APPENDIX D

RESPONSE SUMMARY TO PUBLIC COMMENTS ON THE DRAFT LOWER LITTLE MIAMI RIVER TMDL REPORT

The draft Lower Little Miami River Watershed Total Maximum Daily Load Report was available for public review from July 6 through August 16, 2010. This appendix contains the comments received and responses to those comments. Please note that references to page numbers in the draft report may not correspond to the same page numbers in the final report.

Three sets of comments were submitted. The comments and responses are grouped by commenter; the number in parenthesis indicates the author of the specific comment, as listed here.

#	Date Received	Name	Affiliation
1	August 16, 2010	Eric B. Partee, Executive Director	Little Miami Inc.
2	August 16, 2010	Brian J. Bohl, Stream Specialist	Hamilton County Soil & Water Conservation District
3	August 16, 2010	Michael C. Miller, Adjunct Emeritus Professor	Department of Biological Sciences, University of Cincinnati

Comment (1)
1) Do long term trends in riffle embededness show the positive impact of these many years of good work by Soil and Water Conservation Districts and NRCS with watershed farmers?

Response
Based on the macroinvertebrates data, embeddedness is not currently a significant issue in the LMR. Most of the expected riffle taxa are present, and in relatively high abundance, which indicates that the amount of fine sediment in the river is not causing problem (i.e., is too high). Similarly, sensitive fish species are present. In particular, madtoms were more common and abundant than in any of the previous surveys, and because they require clean substrates with open interstitial spaces to spawn they further illustrate the good condition of the river in terms of healthy sediment dynamics. Since fine sediment loading is not a problem in the mainstem, it is possible that the conservation work in the watershed has contributed to this good quality in the river.

Comment (1)
2) Do long term trends in ambient phosphorus levels coincide with improvements in stream biology? You have addressed this point in the email below and this could well be included in the TMDL report.

Response
A comparison of the sites across three surveys years (1993, 1998, 2007) was done with paired t-tests to see if there has been a change in TP concentrations across time. An analysis of variance was also performed to see if the group means for any of the respective sampling years were different from one another. As it turns out, there is little difference in the ambient TP concentrations. As shown in the public presentations (July 29, 2010, in Wilmington and in Milford) and in the TSD and TMDL reports, flow conditions were considerably different between these surveys. In light of that, perhaps with higher flow in 2007 the nutrient concentrations would have been somewhat lower. The confounding factor is that there are two major differences between 1993 and 1998 surveys and the 2007 survey. That is, waste water treatment improved, but also the flows were low for 2007. Perhaps the only way to really know

the response in terms of nutrients is more monitoring data when flows are comparable including data derived from long-term monitoring programs.

The following tables show the results of the statistical analyses that were described above. A version of these tables has also been added to the TMDL report in Section 2.2.5.

Results of the analysis of variance (ANOVA)

Source of Variation	*Sum of Squares*	*Degrees of freedom*	*MS*	*F- statistic*	*P-value*	*F critical*
Between Groups	0.037091	2	0.018546	1.324932	0.27752	3.238096
Within Groups	0.5459	39	0.013997			
Total	0.582991	41				

Results of the paired t-test

	1993	*2007*	*1998*	*2007*	*1993*	*1998*
Mean	0.390214	0.331429	0.398	0.331429	0.390214	0.398
Variance	0.017561	0.022475	0.001956	0.022475	0.017561	0.001956
Observations	14	14	14	14	14	14
Pearson Correlation	0.570943646		-0.497677679		-0.445711161	
Hypothesized Mean Difference	0		0		0	
df	13		13		13	
t Stat	1.6698596		1.414014224		-0.185199917	
P(T<=t) one-tail	0.059417637		0.090428607		0.427965214	
t Critical one-tail	1.770933383		1.770933383		1.770933383	
P(T<=t) two-tail	0.118835275		0.180857215		0.855930427	
t Critical two-tail	2.160368652		2.160368652		2.160368652	

Comment (1)
3) Could you expound on the bacteria loading throughout the watershed? Is there cause for real concern on the mainstem given the public contact that is ongoing? Could more frequent bacteria monitoring be justified?

Response
Bacteria loading in the lower Little Miami River watershed (i.e., this TMDL project area) can be evaluated using the most recent data (from the recreation season of 2007 and 2008). What we know about the bacteria loading within the upper LMR dates back to the survey carried out in 1998. No TMDLs for pathogens were developed based on those data in the Total Maximum Daily Loads for the Upper Little Miami River Final Report (Ohio EPA, 2002). Since TMDLs were not developed for the upper LMR and the fact that those data are now over ten years old, it is best to limit discussion of bacteria loading in the basin to the lower LMR. Ohio EPA will be monitoring the upper watershed in 2011 and any needed TMDLs will be developed from that data.

Table 2.3 in the TMDL report for the lower LMR shows a summary of the results from each of the 37 sites that were sampled for bacteria in 2007 and 2008 (this table is based on data presented in the Biological and Water Quality Study of the Lower Little Miami River and Selected Tributaries 2007 Including the Todd Fork subwatershed (Ohio EPA, 2007)). Also presented is a listing of the suspected sources of bacteria found at those sites (that is if the geometric mean concentration exceeded the minimum quality criteria). The sources listed in this table and the subsequent load analyses (based on load duration curves) correspond fairly well with one another. Specifically, Table 3.21 shows what the typical sources of E. coli are at various stream flows. Section 4.5 shows the actual LDCs for each of the impaired sites, which if matched with Table 3.21, provides a strong indication of the types of sources that are causing the greatest amount of bacteria. Most of the sites had exceedances in the dry flow regime and the heavily suburban land use where there is likely to be a fairly high number of poorly operating home sewage treatment systems are a probable source.

