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RE: Public Comment on WV 303D List

DATE: June 4, 2012

We are writing to express our concern that the WVDEP continues to interpret the WV Stream Condition Index inappropriately in assessing the narrative criteria of biological impairment. The purpose of biotic indices such as the WVSCI is to recognize that increases in pollutant or sediment loads may lead to significant degradation of stream communities even in cases where no single water quality criterion is violated. This may occur because many different waste constituents are elevated above reference conditions (leading to additive or synergistic impacts) or because stressors for which numeric water quality criteria have not yet been determined are negatively impacting biota.

In the West Virginia Draft 2012 Section 303(d) List the authors state:

“The West Virginia Stream Condition Index (WVSCI) is composed of six metrics that were selected to maximize discrimination between streams with known impairments and reference streams. Streams with WVSCI scores of less than 60.6 are considered biologically impaired and included on the 303(d) List.”

A value of 60.6 is not protective of aquatic life. It is below the minimum value reported for any reference site in the mountains ecoregion of WV (based on analysis of WV WAB database received June 2010, n=241 sites) (Table 1)

Indeed, the index as originally formulated by Tetra Tech for WVDEP¹ suggested that the WVSCI impairment threshold should be set at 68 – this was set to be equivalent to the 5% quartile of reference streams. This means that streams are only considered biologically impaired when they are worse than 95%

100.0%	maximum	99
99.5%		98.7081
97.5%		96.931
90.0%		94.222
75.0%	quartile	91.77
50.0%	median	87.48
25.0%	quartile	82.75
10.0%		76.63
2.5%		69.795
0.5%		62.6764
0.0%	minimum	61.87

¹ Gerritsen, J.; Burton, J.; Barbour, M. T., A Stream Condition Index for West Virginia Wadeable Streams.. Prepared for U.S. EPA Region 3 Environmental Services Division and U.S. EPA Office of Science and Technology Office of Water: Available online at http://www.dep.wv.gov/WWE/watershed/bio_fish/Documents/WVSCI.pdf, 2000.

of state reference streams. This index was to be updated as new data were acquired from reference sites, based on more recent reference site data (Table 1) the WVDEP should consider raising the WVSCI impairment threshold rather than lowering it.

Instead, in the 303D report, the WVDEP states: *“Although the true WVSCI impairment threshold is 68.0, DEP identified biological impairment in the 303(d) listing process only in response to WVSCI scores less than 60.6, so as to allow the highest degree of confidence in the validity of the listed biological impairments.”*

The state of WV justifies their decision to lower the impairment threshold based on the imprecision of the WVSCI index. In repeated sampling at some WV sampling locations – computed WVSCI scores varied by as much as 14.8 points. This represents a precision interval around any measured score of (± 7.4).

(1) WVDEP’s decision to downgrade the impairment threshold based on precision estimates is inappropriate.

In a succinct statement of the way in which precision or confidence intervals should be interpreted Stribling et al (2008)² state:

“The purpose of a CI is to enhance comparison of observed indicator values to other values or decision thresholds. CIs should never be used to justify assignment of a value other than the specific observed value, nor should CIs be used to question the position of a value relative to a threshold or another point. Rather, the appropriate use of the CI is expression of uncertainty associated with an observation. If the CI contains a threshold of concern, then individual streams in the data set might be targeted for continued or more intensive assessments using additional, ancillary information.”

(2) The use of a “gray zone” is not consistent with the precautionary principle that should guide protective water quality standards.

To consider uncertainty in only a single direction (that a collection is likely to underestimate the true WVSCI score by 7.4 units) is inappropriate. It is equally likely that a single collection will overestimate the true WVSCI score by 7.4. The true gray zone (if there is to be one) should extend from 60.6 to 75.4, such that only sites with a WVSCI > 75.4 can be reliably considered to be unimpaired. Such streams would still have macroinvertebrate communities that are worse than 90% of reference streams (Table 1).

The WVDEP appears to be skewing the index to reduce the likelihood of detecting pollution problems rather than interpreting the index to protect water quality and stream biota.

² Quoted from p. 65 of Stribling, J.B., B.K. Jessup and D. L. Feldman. 2008. Precision of benthic macroinvertebrate indicators of stream condition in Montana. *Journal of the North American Benthological Society*. 27: 58-67 [Authors of this paper are from TetraTech (Stribling and Jessup) and Montana DEQ (Feldman)]

A better solution (and one posed in the literature on this topic) would be to incorporate additional metrics or followup sampling for sites that fall within the confidence interval surrounding the impairment threshold (60.6-75.4). If additional metrics are significantly different from reference conditions or if repeated sampling returns a similar result, this would help confirm that the site is indeed impaired.

