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Monitoring Fish Diversity in Massies Creek, Ohio

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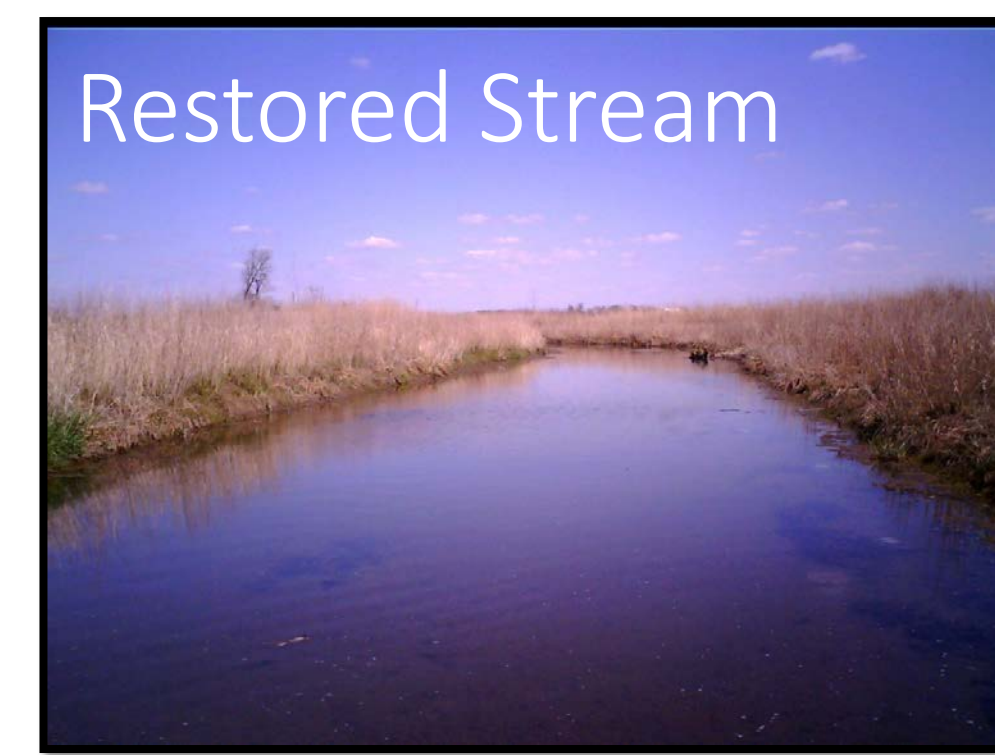
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Monitoring Fish Diversity in Massies Creek, Ohio

Connor Gilmour, Jennie Krob, Angela McCain, and Mark Gathany

Introduction

Seeing as how fish diversity depends largely on habitat we have been monitoring the species present in restored and unrestored portions of Massie Creek. In 2006, parts of the stream were restored in an effort to improve the stream habitat quality, which in turn should increase biodiversity. Previous agricultural practices had channelized and degraded the overall stream quality. This study continues this previous work while also expanding the number of research sites to include those sampled in the late 1950s by the Ohio DNR. By cataloging the fish species at these stream sites, we can determine the stream fish biodiversity within the watershed.



Objectives

We monitored the diversity of fish species in Massies Creek in order to evaluate the effects of restoration and land use context as well as to draw comparisons to a study completed 50 years earlier.

Study sites

We identified and used 6 study sites spread along Massie Creek and the North and South Forks that were common to the 1960 Ohio DNR report. Here we use the same site numbering system.

Methods

At each site we placed eight minnow traps approximately 10 meters apart in the stream sections. We sampled one pair of restored and unrestored sections twice (11b and 13) and the rest once, making a total of 8 sample days. We used Simpson's Index (D) and the Shannon Index to evaluate fish biodiversity. Finally, we completed a qualitative comparison of our fish diversity with those that had been documented at (or near) the same site used for the 1960 Ohio DNR report.

