



Division of Surface Water Response to Comments

Rules: Water Quality Standards Credible Data Program Rules, OAC Chapter 3745-4:
OAC 3745-4-02: Definitions.
OAC 3745-4-03: Qualified data collectors.
OAC 3745-4-04: Level 1 data requirements and reporting.
OAC 3745-4-05: Level 2 data requirements and reporting.
OAC 3745-4-06: Level 3 data requirements and reporting.

Agency Contact for this Package:

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Ohio EPA held an interested party review comment period from January 11, 2019 to February 25, 2019 regarding five Credible Data Program rules. This document summarizes the comments and questions received during the associated comment period.

Ohio EPA reviewed and considered all comments received during the public comment period. By law, Ohio EPA has authority to consider specific issues related to protection of the environment and public health.

In an effort to help you review this document, the questions are grouped by topic and organized in a consistent format. The name of the commenter follows the comment in parentheses.

General Comments:

Comment: Level 3 Credible Data is uniquely positioned by the Credible Data Law for “developing, reviewing, and revising use designations in water quality standards” (ORC 6111.52) in addition to other uses. In fact, it is the only the data the Director “shall use” for this purpose. Furthermore, the Credible Data rules are clear about the specifications for the types of data and methodologies that can be used. As a result, we have commented several times about the determination of the appropriate and attainable aquatic life use being a data driven process

free from the a priori application of rules-of-thumb that only serve to steer the eventual outcome in potentially erroneous directions. The seeming integration of key aspects of the PHWH methodology and training that is fostered by the proposed rules is a step in the right direction primarily because it provides an opportunity to merge PHWH into the more encompassing WWH/CWH suite of uses and training. Unfortunately, we do not see where the agency is taking parallel steps to assure that this actually takes place. The revised PHWH manual gets to what might prove to be better defined endpoints, but it is unclear how these fit within what is essentially a continuum of WWH/CWH uses. This will be especially confusing given the overlap between the Credible Data related specialties and the Water Quality Certified Professional program and especially with the incomplete and seemingly contradictory elements of the latter. (Midwest Biodiversity Institute, MBI)

Response: Ohio EPA understands the comment, but we are not addressing these types of issues in the context of this rulemaking. The removal of the QHEI as a standalone specialty addresses some of the concerns raised in the comment, however, for the more fundamental issues expressed the Agency believes it would be more appropriate to address those concerns in a future WQS rulemaking and/or update to the biological criteria manuals.

Comment: ***Restoring the Rigor and Original Intent of Level 3 Credible Data***
We have previously voiced our concern about the agency continuing to offer a Level 3 QDC for QHEI alone because it only serves to reinforce the erroneous notion that a habitat assessment alone can be used to conduct a use attainability analysis (UAA). MBI participated in that process and having seen the potential for abuse and misuse (and especially considering the frailties of the WQCP program) we are advocating for removing it as a Level 3 specialty. We believe it should continue to be required training for Level 3 fish and macroinvertebrate QDCs so that it can fulfill its intended role as a support tool for assessing impairments and supporting UAAs. Attempting to conduct a UAA without biological data is prone to inaccurate outcomes and potentially leads to the abrogation of the existing use clause in the Federal Water Quality Regulations. It exceeds the original intent of the QHEI which was designed primarily as a supporting tool for biological assessment and for screening the potential of impaired sites. We acknowledge that there are certain cases involving heavily altered streams where a QHEI has been used by the agency, but this was never done outside of the context of a firm understanding of these limitations by informed and experienced biologists. Most non-agency Level 3 fish or macroinvertebrate biologists simply lack the institutional context and breadth of experience thus we should not expect the same level of understanding as an agency biologist that has performed numerous UAAs in the course of their work. Many QDCs perform work for regulated entities thus the incentives to conduct a

proper UAA are not the same. The determination of the appropriate and attainable aquatic life use is inherently a biologically-centered process therefore only a Level 3 biologist producing Level 3 Credible Data should be allowed to make such a determination. Unlike the proposed WQCP program, the agency is required to review all data submittals and vet the accuracy of any use recommendations prior to considering using it to support a use designation rulemaking or any of the other uses specified by ORC 6111.5.

