Potential uncertainties in interpretation of Great River biocriteria: An example from the rehabilitation of the Kennebec River (Maine)

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One of the principal justifications for monitoring Great River systems is to allow assessment of conservation, management, and regulatory actions and policies. Yet we are not simply assessing the rate of declining health, we also need to be able to quantitatively demonstrate that management and rehabilitation resources are being well spent. Although Impairment or rehabilitation affect biocriteria in complex ways, simply showing management and regulatory agencies and the public that biotic condition changed for the better or worse is not sufficient. One example of the problems posed by this complexity can be seen in attempts at improving river condition through dam removals such as the Edwards Dam on the Kennebec River in Maine. The restoration work on the Kennebec assumed that the management action taken (dam removal) would improve river biota as reflected by diadromous fisheries. The assumption was that that positive fisheries outcome would also reflect what was happening for the structure and function of all river biota. Results from a long-term benthic macroinvertebrate biomonitoring program conducted by the Maine DEP clearly show that there was a strong, general community response within the first twelve months. The overall density of the zoobenthos increased most dramatically (190%) at the restored site when compared to the reference, but other measures of taxonomic diversity were not always as clear-cut as might have been expected. Neither generic richness nor evenness was significantly altered by removal of the dam. While there were some changes among the dominant taxa, substitutions among the minor taxa, suggest these are more reflective of the changing conditions. One potential explanation is that the dam removal did not rehabilitate the Kennebec River system as much as hoped (a disappointing outcome). However the more likely alternative in the Kennebec is that the restored reach was not as different as initially assumed (a surprise outcome). In terms of Large River biocriteria, we conclude that while a robust biomonitoring data set can provide multiple levels of resolution needed, the nature of both the action/impairment being evaluated and resolution provided by the biocriteria will influence which management and policy interpretation are appropriate (an often less appreciated consideration). This applies to a number of emerging large river management concerns including TMDL's, invasive species introductions (e.g., Asian carp, zebra mussels, water hyacinth) and hydrograph naturalization.

Dr. Casper's river research involves a variety of approaches including taxonomic analysis, food webs/stable isotopes, ecophysiology, and field manipulations of macroinvertebrates and plankton in Great. Through on-going collaborations on a variety of projects spanning resource management questions, he explores the under-pinnings of the health and productivity of river systems ranging from the temperate Ohio to the Arctic Mackenzie River Delta. A second area of research focuses on links between fish and invertebrates in the Mississippi, Ohio, and St. Lawrence Rivers and has highlighted the interplay of exotic and native species. (http://www.stpt.usf.edu/coas/espg/casper.asp).