Pierce County

See attachment

April 6, 2018

Susan Braley
Water Quality Program
Department of Ecology
PO Box 47600
Olympia, WA

RE: Pierce County Water Quality 1-11 Comments

Dear Ms. Braley:

Pierce County sincerely appreciates Ecology's opening of Water Quality Policy 1-11 for public review and comments. It is important for Permittees and stakeholders to have an opportunity to submit their constructive comments for policies that will directly affect their programs. We believe our comments represent the constructive dialogue and contributions Ecology intended to solicit through this open process.

As we have expressed in previous comment periods, Pierce County maintains the position that the State should codify the contents of Policy 1-11, and not adopt any new language as standing guidance. The County wants Ecology to formally adopt all new language as regulation, which preserves the public's right to due process and legal appeal.

We have prioritized comments on Benthic Index of Biotic Integrity (B-IBI) issues. We continue to oppose using B-IBI scores alone as a singular justification for assigning a Category 5 listing on Washington's 303(d) list. Pierce County supports using B-IBI as a tool that contributes to a multiple line-of-evidence approach to determining the health of aquatic ecosystems.

In Pierce County, as in many Puget Sound lowland communities, the B-IBI is not a representative or accurate measure of stream health. Many of our creeks and rivers flow through low gradient, alluvial habitat, such as the Puyallup River Basin. The B-IBI index is based on much higher gradient, cold water stream ecology. Ecology's Environmental Assessment Monitoring program sentinel sites do not adequately represent the Puget Sound lowland ecosystem, and thus do not provide better scores for comparison. It is also inappropriate to benchmark urban streams against pristine (undisturbed) streams.

We suggest using benthic data as one of multiple lines of evidence for listing purposes. We also recommend setting threshold values using data from local streams that are categorized with similar streams characteristics and urbanization levels in their drainage areas, instead of using a single threshold based on data from undisturbed "reference" sites; or simply using the tenth percentile line constructed from regional data (such as that available on the Puget Sound Stream Benthos database). These approaches would make benthic data a more effective and appropriate tool for water quality assessment.

More detailed comments are attached. If you have any questions, please feel free to contact me at (253)798-7693.

Sincerely,

Maureen Meehan
Water Quality Manager

C: Melissa McFadden, Assistant County Engineer - Stormwater
        File

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Bioassessment Protocol Suitability

Pierce County continues to oppose using B-IBI scores alone as a singular justification for assigning a Category 5 listing on Washington's 303(d) list. Following is a discussion of our concerns with using B-IBI to represent conditions in the low gradient/fine substrate stream reaches common in Pierce County and other Puget Sound lowland areas. If B-IBI is used, then we offer an approach that is more representative of existing conditions.

Discussion of the Representativeness of B-IBI Scores in Puget Sound Lowlands

Substrate is recognized as the principal driver of benthic macroinvertebrate community development and composition (Hynes, 1970). The scientific literature for the last century is replete with findings and descriptions associating specific taxa to specific substrate types. The primary division by substrate association that is widely recognized in lotic ecosystems is between fine sediments (fines, sand and small gravel) and coarse sediments (coarse gravel, cobbles, boulders, bedrock). A longstanding and major distinguishing attribute used for classifying benthic macroinvertebrates is whether they are associated with erosional habitats with coarse sediment versus depositional habitats with fine sediments (Merritt *et al.*, 2008).

The original development of the Karr B-IBI was principally based on targeted riffle samples from moderate to high gradient streams (Karr & Chu, 1997; Fore *et al.*, 1996; Morley & Karr, 2002). This implies that index development was primarily based on benthic macroinvertebrate communities from coarse substrates. Karr's multi-metric B-IBI was updated in 2014 for the Puget Sound Lowlands Ecoregion and is proposed for use in water quality assessment process to make determinations regarding whether a stream is impaired, not-impaired, or inconclusive categories by the Washington State Department of Ecology. The County believes this update was based primarily on targeted riffle samples with coarse substrates. Dorfmeier (2014b) did not consider stream gradient and substrate in her examination of the influence of natural site features on the B-IBI. When the impact of physical habitat on BIBI scores was evaluated, "The results indicated that poor substrate quality parameters, specifically sedimentation (percent fines...) and embeddedness have a strong association with poor B-IBI scores" (Dorfmeier *et al.*, 2014a).

