WOOD RIVER LAND TRUST

BIG WOOD RIVER WATERSHED MACROINVERTEBRATE TREND MONITORING SYNOPSIS

2022

INTRODUCTION

Biomonitoring using biological assemblages to assess the environment is a practical approach for characterizing ecological conditions of streams because of the ability to integrate multiple stressors and stream conditions over time (Rosenburg and Resh 1996, Barbour, et al. 1999) Aquatic macroinvertebrates cope with the chemical, physical, and biological impacts of their surroundings over the course of their aquatic life cycle, which can last up to several years.

Using macroinvertebrates offers certain advantages such as their ubiquitous nature, high species richness that offers a spectrum of environmental responses, longer life cycles of some taxa, easy sampling methods, and suitability of certain taxa for experimental studies of pollution effects (Bonada, et al. 2006).

Because of this, monitoring aquatic macroinvertebrates has become the standard method for government agencies, scientists, and non-profit organizations like the Wood River Land Trust (WRLT) to keep track of trends in aquatic ecosystem health.

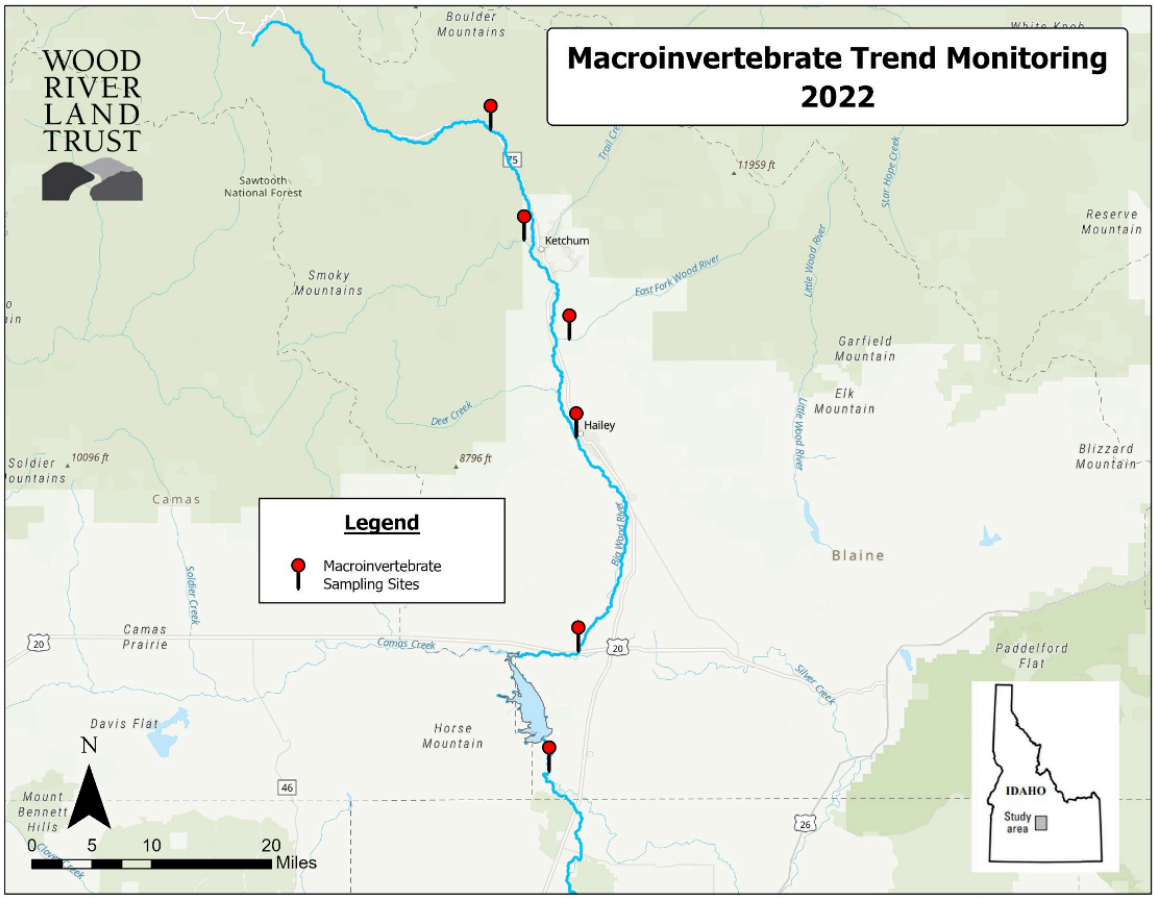
In 2022, the WRLT initiated an annual macroinvertebrate monitoring program to assess temporal and spatial trends at six locations. Taxonomic identification was completed to the species level all taxa except midges. Laboratory work, enumeration, and metric calculations were completed by River Continuum Concepts in Bozeman, MT. A high level overview of these findings are found within this document. These trends may guide future restoration and management activities in the basin.