In regard to the second part of the question, the mainstem actually looked quite good. Twelve of the 14 stations on the lower LMR mainstem were well below the Class A PCR geomean criterion, with one station just barely over at 127. The recreation use index scores for the two lower LMR large river assessment units (LRAUs) were 97 and 96 (a 0-100 scale, with 100 meaning all sites attained the applicable criteria). Table F-11 of the 2010 Integrated Report (Ohio EPA, 2010), shows that the LMR index scores compare well with many of the other LRAUs for which we had enough data to compute an index score.

It should be recognized, however, that regardless of a lower geometric mean concentration, there are days that have higher E. coli levels which increases the risk for waterborne illness for anyone exposed at that time. For example, the geomean E. coli at RM 28 (LMR downstream State Route 22/3 - Little Miami State Park) was only 78, well below the 126 criterion, but on one of the sampling dates (7/19/07) the E. coli concentration was measured to be 640. Likewise, even sites that are measured to be below the criteria, the risk is not zero. Statistically, a site that meets the criteria with a geomean of 126 still carries a risk of contracting a waterborne illness at a rate of 8 per 1,000 swimmers exposed. This assumes you are exposed at an "average level" similar to the exposure assumptions underlying the epidemiology upon which the criterion is based. So, if you are in a canoe on the LMR and never touch the water, your risk is essentially zero, but if you are kayaking and dunking and splashing and getting water on your food, this type of exposure puts you at a greater risk for becoming ill.

In regard to justification for more frequent monitoring, it is our goal to be able to report on the recreation use condition of all our Class A waters, especially the large rivers in future Integrated Reports.

Ohio EPA does not have resources to extensively monitor bacteria in all Class A waters, but would welcome the opportunity to partner with local utilities and others to establish a suitable program. Such data would have to satisfy Level Three credible data requirements (in terms of the Credible Data Law) to be used in making attainment determinations. Ohio's credible data requirements are available OAC 3745-4; program information is available at http://www.epa.ohio.gov/dsw/credibledata/index.aspx

The routine monitoring and advisory program established for beaches on the Lake Erie shore and at some inland state park beaches (a cooperative effort of Ohio Department of Health, Ohio Department of Natural Resources, and in some cases local health departments, and utilities), could serve as an example for an analogous system for PCR class A stream monitoring. Certainly, there would be the audience (the users) and the business interests such as canoe liveries along with any local chambers of commerce that might see such recreational activity as an important economic engine for the local economy.

Comment (1)
4) Could you discuss the relationship between the upper and lower watershed sources? Is there sufficient phosphorus reduction in the upper watershed that mainstem water quality below Waynesville (at the "entrance" into the lower watershed) does not negatively impact the lower mainstem? Please also reference the upcoming 2011 OEPA field work in the upper watershed and how it might relate to future lower watershed restoration efforts.

Response
Results of the biological assessments on the mainstem of the Little Miami River downstream from Waynesville (river mile 54.3 to above river mile 3.5) show exceptional biological communities indicating that the current level of phosphorus loading is not having a deleterious impact on aquatic community health. However, the concentrations of total phosphorus are higher than the target conditions. Specifically, in the large river portion (from RM 33 and below) exceedance was 2.66 and 1.33 times higher than EWH and WWH targets, respectively. For small rivers the exceedance ratio was 1.63 and 0.96, respectively (i.e., it was below the WWH target). A possible explanation for this incongruence is the fact that the river has a high average stream gradient, which tends to ameliorate the adverse impacts of high nutrient concentrations.

There are 18 WWTPs draining to the mainstem above Waynesville (eleven of which discharge an appreciable amount of waste water and the other seven are quite small). These facilities have a total design volume of 38.62 MGD but are much more likely to be discharging at about 75 percent of that rate (i.e., this estimation is based on the work done for the upper LMR TMDL - see Table 7 in that report). In the lower LMR there are several plants that have phosphorus removal in their treatment so it is unlikely that the in the lower LMR the phosphorus removal from the plants in the upper watershed are "buffering" the impact of the plants that do not have phosphorus removal. It does remain somewhat unclear; however, as to just how much phosphorus can be contributed to the lower LMR without causing impairment (since the communities are currently performing so well under slightly elevated concentrations). There certainly is a lower background TP upstream of Turtle Creek in our recent survey versus the prior survey, but instream phosphorus concentrations jump significantly downstream from Lebanon.

The upper Little Miami survey in 2011 will be as comprehensive as resources allow. Results from that survey will determine if additional treatment will or will not be required of the facilities in the upper watershed. As we have already seen from the results of the survey on the lower Little Miami, any improvement in the upper watershed will have positive results in the lower watershed. Much of the restoration in the lower watershed; however, is needed in the tributaries, which of course is separate from any work that will be done in the upper watershed.

Comment (1)
5) Is there any means of looking at the QHEI data and determining if there is "above normal" streambank erosion along the main stem and/or the tributaries. This analysis could assist local building departments/ SWCD's in adjusting their pre/post construction runoff regulations.