Substrates high in fine sediment are the dominant natural substrate for many stream miles in the glaciated trough that forms the Puget Sound Lowlands. Pierce County landforms are primarily permeable river outwash deposits in the valleys and less permeable glacial till-capped plateaus, where low gradient/fine substrate stream reaches dominate (Booth *et al.*, 2003). The current riffle/coarse substrate-based BIBI is unsuitable for assessing low gradient, fine sediment dominated streams (alluvial settings or depositional reaches) because the natural communities which develop on these divergent substrate types are composed of substantially different taxa with different responses to differing environmental gradients.

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The Puget Sound B-IBI is composed of 10 metrics that examine different aspects of the benthic community. EPT populations are almost always highest in cobble riffles because of the structural complexity, flow complexity, aeration, diversity of food resources, and many other factors. Ephemeroptera (mayflies) are typically rare and represented by few taxa in mid-channel (where samples are taken) fine sediment habitats. Plecoptera (stoneflies) are typically absent from mid-channel fine sediment habitats. Trichoptera (caddisflies) may be a little more diverse on fine sediments, but nowhere near the potential diversity found in riffles. Fine sediments may be naturally dominated by tolerant taxa, since these are the taxa that can naturally withstand lower dissolved oxygen and higher stream water temperatures, and can specialize in food resources found in and on fine sediments. Benthic communities in/on fine sediment are often either predator poor or dominated by fewer, larger predators, thus having a lower percent of predators than would be found in riffle communities. There is little to cling to in fine sediment dominated habitats, and thus, these settings or habitats are avoided by clingers.

Expected individual metric scores for fine sediment-dominated habitats in any ecoregion is either a 1 or 3 out of a potential 5. We would not expect a 5 score for any metric regardless of the level of human disturbance. Low gradient streams in the Puget Sound Lowlands, in which Pierce County (with the assistance of Bob Weissman, Aquatic Biology Associates) conducted bioassessment surveys, typically scored 24 or lower on the 10-50 scale of the BIBI. This average score applied to the least impacted sites up to the highly disturbed ones. This "handicap" must be recognized and accounted for when conducting a bioassessment evaluation that can be used to determine a waterbody's impairment and category listing. Pierce County recommends developing a separate B-IBI protocol for low gradient streams (e.g. glides and runs) specific to the Puget Sound Lowlands region. This approach would be more accurate, less biased, and scientifically defensible.

We would like to offer a Pierce County example, the Clarks Creek TMDL. The Puget Lowlands B-IBI Reference Sites memo authored by Hayslip (EPA, 2013) cites stream reference sites as representing the State's relatable (comparable) standard for classifying the B-IBI scores generated in the lower alluvial reaches of Clarks Creek to a Category 5 listing for impairment: Big Beef Creek and Coulter Creek are in Kitsap County, Chuckanut Creek and Oyster Creek are in Whatcom County, Coal Creek is in King County, Crandall Creek is near Sultan in Snohomish County, the Dewatto River is in Mason County and Surveyor Creek near Port Angeles is in Clallam County. None of these cited reference streams are located anywhere near Pierce County or Thurston County in the South and Southeast Central portions of the Puget Sound Lowlands. And as a result, the County believes they can't fully (defendably) capture the average condition (B-IBI score) when it fails to include any representative stream condition from the South or Southeast (central) Puget Sound.

The cited reference streams fail to symbolize (represent) a relative homogeneous sampling of the Puget Sound Lowland's streams and rivers based on soils, geology, inclination (slope) and elevation. The cited reference streams are more erosional, low gradient riffle-pool complexes (fluvial systems) which are distinctly different than the low-lying, meandering fine sediment dominated systems of the central and south Puget Sound. None of the B-IBI reference streams are predominantly alluvial systems nor are they indicative of naturally low-lying (fine sediment) depositional systems. The County is of the opinion this limited suite of reference streams fails to represent a comprehensibly suitable set of benchmarks or

estimates for what one would expect to find (regarding benthic macroinvertebrate scores) if little human impact had occurred (i.e. natural conditions).

An Alternative Approach
Pierce County recognizes the difficulty in finding pristine, undisturbed reference sites in the developed Puget Sound lowlands. The County would like to work with the State to instead find a *least impacted* set of reference that are geomorphically (and biologically) similar to the majority of streams in our jurisdiction. This more localized approach is being explored by others. The Biological Condition Gradient effort currently underway in the Puget Sound Lowlands will help improve the distinction between low and higher gradient streams and the B-IBI scores one would expect as a means for comparison. Other states use separate MMI indices for low and high gradient streams, and RIVPACS and Predator also incorporate watershed slope into their modeling (scoring) algorithms.