SAMPLE SITES

Locations of sampling sites on the Big Wood River (BWR) and tributaries are shown in the map below and listed in Table 1. Because limited macroinvertebrate surveys have been completed in the BWR basin, sampling sites were selected to accompany previous survey work completed by USGS in 2014 (MacCoy and Short 2016).

Though our methodology varies in some aspects from this investigation (USGS composited five samples into one sample per each site, while our methodology opts to keep replicate samples discrete to provide more robust analytic opportunities), there are many similarities such as:

- Five replicates per site
- Five of the seven exact sampling sites used in the USGS investigation were surveyed, which are near existing USGS gaging stations
- Riffle region sampling
- A subset of metrics and indices can be derived and compared between investigations



SITE	DATE	DENSITY	TAXA	DIVERSITY	EVENNESS	EPT_TAX	P_EPT	P_Chiro	P_NONI	HBI	DOMINANT TAXA	INVASIVEABUND
Big Wood River SNRA	3/29/2022	2830.55	23.40	2.19	0.69	12.20	70.12	14.34	8.29	2.40	Lepidostoma	0
Warm Springs Creek	3/29/2022	19051.21	13.60	1.54	0.59	5.40	29.60	53.19	12.45	5.05	Chironimidae	0
East Fork Big Wood River	3/28/2022	5173.77	21.40	2.19	0.72	11.20	33.76	19.46	16.96	4.38	Optioservus	0
Big Wood River Hailey	4/6/2022	15214.37	14.20	1.51	0.57	6.60	43.91	25.15	26.08	3.93	Lepidostoma	0
Big Wood River Stanton	4/1/2022	9466.48	17.80	1.80	0.62	5.80	20.22	10.90	64.90	6.94	Naididae	0
Big Wood River Below Magic	4/1/2022	50983.12	11.60	1.32	0.54	2.60	23.09	47.66	15.51	5.93	Chironimidae	3

Table 1. Composite macroinvertebrate metrics among sites

PROJECT	Wood River Land Trust Macroinvertebrate Trend Monitoring, Spring 2022
SITE	Location of samples
DATE	Date of sample collection
DENSITY	Macroinvertebrate Density, expressed in animals/m^2
TAXA	Taxa richness: the number of distinct types (genus/species etc) after apportioning
DIVERSITY	Shannon-Weaner Diversity index. Values should be above 2. Close to 3 are excellent
EVENNESS	Pielou's evenness index. A function of Diversity and taxonomic abundance
EPT_TAX	Richness of Ephemeroptera, Plecoptera, and Trichoptera,
P_EPT	Relative abundance of Ephemeroptera, Plecoptera, Trichoptera (%)
P_Chiro	Relative abundance of chironomid midges (%)
P_NONI	Relative abundance of Non-Insects (%)
HBI	Hilsenhoff biotic index, tolerance from Barbour 1999: *Evaluation of Water Quality Using Biotic Index Values* Biotic Index — Water Quality — Degree of Organic Pollution 0.00 - 3.50 — Excellent — No apparent organic pollution 3.51 - 4.50 — Very Good — Possible slight organic pollution 4.51 - 5.50 — Good — Some organic pollution 5.51 - 6.50 — Fair — Fairly significant organic pollution 6.51 - 7.50 — Fairly Poor — Significant organic pollution 7.51 - 8.50 — Poor — Very significant organic pollution 8.51 - 10.00 — Very Poor — Severe organic pollution
DOMINANT TAXA	The dominant genus/species
INVASIVE_ABUND	The number of invasive species present