Results

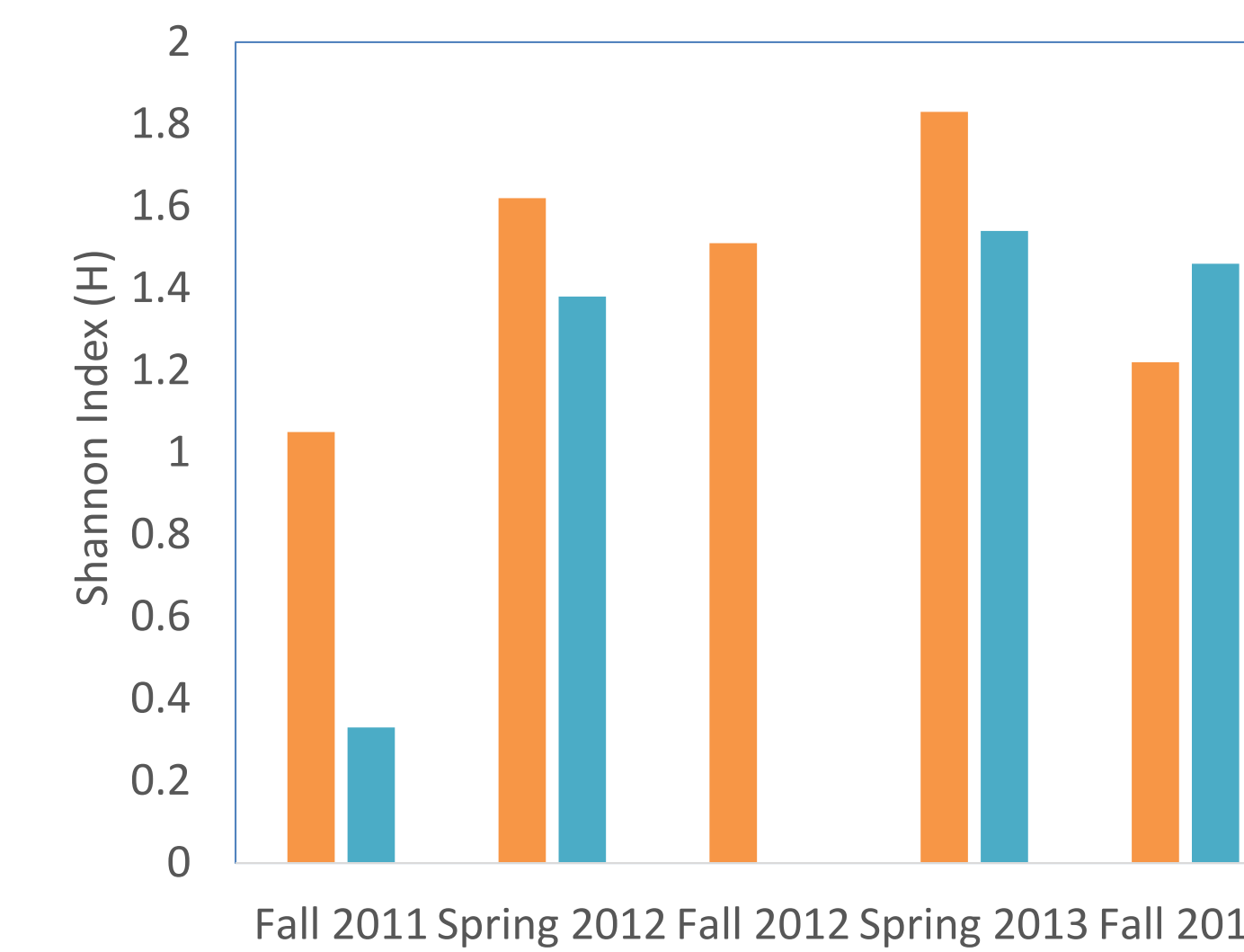
