Appendix I – Compilation of partnership feedback and responses on the draft report

The draft report was posted on July 10, 2019 and subsequently distributed to the Water Quality GIT, Habitat GIT, Wetland Workgroup, Agriculture Workgroup, Urban Stormwater Workgroup, Watershed Technical Workgroup and CBP Advisory Committees (STAC, CAC and LGAC) for review and feedback. A "recommendations roll-out" webcast was hosted on July 31 detailing the panel's recommendations. The webcast recording and other materials are available on the corresponding CBP calendar entry: https://www.chesapeakebay.net/what/event/wetland_bmp_expert_panel_recommendations_roll_out_webcast

Feedback on the draft report was requested by COB August 15. Under the BMP Protocol, the Panel Chair (Neely Law) and Panel Coordinator (Jeremy Hanson) worked to compile the feedback and respond on the panel's behalf. The panel would be consulted in the event that partnership feedback would involve substantive changes to the panel's conclusions or recommendations. To date (September 3, 2019), there were no revisions that required the full panel's input.

Name of commenter (affiliation)	Section or page reference, if provided	Comment or suggested change	Response from Panel Chair and Panel Coordinator
Karen Coffman		(during webcast) Would this BMP be available to the urban sector for load reductions?	The panel's efforts were focused on *voluntary* wetland practices that are historically applied within agricultural settings, as those areas offer the greatest acreage of prior-converted or degraded wetlands. There are other existing practices for constructed wetlands in developed areas that are engineered for stormwater treatment, and this panel's recommendations do not alter those existing BMPs for the developed sector. While the panel's focus was for voluntary practices within agricultural settings, it is possible that these voluntary wetland practices are occasionally applied in suburban or exurban areas that could fall within developed load sources. It is also true that floodplain reconnection or legacy sediment removal projects that restore/create/rehabilitate wetlands do occur within developed areas, and therefore we will ask the USWG to consider if these wetland practices should be expanded to include developed load sources.
Ellen Gilinsky, Ph.D. (STAC)		Jeremy, I read the report as a STAC member and wetland practitioner. Very good report and conclusions make sense.	Thank you very much for reading the report and providing your feedback. We appreciate it!

Tom Schueler (CSN)		Congrats on getting the wetland report done. I think it was well done, and technically sound, and I certainly support its adoption. I did want to check in with you about some issues on how the new wetland report intersects with our protocol 3 stream restoration effort, and the issue of how to credit LSR or valley restoration efforts. It would be helpful to have some agreement on these issues before the report goes to the USWG in September. Although our fledging group 4 may want to weigh in, it would be helpful to get a sense whether floodplain reconnection falls under wetland restoration, creation or rehabilitation, in the context of your new report, especially as it potentially relates to modifying Protocol 3.	The application of the recommended credits as a part of a stream restoration effort will depend on the context, and arguments can be made for any of the three wetland BMPs. If hydric soils exist and the reconnected floodplain was previously a wetland, then it would match the previous panel's definitions of wetland restoration. Alternatively, if a wetland still remains in the floodplain, but in a degraded condition, then it would more closely represent wetland rehabilitation for that floodplain reconnection. Wetland creation seems less likely to apply, but if there are no longer hydric soils then wetland creation may be the more applicable wetland BMP. We acknowledge that Greg Noe (USGS) served on this panel and is also a member of Group 4 for the USWG, along with Bill Stack (CWP). We are confident that Group 4 can make a determination of how to best apply the wetland BMPs in the context of urban (and non-urban) stream corridors, especially in relation to Protocol 3. A main point of consideration is to ensure practice implementation does not result in double-counting of load reductions; one or the other credit protocol should be used. Further, it is encouraged for implementation projects that increase wetland acreage, even though it is a part of a stream restoration project, would ideally be reported and tracked as a separate Bay Agreement Outcome.
Dianne McNally (EPA R3)		I've reviewed the report and consulted with one of our wetlands contacts here at EPA on the expert panel recommendations. I do not have any significant concerns or comments.	Thanks for working with your wetland colleagues to consider the report, and for reaching out to confirm you don't have any significant concerns.
Tess Thompson (Virginia Tech)		Jeremy, I realize I'm a day late, but I wanted to include some comments on the nontidal wetland expert panel report. I think the recommendations contained in the report are reasonable and well justified, given the complexity of the task of assigning nutrient and sediment removal rates for wetlands. I recommend that the report authors complete editorial revisions of page 16. There are numerous typos and grammatical errors that obscure the meaning of the text. If the authors would like a detailed list, I can provide that, but I think a careful reading would clear up the errors.	We edited this section for greater clarity.
Tess Thompson (Virginia Tech)		My only technical concern is the last sentence of the second bullet on page 16. Specifically, the report states that "Created wetlands are least likely to provide improved water quality	Thank you for the suggestion and insight. See edits on page 16-17.

		benefits, assuming the location is not positioned to allow the development of natural wetland processes (else wetlands would have occurred at that location historically)." I find this argument specious. There would be no need to create a wetland in areas that would have had them historically, so, by default, one must choose a non-wetland area to create a wetland. If the conditions in a location are changed to promote wetland hydrology (which the report acknowledges is the master variable), then it is reasonable to assume that created wetlands can eventually develop similar water quality benefits as natural wetlands. In the past the Pierce method (aka the "bathtub" method of compacting soils to minimize infiltration and constructing a berm to regain surface water) was used to create perched wetlands with few functions. However, in more recent years, wetland creation has focused on creating better groundwater/surface water interactions to better replicate natural wetland hydroperiods. Thus, the stated assumption that natural wetland processes cannot be created where they do not currently exist should be substantiated or removed. I recommend the second bullet on page 16 be rewritten. There are many reasons why created wetlands may not function as well as natural wetlands (e.g. due to lower organic matter levels in the soils), but the reason provided in the report is not well supported. If you have any further questions, don't hesitate to contact me.	
PA DEP (David Goerman, Jr.; Jamie Eberl; Jeff Hartranft), submitted by Kristen Wolf		[Editor's Note: PA DEP had a short call with the Panel Chair and Coordinator on 8/16/19 and were given a short extension to finish their feedback.]	[Editor's Note: DEP's memo with full feedback was provided by Kristen Wolf on 8/19/19. The full memo is copied in the rows below, but without corresponding figures or references. In some cases the paragraphs in the original memo have been split to separate issues for the panel's response. The full memo is included at the end of this appendix for the reader and the graphics and bibliography from DEP can be found there.]
PA DEP	General, MS4 Program Comment	Pennsylvania's MS4 program refers MS4 permittees to the Chesapeake Bay Program's Expert Panel Report for guidance when developing BMPs and calculating the sediment and	We appreciate the effort by PA and other jurisdictions when translating recommendations from CBP expert panels into their respective state programs. The wetland practices (creation and rehabilitation) recommended in this panel

