End of Summer Report

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Wild Rice is an ecologically and culturally significant plant native to the Great Lakes region of the United States that, for hundreds of years, the Anishinaabe peoples indigenous to Michigan have used as a staple in their communities. While the cultural importance of wild rice is apparent, less is understood about the ecological role this plant plays within the aquatic environments it inhabits. This summer through FURSCA I was given the opportunity to help expand this environmental knowledge through the sampling of macroinvertebrates. Macroinvertebrates are aquatic arthropods (“bugs”) larger than two millimeters in size that serve as the foundation for many stream ecosystems. The populations of these macroinvertebrates can be sampled in order to test the health of a stream or the health of specific portions of a stream. Based on the species and quantities of organisms present, the biodiversity and pollution of the environment sampled can be extrapolated.

At the beginning of the summer, I planned to sample within the rice beds of the Nottowasepi Huron Band of Potawatomi (NHBP) reservation that sits on the St. Joseph River south of Battle Creek, Michigan. As part of the ongoing relationship between the NHBP and Albion College, they had invited the Albion College Wild Rice Group to their reservation to continue the macroinvertebrate work that had previously been done within the Kalamazoo River. However, the NHBP was unable to meet with us this summer due to scheduling conflicts so instead of sampling on the St. Joseph River I deployed collectors within the Kalamazoo River.

One of my primary tasks this summer was designing and producing culturally consistent and environmentally conscientious birchbark collectors. Previous macroinvertebrate sampling in the Kalamazoo River had been done using Tupperware containers with mesh webbing installed. This summer, however, at the request of the NHBP, we transitioned away from plastic devices to using collectors constructed primarily of natural birchbark, a resource that is culturally significant

to the Anishinaabe peoples. The collectors were created using a 3D-printed frame that was made of wood PLA (Polylactic Acid). Wood PLA is a biodegradable combination of 30 percent wood pulp and 70 percent cornstarch-based plastic. I spent most of the first three weeks of FURSCA perfecting the design for the collectors and printing them at the Albion College innovation lab. Once these frames were printed I then filled them with dead leaves, wrapped them in soaked birchbark, and tied them together using artificial deer sinew so that they could be deployed within the Kalamazoo River.

At the beginning of July, I deployed 12 collectors at 6 different sites within the Kalamazoo River–three of these sites were within wild rice beds while the other three were set outside the beds. After two weeks of sitting in the river, the collectors were retrieved and brought back to the lab to be processed and analyzed. In the lab, I dismantled the collectors by cutting the sinew off, removing the birch bark, and transferring the contents of the collectors into a fine-grained sieve. The contents were then sieved to remove small sediment and debris from the sample leaving only things large enough to be significant within the study. Finally, samples were preserved using 90 percent ethanol and stored in the fridge to ensure the macroinvertebrates remained intact while I analyzed each collector. I then spent the following weeks analyzing each sample under a low-magnification microscope where I counted, identified, and recorded all the macroinvertebrates present within each sample.

Once all the samples were analyzed I used the statistical program R-Studio to establish richness, diversity, and biotic index for each collector. These three metrics assess the stability and health of an ecosystem in different ways. Richness measures the number of different species within a sample. Diversity measures the distinct species as well as the number of individuals of each species. The diversity measurment shows not only what kinds of organisms are present in the sample, but also the total composition of the community within the sample by weighing each species based on the number of individuals present. The biotic index shows the pollution present within an ecosystem by assessing the pollution tolerance of a community of

macroinvertebrates based on previously understood tolerances of macroinvertebrate species. Using these three metrics I was able to test to see if the ecosystems within the rice beds were healthier and less polluted than the samples taken on the same river outside of the rice beds.

My data shows little difference in the macroinvertebrate communities within and outside of the wild rice. Using a T-test to look for statistical differences between the sample sites, diversity ($P = 0.291$), richness ($P = 0.147$), and biotic index ($P = 0.648$) all had P-values greater than 0.05. This shows that there is not a significant difference in any of the three metrics when comparing the samples taken within and outside of the wild rice. While there is no statistical significance proving a correlation between the wild rice and the macroinvertebrate populations within the section of the river sampled, there was great variance in the diversity, richness, and biotic index throughout the sample area (Figure 1,2,3). Furthermore, all of my sampling sites were concentrated within a small area of the river. Therefore the data I collected this summer is not a conclusive estimate of the overall effect that Wild Rice has on these macroinvertebrate populations. Within the final week of my summer research, I deployed a second set of collectors within a larger stretch of the Kalamazoo River, using 24 collectors spread across 12 different sample sites. I hope this data can be used to add further depth to the present data and provide more conclusive evidence on the effects of wild rice on macroinvertebrate populations.

I am incredibly grateful to be able to participate in this Summer's FURSCA term and I plan on presenting this summer's findings at the Elkin Isaac Student Research Symposium this coming spring. Through this work, I gained valuable experience doing hands-on research. As an environmental studies major I believe having experience working both in the field and within a laboratory setting is necessary for me to have a successful future within the environmental discipline and this FURSCA experience gave me a useful foundation through which I can continue to learn and practice these research skills. I especially thank Dr. Cahill for patiently leading me through this process and thank all the FURSCA donors especially the Robson Family Fellows Endowment for making it possible for me to pursue my research.

