



ABI ENVIRONMENTAL
SERVICES

Dec 8, 2025

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Dear Petra and Sarah,

Please find following, our report on the benthic macroinvertebrates from sites in the Athabasca watershed. In this report you will find the taxa and occurrence (total count) of macroinvertebrates per site, a list of the CABIN excluded taxa per site and quality control assurances. We have followed the CABIN protocol as outlined in the CABIN Laboratory Methods (2021) for subsampling, sorting, taxa identification and the auditing protocols. A digital copy in Excel is provided with the first tab containing the chain of custody form, the second the CABIN QA QC CL form, the third tab is clean data, followed by the tabulated data (included and excluded taxa) and finally the CABIN-ready data for upload. It is recommended that the CABIN-ready data be copied and pasted into the CABIN Excel template (also supplied) for uploading. After uploading, please check the log file and contact us if errors are present.

We have identified 96.6% of the organisms present in this analysis to the genus-level. In a few cases, invertebrates were identified to the family level because they were too immature, no keys were available to the generic level or were too damaged to proceed to the genus level.

In terms of 'interesting' taxa, it was exciting to see the specimens of the caddisfly genus *Psychomyia* as we only see them in 2-3 samples in a year (very uncommon). This watershed's family and genus count went up substantially from last year at these sites (from 34 families, 71 genera to 43 families, 86 genera). From the 2025 samples there were 5 new family and 11 new generic records for Athabasca that haven't been recorded from this watershed (2021-2024).

It has been our pleasure to work with you and the Athabasca Watershed Council. We hope that these data meet your expectations, and we would be delighted to work with you again. If you have any questions or require further information, please don't hesitate to contact us.

Yours sincerely,

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Report of Benthic Macroinvertebrates

Athabasca Watershed 2025

Taxonomy, Methods, and Quality Control

For

Athabasca Watershed Council

December 8, 2025

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LAND ACKNOWLEDGEMENT

ABI Environmental Services is in the traditional territories of the Niitsitapi (Blackfoot) and the people of the Treaty 7 region in Southern Alberta, which includes the Siksika, the Piikuni, the Kainai, the Tsuut'ina, and the Iyârhe Nakoda. We are situated on land where the Bow River meets the Elbow River, and the traditional Blackfoot name of this place is "Mohkinstsis" which we now call the City of Calgary. The City of Calgary is also home to Metis Nation of Alberta, Region III.

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Sample Reception

Samples of benthic macroinvertebrates were collected from eight sites by personal from the Athabasca Watershed Council using a kicknet (400um) and the CABIN method. The samples were received by ABI Environmental Services on October 1, 2025. All sample containers were found to be free from damage. The preservative in each container was replaced with 70% ethanol on October 1, 2025. All samples corresponded to those listed from the COC sheet (Table 1).

Sample Processing

Some samples contained significant amounts of macrophytes (twigs, leaves), silt/mud and sand. Large plant material like twigs and leaves were rinsed and then removed from the samples and discarded. The amount of smaller macrophytes and the silt/mud, gravel and sand were reduced in the samples by washing and sieving to separate the invertebrates from this debris. Samples were emptied on to stacked sieves, in order from the top: 4000 um, 2360 um and 400 um, and then gently washed with water. A pan or basin was placed under the bottom sieve (400 um). The large vegetation and substrate resting on the 4000 and 2360 um sieves were gently washed with water, inspected for invertebrates, and discarded. Any large invertebrates captured on the coarse sieves were transferred to a temporary holding jar. The contents resting on the sieves were inverted into a basin and gently washed into a shallow white pan. These invertebrates from the coarse and fine fractions were combined. Samples with coarse and fine (sand) particulates were also inspected for invertebrates and if any found were removed and add to the white pan. The fraction that passed through the 400-um sieve was inspected for invertebrates and none were found. This procedure was repeated for all 8 samples.

