Assessing the Effects of Land Use on Little Beaver Creek Water Quality Using Macroinvertebrates

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Introduction

Little Beaver Creek (LBC) in Columbiana County, Ohio is a State and Federal Scenic River (Ohio EPA 2019). Due to this categorization, this river is under constant monitoring to the protect the river from sources of pollution. The purpose of this study was to determine if this river was affected by surrounding land use, specifically agricultural and urban uses using macroinvertebrate analysis.

Materials and Methods

Three sites were chosen based on surrounding land use:

- Teagarden Covered Bridge (TCB), Salem, Ohio: Agriculture
- Beaver Creek State Park (BCSP), East Liverpool, Ohio: Forest
- Leslie Run (LR), East Palestine, Ohio: Urban

Sampling occurred in September and October of 2019, using a Surber Sampler for a daily sample and Hester Dendy traps for a month-long sample. Hach kits were used to determine the chemical parameters of the sites. The macroinvertebrates were identified in the spring of 2020. The cumulative index value (CIV), Shannon and Simpson's indices were used to determine the health and biodiversity of the three sites.

Results

Table 1: Stream biodiversity and water quality using data collected from Surber Sampler

Sites	*Average H*	*Total Number of Species*	*Average Simpson's Index of Diversity*	*Cumulative Index Value*	*Stream Quality*
Salem (Teagarden Covered Bridge)	0.701	8	0.372	17	Good (17-22)
Beaver Creek State Park	1.420	10	0.660	17	Good (17-22)
East Palestine (Leslie Run)	1.187	13	0.498	22	Excellent (>22)

Table 2: Stream biodiversity and water quality using data collected from Hester Dendy traps

Sites	*Average H*	*Total Number of Species*	*Average Simpson's Index of Diversity*	*Cumulative Index Value*	*Stream Quality*
Salem (Teagarden Covered Bridge)	1.110	6	0.550	14	Fair (11-16)
Beaver Creek State Park	1.100	6	0.560	12	Fair (11-16)
East Palestine (Leslie Run)	1.68	7	0.813	11	Fair (11-16)

The Surber Sampler found that LR had the highest CIV and the second highest biodiversity. TCB and the BCSP had the same CIV, while the state park had the highest biodiversity.

The Hester Dendy traps found that all three sites had similar CIV scores, while Leslie run had the highest biodiversity.

Discussion

All three sites were found to be healthy and following the trends of ODNR's sampling from 2007 to 2016. In particular, the findings *regarding* LR contradicted previous research that states that urban streams are under the highest pressure (Lenat and Crawford 1994). TCB and BCSP were well buffered sites, resulting in their high biodiversity and CIV scores.

The Hester Dendy traps resulted in similar CIV scores for the sites, with LR having the highest biodiversity. This may be due to the species present in LBC, which may not prefer the traps. For example, little to no caddisflies or snails were captured using the traps, although they were extremely common using the Surber Sampler.

Conclusion

This study found that Little Beaver Creek was not affected by land use. It was limited by the amount of time samples could be taken. Further monitoring is required to ensure that the stream stays healthy and more sampling dates are required to gain a fuller picture of the health of the stream.

Literature Cited
Division of Parks & Watercraft (OH). 2019. Little Beaver Creek State Wild & Scenic River and National Scenic River [Internet]. Columbus (OH): Department of Natural Resources (OH); [cited 2019 Oct 17]. Available from http://watercraft.ohiodnr.gov/littlebeaversr.
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Lenat DR, Crawford JK. 1994. Effects of land use on water quality and aquatic biota of three North Carolina Piedmont streams. Hydrobio. 294:185-199.