		nutrient load reductions that correspond with those BMPs. Therefore, it is important to Pennsylvania that the wording of the Expert Panel Report be concise and avoid using language that can be open for interpretation. While the state has flexibility in approving BMP credit for MS4 permittees to comply with state permitting requirements, we exercise caution when approving credit for any BMP project that cannot be defended by the language in the Expert Panel Report. We use it as a standard for consistency between MS4 permittees. The state must also ensure that any BMP approved to meet the pollutant load reduction obligations of MS4 permittees, is also eligible for the state to use in meeting their pollutant load reduction obligations from the Chesapeake Bay TMDL.	report are associated with voluntary environmental programs, predominantly focused in agricultural areas. The panel's recommendations may be expanded to include developed load sources, per other CBP feedback, but the panel did not consider setting extensive standards or criteria for these practices because they are not directly associated with regulatory programs like MS4 programs. Rather, it is the stormwater practices like the "wet pond or wetland" or the "stormwater performance standard" or "retrofit" practices that would apply in a regulatory context that has standards and specs described in a jurisdiction's respective Stormwater BMP Manual. The panel determined that the best approach was to set basic guidance in the report and qualifying conditions that are not exhaustive or prescriptive, thereby giving flexibility to the jurisdictions. Additional guidance for the CBP practices can be developed following approval of the report, e.g., and entry for in CBP's BMP Guide and a more detailed fact sheet.
	General, MS4 Program Comment	Inclusion of clarification language in the following areas of the Expert Panel Report would be of assistance to Pennsylvania's MS4 program: qualifying site conditions for use of the Wetland Creation Expert Panel Report (versus other related expert panel reports), applicability of compensatory mitigation projects for use as Bay Program BMPs, and description of whether or not land use change is included as part of the wetland removal efficiencies.	[see previous comment regarding qualifying conditions] Compensatory Mitigation projects are not eligible for nutrient and sediment reductions toward the TMDL, as stated in WEP (2016). This fact was implied but not explicitly stated in the current draft report. Language has been added to the report (p. 5, under Panel Charge and Membership) to clarify that compensatory mitigation projects, while important, remain ineligible for reporting and credit toward TMDL goals. See Table B-2 in Appendix B. A land use change is part of the overall reduction for the Wetland Creation BMP, as simulated in the CBWM. Wetland Rehabilitation does not have a land use change associated with it. Both BMPs apply an efficiency to upland acres to thereby reduce those loads.
PA DEP	Introduction (pg. 3)	A statement in the second paragraph is not supported by our knowledge and understanding of temporal losses in PA and outside of the coastal plain. Most of the historic wetland losses by infill (i.e. legacy sediment) were prior to the 20th century (Walter and Merrtitts, 2008, Merritts, et al., 2011,). These losses from infill in PA impacted natural wetlands, similar to modern reference standard wetlands, and exceed the functional losses from typical 20th century activities. Wetland infills from legacy sediment impacted the highest functioning wetlands in the watershed.	We appreciate the additional context. Clarifying edits have been made accordingly to the given paragraph to describe the regional history of wetlands more accurately, and in coordination with feedback from Chris Spaur, USACE, on the same section.
PA DEP	Introduction (pg. 3)	One key principle for successful aquatic ecosystem restoration projects is identifying the cause of degradation and addressing it (USEPA, 2000). A statement that current site	Wetland projects are complex and each one is unique, and the current language did not intend to exclude important factors like the cause of degradation from

		conditions identify which techniques are appropriate is problematic for identifying impairments that occurred centuries prior (e.g. Legacy sediment). Modern conditions, particularly those derived from current and adjacent land uses, often will not result in appropriate selection of a restoration technique.	consideration. We will insert "and the cause of degradation" into the first/second sentence to clarify.
PA DEP	Introduction (pg. 3)	While the generalizations regarding wetland loss may apply to some areas of the six Bay states, it has become clearer and clearer, that Pennsylvania lost the majority of its wetlands in the 18th and 19th centuries rather than the latter half of the 20th century. This is evidenced by the widespread occurrence of buried organic horizons across the Commonwealth in a variety of physiographic provinces and landscape positions. This infill occupies the former wetlands, in many cases it has for over 200 years, during which time if not manipulated, the fill surface has naturalized and now gives the appearance of an unaltered landscape in many instances. This “modern” land surface may have subsequently developed wetlands that were then altered or drained at a later time for land development or agricultural production. However, the wetlands that are present on this modern land surface are not as interconnected hydrodynamically as the original wetlands. The landscapes we see today are an integration of past natural processes and events and anthropogenic alterations that have varying time and spatial scales of effect or impact that can establish boundary conditions that control modern conditions and restoration of environments (Beven, 2015). Suffice it to say that little effort has been expended by most parties to better understand these altered landscapes and how they affect water quality and biological communities at varying scales. Without such knowledge it is difficult to understand how recovery can occur when we do not understand or even identify the persistent modified boundary conditions that affect resource recovery.	We appreciate the additional information and insight. We think edits made thus far provide sufficient clarity about past causes of wetland loss. While informative, the comments primarily refer to broader policy or management concerns beyond the purview of the panel.
PA DEP	Wetland Mapping and Acceptance as Landcover	The Department would like to have the process (including associated time frames) outlined for the jurisdictions for updating the wetland land cover data layer or the location of that process referenced. The wetland program is working to develop a living mapping system that provides a variety of updates to the baseline wetland probability of occurrence	It is great that PA DEP continues to build on its previous efforts to map wetlands and improve its geospatial data layers. The specific process and methods for how land cover data and wetlands are translated into land uses for the CBWM is outside the scope of this expert panel and report and thus we will not add/edit language in the report to address this issue. We can work with relevant DEP and CBPO staff to clarify the process and applicable timelines/deadlines offline.

		mapping recently completed for the entire state. This process may already be outlined, but since there are clear cross connections from one expert group to another the process for updating and/or revision should be clearly cross-referenced. ***How does the Department update its wetland mapping for the Chesapeake Bay in the near future when the upgraded mapping is completed?***	
PA DEP	Page 7: Discussion of Land to Water (L2W) Factors	The Department is in the process of developing a research study that may better inform the L2W factors related to wetlands and degraded headwater environments. The Department will be seeking additional information to understand how these factors are utilized within the modeling to better inform its multi-year study. As it currently appears, there is a lot to learn about headwater hydrodynamics and nutrient cycling. The Department is interested in providing quality data that will better inform modeling of these processes.	[see two rows down]
PA DEP	Page 7: Discussion of Land to Water (L2W) Factors	However, there are studies that provide lines of evidence to better support the role that headwater hydrodynamics play in nutrient transformation. Specifically, how in-stream hydraulics play a role in residence-time distributions in water transient storage zones which influence whole-reach nutrient-uptake rates for NH4+ but do not for soluble reactive phosphorus. (Drummond, et. al., 2016). This review did not include enough time to review Chapter 7 of the Chesapeake Bay Watershed Model (CBWM) documentation. Although, the current factors as outlined in Table 1 may be too inadequate or simplified to truly address the complexities of L2W dynamics. However, there has been a significant amount of research looking into these factors that may be worth revisiting in the very near future. The DEP is reserving further ability to evaluate these factors as they affect headwater wetland/riverine systems.	[see next row down]
PA DEP	Page 7: Discussion of Land to Water (L2W) Factors	This may not be the location for this comment, but it underlies everything about the CBWM. Much of the hydrology underlying our wetlands and stream, especially in the headwater systems in many cases flows through agricultural soils or soils that were once farmed. There are other legacy alterations that affect watershed hydrologic and biogeochemical processes that may present additional	The information about L2W factors was included in the report for background and context only. This aspect of the CBWM is outside the purview of this Wetland BMP expert panel. We shared your input with Gary Shenk (USGS, CBPO) who provided the following response:

