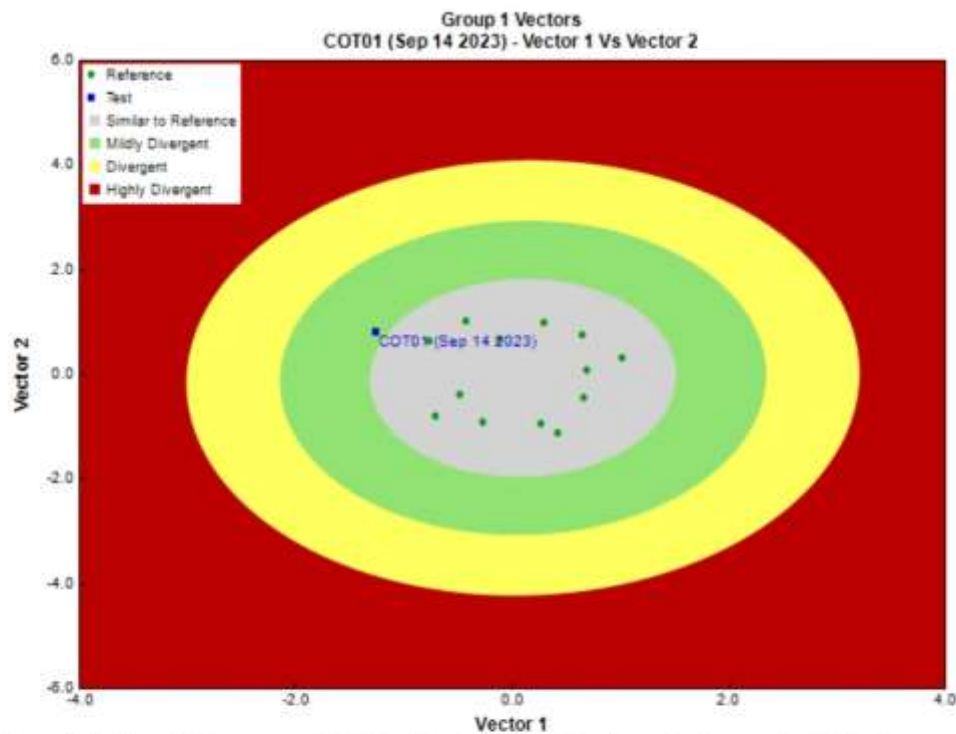
Figure 3. CABIN ordination assessment of the test site with the predicted group of reference sites. Each axis represents the relative abundance of the entire benthic invertebrate community with different organisms weighted differently on each axis.

Sample Information

Sampling Device	Kick Net
Mesh Size	400
Sampling Time	3

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Sample Information

Taxonomist	-
	-
Sub-Sample Proportion	10/100

Community Structure

Phylum	Class	Order	Family	Raw Count	Total Count
Annelida	Clitellata		Enchytraeidae	3	30.0
		Lumbriculida	Lumbriculidae	10	100.0
Arthropoda	Arachnida	Trombidiformes	Hygrobatidae	1	10.0
			Sperchontidae	1	10.0
			Torrenticolidae	7	70.0
	Insecta	Coleoptera	Elmidae	38	380.0
		Diptera		1	10.0
			Chironomidae	15	150.0
			Psychodidae	4	40.0
		Ephemeroptera		8	80.0
			Baetidae	34	340.0
			Ephemerellidae	38	380.0
			Heptageniidae	54	540.0
		Plecoptera		6	60.0
			Capniidae	1	10.0
			Chloroperlidae	18	180.0
			Nemouridae	36	360.0
			Perlodidae	2	20.0
			Taeniopterygidae	20	200.0
		Trichoptera		16	160.0
			Apataniidae	4	40.0
			Hydropsychidae	2	20.0
			Rhyacophilidae	7	70.0
Mollusca	Bivalvia	Veneroida	Pisidiidae	1	10.0
	Gastropoda	Basommatophora	Planorbidae	2	20.0
Platyhelminthes				4	40.0
			Total	333	3,330.0

Metrics

Name	COT01	Predicted Group Reference Mean ±SD
Bray-Curtis Distance	0.72	0.4 ± 0.1
Biotic Indices		
Hilsenhoff Family index (Mid-Atlantic)	4.2	3.7 ± 1.0
Hilsenhoff Family index (North-West)	4.2	3.8 ± 0.9
Intolerant taxa	--	1.0
Long-lived taxa	2.0	2.9 ± 1.5
Tolerant individuals (%)	0.6	0.6
Functional Measures		
% Filterers	--	0.6
% Gatherers	50.2	50.0 ± 20.3
% Predatores	10.5	31.9 ± 22.5
% Scrapers	46.2	41.5 ± 22.0
% Shredder	29.7	17.5 ± 12.3
No. Clinger Taxa	21.0	17.0 ± 5.4
Number Of Individuals		
% Chironomidae	5.0	25.7 ± 24.5
% Coleoptera	12.8	1.0 ± 2.0
% Diptera + Non-insects	13.8	29.7 ± 25.4
% Ephemeroptera	42.3	43.3 ± 22.7
% Ephemeroptera that are Baetidae	27.0	43.3 ± 23.0
% EPT Individuals	72.5	68.9 ± 25.5
% Odonata	--	0.0 ± 0.0
% of 2 dominant taxa	30.9	59.1 ± 16.7
% of 5 dominant taxa	67.1	83.4 ± 8.1
% of dominant taxa	18.1	41.7 ± 17.7