Table 2. Description of metrics

The southernmost sampling site is the BWR below Magic Dam (BLWMAG), upstream of the Richfield diversion canal. This is the only site that does not coincide with a USGS gaging station, as tailwater flow dynamics below dams do not generally offer informative community data, due to the highly oxygenated water exiting the reservoir. Instead, a site was chosen downstream where dam affects are attenuated.

The next farthest downstream sampling site, Stanton Crossing (BWSTANTON, 13140800, RK 122), is in the western Bellevue Fan area that drains about 1,900 km2.

The BWR Hailey study site (BWHAILEY, 13139510, RK 136) is located within the City of Hailey at the USGS stream gaging station that has been in operation since 1916, near the Bullion Bridge.

The East Fork BWR site (EFORK, 13138000, RK 146) discharges to the BWR main stem downstream of Ketchum.

The Warm Springs Creek tributary site is located within the city of Ketchum, about 1.5 km above the confluence with the BWR (WRMSPG, 13137000, RK 156).

The northernmost site in the watershed is the BWR near the Sawtooth National Recreation Area office, (BWSNRA, 13135500) at 170 river kilometers (RK) upstream of the mouth of the BWR.

SUMMARY

The ecological integrity of each site generally followed the elevation gradient (Figure 1; low elevation sites to the left on x-axis), with sites lower in the basin such as below Magic Reservoir and Stanton Crossing (4672' and 4829' elevation) exhibiting low richness, poor HBI scores, and a dominance of aquatic worms and midges.

Higher elevation sites in the upper Big Wood and East Fork (1640' and 5580' elevation) were taxonomically diverse, and displayed a balanced assemblage of functional feeding groups, which is in line with findings from the 2016 USGS Report (Figure 2).

Warm Springs Creek (5830' elevation) was an outlier to the elevation trend, and did not show signs of a balanced assemblage. Warm Springs Creek presented nearly the lowest taxonomic richness and EPT richness, and over 50% of the relative abundance was comprised of midge species.

Surprisingly, the mean HBI score for the Hailey site adjacent to Lion's park was very good (3.93), which can be attributed to the mean relative abundance of Lepidostoma (34%). Lepidostoma, more commonly known as the Little Brown Sedge or Quiltmaker Caddis, are pollution intolerant facultative shredders, and were also the dominant species at the upper Big Wood site near the SNRA headquarters. Though the EPT richness was moderate at the Hailey site, 44% of the abundance was comprised of EPT taxa, only second to the upper Big Wood site (70%). Trends between 2014 and 2022 indicate roughly a 50% decrease in EPT richness at the higher elevation sites, and density increases at the Hailey and Warm Springs site (Figure 2). These comparisons must be interpreted with caution when comparing metrics between the USGS study and our recent survey, as those data were collected with a different instrument and replicate locations were not stratified.

River Continuum Concepts also performed a "Large and Rare" search in conjunction with standard subsampling methods, to provide information about endangered, invasive, or interesting species thought to be relevant to the fly fishing community.

Notable findings include an abundance of seven Pteronarycys californica (salmonfly) species at the Hailey site, and one at the Warm Springs site. The 2016 USGS study did not report finding any Pteronarcys californica, likely due to subsampling, but they are generally not thought to exist in the Big Wood River basin. Had the Large and Rare data been incorporated into the analysis, the Hailey site would have excellent HBI scores, as Pteronarycs californica is extremely pollution intolerant, given their long life history and narrow ecological niche.