At present, the two-day QHEI training alone is simply insufficient to assure consistently accurate outcomes in terms of assigning the correct designated use tier. The agency has allowed Level 2 QHEI trainees who have independently assessed a handful of additional sites to become eligible for a Level 3 QDC, which does not overcome the inherent deficiency of not having the requisite biological training and experience. What we are instead suggesting is to offer supplemental training for Level 2 QDCs that would include a new module about how to conduct a UAA and most importantly to recognize when Level 3 data is essential to make an accurate determination of the appropriate and attainable use and safeguard against making unnecessary errors. While this should not equate to a Level 3 QDC, it would educate a Level 2 QDC about when they would need to access Level 3 bioassessment capabilities to conduct a proper UAA. We have commented many times (and contrary to the agency's assertions to the contrary) that a QHEI (or HHEI) alone is insufficient to conduct a valid UAA. Some of that is based on the comparatively weak training and testing regimen for Level 2, but more on the fact that biological data is needed to make accurate use determinations especially in small headwater streams. Unfortunately, the new requirement to have a "Level 3" QHEI applicant sample 20 sites does not overcome these fundamental shortcomings. Simply put, elimination of the Level 3 QHEI (and HHEI) specialty would preclude these problems and time wasted by the agency reviewing inadequate data.

There are two important initiatives that the agency needs to undertake to avoid the pitfalls mentioned above:

1. Unify the currently fragmented concepts and practice in primary headwater streams under the WWH and CWH suite of uses. This would entail, as we have suggested before, the development of new subcategories of aquatic life uses that are consistent with both CWA goal and less than CWA goal uses, the latter requiring a UAA to be considered. This would in effect unify the PHWH under WWH/CWH uses concept.
2. Specify that for any stream draining <2.5 mi. and with sufficient water to support aquatic life this should include fish, macroinvertebrates, salamanders,

QHEI, and HHEI. This allows the data to drive the determination of the appropriate and attainable aquatic life use.

MBI has conducted numerous assessments of small, headwater streams using this data driven approach since 2011 and we offer that experience in assisting the agency in making these necessary transitions. (MBI)

Response: Ohio EPA agrees to remove QHEI as a stand-alone Level 3 specialty, however, QHEI will remain a certification option for those within Level 2. Ohio EPA recognizes that the QHEI must be accompanied by biological data in order to conduct a use attainability analysis and make an accurate assessment of an aquatic life use designation, therefore, QHEI assessments will only be allowed-alone “habitat” specialty for Level 3.

Level 2 training currently includes an overview of Ohio water quality standards and the specific types of data needed in order to perform a use attainability analysis. Trainees are made aware of the assessments that are required to determine stream attainment.

The removal of the QHEI as a stand-alone specialty addresses some of the concerns raised in the comment, however, for the more fundamental issues expressed the Agency believes it would be more appropriate to address those concerns in a future WQS rulemaking and/or update to the biological criteria manuals.

Comment: ***Comments on Merging QHEI and HHEI***

While we generally support the merging of training for QHEI and HHEI in the Stream Habitat Assessment specialty we have several questions. We are obviously supportive because we have advocated for a data driven approach to determining the appropriate and attainable aquatic life use. While this requires both types of habitat data, it also needs to include Level 3 biological data to accurately determine the appropriate and attainable aquatic life use. We also see the need to clearly distinguish this more rigorous use of Level 3 Credible Data from Level 2 purposes where no aquatic life use determination is allowed by law. This would also apply to the proposed use of the HMFEL which as a family level based assessment does not qualify as Level 3 data. This should apply to any UAA or “determination of the existing use” for any 401 certification even though the agency has argued in the past that because a 401 is exempted by 6111.51(C) the data is deemed credible unless determined otherwise by the Director. However, if an incomplete assessment using only HMFEL and HHEI are allowed to pass as credible this presents a stark conflict with the lowest taxonomic level of taxonomy provisions of Level 3 Credible Data under 6111.51(B)(1) and the

provisions of the proposed Credible Data rules and the references therein to the Ohio WQS. (MBI)

Response: Ohio EPA recognizes the necessity of having QHEI paired with biological data, therefore, QHEI has been removed as a stand-alone specialty from Level 3. HHEI, however, will remain as a stand-alone Level 3 specialty. HMFEI will now be recognized as a Level 2 assessment, since it is only Family-level taxonomy. Evaluation of macroinvertebrates down to lowest practical taxonomic level is necessary to determine a stream's aquatic life use.

The portion of the comment referencing 401 practices falls outside of the Credible Data Program and is not applicable to this rulemaking.

Comment: **Revise the Passing Score for Level 2 QHEI and Offer Remedial Intervention**
Based on our 5+ years of experience with Level 2 QHEI training we are recommending that the passing grade be raised to >90% from 80%. We have already provided an analysis of multiple Level 2 training classes dating to 2013 that show a significant departure in QHEI test scores from the instructor for grades of <90%. What is more interesting is that two groups emerged – one group that overscored and the other that underscored the QHEI. Both errors can cause problems with using the results even for Level 2 purposes, and it would only be amplified if an applicant was granted Level 3 status. What we are suggesting is that trainees with test scores <90% receive further instruction about their errors and be required to retest. We believe this is a reasonable expectation for improving the quality of Level 2 data. (MBI)

Response: Ohio EPA agrees that the testing requirements should be more rigorous than past requirements for reasons mentioned in the comment. Ohio EPA has taken steps to improve the testing rigor.

