# FREQUENTLY ASKED QUESTIONS:

## URBAN STREAM RESTORATION BMP

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## OVERVIEW

In May of 2013, the Water Quality Goal Implementation Team (WQGIT) approved the "Final Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects". Due to the complexity of the crediting protocols, the Expert Panel decided to implement a 6-month "test drive" following the approval of the report to allow states and localities to test the protocols on actual projects and provide feedback. The results of the test drive and subsequent revisions to the report were published in an appendix (Appendix G) and approved by the WQGIT in September of 2014.

This document provides a "one-stop-shop" for answering questions about the crediting of Stream Restoration BMPs under the Chesapeake Bay TMDL framework. Within this document, you will learn which projects are eligible for crediting, how to apply the crediting protocols and how the credits will be simulated within the Chesapeake Bay Program's Phase 6 Watershed Model.

## PROJECT ELIGIBILITY

The following section describes the qualifying conditions, outlined by the Expert Panel, that must be met for a stream restoration project to be eligible for crediting under the Chesapeake Bay TMDL framework. Stream restoration projects as defined by the Expert Panel and interpreted in this FAQ document may be subject to authorization and associated requirements from federal, State, and local agencies. The recommendations are not intended to supersede any other requirements or standards mandated by other government authorities. Consequently, some stream restoration projects may conflict with other regulatory requirements and may not be suitable or authorized in certain locations. Please contact your appropriate regulatory agency for specific questions about these requirements.

**Q1. What are the basic qualifying criteria for a stream restoration project to be eligible for crediting?**

A1. In addition to several protocol-specific qualifying criteria, all projects must meet the following criteria to be eligible for credit:

- Reach restored must be greater than 100ft in length.
- Reach restored must be actively enlarging or degrading.
- Reach restored MAY NOT be tidally influenced.
- The project MAY NOT be primarily designed to protect public infrastructure. Bank armoring and rip rap are not eligible for stream restoration credit.

- Restoration plan must utilize a comprehensive approach to stream restoration design, addressing long-term stability of the channel, banks, and floodplain.
- Must comply with all state and federal permitting requirements, including 404 and 401 permits.

The Expert Panel also notes that stream restoration is a carefully designed intervention to improve the hydrologic, hydraulic, geomorphic, water quality, and biological condition of degraded urban streams, and must not be implemented for the sole purpose of nutrient or sediment reduction. Restoration projects should be developed through a functional assessment process, such as the stream functions pyramid (Harman et al., 2011) or functional equivalent.

**Q2. Are non-urban stream restoration projects eligible?**

A2. Yes, if the stream restoration project is designed using the Natural Channel Design (NCD), Legacy Sediment Removal (LSR), Regenerative Stormwater Conveyance (RSC) or other approaches, and also meet the relevant qualifying conditions, environmental considerations and verification requirements, it is eligible to receive credit under the stream restoration BMP protocols. However, the following projects are NOT eligible for crediting:

- Enhancement projects where the stream is in fair to good condition, but habitat features are added to increase fish production (e.g., trout stream habitat, brook trout restoration, removal of fish barriers, etc.)
- Projects that seek to restore streams damaged by acid mine drainage
- Riparian fencing projects to keep livestock out of streams

**Q3. Which perennial stream orders are eligible for crediting?**

A3. First through third order perennial streams are eligible. If larger fourth and fifth order streams are found to contribute significant and uncontrolled amounts of sediment and nutrients to downstream waters, consideration for this BMP would be appropriate, however, they could not receive credit under the Chesapeake Bay TMDL framework.

**Q4. Are restoration projects on zero order streams eligible for credit?**

A4. Yes. Restoration projects on zero order streams, including ephemeral and intermittent streams, are eligible for credit. The approach most commonly applied to zero order streams is dry channel regenerative stormwater conveyance (RSC), which is not credited using the three stream restoration protocols. To determine credit for eligible dry RSC projects, please use the Runoff Reduction (RR) curves in the Urban Stormwater Retrofit BMP Expert Panel report.

**Q5. Are wet channel RSC projects eligible?**

A5. Yes, the Panel concluded that wet channel RSC systems, including inline pond retrofits, were a stream restoration practice, and their pollutant removal rate can be estimated based on the appropriate protocols outlined in this document.