		boundary conditions (Larson, 2015, Sloan, 2016 and Van Meter 2015, 2016). For example, recent work done by Van Meter 2016 estimates that there is a reactive nitrogen pool and that approximately 18% of the annual load in the Susquehanna River Basin is greater than 10 years old. The soil organic nitrogen legacy pool does not form from overland flow but is generated from groundwater systems, many of which are short circuited through tile drainage and ditching of uplands and wetlands.	Thank you for the comments on land-to-water factors in the CBWM. There are no current plans to update the land-to-water factors in the immediate future, however the Modeling Workgroup is always interested in new techniques to improve future modeling efforts that may be requested by the partnership. The Modeling Workgroup would welcome presentations on the plans for and findings of the study of factors controlling headwater nutrient dynamics referenced in your comment.
PA DEP	Page 7-8: Phase 6 Wetland Landuses: Discussion of wetland classification carried forward from the WEP(2016).	The categories of "Other Wetlands" and "Floodplain Wetlands" for establishing upland acres treated and wetland retention efficiencies is problematic because it may discount the functions and services of headwater wetlands and there are many misgivings about these designations. This classification's purpose stems from how the model characterizes the pollution sources. There is no accounting of groundwater as a main nitrogen source (significant portion). While it is understandable from a modeling stance to simplify the process of how nitrogen enters surface waters, however, it is not acceptable that this pathway is completely ignored altogether. This is especially true for understanding the role wetlands play in the groundwater to surface water hydrodynamics and biogeochemistry. The "wetland" classification system results in reducing or discounting headwater systems where groundwater is expressed most often in the form of headwater complex wetlands/riverine systems across all jurisdictions. These areas represent the majority of the land surface of the watershed, generation of shallow (lateral) and deep groundwater interfaces, and therefore provide the majority of the base flow and biogeochemistry of any given riverine system.	The information about the two wetland land use categories was included in the report for background and context only. This aspect of the CBWM is based on previous recommendations from WEP (2016), the Wetland Workgroup and Land Use Workgroup, as part of the overall Midpoint Assessment effort to develop the Phase 6 Watershed Model. Concerns or issues over the existing land use categories and land use mapping/classification is outside the purview of this Wetland BMP expert panel. We shared your comments with Peter Claggett (USGS, CBPO) who provided the following response: The Land Use Workgroup oversees the development of the CBP high-resolution land cover data for 2017/18 and 2021/22. Currently, we are working on updating the 2013/14 land use data with 2017 and 2018 imagery and LiDAR. While the Water Quality Goal Implementation Team and Modeling Workgroup require that future land use maps can be completely cross-walked to the original 2013 land use classification, we can subdivide classes now and in the future for other purposes. Headwater wetlands fall under our "Wetland Other" category. I expect that most if not all of these wetlands are "headwater wetlands". With additional information such as topographic derivatives, we could subdivide this class into headwater and non-headwater categories. A finer classification of wetlands might be useful for local implementation of restoration activities and inform future variable BMP efficiencies if the CBP Partners decide to develop them. However, for running the watershed model (aka CAST) through 2025, we will continue to need to aggregate wetland classes into the more general "floodplain" and "other" categories. I [Peter C.] suggest this issue be raised at a future Land Use Workgroup and/or Wetlands Workgroup meeting.

PA DEP	Page 7-8: Phase 6 Wetland Landuses: Discussion of wetland classification carried forward from the WEP(2016).	In the three major physiographic provinces that occur in PA's portion of the Chesapeake Bay watershed these streams represent between 69% and 82% of all the stream reaches (2008 Walsh). Regionally, headwaters are the cumulative source of approximately 60% of the ***total mean annual flow*** to all northeastern U.S. streams and rivers (EPA, 2015).	[see previous response]
PA DEP	Page 7-8: Phase 6 Wetland Landuses: Discussion of wetland classification carried forward from the WEP(2016).	This is especially the case for those wetlands connected to and integrated in the upper portions of watersheds (reference to streams of first through third order) and that are classified as "Other Wetlands". ***The jurisdictions should have control over how these classifications are made and provide them to the CBP for their use. Conversely, the CBP should not delineate these resources absent our direct involvement and utilization of accepted classification criteria.***	[see previous]
PA DEP	Page 7-8: Phase 6 Wetland Landuses: Discussion of wetland classification carried forward from the WEP(2016).	Numerous studies have been conducted related to the role that Iron, Manganese and Sulphur, but especially Iron (Fe) plays in nutrient transformation processes and pathways. A metadata study utilizing EPA's stream water quality monitoring data developed recommended levels of Fe for stream types and found that wetland presence was the most dominant contributable variable to whether a stream achieved those minimum levels. It should be noted that most streams are Fe deficient by that study's standards, despite the pervasive presence of iron in most shale formations prevalent across Pennsylvania. Local research into Fe cycling hypothesis' that isotopically heavy Fe-rich colloids form in soils and are then transported out of soils to streams. This transported Fe could be important sources of isotopically heavy Fe to rivers (Yesavage, et al, 2012). The comparison of precipitation and observed total dissolved Fe levels in a small stream in York County, PA depicted in the chart below supports this hypothesis (PA DEP Water Quality Data). The general trend of increased annual precipitation and	[see previous]

		corresponding increases in observed dissolved Fe levels can be seen in the chart below.	
PA DEP	Page 7-8: Phase 6 Wetland Landuses: Discussion of wetland classification carried forward from the WEP(2016).	The Department is developing a more robust geomorphic landform-based classifications to better inform its wetland mapping recently completed. This mapping will also inform stream classification (PA ACC) systems as well. The current wetland classification does not adequately represent headwater systems and the critical role that wetlands play in establishing the base flows and geochemistry of riverine systems. ***How will the Chesapeake Bay Program allow for the utilization of such efforts in the near future when completed?***	[see previous]
PA DEP	Page 11-12: Discussion of conceptual modelling to explain the wide range of water quality benefits reported in wetlands.	The Department believes that there is an argument to be made that wetland rehabilitation, should have two different efficiencies. Especially when reestablishment of a wetlands former hydrodynamics is involved. PA DEP believes this type of project is significantly more valuable than wetland creation as it relates to functioning and pollutant removal potential. These natural systems in our experience have significantly more organic matter present, have significantly higher levels of micro and macro-topographic relief, soil heterogeneity and microbial activity. These features are critical in nutrient transformation and sediment deposition and long-term storage. In some cases, these hydrodynamically altered wetlands could be leaky sources of forms of nitrogen and reactive phosphorus instead of the sinks they are generally believed to be when the hydrodynamics are intact.	Recommended efficiencies reflect the average expected "lift" versus the post-construction effect of the (rehabilitated) wetland. All effectiveness estimates for BMPs approved by the CBP must account for the baseline (pre-BMP or pre-construction) condition of the site. The panel's understanding of the post-construction performance of a rehabilitated wetland matches the commenter's description of beneficial characteristics (organic matter, etc.). Sites that are candidates for rehabilitation are already reflected in the model through calibration, as they are existing wetlands.
PA DEP	Page 11-12: Discussion of conceptual modelling to explain the wide range of water quality benefits reported in wetlands.	These factors are echoed by the panel's report on Page 14 under the Key Findings Section, but yet the efficiency's and preferential treatment of Creation remains. The WEP argues that there was sufficient information to separate naturally wetland efficiencies from wetland BMP efficiencies. Which just based upon the basic definition and comparison of accompanying attributes, wetland creation is a wetland BMP and not a natural wetland. The argument that created wetlands perform at a higher efficiency because they are converting upland to wetland and that a wetland rehabilitation is not because it was already a wetland, regardless of how altered, is a tenuous argument. On Page 26, the WEP	[see previous response]