Subsampling and Sample Sorting

The invertebrates in the white pan were inspected and roughly counted to determine if subsampling was necessary. Subsampling was carried out as the invertebrates were found to be abundant in samples from all 8 of the sites (Table 2). The method of subsampling was accomplished following the CABIN procedure (Martens et al., 2021). Briefly, the samples were mixed with water and transferred to a Marchant box. The Marchant box was sealed, inverted, swirled, and quickly righted. Using a random number generator from Excel, the first five cells of the Marchant Box were selected, and the inverts removed to watch glasses using a transfer pipette. The inverts in each watch glass were counted and rough sorted into major taxa groups. If at least 300 organisms of the taxa of interest (listed in Table 4) were not reached in these five cells, additional cells were randomly chosen until the 300-organism criterion was reached. If the count was met partway through the cell the entire cell contents was counted as per the CABIN protocol. At the end of sorting these invertebrates were placed in labeled glass vials with 70% ethanol. Excluded taxa were identified and noted (Table 5). For each of the samples, the sorted fractions (invertebrates removed) were bulked together, labeled as "sorted" and retained for auditing. For each of the samples, the unsorted fractions were labelled as "unsorted" and transferred



back to their original containers and retained. These fractions will be retained for 60 days.

Sorting Audit Protocol

Three of the eight samples (38%) were randomly chosen for resorting by another team member. Sorting precision was calculated as percent sorting efficiency (% SE) using the CABIN method.

$$\%SE = \left(1 - \frac{\# \text{ of Organisms Missed}}{\text{Total \# of Organisms Found}}\right) * 100$$

The sorting efficiency is in Table 3, the samples met or exceeded the CABIN protocol of 95% with an average sorting efficiency of 96.7% (Table 3).

Identification and Taxonomy

The rough sorted samples were further examined to identify organisms to the lowest taxonomic level possible. During identification the taxa were entered on paper data sheets and then transferred to an Excel spreadsheet. The CABIN protocols for effort and identification level of respective taxa were followed as closely as possible. In the case of Chironomidae, temporary glycerin slide mounts of dissected specimens were made to confirm identifications to the genus level. Where there were disarticulated specimens only those with heads were counted to avoid double counting specimens. There were also exuviae from larval moults in some samples that were not counted as this may have been double counting specimens present or counting specimens that were not in the sampled portion of the stream bed as exuviae tend to float downstream after a moult. This is especially true for Ephemeroptera. Where possible pupal keys were used to identify fly pupae to family/genus.

Counts per taxa and sample were summarized using a Pivot Table in Excel. Taxa counts for the subsampled (all 8 sites) samples were calculated as Count and Total Count. Total Count was calculated as the number per subsample scaled up to 100% and is the number of inverts present in an entire sample. The Count and Total Count data are presented in Tables 2 and 7, respectively. The number of organisms identified (Count) in the included taxa from the sub-samples were 3122 (Table 2). To facilitate comparisons among the samples, the subsampled collections were scaled up to a full sample (Total Count), with the total number of organisms being 45357 (Tables 2 and 7). These organisms were distributed among 43 families and 86 genera (Table 7).



Auditing Protocol

The auditing protocol was performed on the same samples as the sorting efficiency. We followed the CABIN protocol for determining the Identification Error Rate and tabulated the incorrect identifications and missed organisms (Table 6A, 6B and 6C). The Identification Error Rate for samples UAB005, UAB006 and UAB007 were 0.46%, 0% and 0%, respectively. These error rates were within the tolerances for CABIN (%IE ≤ 5%).

$$\% \text{ Identification Error} = \left(\frac{\# \text{ Incorrect Identifications}}{\text{Total \# of Organisms in Audit}} \right) * 100$$

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Equipment List

- Tyler stainless steel and brass sieves: 13.3 mm, 4000 um, 2000, 1000 um and 400 um
- Catchment pan and basins
- Marchant box for subsampling
- Tools: Transfer pipettes, forceps, acid free paper, squeeze bottles
- Watch glasses – several diameter sizes: 6.5, 8.5, 10.5 cm
- Mason Jars: 125, 250, 500 and 1000 ml
- 70% Ethanol
- Glass vials with screw tops
- Glycerin for temporary slides, slides and cover slips
- Dissecting microscopes: Leica MZ6 and Leica MS5 (4 – 80X)
- Compound microscope Olympus CX41 (40-1000X)
- Light sources: two MI-150 Fiber-lights



Tables

Table 1. Sample reception – field site/sample identification and description, number and size of collection jars and date of collection from the Athabasca River Watershed 2025.