Comment: **Requiring Training for Any Person Using the QHEI**
We have recently become aware that there are persons using the QHEI without having received any sanctioned training. It is a fundamental tenet of the QHEI that all users receive training because of the need to have consistency between users (see Rankin 1995). We urge the agency to consider adding a provision that any formal use of the QHEI be done only by trained individuals. It is our understanding that Level 2 QHEI data is used in regulatory applications outside of the direct control of Ohio EPA thus it would be prudent for the custodians of this tool at least require all official uses to be supported by Level 2 training and testing. We urge the agency to consider adding a general provision that addresses this concern. (MBI)

Response: This comment is regarding a situation within the 401 program and is not applicable to the Credible Data Program because data collected for 401 purposes does not go through the Credible Data Program. All individuals submitting data through the Credible Data Program are required to meet the minimum educational and experience requirements within the rule and must successfully complete applicable training and testing. The program is voluntary, and the CDP does not compel training for use of assessment methods in other programs.

3745-4-02:

Comment: (P)(7) The new rules designate that state universities qualify as a "State environmental agency."
As a political subdivision of the State of Ohio whose primary function is the protection of the natural environment as well as the study or assessment of the environment, the NEORSD requests that Ohio EPA consider adding NEORSD and similar governmental organizations to the definition of "state environmental agency."

Similarly, the NEORSD believes that state universities should not be designated as "State environmental agencies" for the purpose of this rule. The primary function of universities is education, not protection, management, study or assessment of environment, natural resources or ecological systems. As such, state universities better fit under the (G) Educational Monitoring Program definition. (NEORSD)

Response: As stated in the draft rule OAC 3745-4-02 (Q)(7), Ohio EPA is using the definition of "state university" as is defined by The Ohio Department of Higher Education in ORC 3345.011. This reads:

"State university" means a public institution of higher education which is a body politic and corporate. Each of the following institutions of higher education shall be recognized as a state university: university of Akron, Bowling Green state university, Central state university, university of Cincinnati, Cleveland state university, Kent state university, Miami university, Ohio university, Ohio state university, Shawnee state university, university of Toledo, Wright state university, and Youngstown state university.'

While Ohio EPA recognizes the work that NEORSD does is beneficial to the environment, that does not mean that NEORSD meets the definition of "state university." The Agency will not be making this change.

3745-4-03:

Comment: In 3745-4-03(A)(2), entitled “Level 2 requirements. **Four** categories . . .”, the Four categories should be changed to **Three**. Stream Habitat, Benthic Macroinvertebrate, and Chemical Water Quality are the only Level 2 specialties mentioned. (MBI)

Response: Ohio EPA appreciates the comment. However, Level 2 certification will retain QHEI and HHEI as separate specialties, in addition to macroinvertebrate and chemical water quality.

Comment: (A)(2)(a)(ii) and (iii). The combination of the stream habitat assessment methods into a single QDC certification [3745-4-03 (A)(2)(a)(iii) and (A)(3)(a)(iii)] may be difficult for existing QDCs, the majority of whom are only certified for the QHEI method. Ohio EPA has not offered Credible Data Program training for several years and there are no HHEI trainers at level 2 or 3 on the list of current QDCs. While there are Credible Data workshops offered by other entities in Ohio that may offer HHEI training in the future, there may be attendance barriers for many QDCs including limited class sizes, distance, and cost. What options will be available for current QDCs who would like to renew and retain their stream habitat certification, but may not have access to HHEI training/testing? (Cleveland Metroparks)

Response: Ohio EPA recognizes that Agency-sponsored training opportunities have been scarce. The Agency will ensure Primary Headwater trainers are trained and certified. Ohio EPA understands that this will take time, so the Agency is willing to take necessary actions to facilitate this transition.

Ohio EPA is no longer considering combining the QHEI and HHEI specialties into a single Level 3 QDC certification. Instead the Agency is proposing to remove the Level 3 QHEI specialty and require Level 3 fish training and testing to accompany Level 3 QHEI assessments. This will require any QDC who currently holds only a Level 3 QHEI certification to pair it with the fish community biology assessment specialty or else the Level 3 QHEI certification will be grandfathered into a Level 2 QHEI certification. Those who wish to have a Level 3 certification in HHEI must attend an approved training and go through the corresponding testing for assessing habitats in headwater streams. Ohio EPA has developed an HHEI test site network and will develop a mechanism for vetting QDCs for primary headwater habitat assessments.