**Q6. Are outfall stabilization projects eligible for crediting?**

A6. No. At this point in time, outfall stabilization projects are not eligible for crediting under the stream restoration protocols.

**Q7. Can the protocols be used for local TMDLs in addition to the Chesapeake Bay TMDL?**

A7. While these protocols may be used to estimate edge of stream pollutant load reductions from any eligible stream restoration practice, the crediting process was developed specifically for Chesapeake Bay TMDL application. Sediment delivery models and credit calculation methods may differ depending on your location, so please contact your state regulatory agency for guidance as to whether these protocols may be used to meet local TMDLs.

## APPLYING THE PROTOCOLS

The Expert Panel crafted three general protocols that can be used to define the pollutant load reductions associated with individual stream restoration projects. A fourth protocol is used for dry channel RSC projects. Below is a brief description of each protocol. Questions about how to calculate your nutrient and sediment reduction credit are addressed in the next section of this document.

NOTE: The following protocols are additive, and an individual stream restoration project may qualify for credit under one or more of the protocols, depending on its design and overall restoration approach.

**Protocol 1: Credit for Prevented Sediment during Storm Flow** -- This protocol provides an annual mass nutrient and sediment reduction credit for qualifying stream restoration practices that prevent channel or bank erosion that would otherwise be delivered downstream from an actively enlarging or incising urban stream.

**Protocol 2: Credit for Instream and Riparian Nutrient Processing during Base Flow** -- This protocol provides an annual mass nitrogen reduction credit for qualifying projects that include design features to promote denitrification during base flow. Qualifying projects receive credit under Protocol 1 and use this protocol to determine enhanced nitrogen removal through denitrification within the stream channel during base flow conditions. The credit is applied to a "theoretical" box where denitrification occurs through increased hyporheic exchange for that portion of the channel with hydrologic connectivity to the adjacent riparian floodplain.

**Protocol 3: Credit for Floodplain Reconnection Volume**-- This protocol provides an annual mass sediment and nutrient reduction credit for qualifying projects that reconnect stream channels to their floodplain over a wide range of storm events. Qualifying projects receive credit for sediment and nutrient removal under Protocols 1 and 2 and use this protocol to determine enhanced sediment and nutrient removal through floodplain wetland connection. A wetland-like treatment is used to compute the load reduction attributable to floodplain deposition, plant uptake, denitrification and other biological and physical processes.

**Protocol 4: Credit for Dry Channel RSC as an Upland Stormwater Retrofit**-- This protocol computes an annual nutrient and sediment reduction rate for the contributing drainage area to a qualifying dry channel RSC project. The rate is determined by the volume of stormwater treatment provided in the

upland area using the retrofit rate adjustor curves developed by the Stormwater Retrofit Expert Panel (WQGIT, 2012).

## DETERMINING YOUR NUTRIENT AND SEDIMENT REDUCTION CREDIT

The Expert Panel recommended that all qualifying stream restoration projects receive credit towards meeting the Chesapeake Bay TMDL requirements for reducing nutrients and sediments. The specific nutrient reductions vary from site to site based upon application of the four stream restoration crediting protocols, however, the Expert Panel also recommended default reduction rates for planning purposes as well as for crediting non-conforming practices.

**Q8. What are the default nutrient and sediment reductions for eligible stream restoration BMPs?**

A8.

**Table 1**. Default Nutrient and Sediment Reductions per Linear Foot of Qualifying Stream Restoration (lb/ft/yr), Applied at Edge-of-Stream.

| | **TN** | **TP** | **TSS** |
|---|---|---|---|
| **Reduction** | 0.075 | 0.068 | 248 |

**Q9. When should I use the default rate versus the Protocols?**

A9. The Watershed Technical Work Group decided in their April 1, 2013 meeting that the default rate will apply to historic projects and new projects that cannot conform to recommended reporting requirements as described in Section 7.1. of the Expert Panel Report. The expert panel encouraged the use of the Protocols in all other instances.