Response
The result of the QHEI analysis that was done to address habitat and sediment impairments evaluates the scores of the riparian metric of the QHEI (see Table 4.9). This metric directly addresses bank erosion via the “erosion” sub-metric where the scoring choices are “none”, “moderate” and “heavy/severe” which each are valued at 3, 2, and 1 points, respectively. Other submetrics are useful but do not evaluate bank erosion this directly. They include “riparian

width" and floodplain quality" with the total possible points for each are four and three, respectively. The riparian width submetric reflects the type of vegetation growing adjacent to the banks which indicates the stability of the banks as a result of supporting root structure (this is one indication of the likelihood or potential for bank failure and erosion). The floodplain quality submetric also indicates the likelihood for bank failure because well-functioning floodplains reduce stream power (and therefore the capacity for bank erosion). Good floodplains also have relatively low bank heights (i.e., channel that is not incised), which ultimately increases resistance to slip and/or cantilever bank failure. The riparian metric is worth a maximum of ten points. Evaluation of this particular metric should be an indicator of the localized bank condition at the survey sites. This evaluation; however, does not address large scale geomorphic stability issues, nor does it make reference to the evolution of the channel (see Rapid Geomorphic Evaluation indices for such information). Table 4.8 in the TMDL report shows the QHEI analysis with the actual scores and the percent deficit of the score relative to the target for the riparian metric.

Comment (1)
6) Some 24% of the length of the mainstem's riverbanks receives some protection by local authorities who have adopted "river buffer" zoning. An additional 51% of the main stem's riverfront is protected through ownership by ODNR, LMI and local authorities. Could you comment on the importance of this historic work? On a related note, would the agency find it helpful to have a "Citizen's QHEI" effort launched along the Little Miami to help track riparian conditions over time?

Response
Past efforts to protect the Little Miami River have resulted in water quality benefits. What has been done on the mainstem of the Little Miami River should be a model for activities on the tributary streams in addition to the installation of best management practices in upland areas.

Currently, there is a Citizen's QHEI that is used in education programs within the Ohio Department of Natural Resource and Ohio EPA's Office of Environmental Education (e.g., Health Water Healthy People) The Citizen's QHEI is also available for general use by the public (see the following website:
http://www.epa.state.oh.us/LinkClick.aspx?fileticket=25cdrTQGhqg%3d&tabid=2248).

The data from the Citizen's QHEI is considered Level One (in terms of the Credible Data Law), which means that it cannot be used for making water quality management decisions. The primary purpose for collecting this type of data is educational, with the goals of increasing public involvement, and raising public awareness. Awareness and involvement is valued by the agency. Specifically, greater public understanding of issues facing water quality may ultimately result in cooperative efforts among groups to address water quality problems and voluntary adoption of management practices beneficial to water quality (e.g., nutrient management for residential lawns and cropland). Ohio EPA would encourage continued or expanded use of this tool for citizens in the Little Miami River watershed.

The QHEI data that is used in considering causes and sources of aquatic life use impairment is Level Three. The QHEI informs decisions about causes and sources of impairment therefore, QHEI scores gathered by evaluators that meet level three criteria, would improve our understanding of the Little Miami River system. For instance, scores gathered from additional sites or more frequent evaluations at historically evaluated sites would necessarily fill gaps in our knowledge of the basin. In recent years Ohio EPA has expanded its formal QHEI training program to watershed groups in the hopes of acquiring more of this kind of data to augment the agency's own monitoring efforts.

Comment (1)
7) In 2007 the ODNR Division of Wildlife and LMI co funded a mussel survey on the main stem by Dr. Michael Hoggarth. In that effort, mussels were generally under some remaining stress, even though OEPA researchers found the main stem in full attainment. Please comment. Might a Mussel IBI be in the offing?

Response
Dr. Michael Hoggarth's study compared results from a study conducted in 1990 and 1991 vs. that of 2006. That spans 15 years. In that time period, we had two TMDL surveys in the watershed, in 1993 and in 1998. Those two surveys both found widespread non-attainment of biological criteria, particularly in the fish community. That is already well known. Dr. Hoggarth's survey in 2006 essentially agrees with our agency's findings from those two studies. So why does his 2006 survey not agree with our 2007 survey?

The mussel fauna may be on their way to recovery, but we might not know for some time to what extent, if any, their recovery might be. There are so many variables affecting whether or not lost mussel fauna will re-establish itself. It's not just water quality, but fish host species, recruitment of mussels from other watersheds (which also relies on fish migration, because those mussels will not move themselves), substrate quality/availability, surrounding land use, etc. Add all that to their long, slow life cycle and it could be some time before we will see any significant improvement to the damage that has been done to the mussel communities of the Little Miami River watershed.

The Scioto River is a prime example of a river that has been affected by the same issues that affect the LMR. Historically, mussels have been difficult to encounter in the Scioto, but now more species are found with greater ease. In time, this may similarly be the case with the LMR. The mussels just don't rebound as fast as the fish or bugs.

As far as a mussel IBI, it is something that will not likely be developed at Ohio EPA. Fish and macroinvertebrates provide a lot more data that is more easily related to water quality and habitat. Plus, understanding is limited as far as what to expect regarding a healthy mussel population because mussel populations are sporadic and variable across Ohio. Expectations are probably watershed-specific, making the assignment of numeric criteria difficult. The most practical approach is to track changes through time much in the way that Dr. Hoggarth has done, and draw conclusions from there.

Comment (1)
8) The subject of remaining assimilative capacity might be covered in the report as well so that the public and local planners might more fully understand the impact on future development trends.

Response
Again, the biological communities along the mainstem of the Little Miami River showed excellent health. However, this does not necessarily mean that the water chemistry on the mainstem likewise demonstrates exceptional quality. As pointed out in the responses to comments number four and two above (also text and tables that have been added to the draft report in a

new Section 2.2.5) total phosphorus concentrations in the mainstem remain well above the targets that were developed in the [*Association Between Nutrients, Habitat, and the Aquatic Biota in Ohio Rivers and Streams*] (Ohio EPA, 1999). Although the Little Miami River demonstrates a high assimilative capacity, most likely due to the high gradient of the stream and good habitat characteristics, it is also likely that with such high in-stream total phosphorus concentrations, the river is near its assimilative limit.