Comment: (A)(3)(a)(ii) and (iii). Ohio EPA proposes to add a requirement that applicants must now undergo training and testing for both the QHEI and HHEI. The NEORSD's Environmental Assessment group consists of full-time staff dedicated

to the collection of environmental data for the streams, rivers and lakes within the NEORSD service area. As a part of their work, the staff routinely conduct Level 3 QHEIs. However, the District has a very limited need to conduct HHEIs as a part of our normal stream assessment activities. Therefore, the new requirement to have both QHEI and HHEI certification would place an undue burden on NEORSD staff. The NEORSD requests that the QHEI-only subspecialty remains an option. The NEORSD believes that those with expertise in habitat assessments using the QHEI will have enough understanding to know the appropriate uses for that method and when the HHEI should be used instead without the need to require certification in it. Requiring expertise in both assessment methods would result in unnecessary burden for people who may not need certifications in both. This burden would include the need to use resources to obtain the initial certification through additional training and testing, but also by requiring the completion of site assessments through approved study plans in order to maintain the certification. (NEORSD)

Response: Based upon comments received, Ohio EPA is now removing QHEI as a stand-alone specialty for Level 3 certification and is no longer proposing the merging of both Level 3 habitat assessments (QHEI and HHEI) into a single Level 3 specialty. QHEI will remain a Level 3 assessment but it must be accompanied by a biological assessment and must be conducted by an individual who holds certification in Fish Community Biology and has had training/testing in QHEI. HHEI will be the only “stand-alone” habitat assessment method for Level 3.

Comment: In 3745-4-03(A)(3)(b) Level 3 Fish community biology. There should be mention of the **PHWH field fish sampling methods as a subspecialty**, the same as it is mentioned in 3745-4-03(A)(3)(c)(i) for the Benthic macroinvertebrate biology subspecialty, and also in 3745-4-03(A)(3)(d)(i) for the Stream Salamander community assessment. In fact, given our prior recommendation to unify the collection of fish, macroinvertebrate, salamander, and QHEI/HHEI in a data driven approach, there should be no difference between the standard fish sampling protocol and that used in the PHWH methodology. Given that fish are the limiting assemblage in primary headwater streams insofar as the appropriate and attainable use is determined there can be no uncertainty injected by having two different fish collection and assessment protocols, especially if the cursory PHWH method under-samples the fish assemblage. (MBI)

Response: Fish assessment protocols for primary headwater streams are based on data collected during calibration studies conducted in 1999 and 2000. A 200 ft (61 m) distance was selected because this was the distance used to calibrate the association between biological and habitat variables during the 1999 and 2000 calibration survey. This length of stream allows for a complete assessment of the

natural scale of habitat variability that is present in these types of headwater streams.

Comment: (A)(3)(c)(i). Ohio EPA proposes to add a requirement that subspecialties for benthic macroinvertebrate biology will require use of the headwater macroinvertebrate field index and testing in the HHEI. The NEORSD is seeking clarification of what the subspecialties for benthic macroinvertebrate biology will be given that the new rules state that some subspecialties will require use of the headwater macroinvertebrate field index and testing in the HHEI. As stated in the previous paragraph regarding Level 3 QDC status for habitat, the NEORSD believes that subspecialties that include primary headwater methods should be separate, for the same reasons. In addition, according to Ohio EPA's Field Methods for Evaluating Primary Headwater Streams in Ohio manual, the Headwater Macroinvertebrate Field Evaluation Index (HMFEI) is considered to be a Level 2 assessment. How will this index be used in a Level 3 assessment when identification of the macroinvertebrate qualitative sample to the lowest taxonomic level is also required? NEORSD believes that it is inappropriate to use Level 2 methodology as part of a Level 3 assessment. (NEORSD)

Response: HMFEI will be recognized as a Level 2 macroinvertebrate assessment since it is a Family- or Order-level taxonomy as oppose to identification to the lowest practical taxonomic level that is associated with Level 3 assessments. The HMFEI must be accompanied with an HHEI.

Comment: (A)(3)(c)(i). The new rules will impact existing Qualified Data Collectors (QDCs). The NEORSD is also seeking clarification on how these new rules will impact existing QDCs. If the primary headwater subspecialties cannot remain separate from existing ones, it is recommended that current QDCs have the option to be grandfathered in without the need to undergo further testing in order to retain their status. This could be done with the understanding that they are not able to submit data to the program for those areas in which they are not certified. If they decide to undergo training and testing in the future to obtain certification for those subspecialties, they should be able to do so without needing to be re-tested on those areas of their current certifications. (NEORSD)

Response: Currently certified QDCs will not be required to attend additional primary headwater training and complete the necessary testing in both HHEI and HMFEI to become current with the newly implemented PHW protocols. In the event a PHW assessment was conducted, it must be done with individuals holding proper certifications. NEORSD operations are restricted to the Northeast portion of the state and do not currently perform assessments of primary headwater streams. However, this credential is for an individual as opposed for an

organization that could potentially “travel” with the QDC should that person separate from their current organization.

