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The development and application of biological assessment tools and biocriteria for the assessment of impacts to aquatic assemblages in large non-wadeable streams

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The biological assessment of lotic resources by states in the U.S. has largely focused on wadeable rivers and streams. However, increased emphasis is being placed on larger non-wadeable lotic habitats. Some of these efforts are built on the legacy of the pioneering work of Gammon in the Wabash River of the Midwestern U.S., the State of Ohio, the State of Maine, and more recent efforts by the State of Wisconsin, ORSANCO (Ohio River), and western large rivers. The challenges of sampling fish and macroinvertebrate assemblages in large rivers include logistical and technical considerations. State programs must address multiple management objectives at multiple scales with the same database. Hence, sampling designs must produce a large number of sites sampled over extended river reaches during a defined sampling season. Defining reference for non-wadeable rivers has represented a different challenge than with wadeable streams. For the latter, sufficient suitable reference analogs usually exist, thus reference condition can be developed empirically. However, in heavily industrialized states with a legacy of heavily polluted mainstem rivers, such analogs may either be rare or they do not reflect historical potential. Thus historical knowledge of the aquatic faunas is beneficial in developing the expectations that are necessary for metric or model calibration and index development. This is also where EPA's Biological Condition Gradient shows promise in providing a structured framework within which such conditions can be better visualized and organized. Once developed, metrics, models, and indices can provide meaningful measures of assemblage quality and serve as the primary response variable for assessing chemical, physical, and biological influences and perturbations. Successfully applying this protocol to non-wadeable rivers first involves the development of sampling and assessment methodologies. Examples from Maine and Ohio will be used to illustrate how multiple management objectives including the implementation of tiered aquatic life uses (TALU) can be supported via a systematic large river monitoring program, including the design and use of pollution surveys of large mainstem rivers.

Chris O. Yoder is involved in the national development of biological assessments and biocriteria, including multimetric index development for wadeable streams and large rivers. He is the principal investigator of a cooperative agreement with the U.S. EPA, Office of Water for monitoring and assessment, indicators, and biological criteria development and implementation. He was most recently Manager of the Ecological Assessment Section at Ohio EPA (1989 – 2001). His experience also includes service on national, regional, and state working groups and committees dealing with monitoring and assessment, environmental indicators, biological assessment, biological criteria, and WQS development and implementation. Recently he served as a member of the National Research Council committee on the role of science in the TMDL process. He has 35 years of experience in the assessment of fish assemblages and other aquatic organism groups, their associated habitats, and 30 years in water quality management including the integration of multiple indicators of stress, exposure, and response.