From a regulatory standpoint it is important to remember that the antidegradation rules (OAC 3745-1-05) which require a 70 percent set-aside of the assimilative capacity for a given pollutant (that is, for Outstanding State Waters) apply only to pollutants that have promulgated water quality standards (e.g., ammonia). Total phosphorus does not have a water quality standard currently codified and therefore, is not required to have its assimilative capacity determined. TMDLs did not directly address the issue of assimilative capacity because aquatic life uses were met at all but one site on the mainstem and this site was addressed by TMDLs developed on the nearby tributaries.

Comment (1)
9) Some comment in the report regarding the recommendations of the OEPA Phosphorus Task Force as it might relate to the Little Miami would be instructive to the reader and area natural resource managers, along with some comment on dissolved phosphorus versus total phosphorus levels as it relates to phosphorus sources and in-stream monitoring.

Response
Ohio EPA agrees that it is appropriate to include some discussion regarding the work and potential activities of the Ohio Phosphorus Task Force. The following text has been added to the implementation planning section of the report (Section 5.3).

The Phosphorus Task Force is working to gather the information needed to effectively manage phosphorus in the Lake Erie watershed, particularly areas draining to the western basin. In doing so the task force laid out several objectives. Those that are especially good for increasing the understanding of phosphorus dynamics and have implications for management decisions in other watersheds in Ohio include:

- *Evaluate potential sources of phosphorus along with transport pathways*
- *Identify agricultural practices that may increase the loading of dissolved reactive phosphorus*
- *Recommend management actions*

The task force published a report which tells of the group's findings and recommendations for management and monitoring activities that are aimed at reducing phosphorus loading to Lake Erie. This report is available at:
http://www.epa.state.oh.us/portals/35/lakeerie/ptaskforce/Task_Force_Final_Report_April_2010.pdf

Information presented significant to the lower Little Miami River watershed relate to the proportion of the loading and the loading dynamics of dissolved reactive phosphorus (DRP), which is entirely or almost entirely biologically available for plant production and ultimately this plant productivity is the cause of impaired aquatic life communities. In contrast to DRP, particulate forms of phosphorus have been estimated to be only about 30 percent biologically available. The dominant sources in the western Lake Erie basin (WLEB) are agriculture and point sources. Major point source dischargers are required to treat to an effluent quality no *more than 1.0 mg/l of total phosphorus, a limit applied to relatively large waste water treatment plants in the lower Little Miami River watershed.*

Factors impacting phosphorus delivery to surface waters via nonpoint sources include the clay content of the soils, where higher clay content translates to more phosphorus delivery (related to clay's affinity for particulate phosphorus). Once in the stream system, phosphorus bound to the clay particles may dissolve into solution and become biologically available for algae production. The disassociation of phosphorus from clay more readily occurs under hypoxic or anoxic conditions where iron species on the clay particle are reduced and becomes more soluble. In contrast to soils found in the WLEB, soils in the lower Little Miami River watershed have a much lower clay content where, proportionally speaking, they occur as low as one sixth of what they do in the Portage River watershed (a significant WLEB tributary river).

Other notable facts regarding source loading on a per unit area basis is that runoff from highly managed turf areas, primarily residential lawns, is decreasing over time due to lower phosphorus content in commercial fertilizers and improved practices regarding application, which includes better timing and the equipment and methods used in application. Although this is progress, abating runoff from residential and commercial areas remains important, particularly in watersheds like the lower Little Miami River watershed where these types of land uses are extensive.

In terms of transport pathways for phosphorus, it is recognized that hydraulic retention is likely to be a significant way to reduce loading to streams. The dissolved fraction of the phosphorus is believed to be readily transported in subsurface drainage tiles, along with nitrates. Therefore, reducing the overall volume of discharge from this pathway would likely abate nutrient issues substantially. Water table management or controlled drainage could, with minimal management and at relatively little sacrifice in terms of operational efficiencies to producers, reduce annual tile flow discharges by about 40 percent (with a corresponding reduction in the annual nutrient loading). This is achieved if tiles are essentially put out of use for the period beginning just after harvest (e.g., early November) until the period just before planting preparations are being made in the spring (e.g., March to April). More intense and sophisticated management may lead to even greater load reductions and may also produce benefits in terms of increased crop yield.

Run-off based hydraulic retention and targeted treatments are largely aimed at minimizing and/or treating concentrated flow paths. Filter areas (or wetlands) strategically located within fields or on the margins in low depression areas where flow accumulates (and possibly switches from sheet flow to a more concentrated flow), can be areas where infiltration occurs or, at a minimum, flows are detained, sediment is settled and nutrient are more readily assimilated. There are also management options that can reduce the concentrated flow that are not as widely promoted nor researched as practices such as grassed waterways, contour farming, and strip cropping. Specifically, designing buffers in consideration of ratios of effective buffer areas to contributing runoff area (i.e., ensuring that there is sufficient effective buffer area per runoff area in order to achieve the desired reduction efficiencies). Likewise, orienting furrows perpendicular to the buffer margin so that runoff is better dispersed across the buffer area would improve phosphorus treatment; however, consideration needs to be made of the any deleterious consequences like increased rill or gulley erosion on more steeply sloped soils. Hydraulic retention is discussed at length in Section 5 of the report generated by the Phosphorus Task Force.