No.	Sample ID	Field Site Description	Jar # & Size	Date Collected	Condition
1	UAB002	Gregg River Test	1 – 1L	2025-09-26	Few organics, some substrate (sand)
2	UAB003	Whitehorse Creek Potential Ref	1 – 1 L	2025-09-28	Few organics, some substrate (sand)
3	UAB004	McLeod River (Bridge) Test	1 – 1L	2025-09-28	Moderate algae, some gravel
4	UAB005	McLeod River (Cadomin)Test	1 – 1 L	2025-09-26	Some organics
5	UAB006	Embarras River Test	1 – 1 L	2025-09-28	Organics and moderate substrate (sand)
6	UAB007 ^c	Gregg River (West) Test	1 – 1 L	2025-09-26	Heavy aquatic plant
7	UAB008	Lovett River Test	1-1 L	2025-09-28	Notable: Nostocs (cyanobacteria) present
8	UAB009	Hardistry Creek Potential Ref	1 – 1 L	2025-09-27	Unremarkable

- A. All samples received Oct 1, 2025
- B. Alcohol changed in jars October 1, 2024



Table 2. Subsampling effort and measured and calculated number of invertebrates per sample, the Athabasca River Watershed 2025.

Sample ID	Number of cells sampled from Marchant box ¹	No. of organisms in subsamples ²	Total number of organisms in sample
UAB002	10	381	3810
UAB003	7	378	5400
UAB004	18	362	2011
UAB005	5	423	8460
UAB006	5	433	8660
UAB007	5	390	7800
UAB008	7	391	5586
UAB009	10	401	4010
Total		3159	45737

1. A Marchant box has 100 cells, this is the number/percentage sampled to reach at least 300 organisms.
2. Taxonomy performed on these organisms.



Table 3. Sorting efficiency (SE) for three randomly selected samples the Athabasca River Watershed 2025.

Sample ID	Original Count	QA Audit Count	Comments	% SE
UAB005	410	423	13 Missed: 2 <i>Ameletus</i> , 1 <i>Eukiefferiella</i> , 1 <i>Pagastia</i> , 2 <i>Polypedilum</i> , 1 <i>Ephemerella</i> , 3 <i>Leptophlebia</i> , 2 <i>Zapada</i> , 1 <i>Polycelis</i>	96.9
UAB006	416	433	17 Missed: 5 <i>Ameletus</i> , 1 <i>Cricotopus</i> , 4 <i>Eukiefferiella</i> , 1 <i>Polypedilum</i> , 1 <i>Ephemerella</i> , 1 <i>Lebertia</i> , 1 <i>Leptophlebia</i> , 1 <i>Isoperla</i> , 2 <i>Pericoma</i> ,	96.1
UAB007	384	390	11 missed: 3 <i>Eukiefferiella</i> , 1 <i>Polypedilum</i> , 1 <i>Ephemerella</i> , 1 <i>Leptophlebia</i> , 5 <i>Zapada</i>	97.2
Average % Sorting Efficiency				96.7

Table 4. Standard taxonomic effort for practical Identification.

Group	Taxa	Attained Level of Identification
Insects	Coleoptera	Family/Genus
	Diptera	Family/Genus
	Ephemeroptera	Family/Genus
	Plecoptera	Family/Genus
	Trichoptera	Family/Genus
Non-insects		
	Ectobranhia	Family/Genus
	Enchytraeidae	Family
	Gordioidea	Family/Genus
	Tricladida (Platyhelminthes)	Family/Genus
	Trombidiformes (Mite)	Family/Genus
	Tubificida (Annelida)	Family/Genus
Veneroida	Family/Genus	



Table 5. Excluded Taxa -Total Count per site, the Athabasca River Watershed 2025.

Taxonomic Group	UAB 002	UAB 003	UAB 004	UAB 005	UAB 006	UAB 007	UAB 008	UAB 009	Total
Hemiptera Aphididae			6				29		34
Hemiptera Triozidae							14		14
Hymenoptera Scelionidae			6						6
Metacopina	40	57	39	40				150	326
Total	40	57	51	40			43	150	380



Table 6A. Identification error rate for sample UAB005, the Athabasca River Watershed 2025.