Furthermore, instead of benchmarking urban streams again **pristine (undisturbed) streams**, we suggest setting threshold values using data from **local streams** that are categorized with similar stream characteristics and urbanization levels in their drainage areas. Another alternative is simply using the 10th percentile line constructed with all current Puget Sound Stream Benthos (PSSB) database sites using a method similar with those shown in Fig. 1. The suggestion is based on WAC 173-201A-260 (1) (b) (WSL, 2018) for other water quality criteria for natural and irreversible human conditions and statistics of currently available BIBI data at PSSB database (PSSB., 2018). Fig. 1 is a copy of a figure from Pierce County's Spanaway Lake Watershed-Scale Stormwater Management Plan final report (PCSWM, 2017), showing the correlation of BIBI score with the level of watershed urbanization from the data from Puget Sound Lowlands sites evaluated in the Fore et al. (2013) study.

The strong inverse correlation of BIBI and percent urbanization in the associated drainage areas indicates that we may not be able to restore an urban stream BIBI condition back to it nature high BIBI values within reasonable time frame with reasonable inputs of resources.
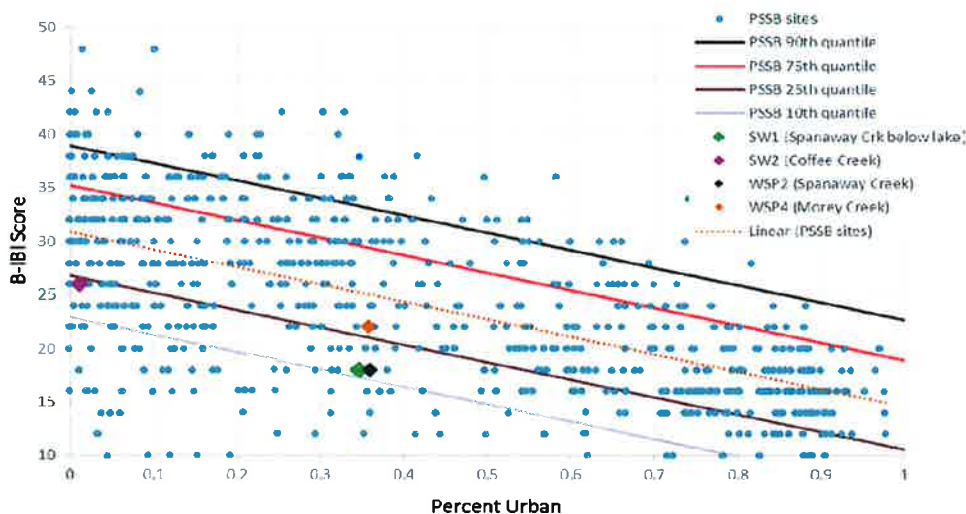

Fig. 1 BIBI score vs percent urban in drainage area for Puget Sound Lowland sites

Conclusion

Pierce County continues to oppose using B-IBI scores alone as a singular justification for assigning a Category 5 listing on Washington's 303(d) list. We recommend a different approach for comparing B-IBI data, which sets threshold or benchmark values using data from local streams that are categorized with similar streams characteristics and urbanization levels in their drainage areas, instead of using a single threshold based on data from undisturbed "reference" sites; or simply using the tenth percentile line constructed from regional data (such as that available on the Puget Sound Stream Benthos database). We agree that B-IBI could contribute as one of multiple lines of evidence for impairment, if conducted and scored appropriately. These approaches would make benthic data a more effective and appropriate tool for water quality assessment.

References

Fore, Leska, et al. 2013. Using natural history attributes of stream invertebrates to measure stream heath. Available at: https://www.pugetsoundstreambenthos.org/Projects/EPA_Grant_2010/TechDocs/Final/Invertebrate_Attributes_2013_v2.pdf, accessed on 3/1/2018.

King County. 2014. Recalibration of the Puget Lowland Benthic Index of Biotic Integrity (B-IBI). Prepared by Jo Opdyke Wilhelm, (Water and Land Resources Division [WLRD]); Leska Fore (Statistical Design), Deb Lester (WLRD) and Elene Dorfmeier (WLRD). Seattle, Washington. Available at: https://pugetsoundstreambenthos.org/Projects/EPA_Grant_2010/TechDocs/B-IBI_Recalibration.pdf, accessed on 3/19/2018.

