# Coalition To Stop Stream Destruction

**July 15, 2024**

**To:** Maryland Department of the Environment
Water and Science Administration,
1800 Washington Boulevard,
Baltimore, Maryland, 21230, or
Stewart Comstock
Stewart.Comstock@Maryland.gov

**Subject:** NPDES MS4 permit for MDOT SHA, NPDES Permit Number: MD0068276, MDE Permit Number: 24-DP-3313

> Maryland's NPDES Municipal Separate Storm Sewer System (MS4) Permits
> https://mde.maryland.gov/programs/water/StormwaterManagementProgram/pages/storm_gen_permit.aspx
>
> MDOT SHA Permit
> https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Documents/MS4/SHA/TD%20MS4%20Permit%20MDOT%20SHA_4-19-2024.pdf
>
> MDOT SHA Fact Sheet
> https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Documents/MS4/SHA/MDOT%20SHA%20MS4%20Fact%20Sheet_4-19-2024.pdf
>
> Maximum Extent Practicable (MEP) Submission (April 2024)
> https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Documents/MS4/SHA/SHA_MEP_Analysis_03.22.2024.pdf

Dear Mr. Comstock:

(Note: please add us to the "interested party" list)

We urge Maryland Department of the Environment (MDE) to remove all proposed new so-called stream "restoration" projects as well as all "Adaptive Management" stream "restoration" repairs from the Maryland Department of Transportation (MDOT) State Highway Administration (SHA) Municipal Separate Storm Sewer System (MS4) permit for the following reasons.

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## MDOT SHA's past performance was anything but exemplary

First, we take strong exception to the Maryland Department of the Environment (MDE) statement in the MDOT SHA Fact Sheet[1] for the draft Municipal Separate Storm Sewer System (MS4) permit that "recognizing MDOT SHA's exemplary performance, the Department determined that additional restoration is achievable." This is a ludicrous statement given that SHA's stream "restoration" of an unnamed tributary in the Longfellow area of Columbia as part of the Upper Little Patuxent Stream Restoration[2] has been an unmitigated disaster. A previously healthy riparian forest section was clear-cut and turned into a sunbaked open field. See the photo below with an Orwellian sign that says "restore, replant, renew":

[1] https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Documents/MS4/SHA/MDOT%20SHA%20MS4%20Fact%20Sheet_4-19-2024.pdf

[2] https://jmt.com/projects/upper-little-patuxent-stream-restoration/


This project does not even have pre-construction baseline in-stream biological data[3] against which functional uplift can be proven. The Year 2 Monitoring Report states that "Based on the visual survey completed September 20, 2022, the goals of the restoration are being met." But NWP 27's requirement for "net increases in aquatic resource functions and services" and the CWA's requirement for "biological improvement" cannot be proven by a visual inspection. Yet this report was accepted and signed by the USACE on 1/26/2023 and presumably by MDE as well.

Second, it is clear that MDOT SHA is operating in a parallel universe where the logic of common sense, the adherence to scientific principles, and the acceptance of scientific evidence is not part of its culture. MDOT SHA cannot be trusted with any aspect of stream "restoration projects - neither the selection process, construction oversight, monitoring, nor accurate post-construction reporting. This is exemplified in an MDOT SHA Memorandum dated July 2, 2019 from Division Chief Donna Buscemi to Director Sonal Ram with the subject "FULL DELIVERY STREAM RESTORATION (TMDL)-TRIBS. LITTLE PATUXENT PROGRAMMATIC CATERORICAL EXCLUSION[4]" in which it is stated, "

[3] The Year 2 Monitoring Report's Table 1 indicates that the Stream Functional Assessment was done using the "EPA RBP habitat from for high stream gradients." However, no data is provided in the Year 2 Monitoring Report. Note that the EPA Rapid Bioassessment Protocols https://www3.epa.gov/region1/npdes/merrimackstation/pdfs/ar/AR-1164.pdf , "Biosurvey techniques, such as the Rapid Bioassessment Protocols (RBPs), are best used for detecting aquatic life impairments and assessing their relative severity." The EPA RBP only measures physical habitat parameters. It does not actually measure in-stream biology such as FIBI or BIBI.

[4] https://www.environment.fhwa.dot.gov/nepa/programmatic_ce.aspx

> "In compliance with the 2017 Programmatic Agreement for the Processing of Certain Categorical Exclusion Actions between the Maryland Department of Transportation State Highway Administration (MDOT SHA) and the Federal Highway Administration (FHWA), the subject project has been classified as a PCE. Based on environmental analyses, no significant environmental impacts would occur." (emphasis added).

Anyone familiar with steam "restorations" knows that significant environmental impacts occur as a result of every project. Please see the photographs of steam "restorations" in Appendix 2. The photograph above from SHA's stream "restoration" in the Longfellow area of Columbia where a riparian forest was clear-cut demonstrates that SHA has no credibility on any aspect of stream "restorations."

## Why stream "restorations" should not be allowed in MS4 permit

Even though so-called "stream restorations" are allowed by MS4 permits, that does not mean that they should be done. Stream "restorations" should not be allowed in MDOT SHA's MS4 permit for the following reasons.

### Fraudulent mis-representation to the public and elected officials

The term stream "restoration" is a fraudulent mis-representation of epic proportions since not only do these projects not restore streams, they convert natural streams into engineered stormwater conveyances. So-called stream "restoration" is a misnomer used by the 25-billion-dollar industry,[5] MDE, MDOT SHA, USACE, EPA, local jurisdictions, and other proponents to greenwash, falsify, and distort the real nature of this practice.

In a grand understatement, a paper by Fraley-McNeil et. al. (2022) notes that "It is important to note that the term "restoration" can be misleading because it has the connotation that the stream will be returned to a historical condition, which is often not possible due to changes in hydrology, soils, flow and general pattern and profile."[6]

Every stream "restoration" presentation, document, and website for the public and elected officials by proponents goes to great lengths to greenwash the practice and downplay or ignore the negative aspects. The published scientific literature (see Appendix 1) shows that stream "restorations" do not work and empirical evidence (photographs in Appendix 4) shows that these projects are being washed out by storms since the root cause stressor (uncontrolled stormwater from impervious surfaces in MS4 permitted areas fire-hosing into streams) is not managed.

**It appears that stream "restoration" proponents, including MDE, are either ignorant of the science or simply choose to ignore the it.**

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[5] "Ecological Restoration – Now $25 Billion in U.S," by Michael Sprague, Trout Headwaters, Inc. https://www.troutheadwaters.com/ecological-restoration-now-25-billion-in-u-s/ .

[6] Fraley-McNeal, L. et al. (2022), "Maintaining Forests in Stream Corridor Restoration and Sharing Lessons Learned," Center for Watershed Protection; https://owl.cwp.org/mdocs-posts/maintaining-forests-in-stream-corridor-restoration-and-sharing-lessons-learned-final-report/

The proponents of stream "restorations" greenwash these projects by hiding from the public and elected officials the fact that these projects result in the destruction of countless trees, understory plants, forest soils, and animals. Many of these projects prevent the movement of aquatic organisms by creating series of small dams (photos in Appendix 3).

In addition, proponents misinform the public and elected officials that the impact of clearcutting forests and grading forest floors down to bare earth during a stream "restoration" will only be a "temporary" disturbance in a deliberate attempt to minimize public scrutiny and opposition and to gain the support of elected officials. For example, a City of Gaithersburg web site for the Solitaire Court stream "restoration"[7] stated that "It will take a year or two for the park to fully revegetate," and "It is expected that terrestrial wildlife and some of the aquatic species will move away from the area when the construction equipment arrives. Wildlife normally returns to the area once the construction is over." These statements raise greenwashing to an art form.

Permitees are not required to document how many of these animals plus snakes, frogs, toads, salamanders, moles, voles, mice, etc. were killed because they could not outrun the heavy machinery. For example, Montgomery County Department of Environmental Protection (DEP) has said, "While animals like deer, rabbits, birds, frogs, and snakes will have their habitat temporarily disturbed by restoration, they will return as newly planted trees and other plants grow and the stream returns to a more natural state."[8]

Stream "restoration" proponents fail to alert the public that projects in their neighborhoods and backyards will have a recovery period from the "temporary" disturbance of decades, if not one hundred years:

- "…years of ecosystem maturation may be needed before a project fully meets its long-term restoration objectives and realizes its full environmental benefits[9] (Kaushal et al., 2021[10]; Wood et al., 2021[11])."

[7] https://www.gaithersburgmd.gov/home/showpublisheddocument/9316/637607355144330000

[8] "DEP Response to Stream Restoration Letters" (©79-88) in staff report labeled T&E COMMITTEE #2A,2B, March 4, 2024 Worksession; https://montgomerycountymd.granicus.com/MetaViewer.php?view_id=169&event_id=16077&meta_id=172894

[9] Fraley-McNeal, L. et al. (2022), "Maintaining Forests in Stream Corridor Restoration and Sharing Lessons Learned," Center for Watershed Protection; https://owl.cwp.org/mdocs-posts/maintaining-forests-in-stream-corridor-restoration-and-sharing-lessons-learned-final-report/

[10] Kaushal, S. S., Wood, K. L., Vidon, P. G., & J. G. Galella. 2021. Tree Trade-Offs in Stream Restoration Projects: Impact on Riparian Groundwater Quality. A Report Submitted to the Chesapeake Bay Trust. Retrieved from: https://cbtrust.org/wp-content/uploads/Tree-Trade-off_University-of-Maryland-College-Park_Kaushal_final_report_032921.pdf

[11] Wood, D., Schueler, T., and B. Stack. 2021. A Unified Guide for Crediting Stream and Floodplain Restoration Projects in the Chesapeake Bay Watershed. https://chesapeakestormwater.net/wp-content/uploads/dlm_uploads/2021/10/Unified-Stream-Restoration-Guide_FINAL_9.17.21.pdf

- Per scientist Robert Hilderbrand, "…it's going to take decades for those trees to become re-established."[12]
- DC-area botanist John Parrish (formerly with the National Park Service Center for Urban Ecology, past vice president of the Maryland Native Plant Society, currently serving on the Boards of Conservation Montgomery and the Friends of Ten Mile Creek) has said, "Planting groups of trees on open ground to mitigate forest loss cannot replicate the loss of long-established forest soils, structure and biodiversity of forests destroyed by development. …It will take 100 years or more for a forest to develop soils and structure capable of sustaining a full complement of native plants and animals."[13]

Worse than greenwashing is a disinformation example in a 10/18/2021 Montgomery County DEP fact sheet about their Falls Reach, Potomac stream "restoration" which states "Vegetative cover in the stream riparian area has successfully been reestablished…." However, a site visit on 10/24/2023 showed that four and a half years after project completion in March 2019, the forest floor was overrun with the non-native invasives Japanese Stiltgrass (*Microstegium vimineum*) and Hairy Jointgrass (*Arathroxon hispidus*).[14]

A Montgomery County DEP presentation on the proposed Grosvenor stream "restoration" implies that a relatively small number of trees will be removed by showing a table with only trees greater than 24 inches in diameter while ignoring the smaller trees and shrubs[15] as if they were less important to ecosystem function. They also show a table with a bottom-line number of healthy trees to be removed (30% of trees to be removed) that downplays the value of the dead and poor condition trees as valuable wildlife habitat (70% of trees to be removed).

Another example of greenwashing is when the public is told that "only necessary trees will be removed." This standard greenwashing line from proponents conveniently ignores the obvious fact that no trees would need to be removed if the stream "restoration" project is not done.

A horrifying yet typical example of a stream "restoration" can be seen in the short video "How a stream is 'restored' in Gaithersburg" at https://youtu.be/NvTvPnG6Qs8. As described in this video, the typical stream restoration results in a landscape that is "…clearcut, demolished, torn out, stripped to bare dirt, leaving no trace of life. A desert landscape. …The canopy gone, leaving the entire corridor open to hot, baking sun and drying winds." This perfectly describes SHA's Longfellow project mentioned and shown in

[12] "Stream restoration techniques draw pushback; Some scientists, environmentalists, residents question wisdom of tree removal;" by Timothy B. Wheeler Oct 7, 2020, Chesapeke Bay Journal, https://www.bayjournal.com/news/pollution/stream-restoration-techniques-draw-pushback/article_ffc96960-0895-11eb-b36f-efa466158524.html

[13] Public Hearing Testimony to the Montgomery County Council, RE: Bill 25-22 Forest Conservation – Trees (Oct. 4, 2022 Public Hearing), by John Parrish

[14] Site visit by K. Bawer on 10/24/2023.

[15] DEP presentation on Grosvenor project to SWPN on 1/16/2024

a photograph above. These are just a few examples that give the lie to an industry statement that ""The most current [stream "restoration"] practices are actively avoiding tree removals."[16]

Stream "restorations" convert sections of natural stream valleys into engineered stormwater management projects. They create "Frankenstreams" – engineered creations that are never found in nature with artificial meanders, unnatural rock dams, stream channels in which fill material is dumped, stream channels that are moved to a new location, and stone-armored banks (see photographs in Appendices 2 and 3).

Because of the purposely misleading name, it is understandable that some members of the public and elected officials misunderstand and support so-called "restorations" without knowing the full truth. After all, with a warm and fuzzy name like stream "restoration," what could possibly be bad? There is a reason why the industry and proponents do not use a more accurate term such as "engineered drainage ditch" or "engineered stormwater conveyance" to describe the result of these projects. Noam Chomsky said, "That's the whole point of good propaganda. You want to create a slogan that nobody's going to be against, and everybody's going to be for. Nobody knows what it means, because it doesn't mean anything."[17] But this is the way these projects are sold to an unsuspecting public and elected officials who take the industry and government officials at their word that the streams will be "restored."

Policy and environmental solutions, including the selection of MS4 permit projects, should be guided by science, empirical observations, and evidence, not by for-profit industry hucksterism or the misguided personal opinion of government employees (more below in the section "MDOT SHA's false claims").

The greenwashing of information about stream "restorations" so that the negative consequences are obscured from the public and elected officials is a form of fraud.

## Lack of adequate public notification and public input

A public outreach and education program is a required component of all MS4 permits. There are three aspects of public notification and public input.

The first has to do with public notification and public input to the new MS4 permit. As evidenced by the small handful of residents, aside from public employees, who attended the MDOT SHA MS4 permit hearing on June 4, 2024 in Baltimore, the lack of widespread public notification was apparent. In addition, the requirement to travel to Baltimore instead of allowing virtual participation seemed to be designed to discourage public input. These facts surely demonstrate that adequate public notification was not given, reasonable accommodation for remote participation was not made, and therefore that the MDOT SHA MS4 permit cannot be finalized.

[16] Industry representative statement entered into chat during a Zoom presentation by K. Bawer for Carroll County's Finksburg Library on 1/6/2023

[17] https://www.goodreads.com/quotes/237623-that-s-the-whole-point-of-good-propaganda-you-want-to

The second aspect of notification is the requirement to provide the public with enough information to be able to comment on actual projects in the MS4 permit, not just on vague generalities. SHA did not give the exact locations, nor even the county, for all the projects listed in the Maximum Extent Practicable (MEP) Submission document[18], so it was impossible for the public to pick out projects of concern to them.

The third aspect of public notification and public input has to do with individual projects before they are approved and construction starts. One reason there has not been a massive outcry about stream "restoration" projects is that the notification process for public comment is hopelessly broken. Currently, only immediately adjacent property owners are notified about projects even when entire surrounding neighborhoods will be impacted. **In fact, since projects done for MDOT SHA's MS4 permit use state funds, it should be required that public notification be state-wide, not just to adjacent property owners**.

The current public education practices are a dog and pony show (i.e., "a highly promoted, often over-staged performance, presentation, or event designed to sway or convince opinion for political, or less often, commercial ends"[19] ) during which residents are only told how great the "restoration" projects will be in the absence of any scientific evidence and without discussion of the negative impacts or any scientifically defensible reason why the project was selected instead of out-of-stream alternatives.

MDE's Notice of Public Comment Period (a.k.a. Opportunity to Provide Written Comment or Request an Informational Hearing) and company plans or prospectuses for stream "restorations," neither which the wider public ever sees due to lack of adequate public notification, use greenwashing descriptions to falsify claims that mislead the public into believing that certain impacts, including tree removal, would be temporary. For example, one notice states that "The project temporarily impacts 312 linear feet (1,390 square feet) of perennial stream and 45,959 square feet of 100-year nontidal floodplain."[20] Misleading descriptions such as this certainly cause residents to ignore the Notice and choose not to comment. Residents in the community not immediately adjacent to a project, but who will none-the-less be impacted, are never made aware of the project unless they sign up for notification on MDE's web site of which the wider public has no knowledge. This situation enables MDE to declare that, since there is barely any public response, the public must concur with any given project.

[18] Maximum Extent Practicable (MEP) Submission (April 2024) https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Documents/MS4/SHA/SHA_MEP_Analysis_03.22.2024.pdf

[19] https://en.wikipedia.org/wiki/Dog_and_pony_show

[20] Notice of Application for State Wetland Licenses, Private Wetland Permits, Nontidal Wetlands and Waterways Permits and/or Water Quality Certification and the Opportunity to Provide Written Comment or Request an Informational Hearing, December 1, 2023; Montgomery County, 22-NT-3292/202262014 BLOOM MV DEVELOPMENT LLC

## Impact of stream "restorations" on project sites

According to Fraley-McNeal et. al (2022),[21] the negative impacts of stream "restorations" from these construction projects include:

- Tree & ecosystem services loss
  - "…years of ecosystem maturation may be needed before a project fully meets its long-term restoration objectives and realizes its full environmental benefits (Kaushal et al., 2021[22]; Wood et al., 2021[23])."
  - "For projects that involve floodplain reconnection, mortality of trees in the riparian zone may occur as soils are inundated over time."
  - "When mature trees are removed, they cannot be replaced with similar-sized trees that perform the same ecological functions."

Plus,

- Temperature Impacts
  - "Loss of existing trees in the riparian zone from stream restoration implementation occurs either through direct removal during construction or mortality afterwards due to increased groundwater elevations and/or extended inundation of the floodplain, compaction, and root disturbance from construction activities. …There is a direct link between riparian forests and stream temperature, which is a critical metric of stream health."
  - "…impact to a stream's thermal regime…. Protecting thermal regimes in streams is important for a variety of reasons, including maintaining spawning habitat and healthy conditions for fish, reducing algal growth, reducing populations of parasites that favor warmer temperatures, and regulating nutrient/carbon/oxygen dynamics, since temperature affects the dynamics of many gaseous and aqueous compounds (Demars et al., 2011; Mayer et al., 2010; Wilkerson et al., 2006). …There is evidence that stream temperatures increase post-restoration (Fanelli et al., 2017; Sudduth et al., 2011)."
- Biologic, Habitat, & Water Quality Impacts
  - "When trees are removed for stream restoration projects, the critical habitat provided by their canopy and root systems is also removed. Although removed trees are typically replanted in-kind, the maturation of the restored vegetation can take many years."

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[21] Fraley-McNeal, L. et al. (2022), "Maintaining Forests in Stream Corridor Restoration and Sharing Lessons Learned," Center for Watershed Protection; https://owl.cwp.org/mdocs-posts/maintaining-forests-in-stream-corridor-restoration-and-sharing-lessons-learned-final-report/

[22] Kaushal, S. S., Wood, K. L., Vidon, P. G., & J. G. Galella. 2021. Tree Trade-Offs in Stream Restoration Projects: Impact on Riparian Groundwater Quality. A Report Submitted to the Chesapeake Bay Trust. Retrieved from: https://cbtrust.org/wp-content/uploads/Tree-Trade-off_University-of-Maryland-College-Park_Kaushal_final_report_032921.pdf

[23] Wood, D., Schueler, T., and B. Stack. 2021. A Unified Guide for Crediting Stream and Floodplain Restoration Projects in the Chesapeake Bay Watershed. https://chesapeakestormwater.net/wp-content/uploads/dlm_uploads/2021/10/Unified-Stream-Restoration-Guide_FINAL_9.17.21.pdf

  - "Recent work by Wood et al. (2021) and Kaushal et al. (2021) demonstrated that tree removal during stream restoration construction can trigger sub-surface fluxes of nutrients out of the riparian zone and into the stream…." This defeats the purpose of the stream "restoration."
  - "It is important to note that the post-restoration recovery of the ecosystem as a whole typically takes many years."
  - "Some studies have found either no evidence or very limited evidence that stream restoration projects in urban watersheds have the potential to improve habitat quality in a meaningful or reliable way, partially due to the influence of the contributing drainage area to the stream (Hilderbrand, 2020; Hilderbrand et al., 2015; Violin et al., 2011)."
  - "However, it is clear that the removal of mature trees during restoration physically alters the available habitat in a stream-riparian system, and those physical alterations have coincidental effects on stream-water chemistry. Both of these restoration-related changes—physical and chemical—affect the biological uplift provided by a restored stream."
- Inundation Impacts from Floodplain Reconnection
  - "Stream restoration projects that enhance floodplain reconnection can impact existing riparian vegetation species due to increased groundwater elevations and/or extended inundation of the floodplain. Flooding may reduce upland tree species root growth which may lead to decline, death, and decay over time (Coder, 1994)."

## Impact of stream "restorations" on human health

The selection of projects to meet the MDOT SHA MS4 permit is a zero-sum game. When more stream "restorations" are selected, fewer out-of-stream projects are done.

One negative result of stream "restorations" rather than the use of out-of-stream projects, is that pollutants from roads such as oil, salt, toxic tire dust, and trash are washed into our natural areas where they are harmful to humans as well as the plants and animals. This can be avoided by keeping stormwater runoff from roads out of streams in the first place.

A Washington post article that interviewed people from the Anacostia Riverkeeper group said that out-of-stream stormwater control practices such as "…rain gardens can intercept pollutants before they reach rivers. Sediment picked up by storm water can carry toxic compounds and cloud river water, harming aquatic plants and fish…. Dog waste and trash can also get washed into local waterways. Rain gardens also create green spaces in cities."[24]

Stream "restoration" projects remove trees and destroy natural areas that reduce quality of life and human health. Please see the photographs in Appendix 2 which show the damage caused by stream "restorations."

