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Strengthening the Use of Aquatic Habitat Indicators in Clean Water Act Programs

Stephen B. Bauer and Stephen C. Ralph

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Abstract

The loss of freshwater fluvial habitats is generally regarded as a key factor in the precipitous decline of native salmonids in the northwestern United States. State and federal water quality regulations, under the authority of the Clean Water Act (CWA), could be more relevant to recovery of Pacific salmon if physical habitat quality was explicitly integrated into water quality standards. We examine the concept of incorporating instream habitat measures into water quality regulations since these standards are the foundation of CWA programs. Commonly measured instream habitat variables for salmonids (flow regime, habitat space, channel structure, substrate quality, streambank stability) were evaluated in terms of their suitability as water quality criteria. The basis for this evaluation focused on these indicators in light of their: (1) relevance to ecological requirements of salmonid fishes, (2) applicability to landscape processes and the stream network in which they occur, (3) responsiveness to human-caused stressors (linking cause v. effect), and (4) degree of measurement reliability and precision. Our evaluation suggests that most habitat indicators, as currently measured, do not meet these criteria due to the limitations in the state of the science as well as constraints imposed by the existing framework for water quality standards. There is general agreement on salmonid habitat requirements and the effects of land use on these habitats; there is less certainty on quantifying physical habitat quality and on the reliability of habitat assessment techniques. These obstacles can be overcome by applying the principles of landscape ecology and stream network classification to indicator development, identifying and quantifying reference area conditions at a regional scale, calibrating relevant indicators to specific locales, and developing systematic monitoring procedures that meet rigorous data quality objectives.