		argument for relative ranking of wetland BMPs and their efficiencies is solely based upon best professional judgement. In our professional experience restoring wetland systems, this includes rehabilitating as well, we respectfully disagree.	
PA DEP	Page 11-12: Discussion of conceptual modelling to explain the wide range of water quality benefits reported in wetlands.	It would be best left to the jurisdictions to decide when a wetland rehabilitation project rises to a higher level of efficiency by providing some qualitative factors related to hydrologic modification and/or departure from typical HGM hydrographs. ***To better reflect real world projects, we would propose a tiered approach at this time. This would allow jurisdictions to address real world circumstances when awarding efficiencies, which further provides jurisdictions a means to push priorities as well.*** No factors listed – current proposed efficiency Qualitative Factors occurring - same as creation efficiency Hydrograph departure demonstration - same as restoration efficiency	Conference calls to review comments and responses with representatives from PA DEP occurred on August 16 & 28. PA DEP described efforts of continuously improving their wetland mapping and the site-specific conditions that may warrant, and result in, more comprehensive wetland function to an existing degraded wetland. The panel acknowledged, and supported through the literature, the wide range in water quality benefits provided by a wetland BMP that depends on many factors. As noted in the Panel's report the ability to capture all of these factors – from design parameters to site location –into a crediting protocol was challenging and therefore a multiple lines of evidence approach was used to adopt the recommended credit protocols. As such, the credit for rehabilitation converged upon multiple sources of information that provided an acceptable and reasonable value given the wide range of possible water quality outcomes. No change is recommended. In our discussion with DEP staff, it was clear that there were concerns about how to translate wetland restoration/creation/rehabilitation activities, as understood and defined by DEP, into the CBP-defined wetland BMPs. The panel's recommendations are intended to provide flexibility for the states to determine how BMPs implemented with their jurisdiction should be counted for CBP purposes, which will reflect their unique programs. For example, DEP described instances of perched wetlands in floodplains that resulted from legacy sedimentation. While these areas would not necessarily count as prior-converted or historic natural wetlands, if they are mapped as wetlands then restorative actions to these wetlands would best be considered as wetland rehabilitation for CBP purposes.
PA DEP	Page 27: Discussion of Upland Treated Acres for reported wetland BMPs.	The original proposal in the WEP(2016) was perplexing as much as it was disturbing in recommendations. Many of the recommendations were counter to the building resource knowledge of wetland hydrodynamics. At least the WEP acknowledged they had as much p[problem rectifying this approach as the jurisdictions did. This proposed section in the WEP(2016) report was not received well then and nor is the continuation of the use of this proxy for assigning the upland treatment acres. This proxy measure is trying to turn what are mainly groundwater dominated systems into some surface	Jurisdictions will have the option to report the contributing area for the created/rehabilitated wetland. It is outside the scope of the current panel to revisit the previous panel's upland acre ratios as applied to the restoration BMP.

		drainage proxy to address the CBWM 's lack of integrating groundwater nutrient source loading. ***This whole approach should be revisited altogether, there is no real apparent basis for this ratio.***	
PA DEP	Table 13. Wetland Techniques Matrix (pg. 31-32)	The Legacy Sediment Removal BMP should be included in the Typical Techniques, especially for Hydrology and Soils Wetland Components. This is particularly true because Legacy Sediment Removal is included in WEP(2016). The WEP(2016) recommendations include Legacy Sediment Removal as a Practice and Project Example in Table 2. Practice and Project Examples from WEP(2016) are equivalent to the Typical Techniques categories for each wetland component in the Wetland Techniques Matrix presented in Table 13.	We will add Legacy Sediment Removal to Table 13.
PA DEP	Bibliography	[see full PA DEP memo at end of this appendix]	

Mr. Spaur's feedback is provided in a separate table to include his full input that included an additional column.

Name (affiliation)	Section or page ref.	Comment or suggested change	Rationale	Response from Panel Chair and Panel Coordinator
Christopher Spaur (USACE)		[Email text provided in this row; comments from attached comments copied verbatim here in separate rows] Attached please find comments from me (Wetland Workgroup Member). Because of competing priorities (my own and others), I wasn't able to circulate these comments internally with adequate time for other USACE people to review what I'm sending in. However, I attempted to think from both USACE planning and regulatory perspective, and although I err on being too wordy (and perhaps slightly rude), I think comments I've submitted are fair.		
Christopher Spaur (USACE)	Cover Page, Title	Change title to something like "Nontidal Wetland Best Management Practices (BMPs)"	Current title (Nontidal Wetland Creation, Rehabilitation and Enhancement) confusing in that it leaves out term "restoration," but	We've included "enhancement" in the title and other places in the report alongside creation and rehabilitation since all three were considered throughout the panel's

			includes term “enhancement” but then this BMP type is rejected within the document	deliberations. Wetland restoration was included in the deliberations as a point of reference, but the panel was not charged to recommend any changes to that practice. The suggested change would therefore be too general so we will instead keep the existing title for posterity.
Christopher Spaur (USACE)	Executive Summary	Include summary of “Future Research and Management Needs.” Also, consider adding ideas from comments below on bioavailability to that subsection.	Future research topic omitted (?) from executive summary, even though considered in report.	The executive summary does not summarize all aspects of the report in order to limit its length to a single page.
Christopher Spaur (USACE)	Executive Summary and Throughout	Note that it’s arguably inconsistent with other TMDL credited efforts that we’re rejecting “wetland enhancement.” In reality the vast majority of sanctioned “stream restoration” projects would be called “stream enhancement” projects if the Stream Health Workgroup utilized the Wetlands Workgroup definition for the term “enhancement.”	Following Wetlands Workgroup terminology, the only “stream restoration” projects that aren’t “enhancement” are those that restore actual LOST streams (i.e., daylighting piped streams, taking concrete substrate out from concreted streams, rewatering dewatered streams). Most stream restoration work in urban areas is effectively instream stormwater management.	Enhancement, as defined in the report, is considered to occur on otherwise functioning wetland sites, whereas rehabilitation occurs on degraded wetlands. The CBP's qualifying conditions for the stream restoration BMP include an expectation of functional uplift on a stream that is actively enlarging or degrading. Therefore the "stream restoration" BMP is more analogous to the proposed wetland rehabilitation BMP, while stream restoration of lost streams is indeed analogous to wetland restoration. Thus, we respectfully offer that the wetland panel's logic is fully consistent with other credited BMPs like stream restoration.
Christopher Spaur (USACE)	Introduction, p.3, first paragraph	Revise first two sentences of first paragraph to one sentence focused on habitats rather than species, something like “The modern history of human activities across a 64,000 square mile watershed has dramatically shifted the ecosystem structure of the Chesapeake Bay, thus leading to the decline of many iconic habitats, including submerged aquatic vegetation, wetlands, and oyster beds. In 2014, the Chesapeake Bay Program (CBP) partnership committed to the fundamental goal of restoring the Bay ecosystem health in the Chesapeake Bay Restoration Agreement.“	Paragraph somewhat misrepresentative of Bay charismatic resources, stressors, and trends. Easy correction would be to simplify it. Identifying “species” regarding SAV somewhat misleading in that SAV beds include many, and are more accurately considered a habitat type. SAV has declined because of impaired water clarity (principally from anthropogenic nutrient loading [water quality]). Blue crab populations are dynamic and have had periods of recovery; fishing pressure can be less important than natural factors involving Bay-ocean circulation (anthropogenic water quality impacts of low importance). Oysters have	We accept this clarifying edit with slight modification. We will also correct the [Chesapeake Bay] "Restoration Agreement" to "Watershed Agreement" for consistency with CBP parlance.

