Coalition to Stop Stream Destruction

8 Cleveland Ct.
Rockville, MD 20850

March 3, 2026

To: Senate Education, Energy, and the Environment Committee

Subject: SB0688 Environment – Stream and Floodplain Restoration Projects – Requirements and Limitations

POSITION: FAVORABLE

Dear Chair Feldman, Vice Chair Kagan, and Members of the Committee:

The Coalition to Stop Stream Destruction supports a favorable report on this bill. For the record, we have no direct or indirect financial interests in this bill.

This is a common sense bill that encourages only necessary and effective stream restorations. If you have not seen an engineered stream restoration, watch a few short **videos**[1] (https://www.youtube.com/@EngineeredStreamRestoration) and read **a one page fact sheet** (Attachment 3). Please also see some **Frequently Asked Questions** (Attachment 1).

It is common sense that we only want the best projects done in our streams that will not require constant repair at taxpayer expense. Unfortunately, that has not been the case. I have photographs showing washed-out projects in many locations in Maryland and Virginia:

- Montgomery County (Josephs Branch, Cabin John Creek, Long Branch, Snakeden Branch, the Bedfordshire project, Old Farm Creek Tributary, the Grosvenor-Luxmanor project, Northwest Branch, Lower Booze Creek)
- Gaithersburg (tributary to Great Seneca Creek),
- Washington County (Block Rock Run),
- Baltimore City (Stony Run),
- Anne Arundel County (Annapolis Landing project, Bacon Ridge Branch),
- Columbia (Longfellow stream),
- Reston, VA (The Glade, Upper Snakeden Branch),
- Arlington, VA (Donaldson Run),
- Fairfax, VA (Little Pimmit Run).

[1] https://www.youtube.com/@EngineeredStreamRestoration

This is not an exhaustive list - these are just the ones I know about. The Lower Booze Creek stream restoration in Potomac, Maryland cost 3.6 million dollars to repair after it was washed-out by storms.

It is common sense to minimize disturbance to existing streams, floodplains, and forests where feasible, as the bill says.

The science and observations on the ground show that engineered stream restorations do not restore streams. In spite of what proponents claim with anecdotes about converting V-shaped to U-shaped streams, their unattainable goal to recreate "natural" or "historical" pre-colonial conditions is impossible given today's land use and climate. The Chesapeake Bay Program's "Comprehensive Evaluation of System Response" (CESR) report written by more than 50 experts 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." Likewise, it will be impossible to restore local streams to pre-colonial conditions.

WHAT DOES THE SCIENCE SAY? The purported benefits of engineered stream restorations are not supported by the published science. A Chesapeake Bay Program Expert Panel Report[2] acknowledges that engineered stream restorations do not stop erosion. Published papers[3] analyzed over 700 engineered stream restorations to show that water quality and ecological function are not improved and are sometimes worse. A few claims of successful projects do not disprove the preponderance of the scientific evidence. See also the attached annotated bibliography (Attachment 2).

ALTERNATIVES ANALYSIS: This bill has a common sense requirement that stormwater management plans that include stream-related projects also include an **alternatives analysis** evaluating non-stream-disturbing options. Applicants would need

---

[2] https://chesapeakestormwater.net/wp-content/uploads/2022/07/9928-1.pdf

[3] 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);
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;
Southerland, M., et. al., 2021, "Vertebrate Community Response to Regenerative Stream Conveyance Restoration as a Resource Trade-Off," CBT Research Grant; https://cbtrust.org/wp-content/uploads/FINAL-Report-for-18002-Tetra-Tech-CBL-CBT-RR-Vertebrates-in-RSCs-30SEP2021-Submitted-to-CBT.pdf.
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/

to clearly establish project objectives, assess benefits and adverse impacts, and document why less disruptive practices cannot reasonably achieve the same outcomes.

It is common sense to require an alternatives analysis to ensure that the best project is selected. It is common sense to at least analyze the feasibility of addressing the root cause of excessive stream erosion which is out-of-stream stormwater runoff.

WHAT ABOUT COST? Any additional costs that may be associated with this bill could be offset by the use of alternative, out-of-stream projects that are less expensive than engineered stream restorations. Maryland Department of the Environment's (MDE) Annual Report on Financial Assurance Plans[4] lists twenty out-of-stream practices that are cheaper than stream restorations such rainwater harvesting, dry swales, and forest planting.

WHAT ARE THE CO-BENEFITS? In contrast to engineered stream restorations, since the alternatives can be built in already disturbed developed areas, they provide co-benefits such as reducing urban flooding and heat islands, providing green spaces, increasing property values, and protecting streams and floodplains from toxins in stormwater.

Therefore, we respectfully request a FAVORABLE report on this bill.

Thank-you for your consideration.