Overall recommendations from the Phosphorus Task Force include:

- *Develop consistent state-wide minimum standards for home septic treatment systems*

- *Minimize the use of systems that have off-lot discharges*
- *Provide training and continuing education opportunities for designers, installers, inspectors, regulators, and maintainers and operators of these systems*
- *Develop memorandum of understanding between the State and lawn care manufacturers to achieve reductions in phosphorus applied in lawn care products*
- *Develop outreach and education programs for homeowners to better water resource stewardship*
- *Promote use of Tri-State agronomic recommendations for cropland through such means as providing opportunities for training and education*
- *Develop and implement a phosphorus risk index for cropland including incentivizing its use through such means as tax reductions or rebates on fertilizer purchases*
- *Expand and promote consistent standards in soil testing and develop a clearinghouse of soil phosphorus concentration data*
- *Discourage application of phosphorus when critical threshold values are exceeded with the phosphorus risk index*

Comment (2)
Regarding the distribution of sources and causes of aquatic life use (ALU) impairments listed on page 26 of the draft report, it is curious that the dominant source of ALU impacts is listed as natural, while the dominant cause is listed as siltation.

Response
The dominant causes of impairment are both sediment and stream dryness or desiccation (stated as “natural conditions (flow)”). Both of the stressors are responsible for, or at least contribute to, aquatic life impairment at 11 different sites and each constitutes 28 percent of the stressor occurrences.

The aggregate statistics presented in the report may be misleading. If all of the "causes" that are listed are tallied (i.e., a count of the number of sites impacted by each of the “causes”), both sediment and dry conditions are dominant (i.e., at 28 percent of the total). However, when doing the same for "sources" only natural conditions is dominant because there are multiple sources for sediment (e.g., cropland, channelization / bank erosion), but there is only one source listed that is associated with the dry conditions (i.e., natural). Ultimately, the fact that dryness is a problem that occurs equally throughout the watershed with sediment issues, and dryness was exclusively associated with the drought conditions, while sediment conversely, came from multiple sources, not one of which was responsible at each of the sediment impaired sites, creates the apparent disparity between the aggregate statistics for the causes and the sources.

Comment (2)
The Executive Summary indicates that nearly half of the impaired locations are listed as such due exclusively to low stream flow caused by an unusually dry year. In many of the tributary sampling locations, the fish surveys met Warmwater habitat (WWH) criteria, but Invertebrate Community Index (ICI) and/or Qualitative Habitat Evaluation Index (QHEI) scores were low.

Response
The disparity between the IBI and the ICI under dry conditions may be explained by the life history of the organisms in question. Under conditions where the stream begins to go dry fish

often will seek local refuge in the deeper pool areas and essentially wait for flow conditions to increase again with the coming rains. Stream insects on the other hand can accelerate their individual growth rates and emerge as adults earlier when these types of environmental stresses are present (i.e., drying). So in essence the fish present in a given section of stream will be somewhat concentrated in an overall smaller habitat area (the pools) whereas many of the insects may have emerged as adults and left the stream to reproduce, leaving eggs and early instars (very small insect larvae) in their place.

In terms of the QHEI, and as a point of clarification, its score is not used in determining the attainment status of a given site. Rather, the QHEI is a tool used to help provide explanatory information to the results that are found with the biological indices. It is also the case that the QHEI scores can be hindered under drier stream conditions because habitat areas become inaccessible to aquatic organisms. One of the most significant examples of this is when a riffle becomes dry. A stipulation of the QHEI scoring procedures is that the habitat being evaluated must be accessible to aquatic organisms at the time the evaluation is being done. So in many cases, areas of habitat that would have otherwise increased the score of the QHEI cannot be counted.

Comment (2)
Causes listed in many cases are "Natural conditions (flow)" and sources listed are "Natural". The high percentage of impervious surface in sections of the Lower Little Miami River watershed as well as agricultural drain tile can limit ground water infiltration. Consequently, HCSWCD requests that OEPA re-examine the subwatersheds for which "Natural conditions (flow)" and "Natural" are given as causes and sources of nonattainment respectively.

Response
Most of the sites where desiccation was the cause of impairment occur on relatively small tributaries (i.e., drainage areas around 20 square miles) which are more susceptible to desiccation (it is widely accepted that smaller watersheds are more responsive to precipitation conditions – drought or otherwise). Additionally, the site on Turtle Creek is in an area of high relief, which despite also being located in a relatively urban area, would be expected to go dry under drought conditions. High relief streams and watersheds drain more quickly than those with lower relief, consequently they tend to have less water stored to sustain flows during dry periods. So in light of these factors, it is not unreasonable to attribute the dryness exclusively to a natural occurrence.

However, the fact that several of the other sites have a contributing watershed that is relatively flat and likely experiencing a high level of artificial land drainage and/or substantial impervious covers (one site that is) support the comment above. It is possible therefore that both the impervious surfaces and artificial land drainage in agricultural areas have had some impact on the dryness experienced in the streams. A confounding issue with this assertion is that there are other sites that are in full ALU attainment which share similar conditions as those impaired by dryness (examples include two sites on East Fork of Todd Fork, Turtle Creek just a short distance from the impaired site and two sites on Todd Fork).

This uncertainty and the lack of a clear cause-effect case linking the land uses to the stream desiccation make it difficult to commit to listing impervious surfaces and artificial land drainage as sources. The severity of the drought also makes ascribing land uses as the source, instead of merely the natural decadal drought cycle, a more tenuous proposition. Thus, although we have reviewed the available data, we stand by the original cause and source assignment decisions. Also, due to resource limitations we are not able to collect additional data at these sites at this time.