PCSWM. 2017. Final Spanaway Lake watershed-scale stormwater management plan. Pierce County Surface Water Management, WA. Available at: https://fortress.wa.gov/ecy/paris/DownloadDocument.aspx?Id=216587, accessed on 3/1/2018.

PSSB. 2017. Analysis: benthic index of biotic integrity. Puget Sound Stream Benthos. Available at: https://pugetsoundstreambenthos.org/Biotic-Integrity-Scores.aspx, accessed on 3/1/2018.

WSL. 2018. WAC 173-201A-260 natural conditions and other water quality criteria and applications. Washington State Legislature. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-201A-260, accessed on 3/1/2018.

Comments on the Ecology's *Public Review DRAFT Water Quality Program, Policy 1/11-February 2018*

General Comments:

1. Where applicable, explicitly define and list "critical period" for each major watershed or WRIA.

2. We recommend that data be analyzed over the water year instead of the calendar year wherever possible.

3. Pierce County continues to request Ecology revise its procedure to demonstrate the same level of rigor and burden of proof for delisting waterbodies as for listing waterbodies.

4. Pierce County continues to recommend that waterbody segments assed with data older than five years be placed in Category 2 instead of Category 5.

5. Data used for averaging over a period should be roughly evenly spaced. Ecology should be careful when averaging data that displays discontinuous or clustered patterns, and may not represent typical circumstances.

6. When working with spatially distributed data, Ecology should apply area-weighted methods to more accurately compare data.

7. Data distribution should be considered when applying the hypergeometric test, particularly when few samples are involved.

Section-Specific Comments:

Page 7. Part 1D: Ensuring Data Credibility in the Assessment. Ecology did not open Chapter 2 of Policy 1-11 to public comment and revision.

> **Recommendation:** Open Policy 1-11 Chapter 2 to public comment and revision, thereby increasing transparency of the decision-making process, understanding among stakeholders of what qualifies as credible data, and rigor of the criteria used to assess data credibility in the Policy. Additionally, Ecology should collaborate with external stakeholders to ensure that approved external QAPPs produce data that meet the data credibility requirements in Policy 1-11 Chapter 2.

Page 12. Part 1E. Quality Assurance Levels for Data Submittals to EIM. Quality assurance levels are vaguely described and difficult to understand.

> **Recommendation:** Provide further guidance on how to determine Quality Assurance Level when submitting data to EIM. Develop and conduct regular training for data submitters and QAPP writers. Explicitly state who can determine Quality Assurance level.

Page 12. Part 1E. Numeric Data Submitted to EIM. "Only one value per day per AU will be used in the WQA. The highest measurement per day will be used unless otherwise specified, except for dissolved oxygen for which the lowest measurement will be used, and pH for which the highest or lowest measurement will be used as applicable."

> **Recommendation:** In the case of temperature, pH, and dissolved oxygen, an average of measurements collected over multiple days would help confirm whether adverse conditions are persistent, and would better represent the magnitude and duration of conditions to which the aquatic life is exposed. This is a much more representative and useful approach than only looking at the most "extreme" (and potentially short-lived) condition.

Page 14. Part 1E: Assessment of Studies to Determine Impairment based on Narrative Standards. "For water quality studies that are submitted to Ecology for consideration in the WQA, the study must show a link between the environmental alteration in the waterbody and the impairment of a beneficial use" and "The linkage between source, cause, and effects needs to be clearly documented in order to meet credible data requirements in Washington"

Comment: These strong statements directly conflict with the proposed process for making Category 5 Bioassessment listing determinations. Ecology proposes to list AUs prior to establishing any linkages between alterations, impairments, sources, causes, or effects.

Recommendation: For bioassessments, conduct a stressor analysis study prior to making a Category 5 determination and make any subsequent listings for the identified stressor(s), when appropriate.

Page 15. Part 1E. Additional Information on Data Submittals. Age of data considered in the WQA. In the stakeholder meetings, Ecology stated their willingness to review data older than 10 years old using the new guidance in an updated Policy 1-11.

Recommendation: Upon completion of an updated Policy 1-11, review listing determinations made using data older than 10 years according to the updated criteria.

Page 15. Part 1E. Comparison of data to a water quality criteria expressed as an average – Instantaneous measurement are assumed to represent hourly averaging periods specified in the State's surface water quality standards for both acute and chronic criteria.