[24] https://www.washingtonpost.com/climate-solutions/2023/12/10/rain-garden-cities/

Regarding the impact of tree removal on air quality, Scenic America says "Trees reduce air pollution and help to purify the air by absorbing carbon and other pollutants. A mature tree absorbs between 120-240 pounds per year of small particles and gases, like carbon dioxide, which are released into the air by automobiles and industrial facilities."[25]

According to Scenic America, "Excessive or unwanted sound has negative physical and psychological effects. Noise can come from many sources, especially roads and highways. Trees can plan an important role in deadening unwanted noise. Sound waves are absorbed by a tree's leaves, branches, and twigs. Studies suggest that belts of trees 100 feet wide and 45 feet long can cut highway noise in half."[26]

An article in Scientific American says the "…idea that loud noise 'can't be good' is well supported by science. Noise can damage more than just your ears. Through daytime stress and nighttime sleep disturbances, loud sounds can hurt your heart and blood vessels, disrupt your endocrine system, and make it difficult to think and learn."[27]

The Nature Conservancy says that "Research has linked the presence of urban trees to reduced obesity, better stormwater management, increased property values, reduced stress, fewer particulate pollutants, cooler city streets, reduced disease rates, and increased biodiversity."[28] The more stream "restorations" that are done, the fewer tree planting projects such as forest planting, riparian forest planting, and urban tree canopy planting will be done for the MS4 permit.

In a September 8, 2021, interview on WBUR's Radio Boston, Peter James, assistant professor in Harvard T.H. Chan School of Public Health's Department of Environmental Health, said that trees' effects on us "translate into long-term changes in the incidence of depression, anxiety, cognitive decline, and chronic diseases including cardiovascular disease and cancer."[29]

Stream "restorations" that clearcut sections of riparian forest raises ambient temperatures. According to the EPA, "Trees and other plants help cool the environment, making vegetation a simple and effective way to reduce urban heat islands."[30]

The floodplain reconnection method of stream "restoration" increases mosquito habitat when the receding water leaves behind pools of stagnant water. Maryland Department of Agriculture lists mosquito diseases as Dengue (Break-Bone Fever), Encephalitides, Malaria, Yellow Fever, and Zika.[31]

Out-of-stream stormwater control practices avoid destruction of the countless numbers of trees, shrubs, grasses, and flowering forbs that happens during a stream "restoration" project. As stated in the press

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[25] Scenic America, "Benefits of Trees," https://www.scenic.org/why-scenic-conservation/placemaking-and-community-planning/tree-conservation-and-native-planting/benefits-of-trees

[26] Ibid

[27] "Quiet! Our Loud World Is Making Us Sick," by Joanne Silberner, Scientific American, APRIL 16, 2024 https://www.scientificamerican.com/article/everyday-noises-can-hurt-hearts-not-just-ears-and-the-ability-to-learn/

[28] Green Heart Project in Louisville, KY; https://www.nature.org/en-us/about-us/where-we-work/united-states/kentucky/stories-in-kentucky/green-heart-project/

[29] https://www.hsph.harvard.edu/news/hsph-in-the-news/the-health-benefits-of-trees/

[30] https://www.epa.gov/heatislands/using-trees-and-vegetation-reduce-heat-islands

[31] https://mda.maryland.gov/plants-pests/Pages/mosquitoes_disease.aspx

release for a Montgomery County, MD tree-related bill[32], "Trees are one of the most important natural resources and one of the few truly renewable resources. Tree canopies play a pivotal role in enhancing quality of life and contributing to the well-being of residents. A thriving tree canopy reduces air, water and noise pollution, alleviates heat stress and reduces heat islands, and positively impacts physical and mental health outcomes, among other benefits. Protecting the tree canopy will help mitigate climate effects and help Montgomery County reach its ambitious climate goals." And yet, Montgomery County is a huge proponent of stream "restorations."

## Impact of stream "restorations" on property values & expenses

Stream "restoration" projects adjacent to residential areas remove trees which decreases property values. The realtor.com website says, "Research has shown that planting large trees can increase property values anywhere from 3% to 15%, according to the Arbor Day Foundation."[33]

Scenic America says, "Trees can reduce heating and cooling costs and counteract the 'heat island' effect in urban environments. Urban areas with little vegetation can experience temperatures of up to seven degrees higher than those with tree coverings. Properly planted trees can cut heating and cooling costs by as much as 12 percent and reduce overall power demand."[34] Removing trees for stream "restorations" has the opposite effect.

By contrast, out-of-stream practices in the MDE Accounting Guidance[35] such as forest planting, riparian forest planting, and urban tree canopy planting increase property values and reduce utility expenses.

## Impact of stream "restorations" on property damage from flooding

Stream "restorations" done with the floodplain reconnection method increase the frequency and duration of local flooding by design. But causing a floodplain to flood more frequently can water-log the floodplain like a sopping wet sponge. The addition of more flood water during subsequent storms to the already saturated sponge results in the additional water just flowing off the floodplain, possibly creating flooding problems for adjacent property owners or downstream.

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[32] Bill 40-23, Tree Canopy and Roadside Tree Requirements - Fee Revisions, https://montgomerycountymd.granicus.com/MetaViewer.php?view_id=169&event_id=15959&meta_id=166986

[33] https://www.realtor.com/advice/home-improvement/how-trees-can-affect-the-value-of-your-home/

[34] Scenic America, "Benefits of Trees," https://www.scenic.org/why-scenic-conservation/placemaking-and-community-planning/tree-conservation-and-native-planting/benefits-of-trees

[35] "Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated, Guidance for National Pollutant Discharge Elimination System Stormwater Permits," a.k.a. "Accounting Guidance," https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Documents/Final%20Determination%20Dox%20N5%202021/MS4%20Accounting%20Guidance%20FINAL%2011%2005%202021.pdf

## Lack of co-benefits compared to out-of-stream practices

Stream "restorations" provide none of the co-benefits that out-of-stream practices provide to communities. Among the co-benefits from out-of-stream stormwater control practices are decreasing heat islands (which reduces utility bills and decreases heat-related health problems), reducing urban flooding, improving air quality, increasing property values, protecting natural areas, and providing urban green spaces.

In contrast, MDE allows MS4 permitees to inflict stream "restorations" on communities. These projects do nothing to actually improve streams (see scientific papers in Appendix 1) while resulting in cutting community trees, destroying their natural areas, increasing heat islands, decreasing air quality, and decreasing property values, while doing nothing to reduce pluvial (surface water) flooding in urban areas or to provide urban green spaces.

## Lack of MDE-required biological uplift

The MDE document titled "Guidance for Stream Restoration Based on Key Wildlife Habitats: Piedmont and Coastal Plain Streams with Associated Wetlands"[36] states,

> "10) Regardless of channel condition, designs at project sites with IBI scores of fair or better must be designed and constructed to maintain or improve the IBI abundance, diversity, and balance of pollution intolerant vs. tolerant species at this site. …When there is a higher quality riparian area and biota, the design and construction should support or improve the condition of these resources." p. 16

However, the published science shows that biological uplift does not happen with stream "restorations" and often decreases (Appendix 1). Therefore, MDE must disallow the use of stream "restorations" in the MDOT SHA MS4 permit. The scientifically discredited practice of stream "restoration" undermines efforts to restore the health of the Chesapeake Bay, undermines efforts to protect communities from the effects of climate change, and undermines efforts to advance environmental progress.

## Stream "restoration" crediting methodology is fatally flawed

For MS4 permits, the stream "restoration" crediting methodology is fatally flawed. MDE defers to, and uses, the Chesapeake Bay Program Expert Panel Report for Protocol 1 Guidance"[37] on this matter.

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[36] "Guidance for Stream Restoration Based on Key Wildlife Habitats: Piedmont and Coastal Plain Streams with Associated Wetlands," 2023, https://mde.maryland.gov/programs/water/WetlandsandWaterways/Documents/Restoration%20Guidance/Guidance%20for%20Stream%20Restorations_Piedmont%20%26%20Coastal%20Plain.pdf

[37] 2019 Protocol 1 Guidance: "Consensus Recommendations for Improving the Application of the Prevented Sediment Protocol for Urban Stream Restoration Projects Built for Pollutant Removal Credit," p. 23; Full Report: https://chesapeakestormwater.net/wp-content/uploads/2022/07/9928-1.pdf

The first problem is that these reports were not created by an independent panel of scientists with no financial conflicts of interest. The CBP Expert Panel included employees of for-profit engineering companies who are primarily engineers, not scientists, and who may have had a vested interest in ensuring that the crediting calculations maximized their profits. This has the appearance of a conflict of interest and has, at a minimum, the appearance of impropriety. As such, the use of these Expert Panel reports by MDE is arguably a corrupt process. It fails the "reasonable person" test.

The second problem is that the Expert Panel report allows the use of the BANCS method, a theoretical calculation, to *estimate* the rate of stream bank erosion. Per the report:

> "The most common technique to estimate bank erosion rate is the BANCS Method (Rosgen, 2001), where field surveys are used to calculate BEHI and NBS scores, which in turn, are entered into regional bank erosion curves to determine the annual rate of streambank retreat."[38] (emphasis added).

Stream bank erosion rate is a critical variable in calculating the MS4 permit credits to be awarded. But the report states that these theoretical calculation tools are "…susceptible to high variability when performed by different practitioners in the field."[39] (emphasis added). If a measurement cannot be reproduced by different people using the same methodology, it is scientifically worthless. **If used, it is arguably fraudulent if used to prove that a stream is eroding to justify a stream "restoration" project and garner MS4 permit credits.**

The only accurate method to determine geomorphic evidence of active stream degradation is actual boots-on-the-ground, long-term measurements of bank erosion by traditional, fixed-station methods, such as bank pin monitoring.

Per the report, stream "restoration" companies may, in fact, use direct physical measurements to determine erosion rates:

> "Designers also have the option to directly measure the rate of bank retreat in the project reach using bank pins, cross section surveys or other alternative methods that were not explicitly defined in the original expert panel report."[40]

However, direct measurement to determine erosion rates is not a requirement. In fact, virtually no stream "restoration" companies do boots-on-the-ground actual measurements over time because it takes too long. Being profit-driven, the theoretical estimation method saves companies time and money.

On top of that, the Expert Panel itself is so mistrustful of the BANCS estimation methodology that they take its initial estimate of pollutant reduction and randomly cut that by 50%.[41] This should cause a huge amount of skepticism as to the veracity of stream erosion claims made using theoretical modeling. **The**

[38] Ibid.
[39] Ibid.
[40] Ibid.
[41] Ibid.

**current Expert Panel erosion-rate calculations are basically a thought experiment that should not be a substitute for actual on-site physical measurements.**

If the actual erosion rate based on physical measurement is much less than the theoretical methodology indicates, that would make stream "restorations" less attractive for MS4 permit projects since they would be awarded less nitrogen, phosphorous, and suspended sediment credits.

Included in the Protocol 1 Guidance is this damning "Pennsylvania DEP Position on The Use of the BANCS Method":

> "These memo recommendations are advisory and the appropriate state and federal permitting agencies reserve the authority to decide how to handle stream restoration projects using Protocol 1. The Pennsylvania Department of Environmental Protection (PADEP) continues to have substantial concerns regarding the development and application of BANCS methods for stream restoration crediting purposes in all hydrogeomorphic regions. One of their primary concerns is the use of BANCS methods within the Chesapeake Bay Watershed where BANCS relationships have not been appropriately validated and data is limited. They are also concerned that BANCS relationships developed using short-term monitoring-intervals may not produce valid results for reduction crediting."[42]

## Stream "restorations" do not stabilize streams

Stream "restorations" simply do not stabilize streams since these projects are washed out by post-construction storms. As shown in Palmer's (2014) analysis of 644 stream "restorations,"[43] less than half of all stream "restorations" showed improvement in stabilizing channels – worse than a coin toss.

Per Lisa Fraley McNeal, Bill Stack, et al. (2021)[44], "To comply with the requirements of the Clean Water Act (CWA), Title 4, Subtitle 2 of the Environment Article of Annotated Code of Maryland states that 'the management of stormwater runoff is necessary to reduce stream channel erosion, pollution, siltation and sedimentation, and local flooding, all of which have adverse impacts on the water and land resources of Maryland.'" Stream "restoration" projects do nothing to manage stormwater runoff before it enters streams, which is the original intent of the CWA. Instead, stream "restorations" are in-stream construction projects that attempt, but fail (per the scientific evidence in Appendix 1), to decrease stream bank erosion. The science says that stream "restorations" do not reduce stream channel erosion, pollution, siltation, sedimentation, or local flooding.

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[42] Ibid.

[43] Palmer, M. A., K. L. Hondula, and B. J. Koch, University of MD, 2014, "Ecological Restoration of Streams and Rivers: Shifting Strategies and Shifting Goals,", Annu. Rev. Ecol. Evol. Syst. 2014. 45:247-269. (https://akottkam.github.io/publications/Palmerpublications/Palmer2014a.pdf )

[44] The Self-Recovery of Stream Channel Stability in Urban Watersheds due to BMP Implementation" by Lisa Fraley McNeal, Bill Stack, et. al. https://cwp.org/the-self-recovery-of-stream-channel-stability-in-urban-watersheds/ and https://cbtrust.org/wp-content/uploads/Self_Recovery_of_Stream_Channel_Stability_Final_Draft_03-23-21.pdf

Empirical evidence of failed stream "restoration" projects (see photos in Appendix 4) and published scientific papers (see Appendix 1) prove that stream "restorations" are not an effective practice to keep nitrogen, phosphorous, and sediment out of the Bay by stabilizing stream banks, nor to improve the ecology at the project location.

Some would claim that the examples of washed-out projects in Appendix 4 are cherry-picked. They are not. To prove this, DEP should provide data for each stream restoration in the state showing each storm event, date, and size storm (e.g. 1-year, 100-year, etc.) that each project has been subjected to post-construction. If, for example, a given stream "restoration" has only experienced 1-year storms, it would be a weak argument to claim that the project resulted in stream stabilization. Yet this is the argument being made by stream "restoration" proponents in spite of the lack of evidence – that a given project will always be stable simply because it has not yet been washed out.

In recognition of the susceptibility of stream "restorations" to being washed-out, the Chesapeake Bay Program report titled, "Recommended Methods to Verify Stream Restoration Practices (2019)"[45] states that "The duration of the credit is shorter than other urban BMPs, since these projects are subject to catastrophic damage from extreme flood events".

Appendix 4 has photos of failed, washed-out stream "restorations" in Maryland. Stormwater needs to be controlled *before* it firehoses into streams to eliminate the root cause stressor of stream erosion. To give an analogy, if there is a leaking roof that is damaging furniture, no one in their right mind would replace the furniture before the source of the problem is fixed, which is the leaking roof. But this is exactly what is happening with stream "restorations." MS4 permitees are trying to repair, or at least stabilize, the streams before fixing the source of the problem – urban stormwater runoff. **This is simply throwing tax dollars away and it is a gross mismanagement of state funds in the case of MDOT SHA**.

Some examples of washed-out projects shown in Appendix 4 include Josephs Branch in Kensington, Cabin John Creek near Montgomery Mall, Long Branch in Takoma Park, Snakeden Branch in Potomac, Bedfordshire Tributary in Potomac, Old Farm Creek in North Bethesda (scheduled to be repaired in 2024 for $800K), the Grosvenor Luxmanor project in North Bethesda (scheduled to be repaired in 2024 for $4.8M), Lower Booze Creek in Potomac (repaired for $3.6M), Northwest Branch in Silver Spring, Stony run in Baltimore City, and Annapolis Landing in Anne Arundel County.

Rather than building new stream "restorations" and repairing failed stream "restorations" that will simply get washed out again, this money should be spent on out-of-stream stormwater control projects that prevent the root cause of stream erosion. Since stream "restorations" do not stabilize streams, they should not qualify for MS4 permit credits.

## Stream "restorations" do not result in ecological recovery

In spite of claims by proponents, the purpose of MS4 permit stream "restorations" is not to help the local environment (they do not) – their purpose is to get credits to meet the EPA-mandated MS4 permit.

[45] https://chesapeakestormwater.net/wp-content/uploads/2022/07/9621-1.pdf

In fact, stream "restorations" are the only environmentally destructive practice for garnering MS4 permit credit in MDE's Accounting Guidance[46].

MDE, MDOT SHA, Maryland Department of Natural Resources (DNR), and the U.S. Army Corps of Engineers (USACE), some local jurisdictions, the $25B stream restoration industry, and some river keepers, and non-profit federations and conservancies falsely claim that ecological recovery occurs at stream "restoration" sites in direct contradiction to the published scientific literature (see Appendix 1).

They also know that the promise ecological recovery from stream "restorations" is bogus because direct observations on the ground show the clearcutting of stream-side forests which destroy miles of natural habitat (see photographs in Appendix 2). They know that although these projects are supposed to stabilize streams, they are being washed-out by storms after construction. At some locations, photographic documentation shows muddy, sediment laden water running through the sites of supposedly "restored" streams (see Appendix 4).

Furthermore, removal of what is known as course woody debris (CWD) - fallen dead trees and large branches on the ground - as well as root balls and tree stumps, as is typically done by stream "restoration" companies, is detrimental to a forest. According to the USDA, "Coarse woody debris is an important component in the structure and functioning of ecosystems. …Coarse woody debris contributes to biodiversity by being part of the life cycle of soil mites, insects, reptiles, amphibians, mammals, and birds (Brown 2000)."[47] In addition, removal of CWD, root balls, and tree stumps allow forest soil to be more easily eroded.

## Stream "restorations" are high-risk, no-benefit endeavors

The fundamental equation of risk is: RISK = PROBABILITY x IMPACT. "This means that the total amount of risk exposure is the probability of an unfortunate event occurring, multiplied by the potential impact or damage incurred by the event. If you put a dollar value on the impact, then you can value the risk and in a simple way compare one risk factor to another."[48] The published science in Appendix 1 warrants assigning a 100% probability of failure to a stream "restoration" project. The impact of this failure is a misuse of taxpayer dollars, destruction of natural resources, and potential damage to private property. There is no avoiding the conclusion that stream "restorations" are a high-risk, no-benefit endeavor. The alternatives are low-risk, high-benefit out-of-stream stormwater control practices.

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[46] "Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated, Guidance for National Pollutant Discharge Elimination System Stormwater Permits, https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Documents/Final%20Determination%20Dox%20N5%202021/MS4%20Accounting%20Guidance%20FINAL%2011%2005%202021.pdf

[47] Brown, J.K, et. al., (2003), "Coarse Woody Debris: Managing Benefits and Fire Hazard in the Recovering Forest," United States Department of Agriculture, Forest Service, Rocky Mountain Research Station, General Technical Report RMRS-GTR-105, https://www.fs.usda.gov/rm/pubs/rmrs_gtr105.pdf

[48] "Risk = Likelihood x Impact," BrandPost By Jim Kent" https://www.cio.com/article/238969/risk-likelihood-x-impact.html

## Videos & photographic documentation of stream "restoration" destruction

To see a short video of the destruction done by a typical stream "restoration" at the Solitaire Court site in Gaithersburg, use this link: https://www.youtube.com/watch?v=NvTvPnG6Qs8.

The following link shows a video of a stream "restoration" in Takoma Park on Montgomery Parks property taken on May 6, 2024: https://www.youtube.com/watch?v=s63H0nidRGw.

Appendix 2 has photos showing the destruction of natural areas caused by stream "restoration" construction projects. These photos show the massive loss of fish and wildlife habitat, the loss of habitat for disappearing pollinators like bees and butterflies, and the clearcutting of stream-side forests that accelerates global warming and which will take decades[49] or more to replace. According to University of Maryland scientist Robert Hilderbrand, "…it's going to take decades for those trees to become re-established." The pre-eminent Washington, DC-area botanist John Parrish (formerly with the National Park Service Center for Urban Ecology, past vice president of the Maryland Native Plant Society, currently serving on the Boards of Conservation Montgomery and the Friends of Ten Mile Creek) has said, "Planting groups of trees on open ground to mitigate forest loss cannot replicate the loss of long-established forest soils, structure and biodiversity of forests destroyed by development. …It will take 100 years or more for a forest to develop soils and structure capable of sustaining a full complement of native plants and animals."[50]

Appendix 3 has photos of stream "restorations" that impede aquatic life movement.

Stream "restorations" result in the destruction of natural habitats that are important to protecting our quality of life and for future generations to enjoy.

## The fallacy that permitted projects are good

A standard ploy of proponents when defending a stream "restoration" project is to point out that all of the statutory and regulatory criteria were met and that all of the necessary permits at the state and federal level were obtained. While accurate, such self-congratulatory proclamations are meant to imply that being granted permits means that a given project is not just legal, but is implicitly blessed by the government as being good, worthwhile, and environmentally sound. In reality, being granted a permit only means that a project is legal. Furthermore, just because stream "restoration" projects are granted a

[49] "Stream restoration techniques draw pushback; Some scientists, environmentalists, residents question wisdom of tree removal;" by Timothy B. Wheeler Oct 7, 2020, Bay Journal, https://www.bayjournal.com/news/pollution/stream-restoration-techniques-draw-pushback/article_ffc96960-0895-11eb-b36f-efa466158524.html

[50] Public Hearing Testimony to the Montgomery County Council, RE: Bill 25-22 Forest Conservation – Trees (Oct. 4, 2022 Public Hearing), by John Parrish

permit does not mean that the projects will work in terms of stabilizing stream banks, improving water quality, and providing ecological uplift (they do not).

Nothing could be further from the truth. The published scientific literature (see Appendix 1) shows that stream "restorations" do not work and empirical evidence (photographs in Appendix 4) shows that these projects are being washed out by storms since the root cause stressor (stormwater from impervious surfaces in MS4 permitted areas) is not controlled.

Permitted stream "restorations" have nothing to do with improving the local environment. In fact, local natural resources – stream valleys, their forests, and their animals – are being needlessly sacrificed on the altar of saving the Bay since the primary purpose of stream "restorations" is to generate EPA-mandated National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit credits.

Rather than primarily trying to control polluted stormwater before it enters streams, SHA and many jurisdictions heavily rely on the construction of stream "restorations" to help meet their MS4 permits.

## Stream "restorations" violate Clean Water Act, Army permits, Code of Maryland, & MDE permits

### Stream "restorations" violate Clean Water Act

Per the 2018 version of the Clean Water Act (CWA) from the U.S. Code, title 33, chapter 26, section 1251 titled "Congressional declaration of goals and policy," the objective of the Act is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters."[51] (emphasis added).