Comment: (A)(3)(c)(i). There is concern about the ability to train and test new employees to become QDCs. NEORSD is concerned regarding the ability to train and test new employees to become QDCs given the new requirements and the lack of training offered by Ohio EPA in the past. Under the existing rules, NEORSD has Level 3 trainers for Benthic Macroinvertebrate Biology and Stream Habitat Assessment. However, these individuals have not been certified in primary headwater assessment methods and, therefore, cannot train others to become Level 3 QDCs in these specialties. NEORSD is requesting that Ohio EPA commit to providing training and testing opportunities for all proposed specialties at least annually. (NEORSD)

Response: Ohio EPA will conduct trainings and go through a “train the trainer” effort to identify subject matter experts. However, the Agency anticipates there will be a lapse in time before additional available trainings will be administered by certified, external individuals, as those trainers must first be trained on primary headwater methodologies as well as pass the required testing to prove competency to Ohio EPA.

Comment: In 3745-4-03 (A)(3)(c)(ii) Level 3 Benthic macroinvertebrate biology training. As in the Stream Habitat assessment 3745-4-03(A)(3)(a)(ii) and Fish Community biology 3745-4-03(A)(3)(b)(ii) training, the phrase “and biocriteria” should be added to the Level 3 Benthic macroinvertebrate biology specialty. This will assure that all Level 2 trainees at least receive an orientation to fundamentals of aquatic ecology, adequate monitoring and assessment, the Ohio WQS, the tiered aquatic life uses, and the biocriteria. (MBI)

Response: Ohio EPA does not see the need to incorporate such language as a requirement, within the Level 2 macroinvertebrate specialty. The data generated from Level 2 studies cannot be used in a use attainability analysis and is only utilized for trend analysis. Ohio EPA is encouraging Level 2 participation in the program and feels this added requirement would create an unnecessary burden and disincentivize Level 2 QDC participation. Biocriteria material and resources are made available to Level 2 QDCs.

Comment: In 3745-4-03(A)(3)(c)(iv) Level 3 Benthic macroinvertebrate biology. The following additions (in red) should be added to clarify the testing requirements. The applicant shall have knowledge of and the ability to accurately use macroinvertebrate taxonomic references and dichotomous keys to identify **Midwestern** aquatic macroinvertebrates to the level of taxonomy used by Ohio

EPA for the Level 3 macroinvertebrate identification specialty or to family level for the Level 3 sampling and data analyses only specialty. (MBI)

Response: The rule only states the minimum requirements necessary for participation, which includes experience and education. Ohio EPA will not be making this change.

3745-4-06:

Comment: (C)(4)(b). Under References for stream habitat measurement methods the 2006 QHEI manual is cited as:

(b) "Midwest Biodiversity Institute (for Ohio EPA, Division of Surface Water). 2006." Methods for assessing habitat in flowing waters using the qualitative habitat evaluation index (QHEI). 26 pp.

We have been citing this document as:

Ohio Environmental Protection Agency (Ohio EPA). 2006. Methods for assessing habitat in flowing waters: using the qualitative habitat evaluation index (QHEI). Division of Surface Water, Ecological Assessment Section, Columbus, OH. 23 pp.

We believe that a more appropriate citation should grant authorship to Ohio EPA. We would be amenable to adding a reference to MBI after the title, but primary authorship should be to Ohio EPA. This would avoid any potential ownership issues or potential conflicts in the future. Please consider the following modification:

Ohio Environmental Protection Agency (Ohio EPA). 2006. Methods for assessing habitat in flowing waters: using the qualitative habitat evaluation index (QHEI). Prepared by the Midwest Biodiversity Institute for the Division of Surface Water, Ecological Assessment Section, Columbus, OH. 23 pp. (MBI)

Response: Ohio EPA agrees to make this change.

Primary Headwater Manual Comments:

Comment: The current revision of the PHW Manual, Version 4.0, should be labelled as Draft since this document has not yet been formally incorporated by reference within the OAC. (Paul Anderson)

Response: Agreed. The latest update of the PHW manual, Version 4.1, will contain the "draft" watermark until final rule adoption.

