

Abstracts

Thursday, May 1

Session L2: Assessment of Stream Condition with Macroinvertebrates, Part 1

1:30 – 3:00 pm | Room 262

Evaluation of an Alternate Benthic Macroinvertebrate Sampling Method for Low Gradient Streams Sampled in the National Rivers and Streams Assessment

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Abstract

Benthic macroinvertebrates are one of the primary biological indicators of condition used in the U.S. Environmental Protection Agency's National Rivers and Streams Assessment. Following EPA's Wadeable Streams Assessment, States recommended that a different yet comparable method be evaluated for low gradient streams. Consequently, the 2008-2009 National Rivers and Streams Assessment included a research element to conduct a side-by-side comparison of the standard reachwide macroinvertebrate sampling method with an alternate method specifically designed for low-gradient wadeable streams and rivers that focused more on stream edge habitat. Five of nine aggregate ecoregions (AOEs) sampled in the conterminous United States contained high proportions of low-gradient streams. However, because there was not a defined stream slope cutoff for "low-gradient", crews collected samples using each method across the range of stream gradients at 525 wadeable sites in these AOEs. We compared methods based on estimated numbers of organisms collected, the benthic macroinvertebrate multimetric index (MMI) developed for the 2006 Wadeable Streams Assessment, and its component metrics, using paired nonparametric tests. We used McNemar's test of symmetry to determine whether one method more often provided at least 300 organisms, the minimum sample size desired for the MMI. Relationships between method differences and stream gradient were evaluated using generalized linear models across all sites and for sites with a gradient < 1%. Analyses were conducted overall and for each AOE, and some small differences were detected for certain ecoregions and specific metrics. However, statistical analyses did not reveal any biases or trends with stream gradient that would suggest the overall assessment of low-gradient streams on a regional or national scale would change if the alternate method was used rather than the standard sampling method, regardless of the gradient cut-off used to define low-gradient streams. Based on these results, we conclude that incorporating the alternate method into the National Rivers and Streams Survey is unnecessary, and that the survey should continue to use the standard field method for sampling all wadeable streams. This is an abstract and does not necessarily reflect EPA policy. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

A Credible Water Quality Assessment Using Citizen- Collected Macroinvertebrate Data

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Abstract

For citizen science data to be valuable for decision making, it must be credible. Citizen science macroinvertebrate sampling is particularly vulnerable to credibility concerns because there are many potential sampling and identification errors that could occur. Traditional quality assurance procedures include frequent training, project specific quality assurance plans and audits. Although these methods can be effective, they are very time consuming for both the citizen scientist and the coordinating organization.

We present an alternate water quality assessment using citizen-collected macroinvertebrate data which is resilient to sampling and identification errors and which requires a greatly reduced time commitment both on the part of

the citizen scientist and the coordinating organization. It is based, in part, on the method used by Connecticut's River Bioassessment by Volunteers and relies on the presence (and not the absence) of key macro invertebrate families in a voucher collection to define stream quality. This strategy produces data that are both credible and reliable with a low risk of false positives and can be easily scaled to large monitoring programs with minimal full-time staff. The disadvantage of this method is that it only defines approximately 50% of the total samples collected, as not every sample contains sufficient indicator species. Citizen monitoring programs must find the balance between data quality and data needs that allotted time and resources allow. This method provides a useful alternative for those programs with limited resources but still a need for highly reliable data.

Overview of the Biological and Water Quality Assessment Program for Metropolitan Sewer District of Greater Cincinnati Service Area, Cincinnati, Ohio

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Abstract

MSDGC initiated a biological and water quality assessment program for its service area in 2011. This monitoring and planning program was conducted following the design of a comprehensive assessment of the MSDGC service area. The emphasis of these assessments is on determining the status of aquatic life and recreational uses as they are defined by the Ohio Water Quality Standards (WQS) and as assessed in practice by Ohio EPA. The sampling and analysis was performed by Level 3 Qualified Data Collectors and under a biological Project Study Plan approved by Ohio EPA under the specifications of the Ohio Credible Data Law.

The principal objectives of the assessment is to evaluate and determine associated causes and sources of any impairments and potentially use such information in watershed planning efforts to improve or reduce SSO/CSO and overall system performance. The results of this study will be incorporated in an ongoing and more detailed assessment of stressors and their root causes and sources across the MSDGC service area. Termed the Integrated Prioritization System (IPS) it will include more detailed analyses of regional patterns in these stressors and will range from sampled data generated by these surveys to ancillary data available in GIS coverages.

Environmental Drivers of Biological Stability and Persistence at Reference and Managed Sites within the Interior Columbia River Basin, USA

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Abstract

Lotic macroinvertebrates inhabit temporally variable environments; however, studies of assemblage dynamics disproportionately focus on short-time scales. Understanding long-term macroinvertebrate assemblage dynamics is critical to status and trend monitoring, because biological assessments assume that estimates of the range of natural temporal variation in assemblage composition at reference sites are stable. The range of natural variation at reference sites is typically estimated via a space for time substitution. We quantified 12 years of macroinvertebrate inter-annual variability for 19 reference and 29 managed sites within the Interior Columbia Basin, USA. We then related assemblage temporal dynamics to environmental variability and watershed attributes. Preliminary results suggest that macroinvertebrate stability and persistence were relatively high for reference sites, with only 9% of reference sites changing condition class over 12 years. The coefficient of variation for reference site O/E scores was less than 15%. In contrast, macroinvertebrate stability and persistence decreased as O/E scores deviated from one. The increased variability at managed sites resulted in greater than 25% of sites changing condition class over 12 years, and the direction of change was not concordant among sites or years.

The environmental drivers of macroinvertebrate stability and persistence differed between reference and managed sites. Reference site variability was best explained by natural environmental variability. Temporal variation in precipitation and ambient air temperature accounted for 41% of macroinvertebrate variability. In

contrast, the interannual variability of managed sites was most strongly related to changes in fine sediment levels and bank stability ($R^2 = 34\%$). Our results suggest that current estimates of the range of natural biotic variation at reference sites are reasonably precise, but these estimates could be significantly affected by climate change. In contrast, the relatively high interannual variability in index values observed at managed sites implies that one-time sampling is unlikely to provide a robust estimate of site status.