Likewise, the USACE Baltimore District website states, "The objective of the Clean Water Act (CWA) is 'to restore and maintain the chemical, physical, and biological integrity of the Nation's waters.'"[52] (emphasis added).

The scientific literature on the results of stream "restorations" (Appendix 1) shows no reduction in nutrient or sediment pollution and no functional uplift in physical, chemical, or biological aquatic resource functions. **Therefore, the use of stream "restorations" for MS4 permit credits cannot be allowed since these practices do not meet the CWA's goal to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters."**

Per the EPA's Summary of the Clean Water Act, "The CWA made it unlawful to discharge any pollutant from a point source into navigable waters, unless a permit was obtained: EPA's National Pollutant Discharge Elimination System (NPDES) permit program controls discharges."[53]

[51] https://www.govinfo.gov/content/pkg/USCODE-2018-title33/pdf/USCODE-2018-title33-chap26.pdf, page 328.
[52] https://www.nab.usace.army.mil/Missions/Regulatory/Mitigation/
[53] https://www.epa.gov/laws-regulations/summary-clean-water-act

The draft MS4 permit for MDOT SHA[54] states on page 1 that one of the CWA and National Pollutant Discharge Elimination System (NPDES)[55] water quality requirements is to "Effectively prohibit pollutants in stormwater discharges or other unauthorized discharges into, through, or from the MS4 as necessary to comply with Maryland's receiving water quality standards." Stream "restorations" do not prevent pollutants in stormwater discharges *into, through, or from* the Municipal Separate Storm Sewer System (MS4) since stream "restorations" are downstream from MS4 system outfalls (which are considered point sources). Stream "restorations" do not capture or treat any stormwater prior to stormwater entering the MS4 system, nor do stream "restorations" capture or treat stormwater from MS4 system outfalls. Stream "restorations" do nothing to prevent upland MS4 stormwater pollutants from entering streams. Since so-called stream "restorations" meet none of these requirements, they violate the CWA and should not be allowed in SHA's MS4 Permit**.**

The draft of a new 2024 Chesapeake Bay Program (CBP) Scientific and Technical Advisory Committee (STAC) report on stream "restoration"[56] states that "biological improvement is a condition of CWA permits." Since stream "restorations" do not meet the CWA's requirement to result in biological improvement per the preponderance of the scientific literature (Appendix 1), they should not be allowed in SHA's MS4 permit.

The original intent of the MS4 permitting system was to treat pollutants in urban stormwater runoff before it enters waterways. Stream "restorations" do nothing to accomplish this, and thus are in violation of the CWA and MS4 permit. It remains to be uncovered why stream "restorations" were ever added to the list of accepted MS4 permitted practices in Maryland MDE's Accounting Guidance document[57]. Presumably, it was due to an intense lobbying effort by the $25 billion stream "restoration" industry and others that stood to gain financially. As with most of things of this nature, following the money usually uncovers the motivation.

It is clear that stream "restorations" violate the NPDES MS4 permit and thus the CWA.

## Stream "restorations" violate Department of the Army permits

The Army defines that the requirement for restorations must include biological uplift:

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[54] https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Documents/MS4/SHA/TD%20MS4%20Permit%20MDOT%20SHA_4-19-2024.pdf

[55] https://www.epa.gov/npdes/npdes-permit-basics

[56] Noe, G., N. Law, J. Berg, S. S. Filoso, Drescher, L. Fraley-McNeal, B. Hayes, P. Mayer, C. Ruck, B. Stack, R. Starr, S. Stranko, and T. Thompson. 2024. The State of the Science and Practice of Stream Restoration in the Chesapeake: Lessons Learned to Inform Better Implementation, Assessment and Outcomes. STAC Publication Number 24-005, Edgewater, MD. 90 pp, https://www.chesapeake.org/stac/events/the-state-of-the-science-and-practice-of-stream-restoration-in-the-chesapeake-lessons-learned-to-inform-better-implementation-assessment-and-outcomes/

[57] "Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated, Guidance for National Pollutant Discharge Elimination System Stormwater Permits, https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Documents/Final%20Determination%20Dox%20N5%202021/MS4%20Accounting%20Guidance%20FINAL%2011%2005%202021.pdf

- The definition of functional uplift per the Department of the Army[58]:

  "Functional Lift (or "Functional Gain"): Measurable improvement of physical, chemical, **and** biological aquatic resource functions between existing and proposed conditions as a result of a restoration or enhancement activity at the project site." (emphasis added).

The scientific literature on the results of stream "restorations" (Appendix 1) shows no reduction in nutrient or sediment pollution and no functional uplift in physical, chemical, or biological aquatic resource functions. Therefore, stream "restorations" violate the Army's definition of functional uplift and cannot be allowed for MS4 permit projects.

## Stream "restorations" USACE permits

Per the USACE Baltimore District website, "In the Baltimore District, we use three types of General Permits to authorize work in Maryland: the Maryland State Programmatic General Permit-6, Nationwide Permits (NWPs), and the Chesapeake Bay Total Maximum Daily Load (TMDL) Regional General Permit (TMDL RGP). These General Permits may be used to authorize impacts to waters of the United States that have been determined to result in no more than minimal adverse environmental effects."[59] It is clear from the science (Appendix 1) and empirical evidence (see photographs in Appendices 2, 3, and 4) that the activity of stream "restorations result in more than minimal adverse environmental effects. Therefore, stream "restorations" do not qualify for any of the three types of General Permits.

## Stream "restorations" violate USACE's Nationwide Permit 27

The USACE's Nationwide Permit 27, Aquatic Habitat Restoration, Enhancement, and Establishment Activities[60] permits "Activities in waters of the United States associated with the restoration, enhancement, and establishment of tidal and non-tidal wetlands and riparian areas, the restoration and enhancement of non-tidal streams and other non-tidal open waters, and the rehabilitation or enhancement of tidal streams, tidal wetlands, and tidal open waters, provided those activities result in net increases in aquatic resource functions and services." (emphasis added).

Per the USACE Baltimore District Website, "Nationwide Permits (NWPs) are general permits issued on a nationwide basis to authorize minor activities with minimal evaluation time. NWPs have been established to reduce the regulatory reporting burden for specific activities that have no more than minimal impacts to the aquatic environment."[61] (emphasis added).

It is clear from the science (Appendix 1) and empirical evidence (see photographs in Appendices 2, 3, and 4) that the activity of stream "restorations" does not "result in net increases in aquatic resource

[58] "Department of the Army Regional General Permit For Chesapeake Bay Total Maximum Daily Load (TMDL) Activities" https://www.nab.usace.army.mil/Portals/63/NAB-2019-00527_TMDL_RGP_1.PDF
[59] https://www.nab.usace.army.mil/Missions/Regulatory/Permits-MD/
[60] USACE Nationwide Permit 27 https://saw-reg.usace.army.mil/NWP2021/NWP-27.pdf https://www.nww.usace.army.mil/Portals/28/docs/regulatory/NWPs/NWP27.pdf and https://www.swt.usace.army.mil/Portals/41/docs/missions/regulatory/2021%20NWP/NWP-27.pdf?ver=2Lce-C9I_3zKSuZfvgv-lw%3D%3D
[61] https://www.nab.usace.army.mil/Missions/Regulatory/Nationwide-Permits/

functions and services" are not "minor activities," and are not activities having "no more than minimal impacts to the aquatic environment." Therefore, stream "restorations" do not qualify for NWPs.

Likewise, per the USACE's Conversion Test Sheets document, the Nationwide Permit 27 (NWP 27) was created to "streamline permit review for stream and wetland restoration projects which provide functional lift…."[62] (emphasis added). However, the science (see Appendix 1) shows that stream "restoration" projects do not provide functional uplift. Thus, stream "restorations" do not qualify for NWP 27 permits for stream "restorations" for SHA's MS4 permit.

A prime example of a project not providing functional uplift is SHA's ruinous stream "restoration" of an unnamed tributary in the Longfellow area of Columbia as part of the Upper Little Patuxent Stream Restoration.[63] Please see the photograph below.


## Stream "restorations" violate USACE's Bay TMDL RGP permit

The USACE's Regional General Permit For Chesapeake Bay Total Maximum Daily Load (Bay TMDL RGP) permit can also be used for certain stream "restorations."

Per the USACE Baltimore District website, "In the Baltimore District, we use three types of General Permits to authorize work in Maryland: the Maryland State Programmatic General Permit-6, Nationwide Permits (NWPs), and the Chesapeake Bay Total Maximum Daily Load (TMDL) Regional General Permit (TMDL RGP). These General Permits may be used to authorize impacts to waters of the United States

[62] https://www.nab.usace.army.mil/Portals/63/docs/Regulatory/Bay_TMDL/ImpactsandConversions.pdf
[63] https://jmt.com/projects/upper-little-patuxent-stream-restoration/

that have been determined to result in no more than minimal adverse environmental effects."[64] It is clear from the science (Appendix 1) and empirical evidence (see photographs in Appendices 2, 3, and 4) that the activity of stream "restorations result in more than minimal adverse environmental effects. Therefore, stream "restorations" do not qualify for any of the three types of General Permits including the TMDL RGP.

Per the USACE's Conversion Test Sheets document regarding Bay TMDL RPG projects, "These projects are granted limited conversion[65], but can only be performed in degraded waters …cannot impede aquatic life movement, and cannot occur in tidal waters."[66] Since most stream "restoration" projects place in-stream structures such as cross veins and step pools which impede aquatic life movement, they should not be permitted for MS4 Permits. See photos of stream "restorations" in Maryland that impede aquatic life movement in Appendix 3.

Furthermore, per the Department of the Army document "Regional General Permit For Chesapeake Bay Total Maximum Daily Load (TMDL) Activities,"[67] the section on "Nontidal Streams and Wetland Restoration Activities" on page five states,

- "This activity authorizes stream and wetland restoration and enhancement activities in WOTUS, where the activity is part of an acceptable watershed strategy to reduce nutrients and sediment pollution **and** produces functional lift within the project site." (emphasis added).

Since stream "restoration" projects do not benefit the watershed, per the preponderance of the scientific evidence that they do not improve water quality, stabilize banks, or provide ecological uplift (see Appendix 1), the proposed stream "restorations" in the draft SHA MS4 permit cannot be approved for a Bay TMDL RGP permit.

## Stream "restorations" violate Maryland State Programmatic General Permit-6

Per the USACE Baltimore District website, "In the Baltimore District, we use three types of General Permits to authorize work in Maryland: the Maryland State Programmatic General Permit-6, Nationwide Permits (NWPs), and the Chesapeake Bay Total Maximum Daily Load (TMDL) Regional General Permit (TMDL RGP). These General Permits may be used to authorize impacts to waters of the United States that have been determined to result in no more than minimal adverse environmental effects."[68] It is clear from the science (Appendix 1) and empirical evidence (see photographs in Appendices 2, 3, and 4) that the activity of stream "restorations result in more than minimal adverse environmental effects.

[64] https://www.nab.usace.army.mil/Missions/Regulatory/Permits-MD/
[65] Limited conversion" refers to limited conversion among aquatic resource types, for example loss of wetland.
[66] "WOUS and Conversion Test Sheets For Stream Restoration and SWM Retrofit Projects," https://www.nab.usace.army.mil/Portals/63/docs/Regulatory/Bay_TMDL/ImpactsandConversions.pdf
[67] Department of the Army, Regional General Permit For Chesapeake Bay Total Maximum Daily Load (TMDL) Activities," https://www.nab.usace.army.mil/Portals/63/NAB-2019-00527_TMDL_RGP_1.PDF
[68] https://www.nab.usace.army.mil/Missions/Regulatory/Permits-MD/

Therefore, stream "restorations" do not qualify for any of the three types of General Permits including the Maryland State Programmatic General Permit-6 (MDSPGP-6)[69].

## Stream "restorations" violate Code of Maryland & COMAR

### Code of Maryland violation

Per the Code of Maryland, Environment Article, Title 5, Subtitle 5, section §5-503(a)(1)(iv), a permit is required to "Change, in any manner, in whole or part the course, current, or cross section of any stream or body of water within the State, except tidal waters."[70]

Per Lisa Fraley McNeal, Bill Stack, et. al. (2021)[71], "To comply with the requirements of the Clean Water Act (CWA), Title 4, Subtitle 2 [Stormwater Management] of the Environment Article of Annotated Code of Maryland states that 'the management of stormwater runoff is necessary to reduce stream channel erosion, pollution, siltation and sedimentation, and local flooding, all of which have adverse impacts on the water and land resources of Maryland.' [72] "

However, stream "restorations" do not manage stormwater runoff by any treatment that reduces pollutants in stormwater runoff before it enters a stream. Nor do stream "restorations" reduce the total volume or flow rate of erosive stormwater runoff entering a stream.

The scientific evidence (in Appendix 1) and observations (in Appendix 4) show that stream "restorations" fail to reduce stream channel erosion and thus fail to reduce stream pollution, siltation, and sedimentation from such erosion. Because stream "restorations" are in-stream construction projects, they cannot reduce pollution of streams from upland (out-of-stream) stormwater. Furthermore, some

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[69] https://mde.maryland.gov/programs/water/WetlandsandWaterways/Pages/MDSPGP-6-Reissuance.aspx

[70] https://advance.lexis.com/documentpage/?pdmfid=1000516&crid=d81ea96c-bb98-40b3-b610-e7341aff4bc4&nodeid=AAOAAGAAFAAD&nodepath=%2FROOT%2FAAO%2FAAOAAG%2FAAOAAGAAF%2FAAOAAGAAFAAD&level=4&haschildren=&populated=false&title=%C2%A7+5-503.+Permit+to+construct+or+repair+reservoirs%2C+dams%2C+or+waterway+obstructions.&indicator=true&config=014EJAA2ZmE1OTU3OC0xMGRjLTRlNTctOTQ3Zi0wMDE2MWFhYzAwN2MKAFBvZENhdGFsb2e9wg3LFiffInanDd3V39aA&pddocfullpath=%2Fshared%2Fdocument%2Fstatutes-legislation%2Furn%3AcontentItem%3A63SM-VW21-DYB7-W2GG-00008-00&ecomp=6gf5kkk&prid=b29dc3e0-9562-4d0d-a0fe-03261a805ee1

[71] The Self-Recovery of Stream Channel Stability in Urban Watersheds due to BMP Implementation" by Lisa Fraley McNeal, Bill Stack, et. al. https://cwp.org/the-self-recovery-of-stream-channel-stability-in-urban-watersheds/ and https://cbtrust.org/wp-content/uploads/Self_Recovery_of_Stream_Channel_Stability_Final_Draft_03-23-21.pdf

[72] Code of Maryland: https://advance.lexis.com/documentpage/?pdmfid=1000516&crid=442e64b7-6d6d-40fa-8ad5-0e691c0ca4b2&nodeid=AAOAAFAACAAB&nodepath=%2FROOT%2FAAO%2FAAOAAF%2FAAOAAFAAC%2FAAOAAFAACAAB&level=4&haschildren=&populated=false&title=%C2%A7+4-201.+Legislative+findings%3B+intent+of+subtitle.&config=014EJAA2ZmE1OTU3OC0xMGRjLTRlNTctOTQ3Zi0wMDE2MWFhYzAwN2MKAFBvZENhdGFsb2e9wg3LFiffInanDd3V39aA&pddocfullpath=%2Fshared%2Fdocument%2Fstatutes-legislation%2Furn%3AcontentItem%3A63SM-VW21-DYB7-W2BC-00008-00&ecomp=6gf5kkk&prid=4f9f33ea-d0cf-4c40-b3fc-cd449c577c79

stream “restorations” actually increase the possibility of local flooding since causing the floodplain to flood more frequently, via floodplain reconnection, water-logs the floodplain like a wet sponge. The addition of more flood water during subsequent storms to the already saturated floodplain soil results in the additional water just flowing off the floodplain, possibly creating flooding problems for adjacent property owners or downstream.

Thus, stream “restorations” do nothing to manage upland stormwater runoff before it enters streams, which is the original intent of the CWA.

For these reasons, stream “restorations” violate the Code of Maryland.

## Code of Maryland Regulations (COMAR) violation

Per the Code of Maryland Regulations (COMAR) 26.17.04 COMAR 26.17.04.04 Permit Applications — General Requirements[73]

> “B. An application to the Administration shall include evidence of the benefits to be derived from the project. This evidence shall be stated in monetary terms or, when more appropriate, other quantitative or qualitative terms.” (emphasis added).

Approving a permit for stream “restorations” for MS4 permit credits violates the above section of the COMAR since there are no monetary benefits given that MDE’s 2022 Annual Report on Financial Assurance Plans (FAPs)[74] shows there are twenty non-destructive, out-of-stream project types that are more cost effective than stream “restorations.” Also, there are no quantitative or qualitative benefits of stream “restorations” since they lack the numerous co-benefits from out-of-stream practices such as not destroying natural areas, decreasing heat islands (which reduces utility bills and heat-related health problems), reducing urban flooding, improving air quality, increasing property values, and providing urban green spaces.

Per the Code of Maryland Regulations (COMAR) 26.08.02.01[75], “this State shall adopt water quality standards to: (1) Protect public health or welfare; (2) Enhance the quality of water; (3) Protect aquatic resources….” Stream “restorations” violate this section of the COMAR since these projects (1) harm public health by cutting community area trees, destroying their natural areas, increasing heat islands, decreasing air quality, and decreasing property values, while doing nothing to reduce pluvial (surface water) flooding in urban areas; (2) the science (Appendix 1) shows that these projects do not enhance the quality of water; and (3) empirical evidence (see photographs in Appendix 2) shows that aquatic resources are decimated by the clearcutting of riparian forests and operating heavy machinery within stream channels. Aquatic resources are further destroyed by some projects which create numerous dams which block the passage of aquatic organisms (see photographs in Appendix 3).

[73] https://dsd.maryland.gov/regulations/Pages/26.17.04.04.aspx
[74] https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Pages/WPRPFinancialAssurancePlans.aspx
[75] https://dsd.maryland.gov/regulations/Pages/26.08.02.01.aspx

Per MDE's boilerplate verbiage in its "Summary Basis for Decision" documents, as exemplified by one for the Green Bloom MV Development , LLC construction project application (22-NT-3292/202262014) dated March 19, 2024,[76] "The Environment Article, Annotated Code of Maryland and the Code of Maryland Regulations establish criteria for the Maryland Department of the Environment (Department or MDE) to consider when evaluating projects that propose to change the course, current or cross section of a nontidal stream or other body of water or to impact a nontidal wetland. If the criteria are satisfied, the Department may issue a permit for the proposed activity. The Department may deny a permit for a waterway construction activity that it believes is inadequate, wasteful, dangerous, impracticable or detrimental to the best public interest." (emphasis added).

MDE must deny permits for stream "restorations" since they are "inadequate" for the task of stopping stream erosion per the science (Appendix 1) and empirical evidence (photographs in Appendix 4). A meta-analysis by Palmer et. al. (2014)[77] of 644 stream "restorations" found that "Less than half of these projects showed improvements in channel stability compared with prerestoration regardless of how stability was measured and even though many of the projects involved the use of large boulders or other materials to hold the banks in place. …We show that a major emphasis remains on the use of dramatic structural interventions, such as completely reshaping a channel, despite growing scientific evidence that such approaches do not enhance ecological recovery, and the data we assembled (Table 2) suggest they are often ineffective in stabilizing channels when stability is the primary goal."

MDE must deny permits for stream "restorations" since they are "wasteful." MDE's 2022 Annual Report on Financial Assurance Plans (FAPs)[78] shows there are twenty non-destructive, out-of-stream practices that are more cost effective than stream "restorations." Stream "restorations" get washed out (see photographs in Appendix 4) and taxpayer dollars must then be spent to repair or replace them since the typical industry stream "restoration" guarantee is only one year, after which tax dollars must be spent on repairs.

MDE must deny permits for stream "restorations" on the basis that they are clearly "detrimental to the best public interest" since:

(1) the science (Appendix 1) says that stream "restorations" do not work,

(2) these projects get washed out (see Appendix 4) and taxpayer dollars must be spent to repair or replace them because the typical industry stream "restoration" guarantee is only for one year, after which tax dollars must be spent on repairs,

[76] Green Bloom MV Development, LLC, 22-NT-3292/202262014, March 19, 2024

[77] Palmer, M. A., K. L. Hondula, and B. J. Koch, 2014, "Ecological Restoration of Streams and Rivers: Shifting Strategies and Shifting Goals,", Annu. Rev. Ecol. Evol. Syst. 2014. 45:247-269. (https://akottkam.github.io/publications/Palmerpublications/Palmer2014a.pdf )

[78] https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Pages/WPRPFinancialAssurancePlans.aspx

(3) MDE's 2022 Annual Report on Financial Assurance Plans (FAPs)[79] shows there are twenty non-destructive, out-of-stream project types that are more cost effective than stream "restorations," and

(4) stream "restorations" result in cutting community area trees, destroying community area natural areas, increasing heat islands, decreasing air quality, and decreasing property values, while doing nothing to reduce pluvial (surface water) flooding in urban areas or to provide urban green spaces.

Per the Code of Maryland Regulations (COMAR) 26.08.02.10 paragraph A (1)[80], "The Federal Act prohibits the issuance of a federal permit or license to conduct any activity which may result in any discharge to navigable waters unless the applicant provides a certification from this State that the activity does not violate State water quality standards or limitations." Section 401 of the Clean Water Act (CWA) has the same requirement.

Maryland Water Quality Standards are in COMAR Online[81] sections 26.08.01 and 26.08.02.

Per COMAR 26.08.02.01[82],

".01 Surface Water Quality Protection.

A. Purpose. To protect surface water quality, this State shall adopt water quality standards to:

(2) Enhance the quality of water;

(3) Protect aquatic resources;"

It is abundantly clear that stream "restoration" projects violate Maryland water quality standards since they fail to meet the above standards as explained below:

(2) Failure to enhance the quality of water:

- Stream "restorations" do not enhance the quality of water according to the published scientific literature (Appendix 1). Studies by Palmer, Hilderbrand, Carr, and Southerland that analyzed over 700 projects concluded that stream "restorations" do not improve water quality.