Order	Family	Genus	Raw Count	Audit Count	Audit Flag	IE Error	Comments
Diptera	Simuliidae	<i>Simulium</i>	42			2	(-2) shed pupae
Total						2	
Total organisms in audit			425	423			
Average % Identification Error Rate						0.46%	Pass

Table 6B. Identification error rate for sample UAB006, the Athabasca River Watershed 2025.

Order	Family	Genus	Raw Count	Audit Count	Audit Flag	IE Error	Comments
Total							
Total organisms in audit			433	433			
Average % Identification Error Rate						0%	Pass

Table 6C. Identification error rate for sample UAB007, the Athabasca River Watershed 2025.

Order	Family	Genus	Raw Count	Audit Count	Audit Flag	IE Error	Comments
Total							
Total organisms found in audit			390	390			
Average % Identification Error Rate						0%	Pass



Table 7. Total count of benthic macroinvertebrates from field sites in the Athabasca River Watershed 2025.

Taxonomic Group	UAB002	UAB003	UAB004	UAB005	UAB006	UAB007	UAB008	UAB009	Total
Order: Coleoptera									
Family: Elmidae									
<i>Heterlimnius</i>	90		17		900	60	129	80	1275
<i>Narpus</i>	10								10
<i>Optioservus</i>							14		14
Order: Diptera									
Family: Ceratopogonidae									
<i>Palpomyia</i>	10				20	40	14		84
Family: Chironomidae	10		6		100	20			136
<i>Brillia</i>		43		80	20	20	14	10	187
<i>Cardiocladius</i>	20	29						10	59
<i>Corynoneura</i>						20			20
<i>Cricotopus</i>	40	86	22	60	140	360	57	40	805
<i>Cryptochironomus</i>								10	10
<i>Eukiefferiella</i>	70	1657	44	500	280	1660	243	10	4464
<i>Krenosmittia</i>			6						6
<i>Micropsectra</i>			6		100	20	14	60	200
<i>Neostempellina</i>		14							14
<i>Orthocladius</i>	450	71	22			120	57		721
<i>Pagastia</i>	100	214		40	40	180			574
<i>Parakiefferiella</i>		29		20	20	40			109
<i>Parametricnemus</i>		14							14
<i>Polypedilum</i>	30		6	40	140	20	29	30	294
<i>Potthastia</i>	10	14				40			64
<i>Procladius</i>			6						6
<i>Psectrocladius</i>						60			60
<i>Pseudosmittia</i>						20			20
<i>Tanytarsus</i>					20	40			60
<i>Thienemannimyia</i>					20				20
Family: Empididae									
<i>Chelifera</i>	10				20			10	40
<i>Neoplasta</i>	20		6			160			186
<i>Oreogeton</i>					20			30	50
Family: Ephydriidae						20			20
Family: Psychodidae									
<i>Pericoma</i>	30		11		720	60	29	10	860
Family: Simuliidae									
<i>Simulium</i>	10			40			129	30	209
Family: Tipulidae									
<i>Antocha</i>					20		86		106
<i>Dicranota</i>				20					20
<i>Hexatoma</i>	10		11	20					41
<i>Limnophila</i>					20				20



Table 7. Total count of benthic macroinvertebrates from field sites in the Athabasca River Watershed 2025.