**Q10. Does the default rate apply to just one side of the stream, or can I receive double the credit if my project restores both banks?**

A10. The default rate is based upon measurements of the entire reach using the assumption that both sides of the stream were restored. If only one side of the stream is restored, you should not use the default rate, but instead apply the Protocols.

**Q11. What are the appropriate curves to use to estimate the erosion rates for Protocol 1?**

A11. The expert panel provided the Hickey Run curves, developed by the U.S. Fish and Wildlife Service, as an example, although it should be used with relative caution because limited data was used to construct some of the curves. As an alternative, practitioners can use the spreadsheet in Appendix A that was developed specifically for TMDL purposes using data from multiple stream sources including Hickey Run. This spreadsheet allows for user defined variables such as bulk density and nutrient concentration. Other options, including adjusted Hickey Run curves, and new Fairfax curves are under development and should be available later in 2018.

**Q12. To determine my credit using Protocol 1, I have to multiply my calculated bank erosion by a default 50% reduction estimate. If I have monitored data to prove that my reductions are greater than 50% of the bank erosion, can I receive credit for the additional reduction?**

A12. Yes. Once a project has been monitored for the time period and method required by your state regulatory agency, the monitored reduction may be applied to the calculated bank erosion rate in place of the default rate. For more information on your state's monitoring requirements, please contact your state regulatory agency.

**Q13. In Protocol 1, can I use the bulk density from the Expert Panel's design example (125 lbs/ft$^3$) as a default when using the BANCS method?**

A.13. No. The bulk density from the design example was used only to show typical values that might be found. The protocol recommends that each project require its own bulk density analysis at several locations in the stream channel as bulk density can be highly variable. Van Eps et al. (2004) describes how bulk density is applied using this approach. Note that if monitoring data or other models similar to the BANCS method are used, loading rates will also have to be adjusted for bulk density.

**Q14. Protocol 3 only treats loads from upland sources, not from within the stream channel. How do other BMPs installed within the project's drainage area affect the stream restoration credit?**

A14. In Phase 5.3.2 of the Watershed Model, Protocol 3 required jurisdictions to account for runoff reduction practices upstream of the stream restoration reach in order to determine the N, P and TSS load delivered to the project reach. In Phase 6, the Chesapeake Bay Program's CAST tool can be used to determine the loads delivered to your project reach, making this calculation easier. While Protocol 3 treats loads from upland sources, the reductions earned by each project will reduce the "Stream Bed and Bank" load within the Phase 6 Model. This calculation method may be revisited in the future.

**Q15. If monitoring results from previous studies have shown reductions greater than the default reduction credit, can that reduction credit be used or is unique monitoring required?**

A15. No. You must have site-specific monitoring data, as described in A12, to earn pollution reduction credit that is greater than the default. A future expert panel would have the ability to review any collected monitoring data and provide new default rates in a new report.

**Q16. Are there any other limitations on the nutrient and sediment reduction credits I can receive for my project?**

A16. For Protocol 3, there is a minimum floodplain surface area to watershed ratio of one percent to ensure there is adequate hydraulic detention time for flows in the floodplain. The credit is discounted proportionally for projects that cannot meet this criterion. For instance, if the watershed to surface area ratio is 0.75% rather than the 1% minimum then the credit would be 75% of the full credit. The Phase 6 Model may also cap nutrient and sediment reductions. More information on these caps can be found in Q20.

**Q17. My project is eligible for credit under more than one of the protocol, can I receive credit under each?**

A17. Yes. The credits are additive and you have the ability to report the pounds reduced under each of the protocols.

## STREAM RESTORATION IN THE PHASE 6 WATERSHED MODEL

When the final version of the Stream Restoration Expert Panel's report was approved by WQGIT in 2014, the Chesapeake Bay Program was still tracking and crediting BMPs using the Phase 5.3.2 Watershed Model. The development of the Phase 6 Watershed Model, which will be used beginning in 2018, will result in changes to the way in which streams and sediment delivery are simulated. The following section will address questions about changes in the way sediment delivery and stream restoration BMPs are simulated in the Phase 6 Watershed Model.