(3) Failure to protect aquatic resources:

- See the above section titled "Impact of stream 'restorations' on project sites" that discusses the negative impacts of stream "restorations" including tree & ecosystem services loss, temperature Impacts, biologic, habitat, and water quality impacts, and inundation Impacts from Floodplain Reconnection.

[79] https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Pages/WPRPFinancialAssurancePlans.aspx
[80] https://dsd.maryland.gov/regulations/Pages/26.08.02.10.aspx
[81] https://dsd.maryland.gov/Pages/COMARHome.aspx
[82] https://dsd.maryland.gov/regulations/Pages/26.08.02.01.aspx

- Stream "restorations" do not protect aquatic resources - in fact they do quite the opposite. Most stream "restoration" projects place in-stream structures such as cross veins and step pool dams which alter the physical aquatic habitat and impede aquatic life movement. See photos in Appendix 3.
- Stream "restorations dump imported material into stream channels for the floodplain reconnection "fill" method. This changes the physical channel substrate into one which is foreign and possibly inhospitable to aquatic organisms at that site.
- During stream "restoration" construction, the entire stream is pumped around a site through pipes. According to a USDA National Engineering Handbook titled "Stream Restoration Design," "Aquatic life would either be prevented from passing the project or pulverized by the pumps."[83]

Per COMAR 26.08.02.03-3 Water Quality Criteria Specific to Designated Uses,[84] and MDE's web site[85], the water quality criteria, or standards, is different for each of the designated uses:

A. Class I Waters — Water Contact Recreation and Protection of Nontidal Warmwater Aquatic Life.
B. Subcategory Class I-P Waters — Water Contact Recreation, Protection of Nontidal Warmwater Aquatic Life and Public Water Supply
C. Class II Waters — Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting
D. Class III Waters — Nontidal Cold Water
E. Class III-P Waters — Nontidal Cold Water and Public Water Supplies
F. Class IV Waters — Recreational Trout Waters
G. Class IV-P Waters — Recreational Trout Waters and Public Water Supplies
H. Public Water Supply Reservoirs

However, regardless of the official designated use, and therefore the legal water quality criteria , of the stream in which a stream "restoration" project is constructed, Maryland residents expect that their water quality be protect to the maximum extent.

Clearcutting riparian forests for stream "restorations" increases water temperature by exposing formerly shaded streams to full sun (see examples in Appendix 2) which reduces dissolved oxygen concentration. The introduction of foreign material including wood chips, rocks, and soil changes water pH. Grading of stream banks exposes soil to erosion, and removal of course woody debris, root balls, and tree stumps allow forest soil to be more easily eroded which increases water turbidity. It is clear that temperature, dissolved oxygen concentration, pH, and turbidity are negatively affected to the extent that stream "restorations" violate COMAR 26.08.02.03-3 Water

[83] "Stream Restoration Design," National Engineering Handbook, Part 654,August 2007, United States Department of Agriculture, Natural Resources Conservation Service, Case Study 6, p. CS6–13.
[84] https://dsd.maryland.gov/regulations/Pages/26.08.02.03-3.aspx
[85] https://mde.maryland.gov/programs/Water/TMDL/WaterQualityStandards/Pages/wqs_designated_uses.aspx

Quality Criteria Specific to Designated Uses,[86] and therefore disqualify steam "restorations" from Water Quality Certification (COMAR 26.08.02.10).[87]

## Stream "restorations" violate MDE permits

### MDE Non-tidal Wetlands and Waterways Permit / Water Quality Certification (CWA Section 401 WQC)

COMAR 26.08.02.10[88] has Maryland's regulations governing the processing and issuance of Water Quality Certifications (WQC)s. It states that "The Federal Act prohibits the issuance of a federal permit or license to conduct any activity which may result in any discharge to navigable waters unless the applicant provides a certification from this State that the activity does not violate State water quality standards or limitations." (emphasis added).

MDE's Wetlands & Waterways Program issues Water Quality Certifications (WQCs)[89] for stream "restoration" projects. Per MDE's document titled "Key Elements for a Request for a …Water Quality Certification…,"[90] among the key elements required to be submitted to MDE as part of a 401 WQC request, per sections 1(h)(i)(a) and 1(i), is "A description of any other aspect associated with construction and operation of the activity that would affect the chemical composition, temperature, flow, or physical aquatic habitat of the surface water." (emphasis added).

Clearly, stream "restorations" negatively affect the chemical composition, temperature, flow, or physical aquatic habitat of the surface water, as described below, and therefore should not qualify for a WQC.

**Chemical composition**

Soil grading of the stream bed and banks that occurs during stream "restorations" disturbs the existing geochemical and biogeochemical functions of the existing soils which in turn affects water. The introduction into streams of imported wood chips, boulders, cobbles, gravel, and soil also modifies the local geochemistry of water. See photographs in Appendices 2 and 3.

Although iron flocculate is a natural phenomenon in some locations, some stream "restoration" projects cause an unnatural amount of iron flocculate to be generated in streams that was not previously present (or present in much smaller amounts) pre-construction. Per Tom Jordan, a senior scientist with the Smithsonian Environmental Research Center referring to a stream "restoration" in Muddy Creek in Edgewater, Anne Arundel, "The restoration had another unexpected effect — and not for the better. Portions of the stream have turned a rusty color, a symptom of iron leaching out of the rehydrated soil around it. The iron oxidizes when it comes in contact with the air at the water's surface. The bacteria

[86] https://dsd.maryland.gov/regulations/Pages/26.08.02.03-3.aspx
[87] https://dsd.maryland.gov/regulations/Pages/26.08.02.10.aspx
[88] Ibid.
[89] https://mde.maryland.gov/programs/Water/WetlandsandWaterways/Pages/WQC.aspx
[90] https://mde.maryland.gov/programs/water/WetlandsandWaterways/Documents/WQC/Key%20Elements_rev.%20Nov.%202023.pdf

that feed on the iron deplete the oxygen in the water."[91] This can create dead zones which result in fish kills.

An EA Engineering, Science, and Technology report for the Chesapeake Bay Trust[92] says that another paper by Williams, Wessel, and Filoso[93] reports that an observation on streams that have been restored following RSC design is the presence of iron flocculate. They say that the RSC technique and constructed wetlands favor the generation of iron flocculate.

Also per the EA Engineering, Science, and Technology, Inc. report, "In addition to concerns regarding the aesthetics of iron flocculate in streams, there is also the potential that iron in streams may impact the biological community (Kotalik et al. 2019)."[94] [95]

According to Fraley-McNeal et. al (2022),[96] "Recent work by Wood et al. (2021) and Kaushal et al. (2021) demonstrated that tree removal during stream restoration construction can trigger sub-surface fluxes of nutrients out of the riparian zone and into the stream…." This change in chemical composition defeats the purpose of the stream "restoration" which is to decrease nutrients in the stream.

Also, according to Fraley-McNeal et. al (2022),[97] "…it is clear that the removal of mature trees during restoration physically alters the available habitat in a stream-riparian system, and those physical alterations have coincidental effects on stream-water chemistry. Both of these restoration-related changes—physical and chemical—affect the biological uplift provided by a restored stream."

**Temperature**

Per Fraley-McNeal et. al (2022),[98] "Loss of existing trees in the riparian zone from stream restoration implementation occurs either through direct removal during construction or mortality afterwards due to increased groundwater elevations and/or extended inundation of the floodplain, [soil] compaction, and

[91] BAY SCIENTISTS SAY STREAM RESTORATION NOT DELIVERING AS MUCH AS HOPED
By Maryland Reporter | November 28, 2018, https://marylandreporter.com/2018/11/28/bay-scientists-say-stream-restoration-not-delivering-as-much-as-hoped/

[92] FINAL REPORT ON TEMPORAL TRENDS OF IRON IN STREAMS AND EFFECTS TO STREAM COMMUNITIES
Prepared for: The Chesapeake Bay Trust, September 1, 2021 – Final, https://cbtrust.org/wp-content/uploads/Final_Field-Report_1-Sept.pdf

[93] Williams, M.R., B.M. Wessel, and S. Filoso. 2016. Sources of iron (Fe) and factors regulating the development of flocculate from Fe-oxidizing bacteria in regenerative streamwater conveyance structures. Ecological Engineering 95: 723 – 737. https://repository.library.noaa.gov/view/noaa/33104

[94] FINAL REPORT ON TEMPORAL TRENDS OF IRON IN STREAMS AND EFFECTS TO STREAM COMMUNITIES
Prepared for: The Chesapeake Bay Trust, September 1, 2021 – Final, https://cbtrust.org/wp-content/uploads/Final_Field-Report_1-Sept.pdf

[95] Kotalik, C.J., Cadmus, P., and W.H. Clements. 2019. Indirect Effects of Iron Oxide on Stream Benthic Communities: Capturing Ecological Complexity with Controlled Mesocosm Experiments. Environ. Sci. Technol., 53, 11532−11540.

[96] Fraley-McNeal, L. et al. (2022), "Maintaining Forests in Stream Corridor Restoration and Sharing Lessons Learned," Center for Watershed Protection; https://owl.cwp.org/mdocs-posts/maintaining-forests-in-stream-corridor-restoration-and-sharing-lessons-learned-final-report/

[97] Ibid.

[98] Ibid.

root disturbance from construction activities. …There is a direct link between riparian forests and stream temperature, which is a critical metric of stream health."

Also, per Fraley-McNeal et. al (2022),[99] "Protecting thermal regimes in streams is important for a variety of reasons, including maintaining spawning habitat and healthy conditions for fish, reducing algal growth, reducing populations of parasites that favor warmer temperatures, and regulating nutrient/carbon/oxygen dynamics, since temperature affects the dynamics of many gaseous and aqueous compounds (Demars et al., 2011; Mayer et al., 2010; Wilkerson et al., 2006). …There is evidence that stream temperatures increase post-restoration (Fanelli et al., 2017; Sudduth et al., 2011). …canopy reduction still impacts stream-water temperatures." (emphasis added).

According to Van Meter et. al., (2016), "Human impacts can contribute to increases in stream temperature, often with negative consequences for aquatic organisms adapted to cooler temperature regimes (Moore et al., 2005; Bowler et al., 2012; Nichols et al., 2014)."[100]

**Flow**

Per Fraley-McNeal et. al (2022),[101] "It is important to note that the term 'restoration' can be misleading because it has the connotation that the stream will be returned to a historical condition, which is often not possible due to changes in hydrology, soils, flow and general pattern and profile." (emphasis added).

Also, Per Fraley-McNeal et. al (2022),[102] "Each of these primary drivers—streamflow, channel width, and riparian cover—are typically impacted in some way by stream restoration projects." (emphasis added)

Appendix 3 has photos of stream "restorations" that change water flow and thus impede aquatic life movement. Most stream "restoration" projects place in-stream structures such as cross veins and step pool dams that change water flow which impedes aquatic life movement.

**Physical aquatic habitat**

Most stream "restoration" projects place in-stream structures such as cross veins and step pool dams which alter the physical aquatic habitat and impede aquatic life movement. See photos in Appendix 3. In addition, stream "restorations" dump imported material into stream channels for the floodplain reconnection "fill method," a.k.a. "Raising the Stream Bed." This changes the physical channel substrate into one which is foreign and possibly inhospitable to aquatic organisms at that site.

[99] Ibid.
[100] K. Van Meter, ... N.B. Basu, (2016), "Human Impacts on Stream Hydrology and Water Quality" in Stream Ecosystems in a Changing Environment, Academic Press, ISBN 978-0-12-405890-3
[101] Ibid.
[102] Ibid.

According to Fraley-McNeal et. al (2022),[103] "…it is clear that the removal of mature trees during restoration physically alters the available habitat in a stream-riparian system, and those physical alterations have coincidental effects on stream-water chemistry. Both of these restoration-related changes—physical and chemical—affect the [potential] biological uplift provided by a restored stream."

**As describe above, since stream "restorations" negatively affect the chemical composition, temperature, flow, or physical aquatic habitat of the surface water, they should not qualify for MDE Water Quality Certification.**

## MDE Water Quality Certification using Maryland State Programmatic General Permit-6 (MDSPGP-6)[104]

Per the MDE Water Quality Certification using Maryland State Programmatic General Permit-6 (MDSPGP-6)[105], "Activities authorized by the MDSPGP-6 must be components of a single and complete project, including all attendant features both temporary and permanent, which individually and cumulatively result in no more than minimal adverse environmental impacts."[106] (emphasis added).

It is clear from the science (Appendix 1) and empirical evidence (see photographs in Appendices 2, 3, and 4) that stream "restoration projects result in much more than minimal adverse environmental impacts.

In addition, the following statements from subject matter experts make clear that stream "restorations" result in more than minimal adverse environmental impacts:

- "…years of ecosystem maturation may be needed before a project fully meets its long-term restoration objectives and realizes its full environmental benefits[107] (Kaushal et al., 2021[108]; Wood et al., 2021[109])."

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[103] Ibid.
[104] https://mde.maryland.gov/programs/water/WetlandsandWaterways/Pages/MDSPGP-6-Reissuance.aspx
[105] https://mde.maryland.gov/programs/water/WetlandsandWaterways/Documents/WQC/Mar2021_Final_signed_WQCGP6.pdf
[106] Ibid.
[107] Fraley-McNeal, L. et al. (2022), "Maintaining Forests in Stream Corridor Restoration and Sharing Lessons Learned," Center for Watershed Protection; https://owl.cwp.org/mdocs-posts/maintaining-forests-in-stream-corridor-restoration-and-sharing-lessons-learned-final-report/
[108] Kaushal, S. S., Wood, K. L., Vidon, P. G., & J. G. Galella. 2021. Tree Trade-Offs in Stream Restoration Projects: Impact on Riparian Groundwater Quality. A Report Submitted to the Chesapeake Bay Trust. Retrieved from: https://cbtrust.org/wp-content/uploads/Tree-Trade-off_University-of-Maryland-College-Park_Kaushal_final_report_032921.pdf
[109] Wood, D., Schueler, T., and B. Stack. 2021. A Unified Guide for Crediting Stream and Floodplain Restoration Projects in the Chesapeake Bay Watershed. https://chesapeakestormwater.net/wp-content/uploads/dlm_uploads/2021/10/Unified-Stream-Restoration-Guide_FINAL_9.17.21.pdf

- Per scientist Robert Hilderbrand, "…it's going to take decades for those trees to become re-established."[110]
- DC-area botanist John Parrish (formerly with the National Park Service Center for Urban Ecology, past vice president of the Maryland Native Plant Society, currently serving on the Boards of Conservation Montgomery and the Friends of Ten Mile Creek) has said, "Planting groups of trees on open ground to mitigate forest loss cannot replicate the loss of long-established forest soils, structure and biodiversity of forests destroyed by development. …It will take 100 years or more for a forest to develop soils and structure capable of sustaining a full complement of native plants and animals."[111]

**Therefore, stream "restorations" do not qualify for MDE Water Quality Certification using Maryland State Programmatic General Permit-6.**

## Scientific evidence that stream "restorations" do not work

Certainly, everyone promoting and approving stream "restorations," including MDE, MDOT SHA, and the USACE, is familiar with the published scientific literature (see Appendix 1) showing that these projects do not work to either stabilize streams or improve the ecology. It appears that stream "restoration" proponents are either ignorant of the science or simply choose to ignore the science.

Scientific evidence that stream "restorations" do not work includes:

- A meta-analysis of 644 projects by M. Palmer et al. who said, "We show that a major emphasis remains on the use of dramatic structural interventions, such as completely reshaping a channel, despite growing scientific evidence that such approaches do not enhance ecological recovery, and the data we assembled (Table 2) suggest they are often ineffective in stabilizing channels when stability is the primary goal."[112] They also showed that water quality does not improve, that biology does not improve, and that ecology does not improve.
- R. Hilderbrand's meta-analysis of 40 Natural Channel Design (NCD)- and Regenerative Stormwater Conveyance (RSC)-type projects that concluded, "There simply were few ecological differences between restored and unrestored sites. In fact, the unrestored

[110] "Stream restoration techniques draw pushback; Some scientists, environmentalists, residents question wisdom of tree removal;" by Timothy B. Wheeler Oct 7, 2020, Chesapeke Bay Journal, https://www.bayjournal.com/news/pollution/stream-restoration-techniques-draw-pushback/article_ffc96960-0895-11eb-b36f-efa466158524.html

[111] Public Hearing Testimony to the Montgomery County Council, RE: Bill 25-22 Forest Conservation – Trees (Oct. 4, 2022 Public Hearing), by John Parrish

[112] Palmer, M. A., K. L. Hondula, and B. J. Koch, University of MD, 2014, "Ecological Restoration of Streams and Rivers: Shifting Strategies and Shifting Goals,", Annu. Rev. Ecol. Evol. Syst. 2014. 45:247-269. (https://akottkam.github.io/publications/Palmerpublications/Palmer2014a.pdf )

sections upstream [from the restoration sites] were often ecologically better than the restored sections or those downstream of restorations."[113]

- A meta-analysis of 30 projects by Carr et. al. concluding that the ecology did not improve.[114]
- An analysis of 11 streams In Anne Arundel County by Southerland et. al. showing that the biology did not improve.[115]

In addition, Montgomery County Department of Environmental protection has admitted that none of their past 56 projects[116] starting in 1992 improved stream ecology.[117]

Some might say they have seen an article or have anecdotal evidence showing that a particular restoration project worked. It would not be surprising if the odd project was successful in terms of nitrogen, phosphorous, and sediment reduction, and maybe even biological uplift. But the meta-analyses of over 700 projects referenced above (in Appendix 1) show that any successful projects are outliers - the rare exception rather than the rule. It is the rule that establishes the science, not one-offs.

## The myth that streams can be "restored" to pre-colonial conditions

Any arm waving about the need to "restore" streams to pre-colonial conditions before legacy sediments[118] were added to stream valleys during the era of colonial-era upland erosion and mill dams ignores the reality that this is impossible given the current level of watershed development and

[113] Hilderbrand, Robert H., et. al.,2020, "Quantifying the ecological uplift and effectiveness of differing stream restoration approaches in Maryland," Final Report Submitted to the Chesapeake Bay Trust for Grant #13141, (https://cbtrust.org/wp-content/uploads/Hilderbrand-et-al_Quantifying-the-Ecological-Uplift.pdf)

[114] Carr, J., Hart, D., McNair, J., 2006, "Compilation and Evaluation of Stream Restoration Projects: Learning from Past Projects to Improve Future Success," The Patrick Center for Environmental Research, The Academy of Natural Sciences of Drexel University, Report Submitted to the William Penn Foundation. https://ansp.org/research/environmental-research/projects/restoration/

[115] Southerland, Mark, et. al., 2021, "Vertebrate Community Response to Regenerative Stream Conveyance (RSC) Restoration as a Resource Trade-Off," Award: 18002 CBT Restoration Research Grant to Tetra Tech and UMCES-Chesapeake Biological Laboratory; https://cbtrust.org/wp-content/uploads/FINAL-Report-for-18002-Tetra-Tech-CBL-CBT-RR-Vertebrates-in-RSCs-30SEP2021-Submitted-to-CBT.pdf

[116] Montgomery County, Maryland Department of Environmental Protection, Watershed Restoration Projects, https://apps2.montgomerycountymd.gov/MCGSPApps/Project.aspx?id=2, searched on "stream Restoration" for COMPLETED projects.

[117] Montgomery County Department of Environmental Protection presentation Stormwater Partners Network on January 16, 2024. ""We have not seen benthic [macroinvertebrate] improvement in any of our stream restorations." BMIs are a standard measure of stream health.

[118] McMahon, P., et. al., (2021), "Effects of stream restoration by legacy sediment removal and floodplain reconnection on water quality," Environ. Res. Lett. 16 (2021) 035009, https://doi.org/10.1088/1748-9326/abe007

population size. The same is true of the Bay itself per the recent Chesapeake Bay Program's STAC report known as CESR on achieving water quality goals.[119]

Fraley-McNeil et. al. (2022) point out that "It is important to note that the term "restoration" can be misleading because it has the connotation that the stream will be returned to a historical condition, which is often not possible due to changes in hydrology, soils, flow and general pattern and profile."[120]

## MDOT SHA's numerous false claims about stream "restoration"

From MDOT SHA's false claims as documented below, it appears that SHA either knows what the scientific literature concludes and disregards it, or they have not bothered to educate themselves on the science. Either way, the result is that they are spewing misinformation and disinformation to the public which is a breach of their professional responsibilities and a breach of the public trust.

MDOT SHA cries crocodile tears that they are concerned about the environment when they are apparently only trying to meet their MS4 permit regardless of the environmental consequences.

### MDOT SHA falsely claims that stream "restorations" are safer to construct than out-of-stream projects.

SHA grasps at straws to justify their use of stream "restorations." For example, they say one reason they prefer stream "restorations" over roadside bioretentions is safety, since someone was killed by a car during a roadside bioretention construction.[121] While this is certainly tragic, it is a radical conclusion to say that bioretention construction is an unsafe endeavor based on one incident. Did SHA examine their roadside safety protocols after this accident? What is the SHA's safety record for steam "restorations" compared to out-of-stream practices?

### MDOT SHA falsely claims that stream "restoration" science is out of date and in its early stages.

[119] Chesapeake Bay Program report: Scientific and Technical Advisory Committee (STAC). (2023). Achieving water quality goals in the Chesapeake Bay: A comprehensive evaluation of system response [CESR] (K. Stephenson & D. Wardrop, Eds.). STAC Publication Number 23-006, Chesapeake Bay Program Scientific and Technical Advisory Committee (STAC), Edgewater, MD. 129 pp. https://www.chesapeake.org/stac/wp-content/uploads/2023/05/CESR-Final-update.pdf

[120] Fraley-McNeal, L. et al. (2022), "Maintaining Forests in Stream Corridor Restoration and Sharing Lessons Learned," Center for Watershed Protection; https://owl.cwp.org/mdocs-posts/maintaining-forests-in-stream-corridor-restoration-and-sharing-lessons-learned-final-report/

[121] Personal communication with MDOT SHA on 6/4/2024 at public hearing for MDOT SHA MS4 permit.