Sincerely,

Kenneth Bawer
Coalition to Stop Stream Destruction
(kbawer@msn.com

[4] 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. Practices cheaper than stream "restoration": Green Roof, Extensive; Rainwater Harvesting; Dry Well; Shallow Wetland; Pocket Wetland; Surface Sand Filter; Dry Swale; Other; Redevelopment; Forestation on Pervious Urban (i.e., Forest Planting); Riparian Forest Planting; Urban Tree Canopy; Septic Denitrification; Septic Connections to WWTP; Shoreline Management; Catch Basin Cleaning (i.e., Storm Drain Cleaning); Mechanical Street Sweeping; Regenerative/Vacuum Street Sweeping (i.e., Advanced Street Sweeping); Nutrient Credits [Trading]; Septic Pumping

Attachment 1: Frequently Asked Questions

Q: Aren't engineered stream restorations necessary to recreate natural or historical pre-colonial conditions by converting V-shaped streams to historically U-shaped streams?

A: That goal, while laudable, is impossible given today's land use and climate. The Chesapeake Bay Program's "CESR" (Comprehensive Evaluation of System Response) report written by more than 50 experts says that the Bay of the future will be different from the Bay of the past because of permanent changes in land use, climate change, and population growth. That is why it is also impossible to restore local streams to pre-colonial conditions. The question becomes, why would we want to destroy an existing ecosystem to try to recreate pre-colonial conditions which we know can't happen?

Q: Proponents of stream restoration projects talk about the importance of reconnecting to the floodplain. What are some of the negative consequences of this practice?

A: Unfortunately, proponents hide the negative consequences of restorations that involve floodplain reconnection[5]. These include 1) more flooding due to more saturated floodplains and loss of evapotranspiration from clearcutting of riparian forests, 2) the death of remaining trees due to water-logged soil, 3) more mosquitoes from standing water in floodplains, and 4) the deposition into floodplains of toxins in stormwater runoff that are hazardous to animals and children. And proponents neglect to say that the forest they destroy will take 100 years or more to recover.

Q: Do all streams have floodplains?

A: You might think so if you listen to the stream restoration promoters. But the answer is: No. For example, the reason given for an industry-proposed stream restoration in Taylor Run in Alexandria, VA was to "reconnect to the floodplain." However, Rod Simmons, the City's Natural Resources Manager pointed out that this would have destroyed a globally rare acidic seepage swamp that is never found in floodplains. The project was cancelled.

Q: What have you seen happen to some of these stream restoration projects?

[5] The floodplain reconnection techniques of "restoration" try to re-create pre-colonial conditions when stormwater more frequently overflowed stream banks and spread into a floodplain where eroded sediment is deposited. In the "Legacy Sediment Removal" method, the stream valley is clearcut then tons of soil are removed to lower the valley to the stream level. In the FILL method, material is dumped into a stream channel to raise its level closer to the valley floor (only to be eroded out again by uncontrolled stormwater runoff.)

A: Even a Chesapeake Bay Program Expert Panel Report says that engineered stream restorations don't stop erosion. Why? Because they that don't address the root cause of stream erosion which is stormwater runoff from impervious surfaces and agricultural land. This is like having a leaking roof that damages your furniture and carpet, and you go out and buy new furniture and carpet but don't fix the roof. This is exactly what stream restorations are doing. The source of the problem is not being fixed.

What happens is that the fill material dumped into streams gets washed away, and the rocks used to stabilize the banks get eroded around. This requires costly repairs, if they are even done. I have photographs showing washed-out projects in

- Montgomery County (Josephs Branch, Cabin John Creek, Long Branch, Snakeden Branch, the Bedfordshire project, Old Farm Creek Tributary, the Grosvenor-Luxmanor project, Northwest Branch, Lower Booze Creek)
- Gaithersburg (tributary to Great Seneca Creek),
- Washington County (Block Rock Run),
- Baltimore City (Stony Run),
- Anne Arundel County (Annapolis Landing project, Bacon Ridge Branch),
- Columbia (Longfellow stream),
- Reston, VA (The Glade, Upper Snakeden Branch),
- Arlington, VA (Donaldson Run),
- Fairfax, VA (Little Pimmit Run).

This is not an exhaustive list - these are just the ones I know about.

Q: Aren't there some good stream restorations?
A: Even if a few successful projects exist, they don't outweigh the preponderance of the scientific evidence that stream restorations don't work. That's the way science works.

I was a member of Maryland Department of the Environment's Ecological Restoration Permitting Study convened under Senate Bill 945 (House Bill 869), "Permitting for Ecological Restoration Projects – Required Study," in 2022. During one of the meetings, a vocal proponent of stream restorations said that for every failed project, they could give an example of a good project. I gave them the references for 700 failed projects from papers by Palmer, Hilderbrand, Southerland, and Carr. We never heard from them again.