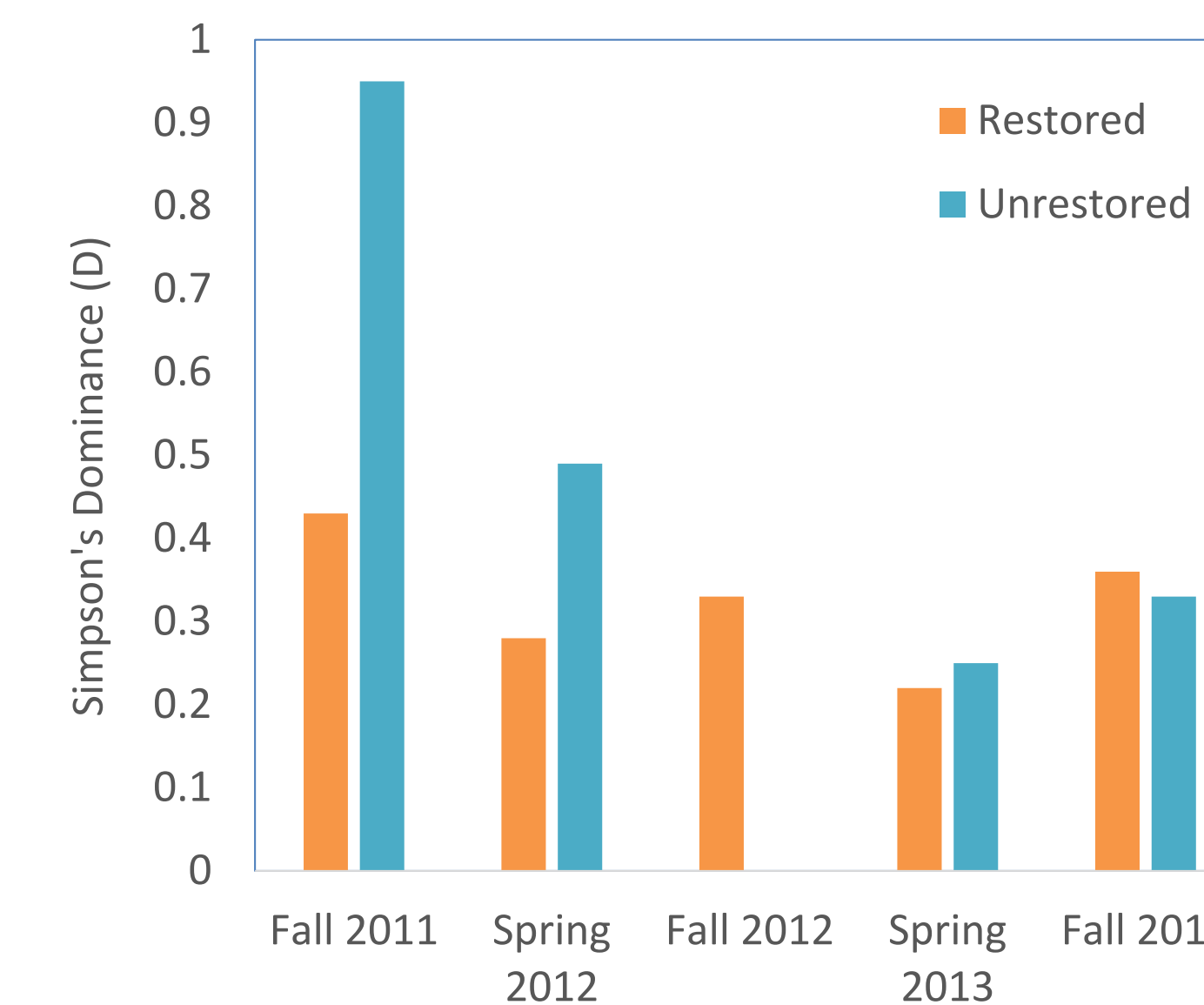
Site Restoration