In a crude attempt to deflect from the facts, MDOT SHA made the false claim that scientific references showing that stream "restorations" do not work are both out-of-date and "very early science," implying that it is still inconclusive.[122] Following up on that claim, a request was made to SHA: "In a continuing effort to educate myself on all sides of the issue, would you be able to send me links to papers you are aware of showing that stream restorations improve water quality, stabilize banks, or provide ecological/biological uplift?"[123] Rather than substantiating their position with scientific evidence, MDOT SHA's response was simply, "…I can't spend too much more time…."[124]

MDOT SHA's refusal to provide any scientific meta-analyses of projects showing that stream "restorations" improve conditions should be interpreted that such data does not exist. Indeed, a search of the literature did not find any studies showing that most stream restorations improve water quality, stabilize banks, or provide ecological/biological uplift. In contrast, a subset of papers cited in Appendix 1 surveyed over 700 projects and concluded that stream "restorations" do not work. It should be emphasized that the results of a few projects that show positive results do not constitute established science.

The following is a total list of references in Appendix 1 showing that they are span the time from fairly recent to the past eighteen years. This puts the lie to SHA's assertion that scientific references showing that stream "restorations" do not work are both out-of-date and "very early science."

- Carr, J., Hart, D., McNair, J., 2006.
- Hilderbrand, Robert H., et. al.,2020.
- Jepsen, R., Caraco, D., Fraley-McNeal, L, Buchanan, C., and Nagel, A. 2022.
- Kaushal, Sujay S. et. al., 2018.
- Laub, B.G, McDonough, O.T, Needelman, B.A., Palmer, M.A., 2013.
- McNeal, L. F., Stack, Bill, et. al., 2021
- Palmer, M.A., H.L. Menninger, and E. Bernhardt. 2010.
- Palmer, M. A., K. L. Hondula, and B. J. Koch, 2014
- Pedersen ML, Kristensen KK, Friberg N, 2014.
- Smith, Charles, Jonathan Witt, 2023
- Southerland, Mark, et. al., 2021
- Thompson, Tess, and Eric Smith. 2021

## MDOT SHA falsely claims that "stream restoration and the science behind it is in their infancy."

MDOT SHA falsely claims "…that stream restoration and the science behind it is in their infancy…."[125] The implication is that the existing science cannot possibly render judgement on the practice of stream

[122] Ibid.
[123] Email to MDOT SHA on 6/5/2024.
[124] Email from MDOT SHA on 6/5/2024.
[125] Ibid

"restoration." Yet the industry and government agencies have been constructing stream "restorations" with accelerating frequency as if it is established science.

Contrary to what MDOT SHA may choose to believe, the practice of stream "restoration" is decades old, and science of stream "restoration" analysis has a long history – see the above section.

Dave Rosgen, the "god-father" of stream "restoration" by Natural Channel Design, published a paper titled "A classification of the Wetlands Engineering and of natural rivers"[126] and "Applied River Morphology"[127] back in 1994 and 1996 respectively. Another paper was published in 1992 by Berg.[128] There are many, many others.

In Maryland alone, hundreds of miles of stream have already been "restored"[129] (unfortunately with dismal results). "Since 2014, Maryland has permitted more than 600 projects and Virginia more than 300. …States and localities once anticipated doing 655 miles of stream work by 2025 but are now planning to complete 900 miles by that time, Bay Program data show. The estimated total cost: $500 million."[130] This is not a practice in its "infancy."

Likewise scientific research on the results of stream "restorations" goes back decades. Appendix 1 is a list of only the more recent meta studies. Palmer (2014)[131] alone cites 138 papers.

Another example is the work of the Mayer, Kaushal, et. al. team that has had 50 stream "restoration" related publications in 20 years.[132]

If MDOT SHA claims that we do not have enough science to judge the efficacy of stream "restorations," then it is promoting their use without any scientific justification.

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[126] Rosgen, D. L. 1994. A classification of the Wetlands Engineering and of natural rivers. Catena 22:169-199.
[127] Rosgen, D.L. (1996). Applied River Morphology. Pagosa Springs, CO: Wildland Hydrology
[128] Berger, J.J. (1992). The Blanco River. In Restoration of Aquatic Ecosystems: Science, Technology, and Public Policy. Washington, DC: National Academy Press
[129] https://mde.maryland.gov/programs/Water/Pages/Stream_Restoration.aspx
[130] "Stream restoration techniques draw pushback Some scientists, environmentalists, residents question wisdom of tree removal," Timothy B. Wheeler Oct 7, 2020, Bay Journal, https://www.bayjournal.com/news/pollution/stream-restoration-techniques-draw-pushback/article_ffc96960-0895-11eb-b36f-efa466158524.html
[131] Palmer, M. A., K. L. Hondula, and B. J. Koch, University of MD, 2014, "Ecological Restoration of Streams and Rivers: Shifting Strategies and Shifting Goals,", Annu. Rev. Ecol. Evol. Syst. 2014. 45:247-269. (https://akottkam.github.io/publications/Palmerpublications/Palmer2014a.pdf )
[132] Mayer, P. and Kaushal, S., "Water quality effects of stream restoration in the Chesapeake Bay watershed: benefits, trade-offs, and unintended consequences," presentation, Chesapeake Bay Program STAC Workshop: "The State of the Science and Practice of Stream Restoration in the Chesapeake: Lessons Learned to Inform Better Implementation, Assessment and Outcomes," March 21, 2023 - March 23, 2023, Woodbridge, VA, https://www.chesapeake.org/stac/wp-content/uploads/2023/04/Mayer-Paul-Water-Quality.pdf

**MDOT SHA falsely claims that not enough time has passed to demonstrate stream "restoration" biological uplift on any project.[133]**

This is an unsubstantiated claim. Would MDOT SHA have us wait 100 years before ruling on the success or failure of a stream "restoration"? If MDOT SHA believes that not enough time has passed to allow recovery from a stream "restoration," then MDE should rule that no more stream "restorations" be permitted for the next 100 years or until the results of past projects can be determined. This is the way real science is performed: an experiment is done, and then the results of that experiment are analyzed before performing the next experiment.

Plus, page 11 of the MDOT SHA MS4 permit draft[134] states that "The permittee must demonstrate functional lift and stability by comparing pre-construction and post-construction ecological functions and conditions using an FCAM[135] for three (3) years following construction completion." Clearly, MDE believes that uplift can de demonstrated within three years.

(Others have suggested that neither FIBI nor BIBI may be the appropriate indicator of biological uplift, but no other tests have been deemed acceptable by MDE.)

If SHA claims that more time is needed for stream "restorations" to exhibit biological uplift, then MDE should analyze results from the past stream "restoration" projects from SHA and others and publish the results showing uplift (or not) over time. If it turns out that proof of biological uplift cannot be determined for 5 or 10 years, for example, then credits must be withheld for that long. In the meantime, MDE should pause new projects before falsely claiming success and then permitting new stream "restoration" projects.

Having claimed that not enough time has passed to demonstrate stream "restoration" uplift on any project[136], MDOT SHA contradicts themselves by claiming that "We also know stream structure/function can be improved through restoration, thereby increasing ecological lift potential."[137] There is no scientific data that supports this claim.

**MDOT SHA falsely claims that "…gauging success [of stream "restorations"] may be difficult…."**

[133] Personal communication with MDOT SHA at 6-4-2024 MS4 permit hearing.
[134] MDOT SHA Permit https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Documents/MS4/SHA/TD%20MS4%20Permit%20MDOT%20SHA_4-19-2024.pdf
[135] a Corps approved Functional or Conditional Assessment Methodology (FCAM) or BIBI Score https://www.nab.usace.army.mil/Portals/63/APPENDIX%202%20Self-Verification_1.pdf
[136] Personal communication with MDOT SHA at 6-4-2024 MS4 permit hearing
[137] Email from MDOT SHA on 6/5/2024.

MDOT SHA falsely claims that "…gauging success [of stream "restorations"] may be difficult, as there are many uncontrollable variables in a stream system."[138]

Gauging success of stream "restorations" is quite easy in practice. One measures pre-construction conditions (e.g., erosion rate and concentration of nitrogen and phosphorous in stream water during rain events) and compares that with post-construction conditions.

Page 11 of the MDOT SHA MS4 permit draft[139] states that "The permittee must demonstrate functional lift and stability by comparing pre-construction and post-construction ecological functions and conditions using an FCAM[140] for three (3) years following construction completion." Clearly, MDE believes that uplift can de demonstrated within three years.

Even though MDOT SHA says that gauging success is difficult, they seem to have no trouble proclaiming that all of their steam "restorations" have been outstanding successes. But given the disastrous results of SHA's stream "restoration" at the Longfellow site in Columbia as part of the Upper Little Patuxent Stream Restoration, SHA is talking out of both sides of their mouth.

If MDOT SHA believes that gaging success of stream "restorations" is so difficult, how can they claim that "We know stream restoration stabilizes banks, thereby reducing onsite erosion and the loss of pollutants"[141]?

## MDOT SHA falsely claims benefits of floodplain reconnection by stream "restorations."

First, SHA fails to acknowledge that not all streams have or historically had floodplains and that it would not be advisable to create a floodplain where none existed before. This could lead to the destruction of existing non-floodplain ecosystems and their ecosystem services. For example, per Rod Simmons, City of Alexandria Natural Resources Manager, regarding a globally and state rare Acidic Seepage Swamp along the south bank of Taylor Run at Chinquapin Park in the City of Alexandria, "Despite some protection from encroachment, natural channel design will destroy this ground-water controlled, non-alluvial wetland by creating an artificial floodplain were none naturally exists and using the non-alluvial wetland as an alluvial habitat to be washed out by overland flooding regimes."[142]

Most stream "restorations" include a bogus effort to "reconnect" the stream to its floodplain. This is almost always recommended whether or not a stream historically had a floodplain – it is a solution looking for a problem. This stream "restoration" technique requires either dumping fill material into the

[138] Email exchange with MDOT SHA on 6/5/2024.
[139] MDOT SHA Permit https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Documents/MS4/SHA/TD%20MS4%20Permit%20MDOT%20SHA_4-19-2024.pdf
[140] a Corps approved Functional or Conditional Assessment Methodology (FCAM) or BIBI Score https://www.nab.usace.army.mil/Portals/63/APPENDIX%202%20Self-Verification_1.pdf
[141] Email from MDOT SHA on 6/5/2024.
[142] "Native Biodiversity Conservation and Restoration Challenges in Urbanized Areas," presentation to Pocahontas Chapter of the Virginia Native Plant Society, February 4, 2021

stream channel to raise its level, or clearcutting a steam valley forest and then removing tons of soil to lower the stream valley closer to the level of the stream. These methods allow more frequent overflowing of the stream bank onto a floodplain.

Proponents point out, correctly, that this would allow stormwater to spread out and slow down to allow some infiltration into the floodplain soils. They say this will reduce stream bank erosion, control flooding downstream, and keep pollutants out of the Bay. But this is only a temporary fix as explained below.

Floodplain reconnection is a futile and misguided attempt to recreate a pre-colonial environment. This is an impossible task given current watershed development and population growth compared to past centuries. Just as the recent CESR report from the Chesapeake Bay Program states that "The Bay of the future will be different from the Bay of the past because of permanent and ongoing changes in land use, climate change, population growth, and economic development,"[143] so will streams of the future be impossible to "restore" to pre-colonial conditions. Fraley-McNeil et. al. (2022) say that "It is important to note that the term "restoration" can be misleading because it has the connotation that the stream will be returned to a historical condition, which is often not possible due to changes in hydrology, soils, flow and general pattern and profile."[144]

Floodplain reconnection using the cut (or legacy sediment removal) method completely destroys the previously existing forest that may have been decades to hundreds of years old. The proponents always minimize the negative environmental impact of these projects.

Floodplain reconnection using the fill (raising the stream bed) method, the most common method used, is only a temporary fix. It typically requires tons of fill material to be dumped into the stream to raise the stream bed level. The problem is that this increases the elevation gradient along the stream which increases stream velocity, thus increasing erosion. Therefore, all the added fill material will eventually be eroded out because the root cause of the original erosion (stormwater runoff from imperious surfaces and fields fire hosing into streams) has not been controlled. Thus, any purported benefits of floodplain reconnection are short-lived.

According to fluvial geomorphologist Dr. John Field, adding sediment to the stream channel actually increases the slope compared to the original stream bed. The water still must get to sea level, so if the stream channel is raised, the slope increases somewhere, by definition. This increase in slope enables more erosion since the water flows faster. Adding sediment moves the stream away from equilibrium. As

[143] Scientific and Technical Advisory Committee (STAC). (2023). "Achieving water quality goals in the Chesapeake Bay: A comprehensive evaluation of system response," (K. Stephenson & D. Wardrop, Eds.). STAC Publication Number 23-006, Chesapeake Bay Program Scientific and Technical Advisory Committee (STAC), Edgewater, MD. https://www.chesapeake.org/stac/cesr/

[144] Fraley-McNeal, L. et al. (2022), "Maintaining Forests in Stream Corridor Restoration and Sharing Lessons Learned," Center for Watershed Protection; https://owl.cwp.org/mdocs-posts/maintaining-forests-in-stream-corridor-restoration-and-sharing-lessons-learned-final-report/

a result, such a project makes the stream less stable - meaning there will be more erosion - not more stable.[145]

Another negative effect of floodplain reconnection is that more frequent over-bank flooding will kill existing trees and other sometimes rare plant community types that cannot survive water-logged soil. Any replanted floodplain species (e.g., sycamore, box elder, etc.) will take decades to replace the ecological benefit (ecosystem services) of the original trees.

Yet another negative result of "floodplain reconnection" is that upland pollutants in stormwater such as road oil and salt, lawn pesticides, herbicides, lawn fertilizer, toxic tire dust, pet waste, and trash are washed into natural areas where they are harmful to humans, plants, and animals. All this can be avoided by simply keeping the uncontrolled stormwater out of streams in the first place using out-of-stream stormwater control practices such as rain gardens, bioretentions, tree planting, and permeable pavement.

For example, in a Wahington Post article, Trey Sherard with the nonprofit Anacostia Riverkeeper group said that "…rain gardens can intercept pollutants before they reach rivers. Sediment picked up by storm water can carry toxic compounds and cloud river water, harming aquatic plants and fish. Dog waste and trash can also get washed into local waterways."[146] Besides rain gardens, there are many other out-of-stream stormwater control practices in MDE's Accounting Guidance document for MS4 permit practices.[147]

Even when deeply incised streams are well below the level of the floodplain, trees on the floodplain still absorb vast amounts of water via evapotranspiration which helps dry out floodplain soil and lower the water table. This allows floodplain soil to absorb more stormwater during heavy rains and flooding events, like the ability of a slightly damp sponge to absorb more water than a fully saturated sponge. Clearcutting trees and shrubs in riparian areas and the floodplain during stream "restorations" (see photographs in Appendix 2) eliminates the ability of those plants to dry out the floodplain and lower the water table between rain events.

Stream "restorations" done with the floodplain reconnection method increase the frequency and duration of local flooding by design. However, causing a floodplain to flood more frequently can water-log the floodplain like a sopping wet sponge. The addition of more flood water during subsequent storms to the already saturated "sponge" results in the additional water just flowing off the floodplain, creating flooding problems for adjacent property owners or downstream. More floodplain flooding also increases risks to roads, bridges, and other infrastructure. What is the government liability for the resultant repair costs, human injuries, and loss of property value?

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[145] Adapted from Dr. John Field, Field Geology Services, from "Analysis of Taylor Run Stream Restoration Plan" in City of Alexandria, VA

[146] https://www.washingtonpost.com/climate-solutions/2023/12/10/rain-garden-cities/

[147] "Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated, Guidance for National Pollutant Discharge Elimination System Stormwater Permits," November 2021 https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Documents/Final%20Determination%20Dox%20N5%202021/MS4%20Accounting%20Guidance%20FINAL%2011%2005%202021.pdf

In addition, floodplain reconnection increases mosquito habitat when the receding water leaves behind pools of stagnant water. Maryland Department of Agriculture lists mosquito diseases as Dengue (Break-Bone Fever), Encephalitides, Malaria, Yellow Fever, and Zika.[148]

### MDOT SHA falsely claims universal acknowledgement of stream "restoration" benefits.

MDOT SHA falsely claims that, "We also know stream structure/function can be improved through restoration, thereby increasing ecological lift potential."[149] This is an example of gaslighting. MDOT SHA completely ignores the published science and hopes that the public and elected officials will accept SHA's unsubstantiated claims as if they were established fact. The public expects the truth, not greenwashing, from our government employees and officials.

### MDOT SHA falsely claims that "we may disagree on expectations of when biological improvement may occur (and if it is possible)."[150]

MDOT SHA offers this statement as a disagreement between well meaning people. However, this is not a disagreement about personal expectations. Biological improvement it is an absolute requirement of the Clean Water Act, and the science (Appendix 1) shows that stream "restorations" do not result in biological improvement.

### MDOT SHA falsely claims that "…the short term (geologically speaking) impacts are worth the long-term and downstream benefits."[151]

Again, MDOT SHA completely ignores the published science that there are no local long-term benefits from stream "restorations" (see Appendix 1). As was mentioned, stream "restorations" using the flood plain reconnection "fill" method will have no long-term benefits since all the added material used to raise the stream channel will eventually be eroded out because the root cause of the original erosion (stormwater runoff from imperious surfaces and fields) has not been controlled. Furthermore, there is no science that demonstrates any long-term downstream benefits to the Chesapeake Bay from stream "restorations."

### MDOT SHA falsely claims that stream "restorations" stabilize streams.

[148] https://mda.maryland.gov/plants-pests/Pages/mosquitoes_disease.aspx
[149] Email exchange with MDOT SHA on 6/5/2024.
[150] Email from MDOT SHA to K. Bawer on 6/5/2024.
[151] Ibid

MDOT SHA claims that "We know stream restoration stabilizes banks, thereby reducing onsite erosion and the loss of pollutants."[152] MDOT SHA was asked to provide documentation to support their claim, but they refused,[153] presumably because the scientific evidence does not exist.

It is a false statement that stream "restorations" stabilizes banks given the scientific literature (see Appendix 1) including studies by Palmer, Hilderbrand, Carr, and Southerland that analyzed over 700 projects and concluded that stream "restorations" do not improve water quality, do not improve - and sometimes degrade - the ecology, and that more than half are ineffective in stabilizing channels.

It is a question of when, not if, a stream "restoration" project will be washed-out by a post-construction storm event due to uncontrolled out-of-stream stormwater. Appendix 4 has photographs of washed-out stream "restoration" projects.

These projects are the gift that keeps on giving for the 25-billion-dollar stream "restoration" industry since their guarantee is typically only for one year. The industry knows that these projects will get washed out by future storms. After that, we the taxpayers pay for the repairs.

Some examples of Maryland projects that failed to stabilize stream banks shown in Appendix 4 include Josephs Branch in Kensington, Cabin John Creek near Montgomery Mall, Long Branch in Takoma Park, Snakeden Branch in Potomac, Bedfordshire Tributary in Potomac, Old Farm Creek in North Bethesda (scheduled to be repaired in 2024 for $800K), the Grosvenor Luxmanor project in North Bethesda (scheduled to be repaired in 2024 for $4.8M), Lower Booze Creek in Potomac (repaired for $3.6M), Northwest Branch in Silver Spring, Stony run in Baltimore City, and Annapolis Landing in Anne Arundel County.

Rather than literally buying into the cycle of construction and then repair (or, as MDOT SHA euphemistically calls it, "adaptive management") of failed stream "restorations" that have been washed out, this money should be spent on out-of-stream stormwater control projects such as bioretentions and conservation landscaping, to capture stormwater before it enters streams which removes the root cause stressor of stream erosion.

## MDOT SHA falsely claims upland (out-of-stream) stormwater control cannot stop stream erosion.

MDOT SHA falsely claims that "all the literature now" supports their assertion that upland (out-of-stream) stormwater control cannot stop stream erosion.[154] MDOT SHA specifically referenced[155] a study funded by a Chesapeake Bay Trust Restoration Research Grant by Thompson et al. titled, "Effectiveness

[152] Ibid
[153] Email exchange between MDOT SHA and K. Bawer on 6/5/2024.
[154] Personal communication with MDOT SHA on 6/4/2024 at public hearing for MDOT SHA MS4 permit
[155] Personal communication with MDOT SHA on 6/4/2024 at public hearing for MDOT SHA MS4 permit.

of stormwater management practices in protecting stream channel stability."[156] [157] SHA falsely claims that this study in Clarksburg, Maryland showed that everything that could have been done at that site to control stormwater was installed and yet the stream continued to degrade.

In reality, what this paper actually demonstrated was that out-of-stream stormwater control projects built to the minimum standards required by law were clearly insufficient. This research merely highlighted the need to build more out-of-stream stormwater control facilities and facilities that can treat higher volumes of stormwater in order to halt stream erosion.

The paper itself[158] concludes that, "current stormwater regulations …fall short in maintaining long-term channel stability. Specifically, model results, supported by field observations, demonstrate that neither [current standards for] distributed nor centralized SCMs [stormwater control measures], in isolation or in combination, could fully safeguard against channel degradation."

There are other papers cited by stream "restoration" proponents purporting to prove that upland stormwater control does not stop stream erosion. The papers in Appendix 5 were proffered by the Montgomery County Department of Environmental Protection to support that claim. However, the only conclusion that should be drawn from these additional papers is again that there were too few out-of-stream stormwater control projects and that they were inadequately sized to stop stream erosion. These papers area a tacit acknowledgement of the inadequacy of both past and current "meets minimum" stormwater control standards for larger storm events. There is nothing to stop a jurisdiction or SHA from requiring that stormwater control projects exceed the current minimum standards which are clearly insufficient to control today's larger stormwater events. There are bonus credits awarded by the MDE Accounting Guidance for greater than "meets minimum" BMP designs, but these are insufficient to discourage the use of stream "restorations" or to stop stream erosion.