Q: When you say that the material dumped into streams will be washed-out if the source of the stormwater is not controlled, what do you say to those who say that

much care goes into the design and engineering of these types of projects and that all the permitting was approved.[6]
A: That is exactly the answer given online by a stream restoration contractor. They also say that all the engineering and permitting was reviewed and approved by county, state, and federal permit reviewers. This is what we call "lawful but awful." Sure, it is all legal and approved, but that does not change the fact that the scientific evidence shows that these projects don't stop erosion, don't improve water quality, and don't improve stream biology. And on top of that, they destroy riparian forest areas during the construction process.

Q: Some companies say that their projects are engineered to ensure that the project can handle the increased stormwater coming from upstream sources.[7]
A: If any company claims that their projects have been so sufficiently engineered, then why don't they offer lifetime guarantees against being washed-out? There is a good reason that the industry-standard guarantee is only for one year. After that, taxpayers pay for the repairs.

Q: What do you say to those who agree that stormwater should be controlled at the source, but that is not a viable alternative to restoring any given stream since the damage is already done and can only be repaired through direct intervention.
A: This is what proponents say about every single proposed engineered stream restoration project. The problem is that the viable, alternative out-of-stream analysis is never done. I know for a fact that Montgomery County does not do alternative analyses, and none were done for the other projects I have looked at around the state. When they say the damage is already done, they don't acknowledge that the damage from uncontrolled upland stormwater continues to firehose into streams, and the problem can't be fixed until this root cause of the damage is controlled. This goes back to the leaking roof analogy. Why would you replace your future and carpeting while the roof is still leaking. It makes no sense.

As to saying that "the damage is already done, and can only be repaired through direct intervention," the assumption is that pre-colonial or pre-development conditions can be engineered. That is not what the 50 experts of the CESR report said. They said you can't

[6] https://www.bayjournal.com/columns/chesapeake_born/for-stream-revival-ask-wwbd-what-would-beavers-do/article_5cc96246-c4fe-11ee-9e4a-ff6de288c95f.html
[7] https://www.bayjournal.com/columns/chesapeake_born/for-stream-revival-ask-wwbd-what-would-beavers-do/article_5cc96246-c4fe-11ee-9e4a-ff6de288c95f.html

re-create pre-development conditions given the population, climate and development that exists now.

In addition, there is evidence that, once out-of-stream stormwater is controlled, the streams will self-heal.[8] Will they look like pre-colonial streams? No. Will they be functioning ecosystems that provide ecosystem services like carbon sequestration and wildlife habit? Of course.

[8] Fraley-McNeal, et. al. (2021), "The Self-Recovery of Stream Channel Stability in Urban Watersheds due to BMP Implementation," https://cbtrust.org/wp-content/uploads/Self_Recovery_of_Stream_Channel_Stability_Final_Draft_03-23-21.pdf; streambank soil will slough off into streams during self-stabilization, but the science (note vi) shows that most stream "restorations" do not stabilize streams anyway, and photographic evidence shows that "restorations" are being eroded away by post-construction storms.

Attachment 2: ANNOTATED BIBLIOGRAPHY OF STREAM RESTORATION MONITORING REPORTS, STUDIES, AND INVESTIGATIONS

Beauchamp, Vanessa, Joel Moore, Patrick McMahon, Patrick Baltzer, Ryan A. Casey, Christopher J. Salice, Kyle Bucher, and Melinda Marsh. 2020. Effects of Stream Restoration by Legacy Sediment Removal and Floodplain Reconnection on Water Quality and Riparian Vegetation. Study funded by Chesapeake Bay Trust Award #13974. December 2020. Accessed at https://cbtrust.org/grants/restoration-research/ on 6/10/23.

Observation:

This report concludes that stream restorations did not have any impact on nitrogen concentrations. Preservation of high-quality forest areas, even if they have invaded previous floodplains, should be considered. The effects of loss of tree canopy should also be considered.

Bernhardt, E. S., and Palmer, M. A., 2011, "Evaluating River Restoration," 91-page Invited Feature, Ecological Applications, Vol. 21, No. 6

Following are some quotes from the study:

- *"Empirical evaluation of a variety of channel-based restoration projects discovered little evidence of ecologically successful outcomes. Violin et al. find that urban stream restoration efforts in the southeastern United States had no demonstrable effect on habitat diversity or on macroinvertebrate communities. More disheartening, Louhi et al. find that several restored streams in Finland have stream invertebrate communities that are depauperate relative to unrestored upstream reference reaches even 15 years following restoration. Sundermann et al. find that most of the restored streams they sampled in Germany show no measurable improvement in macroinvertebrate communities, and the few that do are close to intact, forested catchments."*
- *"Sudduth et al. report that restored urban streams in North Carolina have significantly higher temperatures than unrestored urban streams as a result of removing riparian trees to facilitate restoration projects. Filoso and Palmer show that efforts to reduce the flux of nitrogen to coastal waters through hydrogeomorphic stream restoration approaches are rarely successful. Jahnig et al. document the existence of different perceptions of restoration success and show that, according to data from river restoration projects in Germany, water managers tend to be overly positive in their self-evaluation of restoration projects."*