Overall, these changes make the practice simpler for practitioners in several ways:

- Stream bank nutrient and sediment loads are a separate category in the Phase 6 Model, making accounting for your reductions simpler
- There is no longer a need to calculate a sediment delivery factor before reporting your practice
- The Chesapeake Assessment Scenario Tool (CAST) is now synced directly with the Phase 6 Watershed Model, making planning and estimating your credit easier.

**Q18. Are there any changes to what I need to report to NEIEN to receive credit for my stream restoration BMP in Phase 6?**

A18. Below is a complete list of the parameters that should be submitted to NEIEN for each project:

- BMP Name: Stream Restoration
- Measurement Name and associated unit amount: Length Restored; Protocol 1 TN; Protocol 1 TP; Protocol 1 TSS; Protocol 2 TN; Protocol 3 TN; Protocol 3 TP; Protocol 3 TSS
- Land Use: Approved NEIEN land uses – The default land use group for Stream Restoration will be Stream Bed and Bank.
- Location: Approved NEIEN geographies: County; Hydrologic Unit Code (HUC12, HUC10, HUC8, HUC6, HUC4), State (CBWS Only)
- Date of Implementation: year the project was completed

If a jurisdiction does not report the protocol used and the pounds reduced, they will receive the default nutrient and sediment reduction credit.

**Q19. Which source sector will be credited with reductions achieved by stream restoration BMPs?**

A19. In the Phase 6 Model, nutrient and sediment loads from stream banks are accounted for separately. All reductions from stream restoration BMPs will be taken from the stream bed and bank load. This means that they are not credited as either an urban or an agricultural BMP, but will fall in their own category. Communities may choose to continue tracking the predominant upland land use for their own purposes.

**Q20. What will happen to stream projects that have already been installed and have been credited in Phase 5.3.2 of the Watershed Model?**

A20. All stream restoration projects installed and reported for the Phase 5.3.2 Watershed Model were rolled over into Phase 6 and will be credited automatically. Changes to the model could change the net delivered load from the project site. While any changes are likely to be minor and are site dependent, communities are encouraged to revisit pollution reduction plans and implementation plans that were developed under the Phase 5.3.2 Watershed Model.

**Q21. Is there a cap on how much nutrient and sediment reduction credit I can receive for my project?**

A21. Yes. If you report feet of stream restoration for the default credit, you will be capped at the total available linear feet of streams in the project's land-river segment. The watershed average of 16.5 linear feet of streams per acre may be used for planning purposes, though it is recommended that you consult CAST to determine your cap. If you report pounds of TN, TP or TSS using any of the three Protocols, your load reduction will be capped at the total Stream Bed and Bank load for the Land-River Segment within which the project is located. In other words, a land-river segment can not have a negative stream bed and bank load in the Phase 6 Model.

**Q22. What happens if the load reduction credit exceeds the net delivered load for the upstream river segment?**

A22. The load reduction cap is determined by the geography at which the BMP is reported. If a stream restoration project is reported in a small land-river segment, the cap is set by the stream bed and bank load from that land-river segment alone. The cap is not raised by loads delivered from an upstream river segment. Therefore, the load reduction earned by the BMP can not exceed the stream bed and bank load for the land-river segment it is located within, regardless of the load delivered from an upstream segment. Most land-river segments are large enough that this cap should not be reached.

**Q23. Do I still need to apply a sediment delivery factor to my load reductions before I report them in the Phase 6 Model?**

A23. No. In the Phase 6 Watershed Model sediment delivery factors are handled within the model, rather than prior to reporting. Delivery factors now vary by land-river segment across the watershed and may impact the effectiveness of your stream restoration practice. For example, a project located upstream of a reservoir will not provide the same benefit as a project in a stream reach that effectively delivers sediment to the Bay. The CAST tool can be used to determine the delivery factor for your project reach. Delivery factors can be downloaded in the source data table. Communities are encouraged to revisit pollution reduction plans and implementation plans that were developed under the Phase 5.3.2 Watershed Model to see how their load reductions may have been affected.

