The paper *Basic Principles and Ecological Consequences of Altered Flow Regimes in Biodiversity* by Bunn and Arthington (2002) condenses a great deal of information about the effects of altered flow regimes on biodiversity into one comprehensive literature review. The paper gives an overview of the current body of knowledge on the topic, suggests gaps in the understanding, and indicates further research needed to effectively manage changing flow regimes to best protect biological diversity. Overall it is a useful summary of the relationship between flow regime change and biodiversity, but it's somewhat limited scope means that it should be used together with other information to develop further research and management agendas.

The authors' objectives are clearly articulated in the papers introduction, stating that "the primary goal of the review is to illustrate how altering flow regime affects aquatic biodiversity in streams and rivers." The introduction highlights the significant influence of flow regime on lotic habitats and stresses its important influence on the system's biological diversity. However, an argument for maintaining biological diversity is less explicit. Although the need to preserve biodiversity is almost universally accepted, it may be useful to describe more general implications for the information in the introduction to keep the study's overall importance in context.

Because this is a literature review, the methods are brief and included in the introduction rather than in a section of their own. Although it can be difficult to quantify literature review methods, this characteristic lends itself to criticism because it circumvents the basic scientific requisite of study repeatability. Without a way to standardize a review

there is no way to prove that the study has looked at all relevant literature on the topic, and there may be bias in the results. For instance, an author can select only literature that supports the point they want to make, while ignoring other relevant literature that may not support their objective. With such a broad topic it can be difficult to use a standardized method (such as using meta-analysis to combine similar data from many different studies.) However, there has been a recent movement in conservation and ecological management toward standardizing systematic review methods to strengthen the utility of such reviews in policy and management situations. This standardized system is based on methods used in the health services sector and uses consistent search methods, evaluates the quality of studies referenced, and provides quantitative analysis of the collected literatures' results. (University of Birmingham, 2006) Using a method like this would strengthen the paper's arguments, making the paper a stronger tool for river management decisions.

Methods aside, the literature review is well organized and clearly addresses the objectives of the study, illustrating the mechanisms by which altered flow regimes affect biodiversity. Splitting the flow regime's effect on biodiversity into four principle mechanisms is effective, breaking down the issues into separate and understandable pieces. In addition the support from the literature is diverse, providing ample evidence of how change in flow regime affects each aspect of the habitat over a wide range of geography and scale, giving the paper broad applicability. Figure one is especially helpful in relating the four principle effects of flow change to each aspect of an organism's needs, providing a graphical representation of this information. The paper also provides

lists of all effects addressed in the reviewed literature, providing useful organization of the information for quick and comprehensive future reference.

However, by using a limited selection of literature it is possible that the authors have not explored every influence of flow regime change on biological diversity. For instance, they did not look at the fact that there is often a change in natural equilibrium between moving water and moving sediment due to human induced flow change (Dunne and Leopold, 1978) which could potentially influence success of organisms and thus the biological diversity of an altered system. Also, it would have been helpful to compare anthropocentric flow change with naturally occurring flow change and its broad effects on community structure (Poff and Ward, 1989.)

Although the authors did not provide an exhaustive evaluation of all possible biotic effects of flow change, they did provide a broad overview of the impacts change has on biological diversity. Their discussion of the difficulty with separating flow regime change from other human driven impacts is important, and they make an excellent assertion that future manipulative research is needed to separate these variables. Overall the paper gives a good background of flow change and its impact on biological diversity, providing an important tool for management and research. However, as is not completely comprehensive it should not be used alone, but also with other resources to determine best management practices in instances where flow regime changes are necessary.

References:

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