Per Lisa Fraley-McNeal, Sr. Watershed & Stormwater Research Specialist, Center for Watershed Protection, "I don't know of any studies in larger watersheds where there was sufficient upland stormwater control to significantly reduce stream erosion."[159]

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[156] Thompson, Tess Wynn et al., (2023) "Effectiveness of stormwater management practices in protecting stream channel stability," presented at the 2023 Maryland Water Monitoring Council Annual Conference (11/17/2023). Not yet posted to https://cbtrust.org/grants/restoration-research/
From https://dnr.maryland.gov/streams/Documents/MWMC/AGENDA-MWMC-Annual-Conference-2023.pdf , link to presentation at https://drive.google.com/file/d/1isYAs58zVsLJ9H1VOiu4PvzMuYvSplf3/view

[157] Sami Towsif Khan, Theresa Wynn-Thompson, David Sample, Mohammad Al-Smadi, Mina Shahed Behrouz, Andrew J. Miller, 2024, "Effectiveness of stormwater control measures in protecting stream channel stability," Hydrological Processes, Volume 38, Issue 6, June 2024, https://onlinelibrary.wiley.com/doi/10.1002/hyp.15178

[158] Ibid

[159] Personal communication by MDOT SHA to K. Bawer on 3/28/2024

**MDOT SHA falsely claims that the amount of land required for upland (out-of-stream) stormwater control to stop stream erosion would require "half the houses" in a watershed to be removed and replaced by stormwater control facilities.[160]**

This is typical of the unsubstantiated FUD (fear, uncertainty, and doubt) factors thrown out by stream "restoration" proponents like SHA and the industry, without any evidence, to "prove" that there is never enough land available, in any scenario, for upland stormwater control to stop stream erosion. This is the type of outrageous fearmongering by stream "restoration" bigots that attempt to shut down any meaningful, fact-based discussion and analysis of out-of-stream stormwater control alternatives.

Apparently, SHA's standard modus operandi is:

- Pick a location for a proposed stream "restoration,"
- Never do a fact-based, alternative practices analysis having already concluded from their own speculation that there are not enough meets-minimum specification out-of-stream projects that could be done to stop the root cause of stream erosion at that selected stream "restoration" site, and
- Never abandon a proposed stream "restoration" project in favor of distributed, out-of-stream stormwater control projects that would protect natural areas, could be spread out over multiple watersheds to obtain the same amount of MS4 permit credits, and that would provide a long list of co-benefits unlike stream "restorations."

SHA would have us believe that its MS4 permit requires it to do stream "restorations" especially because SHA is so concerned about stopping stream erosion. But SHA is crying crocodile tears. They are merely using this mock concern for the environment to deflect criticism from their unreasonable refusal to garner MS4 permit credits using the most environmentally sound practices – out-of-stream stormwater control projects.

Another example of false FUD factors by the industry is to make the generic claim that upland stormwater control is impractical and too complicated due to all the underground pipes.[161] This is insulting to say that the professionals in our local governments do not know where utility pipes are located so that they can be avoided.

**MDOT SHA falsely claims that upland (out-of-stream) stormwater control projects lead to increased stream erosion.[162]**

MDOT SHA falsely claims that upland (out-of-stream) stormwater control projects lead to increased stream erosion since they "extend the hydrograph" (the rate of water flow versus time) by elongating the time during which a stream is subjected to erosive force as stormwater is released from a detention or

[160] Personal communication with MDOT SHA on 6/4/2024 at public hearing for MDOT SHA MS4 permit
[161] This was claimed by a steam "restoration" industry representative at the Prince George's County Stormwater Forum on 6/22/2023.
[162] Personal communication with MDOT SHA on 6/4/2024 at public hearing for MDOT SHA MS4 permit

retention pond. This incorrectly assumes upland detention and retention ponds cannot be designed to slowly release stormwater at non-erosive rates. MDOT SHA incorrectly concludes that "doing stormwater management can exacerbate the erosion" in streams rather than concluding that some stormwater management projects are poorly designed.

**MDOT SHA falsely claims that upland (out-of-stream) stormwater management facilities cannot prevent or reverse erosional processes in streams because there are no examples of upland (out-of-stream) stormwater management facilities that have prevented erosional processes in streams.**

SHA's basis for this assertion[163] that upland (out-of-stream) stormwater control cannot stop stream erosion is a single paper by Thompson, et al., (2023)[164]. There are other studies (see Appendix 5) also showing that sites with upland (out-of-stream) stormwater control have not stopped stream erosion.

The problem with this leap of faith – that upland stormwater control does not work - is that these studies only prove that installing 1) too few and 2) undersized stormwater management (SWM) facilities does not stop stream erosion. That is like saying that umbrellas cannot keep your head dry during a rainstorm when you only use a two-inch diameter umbrella.

SHA claims to be concerned with not just stopping stream erosion, but healing eroded streams - an issue totally outside their organization's mandate. That said, apparently they have not read a Chesapeake Bay Trust and MD DNR funded paper by Lisa Fraley McNeal, Bill Stack, et. al. (2021)[165] suggesting that eroded stream banks in Carroll County will self-recover after upland stormwater is controlled.

**MDOT SHA falsely claims that upland (out-of-stream) stormwater management does not help entrenched streams get back to a functioning system and will not heal the eroded channels except over geologic time.[166]**

SHA conflates two unrelated concepts: the purpose of the MS4 permit and the environmental health of streams. This is classic misdirection. The purpose of the MS4 permit is to keep pollutants in urban

[163] Personal communication with MDOT SHA on 6/4/2024 at public hearing for MDOT SHA MS4 permit.
[164] Thompson, Tess Wynn et al., (2023) "Effectiveness of stormwater management practices in protecting stream channel stability," presented at the 2023 Maryland Water Monitoring Council Annual Conference (11/17/2023) . Not yet posted to https://cbtrust.org/grants/restoration-research/
From https://dnr.maryland.gov/streams/Documents/MWMC/AGENDA-MWMC-Annual-Conference-2023.pdf , link to presentation at https://drive.google.com/file/d/1isYAs58zVsLJ9H1VOiu4PvzMuYvSplf3/view
[165] The Self-Recovery of Stream Channel Stability in Urban Watersheds due to BMP Implementation" by Lisa Fraley McNeal, Bill Stack, et. al. https://cwp.org/the-self-recovery-of-stream-channel-stability-in-urban-watersheds/ and https://cbtrust.org/wp-content/uploads/Self_Recovery_of_Stream_Channel_Stability_Final_Draft_03-23-21.pdf
[166] Personal conversation with K. Bawer on 3/28/2024

stormwater out of streams. Its purpose is not to heal eroded stream channels or create functioning ecosystems.

However, since SHA claims to be concerned with healing eroded streams, an issue outside their lane, they surely have read the paper by Lisa Fraley McNeal, Bill Stack, et. al. (2021)[167] suggesting that eroded stream banks in Carroll County will self-recover after upland stormwater is controlled. This research says, "there is strong evidence that the channels below the treatment sites will stabilize and adjust as the frequency of erosive flows diminishes. This will likely translate to corresponding decreases in sediment erosion." Their evidence is based on four years of observation, hardly the geologic time frame that SHA says would be required.

The paper further says, "It is expected that, with the reduced hydraulics [from erosive flows] within the catchment, these banks will continue a trajectory toward stability as indicated by reduced bank angles and vegetation establishment."

## MDOT SHA falsely claims that stream "restorations" are needed to heal streams to re-create functioning ecosystems.[168]

MDOT SHA has argued that stream "restorations" are needed to heal streams to re-create functioning ecosystems. First, however, existing streams and their riparian environs are already functioning ecosystems. One only has to observe the existing plants, aquatic organisms, and animals at any proposed stream "restoration" site. Second, that is not the objective of the MS4 permit. The objective of the MS4 permit is to keep pollutants (e.g. N, P, and sediment) out the Bay.

What SHA and other stream "restoration" proponents consider to be a "functioning" ecosystem is one that is identical to pre-colonial conditions. But we cannot re-create pre-colonial conditions. This is an impossible task given current watershed development and population growth compared to past centuries. The recent CESR report from the Chesapeake Bay Program states that "The Bay of the future will be different from the Bay of the past because of permanent and ongoing changes in land use, climate change, population growth, and economic development."[169] Likewise, streams of the future will be different from streams of the past – it will be impossible to "restore" them to pre-colonial conditions. The objective should be to remove the uncontrolled upland stormwater stressor, and then let streams self-heal.

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[167] The Self-Recovery of Stream Channel Stability in Urban Watersheds due to BMP Implementation" by Lisa Fraley McNeal, Bill Stack, et. al. https://cwp.org/the-self-recovery-of-stream-channel-stability-in-urban-watersheds/ and https://cbtrust.org/wp-content/uploads/Self_Recovery_of_Stream_Channel_Stability_Final_Draft_03-23-21.pdf

[168] Personal communication with MDOT SHA on 6/4/2024 at public hearing for MDOT SHA MS4 permit.

[169] Scientific and Technical Advisory Committee (STAC). (2023). "Achieving water quality goals in the Chesapeake Bay: A comprehensive evaluation of system response," (K. Stephenson & D. Wardrop, Eds.). STAC Publication Number 23-006, Chesapeake Bay Program Scientific and Technical Advisory Committee (STAC), Edgewater, MD. https://www.chesapeake.org/stac/cesr/

The research of Fraley-McNeal et. al. (2021)[170] showed that when upland stormwater is controlled, the stream stops eroding and begins to self-heal. They say, "…there is strong evidence that the channels below the [out-of-stream] treatment sites will stabilize and adjust as the frequency of erosive flows diminishes. This will likely translate to corresponding decreases in sediment erosion." And, "The enhanced sand filter and wet pond retrofits performed as designed and reduced the magnitude, duration, and frequency of erosive flow rates, substantially reducing the measured runoff curve numbers and simulating a hydrologic regime close to that of the 'woods in good condition' performance standard." They conclude that "…it is likely the channels are on a trajectory leading towards stabilization…."

**MDOT SHA falsely claims that stream "restorations" are self-sustaining.**

On page 10 of the MDOT SHA MS4 permit draft[171], in the "Self-sustaining Design" section, it is stated "The project must be self-sustaining, meaning that a project must be designed in a way which does not require routine work to maintain the as-built integrity."

Stream "restorations" are not self-sustaining, as shown in Palmer's analysis of 644 stream "restorations"[172] that less than half of all stream "restorations" showed improvement in stabilizing channels – worse than a coin toss. Additional observations of failed Maryland projects (see Appendix 4 photographs) show that they are being washed out because the root cause of the problem – uncontrolled stormwater runoff from impervious surfaces (roads, roofs, parking lots, etc.) fire-hosing into streams – was not addressed.

Furthermore, the need to control non-native invasive plants after stream "restoration" construction is not the definition of a self-sustaining project. Per a Chesapeake Bay Program document, "Construction disturbance and frequent inundation of the floodplain can serve as vectors for invasive species along restored… streams."[173]

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[170] Fraley-McNeal, L., Stack, B., et. al. (2021), "The Self-Recovery of Stream Channel Stability in Urban Watersheds due to BMP Implementation," Center for Watershed Protection, Inc, supported by Chesapeake Bay Trust's Restoration Research Grant Program. https://cwp.org/the-self-recovery-of-stream-channel-stability-in-urban-watersheds/ and https://cbtrust.org/wp-content/uploads/Self_Recovery_of_Stream_Channel_Stability_Final_Draft_03-23-21.pdf

[171] MDOT SHA Permit https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Documents/MS4/SHA/TD%20MS4%20Permit%20MDOT%20SHA_4-19-2024.pdf

[172] Palmer, M. A., K. L. Hondula, and B. J. Koch, University of MD, 2014, "Ecological Restoration of Streams and Rivers: Shifting Strategies and Shifting Goals,", Annu. Rev. Ecol. Evol. Syst. 2014. 45:247-269. (https://akottkam.github.io/publications/Palmerpublications/Palmer2014a.pdf )

[173] CBP's "A Unified Guide to Crediting Stream and Floodplain Restoration Practices in the Chesapeake Bay Watershed" (9/17/2021) (a.k.a., Master Stream Restoration Guide) https://chesapeakestormwater.net/wp-content/uploads/2024/01/Unified-Document_Clean_1.12.24_updated-links.pdf , Table 19. Review of Potential Unintended Impacts Associated w/ Stream and Floodplain Restoration Projects

Examples showing that steam "restorations" are not self-sustaining include the following costs of stream "restoration" repairs due to post-construction wash-outs:

- Old Farm Creek, Montgomery Co – washed out by storms and will be repaired for $800K in 2024
- Grosvenor, Montgomery Co - washed out by storms and will be repaired for $4.8M in 2024
- Lower Booze Creek, Montgomery Co - washed out by storms and was repaired for $3.6M
- TD 2024 SHA MS4 permit repairs listed as "ADAPTIVE MANAGEMENT" in SHA MEP Analysis[174]
    - $3,014,000
    - $15,903,000

The industry guarantee is typically only for one year since they know that these projects will get washed out by future storms. After that, taxpayers pay for the repairs. If a project must be repaired, then it is not self-sustaining by definition

Rather than constructing stream "restorations" that are clearly not self-sustaining, SHA's MS4 permit should allow only out-of-stream stormwater control projects.

## MDE should require that MDOT SHA only use upland, out-of-stream stormwater control practices.

As noted in the previous section, SHA's MS4 permit should allow only out-of-stream stormwater control projects since stream "restorations" are clearly not self-sustaining. The use of stream "restorations" violates the requirement, on page 10 of the MDOT SHA MS4 permit draft[175], in the "Self-sustaining Design" section, that "The project must be self-sustaining, meaning that a project must be designed in a way which does not require routine work to maintain the as-built integrity."

MDE acknowledges the reasons to perform upland, instead of in-stream, stormwater control in their document titled "Guidance for Stream Restoration Based on Key Wildlife Habitats: Piedmont and Coastal Plain Streams with Associated Wetlands."[176] It states:

> "The removal or lessening of stressors in the contributing watershed, such as… impervious surface, is highly recommended. Correction of offsite stressors which may allow natural recovery

[174] Maximum Extent Practicable (MEP) Submission (April 2024) https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Documents/MS4/SHA/SHA_MEP_Analysis_03.22.2024.pdf

[175] MDOT SHA Permit https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Documents/MS4/SHA/TD%20MS4%20Permit%20MDOT%20SHA_4-19-2024.pdf

[176] "Guidance for Stream Restoration Based on Key Wildlife Habitats: Piedmont and Coastal Plain Streams with Associated Wetlands," 2023, https://mde.maryland.gov/programs/water/WetlandsandWaterways/Documents/Restoration%20Guidance/Guidance%20for%20Stream%20Restorations_Piedmont%20%26%20Coastal%20Plain.pdf

of the stream should be considered. The following approaches may be needed to improve restoration success: …upland treatments for stormwater management." (Page 10)

"Climate change considerations: Applicants may be required to demonstrate to the Department's satisfaction that they have taken into account future physical climate change-related risks associated with …projected changes in the duration, frequency and magnitude of rainfall events. …MDE strongly encourages jurisdictions to use "supersized" upland treatment facilities and, for MS-4 counties, receive additional impervious surface credit reduction through the Watershed Management Credit. In addition to improving pollutant removal, these upsized stormwater control practices will capture more runoff volume to enhance climate change resilience to localized flooding. Another benefit besides helping to address climate change is that the additional quantity treatment will reduce the increased discharges from urban ruff with would otherwise continue to degrade steams. However, over design and excessive disturbance for stream restoration within channels and floodplains is not generally justified as a basis for future climate adaptation" (Page 11)

"The following standards are recommended and may be required. …Design to support other Chesapeake Bay Agreement goals beyond nutrient and sediment reduction. Goals include stream heath, improving IBI scores, riparian forest buffer, [and] fish passage….

"…intensive disturbance [by projects] may further worsen aquatic life conditions and other water quality or habitat parameters." p. 21

These are important recommendations that MDE should incorporate as requirements into the SHA MS4 permit.

## MDE should disallow repairs ("Adaptive Management") of previous stream "restorations"

Part of the draft SHA MS4 permit is the document titled "Maryland State Highway Administration, Maximum Extent Practicable [MEP] Analysis."[177] The table on page 16 lists "ADAPTIVE MANAGEMENT" programs for stream "restorations." "Adaptive management" is a euphemism for repairing failed or failing projects. This should be a red flag. It is a confirmation that stream "restorations" fail to stabilize stream banks because the root cause of the problem – uncontrolled stormwater from impervious surfaces fire-hosing into streams – was not addressed.

[177] Maximum Extent Practicable (MEP) Submission (April 2024) https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Documents/MS4/SHA/SHA_MEP_Analysis_03.22.2024.pdf

Rather than throwing good money after bad, it should be required that these funds be used to treat stormwater upland (out-of-stream) from these failed stream "restorations" sites which would remove the offsite stressor.

## MDOT SHA project locations must be provided

In accordance with the objective of government transparency, SHA should be required to give the exact locations for all the projects listed in the Maximum Extent Practicable (MEP) Submission document.[178]

The public has not been provided with enough information to be able to comment on actual projects in the MS4 permit. SHA did not give the exact locations, nor even the county, for all the projects listed in the Maximum Extent Practicable (MEP) Submission document[179], so it was impossible for the public to pick out projects of concern to them.

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## Financials – stream "restorations" are more expensive than 20 out-of-stream alternatives

Pro-stream "restoration" supporters often claim that steam "restorations" are the most cost-effective way to meet MS4 permits. In fact, Maryland Department of the Environment (MDE) has statewide data from the 2022 Annual Report on Financial Assurance Plans (FAPs)[180] showing there are twenty non-destructive, out-of-stream project types that are more cost effective than so-called stream "restorations." Please see the details in Appendix 6.

What should really be compared are lifecycle costs which includes cost of construction, maintenance, and repair, but MDE does not provide that information. Some examples of washed-out projects in need of repair in Montgomery County alone include Josephs Branch in Kensington, Cabin John Creek near Montgomery Mall, Long Branch in Takoma Park, Snakeden Branch in Potomac, Bedfordshire Tributary in Potomac, Old Farm Creek in North Bethesda (scheduled to be repaired in 2024 for $800K), the Grosvenor Luxmanor project in North Bethesda (scheduled to be repaired in 2024 for $4.8M), and Lower Booze Creek in Potomac (repaired for $3.6M). Stream "restoration" companies typically only guarantee their work for one year. After that, taxpayers pick up the bill. Thus, it is almost meaningless to only compare the cost of construction of different practices.

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[178] Ibid.

[179] Maximum Extent Practicable (MEP) Submission (April 2024) https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Documents/MS4/SHA/SHA_MEP_Analysis_03.22.2024.pdf

[180] https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Pages/WPRPFinancialAssurancePlans.aspx

Financial comparisons of stormwater control practices should also include a monetization of ecosystem services. Montgomery County Department of Environmental Protection's website states that "Trees contribute to the economic and social vitality of every community. Trees clean the air and water, reduce the cost of cooling and heating homes and businesses, increase biodiversity and increase our general sense of well-being."[181] DEP also says, "Trees are one of the most cost-effective means of helping to clean our air and water, reduce our energy usage, and improve the quality of our lives."[182] And yet, MDE continues to approve the clearcutting of countless trees, shrubs, and other forest plants in our natural areas for stream "restorations" without reporting the monetary costs of so doing.

Therefore, MS4 permit crediting in the Accounting Guidance[183] should take into account the value of the ecosystem services (functions,) that are lost from stream "restorations" and gained by non-destructive stormwater control practices. For example, MDE could monetize the fact that "Research has linked the presence of urban trees to reduced obesity, …increased property values, reduced stress, …cooler city streets [which would decrease air conditioning costs], [and] reduced disease rates…."[184] This would certainly show that out-of-stream stormwater control is even more cost effective than what the current 2022 Annual Report on Financial Assurance Plans (FAPs)[185] shows.

## Permeable pavement credits must be revised in Accounting Guidance

Before the MDOT SHA MS4 permit is approved, MDE should encourage more use of permeable pavement by revising the Accounting Guidance[186] crediting for permeable pavement. Permeable paving systems that can store water below the surface from areas outside the boundaries of a permeable pavement pad should get credits for treatment of areas greater than just the footprint of the permeable pavement. See Appendix 7 for a lifecycle cost comparison of permeable pavement versus conventional paving materials.

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[181] https://www.montgomerycountymd.gov/green/trees/laws-and-programs.html

[182] https://www.montgomerycountymd.gov/DEP/property-care/trees/plant-a-tree.html

[183] "Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated, Guidance for National Pollutant Discharge Elimination System Stormwater Permits," November 2021 https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Documents/Final%20Determination%20Dox%20N5%202021/MS4%20Accounting%20Guidance%20FINAL%2011%2005%202021.pdf

[184] Green Heart Project in Louisville, KY; https://www.nature.org/en-us/about-us/where-we-work/united-states/kentucky/stories-in-kentucky/green-heart-project/

[185] https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Pages/WPRPFinancialAssurancePlans.aspx

[186] "Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated, Guidance for National Pollutant Discharge Elimination System Stormwater Permits," November 2021 https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Documents/Final%20Determination%20Dox%20N5%202021/MS4%20Accounting%20Guidance%20FINAL%2011%2005%202021.pdf

## Pooled Monitoring Program should not be allowed for MDOT SHA MS4 permit

MDOT SHA should not be allowed to contribute to the Pooled Monitoring Program[187] in lieu of monitoring their MS4 permit projects. The "pooled monitoring" concept is a misnomer since it is not related to actual project performance monitoring. Rather it is a pool of money used to fund various research projects.

Funding stormwater-related research projects is a valuable endeavor. The problem with the Pooled Monitoring Program is that it relieves participants from having to monitor their constructed stream "restoration" projects.

While the goal of the Pooled Monitoring Program to fund research is laudable[188], this program should not be a substitute for the monitoring of each stream "restoration" project. MDOT SHA should not be allowed to participate in the Pooled Monitoring Program especially given its disastrous past performance mismanaging the stream "restoration" of an unnamed tributary in the Longfellow area of Columbia as part of the Upper Little Patuxent Stream Restoration.[189] For example, SHA did not require pre-construction baseline in-stream biological data[190] against which functional uplift could be proven. Also, the Year 2 Monitoring Report states that "Based on the visual survey completed September 20, 2022, the goals of the restoration are being met." But NWP 27's requirement for "net increases in aquatic resource functions and services" and the CWA's requirement for "biological improvement" cannot be proven by a visual inspection. Yet this report was accepted and signed by the USACE on 1/26/2023 and presumably accepted by SHA and MDE.