Comment: It is unclear why Ohio EPA has chosen to rename the Primary Headwater (PHW) stream classifications within the manual. Although this issue is somewhat esoteric, the downsides to the renaming convention are that 1) the current category names have been in use for 20 years, and 2) the category names as provided in Version 4.0 are somewhat cumbersome in comparison. At a minimum, I recommend that a new preface for Version 4.0 be provided to provide the logic behind the changes proposed to the naming convention within the manual. However, unless there is a compelling reason for the change, I recommend that the naming convention remain the same as used in previous practice. However, if the current usage of Class I, II, and III is to be abandoned, I recommend that the following simplified naming convention be considered:

a. For “Class I” streams, I recommend the use of “Ephemeral Primary Headwater” or “Ephemeral PHW” rather than the term “Ephemeral Aquatic Stream” (aquatic and stream are redundant).

b. For “Class II” streams, I recommend the use of “Warm Water Primary Headwater” or “Warm Water PHW” be adopted rather than the use of “Small Drainage Warm Water Stream”.

c. For “Class III” streams, I recommend the use of “Cool-Cold Perennial Primary Headwater” or “Cool-Cold Perennial PHW” rather than “Spring Water Stream”. It should be noted that the name “Spring Water” selected by Ohio EPA does not accurately characterize all Class III streams in Ohio, as not all of these streams with cool-cold perennial thermal regimes are fed by “springs”. Many of these streams retain their thermal regimes through diffuse inflow of shallow groundwater via hyporheic exchange flow which in combination with shading from the riparian canopy is sufficient to maintain cool-cold temperatures throughout the growing season with accompanying stream biology adapted to the thermal regime. (Anderson)

Response: For the reasons stated in the comment, the original terminology for the different types of primary headwater streams has been restored.

Comment: The revised manual provides several new photographs throughout that are quite useful and which should remain in the document. However, the placement of these figures within the text often results in awkward alignment of text which makes the document difficult to read in places. In addition, there are several locations within the manual where there is now orphan text that is very easy to overlook while reading the manual. I recommend that Ohio EPA re-format the text to correct these issues. Specific examples can be seen on pages 1, 2, 3, 23-24, 33-34, 35-36, 38-39, 41-42, 47-48, 58-60, 64-65, 71, and 79-80. (Anderson)

Response: Some reformatting has been done to reduce the incidence of orphan text and improve the overall readability.

Comment: The photographs provided in the document for fish and salamander species are excellent. However, I recommend that the common names for the taxa be provided rather than or in addition to the species epithets since the text references are to common names. The species epithets for salamanders are provided in Tables 5 and 6 for reference, and this appears sufficient for accuracy. A solution regarding the fish taxa would be to provide the species epithets within Table 5 while using common names for the photographs. (Anderson)

Response: As recommended, the species epithets for salamanders and fish have been replaced with the common names in the various photographs that appear throughout the manual.

Comment: Page ii, first sentence. This sentence uses the word “assessment” redundantly. Revision of this language is recommended. (Anderson)

Response: This unnecessary redundancy has been removed.

Comment: The underlying ecology and importance of salamanders in headwater streams and their use as indicators for stream classification in Ohio is described by Davic, et al. (2013). Reference to this document in the introduction of the revised PHW manual appears warranted and should be included in the revised manual. The reference is as follows:

Davic, Robert M., Paul Anderson and Steve Tuckerman. 2013. Use of Salamanders for Classification of Primary Headwater Streams. pp. 779-784, Section XI – Subsection 2 in Pfingsten, R.A., J.G. Davis, T.O. Matson, G.J. Lipps, Jr., D. Wynn and B.J. Armitage (eds.). 2013. Amphibians of Ohio. Ohio Biol. Surv. Bull. New Series Vol 17 No. 1. 899 pp. (Anderson)

Response: Agreed that this reference should be included. It has been included within the introduction and list of references.

Comment: The definitions for “stream” and “Primary Headwater Stream” should be moved to Section 1.0 of the manual. As is, these definitions are found much later than first use of the terms and therefore clarity is lacking for how these terms are defined. See for example the phrase “well-defined channel” in Section 1.1.1 (first bullet) which would be understood in context if the term “stream” had already been defined in the document. (Anderson)

Response: The term “stream” has been moved up to the very beginning of Section 1.1, with a reference to Section 1.4 added. Section 1.0 already defines the characteristics of primary headwater streams and where they are found in detail.

Comment: Page 3, first paragraph: this paragraph has been re-written from previous editions of the manual and contains a run-on sentence that covers a wide-ranging concept. I recommend editing of this language for improved clarity. (Anderson)

Response: The sentence mentioned in the comment has been edited for grammar and clarity as recommended.