Berg, J., et.al., the "Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects," Test-Drive Revisions Approved by the [Water Quality Goal Implementation Team]WQGIT: September 8, 2014, Prepared by: Tom Schueler, Chesapeake Stormwater Network and Bill Stack, Center for Watershed Protection https://chesapeakestormwater.net/resource/final-recommendations-of-the-expert-panel-to-define-removal-rates-for-individual-stream-restoration-projects/)

Following are some quotes from the study:

- *"Three recent studies have documented that the construction of stream restoration projects can lead to local destruction of riparian cover within the project reach. The loss of riparian cover can adversely impact functional responses within the stream, including nutrient reduction. For example, Sudduth et al. (2011) and Violin et al. (2011) compared the functional services provided by four forest reference streams, four NCD-restored streams, and four non-restored urban streams in the North Carolina Piedmont. The studies concluded that the heavy machinery used to reconfigure channels and banks led to significant loss of riparian canopy cover (and corresponding increase in stream temperatures), and these were a major factor in the lack of functional uplift observed in restored streams, compared to non-restored streams." Page 25*
- *"It was outside the Panel's charge to resolve the scientific debate over the prospects of functional uplift associated with urban and non-urban stream restoration (i.e., beyond nutrient and sediment reduction)." Page 26.*
- *"…the research reinforces the notion that stream restoration should not be a stand-alone strategy for watersheds, and that coupling restoration projects with upland retrofits/"restorations" and other practices can help manage the multiple stressors that impact urban streams (Palmer et al., 2007)." Page 26.*
- *"Stream restoration is a carefully designed intervention to improve the hydrologic, hydraulic, geomorphic, water quality, and biological condition of degraded urban streams, and must not be implemented for the sole purpose of nutrient or sediment reduction." Page 29.*

Budelis, Drew, Lauren McDonald, Steve Schreiner, and Donald E. Strebel. 2020. An Evaluation of Forest Impacts Compared To Benefits Associated with Stream Restoration. Study funded by Chesapeake Bay Trust Award #14833. February 2020. Accessed at https://cbtrust.org/grants/restoration-research/ on 6/10/23.

This report concludes that:

- *There is no compelling evidence that the benefits of floodplain reconnection outweigh the impacts, and Maryland DNR stresses the need to minimize impacts to existing forests.*
- *While the authors believe that floodplain habitat is of greater value than upland habitat, attempts to convert upland habitat to floodplain habitat are likely to not be successful, especially in areas where habitat is fragmented and has anthropogenic structure, such as Elkhorn Branch.*
- *Reconnection of floodplains does not increase functional composition or diversity of plant communities.*
- *Floodplain reconnection may increase presence of invasive species.*
- *Floodplain reconnection will not affect soil nutrient content.*

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/

Following are some quotes from the study:

- *"Instream and riparian conditions were monitored during 2004 at 30 restored reaches, each paired with a forested upstream reference reach."*
- *"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."*
- *"We also administered a social survey for 31 restoration projects…. We learned that riparian restoration projects are often implemented to achieve aesthetic goals as well as environmental goals."*

Center for Watershed Protection. 2021. The Self-Recovery of Stream Channel Stability in Urban Watersheds due to BMP Implementation. Study funded by Chesapeake Bay Trust. March 2021. Accessed at https://cbtrust.org/grants/restoration-research/ on 6/10/23.

Observation:

This report concludes that, in a study of a limited number of stream restoration sites, the total suspended sediment load increased after restoration.

Following are some quotes from the study:

- *… "[stormwater BMP] retrofits reduce the magnitude, duration and frequency of erosive flow rates." (p. 48)*
- *"…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. (p. 52)*
- *"…, it is likely the channels are on a trajectory leading towards stabilization as anecdotal evidence (which includes photographs)…." (p. 52)*
- *"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." (https://www.cwp.org/the-self-recovery-of-stream-channel-stability-in-urban-watersheds/)*

Center for Watershed Protection. 2022. Maintaining Forests in Stream Corridor Restoration and Sharing Lessons Learned. Acquired by email from Greg Hoffman, Center for Watershed Protection, on 6/14/2023

Observation

This extensive study was intended to respond to the growing observations of massive tree removal and disturbance of riparian area during "stream restoration" projects. The purpose was to review past projects and identify ways to protect riparian buffers and minimize impacts on those buffers, especially healthy, mature trees. The report noted that "there are very few requirements that explicitly focus on protection of existing forests from impacts", meaning that the extent to which these projects remove trees is largely left to the developer. Key Observations included:

