Review of the Amendment of San Diego Water Board Basin Plan to Incorporate Numeric Biological Objectives streams

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OVERVIEW

The purpose of this review is to evaluate Conclusion 1 of the Biological Objective for Perennial and Seasonal Streams for the San Diego Region**.** Conclusion 1 States: "The Basin Plan amendment proposes to incorporate a numeric water quality objective for streams using a reference-based predictive benthic macroinvertebrate scoring index. The proposed Basin Plan amendment uses this index to set the water quality objective using a percentile of reference approach." "The reviewer's charge is to evaluate the scientific assumptions, findings, and conclusions for the San Diego Water Board Biological Objectives Basin Plan Amendment." With this in mind, I evaluated the three parts of Conclusion 1 and present my findings below.

In conducting this review, I have carefully read the Stream Biological Objective Language, chapters 1-4 of the Staff Report (Loflen and Fetscher 2019), Mazor et al 2015 and Mazor et al 2016. I have experience developing biologic criteria and I have high confidence in my review of conclusion 1 and the related documentation. **It is my opinion that the underlying method for deriving the numeric biological objective for streams is scientifically sound and protective of Beneficial Uses.**

REVIEW

a. **Use of benthic macroinvertebrates and the California Stream Condition Index (CSCI)**

The use of biocriteria as a management tool for monitoring stream health is well established in the scientific literature and there is ample evidence regarding the use and value of stream macroinvertebrates as indicators of stream ecosystem condition (Rosenberg and Resh 1993, Barbour et al 1999, Karr 1995). The proposed biological objective utilizes a "reference stream approach." This approach identifies a least-disturbed stream to represent the undisturbed or the "to be obtained" biological community. The biologic community of the study stream is then compared to the reference stream to determine if the study stream is impaired or unimpaired (Hughes 1986, Whittier et al 2007, Mazor et al 2015).

While the advantages of using a reference stream approach are well documented in the literature (Huhes 1986), there are several important issues to consider when implementing this strategy, including reference stream selection (Whittier et al 2007), biologic metric validation (Mazor et al 2016, Bowman and Somers 2006) and the natural variability of stream macroinvertebrates (Li et al 2001). In the San Diego region, one of the major concerns for

applying a reference approach is related to variability in CSCI scores due to flow regimes in nonperennial streams. Mazor et al 2015 investigated the effect of flow duration on CSCI scores and found that the CSCI is applicable in most nonperennial streams as long a certain sampling conditions are met. The proposed CSCI biological objective adequately addresses the limitations and sampling considerations described in Mazor et al 2015. The field data collection methods and laboratory protocols utilized in the proposed biological objective are standard practices commonly used by federal, state and local agencies. **The underlying method for using benthic macroinvertebrates and the California Stream Condition Index is scientifically sound and will protect and restore the biological integrity associated with perennial and seasonal stream systems.**

b. **Use of a reference approach**

The proposed amendment will utilize existing California SWAMP data to identify and select reference "comparator" sites from a state-wide pool of more than 750 sites that have been repeatedly sampled over time. Selection of reference site is based on landuse criteria, water chemistry and the biota present in the stream. The potential for selecting reference streams not indicative of reference condition is minimized by on-the-ground verification and other information about the streams. **The assumptions and methods used to identify and define "reference" as a biological integrity benchmark are scientifically sound and will protect and restore the biological integrity associated with perennial and seasonal stream systems.**

One aspect of the Staff Report and proposed reference approach that needs clarification is the planned sampling regime and details about how study stream data will be compared to reference streams. It is not clear in the Staff Report how frequently streams will be evaluated and if they will be compared to reference sites each sample year or assessed using a mean value derived from multiple samples. Table 2 lists the years of collection; however, there are clearly sites that don't get sampled every year (e.g. Figure 10). What happens if a stream is not sampled or a sample cannot be obtained? I suggest adding more details about the sampling regime and methods for comparing study and reference streams in sections 4.1 or 4.2 of the Staff Report.

c. **Setting of index score threshold**

The CSCI score will be used as the biological objective to determine compliance. The CSCI utilizes both a multimetric index and a ratio of observed-to-expected taxa (Mazor et al 2016). The CSCI threshold criteria will be established at 0.79, which is the lower 10th percentile of all reference streams. The CSCI method has been validated and published in the peer reviewed literature (Mazor et al 2016). The lower 10th percentile is a reasonably conservative threshold for identifying unimpaired streams and reflects the reality of balancing the potential for generating false positives and false negatives. Streams with scores below the criteria will can

be confirmed through an additional process to ensure that the stream is truly different than the reference site. **The assumptions and methods to set the water quality objective as a percentile of reference using the California Stream Condition Index is scientifically sound, incorporates a margin of safety, and will identify sites that have a degraded biological condition. The allowance of site-specific scientific information on the physical, chemical, and biological condition of specific sites to prevent false positive identifications of impairment is scientifically sound."**

BIG PICTURE REVIEW

A) Overall, the proposed amendment is scientifically sound. The challenges of using a reference streams as baseline for listing criteria has been adequality addressed by the and the CSCI has been published in the peer reviewed literature (Mazor et al 2016). The application of the CSCI in non-perennial streams is an important consideration for this amendment and has been investigated by Mazor et al 2015. I agree with the findings of the Mazor et al 2015 report; which states that the CSSI methods are not likely to be affected will not be affected by seasonal drying of stream if certain sampling conditions are met including adequate flow at the time of the sample and a at least 4 weeks since the last drying event. Furthermore, I also agree that efforts should be made to sample more unimpacted non-perennial streams to incorporate as reference streams. And Finally, the proposed 0.79 CSCI criteria is a reasonable threshold that reflects the limitations of the reference stream approach and the potential for stream misclassification. **As a whole, the scientific proportion of the proposed criteria is based upon sound scientific and knowledge, methods and practices.**

b) Anything Missed? One aspect of this amendment that may warrant further consideration is the scientific error associated with the CSSI reference stream approach. False positives occur when a stream is below the CSCI threshold but in reality, the stream is not degraded. The false negative occurs when a stream is classified as unimpaired, but in reality, it is impaired. This situation presents a unique challenge to using bioassessment for meeting water quality objectives because false negatives, which can be result of a poorly classified reference sites, are more difficult to identify and result in unidentified degraded streams that may never be addressed.

I recognize that substantial efforts are made to minimize the misclassification of sites; however, the screening mechanisms described in the Staff Report are primarily focused on misclassifications that results in a false positive. As far as I can tell, only sections 4.4.2 and 4.4.3 address the issue of a false negative and they do so in a vague manner. For example, "Due to this uncertainty, the 10th percentile is used as a threshold for the CSCI" (page 41). Given that a false negative error has serious consequences; i.e. a degraded stream is classified as unimpaired, it's my opinion that the report should more explicitly address this issue.

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