Comment (2)
Lack of ground water flow to a tributary as a result of reduced infiltration within the watershed could be a reason why macroinvertebrate populations are not meeting WWH ICI criteria even though QHEI scores are sufficient. Without excessive impervious surface and/or agricultural drainage, elevated ground water tables providing base flow to the tributaries would also create cooler temperatures and higher dissolved oxygen levels for viable macroinvertebrate populations.

Response
The fact that the fish were meeting WWH standards and the macroinvertebrates were not in most of these streams indicates that the pools were supplemented by cool, sub-surface flow. The lack of a riffle was the limiting factor in these streams in terms of macroinvertebrates, not water temperature or dissolved oxygen.

Comment (2)
Based on Ohio EPA's own research, if a tributary meets WWH or Exceptional Warmwater habitat (EWH) standards based on QHEI, then it is expected that the Index of Biotic Integrity (IBI) and ICI values will follow.

Response
This statement is inaccurate. There are no water quality standards based on the QHEI. There is a correlation between fish community performance and QHEI scores (see Association Between Nutrients, Habitat, and the Aquatic Biota of Ohio Rivers and Streams (Ohio EPA, 1999)), which is used as a tool in determining whether fish community impairments are habitat-derived or a water quality issue. The QHEI and the ICI have no such correlation. Additionally, the majority of the sites used in developing these regression relationships were evaluated under normal flow conditions and not necessarily the extremely low flow conditions that were present in the lower LMR during the 2007 survey, which complicates the relationship between the QHEI and IBI scores for sites in the TMDL project area.

Comment (2)
If not, HCSWCD believes that we have to look deeper into the cause of nonattainment, before simply indicating that the cause and source of impairment is "Natural". Areas with a cause and/or source of impairment listed as "Natural" that meet WWH QHEI standards, but not ICI standards include the following: Cowan Creek at School Rd. and Clarksville Rd.; East Fork Todd Fork at U.S. 68, Reeder Road and SR 132; Whitakers Run downstream of Blanchester PWS (no QHEI performed, was an HHEI conducted?); and Muddy Creek upstream of the WWTP.

Response
Reiterating previous responses, first, we are very comfortable in asserting that the macroinvertebrate community performance is impacted exclusively by dry conditions. Again, the community is responding by insects drifting downstream and/or prematurely emerging as adults (it is well documented in the science that under stress macroinvertebrates will experience accelerated ecdysis). Second, ascribing impervious covers and land drainage as the sources is

not done because of too much uncertainty given the severity of the drought and the lack of clear evidence that stream flow would be substantially higher if these conditions were not present (again the contrary indications based on sites that are meeting despite the same degree of imperviousness and/or land drainage).

Comment (2)
In addition to the nonattainment locations with QHEI scores that meet WWH criteria, there are nonattainment locations with insufficient QHEI scores and causes/sources of impairment listed as “Natural”. In these cases, the ICI and/or the IBI scores also tend to be below WWH targets. Turtle Creek at East Street, Dry Run at Main Street in Lebanon, O’Bannon Creek at Linton Rd., O’Bannon Creek at SR 132 and O’Bannon Creek at Gibson Rd. are not attaining WWH goal due to “Natural” conditions, yet the QHEI riparian corridor and riffle metrics are not meeting TMDL targets. At all of these locations, the QHEI riffle scores are 0, which is not even close to the TMDL target of 2.7. A score of 0 indicates unstable riffle run/substrate (fine gravel or sand) and moderate to extensive embeddedness. This would indicate that land uses, storm water runoff and excessive sedimentation are impacting stream habitat. Essentially, storm water runoff, siltation and/or loss of habitat needs to be indicated as a source of impairment despite the low flow during the sampling year.

Response
The riffles at all of these sites were dry. The zero score reflects lack of flow – meaning that this instream habitat attribute was not available for the fish community to use and therefore could not be evaluated in the QHEI scoring.

Comment (2)
Consideration of these non-natural sources necessitates action to be taken to improve the state of these watersheds. If not addressed, we are concerned that the excessive runoff and sediment loading from the upper tributaries may at some point negatively influence biological communities in the Lower Little Miami River in Hamilton County. Riparian corridor protection and storm water infiltration practices are key components in reducing the storm water flow and sediment impact, and subsequently maintaining biological communities in the lower section of the Little Miami River.

Response
There is little doubt that the management options stated above would be beneficial to water quality. Ohio EPA, however, is limited in what it can require in terms of land based management options such as riparian buffers. Federal and State incentive based programs are often relied upon to be the primary vehicle to spur on the voluntary adoption of such practices. These programs include the conservation programs that provide cost-share to install or adopt certain management practices and/or compensate land owners for opportunity costs for not producing on their land (Wildlife Habitat Incentive Program (WHIP), Conservation Reserve Programs (CRP, CREP, WRP). Also, funding through the Section 319 grant program is designed to address nonpoint sources of pollution. Likewise local entities should prioritize such management to protect water quality and allocate funding and/or develop ordinances that directly address the land based management practices that are needed to sustain or restore good water quality.

Comment (2)
In the HUC units that encompass Hamilton County (0509020214), the draft TMDL report only indicates that habitat and biological data were collected in Sycamore Creek, Duck Creek and Clough Creek, but not in Polk Run, Horner Run and Dry Run. Was habitat and biological data collected in all of these watersheds? Data in Table 2.4 indicates that sources of impairment for Sycamore Creek, Duck Creek and Clough Creek include urban runoff/storm sewers. From responding to numerous stream bank erosion and flooding complaints in the Polk Run and Dry Run watersheds, we suspect that urban runoff is a source of impairment in these watersheds. Therefore, we request QHEI, ICI and IBI data from these watersheds as well. Can OEPA provide those data to HCSWCD?