Comment: Page 4, Section 1.1.1, last bullet: I recommend striking the word “aquatic” from this sentence as unnecessary. (Anderson)

Response: The recommended revision was made.

Comment: Page 6:

a. Spring Water Type A, second bullet: I recommend providing a reference here to the cold-water taxa list provided in Attachment 3 of the document.

b. Spring Water Type B, first bullet: I recommend providing references to the cold-water indicator salamanders in Table 6 and the cold-water fish list provided in Table 8-2 of Volume II of the Ohio EPA biocriteria manual, 2015 updates. (Anderson)

Response: This section of the manual is intended to serve merely as an introductory summary of the characteristics associated with the various classes of PHW streams. As such, it isn't necessary to provide a lot of detail here. However, there is a “Note to Users” at the end of this particular section that does refer the reader to Attachment 3 which pertains to the macroinvertebrates. Otherwise, there are plenty of references elsewhere in the manual that refer the readers to the biological specifics for both the vertebrates and invertebrates.

Comment: Page 8:

a. First paragraph: the text reference to the Ohio EPA 2010 Integrated Water Quality Monitoring and Assessment Report should be updated as appropriate to contemporize the document.

b. Last paragraph: I recommend that the end of the first sentence be revised to read "...associated with spring groundwater-fed streams." (see previous discussion regarding the use of the term "spring"). (Anderson)

Response: The reference has been updated as recommended in part (a) of the comment. The text has been updated on page eight to address the issue raised in part (b) of the comment.

Comment: Pages 10-11: The text box placed below Figure 3 on page 11 is disjointed from the related text found on the end of page 10. As currently formatted, the relevance of the information in the text box is confusing. (Anderson)

Response: Adjustments were made to bring the text box closer to the relevant text.

Comment: Page 26, Section 3.2, first sentence: this sentence correctly indicates that the depth criteria for pools used as the indicator of PHW vs. WWH potential streams are the "...predominant natural pools...". This language should be made more pronounced throughout the manual in order to prevent the common error of using a single deep pool in a reach and/or plunge pools associated with culverts or stream obstructions as the representative maximum depths for differentiating stream categories (PHW vs WWH) and the pool depth metric. (Anderson)

Response: Agreed. This concept has been reinforced within various portions of the manual, such as on pages 1, 14, 28 and 39.

Comment: Page 27, first full paragraph: the circumstances described (use of HHEI evaluation over biology in pollution-affected stream segments) is true for all PHW assessments. It is unclear why this language is included specifically in Section 4.0 when it is covered elsewhere. (Anderson)

Response: While this topic is also addressed elsewhere in the manual, as mentioned in the comment, its inclusion within the rheocene section of the manual ensures readers understand that that the concept applies to the special case of rheocrenes as well as other types of PHW streams. There is no harm in reinforcing this within this section of the manual and has therefore been left as drafted.

Comment: Page 30, Table 3: I recommend that Ohio EPA consider expanding the definitions of the "modification Category" to relate to severely entrenched or aggraded stream segments where the perturbation may have occurred upstream or downstream from the assessed reach. I have observed many "Natural" channels where there is no on-site evidence of direct anthropogenic impact but which nevertheless express modified attributes as the result of impacts either

upstream or downstream. Development of expanded definitions that include these factors would provide an avenue to better capture these types of problems which would provide better insight into the biological community assessment data from channels affected in this way. (Anderson)

Response: The methods in the manual rely on a 200-foot assessment zone to classify primary headwater streams. Measurements and data collection are supposed to occur within this zone for the purposes of stream classification. When possible, observations further upstream and downstream should be made. These observations can be recorded on the PHW field forms, such as in the question on the back side of the HHEI form that ask: “Is the sampling reach is representative of the stream” and in the “additional comments/description of pollution impacts”. If large differences are observed in physical stream characteristics such as hydrology, substrate composition, channel morphology, etc. that could significantly alter the biological condition, multiple assessment zones can be set up for the stream.

Section 3.0 of the manual provides some basic direction on site selection and stream reach delineation but is not intended to provide specific details on every possible situation, such as this one, that could be encountered on the landscape. Section 2.0 pertaining to preparation for PHW surveys also provides information relevant to this situation, but again, is not intended to provide specific details on every possible scenario.

Another option is to employ a level II or level III assessment to classify the stream based on the resident aquatic biota. In this manner, impacts upstream or downstream of the assessment zone that are significant enough to impact the biological condition can be accounted for during the assessment. It is good practice to make at least some rudimentary observations on the biological condition whenever an HHEI is completed (record on page two of the HHEI form) or during field reconnaissance, if that takes place, so that it can be used to hone a study plan and data quality objectives.

Comment: Page 45, last paragraph: text in all other portions of the manual are full-justified while this paragraph is not similarly justified. (Anderson)

Response: This has been corrected.