Taxonomic Group	UAB002	UAB003	UAB004	UAB005	UAB006	UAB007	UAB008	UAB009	Total
Order: Ectobranhia									
Family: Valvatidae									
<i>Valvata sincera</i>	10								10
Order: Ephemeroptera									
Family: Ameletidae									
<i>Ameletus</i>	1430	157	317	320	3020	920	3114	1390	10668
Family: Baetidae	10								10
<i>Acentrella</i>			11				14		25
<i>Baetis</i>				400				10	410
<i>Dipheter</i>				20					20
Family: Ephemerellidae									
<i>Drunella</i>	150	14	67	260	40			170	701
<i>Ephemerella</i>	250	314	50	720	260	1160	57	260	3071
Family: Heptageniidae									
<i>Cinygmula</i>		14	11	40		40	14	30	150
<i>Epeorus</i>	10	14	6					50	80
<i>Rhithrogena</i>	80	143	272	60				120	675
Family: Leptophlebiidae									
<i>Leptophlebia</i>	300	1829	622	3140	540	280	414	780	7905
<i>Neoleptophlebia</i>								10	10
Order: Gordioidea									
Family: Gordiidae									
<i>Gordius</i>	10				20				30
Order: Lumbriculida									
Family: Lumbriculidae									
<i>Lumbriculus</i>								10	10
Order: Plecoptera									
Family: Capniidae									
<i>Capnia</i>	40				60		57	30	187
Family: Chloroperlidae									
<i>Plumiperla</i>	30	14	50			20		90	204
<i>Suwallia</i>	20	43	33					60	156
<i>Sweltsa</i>			28						28
Family: Leuctridae									
<i>Despaxia</i>	10							20	30
<i>Paraleuctra</i>			6						6
<i>Perlomyia</i>		14	17						31
<i>Pomoleuctra</i>			17						17
Family: Nemouridae		29	33	580	40	580	29	10	1300
<i>Malenka</i>	80		11	20	40	60	29	90	330
<i>Nemoura</i>			22			40			62
<i>Zapada</i>	60	100	17	880	220	720	14	160	2171
Family: Perlidae									
<i>Doroneuria</i>		43							43
<i>Hesperoperla</i>	50				80				130
Family: Perlodidae	20		6	20					46
<i>Isoperla</i>	20		11	60	240	120	114	30	595
<i>Kogotus</i>	50	14	6	180	120	140	114		624
<i>Megarcys</i>				60				20	80
Family: Taeniopterygidae			6	80	40	80			206
<i>Taenionema</i>	10	86	100	240	20	60	200		716



Table 7. Total count of benthic macroinvertebrates from field sites in the Athabasca River Watershed 2025.

Taxonomic Group	UAB002	UAB003	UAB004	UAB005	UAB006	UAB007	UAB008	UAB009	Total
Order: Trichoptera									
Family: Apataniidae									
<i>Apatania</i>						20			20
Family: Brachycentridae									
<i>Brachycentrus</i>	50		39		360	20			469
<i>Micrasema</i>		14	6		280		429	20	748
Family: Glossosomatidae									
<i>Glossosoma</i>	20				100	60	29	30	239
Family: Hydropsychidae		14							14
<i>Arctopsyche</i>	10			60					70
<i>Cheumatopsyche</i>				40	40				80
<i>Parapsyche</i>		14		60		20			94
Family: Lepidostomatidae									
<i>Lepidostoma</i>		14							14
Family: Leptoceridae									
<i>Oecetis</i>						20			20
Family: Limnephilidae									
<i>Glyphopsyche</i>				20					20
Family: Psychomyiidae									
<i>Psychomyia</i>	10								10
Family: Rhyacophilidae									
<i>Rhyacophila</i>	10	14	11	80		20		10	145
Order: Tricladida									
Family: Planariidae									
<i>Polycelis</i>		43		80		160	14		297
Order: Trombidiformes									
Family: Feltriidae									
<i>Feltria</i>						20			20
Family: Hygrobatidae									
<i>Hygrobates</i>					40				40
Family: Lebertiidae									
<i>Lebertia</i>	100	86	22		240	80	29	10	567
Family: Limnesiidae									
<i>Limnesia</i>		14		40	20	80	29		183
Family: Oxidae									
<i>Oxus</i>					40		29	10	79
Family: Sperchontidae									
<i>Sperchon</i>	10	100		100	40	80		10	340
Family: Torrenticolidae									
<i>Testudacarus</i>					100			10	110
<i>Torrenticola</i>		29		20	60	40			149



Table 7. Total count of benthic macroinvertebrates from field sites in the Athabasca River Watershed 2025.

Taxonomic Group	UAB002	UAB003	UAB004	UAB005	UAB006	UAB007	UAB008	UAB009	Total
Order: Tubificida									
Family: Naididae								50	50
Order: Veneroida									
Family: Pisidiidae									
<i>Pisidium</i>				20					20
Order:									
Family: Enchytraeidae			6					40	46
Total	3770	5343	1961	8420	8660	7800	5543	3860	45357