Response
There are no recent data from the Polk Run, Horner Run and Dry Run watersheds since the 1998 and 2007 surveys did not include sites in these areas. The most recent data available from the Ohio EPA can be found in the report of the 1992 survey where one site on Dry Run (RM 4.2), one site on Polk Run (RM 0.3), and one site on East Branch of Polk Run (RM 1.5) were evaluated. No sites were surveyed in the Horner Run watershed. The report with this information is available for review at the following web link: http://www.epa.state.oh.us/portals/35/documents/HamiltonCounty1992.pdf. Raw data from the 1992 survey can be obtained by contacting Ohio EPA.

On Dry Run, aquatic life was in non attainment of its designated use and moderate habitat alteration was listed as a cause with an overall QHEI score of 50.5. The site on Polk Run fully met its aquatic life uses with exceptional habitat quality. The site on East Branch Polk Run was partially impaired and minor habitat alteration was listed as the cause, despite a QHEI score of 71.5. As indicated in Table 1.1 of the draft TMDL report, aquatic life use impairment in the Horner Run and Dry Run watersheds were not addressed. The final report has been revised to reflect the fact that aquatic life impairments in the Polk Run watershed are also not addressed through this TMDL project (Table 1.1 in the draft report stated that habitat and sediment impairments were addressed in the Polk Run watershed with this TMDL).

Comment (2)
Based on Table 3.9 on page 43, it does look like OEPA is using a surrogate measure to calculate a TMDL in the Polk Run due to direct habitat alterations and sedimentation/siltation. What does this mean in terms of TMDL requirements for the Polk Run watershed? Given our observations within the previously mentioned watersheds, HCSWCD suggests several additions to Table 5.7 (Restoration and abatement actions recommended for the 14 ten-digit HUC p. 110-111). Recommended actions are represented by an "HC" in the revised Table 5.7 that we are submitting.

Response
This is actually a mistake in Table 3.9 and the habitat and sediment issues were not addressed in the TMDL project. The listings are based on survey data that was collected in 1992 and therefore this data is considered historic (hence the "h" next to the 5 in terms of the 303(d) category) and we have not acted upon it. The listing must remain however until either more recent data supplants the existing listing in this TMDL or a TMDL is developed.

Comment (2)
Based on our field experience and review of the Lower Little Miami TMDL Report, HCSWCD requests the following of OEPA:

- *Re-examination of tributary sites with impairment causes listed as “Natural conditions (flow)” and/or sources listed as “Natural”. As you may know, the Center for Watershed Protection has used numerous studies to correlate watershed impervious cover and stream quality in the well known “Impervious Cover Model”. This model indicates a decline in the diversity of aquatic organisms with as little as 10% impervious cover in a watershed. With the role that impervious surface and agricultural drain tile play in lowering ground water tables and potentially reducing base flow to our streams and rivers, land use dynamics need to be more closely examined prior to using the “Natural” label as a cause or source of watershed impairment. Analysis of the QHEI metrics seem to indicate that there are some un-natural causes and sources of impairment that should be addressed.*

Response
As stated above, the issue is that there was no riffle, which affected the number and types of macroinvertebrate taxa collected in those streams. Most of those streams had solid WWH fish communities, indicating that the streams were still receiving adequate sub-surface (interstitial) flow.

Comment (2)
- *The addition of further restoration and abatement actions in Table 5.7 (see attachments with suggested additions indicated.)*
- *Consideration of actions listed in Table 5.7 in future NPDES permitting and state funding of water quality/restoration projects.*

Response
The additional recommendations for water quality improvements provided by Hamilton SWCD primarily deal with the 12-digit HUCs that were not evaluated in the 2007 survey and therefore are considered impaired based on historic data. It is very likely that, since little has changed in terms of land management and the types and proportions of land covers in those areas that the problems identified in the late 1990s persist today. The recommendations in many instances that were provided by Hamilton SWCD are appropriate to address such water quality stressors and will be included in the table in the final TMDL report.

In some cases the recommendations pertaining to the 12 digit HUCs that were most recently surveyed in 2007 (and therefore have current data that identify stressors generally still in need of abatement) are not necessarily appropriate based on Ohio EPA’s approach to implementation planning. These tables were filled out based on a desktop analysis of the aerial photography, soils, topography and land cover classes (among other types of spatial data) to make the most appropriate recommendations. In light of constraints on the resources available to make water quality improvements, it is important to prioritize actions to produce the greatest water quality improvement for the level of resource expenditure.

Therefore, as an example, 12-digit watersheds where the existing buffers are generally extensive, there are no recommendations for additional buffers since this will result in only minimal improvements from current conditions (i.e., since lack of buffering is not much of a problem). Likewise, abatement options that primarily address stressors that have not been explicitly identified as causing impairment are not recommended (regardless of the conditions on the landscape). In HUC 14-01 organic enrichment is the only cause of impairment identified (at river mile 1.1 on Sycamore Creek) and downstream sites are performing well. For this reason and the fact that there is no compelling evidence that sedimentation is a problem no recommendations are made regarding stream bank protections. Thus, based on the data and field indicators, Ohio EPA believes that a reduction in the organic loading is sufficient to improve water quality and attain water quality standards.