Comment: Figure 18, HHEI Flow Chart:
a. The following errors appear in the flow chart as presented:
i. For the oval below the “Start” item that reads “HHEI>30”, the “NO” identifier for the left arrow is missing.

- ii. For the oval in the lower right that currently reads “Stream Flowing AND Watershed Area <0.1 mi²?”, the connecting arrow going up from the oval to the “YES” box is missing.
- iii. The boxes for “Ephemeral Stream” redundantly include “(Ephemeral)” within them. This redundancy could be removed.

Response: Corrections were made to the errors identified in a) i and ii above. The restoration of the original nomenclature for the various stream types eliminates the redundancy issue brought up in the third comment.

Comment: b. The flow chart logic has been significantly changed from those provided in the manual for Versions 2.0 (2009) and 3.0 (2012). These changes radically change the requirements of the assessment process without any justification provided within the manual or the supporting material for the IPR process for these revisions. I recommend that the flow chart remain unchanged from that developed for Version 2.0 for the following reasons:

i. The Version 4.0 flow chart now includes a box coming from the “YES” decision tree from the “Other Uses Appropriate” oval in the upper right that reads: “Conduct Biological Assessment”. This language replaced that from Version 2.0 which read: “Complete Evaluation for Proper Designated Use(s) See Manual”. The original language correctly referred the reader to other applicable Ohio EPA guidance for conducting stream use attainability analyses. These procedures may or may not require assessment beyond the use of QHEI data. Therefore, it is an incorrect assumption that a biological assessment will always be necessary in this situation. I recommend that if a change is deemed necessary, that the appropriate revision would be: “Complete Evaluation for Proper Aquatic Life Use(s) See Manual”.

ii. The flow chart now includes an illogical decision step following the oval in the lower right that reads: “Stream Flowing AND Watershed Area <0.1 mi²?”. The path that leads from the “NO” decision proceeds to an oval that reads “Watershed Area <0.1 mi²”. It would be impossible to reach this decision oval.

iii. The problem noted above results from the alteration of the Version 2.0 language for the lower-right decision oval which previously read: “Substrate Types of Bedrock, Boulder Slabs, and Cobble Comprise \geq 10% of Stream Substrate” (referred to henceforth as the “substrate filter”). This decision oval was added to the HHEI Decision Flow Chart between Version 1.0 and Version 2.0 in 2009 as the result of an analysis of an extensive data set by the team from the Ohio EPA Northeast District Office who developed the HHEI. A description of the process by which this decision logic was developed and the considerations behind the language that was chosen is provided in Attachment A to this letter. In short, removal of the substrate filter oval from the HHEI Decision Flow Chart

would result in a significant increase in the number of biological assessments that would be required for streams with watershed areas less than 0.1 mi² that would provide little or no benefit for the protection of true rheocrene streams as documented by Ohio EPA's previous analyses. Therefore, I strongly recommend that the Version 2.0 HHEI Decision Flow Chart be restored within the latest revision to the manual unless a subsequent data analysis shows that this change is justified. (Anderson)

Response: The problem in the flow chart regarding the lower right oval as pointed out in comment b)ii and b)iii above was the result of an unintended transcription error that went unnoticed. The original content of that oval has been restored. The text that is referenced in comment b)i has been modified using the recommended text.

Comment: Page 58, last paragraph: I recommend striking the word "Alone" from the first sentence of this text. It is unnecessary. (Anderson)

Response: Agreed, it has been removed.

Comment: Page 76, Section 6.3.2: the line spacing for this paragraph is different from the other text within the document. (Anderson)

Response: This edit was made.

Comment: Literature Cited Section:
a. the Literature Cited section should be revised to include reference to the 2015 updates to Volume II of the Biological Criteria for the Protection of Aquatic Life. This update contains the updated lists for both fish and macroinvertebrates. This document should be referenced within the text of the document as warranted (see for example Comment [on page 6 b] 6.b above).

b. The correct citation for Pfingsten, et al. (2013) should be revised to indicate that the persons listed acted as editors of the overall volume rather than as authors of the entire volume. The various sections within the document were written by multiple authors, and included the editors as well as others not listed in the overall citation for the volume. (Anderson)

Response: The references section does contain the citation to the 2015 update to Volume III of the Biological Criteria for the Protection of Aquatic Life. There is no 2015 update to Volume II as indicated in the comment. Note that within the body of the manual, references to fish, salamander, and macroinvertebrate taxa are generally self-contained, such as in Attachment 3 and Tables 4, 5, and 6. The

clarification regarding the Pfingsten et. al. (2013) reference has been made as suggested.