			declined because of parasites/disease, habitat loss (from overfishing reducing shell production), and overfishing reducing population. If oysters hadn't been overharvested, population arguably could've evolved and recovered by developing resistance to MSX/Dermo. Water quality impairment probably at greater depths (i.e., below pycnocline), but that's not usually what's quantified.	
Christopher Spaur (USACE)	Introductio n, p.3, first paragraph	After sentence "Since colonialization, more than 70 percent of historic wetlands were lost by drainage or infill." add new sentence stating something like "Substantial additional historic floodplain wetlands were lost by burial under anthropogenic sediment ("legacy sediment") following European Settlement."	Historic wetlands losses much greater than what captured by Dahl (1980) or Pavelis (1987). The loss of pre-European Settlement wetlands in floodplains from burial under sediment generated by anthropogenic erosion ("legacy sediment") has not been determined to my knowledge regionally. However, this loss is IN ADDITION to losses from agricultural drainage and infill, etc.	Similar comment offered by PA DEP. Incorporated suggested edit with slight modification.
Christopher Spaur (USACE)	Intro, p. 3, para 2, sentence 3	Change sentence to "The most extensive losses from active ditching and filling occurred in the Coastal Plain, where proximity to water and highly tillable lands naturally led to a concentration of human activities.	To clarify that this sentence refers only to quantified losses, not those unquantified losses from burial under anthropogenic sediment.	We accept this clarifying edit as suggested.
Christopher Spaur (USACE)	Intro, p. 3, para 3	Delete sentence "At this scale, costs and benefits of individual practices likely will not be as significant as evaluating progress toward regional goals (e.g. load reduction targets)."	Sentence confusing and unnecessary. I think (?) it's attempting to state that cumulative impacts (benefits) are what matter, but these aren't well-considered when making local-scale decisions.	We accept this clarifying edit as suggested.
Christopher Spaur (USACE)	2 Natural Wetlands, p. 7	Prior to Table 1, add sentence stating that these factors do not consider actual bioavailability of N and P forms.	This can set the stage for stating in research needs that better consideration of bioavailability likely important to fairly weigh costs/benefits of various nutrient load reduction strategies.	The opening sentence states "account for spatial differences in loads due to physical watershed characteristic" so it infers that other biological and chemical factors are not considered.
Christopher Spaur (USACE)	12, para 1	Clarify that restored wetlands would likely be in landscape setting that historically supported wetlands and may still have wetlands soils, and these factors could optimize potential for nutrient load reduction.	Discussion appears to have likely been limited to like replacing historic like, rather than considering substantial "redesign" to optimize for nutrient load reduction. Wetlands	These are excellent points that did arise in the panel's discussions. The bullet point on page 16 reflects the fact that these points arose later in the panel's evolving deliberations, so we

		However, it should be speculated that created wetlands designed for nutrient load reduction could likely over the long-term outperform natural wetlands as mother nature doesn't design wetlands for this explicit purpose (but people can)! (This is partly discussed in bullet "Optimally Designed Wetland BMPs …" on p. 16.	"designed" to reduce nutrient loads could incorporate numerous features that may not be present in natural features (optimal residence time, tortuous flow, positioned to capture nutrients from known anthropogenic sources, etc.) These designed wetlands though could differ substantially from natural wetlands. Also, two entire HGM classes of natural wetlands – mineral soil flats and organic soil flats – would largely only intercept airborne pollutants. While these can have high biological value, it is quite possible that their pollutant load reduction capability could be enhanced to greater than natural levels (although perhaps with unacceptable risk of biological harm).	prefer to not incorporate the edits as suggested on page 12, which describes the first iteration of conceptual modeling efforts that occurred earlier in the panel's process. The edits would not accurately reflect the panel's own process in that particular sub-section. Instead, we will insert new text on page 11 above Table 2 explaining that the information presented in the section represents the development of panel deliberations as new information arose and panel discussions advanced or revised ideas.
Christopher Spaur (USACE)	13, Key Findings	Add "risk of biotic harm" for enhancement, as mentioned elsewhere in document.	Biologic support functions of existing wetlands can be of substantial enough value that we shouldn't risk compromising those.	We will add a new statement earlier in this section to acknowledge the panel's recognition of these additional functions and possible tradeoffs. The addition fits more appropriately there instead of under key findings for this section. See edits on page 12.
Christopher Spaur (USACE)	15 Conceptual Modeling, Part II	Disagree with combining landscape location/position (essentially HGM class) with pollutant loadings delivered to wetland (function of up-gradient pollutant sources, largely function of land use). I think document should be restructured accordingly.	While I don't know intricacies of Bay Model, this is potentially serious error in that it fails to allow for discriminating between these two factors. However, if that doesn't matter in quantifying benefits because of state of Bay Model, then state that as reason to combine.	The language in the specified section reflects some of the many guiding concepts considered by the panel at the given stage in their deliberations. These were an extension from the WEP (2016) framework and were only "combined" in a conceptual manner as the panel continued their deliberations.
Christopher Spaur (USACE)	15-16 Conceptual Modeling, Part II	Reduce length of paragraph on bottom of p15/top of p 16 to just the first 3 sentences, delete from "The multiple hypotheses …" onward.	Paragraph long and confusing, the first 3 sentences I think sum it up.	We accept deletion of the first sentence mentioned, but feel the need to keep the following sentences, with slight modification, as they support future research recommendations and acknowledge the panel's individual and collective contributions to explain variability and nutrient and sediment processing of wetlands.
Christopher Spaur (USACE)	16, Wetland	Add text clarifying that this section is NOT referring to HGM classification (and thus landscape position), but instead ANY wetland ANYWHERE	I was confused reading this trying to figure out how capacity to provide water quality benefits,	[See added text on page 16

	Condition Heading		and hydrologic degradation related to HGM class.	
Christopher Spaur (USACE)	16, Natural Wetlands … Bullet	Last sentence problematic, re-word to allow for situation that if seeking TMDL credits, and credits were given based upon BMP design and likely function, why would someone NOT put a created wetland in an appropriate position?	Contradictory, unless allowing for crediting based upon additional criteria not practicable. Then, problem is benefits quantification procedures, not engineering design possibilities.	See edits in response to comments from Tess Thompson
Christopher Spaur (USACE)	16, Hydrologic Alteration …" Bullet	After "The extent of hydrologic alteration primarily influences wetland" add "interception and" prior to "retention capacity"	Drainage, which can direct water away from wetlands, would also reduce wetland nutrient load reduction functions.	We accept the suggested clarifying edit.
Christopher Spaur (USACE)	17, "Complexity of Biophysical …" Bullet	After "soil compaction and oxidation" add "soil organic content"	Loss of organic content occurs by drainage/oxidation. While implied, better to just state it	We accept the suggested clarifying edit.
Christopher Spaur (USACE)	17, "Hydrologic connectivity …"	Change word "capacity" after "… sediment loads have greater" to instead the word "opportunity"	Mistaken use of word capacity	Good catch; change made.
Christopher Spaur (USACE)	17 "Expert Elicitation," 2nd paragraph	Explain why "restoration" omitted from list of wetland BMPs in this section when that term is used in table ES-1	Confusing	Restoration was omitted from that statement because it was not a primary focus of the panel's evaluation. As instructed by the Wetland Workgroup the panel was asked to evaluate the other 3 BMPs, with consideration of restoration as a point of reference.
Christopher Spaur (USACE)	18, Key Findings, 2nd Bullet	Could add that wetlands to be enhanced/rehabilitated likely have some level of hydric soil character already which can be quickly restored	To support assumption	We added language to this effect, modifying the sentence for clarity.
Christopher Spaur (USACE)	21, Table 7	Add note that functions 5 and 6 refer to forms of nutrients which are a subset of TN or TP.	Set stage for later "research need" that we need to consider bioavailability, not just TN and TP	This addition fits better in the context of Table 9, so we will accept the clarifying edit there instead.
Christopher Spaur (USACE)	23, Table 9	Follow up comment to above. F5 and F6 are likely highly bioavailable. F7 may not be.	TP if on inorganic particulate only highly "bioavailable" once it reaches Bay in anoxic salty water, NOT oxidized fresher water.	We will accept a clarifying footnote to Table 9 to this effect for F5 and F6. F7 is implied to not be bioavailable.