## Credit trades with wastewater treatment plants should not be allowed

Credit trades with wastewater treatment plants or other sources should not be allowed if only based on environmental justice. This mechanism allows stormwater runoff problems to continue, especially in

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[187] See: https://cbtrust.org/wp-content/uploads/Pooled-Monitoring-Initiatives-Restoration-Research-RFP_Final_110123_.pdf

[188] "The Pooled Monitoring Initiative pools resources to support scientists who answer key restoration questions…." Pooled Monitoring Initiative's Restoration Research Award Program, FY 22 Request for Proposals, Chesapeake Bay Trust

[189] https://jmt.com/projects/upper-little-patuxent-stream-restoration/

[190] The Year 2 Monitoring Report's Table 1 indicates that the Stream Functional Assessment was done using the "EPA RBP habitat from for high stream gradients." However, no data is provided in the Year 2 Monitoring Report. Note that the EPA Rapid Bioassessment Protocols https://www3.epa.gov/region1/npdes/merrimackstation/pdfs/ar/AR-1164.pdf , "Biosurvey techniques, such as the Rapid Bioassessment Protocols (RBPs), are best used for detecting aquatic life impairments and assessing their relative severity." The EPA RBP only measures physical habitat parameters. It does not actually measure in-stream biology such as FIBI or BIBI.

disadvantaged communities. Credit trading results in fewer stormwater control projects being built where they are most needed.

## Stream "restorations" contravene Environmental Justice for underserved and overburdened communities

The TD (Temporary Determination, a.k.a. draft) MDOT SHA MS4 permit currently states, "As part of the required impervious acre restoration in Part IV.E.4 of this permit, MDOT SHA shall make progress toward impervious acre restoration using green stormwater infrastructure in underserved or overburdened communities…."[191] We agree with this wholeheartedly.

However, why would we also want to inflict stream "restorations" on those communities which will cut their trees, destroy their natural areas, increase their heat islands, and yet do nothing to improve the streams? Any stream "restorations" in underserved communities deprive these communities of the co-benefits of alternative out-of-stream stormwater control projects that reduce urban flooding, reduce heat islands, increase property values, provide urban green spaces, and protect natural areas.

It would be unconscionable for MDE to allow stream "restorations" to be inflicted upon underserved and overburdened communities.

## CONCLUSION

Given the numerous problems with stream "restorations," it is incumbent upon MDE (as well as the USACE) to 1) recognize that stream "restorations" cannot be successfully performed based on the preponderance of evidence in the published scientific literature and empirical evidence, and to 2) rule that stream "restoration" applications do not meet the statutory and regulatory criteria necessary for issuance of permits. Therefore, stream "restorations" should be ineligible for MS4 permit credits and removed from the MDOT SHA MS4 permit.

As previously mentioned, a 5/28/2024 draft of "The State of the Science and Practice of Stream Restoration in the Chesapeake: Lessons Learned to Inform Better Implementation, Assessment and Outcomes,"[192] a Scientific and Technical Advisory Committee (STAC) report for the Chesapeake Bay Program (CBP), states that "biological improvement is a condition of CWA permits." Stream

[191] Page 11, TD MS4 Permit MDOT SHA, https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Documents/MS4/SHA/TD%20MS4%20Permit%20MDOT%20SHA_4-19-2024.pdf

[192] Noe, G., N. Law, J. Berg, S. S. Filoso, Drescher, L. Fraley-McNeal, B. Hayes, P. Mayer, C. Ruck, B. Stack, R. Starr, S. Stranko, and T. Thompson. 2024. The State of the Science and Practice of Stream Restoration in the Chesapeake: Lessons Learned to Inform Better Implementation, Assessment and Outcomes. STAC Publication Number 24-005, Edgewater, MD. 90 pp. https://www.chesapeake.org/stac/events/the-state-of-the-science-and-practice-of-stream-restoration-in-the-chesapeake-lessons-learned-to-inform-better-implementation-assessment-and-outcomes/

"restorations" do not meet the CWA's requirement to provide biological improvement. Thus, stream "restorations" violate the CWA.

Plus, given all the false and misleading information about the purported benefits of stream "restoration" projects with no acknowledgement of their failure and negative effects, continued approval of stream "restorations" is legally problematic.

As was discussed,

1. Stream "restorations" destroy natural areas. Direct evidence of washed-out projects and the science show that they do not work to either stabilize streams, improve water quality, or improve the ecology.
2. Funds should instead be spent on out-of-stream stormwater control practices that also address a whole list of residents' concerns such as reducing urban flooding, reducing heat islands, increasing property values, providing urban green spaces, and protecting natural areas. These are some of the many co-benefits not provided by stream "restorations."
3. There are 20 out-of-stream stormwater control practices that are less expensive than stream "restorations" according to Maryland Department of the Environment.
4. The way to stop stream erosion is to address the problem at its source - to control stormwater runoff outside of streams by non-destructive practices such as raingardens, bioswales, tree planting, etc. in already disturbed areas.

We can protect our streams and save money by meeting MS4 permit requirements with upland, out-of-stream practices. Since MDE clearly recognizes the benefits of out-of-stream stormwater control (per their "Guidance for Stream Restoration Based on Key Wildlife Habitats: Piedmont and Coastal Plain Streams with Associated Wetlands"[193]) and since stream "restorations" clearly violate the CWA and the requirements of permits issued by MDE and USACE, stream "restorations" should not be an allowable practice to satisfy the requirements of the new MDOT SHA MS4 permit. Rather than allowing stream "restorations" that will simply get washed as well as possibly creating a legal exposure for MDE and MDOT, MDOT SHA's MS4 permit should only allow out-of-stream stormwater control projects.

We urge MDE to remove stream "restoration" projects and "adaptive management" repairs (which will get washed out yet again) and replace them with out-of-stream stormwater control projects

Thank-you for your consideration,

Kenneth Bawer
Coalition To Stop Stream Destruction
Rockville, Maryland

[193] "Guidance for Stream Restoration Based on Key Wildlife Habitats: Piedmont and Coastal Plain Streams with Associated Wetlands," 2023, https://mde.maryland.gov/programs/water/WetlandsandWaterways/Documents/Restoration%20Guidance/Guidance%20for%20Stream%20Restorations_Piedmont%20%26%20Coastal%20Plain.pdf

# APPENDIX 1: Scientific references that stream "restorations" violate Clean Water Act, Army Permits, and Code of Maryland

Annotated references:

- Analysis of 30 projects by Carr et. al., Drexel University:

  "Our analysis of the differences between the ecological condition of restored sites and their paired reference reaches showed that the restored sites consistently scored lower in riparian habitat quality as well as the biotic integrity of both periphyton (i.e., attached algae) and benthic macroinvertebrate assemblages. These results clearly demonstrate that at the present time these stream reaches continue to exhibit the types of impaired conditions that originally made them candidates for restoration."

  Carr, J., Hart, D., McNair, J., 2006, "Compilation and Evaluation of Stream Restoration Projects: Learning from Past Projects to Improve Future Success," The Patrick Center for Environmental Research, The Academy of Natural Sciences of Drexel University, Report Submitted to the William Penn Foundation. https://ansp.org/research/environmental-research/projects/restoration/

- Analysis of 40 projects by Robert Hilderbrand, University of MD:

  "There simply were few ecological differences between restored and unrestored sites. In fact, the unrestored sections upstream [from the restoration sites] were often ecologically better than the restored sections or those downstream of restorations."

  Hilderbrand, Robert H., et. al.,2020, "Quantifying the ecological uplift and effectiveness of differing stream restoration approaches in Maryland," Final Report Submitted to the Chesapeake Bay Trust for Grant #13141, (https://cbtrust.org/wp-content/uploads/Hilderbrand-et-al_Quantifying-the-Ecological-Uplift.pdf

- Analysis of 644 projects by M. Palmer et al., University of MD:

  "Improvements in the five metrics within the water quality category were found for only 7% of the channel reconfiguration projects and for none of the in-stream channel projects (Table 2)."

  "Unfortunately, recovery of biodiversity was rare for the vast majority of stream restoration projects."

  "Less than half of these projects showed improvements in channel stability compared with prerestoration regardless of how stability was measured and even though many of the projects involved the use of large boulders or other materials to hold the banks in place."

"We show that a major emphasis remains on the use of dramatic structural interventions, such as completely reshaping a channel, despite growing scientific evidence that such approaches do not enhance ecological recovery, and the data we assembled (Table 2) suggest they are often ineffective in stabilizing channels when stability is the primary goal."

Palmer, M. A., K. L. Hondula, and B. J. Koch, University of MD, 2014, "Ecological Restoration of Streams and Rivers: Shifting Strategies and Shifting Goals,", Annu. Rev. Ecol. Evol. Syst. 2014. 45:247-269. (https://akottkam.github.io/publications/Palmerpublications/Palmer2014a.pdf )

- Analysis of 11 streams by Southerland et. al. that were been converted to RSCs (regenerative stormwater conveyances), a type of stream "restoration"

  "…fish diversity in RSCs [a type of stream "restoration"] was lower than in high-quality sites…."

  "Fish indices of biotic integrity (IBIs) [an industry-standard for measuring in-stream biology] were also lower in RSCs than in high-quality sites…."

  Southerland, Mark, et. al., 2021, "Vertebrate Community Response to Regenerative Stream Conveyance (RSC) Restoration as a Resource Trade-Off," Award: 18002 CBT Restoration Research Grant to Tetra Tech and UMCES-Chesapeake Biological Laboratory; https://cbtrust.org/wp-content/uploads/FINAL-Report-for-18002-Tetra-Tech-CBL-CBT-RR-Vertebrates-in-RSCs-30SEP2021-Submitted-to-CBT.pdf

Additional references:

- Carr, J., Hart, D., McNair, J., 2006, "Compilation and Evaluation of Stream Restoration Projects: Learning from Past Projects to Improve Future Success," The Patrick Center for Environmental Research, The Academy of Natural Sciences of Drexel University, Report Submitted to the William Penn Foundation. https://ansp.org/research/environmental-research/projects/restoration/
- Hilderbrand, Robert H., et. al., 2020, "Quantifying the ecological uplift and effectiveness of differing stream restoration approaches in Maryland," Final Report Submitted to the Chesapeake Bay Trust for Grant #13141, (https://cbtrust.org/wp-content/uploads/Hilderbrand-et-al_Quantifying-the-Ecological-Uplift.pdf
- Jepsen, R., Caraco, D., Fraley-McNeal, L, Buchanan, C., and Nagel, A. 2022. "An Analysis of Pooled Monitoring Data in Maryland to Evaluate the Effects of Restoration on Stream Quality in Urbanized Watersheds: Final Report." ICPRB Report 22-2. Interstate Commission on the Potomac River Basin, Rockville, MD. https://www.potomacriver.org/wp-content/uploads/2022/06/ICP-22-1_Jepsen.pdf
- Kaushal, Sujay S. et. al., 2018, "Tree Trade-offs in Stream Restoration Projects: Impact on Riparian Groundwater Quality," University of Maryland, State University of New York ESF,

Maryland Department of Transportation State Highway Administration, 2018 Presentation (https://cbtrust.org/wp-content/uploads/Kaushal-and-Wood_UMD_061219.pdf)

- Laub, B.G, McDonough, O.T, Needelman, B.A., Palmer, M.A., 2013, "Comparison of Designed Channel Restoration and Riparian Buffer Restoration Effects on Riparian Soils," Restoration Ecology, Vol. 21, Issue 6, November 2013 (https://onlinelibrary.wiley.com/doi/abs/10.1111/rec.12010 )

- Palmer, M.A., H.L. Menninger, and E. Bernhardt. 2010. River restoration, habitat heterogeneity and biodiversity: a failure of theory or practice? Freshwater Biology 55: 205–222
    - Only 2 of 78 stream or river restoration showed statistically significant increases invertebrate taxa richness data, though most projects enhanced physical habitat heterogeneity
    - "Managers should critically diagnose the stressors impacting an impaired stream and invest resources first in repairing those problems most likely to limit restoration"

- Palmer, M. A. et. al., 2014, "Ecological Restoration of Streams and Rivers: Shifting Strategies and Shifting Goals," Annual Review of Ecology, Evolution, and Systematics. 2014. 45:247–69 (www.ecolsys.annualreviews.org or www.annualreviews.org )

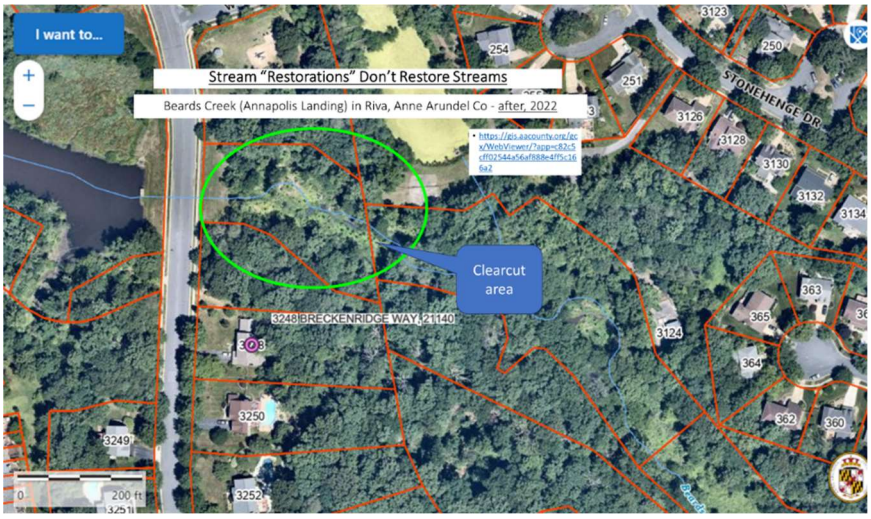
- Pedersen ML, Kristensen KK, Friberg N, 2014, "Re-Meandering of Lowland Streams: Will Disobeying the Laws of Geomorphology Have Ecological Consequences?" (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4180926/ )

- Roni, P, K. Hanson, and T. Beechie. 2008. Global Review of the Physical and Biological Effectiveness of Stream Habitat Rehabilitation Techniques. North American Journal of Fisheries Management 28:856-890
    - "345 studies rarely demonstrated uplift…."

- Southerland, Mark, et. al., 2021, "Vertebrate Community Response to Regenerative Stream Conveyance (RSC) Restoration as a Resource Trade-Off," Award: 18002 CBT Restoration Research Grant to Tetra Tech and UMCES-Chesapeake Biological Laboratory; https://cbtrust.org/wp-content/uploads/FINAL-Report-for-18002-Tetra-Tech-CBL-CBT-RR-Vertebrates-in-RSCs-30SEP2021-Submitted-to-CBT.pdf

# APPENDIX 2: Photographic documentation of stream "restoration" destruction

- **Anne Arundel County:**
  - Beards Creek in Annapolis Landing (below)




  - Broad Creek Valley West (below)

- Broad Creek MVA (below)

Broad Creek MVA Stream "Restoration," Annapolis


- Broad Creek Park (below)

Broad Creek Park Stream "Restoration", Annapolis

o Camp Woodlands (below)

Camp Woodlands Stream Restoration (Broad Creek), Anne Arundel Co.


o Church Creek Headwaters (below)

Church Creek Headwaters, Anne Arundel Co.– Construction

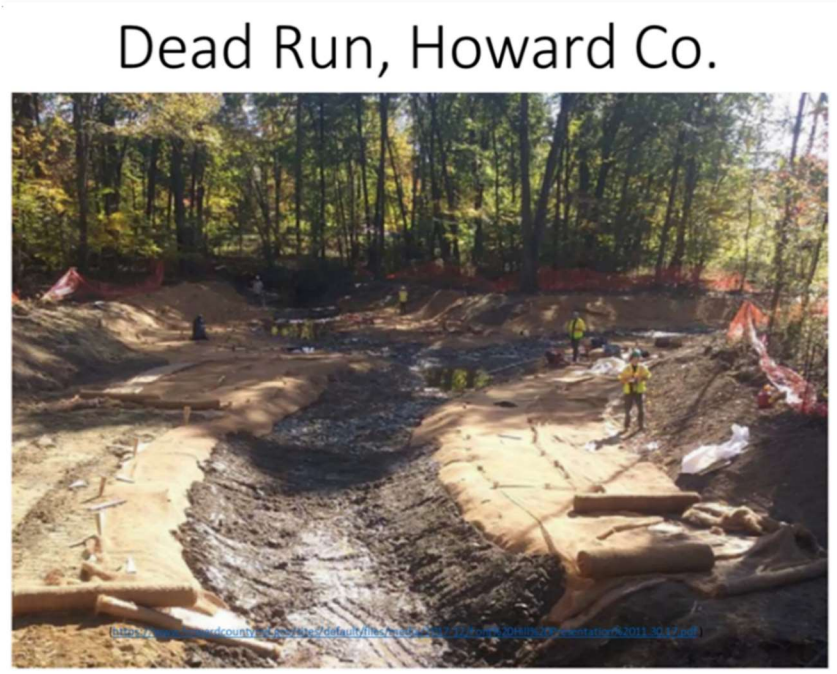
- **Howard County:**
  - Longfellow project - clearcut and then 700 replanted trees died (below)


o Font Hill (below)


o Nash Run (below)


• https://www.howardcountymd.gov/sites/default/files/media/2017-12/Font%20Hill%20Presentation%2011.30.17.pdf

- Dead Run (below)




- **Montgomery County:**
  - Nature Forward (formerly Audubon Naturalist Society) (below)

o Falls Reach (below)

Falls Reach, Potomac, MD


Before Montgomery County DEP "stream restoration" on Falls Reach. (Photo by DEP)


After "stream restoration" on Falls Reach completely destroyed the forest community in its footprint. (Photo by K. Bawer on 3/19/2019)

o Asbury Methodist Village (below)

Asbury Methodist Village, Montgomery County

o Upper Watts Branch (below)


o Whetstone Run (below)


(Stream "restoration" in Blohm Park, Gaithersburg at Watkins Mill Rd. over Whetstone Run at the same location.
Note the stream bank armor-plating on the right. (Left on 9/3/2020; right on 5/03/2021); by K.Bawer)

- Solitaire Court (below)

Solitaire Court, Gaithersburg


**Prince George's County**

- Tinkers Creek (below)

Tinkers Creek, Prince George's County


- https://www.youtube.com/watch?v=7WhlNFKywDM

o Bear Branch (below)

## Bear Branch, Prince Georges County - AFTER


https://www.princegeorgescountymd.gov/DocumentCenter/View/37900/GS-2021-Day-4-Restoration-projects-12-PM

o Crain Stream (below)

## Crain Stream Restoration, Prince George's County


- **Baltimore County**
  - Pearlstone Retreat Center in Reisterstown (below)


  - Scotts Level Branch (below)

- **Fredrick County**
  - Point of Rocks Stream Restoration (below)

Point of Rocks Stream Restoration Project, Fredrick County


- **Harford County**
  - Emmord Branch Unnamed Tributary (below)

Emmord Branch Unnamed Tributary Stream Restoration, Harford Co.

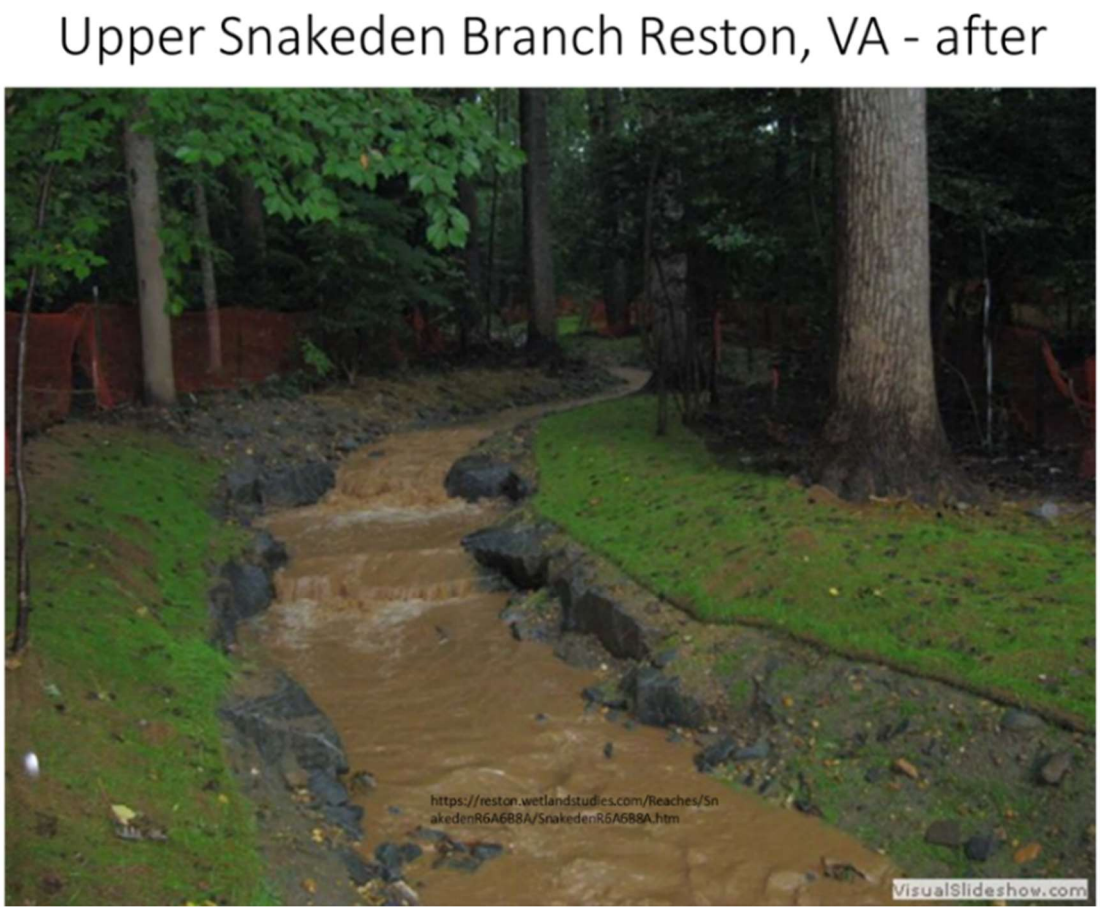
- Heavenly Waters Park (below)


- Annie's Playground Stream Restoration Project (below)

- Barrington Restoration Project (below)


- **Cecil County**
  - Bayview

- **Reston, VA**
    - Upper Snakeden Branch Reston, VA (note how water is chocolate brown after “restoration”)



