METHOD PERFORMANCE CHARACTERISTICS AND THE MERGING OF BIOLOGICAL ASSESSMENT DATASETS

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Biographical Sketch of Authors

James Stribling is an aquatic ecologist and Associate Director at Tetra Tech, Inc. He has worked for approximately 15 years in the field of pollution ecology, and specializes in monitoring program design, ecological data QA/QC, and application of assessment results to water resource management decisionmaking. Dave Loch is an aquatic ecologist with the Mississippi Department of Environmental Quality (MDEQ) Water Quality Assessment Branch, and is the overall Quality Assurance Officer for their projects developing biological indicators of water resource integrity in streams and watersheds. Carmela Biddle is a biologist who co-manages Tetra Tech's Biological Research Facility, where she is responsible for training, managing, performing QC checks, and documenting all aspects of laboratory sample processing of benthic macroinvertebrates, specifically related to data integrity. She has also been extensively involved in setting up, running, and QC activities related to effluent toxicity testing. Matt Hicks is an aquatic ecologist with the Mississippi DEQ Water Quality Assessment Branch, and is the agency technical lead on and overall Project Manager for their IBI project. He is an aquatic entomologist by training, and has worked for over three years to help elevate QA/QC expectations of the agency, and to establish the use of biological indicators for making natural resource management and regulatory decisions.

Abstract

"Standard" protocols for performing biological assessments are actually a series of methods that, when performed together, can provide high quality data and estimates of biological condition. For example, assessment activities that specify rapid bioassessment protocols (RBP) use various specific methods for selecting sampling locations, field sampling, sample sorting, taxonomic identifications, data entry and data management, data analysis, and interpretation of conditions. Different approaches for accomplishing any of these steps may render two datasets or programs incomparable. Even if different programs purportedly use the same methods, each program may be unable to document performance characteristics. This makes combining datasets problematic, since there may be no way to evaluate uncertainty. Performance characteristics include concepts and calculations such as, for example, precision, accuracy, bias, representativeness, and completeness. In this paper, we describe development of two performance characteristics, i. e., percent taxonomic disagreement (PTD), and sample sorting efficiency. The former is a quantification of the precision associated with taxonomic identifications, and is illustrated using benthic macroinvertebrate results. The latter is a numeric description of how well a laboratory is able to separate benthic macroinvertebrates from detritus in the laboratory, and is calculated using results from standard quality control (QC) rechecks. We illustrate the potential use of PTD and sorting efficiency as QA/QC "control limits" for determining 1) the taxonomic quality of a dataset, and 2) the confidence that can be associated with laboratory sorting results. Further, we discuss implications for acceptability of direct comparisons among samples within a dataset, and between datasets.