- *Some stream restoration sites are not severely degraded and therefore result in significant forest losses that could have been avoided with better site selection.*
- *Sites where the quality of the riparian community is poor (e.g., invasive species, poor habitat conditions) may be good candidates for stream restoration project design that incorporates native plantings and habitat improvements. The trade-off here is that short-term forest loss may be necessary to achieve longer-term habitat improvement goals.*
- *Certain stream restoration designs may include extensive removal of riparian vegetation or subsequent tree loss through increased groundwater elevations and/or extended inundation (e.g., floodplain reconnection projects) while others (e.g., legacy sediment removal) may not be intended to include a fully forested riparian area, but instead include a diverse mosaic of herbaceous plants, shrubs, and water-loving trees that represent pre-development site conditions. The specific project goals, objectives, and design approach therefore have an important bearing on how much forest loss results from the project.*

Christopher J., T. D. Fletcher, M. J. Burns, 2012, "Urban Stormwater Runoff: A New Class of Environmental Flow Problem,", PLOS ONE (www.plosone.org), September 2012, Volume 7, Issue 9

Following are some quotes from the study:

- *"Urban stormwater is a new class of environmental flow problem: one that requires reduction of a large excess volume of water to maintain riverine ecological integrity." P. 1*
- *"Urban stormwater runoff, delivered through conventional drainage systems, is a complex enviro-mental flow problem that can, in large part, be solved by harvesting stormwater before it reaches aquatic ecosystems." P. 8*
- *"Degradation of stream biotic assemblages occurs at very low levels of (connected) imperviousness. Therefore, protection of the ecological integrity of stream ecosystems is likely to require interception and treatment of runoff from almost all catchment impervious surfaces, including the prevention of excess runoff from reaching streams." P. 9*

Conley G, McDonald RI, Nodine T, Chapman T, Holland C, Hawkins C, Beck N., 2021, Assessing the influence of urban greenness and green stormwater infrastructure on hydrology from satellite remote sensing. Sci Total Environ. 2022 Apr 15;817:152723. doi: 10.1016/j.scitotenv.2021.152723. Epub 2021 Dec 31. PMID: 34979231.

Following are some quotes from the study:

- *"Green stormwater infrastructure (GSI), which includes features like rain gardens, constructed wetlands, or urban tree canopy, is now widely recognized as a means to reduce urban runoff impacts and meet municipal water quality permit requirements."*

Craft, C., 2016, "Creating and Restoring Wetlands, From Theory to Practice," BookCraft https://www.sciencedirect.com/book/9780124072329/creating-and-restoring-wetlands

Following is a relevant quote from the study:

- *"Complete restoration [via reconnecting the floodplain] of a fully developed mature species-rich forest, critical to migratory songbirds, may require 100 years or more." https://www.sciencedirect.com/science/article/abs/pii/B9780124072329000063*

Craig, Laura S., Margaret A. Palmer, David C. Richardson, Solange Filoso, Emily S Bernhardt, Brian P. Bledsoe, Martin W. Doyle, Peter M. Groffman, Brooke A. Hassett, Sujay S Kaubal, Paul M. Mayer, Sean M. Smith, and Peter R. Wilcock. 2008. Stream Restoration Strategies for Reducing River Nitrogen Loads. Frontiers in Ecology and the Environment. Vol. 6, Number 10, 529-538. Accessed at https://www.jstor.org/stable/20441018 on 5/7/2023.

Observation:

The Prospectus for the Elkhorn Branch project claimed that this article supports the statement "stream restoration WILL improve water quality through the reduction of stream bank erosion and the downstream transport of associated pollutants, improve instream nutrient processing".

The article does not support these claimed "benefits". The use of this article to claim reduction of nitrogen concentrations is moot, since the 2015 CA Watershed Quality Report did not identify nitrogen concentrations in Elkhorn Branch to be elevated. Instead, the article says that "stream restoration alone is not appropriate for compensatory mitigation and should be seen as complementary to land-based best management practices"

Dance, Scott, 2020, "As Maryland pours millions of dollars into ailing streams, research shows some projects don't help clean the bay." https://www.baltimoresun.com/news/environ'ment/bs-md-stream-restoration-20200102-hqwyeoa4m5bgfhtxybgdalrhby-story.html. Baltimore Sun. January 2, 2020.