## APPENDIX 3: Photos of stream "restorations" that impede aquatic life movement

Nature Forward (formerly ANS), Chevy Chase

(3/26/2021. downstream from Jones Mill Rd. Photos by K. Bawer)

(Regenerative Stormwater Conveyance at Asbury Methodist Village; https://www.youtube.com/watch?v=hGZN-L0Qrj0)


Bedfordshire, Potomac, MD
Blocks aquatic wildlife from moving along the streams to hunt and breed.
(By K. Bawa, 10/17/2023)


Solitaire Court stream "restoration", Gaithersburg
(https://www.gaithersburgmd.gov/government/projects-in-the-city/solitaire-court-stream-restoration-project)

(Solitaire Court stream “restoration,” Gaithersburg, MD, by K. Bawer, 6-17-2022)

## Point of Rocks Stream Restoration Project, Fredrick County

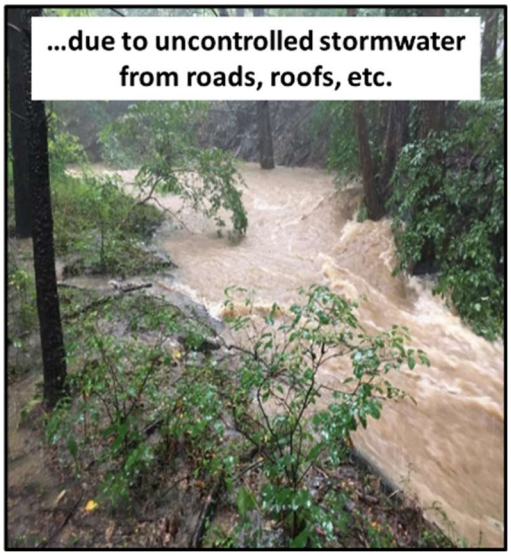

Camp Woodlands Stream Restoration, Anne Arundel Co. – Post Restoration

## Barrington Restoration Project, Harford Co.

## Bynum Run Stream Restoration, Harford Co.

## APPENDIX 4: Photos of failed stream "restorations"

Josephs Branch, Kensington

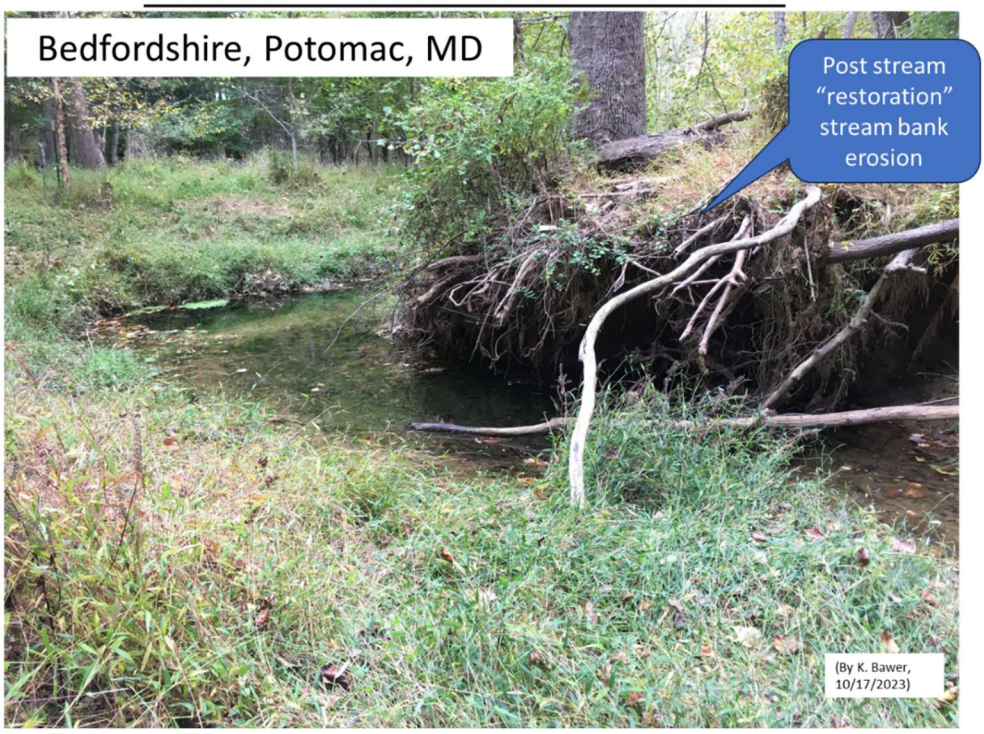




Cabin Branch Stream in Cabin John Regional Park (by K. Bawer, 3/19/2021)


Long Branch, Takoma Park, 10/2/2021 (Photo by K. Bawer)

## Stream “restoration” failures

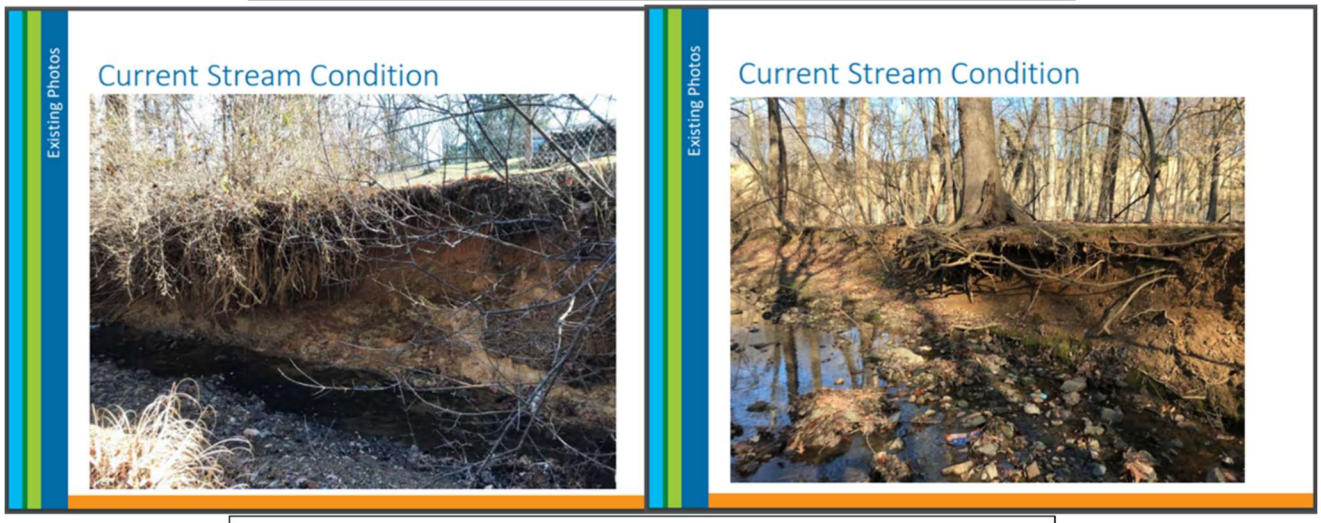



## Stream “restoration” failures.

Old Farm Creek Tributary, North Potomac

# Stream "restoration" failures

## Grosvenor Luxmanor Stream "Restoration,"Mo Co




Wildwood Manor, south of I-270

https://www.montgomerycountymd.gov/water/Resources/Files/restoration/streams/grosvenor-presentation-wildwood-manor.pdf

## Northwest Branch Stream Valley Park, Silver Spring, Mo Co

Photo by K. Bawer, 5/26/2024)

# Stream “restoration” failures

Lower Booze Creek, Potomac, MD
Two different locations.


Lower Booze Creek - Erosion downstream of imbricated wall structure from original stream restoration.

## Stony Run, Baltimore City

(Photo by Fern Shen, Baltimore Brew)

# Annapolis Landing in Riva, Anne Arundel Co.

(Arundel Rivers Federation, Testimony on HB 942 on March 3, 2023)

Upper Snakeden Branch Reston, VA - after


**Figure 1:** Visual Indicators Showing Failures in the Field for Protocol 1

*Exposed Soil on Banks*

*Extreme Undercutting*

*Outflanking of Instream Structures*

*Bank Armoring Collapse*

Photo sources: Tim Schueler and Josh Running



("Recommended Methods to Verify Stream Restoration Practices Built for Pollutant Crediting in the Chesapeake Bay Watershed," Chesapeake Bay Program report," https://www.chesapeakebay.net/what/publications/recommended-methods-to-verify-stream-restoration-practices)

# APPENDIX 5: Research used to falsely claim that upland (out-of-stream) stormwater control does not stop stream erosion.

**K. Bawer response to Montgomery County Department of Environmental Protection (DEP) claims sent to Montgomery County Council on 3/27/2024:**

DEP: "DEP has closely worked with and followed research from the United States Geological Survey (USGS) documenting channel instability in watersheds with high densities of stormwater BMPs. This research has consistently demonstrated continued channel erosion with different eras and types of stormwater BMPs."

> BAWER COMMENT: As described below, the research cited is merely a tacit acknowledgement of the inadequacy of both past and current "meets minimum" stormwater control standards. The conclusion that should be drawn is that there have been too few out-of-stream stormwater control projects and that they have been inadequately sized.
>
> Per Lisa Fraley-McNeal, Sr. Watershed & Stormwater Research Specialist, Center for Watershed Protection, "I don't know of any studies in larger watersheds where there was sufficient upland stormwater control to significantly reduce stream erosion."[194] Montgomery County could do a proof of concept to test this in conjunction with outside scientists like Fraley-McNeal.
>
> There is nothing to stop a jurisdiction from requiring that stormwater control projects exceed the current minimum required by law which is clearly insufficient to control today's stormwater events.

DEP: "In *Hogan et al, 2014*, channel widening and deepening was documented even with the latest erosion and sediment control technologies. This led to increased sediment loading to larger downstream ecosystems."

> BAWER COMMENT: The Hogan et. al., 2014, study[195] says, "Despite the use of the best available S&EC facilities, receiving streams experienced altered flow, geomorphology, and decreased biotic community health." But this study, in Clarksburg, is not applicable to the vast majority of Montgomery County covered by the MS4 permit. For MS4 permits, the vast majority of stormwater runoff in Mo Co comes from existing developed properties, not new construction as in this study, simply because most of the county outside the Ag Reserve is already built out. Thus, an analysis of "during development period" BMPs such as silt fences and earth dikes are

[194] Personal conversation with K. Bawer on 3/28/2024

[195] Hogan, Dianna M., S. Taylor Jarnagin, J.V. Loperfido, and Keith Van Ness, 2014. Mitigating the Effects of Landscape Development on Streams in Urbanizing Watersheds. Journal of the American Water Resources Association (JAWRA) 50(1): 163-178. DOI: 10.1111/jawr.12123 https://www.researchgate.net/publication/263594645_Mitigating_the_Effects_of_Landscape_Development_on_Streams_in_Urbanizing_Watersheds

irrelevant for studying the effectiveness of post-development BMPs such as raingardens and bioretentions which are the types of BMPs being used for credits to meet the MS4 permit.

They describe 2 types of sediment and erosion control (S&EC) practices (BMPs):

During development, a.k.a. development period S&EC BMPs:

- **Structural S&EC BMPs**. Examples of structural S&EC BMPs include sediment control basins (for settling), silt fences, and vegetated buffer strips;
- **non-structural S&EC BMPs** include land management activities designed to reduce sediment movement such as maintaining intact riparian zones or vegetated ground cover

1. After development, a.k.a. stormwater management (SWM) BMPs
    - **Stormwater management (SWM) BMPs**, are used to protect area stream and downstream ecosystem water quality (sediment, nutrients, and other pollutant removal and retention), and to provide stormwater runoff quantity control and timing.

DEP: "Another paper, *Hopkins et al, 2017* concluded "Results suggest that distributed SCMs can reduce runoff and sediment loads during small rain events compared to centralized SCMs, but these differences become less evident for large events when peak discharge likely leads to substantial bank erosion." (In this study BMPs were referred to as "stormwater control measures," SCMs) These larger storms showed similar results across BMP types, placement, or era and yielded significant channel erosion."

BAWER COMMENT: This study by Hopkins et. al., 2017,[196] does nothing to support DEP's contention that, "Unfortunately, current scientific research has not shown that upland BMPs alone can prevent in-stream erosion."[197] In fact the purpose of this paper had nothing to do with analyzing the effect of upland BMPs on stream erosion. The purpose of this paper was to compare two different upland stormwater control strategies (centralized vs. distributed BMPs) with respect to their effectiveness of controlling nutrients and sediment.

DEP's statement that "These larger storms showed similar results across BMP types, placement, or era and yielded significant channel erosion," is a total fabrication – this paper never made that conclusion. What the paper said was that large rain events that overwhelm BMPs "likely leads to substantial bank erosion." This tacitly acknowledgements of the inadequacy of both past and current "meets minimum" stormwater control standards. There is nothing to stop a

[196] Kristina G. Hopkins, J.V. Loperfido, Laura S. Craig, Gregory B. Noe, Dianna M. Hogan, 2017, "Comparison of sediment and nutrient export and runoff characteristics from watersheds with centralized versus distributed stormwater management. Journal of Environmental Management, Journal of Environmental Management, Volume 203, Part 1, 1 December 2017, Pages 286-298.
https://www.sciencedirect.com/science/article/abs/pii/S0301479717307491?via%3Dihub

[197] Staff report for T&E COMMITTEE #2A,2B, March 4, 2024, Worksession, "Worksession: FY25-308 Capital Improvements Program (CIP) Conservation of Natural Resources: Agenda Item #2A: Storm Drains and Agenda Item #2B: Stormwater Management"
https://montgomerycountymd.granicus.com/MetaViewer.php?view_id=169&event_id=16077&meta_id=172894

jurisdiction from requiring that stormwater control projects exceed the current minimum required by law which is clearly insufficient to control today's stormwater events.

The study concluded that distributed out-of-stream BMPs are more effective than centralized out-of-stream BMPs for smaller rain events and that the differences between distributed and centralized out-of-stream BMPs become less for larger rain events. The study further concluded, "However, large, high-intensity precipitation events contribute substantially to overall export and these types of events were not adequately controlled by SCMs in either of the urban study watersheds." But this statement only points to the inadequacy of the upland stormwater treatment. It is fair to say that any lack of stormwater control by upland BMPs (and presumably any downstream channel erosion) can be attributed to the lack of sufficient quantity and capacity of out-of-stream BMPs. In fact, this paper says, "… SCMs [in this study BMPs were referred to as "stormwater control measures] can readily be designed to attenuate peak flows by sizing them with additional runoff storage volume…."

DEP: "More recently, *Williams et al, 2022*, concluded "Despite a high density of stormwater management facilities in urban catchments, substantial alterations to [stream] cross sections were found at multiple locations in each catchment including the controls." This more than 10-year study highlighted the limited impact of stormwater BMPs on channel geomorphology."

BAWER COMMENT: This study by Williams et. al., 2022[198] does nothing to support DEP's contention that, "Unfortunately, current scientific research has not shown that upland BMPs alone can prevent in-stream erosion."[199] It can be reasonably concluded from this paper that continued stream erosion can be attributed to the lack of sufficient quantity and capacity of out-of-stream BMPs. In fact, this paper states, "More high-flow events coupled with ineffective S&EC [sediment and erosion control] BMPs measures may have contributed to the substantial changes in measured metrics at some cross sections within the stream network."

DEP: "Another recent study funded by a Chesapeake Bay Trust Restoration Research Grant, *Effectiveness of stormwater management practices in protecting stream channel stability* (Thompson et al, 2023[200], in review), also analyzed the effectiveness of different eras of stormwater management. The research

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[198] Brianna Williams, Kristina G. Hopkins, Marina Metes, Daniel Jones, Stephanie Gordon, William Bradley Hamilton (2022). Tracking geomorphic changes after suburban development with a high density of green stormwater infrastructure practices in Montgomery County, Maryland. Geomorphology. https://doi.org/10.1016/j.geomorph.2022.108399 )

[199] Staff report for T&E COMMITTEE #2A,2B, March 4, 2024, Worksession, "Worksession: FY25-308 Capital Improvements Program (CIP) Conservation of Natural Resources: Agenda Item #2A: Storm Drains and Agenda Item #2B: Stormwater Management" https://montgomerycountymd.granicus.com/MetaViewer.php?view_id=169&event_id=16077&meta_id=172894

[200] Thompson, Tess Wynn et al., (2023) "Effectiveness of stormwater management practices in protecting stream channel stability," presented at the 2023 Maryland Water Monitoring Council Annual Conference (11/17/2023) . Not yet posted to https://cbtrust.org/grants/restoration-research/
From https://dnr.maryland.gov/streams/Documents/MWMC/AGENDA-MWMC-Annual-Conference-2023.pdf , link to presentation at https://drive.google.com/file/d/1isYAs58zVsLJ9H1VOiu4PvzMuYvSplf3/view

concluded that neither ESD [current Environmental Site Design standards] nor the older "Unified stormwater sizing criteria" (USC) will protect long-term channel stability. The research further demonstrated that many of our streams are still responding to historic impacts, ongoing impacts from infrastructure, and may be "stuck," unable to return to a dynamic equilibrium on their own."

BAWER COMMENT: Regarding DEP's statement that "The research concluded that neither ESD nor the older Unified stormwater sizing criteria' (USC) will protect long-term channel stability," the presentation makes that conclusion based on 1) current inadequate "meets minimum" stormwater management practices, and 2) a theoretical projection over the next 30 and 59 years which assumes that no further upland stormwater control projects are constructed or improved. It is not reasonable to assume that there will never be more, and improved, upland stormwater control projects (BMPs) constructed in areas experiencing stream erosion.

The lead author stated that "Current stormwater regulations do reduce the impacts of urbanization on stormwater runoff, particularly for smaller, more frequent storm events."[201] This acknowledges the benefits of out-of-stream stormwater control, but is also a tacit acknowledgement of the inadequacy of both past and current "meets minimum" stormwater control standards for larger storm events. There is nothing to stop a jurisdiction from requiring that stormwater control projects exceed the current minimum required by law which is clearly insufficient to control today's stormwater events.

[201] Personal communication via email on 3/26/2024 from Tess Thompson, PhD., Associate Professor, Biological Systems Engineering, Virginia Tech. to K. Bawer.

# APPENDIX 6: Cost of stream "restorations" vs. other practices

Maryland Department of the Environment (MDE) has statewide data from the 2022 Annual Report on Financial Assurance Plans (FAPs)[202] showing there are twenty non-destructive, out-of-stream project types that are more cost effective per acre than so-called stream "restorations":

| | **Cost per Acre** |
|---|---|
| **Stream Restoration** | $32,138 |
| | |
| **LOWER CONSTRUCTION COST THAN SR PER 2022 MDE FAP** | |
| 1.Green Roof, Extensive | $14,287 |
| 2.Rainwater Harvesting | $15,767 |
| 3.Dry Well | $24,951 |
| 4.Shallow Wetland | $25,056 |
| 5.Pocket Wetland | $6,236 |
| 6.Surface Sand Filter | $14,877 |
| 7.Dry Swale | $18,342 |
| 8.Other | $30,962 |
| 9.Redevelopment | $569 |
| 10. Forestation on Pervious Urban | $7,644 |
| 11. Riparian Forest Planting | $31,374 |
| 12. Urban Tree Canopy | $6,327 |
| 13. Septic Denitrification | $564 |
| 14. Septic Connections to WWTP | $114 |
| 15. Shoreline Management | $6,694 |
| 16. Catch Basin Cleaning | $22,210 |
| 17. Mechanical Street Sweeping | $7,376 |
| 18. Regenerative/Vacuum Street Sweeping | $7,372 |
| 19. Nutrient Credits [Trading] | $30 |
| 20. Septic Pumping | $1,140 |

What should really be compared are lifecycle cost (a.k.a., Total Cost of Ownership) = (cost of construction + maintenance + repair), but MDE said that "The law does not require life-cycle costs of BMPs."[203]

[202] 2022 Annual Report on Financial Assurance Plans (FAPs): https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Documents/FAP-WPRP/2022%20Stormwater%20Financial%20Assurance%20Plan%20Annual%20Report%20to%20Governor_%20MSAR%20%23%2010954%2010.18.2022.pdf

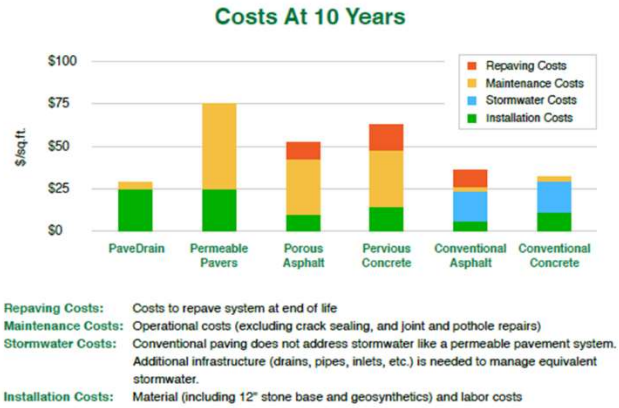
[203] Email from MDE to K. Bawer on 8/10/2023.

# APPENDIX 7: MDE Accounting Guidance needs to revise crediting for permeable pavement

The Ernest Maier Company has been trying to convince MDE to award more MS4 permit credits for systems like their "PaveDrain" system that can store water below the surface and thus should get credits for treatment of more than just the footprint of the permeable pavement.

Below is the company's chart.[204] They say that even though their permeable pavement costs more to install than conventional asphalt or concrete (and they install all three), their PaveDrain system has a cheaper 10-year life-cycle cost than conventional asphalt, concrete, or the other technologies in the chart.

PAVE DRAIN®
www.pavedrain.com




**Repaving Costs:** Costs to repave system at end of life
**Maintenance Costs:** Operational costs (excluding crack sealing, and joint and pothole repairs)
**Stormwater Costs:** Conventional paving does not address stormwater like a permeable pavement system. Additional infrastructure (drains, pipes, inlets, etc.) is needed to manage equivalent stormwater.
**Installation Costs:** Material (including 12" stone base and geosynthetics) and labor costs

(For the record, this is not an endorsement or recommendation for this company. We have no financial connection to this or any other paving company.)

[204] Used with permission from Aaron Fisher, Ernest Maier company.