Dominance

- Soon after restoration, there was a large difference in dominance.
- Dominance has decreased at both sites from initial measurements in 2011.

Diversity

- The changes in dominance reflect the corresponding increases in fish diversity.
- Diversity was greatest in the restored stream for 4 of the 5 sampling dates even though diversity has generally increased at both sites.



Biodiversity across sites

- In 2014 we found that Site 7 on the North Fork had the greatest values of dominance (7, D = 0.84) whereas Site 13 on the South Fork had the lowest values for dominance (13, D = 0.36).
- Site 13 corresponds to the "unrestored" site from our previous studies.
- Within the watershed we estimated Shannon Diversity (H') values for fish biodiversity to be 0.29 – 1.46.

	Sites					
	11b	13	7	9	3b	5
Simpson's Dominance (D)	0.36	0.33	0.84	0.38	0.50	0.63
Shannon Diversity (H')	1.22	1.46	0.29	1.02	0.69	0.56

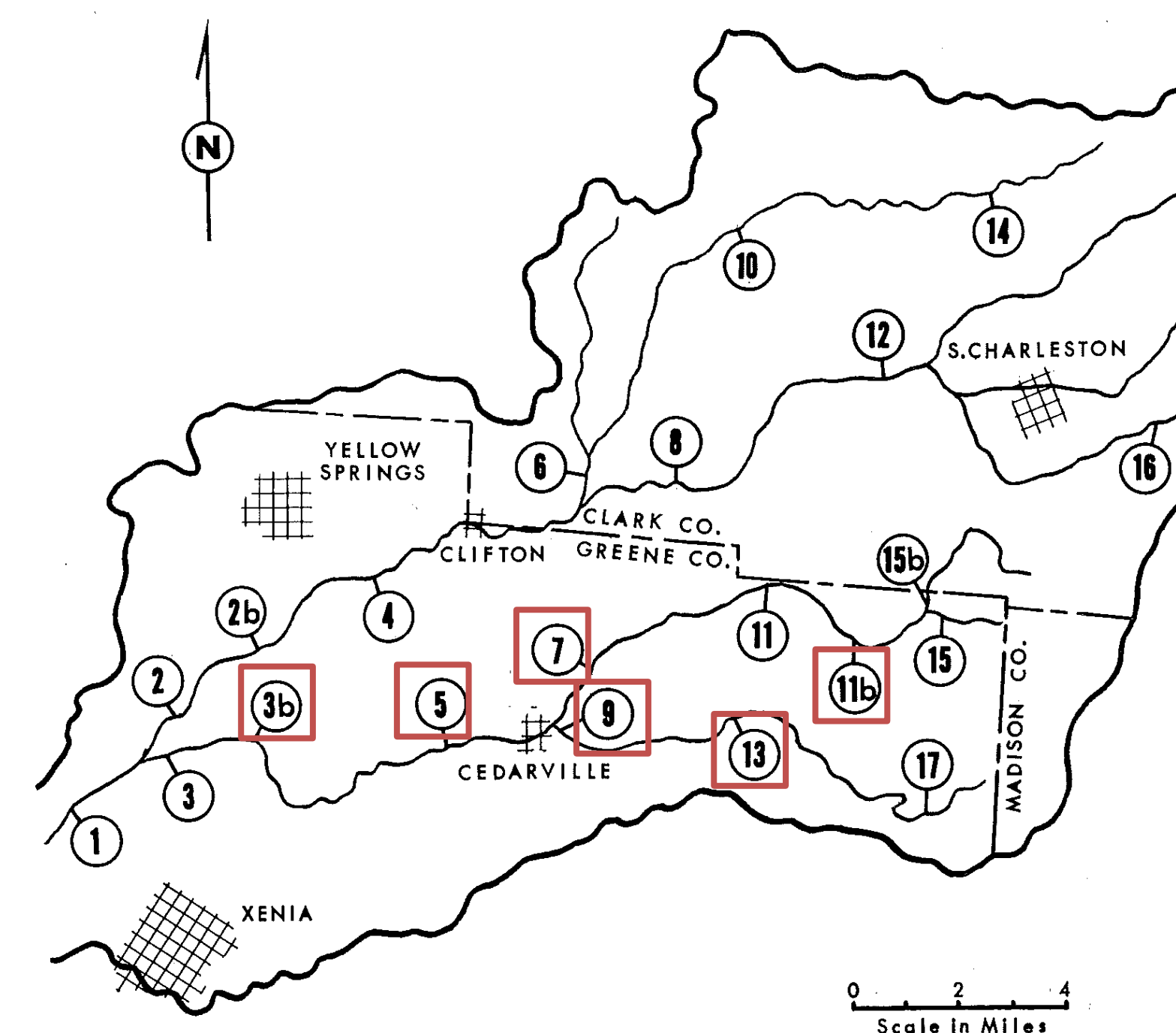
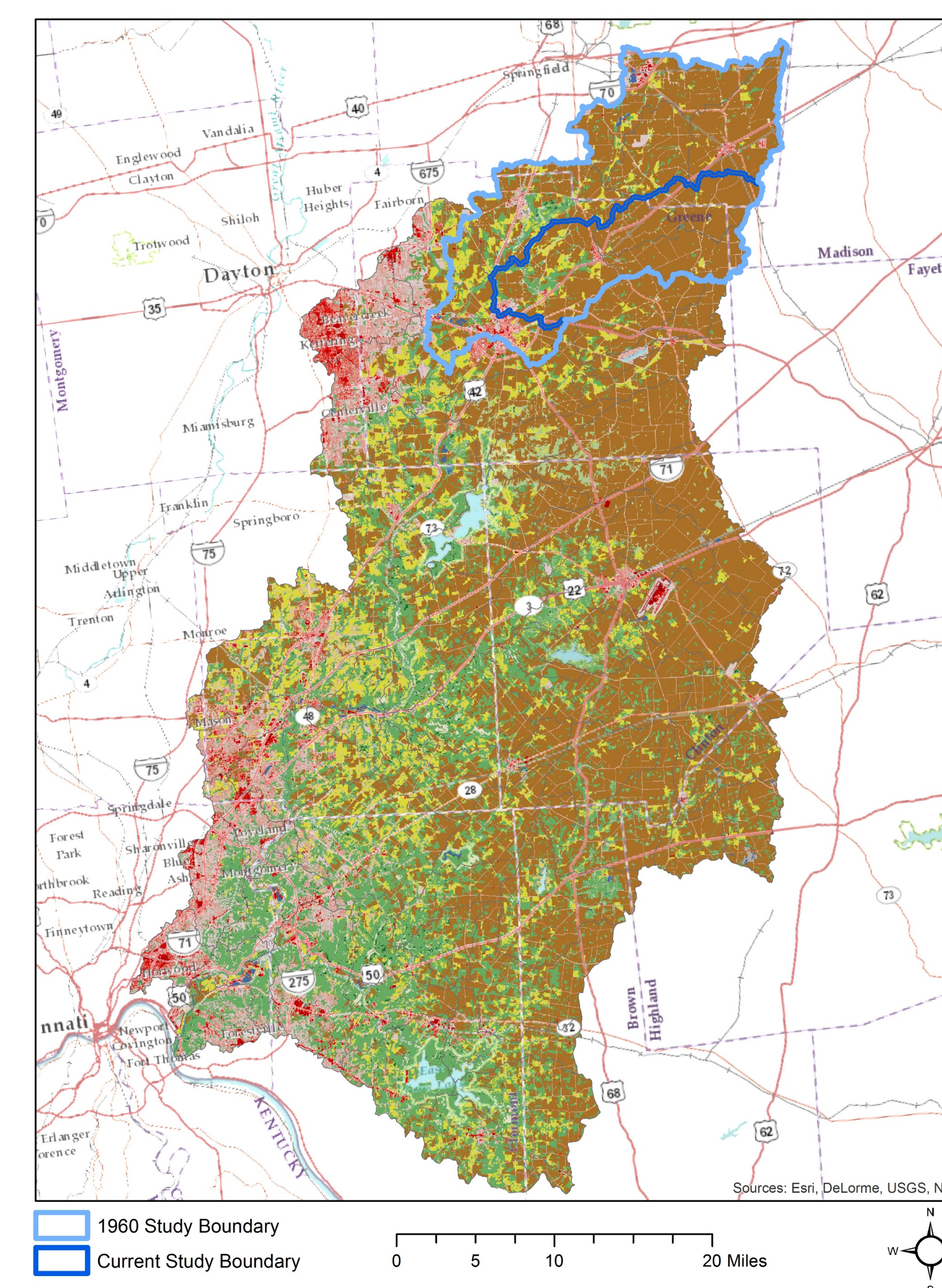


Figure 1. The map above is adapted from the 1960 study and highlights the sites used in common with our study. The map to the right depicts the Little Miami Watershed Land Use in 2011. The watershed areas for the 1960 report (light blue) and our current study (dark blue) are outlined for reference. You may note the relative differences in land use within these respective areas (brown = agriculture, red/pink = developed, green = forest).



Conclusions

- The stream restoration along the North Fork continues to show inter-annual variability when compared to the South Fork without being substantially different with respect to species present.
- The 1960 Ohio DNR report documented 11 - 24 species at these same sites where we collected only 2 - 8 species. This is likely a function of sampling effort as we caught only a small fraction compared to the original study.
- Future research is needed to quantify fish species diversity within these watersheds and what factors may be substantially influencing their distribution with respect to the 1960 Ohio DNR report.