Following are some quotes from the study:

- *"…the only monitoring most rebuilt streams receive are visual checks to see that the streambeds haven't eroded away. Few are studied closely to measure how much pollution is flowing from the streams into rivers and, eventually, the bay."*
- *"…in cases where streams face the heaviest onslaught of polluted runoff, scientists say the investment isn't paying off with cleaner waterways, teeming with aquatic life. 'There's limited evidence these restorations work, as far as ecology is concerned,' said Robert Hilderbrand, an associate professor at the University of Maryland Center for Environmental Science's Appalachian Laboratory. 'Many of these watersheds are just too degraded.'"*
- *"Stream restoration projects are often an easier sell because they have aesthetic value, and because other stormwater-reducing alternatives can be disruptive and expensive and require cooperation of private landowners. 'To avoid political heat, local governments have defaulted to stream restoration,' said Doug Myers, Maryland senior scientist at the Chesapeake Bay Foundation, which instead advocates for greater spending on pavement removal, tree planting or stormwater basins."*

Doyle, Martin W. and F. Douglas Shields, 2012. Compensatory Mitigation for Streams Under the Clean Water Act: Reassessing Science and Redirecting Policy. Journal of the American Water Resources Association (JAWRA), 48(3): 494-509
https://marylandstreamrestoration.files.wordpress.com/2012/02/doyle-and-shields-2012.pdf

Following are some quotes from the study:

- *"Current stream restoration science is not adequate to assume high rates of success in recovering ecosystem functional integrity."*
- *"Physical habitat variables are often the basis for indicating success, but are now increasingly seen as poor surrogates for actual biological function."*
- *"The working assumption by regulators, practitioners, and many academics appears to be that stream restoration, as typically practiced (see Bernhardt et al., 2005), produces increased physical, chemical, and biological integrity. This assumption is necessary for the current implementation of compensatory mitigation to be an option in the CWA 404 permitting program. Our review shows that this assumption is questionable, and that many traditional stream restoration projects are largely ineffective at restoring chemical and biological functions."*

Ensign, Scott H., and Martin W. Doyle. 2005. In-channel transient storage and associated nutrient retention: Evidence from experimental manipulations. Limnology and Oceanography 50, p. 1740-51. Accessed at https://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.files/fileID/13937 on 5/7/2023.

Observation:

The Elkhorn Branch project Prospectus claimed that this article supports the statement "stream restoration WILL improve water quality through the reduction of stream bank erosion and the downstream transport of associated pollutants, improve instream nutrient processing". However, the article does not support these claimed "benefits". The use of this article to claim reduction of nitrogen concentrations is moot, since the 2015 CA Watershed Quality Report did not identify nitrogen concentrations in Elkhorn Branch to be elevated. The study was conducted in a completely different environment type, and concludes by saying that results could not be corroborated because results were affected by sediment disturbance.

Filoso S, Smith SM, Williams MR, Palmer MA, 2015, "The Efficacy of Constructed Stream-Wetland Complexes at Reducing the Flux of Suspended Solids to Chesapeake Bay," Environmental Science & Technology, 2015 Aug 4;49(15):8986-94. doi: 10.1021/acs.est.5b00063. Epub 2015 Jul 16. PMID: 26181355; PMCID: PMC9813913. https://pubmed.ncbi.nlm.nih.gov/26181355/

Following are some quotes from the study:

- *"Studies documenting the capacity of restored streams to reduce pollutant loads indicate that they are relatively ineffective when principal watershed stressors remain intact."*
- *"Constructed stream−wetland complexes [in Coastal Plain lowland valleys] receiving relatively high TSS loads may experience progressive physical and chemical changes that limit their sustainability."*

Groffman, Peter M., Ann M. Dorsey, and Paul M. Mayer. 2005. N Processing within Geomorphic Structures in Urban Streams. Journal of the North American Benthological Society 24: 613-25. Accessed at https://www.jstor.org/stable/10.1899/04-026.1 on 5/7/2023.

Observation:

The Prospectus for the Elkhorn Branch project claimed that this article supports the statement "stream restoration WILL improve water quality through the reduction of stream bank erosion and the downstream transport of associated pollutants, improve instream nutrient processing".

The article does not support these claimed "benefits". The use of this article to claim reduction of nitrogen concentrations is moot, since the 2015 CA Watershed Quality Report did not identify nitrogen concentrations to be elevated. Instead, the article states that "denitrifying structures are difficult to maintain in urban streams because of high storm flows and downstream displacement". Since the Elkhorn Branch project would not have controlled runoff, any in-stream structures were likely to be destroyed.

Hawley, Robert J., Kathryn Russell, and Taniguchi-Quan, Kristine. 2022. Restoring Geomorphic Integrity in Urban Streams via Mechanistically-Based Storm Water Management: Minimizing Excess Sediment Transport Capacity. Urban Ecosystems. Vol. 25, p. 1247-1264. Accessed at https://link.springer.com/article/10.1007/s11252-022-01221-y on 5/8/2023.

Observation:

This article presented case studies showing that, to reach a goal of geomorphic stability in urban watersheds, stormwater control measures to reduce erosion potential must be implemented.

Hilderbrand, Robert H., Joseph Acord, Timothy Nuttle, and Ray Ewing. Undated, except after 2017. Quantifying the ecological uplift and effectiveness of differing stream restoration approaches in Maryland. Study funded by Chesapeake Bay Trust Award #13141. Accessed at https://cbtrust.org/grants/restoration-research/ on 6/10/23.