Comment: It is inappropriate to assume instantaneous measurements represent anything other than one point- and time-specific measurement. WAC 173-201A WQ criteria clearly separates instantaneous concentration from average concentration, and it is inappropriate to use one type of measurement to substitute for another. Also, WQ criteria contain separate standards for acute and chronic thresholds, with chronic thresholds generally much lower. This difference could be unrepresented or misrepresented by use of instantaneous measurements. Hourly averaging periods should be based on continuous data that meets data quality standards.

Page 16. Part 1E. Third Party Data Submittals.

Comment: Please include "third party data submittals" in the glossary.

Page 24. Category 5. The 303(d) List – "…An AU may also be placed in Category 5 if it is currently meeting standards, but credible data and information indicate that the waterbody is not expected to meet applicable water quality standards by the next WQS cycle.

Recommendation: There appears to be an underlying assumption that a listing can be based on a trends analysis that suggests water quality standards will not be met in the near future. The use of trends analyses to support listing decisions lacks the specificity needed to provide assurances of consistent, credible, and transparent analyses. We recommend that before this listing decision is made, Ecology describe the minimum number of samples needed to support a trends analysis, the test statistic proposed, and the confidence interval and listing decisions made based upon the results, Further, please clarify how Ecology will use results from either improving or declining trends to support category determinations where they do not agree with average scores from the two most recent years.

Page 27. Part 1H: Prioritizing TMDLs. Ecology states a willingness to hold annual public meetings to present and receive feedback regarding the proposed list of TMDLs.

> **Comment:** Pierce County is excited by Ecology's new efforts at transparency in the decision-making process and looks forward to fully collaborating with Ecology on prioritizing future TMDLs in our County.

Page 29. Part 2A. Bacteria. "Only one value per day will be used in the WQA. An arithmetic mean value will be calculated from multiple data points collected in the same sampling event for an AU.

> **Recommendation:** We recommend that this be clarified to "only one value per day *per reach* will be used in the WQA." Furthermore, a sampling "event" may continue over multiple days. We recommend that the arithmetic mean only be applied to data collected in the same day, and that the geometric mean be used in events sampled over multiple days.

Page 30. Part 2A. Bacteria. "The final category determination for an AU is based on the most recent data available that qualifies for a category (other than Category 3). For example, if an AU qualifies for Category 5 based on a previous water year dataset, and Category 1 based more recent data, then the AU will be placed in Category 1."

> **Recommendation:** This guidance should be consistently applied to all parameters considered in the WQA.

Page 30. Part 2A: Bacteria. "Agency advisories will also be used to directly assess the protection of designated uses."

> **Comment:** Pierce County recognizes and praises Ecology's incorporation of additional data sources into Policy 1-11 decisions.

Page 34. Part 2B: Benthic Biological Indicators. The use of B-IBI scores for determining the potential impairment of an Assessment Unit.

> **Comment:** Like most indices, the existing B-IBI was constructed to summarize and quickly communicate the extent to which the benthic macroinvertebrate community from a specific stream reach differs from the expected benthic macroinvertebrate community from a reference stream reach or reaches, in this case mid-gradient cobble bottom streams. It can, and often is, calculated for macroinvertebrate communities that come from streams that physically differ from reference stream reaches. Without additional study of other physical and chemical parameters, this can result in misleading or incorrect conclusions about the health of the benthic macroinvertebrate community.

> **Recommendation:** B-IBI scores should not be used as the sole basis or in combination with any other metrics based on benthic macroinvertebrate community structure for determining whether an AU is impaired under any circumstance. Rather, B-IBI scores should be used as one

line of evidence among many to identify a specific parameter or suite of parameters as the cause of a water quality impairment.

The Puget Sound Stream Benthos (PSSB) program, from which Ecology and others extract data for analyses, captures habitat characteristics and other stream data collected as part of the B-IBI sampling methodology. This information is not captured in EIM, nor are submitters required to include any of the metadata associated with sample collection.

Pierce County requests B-IBI data submitted to EIM also be required to include information regarding the description of habitat characteristics. EIM should be amended to be able to accept this type of information from external data submitters. The County recommends these data management refinements as a means for providing more relevant and valuable information and as a measure to prevent unrepresentative sampling efforts from being included in the Water Quality Assessment process (Type I errors).

