

A River Runs Through It: Limnological and Anthropological Perspectives on the Kokosing in Knox County

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Introduction

Plastic waste pollutes global waters, and significant amounts originate inland (Lechner et al. 2014). Increasing microplastic pollution (<5mm) has the potential to accumulate across trophic levels and to sorb and leach potentially harmful chemicals like POPs, CFCs, and heavy metals (Rochman & Browne 2013). This project endeavored to apply methods for studying microplastic in marine environments to the Kokosing River, while placing this important local geographic feature in its human context (Strang 2005). Residents from Knox County, OH (pop. >60,000) were interviewed and surveyed to glean information about river visiting habits, beliefs about pollution, and cultural and natural meanings given to the river (Cronon 1996).

Methods

To sample for microplastic pollution, field sites were selected along the length of the Kokosing River (N=21 sample sites). Bulk water samples were taken with a sampling pole or by hand along with measurements for pH and dissolved oxygen (DO). To isolate particulate matter, samples were vacuum filtered through a 0.45µ Millipore filter with Rose Bengal to stain organic matter. Filters were examined using reflected and transmitted light microscopy and imaged with DinoCapture 2.0.

A survey instrument was developed to learn about the meanings of the Kokosing listed above using a Likert-type scale, along with demographic information (N=220 completed surveys). Survey questionnaires were distributed by email using Google Forms, on paper through the Knox County library system, and in person. Some questions were borrowed and/or adapted from Kempton, Boster, & Hartley 1995. Semi-structured interviews (N=25) were conducted with Knox County residents to discuss questions relating to the Kokosing River and tangents deemed relevant by the interviewee. IRB protocols were followed and interviews were audio-recorded.

References

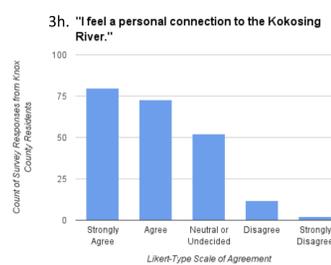
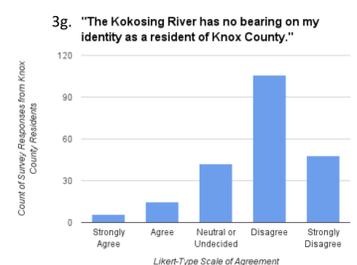
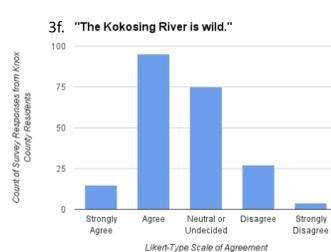
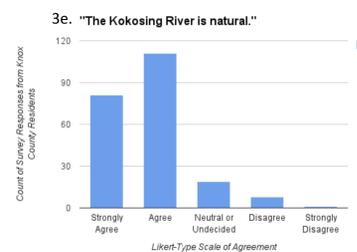
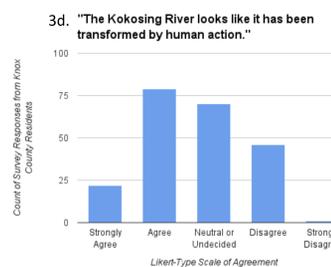
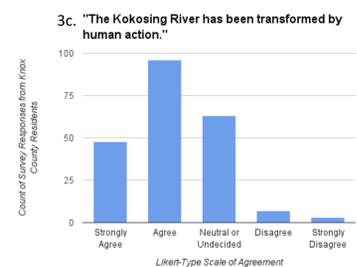
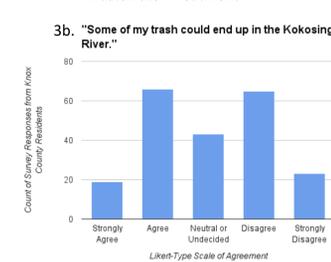
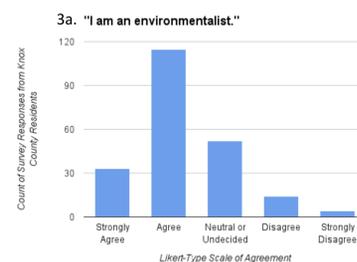
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Figure 1. Possible synthetic fiber, K2 Riverside Park 1.

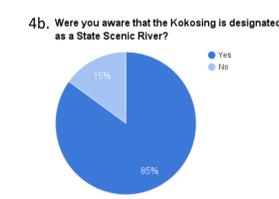
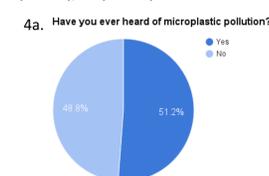


Figure 2. Effluent from Mt. Vernon Wastewater Treatment.



Figures 3a – 3h. Survey responses to Likert-type questions. 3a (N=218), 3b (N=216), 3c (N=217), 3d (N=218), 3e (N=220), 3f (N=216), 3g (N=217), 3h (N=219). Note varied Y axis values.

Figures 4a – 4b. Survey responses to Yes/No questions. 4a (N=209), 4b (N=220).



Results

- Filters are more difficult to examine in riverine than in marine contexts because of the organic detritus that obscures possible plastic (Figure 1). Efforts to verify microplastic fragments and fibers are ongoing.
- Survey Respondent Demographics: Average age 50.5, 52.8% Female, 56.2% identify with a particular faith-based organization, 23.7% hold an MA or equivalent as their highest level of education, respondents have lived in Knox County from 1.5 to 82 years and most reside in and around Mt. Vernon and Gambier.
- Visits to the Kokosing per year include: 1 – 5 (30%), 5 – 10 (13%), 20 – 50 (22%), Every Day (3%). Total (N=189).
- Sample of topics frequently raised by interviewees without direct prompting: kayaking and canoeing, eagles, Native Americans (place names and flint), farm fertilizer runoff, sewage treatment (Figure 2), EPA and ODNR, BFEC, Philander Chase Corporation, Gap Trail.
- Sample of ideas frequently raised by interviewees without prompting: Stewardship, property rights, conservation/preservation, danger/fear, spirituality/religion, rhythms (water, body), anthropomorphism of the river.
- Ideas of nature and wilderness as interpreted through the Kokosing can be defined in relation to emotion, aesthetics, and human creation, alteration, and control. Definitions can be historical, relative within and between rivers, and can vary independently.

Discussion

Testing the filtration method for microplastic is important to understand its limitations in a riverine environment. A detailed knowledge of the optical properties of synthetic vs. organic fragments and fibers could improve microscopy as an analytical method. Views of the Kokosing in Knox County are complex and multifaceted, both between and within individual members of the community. Resident's perceptions of the Kokosing are shaped by their understandings of nature and wilderness, which can in turn be shaped by encounters (verbal and tangible) with the river.

Acknowledgments

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