Christopher Spaur (USACE)	23, last para	Uncomfortable with NOT allowing for wetland enhancement BMP, although I think restrictions should be applied analogous to stream restoration arena in which indicators of severe degradation must be present	Note that “stream restoration” is essentially “stream enhancement.” By the reasoning we’re applying, we should probably disallow most of that because of concern over more harm than good (or minimal good).	See earlier response.
Christopher Spaur (USACE)	24, Wetland Enhancement	Uncomfortable with not allowing enhancement of Phragmites (and perhaps other highly degraded wetlands) wetlands to be given TMDL credit. Enhancement could be done in such a way as to increase water tortuousity, residence time, etc., that would improve water quality functions. However, would require criteria stipulating what degradation adequate to think risk of harm less than likelihood of doing good.	See above – compare to stream restoration logic which effectively allows for stormwater management in the stream channel.	See responses above regarding analogy of wetland enhancement and stream restoration. The CBP's definitions of enhancement states that the characteristics of a wetland are manipulated to "heighten, intensify, or improve a specific function(s)." As such, minimal interventions could be associated with enhancement. The panel recognized a paucity of data associated with any specific enhancement technique and the subsequent uncertainty associated with the potential water quality lift. For example, a recently published review of phragmites in wetlands by Bansal et al 2019 (https://link.springer.com/article/10.1007/s13157-019-01174-7) finds a range of "negative ecological impacts to wetland and agricultural system, but also is linked with a variety of ecosystem services such as bioremediation ..." There is section in the paper that discusses the tradeoffs between invasive phragmites and their nutrient retention function and other wetland functions. We added language (p. 26) to capture tradeoffs discussed in Bansal et al. (2019) regarding phragmites.
Christopher Spaur (USACE)	34, 5 Ongoing verification	To long-term monitoring, could also add satellite imagery	Clarify that some of this now high resolution and likely adequate in some cases	We can add this in the report, but a jurisdiction would have discretion to add this into their verification plans. Added “satellite” on page 36.
Christopher Spaur (USACE)	36, 7 Unintended	Change “will” to “could” in “The conservation of both nontidal and tidal wetlands will also have a critical role	As rate of sea-level rise accelerates, “conserving” tidal wetlands over most of the low-sediment input settings of Bay will likely be	We accept the suggested clarifying edit.

	Consequences	to mitigate the effects of sea level rise in coastal areas."	impossible because of scale of loss. They will instead drown in place, then erode on Bay side.	
Christopher Spaur (USACE)	37, 8 Future Research	Add bullet stating that quantification of wetlands storing/transforming bioavailable (versus poorly bioavailable) nutrient forms should perhaps be given consideration in TMDL crediting. Wetlands likely excel at removing bioavailable forms of N. Conversely, wetlands have finite P storage capability	The topic of "bioavailability" is increasingly recognized to be of importance. For example, see recent Chesapeake Bay Program STAC workshops covering this topic	Will follow-up for clarification about specific STAC workshop(s) for review and referred to here. Willing to add a new bullet point.
Christopher Spaur (USACE)	Appendices	None	Didn't actually review these as didn't see. Not provided for review or available separately (?).	The appendices were posted at a later date than the webcast. Except for the technical appendix (Appendix B) they are for the reader's reference and comments are not expected for the appendices.
Christopher Spaur (USACE)		Dahl, T.E. 1980. https://www.fws.gov/wetlands/documents/Wetlands-Losses-in-the-United-States-1780s-to-1980s.pdf Pavelis, G.E. 1987. https://eric.ed.gov/?id=ED295043		

MEMO

TO Kristen Wolf,
Chesapeake Bay Coordinator
Chesapeake Bay Office

FROM David Goerman, Jr.
Water Program Specialist
Wetland, Encroachment and Training Division
Bureau of Waterways Engineering and Wetlands

DATE September 3, 2019

RE Review and Comments on Draft Nontidal Wetland Creation, Rehabilitation and Enhancement BMP Expert Panel report-July 10, 2019

Please note that comments from Jamie Eberl and Jeff Hartranft at the Department were incorporated into these comments.

General MS4 Program Comment

Pennsylvania's MS4 program refers MS4 permittees to the Chesapeake Bay Program's Expert Panel Report for guidance when developing BMPs and calculating the sediment and nutrient load reductions that correspond with those BMPs. Therefore, it is important to Pennsylvania that the wording of the Expert Panel Report be concise and avoid using language that can be open for interpretation. While the state has flexibility in approving BMP credit for MS4 permittees to comply with state permitting requirements, we exercise caution when approving credit for any BMP project that cannot be defended by the language in the Expert Panel Report. We use it as a standard for consistency between MS4 permittees. The state must also ensure that any BMP approved to meet the pollutant load reduction obligations of MS4 permittees, is also eligible for the state to use in meeting their pollutant load reduction obligations from the Chesapeake Bay TMDL. Inclusion of clarification language in the following areas of the Expert Panel Report would be of assistance to Pennsylvania's MS4 program: qualifying site conditions for use of the Wetland Creation Expert Panel Report (versus other related expert panel reports), applicability of compensatory mitigation projects for use as Bay Program BMPs, and description of whether or not land use change is included as part of the wetland removal efficiencies.

Introduction (pg. 3)

A statement in the second paragraph is not supported by our knowledge and understanding of temporal losses in PA and outside of the coastal plain. Most of the historic wetland losses by infill (i.e. legacy sediment) were prior to the 20th century (Walter and Merrtitts, 2008, Merritts, et al., 2011,). These losses from infill in PA impacted natural wetlands, similar to modern reference standard wetlands, and exceed the functional losses from typical 20th century activities. Wetland infills from legacy sediment impacted the highest functioning wetlands in the watershed.

One key principle for successful aquatic ecosystem restoration projects is identifying the cause of degradation and addressing it (USEPA, 2000). A statement that current site conditions identify which techniques are appropriate is problematic for identifying impairments that occurred centuries prior (e.g. Legacy sediment). Modern conditions, particularly those derived from current and adjacent land uses, often will not result in appropriate selection of a restoration technique.

While the generalizations regarding wetland loss may apply to some areas of the six Bay states, it has become clearer and clearer, that Pennsylvania lost the majority of its wetlands in the 18th and 19th centuries rather than the latter half of the 20th century. This is evidenced by the widespread occurrence of buried organic horizons across the Commonwealth in a variety of physiographic provinces and landscape positions. This infill occupies the former wetlands, in many cases it has for over 200 years, during which time if not manipulated, the fill surface has naturalized and now gives the appearance of an unaltered landscape in many instances. This "modern" land surface may have subsequently developed wetlands that were then altered or drained at a later time for land development or agricultural production. However, the wetlands that are present on this modern land surface are not as interconnected hydrodynamically as the original wetlands. The landscapes we see today are an integration of past natural processes and events and anthropogenic alterations that have varying time and spatial scales of effect or impact that can establish boundary conditions that control modern conditions and restoration of environments (Beven, 2015). Suffice it to say that little effort has been expended by most parties to better understand these altered landscapes and how they affect water quality and biological communities at varying scales. Without such knowledge it is difficult to understand how recovery can occur when we do not understand or even identify the persistent modified boundary conditions that affect resource recovery.