(3) Most of the information content of the WVSCI index occurs in the change between 100 and 68.

The WVSCI index is derived by (a) aggregating genus-level macroinvertebrate data to family-level classification, (b) aggregating family-level data into distinct "metrics" of community structure or function, and (c) aggregating multiple metrics that do the best job of distinguishing reference sites from sites deemed stressed by one or multiple stressors into a multimetric index. The aggregation of information provides a simple, interpretable score by which to rate sites as either unimpaired or impaired. However, through the aggregation process, it becomes increasingly difficult to translate the WVSCI index in terms of the raw biological data, thus making it difficult to assess the biological meaning of a score as well as setting defensible impairment thresholds.

To this end, we examined the relationship between individual taxa abundances and WVSCI scores from a subset of WVDEP stream monitoring locations in the mountain ecoregion of southern West Virginia (n=223). These sites were limited to April –August sample dates between 1997 and 2007, low developed land in catchments (<4.3%), and either presence of current or historical surface mining or no mining history.

We evaluated the response to WVSCI of any genus that was detected at least once in the 25 reference sites that occurred in the study area. We performed Generalized Additive Model (GAM) regression, where the response of each taxon found at the reference sites was fit to the biological condition gradient represented by the WVSCI score.

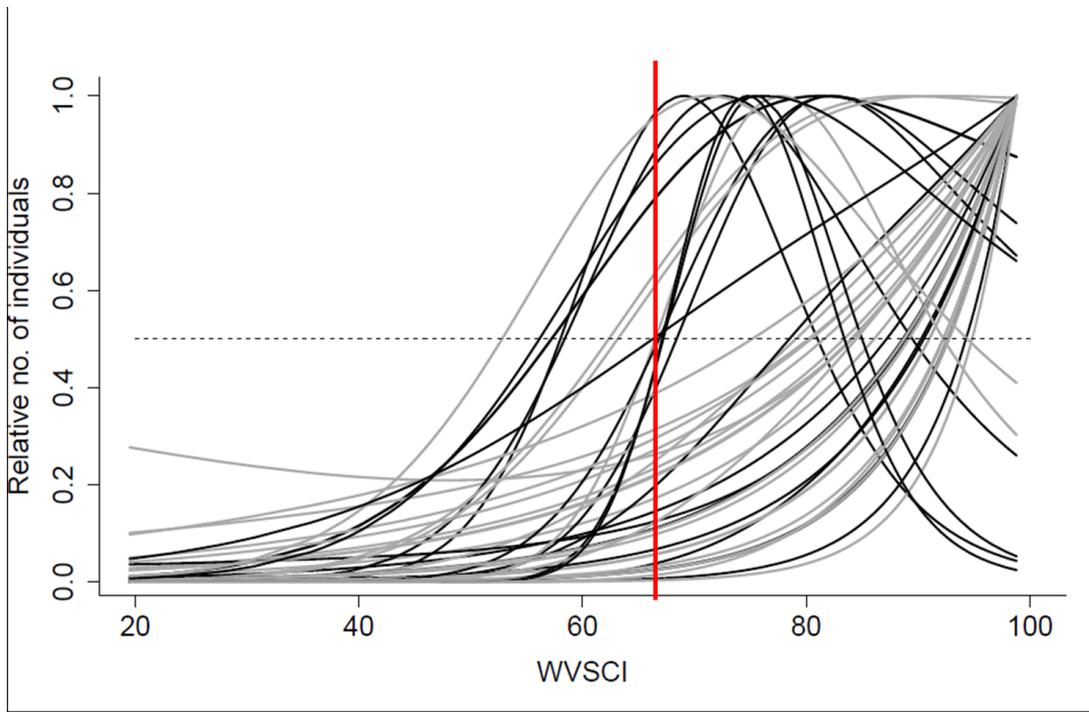


Figure 1. Responses of 46 taxa found at reference sites to WVSCI scores (n=223). A score of 68 is indicated by the red line.

Using this analysis, we found that the vast majority of the taxa had declined by at least 50% at a WVSCI score of 80, and that most of the remaining taxa declined by 50% or more by a WVSCI of 68. Very few additional taxa declined below a WVSCI score of 68. In fact, it appeared as though very little additional information is contained in the index below an impairment threshold of 68, suggesting that most of the biological degradation that can be done to a stream has been achieved once a site is scored at or below 68.

This result adds further support to classifying streams as biologically impaired when a score of 68, but no lower, is reached. There is little empirical support for the gray zone or use of a lower score for classifying streams as impaired.