**Q24. If I am no longer using a sediment delivery factor, how are stream loads and sediment delivery being simulated in Phase 6?**

A24. In the Phase 6 Model, small streams (order 1-3) are now explicitly simulated. Data from the Chesapeake Floodplain Network (Noe et al, 2015a), was used to inform small stream load simulation. Each individual stream load will vary because upland land uses and other BMPs impact the stream load. More definitive documentation on the small stream load simulation will be released in the Chesapeake Bay Phase 6 Model Documentation later in 2018.

The stream bed and bank load is calculated by multiplying the stream length by the average erosion value per foot found in the Chesapeake Floodplain Network. Deposition in small streams is applied as a percentage loss. The same percentage is applied to both stream and non-stream sources. The percentage is chosen such that the total loss through deposition is equal to the bed and bank load, with the exception of urbanized watersheds (as discussed in Q25). As changes in BMPs and land uses alter non-stream load sources, stream bed and bank loads are modified by the same percentage. Stream deposition percentages are not modified in these scenarios.

Once the stream bank load is calculated, delivery factors are applied for "stream to river" losses and "river to bay" losses. In the Phase 5.3.2 Model, when there were no small streams, there was nowhere to apply a stream to river factor, so sediment attenuation occurring within the stream had to be calculated prior to reporting. In Phase 6, sediment attenuation within the stream will be calculated by the Model, eliminating the need to apply a sediment delivery factor when calculating your BMP reductions for reporting purposes.

**Q25. Does the amount of impervious cover in my watershed impact the stream bed and bank load?**

A25. Yes. The stream bed and bank load is calculated as a ratio to the total edge-of-stream load from the non-stream load sources to the stream load source. Because sediment erosion has been shown to be higher in highly impervious watersheds, sediment is adjusted as 4/3rds of the impervious load. The BMP load reduction cap still applies, but is only likely to be reached in limited circumstances.

**Q26. How will a jurisdiction be able to tell, for planning purposes, what benefit a stream restoration project will have in reducing their delivered load?**

A26. The Chesapeake Assessment Scenario Tool (CAST) can be used to determine the benefit of a proposed stream restoration project for planning purposes. It is recommended that these scenarios be run at the land-river segment scale for best results. The CAST tool is completely synced with the Phase 6 Watershed Model, and will produce the exact same load reductions. Alternatively, a community could simply use the edge-of-stream load reductions for planning purposes, since percent reductions will be the same once delivery factors are incorporated. For more information about CAST and the Phase 6 Model, please visit the following resources:

- CAST login: cast.chesapeakebay.net

**Q27. What are the inspection and verification requirements for stream restoration BMPs?**

A27. Load reductions for stream restoration are good for 5 years. Prior to the reductions expiring, a field inspection must be conducted to prove that the practice still exists, is properly maintained and working

as designed. A passed inspection must be reported to the Chesapeake Bay Program to re-start the 5 year clock.

Check with your local state agency for guidance on stream restoration verification. Most states are in the early stages of defining indicators that would trigger a "pass" or "fail" during a field inspection. Additional guidance is expected in the coming year.

**References**

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Noe, G. B., C. R. Hupp, and E. R. Schenk. 2015a. Measuring and predicting sediment and associated nitrogen and phosphorus fluxes of bank erosion, floodplain deposition, and net balance in stream reaches of the Chesapeake Bay watershed: current results from the USGS Chesapeake Floodplain Network. Draft.

Van Eps, M., J. Formica, T. Morris, J. Beck and A. Cotter. 2004. Using a bank erosion hazard index (BEHI) to estimate annual sediment loads from streambank erosion in the west fork white river watershed. Published by the American Society of Agricultural and Biological Engineers, St. Joseph, Michigan.

Water Quality Goal Implementation Team (WQGIT). 2012. Final Approved Report: Recommendations of the Expert Panel to define removal rates for urban stormwater retrofit practices. Chesapeake Stormwater Network and EPA Chesapeake Bay Program.

## Appendix A. Spreadsheet for Calculating Erosion Rate Curves

This spreadsheet was developed specifically for TMDL purposes using data from multiple stream sources including Hickey Run. This spreadsheet allows for user defined variables (e.g., bulk density, nutrient concentration) but must be updated to account for the Phase 6.0 model's delivery factors. It will be included once complete.

Click here to view the spreadsheet