Page 34. Part 2B: Benthic Biological Indicators. "Ecology may use other types of bioassessment data and information (e.g. for periphyton communities) provided that the data meets data credibility requirements and guidelines for listing based on section 1E "Information Submittals Based on Narrative Standards."

Ecology made no reference to using periphyton or other types of bioassessment data in any of the previous discussions stakeholders participated in, and does not elaborate any further than the above statement in the Proposed Policy 1-11. Previous work on the relationship between human disturbance and a diatom index found that pH was a much better predictor of index scores than human disturbance (L. Fore, *Evaluation of Stream Periphyton as Indicators of Biological Condition for Florida Streams*, 2010). At the very least, this result indicates that further research is required before this index or similar indices can be relied upon to make regulatory decisions.

Recommendation: Remove any reference to periphyton or other types of bioassessment data from the proposed policy until the body of scientific research establishes a direct link between changes in the periphyton community, or other biologic communities, and anthropogenic water quality impairments. Clarify that periphyton indices may support impairment determinations, but not form the basis of those decisions.

Page 35. Part 2B: Evaluating Bioassessment Data based on B-IBI. "Benthic macroinvertebrate community data needs to be collected and reported in accordance with the Standard Operating Procedures and Minimum Requirements for the Collection of Freshwater Benthic Macroinvertebrate Data in Streams and Rivers (Ecology SOP EAP073) in order to be used in the WQA."

Comment: Pierce County applauds Ecology's use of clear and concise language to communicate the requirements to collect data that will be considered for use in the WQA. Pierce County encourages Ecology to apply this protocol to all other parameters where a current Ecology SOP exists.

Page 35. Part 2B: Evaluating Bioassessment Data based on B-IBI. "B-IBI data collected using alternative protocols may be used in the WQA provided that the sampling and analysis methodology is at least as rigorous as the Ecology SOPs and results in data to which the B-IBI model can be applied."

> **Recommendation:** Elaborate on how Ecology will determine if alterative data collection methods are at least as rigorous as Ecology's bioassessment SOP. Alternatively, consistently apply the data collection requirements outlined in this section to *all* benthic data considered in (or precluded from) the WQA, regardless of date of collection.

Page 35. Part 2B: Evaluating Bioassessment Data based on B-IBI. "The B-IBI model will be applied to sites with a reach scale channel gradient of 0.1% or greater; channel gradients will be assumed to be in the acceptable range if this information is not readily available."

> **Comment:** It remains unclear how Ecology arrived at the 0.1% threshold. Applying the B-IBI model to reach scale channel gradients as low as 0.1% does not prevent the evaluation of B-IBI scores from low-gradient, depositional, fine-sediment dominated reaches or wetlands.

> **Recommendation:** Limit the application of the B-IBI model to channel gradients no lower than 1%. Utilize additional habitat and morphology data when available, such as pebble counts, embeddedness, habitat unit type, and percent fines to support listing determinations. Provide the scientific rationale for whatever channel gradient threshold is established.

Page 35. Part 2B: Evaluating Bioassessment Data based on B-IBI. "The B-IBI WQA threshold for determining impairment varies by EPA Level 3 ecoregion (i.e. based on the distribution of reference site scores in a given ecoregion)."

> **Recommendation:** Within the relatively broad classification scheme used by Ecoregion Level 3, there exists many distinct, smaller habitat units that would influence the benthic macroinvertebrate communities found in streams in those areas. To account for those different habitat units and potentially different biological communities, Ecology should vary B-IBI WQA thresholds by Ecoregion Level 4.

Page 36. Part 2B: Evaluating Bioassessment Data based on B-IBI. "Data from the most recent two years of data collection are required to determine if the biological community of an AU is degraded. In general, for listings that existed in a prior WQA, the listing category will only be changed if newer data justifies a change in category."

> **Recommendation:** Bioassessment data is known to be highly variable between years. Two years of data cannot be sufficient to rigorously determine the impairment of an AU. Provide the scientific rationale for only requiring two scores in a ten-year period; if none exists, require more than two years of data. Additionally, listings that existed in a prior WQA should be re-evaluated according to the data credibility requirements outlined in the *Evaluating Bioassessment Data based on B-IBI* section of Policy 1-11 to ensure that all listing decisions are fair and consistent.

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Page 36. Part 2B: Evaluating Bioassessment Data based on B-IBI. B-IBI thresholds for indicating degraded biological integrity based on data through 2016 (table). The proposed B-IBI thresholds do not consider the established negative correlation between B-IBI score, urbanization, and slope.