One negative finding from the Large and Rare search was the presence of three Potamopyrgus antipodarum (New Zealand Mud Snail) found below Magic Reservoir. Though common throughout much of the West, Potamopyrgus antipodarum are listed as an aquatic invasive species by the US Fish and Wildlife Service.

They are a nuisance because they can reach phenomenal densities and consume a large amount of algae, which is a primary food for native macroinvertebrates. With its protective shell, the mud snail provides little if any nutrition as prey and may pass through a fish alive. Potamopyrgus antipodarum can live up to 24 hours without water, so educating the public about the potential of spread should be a priority for river management in the basin.

REFERENCES

MacCoy, D., and T. Short. 2016. *Aquatic Biological Communities and Associated Habitats at Selected Sites in the Big Wood River Watershed, South-Central Idaho, 2014.* Scientific Investigations Report, Reston, Virginia: United State Geological Survey.

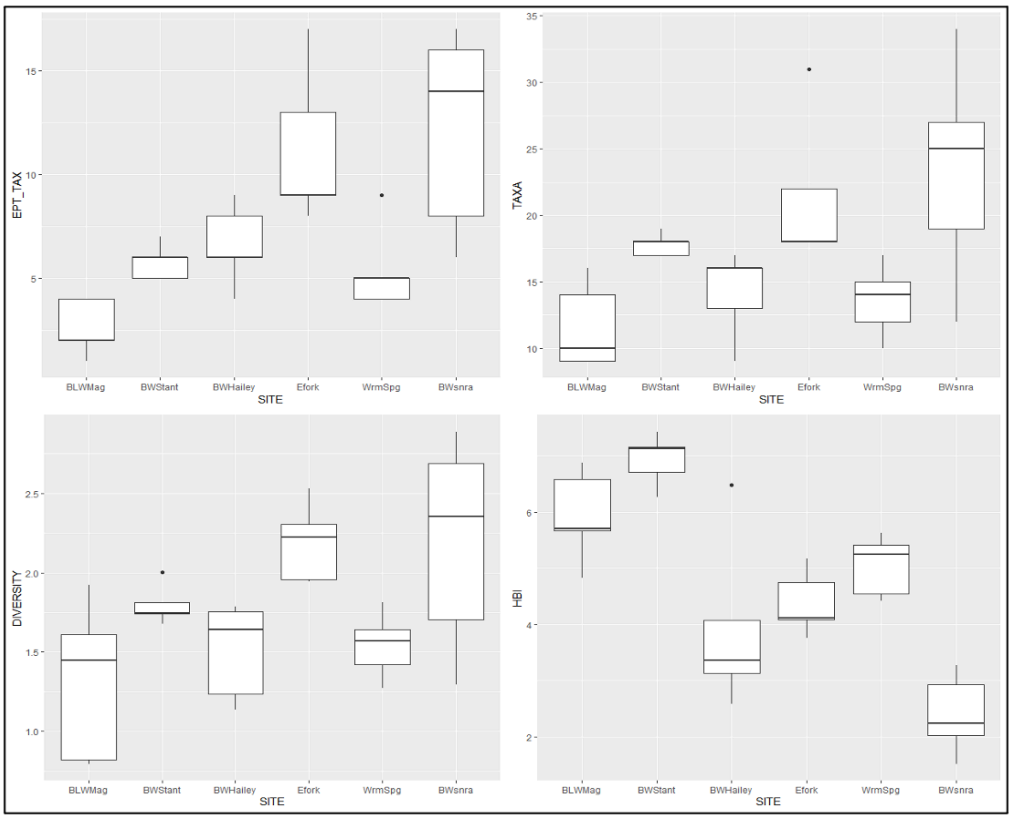


Figure 1. Box and whisker plot of significant taxonomic metrics among sites. These figures display stratified replicate data and are not composited