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Metrics

Name	COT01	Predicted Group Reference Mean ±SD
% Plecoptera	25.8	20.8 ± 13.1
% Tribe Tanyatarisini	--	
% Trichoptera that are Hydropsychida	15.4	14.7 ± 24.2
% Tricoptera	4.4	4.9 ± 6.8
No. EPT individuals/Chironomids+EPT Individuals	0.9	0.7 ± 0.3
Total Abundance	3330.0	1823.3 ± 1298.4
Richness		
Chironomidae taxa (genus level only)	1.0	1.0 ± 0.0
Coleoptera taxa	1.0	0.3 ± 0.5
Diptera taxa	2.0	3.1 ± 1.2
Ephemeroptera taxa	3.0	3.8 ± 0.8
EPT Individuals (Sum)	2160.0	1328.9 ± 1129.6
EPT taxa (no)	11.0	11.0 ± 2.5
Odonata taxa	--	0.0 ± 0.0
Pielou's Evenness	0.8	0.7 ± 0.1
Plecoptera taxa	5.0	4.7 ± 1.3
Shannon-Wiener Diversity	2.5	1.8 ± 0.5
Simpson's Diversity	0.9	0.7 ± 0.2
Simpson's Evenness	0.4	0.3 ± 0.1
Total No. of Taxa	21.0	16.2 ± 3.8
Trichoptera taxa	3.0	2.5 ± 1.6

Frequency and Probability of Taxa Occurrence

Reference Model Taxa	Frequency of Occurrence in Reference Sites						Probability Of Occurrence at COT01
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	
Baetidae	100%	100%	100%	100%	100%	100%	1.00

RIVPACS Ratios

RIVPACS : Expected taxa P>0.50	11.31
RIVPACS : Observed taxa P>0.50	11.00
RIVPACS : O:E (p > 0.5)	0.97
RIVPACS : Expected taxa P>0.70	8.85
RIVPACS : Observed taxa P>0.70	10.00
RIVPACS : O:E (p > 0.7)	1.13

Habitat Description

Variable	COT01	Predicted Group Reference Mean ±SD
Bedrock Geology		
Sedimentary (%)	13.48000	72.45797 ± 36.70120
Channel		
Depth-Avg (cm)	22.7	25.2 ± 17.8
Depth-BankfullMinusWetted (cm)	65.00	57.24 ± 28.97
Depth-Max (cm)	31.5	37.5 ± 24.9
Macrophyte (PercentRange)	1	0 ± 1
Reach-%CanopyCoverage (PercentRange)	3.00	1.00 ± 1.08
Reach-DomStreamsideVeg (Category(1-4))	3	3 ± 1
Reach-Pools (Binary)	0	1 ± 0
Reach-Rapids (Binary)	0	0 ± 0
Reach-Riffles (Binary)	1	1 ± 0
Reach-StraightRun (Binary)	1	1 ± 1
Slope (m/m)	0.0230000	0.0570046 ± 0.0814795
Veg-Coniferous (Binary)	1	1 ± 0
Veg-Deciduous (Binary)	1	1 ± 0
Veg-GrassesFerns (Binary)	1	1 ± 1
Veg-Shrubs (Binary)	1	1 ± 0
Velocity-Avg (m/s)	0.29	0.55 ± 0.42
Velocity-Max (m/s)	0.54	0.81 ± 0.43

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Habitat Description

Variable	COT01	Predicted Group Reference Mean ±SD
Width-Bankfull (m)	9.2	16.1 ± 14.3
Width-Wetted (m)	4.7	9.6 ± 9.6
XSEC-VelMethod (Category(1-3))	1	2 ± 1
Climate		
Precip10_OCT (mm)	78.31000	88.61164 ± 22.09890
Temp12_DECmin (Degrees Celsius)	-9.40000	-11.74201 ± 2.29837
Hydrology		
Drainage-Area (km^2)	63.75000	227.18539 ± 458.61339
Perimeter (Km)	37.36000	79.99141 ± 97.44574
Landcover		
Natl-Grassland (%)	1.53000	3.27800 ± 7.23403
Natl-ShrubLow (%)	0.03400	4.73476 ± 3.22482
Natl-Water (%)	0.15000	0.37895 ± 0.74882
Substrate Data		
%Bedrock (%)	0	0 ± 0
%Boulder (%)	4	7 ± 9
%Cobble (%)	77	49 ± 16
%Gravel (%)	2	7 ± 8
%Pebble (%)	17	37 ± 14
%Sand (%)	0	0 ± 0
%Silt+Clay (%)	0	0 ± 0
D50 (cm)	9.70	7.75 ± 3.16
Dg (cm)	9.3	6.8 ± 3.3
Dominant-1st (Category(0-9))	6	6 ± 2
Dominant-2nd (Category(0-9))	7	6 ± 2
Embeddedness (Category(1-5))	4	4 ± 1
PeriphytonCoverage (Category(1-5))	2	2 ± 1
SurroundingMaterial (Category(0-9))	5	4 ± 2
Topography		
SlopeMax (%)	200.61000	306.43044 ± 136.47512
Water Chemistry		
General-Conductivity (µS/cm)	129.8000000	73.7800000 ± 51.4206357
General-DO (mg/L)	10.7000000	11.3630769 ± 2.0598802
General-pH (pH)	7.2	7.7 ± 0.7
General-SpCond (µS/cm)	183.9000000	119.2000000 ± 132.8872831
General-TempAir (Degrees Celsius)	12.3	9.7 ± 5.1
General-TempWater (Degrees Celsius)	9.6000000	5.9515385 ± 2.8836951
General-Turbidity (NTU)	7.6400000	4.5920000 ± 8.7550283

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