

An Assessment of River Rouge Quality Using the Index of Biotic Integrity

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Abstract.--An index of biotic integrity (IBI), which is based on fish community structure, was used to evaluate environmental quality at 22 sites on the severely degraded River Rouge system in southeast Michigan. The IBI scores generally decreased from upstream to downstream sites. The IBI scores appeared to reflect the negative impacts of accentuated flood peaks and low flows, along with increased loadings of pollutants such as oils, on environmental suitability for fish. The IBI appeared to be sensitive to differences in both physical and chemical habitat conditions. With minor modifications the IBI could be used on other Michigan warmwater rivers and would prove useful for tracking long-term trends in the well-being of these rivers.

Warmwater rivers in Michigan have been negatively impacted by a wide variety of human-induced factors including pollutants, increased sediment loads, and accentuated flood flows and low flows. The latter two factors act in a number of ways to reduce fish habitat. This type of damage cannot be measured by traditional water-quality monitoring techniques. Karr (1981) proposed that the ability of a system to sustain a balanced fish community could be used to assess the health or biotic integrity of water resources. Fish occupy the apex of the aquatic trophic system and, therefore, provide an integrated view of environmental suitability. Other advantages of using fish communities to assess biological integrity include their presence in all but severely polluted or ephemeral streams, the relative ease with which fish species can be identified, their sensitivity to both acute and chronic stresses, and the abundant life history information available for most species. Finally, the general public can readily comprehend statements about fish community condition (Karr 1981).

Karr (1981) developed an index of biotic

integrity (IBI), which is derived by assigning scores to 12 measures or metrics reflecting different attributes of stream fish assemblages. These metrics fall into the three broad categories of species composition, trophic composition, and fish abundance and health. Scores assigned for each metric are tailored to the stream size and zoogeographical region where the index is applied (Karr 1981; Fausch et al. 1984; Karr et al. 1986; Miller et al. 1988). These scores are based on a comparison of fish community attributes with those expected when impacts by man have been minimal. The IBI scores provide a framework for classifying warmwater stream fish communities into categories ranging from excellent to very poor. The IBI has been found to be sensitive to a variety of forms of degradation of midwestern streams including agricultural practices, channelization, sedimentation, and municipal and industrial pollution (Karr 1981; Fausch et al. 1984; Karr et al. 1986; Karr et al. 1987; Angermeier and Schlosser 1987). Moreover, the breadth of information incorporated into the IBI seems to make it more generally useful for detecting