Wetland Mapping and Acceptance as Landcover

The Department would like to have the process (including associated time frames) outlined for the jurisdictions for updating the wetland land cover data layer or the location of that process referenced. The wetland program is working to develop a living mapping system that provides a variety of updates to the baseline wetland probability of occurrence mapping recently completed for the entire state. This process may already be outlined, but since there are clear cross connections from one expert group to another the process for updating and/or revision should be clearly cross-referenced. ***How does the Department update its wetland mapping for the Chesapeake Bay in the near future when the upgraded mapping is completed?***

Page 7: Discussion of Land to Water (L2W) Factors

The Department is in the process of developing a research study that may better inform the L2W factors related to wetlands and degraded headwater environments. The Department will be seeking additional information to understand how these factors are utilized within the modeling to better inform its multi-year study. As it currently appears, there is a lot to learn about headwater hydrodynamics and nutrient cycling. The Department is interested in providing quality data that will better inform modeling of these processes.

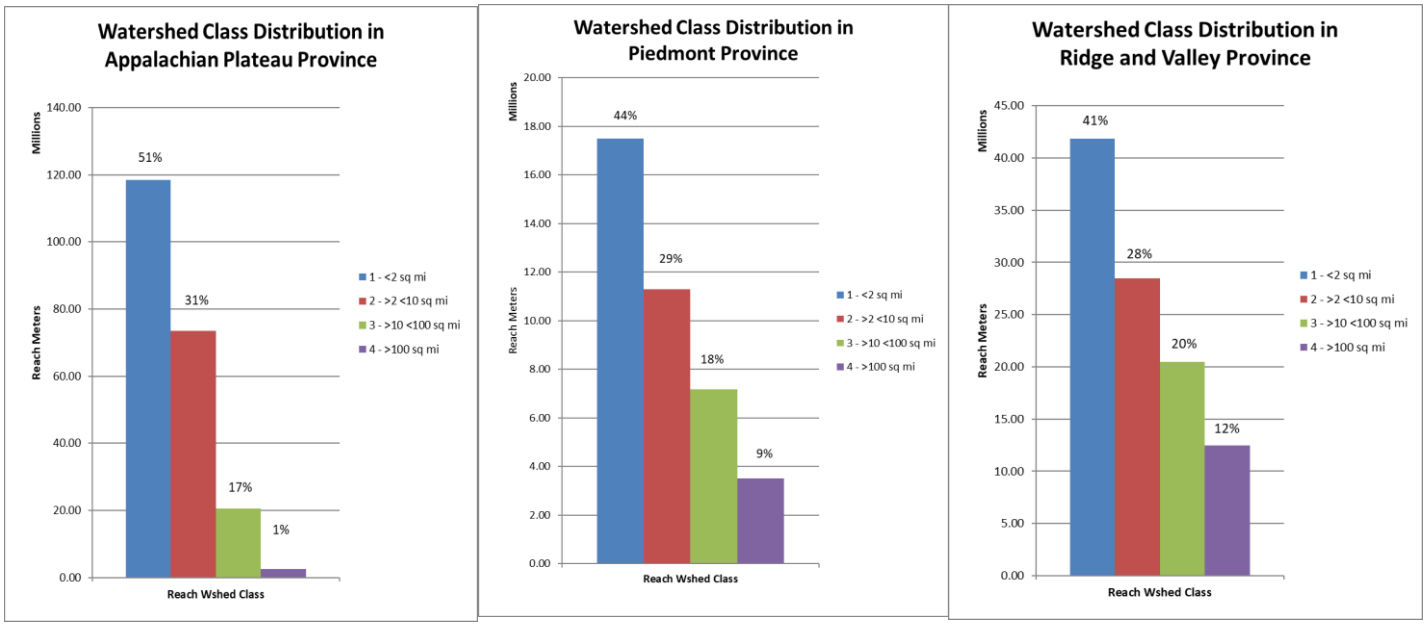
However, there are studies that provide lines of evidence to better support the role that headwater hydrodynamics play in nutrient transformation. Specifically, how in-stream hydraulics play a role in residence-time distributions in water transient storage zones which influence whole-reach nutrient-uptake rates for NH4+ but do not for soluble reactive phosphorus. (Drummond, et. al., 2016). This review did not include enough time to review Chapter 7 of the Chesapeake Bay Watershed Model (CBWM) documentation. Although, the current factors as outlined in Table 1 may be too inadequate or simplified to truly address the complexities of L2W dynamics. However, there has been a significant amount of research looking into these factors that may be worth revisiting in the very near future. The DEP is reserving further ability to evaluate these factors as they affect headwater wetland/riverine systems.

This may not be the location for this comment, but it underlies everything about the CBWM. Much of the hydrology underlying our wetlands and stream, especially in the headwater systems in many cases flows through agricultural soils or soils that were once farmed. There are other legacy alterations that affect watershed hydrologic and biogeochemical processes that may present additional boundary conditions (Larson, 2015, Sloan, 2016 and Van Meter 2015, 2016). For example, recent work done by Van Meter 2016 estimates that there is a reactive nitrogen pool and that approximately 18% of the annual load in the Susquehanna River Basin is greater than 10 years old. The soil organic nitrogen legacy pool does not form from overland flow but is generated from groundwater systems, many of which are short circuited through tile drainage and ditching of uplands and wetlands.

Page 7-8: Phase 6 Wetland Landuses: Discussion of wetland classification carried forward from the WEP(2016).

The categories of “Other Wetlands” and “Floodplain Wetlands” for establishing upland acres treated and wetland retention efficiencies is problematic because it may discount the functions and services of headwater wetlands and there are many misgivings about these designations. This classification’s purpose stems from how the model characterizes the pollution sources. There is no accounting of groundwater as a main nitrogen source (significant portion). While it is understandable from a modeling stance to simplify the process of how nitrogen enters surface waters, however, it is not acceptable that this pathway is completely ignored altogether. This is especially true for understanding the role wetlands play in the groundwater to surface water hydrodynamics and biogeochemistry. The “wetland” classification system results in reducing or discounting headwater systems where groundwater is expressed most often in the form of headwater complex wetlands/riverine systems across all jurisdictions. These areas represent the majority of the land surface of the watershed, generation of shallow (lateral) and deep groundwater interfaces, and therefore provide the majority of the base flow and biogeochemistry of any given riverine system.