Observation:

There is a large amount of information to unpack in this report. In a study of stream restorations on 40 urban streams in the Baltimore/Washington area, this study found no evidence of ecological uplift. The report went on to conclude that the practitioners of stream restoration are aware of this, but the public and regulators are not.

Hilderbrand, Robert H. 2020. Determining Realistic Ecological Expectations in Urban Stream Restorations. Study funded by Chesapeake Bay Trust Award #15823. July 2020. Accessed at https://cbtrust.org/grants/restoration-research/ on 6/10/23.

Observation:

The study of more than 20 stream restoration projects documented that biological uplift goals were not met. Following are some quotes from the study:

- *"We therefore reject our hypothesis that stream restorations improve overall ecological condition or even its subcomponents. Benthic macroinvertebrate communities in restored sections remained similar to unrestored sections on the same stream and were significantly dissimilar to MBSS Sentinel Sites. Similarly, the numerous metrics used in ecological assessments also showed a lack of response."*
- *"The over-arching goal of this research was to determine whether stream restoration activities produce ecological uplift compared to sections on the same stream that have not been restored." P. 7/70.*

- *"We sampled 40 urban stream restorations across the Piedmont and Coastal Plain physiographic regions in the grater Baltimore/Washington DC Metropolitan area of Maryland.*
- *Despite the promise and allure of repairing damaged streams, there is little evidence for ecological uplift after a stream's geomorphic attributes have been repaired.*
- *Unfortunately, the ecological aspects rarely improved despite the improved physical measures.*
- *There simply were few ecological differences between restored and unrestored sites. In fact, the unrestored sections upstream were often ecologically better than the restored sections or those downstream of restorations.*
- *Our results suggest that restoration activities do not mitigate the reasons causing the ecological declines. Higher levels of Impervious Surface Cover (ISC) in the watershed has an overarching influence on Piedmont streams (but not in the Coastal Plain). Restorations actually decreased in ecological health measures to a greater extent as ISC increased than their unrestored counterparts upstream.*
- *Ecological measures also responded negatively to the degree of disruption caused by the restoration. Longer restorations and those with more installed structures had lower ecological uplift measures in the Piedmont, while those in the Coastal Plain responded negatively to greater amounts of installed root wads and step pools. A key point here is that the amount or intensity of restoration did not improve outcomes in either region.*
- *The time since restoration completion partially mitigated these effects when focusing only on responses in restored sections, but it did not produce significant trends when compared against unrestored sections.*
- *We conclude there is little evidence that urban stream restorations can produce meaningful improvements in traditional measures of stream condition as measured with benthic macroinvertebrates. Unfortunately, the possibility of restoring the ecology of urban streams to resemble conditions of streams in lesser disturbed watersheds is limited."*
- *"Justifying degrading activities by claiming that restoration will solve the problems the activities caused is untrue and will lead to misdirected human and financial resources. The steep declines in IBI and richness in restored sections as ISC increases are particularly troubling and suggest that restorations in high ISC watersheds may do more ecological harm than good."*
- *"In relative terms, RSC [Regenerative Stormwater Conveyance]-dominant restorations performed similarly to NCD [Natural Channel Design]-dominated; both showed limited to no ecological uplift due to restoration activities."*

Hodgson, K., Powers, L., and Stranko, S., Resource Assessment Service. 2023. "Evaluating a Regenerative Stormwater Conveyance Stream Restoration and its Effects on Water Quality and Benthic Macroinvertebrates." Maryland Department of Natural Resources. 580 Taylor Avenue, Annapolis, Maryland 21401. DNR 12-042623-352.

https://dnr.maryland.gov/streams/Publications/Evaluating-a-Regenerative-Stormwater-Conveyance-Stream-Restoration-and-its-Effects-on-Water-Quality-and-Benthic-Macroinvertebrates_A-Case-Study-at-Muddy-Creek.pdf

Following are some quotes from the study:

- *"An RSC was installed along 452 linear stream meters on North Branch Muddy Creek on the Smithsonian Environmental Research Center (SERC) property in Edgewater, Maryland to reconnect the stream to its floodplain to increase water storage and sediment deposition, increase nutrient and sediment processing, and provide biological uplift."*
- *"Dissolved oxygen concentrations and saturation levels were frequently significantly lower at the downstream monitoring station compared to the upstream station in the same month, and DO concentrations more frequently fell below the 5.0 mg/L Maryland Use Class I water quality standard violation threshold at the downstream station. Stream temperatures were significantly higher at the downstream station compared to the upstream station in more than half of the months studied."*
- *"Significant decreases in Benthic Index of Biotic Integrity (BIBI) scores, Number of Taxa, Shannon-Wiener Index, and Percent Predators, and significant increases in the Percent Chironomidae and Percent Collectors were observed after restoration."*
- *"Benthic macroinvertebrate communities also experienced a marked shift in composition to the dominance of tolerant taxa."*
- *"Although water chemistry data previously reported by SERC showed significant retention of some nutrients within the reach, dissolved oxygen, water temperature, and benthic macroinvertebrate communities appear to have worsened after restoration."*

Howard County DPW NPDES Permit MD0068322 Annual Report for Fiscal Year 2021.