This could result in jurisdictions being required to expend considerable time, effort, and funds to attempt to recover B-IBI scores in highly urbanized or low slope stream reaches, with little probability of success.

Recommendation: The extent of reach scale urbanization and slope should be reflected in the corresponding B-IBI threshold, with a modified threshold recognizing that highly urbanized or low slope reaches cannot be reasonably expected to obtain the same B-IBI scores as unurbanized, minimally urbanized, or moderate to high slope reaches. Thresholds could be determined based on a linear regression equation between B-IBI scores, percent urbanization, and percent slope.

Page 36. Part 2B: Evaluating Bioassessment Data based on B-IBI. "Scores below the 10th percentile of the reference site score distribution by EPA Level III Ecoregion will be used as the basis for identifying degraded biological integrity."

and

Part 2B: Category Determinations – Category 5. "The average of any pollutant-related biological index score from the most recent two years with data is below the defined tolerance levels, or if not defined, below the 10th percentile of the index scores for the associated reference sites."

Recommendation: Update the Policy and the B-IBI Thresholds Rationale document to include the scientific justification for use of the 10th percentile to support B-IBI category determinations.

Page 37. Part 2B: Category Determinations – Category 5. "Ecology will also consider identifying an AU as impaired when the biological data clearly indicate an ongoing downward trend in B-IBI scores relative to historic conditions."

Recommendation: Clearly and concisely describe the minimum number of samples used to support a trends analysis, the test statistic proposed, the confidence interval, the magnitude or rate of change required, and listing decisions made based upon the results. Further, please clarify how Ecology will use results from either improving or declining trends to support category determinations when they do not support the average scores from the two most recent years.

Page 37. Part 2B: Category Determinations – Category 5. "Bioassessment listings in Category 5 will initially be assigned the parameter name "Benthic Biodiversity – cause unknown." The listing will remain in Category 5 until a stressor identification analysis is done to determine if one or more pollutants are contributing to impairment."

Recommendation: To remain consistent with credible data requirements in Washington that require a linkage between source, cause, and effects to be clearly documented, conduct a stressor analysis study prior to making a Category 5 determination and make any subsequent listings for the identified stressor(s), when appropriate. A more appropriate category for "benthic Biodiversity – cause unknown" until a stressor analysis is complete would be Category 2 "waters of concern."

Page 41. Part 2C: Dissolved Oxygen – Evaluating Data using the Hypergeometric Test. The policy states that data from each year will be assessed separately.

Recommendation: Clarify if data will be assessed by water year or calendar year.

Pages 42 & 47. Part 2C: Dissolved Oxygen and Part 2D: pH. Large Deviations from Criteria Magnitude. Using single measurement exceedances of criteria magnitude as a basis for listing determinations defeats the purpose and benefits of using the hypergeometric test to determine if a pattern of criteria excursions exist.

Recommendation: Use only the hypergeometric test as a basis for making listing determinations, except when specific criteria exist in Table 602.

Comment: Ecology is to be commended for incorporating discrete monitoring requirements for placement in and movement between WQA Categories.

Page 46. Category Determinations.

Comment: This section discusses pH. In the paragraph above the table, DO is mentioned twice.

Page 49. Part 2E: Phosphorus (Total) in Lakes "The collection of phosphorus data must not be grouped or spread out over time so as to mask periods of noncompliance," and "If more than one epilimnion sample value is available for the same AU and day, only the maximum sample value will be used in the mean phosphorus concentration calculation."

Comment: We applaud that data distribution over the time dimension is considered here. Similarly, data distribution over the spatial dimension needs to be considered. It is inappropriate to use the maximum sample value when multiple values are available for averaging. We recommend time- or area-weighted averages.

Page 55. Part 2F: Temperature. Where 7-DADMax criterion is applicable and Where 1-DMax criterion is applicable. On page 52, the proposed policy states that "the evaluation of temperature will focus on temperature measurements collected between June 15 and September 15th...", however, on page 55 the

proposed policy references the period between July 15th and August 15th to show compliance with the criteria.

Recommendation: Please clarify the dates to be used to determine the summer critical period.

Page 58. Part 2H. Averaging Periods.

Recommendation: Instantaneous discreet samples should not be assumed to represent the averaging periods for the acute criteria and the 24-hour chronic criteria. Averaging requires at a minimum two points, and data collected over a reasonable time interval to represent water body conditions.