Title: Framework for evaluating habitat restoration success with respect to fish habitat- and population-related Beneficial Use Impairments

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Abstract: A major challenge of evaluating restoration progress is establishing a cause-effect relationship between observed changes in fish abundance and ongoing aquatic habitat restoration. Since 1979, fish populations within the St. Louis River Area of Concern, which were severely degraded as a result of historical pollution, have exhibited marked changes that have been attributed to improved sediment and water quality, fish stocking, down-stream migration, exotic species, climate change, and increased submerged aquatic vegetation (SAV). Fisheries-related outcomes associated with current remediation and restoration activities need to be quantified, but it is difficult against these broader, system-wide changes. We propose a habitat-based framework for evaluating restoration progress with respect to fish habitat- and population-related Beneficial Use Impairments. Under this framework, habitat models will be used to quantify progress on a project-by-project basis and tagging approaches will be used to identify successful use of the restored area by young fishes because their abundance is positively correlated to population size. Habitat goals (i.e., desired acres of mixed-species SAV beds) for the St. Louis River estuary would be established based on fish life history and relative habitat availability. To achieve this, areal habitat would be measured and quality ranked by using species-specific, life stage-based habitat suitability index (HSI) models for sentinel or indicator species. Evidence of habitat use in restored areas would be documented by naturally occurring chemical (tissue stable isotope techniques) or assigned tags or both. Long-term, fisheries-independent data must be maintained to evaluate progress in the context of a dynamic fish assemblage.