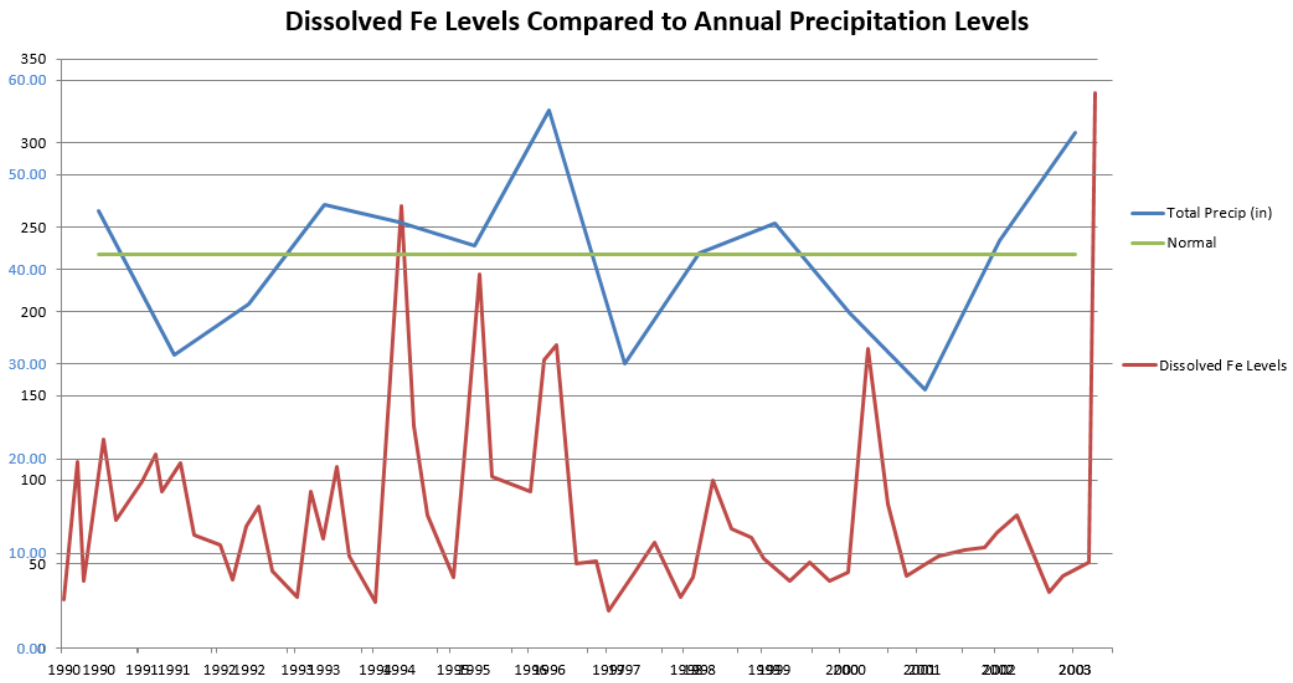
In the three major physiographic provinces that occur in PA’s portion of the Chesapeake Bay watershed these streams represent between 69% and 82% of all the stream reaches (2008 Walsh). Regionally, headwaters are the cumulative source of approximately 60% of the ***total mean annual flow*** to all northeastern U.S. streams and rivers (EPA, 2015).



Source: 2008 Walsh; PA ACC Data

This is especially the case for those wetlands connected to and integrated in the upper portions of watersheds (reference to streams of first through third order) and that are classified as "Other Wetlands***". The jurisdictions should have control over how these classifications are made and provide them to the CBP for their use. Conversely, the CBP should not delineate these resources absent our direct involvement and utilization of accepted classification criteria.***

Numerous studies have been conducted related to the role that Iron, Manganese and Sulphur, but especially Iron (Fe) plays in nutrient transformation processes and pathways. A metadata study utilizing EPA's stream water quality monitoring data developed recommended levels of Fe for stream types and found that wetland presence was the most dominant contributable variable to whether a stream achieved those minimum levels. It should be noted that most streams are Fe deficient by that study's standards, despite the pervasive presence of iron in most shale formations prevalent across Pennsylvania. Local research into Fe cycling hypothesis' that isotopically heavy Fe-rich colloids form in soils and are then transported out of soils to streams. This transported Fe could be important sources of isotopically heavy Fe to rivers (Yesavage, et al, 2012). The comparison of precipitation and observed total dissolved Fe levels in a small stream in York County, PA depicted in the chart below supports this hypothesis (PA DEP Water Quality Data). The general trend of increased annual precipitation and corresponding increases in observed dissolved Fe levels can be seen in the chart below.



The Department is developing a more robust geomorphic landform-based classifications to better inform its wetland mapping recently completed. This mapping will also inform stream classification (PA ACC) systems as well. The current wetland classification does not adequately represent headwater systems and the critical role that wetlands play in establishing the base flows and geochemistry of riverine systems. ***How will the Chesapeake Bay Program allow for the utilization of such efforts in the near future when completed?***

Page 11-12: Discussion of conceptual modelling to explain the wide range of water quality benefits reported in wetlands.

The Department believes that there is an argument to be made that wetland rehabilitation, should have two different efficiencies. Especially when reestablishment of a wetlands former hydrodynamics is involved. PA DEP believes this type of project is significantly more valuable than wetland creation as it relates to functioning and pollutant removal potential. These natural systems in our experience have significantly more organic matter present, have significantly higher levels of micro and macro-topographic relief, soil heterogeneity and microbial activity. These features are critical in nutrient transformation and sediment deposition and long-term storage. In some cases, these hydrodynamically altered wetlands could be leaky sources of forms of nitrogen and reactive phosphorus instead of the sinks they are generally believed to be when the hydrodynamics are intact.

These factors are echoed by the panel's report on Page 14 under the Key Findings Section, but yet the efficiency's and preferential treatment of Creation remains. The WEP argues that there was sufficient information to separate naturally wetland efficiencies from wetland BMP efficiencies. Which just based upon the basic definition and comparison of accompanying attributes, wetland creation is a wetland BMP and not a natural wetland. The argument that created wetlands perform at a higher efficiency because they are converting upland to wetland and that a wetland rehabilitation is not because it was

already a wetland, regardless of how altered, is a tenuous argument. On Page 26, the WEP argument for relative ranking of wetland BMPs and their efficiencies is solely based upon best professional judgement. In our professional experience restoring wetland systems, this includes rehabilitating as well, we respectfully disagree.

It would be best left to the jurisdictions to decide when a wetland rehabilitation project rises to a higher level of efficiency by providing some qualitative factors related to hydrologic modification and/or departure from typical HGM hydrographs. ***To better reflect real world projects, we would propose a tiered approach at this time. This would allow jurisdictions to address real world circumstances when awarding efficiencies, which further provides jurisdictions a means to push priorities as well.***

No factors listed – current proposed efficiency

Qualitative Factors occurring - same as creation efficiency

Hydrograph departure demonstration - same as restoration efficiency

Page 27: Discussion of Upland Treated Acres for reported wetland BMPs.

The original proposal in the WEP(2016) was perplexing as much as it was disturbing in recommendations. Many of the recommendations were counter to the building resource knowledge of wetland hydrodynamics. At least the WEP acknowledged they had as much p[problem rectifying this approach as the jurisdictions did. This proposed section in the WEP(2016) report was not received well then and nor is the continuation of the use of this proxy for assigning the upland treatment acres. This proxy measure is trying to turn what are mainly groundwater dominated systems into some surface drainage proxy to address the CBWM 's lack of integrating groundwater nutrient source loading. ***This whole approach should be revisited altogether, there is no real apparent basis for this ratio.***

Table 13. Wetland Techniques Matrix (pg. 31-32)

The Legacy Sediment Removal BMP should be included in the Typical Techniques, especially for Hydrology and Soils Wetland Components. This is particularly true because Legacy Sediment Removal is included in WEP(2016). The WEP(2016) recommendations include Legacy Sediment Removal as a Practice and Project Example in Table 2. Practice and Project Examples from WEP(2016) are equivalent to the Typical Techniques categories for each wetland component in the Wetland Techniques Matrix presented in Table 13.

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