Figures

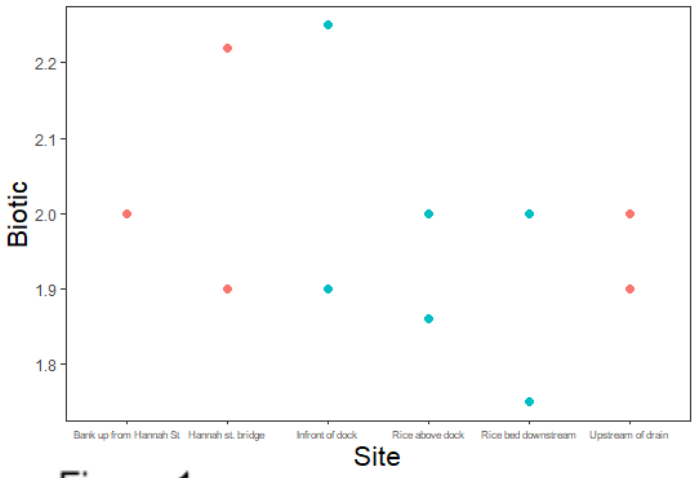

Figure 1

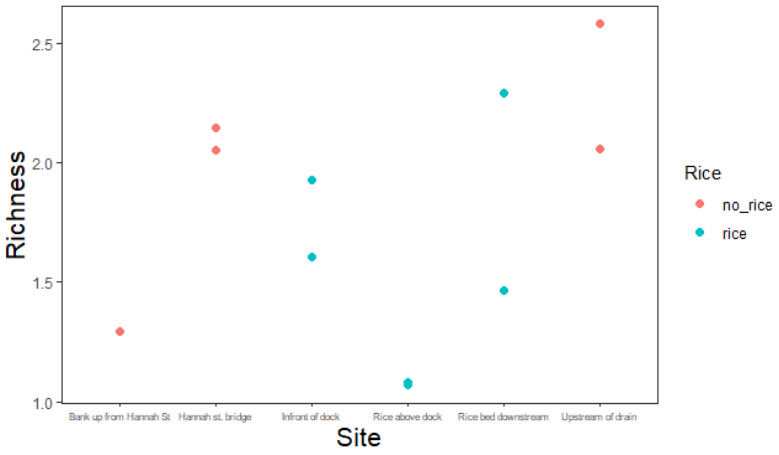

Figure 2

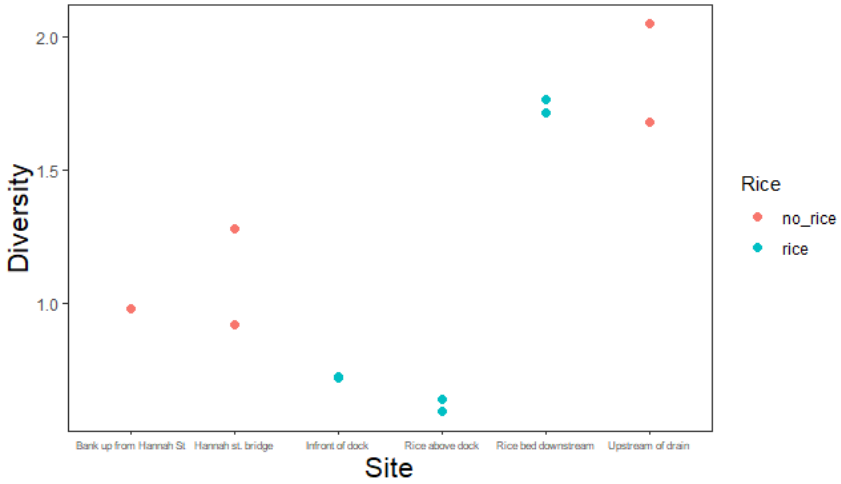

Figure 3

Filter

	Box	Site	Rice	Biotic	Richness	Diversity
b	1	Upstream of drain	no_rice	1.90	2.583178	2.0470323
b.1	2	Bank up from Hannah st	no_rice	2.00	1.295654	0.9826213
b.2	3	Infront of dock	rice	2.25	1.604506	0.7277478
b.3	4	rice bed downstream	rice	2.00	2.291632	1.7657853
b.4	5	Upstream of drain	no_rice	2.00	2.058099	1.6783009
b.5	7	rice up from dock	rice	1.86	1.082786	0.6430634
b.6	9	rice up from dock	rice	2.00	1.070016	0.5953835
b.7	10	Hanna st. bridge	no_rice	2.22	2.148708	1.2812249
b.8	11	rice bed downstream	rice	1.75	1.467610	1.7162110
b.9	12	Hanna st. bridge	no_rice	1.90	2.053547	0.9215651
b.10	13	Infront of dock	rice	1.90	1.926624	0.7194305

Table 1