Comment (3)

***No expansion of concentrated animal feeding operations (CAFOs) on LMR watershed**.*
The demise of Grand Lake St. Marys this year with toxic Aphanizomenon gracile producing both Microcysitin and Saxotonin has been set off by the expansion of CAFOs in the watershed. In the late 1990s before expansion, the Ohio Lake Management Society gave the Lake St Marys Watershed group an award for the reduction in agricultural runoff into the lake. Since then the expansion of CAFOs south of the lake have pushed it over the edge, even if some of the manure and urine is taken out of the watershed for disposal. We have one CAFO in the LMR watershed as best I can read the map. The eurtophy of the Lower Little Miami River is critical. Algal biomasses are looking higher each year, especially during low flow. We frequently find the TP concentration and chlorophyll biomass amongst the highest coming into the Ohio River in our River Runs down the Ohio 2001-2007. We want to curtail more point sources from concentrated animal feedlots. The TMDL should reflect the fact that reduction in nutrients as point sources is responsible for the improvement seen. We worry about unregulated growth of an uncontrollable nutrient input from industrial animal farms.

Response

As you may be aware, the Ohio Department of Agriculture is now responsible for issuing permits to install and operate new or expanding large animal feeding operations. Ohio EPA currently retains our authority to require NPDES permits for operations that have a discharge, or that propose to discharge. However, many large facilities do not discharge or propose to discharge pollutants in a manner or level that would trigger the need to obtain an NPDES permit. The ability to require permits (or deny them) is determined by state and federal laws, and this TMDL cannot change what the laws authorize. Having said that, the TMDL will be an additional tool that Ohio EPA, ODA, and local Soil and Water Conservation Districts can use in determining what management practices should be used to protect water quality. There are several implementation recommendations that are pertinent, including statements such as: “Nonpoint source of nutrients and sediment would be abated with additional stream-side buffering. There are small, first and second order streams passing through cropland that have little in the way of buffers. Buffers consisting of native grasses or trees are recommended to abate overland transport of sediment and nutrients and increase infiltration capacity due to the deep root structure associated with these types of vegetation” and “Other field based management practices that minimize surface erosion, sequester nutrients, and promote more infiltration are recommended such as cover cropping and conservation tillage”. These recommendations would apply to all agricultural fields, not just those used by large livestock farms for manure application.

Comment (3)

2. Concern for PEAK DISCHARGE from impervious surfaces.
The land use shows the Lower LMR to be 10% impervious. This is usually a break point for reduction in biocriteria of IBI and ICI and loss to stenotrophic species. We have just published a paper showing that the peak runoff from the largest annual rainfall event is a serious degradation of IBI and ICI scores for urban stream (3-4th order), but not in reference streams. In Urban streams the runoff surge is destructive eroding both the bottom and sides of the river,

but bringing in a blast of sediment from the watershed and development sites (old and new). See Coleman, Miller and Mink 2010 Hydraulic Disturbance reduces biological integrity in urban streams. Springer Verlag), also WERF has developed a protocol for peak flow disturbance impacts. Our tributary streams, especially the urban impacted ones like Duck Creek, Polk Run, O'Bannon Cree, and Clough Creek do not meet their expected WWH designation largely because of peak discharge disturbance of the biota. The mainstem is still healthy. Is that luck? Or is it the benefit of several clean water tributaries?.

Response
Ohio EPA agrees that the affect of urban land use on hydrology is a substantial stress to water quality, most especially in areas that do not have post construction storm water management controls which are designed to address the significantly higher rate of runoff generation and its overall volume. Water quality degradation due to urban hydrology is documented in several watersheds in Ohio and is also very well documented in the scientific literature as pointed out in this comment. Abating these types of stress is often difficult in areas that were developed without inclusion of storm water infrastructure that is beneficial to water quality. Large-scale efforts to retrofit such infrastructure require serious commitment on the part of local entities and often a substantial expenditure of resources. However, smaller controls that are progressively installed may ultimately result in a significant benefit to water quality. Such efforts may include retrofitting bio-retention in parking areas and drainage from rooftops (e.g., through rain gardens in residential areas) and the minimization of impervious surfaces through better design and planning or use of more porous paving materials.

The streams mentioned above are likely to be impacted by a stressful urban hydrology, but based on this most recent survey this impact is secondary to other issues. Specifically, O'Bannon Creek attained standards for aquatic life uses in the lower two sites while the impaired sites further upstream were primarily impacted by the dry summer. Sewage dischargers from the combined sewage systems have drastically degraded water quality and resulted in an unhealthy aquatic community on Duck and Clough Creeks. Likewise the concrete reinforced channel of Duck Creek leaves little suitable aquatic habitat for a substantial proportion of the stream's length. The mainstem of the Little Miami River appears to be fairly resistant to the impacts of the local urban hydrology in this lower section since, at this point it is a large river and much less susceptible to the flashy hydrology of the fairly small tributaries which only contribute around five percent of its overall drainage area.

Comment (3)
This expansion of unmitigated runoff volume is itself an unrecognized detriment to urban streams and potentially the Little Miami River in its urban passage from Xenia to the Ohio River. Detention, infiltration and evapotranspiration should be emphasized for the urbanized watershed. Duck Creek during an event shouts a surge that dominates the LMR at its mouth. These events are dangerous and stressful to the lower river. MSD is restructuring CSOs and SSOs in response to the US EPA Consent Decree. Retention basins and rapid treatment stations have been installed on many Cincinnati underground stream outfalls, called CSOs. I would encourage Ohio EPA DSW to take a stand on the potential danger of unregulated imperious surfaces on the health of the LMR.

Response
The TSD made a strong point about the effects of Duck Creek on the LMR. The only site that did not meet EWH on the mainstem was just below Duck Creek. The streams where unmitigated urban runoff was obviously a problem were noted in the attainment table and were

addressed in the TMDL. Many of these streams fall under the U.S. EPA consent decree to MSD and will be dealt with appropriately.

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