Observation:

The annual update of results from watershed monitoring includes several watersheds in which "stream restorations" had occurred in prior years. The results are as follows:

- *Wilde Lake – the report discusses the erosion and sedimentation status of the upstream reach (the location of the Longfellow "stream restoration" project) and the downstream reach. As of 2021, the "upstream reaches are not experiencing the same level of erosion as the downstream reach and have remained relatively stable over 2017-2021 period". Given this observation, it is not clear why a "stream restoration" project was implemented in the upper reach in 2020-21. The report goes on to state that a "newly constructed stream restoration project in the upstream reach should provide increased stability". Since the upper reach was not exhibiting any instability, it is not clear how such a destructive project in that area, removing acres of trees, can be expected to provide "increased stability".*
- *Red Hill Branch – This area is downstream of the Bramhope Lane stream restoration project done in 2011. The monitoring in 2021 found no improvement in water quality. The biological monitoring results "have not shown any significant improvement after restoration". The results did show a reduction in erosion, but noted that flood damage to an upstream debris dam had contributed sediment into the survey area.*
- *Dorsey Hall – The post-restoration biological and physical monitoring results showed that "habitat results have been similar throughout the post-restoration period", with the sites falling into the lowest "severely degraded" category. The physical habitat results show that both monitored sites continue to be severely impacted, "with no evidence yet of ecological uplift after restoration".*

Howard County DPW NPDES Permit MD0068322 Annual Report for Fiscal Year 2022.

Observation:

The annual update of results from watershed monitoring includes several watersheds in which "stream restorations" had occurred in prior years. The results are as follows:

- *Wilde Lake – The water quality results continued to show elevated total suspended solids concentrations. With respect to biological monitoring, the report states "Overall, the stream system in the Wilde Lake watershed continues to exhibit evidence of the urban stressors affecting it and has not demonstrated measured improvement in either habitat quality or ecological stream health over the seventeen years of monitoring.".*
- *Most concerning is the geomorphic assessment, conducted long after the Longfellow project was completed. The text states "The main goal of the monitoring is to assess the temporal variability of the geomorphic stability of the stream channels upstream of the lakes as they react to restoration activities. Overall, implementation of projects in the watershed do not appear to have significantly improved the physical habitat in the tributary streams."*
- *Red Hill Branch – This area is downstream of the Bramhope Lane stream restoration project done in 2011. The monitoring in 2021 found no improvement in water quality. The biological monitoring results show that "post-restoration monitoring results indicate a subwatershed in an overall degraded ecological condition, with little change from the first two years of pre-restoration monitoring." In fact, the BIBI scores in 2022 were "slightly worse results than during 2021". Habitat assessments in 2022 were "nearly identical to 2021 and 2020 results", with all sites rated as "degraded". The text states "The biological community and habitat continue to fluctuate slightly from year-to-year, with 2022 results a slight decrease from 2021, but remain in a degraded condition and have not shown any significant improvement after restoration. The report did note that there had been reductions in erosion.*
- *Dorsey Hall – The post-restoration biological and physical monitoring results were the same as reported for 2021. The report showed that "habitat results have been similar throughout the post-restoration period", with the sites falling into the lowest "severely degraded" category. The physical habitat results show that both monitored sites continue to be severely impacted, "with no evidence yet of ecological uplift after restoration".*

Iliff, Jesse, Wayne Martin, and Sarah Giordano, February 9, 2020, "Assessing Watershed-scale Restoration Effectiveness: Treatment Impacts and Monitoring Requirements," Arundel Rivers Federation (South River Federation prior to January 2019) and Smithsonian Environmental Research Center

Following are some quotes from the study:

- *"A suburban watershed with septic systems and fertilized turf might release more nutrients than a more highly impervious watershed lacking turf and septic systems. In some cases, nutrient releases from urban watersheds may come from leakage of sewer pipes." (p. 17)*
- *"With knowledge of the sources of nutrients in a watershed, regulators may decide to address the sources directly rather than constructing BMPs to remove the nutrients after they are released into the streams. If necessary, improving sewage and septic systems*

could be more effective at reducing nutrient discharges than would restoring streams." (p. 17)

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

Following is a relevant quote from the study:

- *"Following large amounts of stream restoration, there is often an apparent decline in stream health." (p. 48)*

Kaushal, Sujay S., Kelsey L. Wood, Phillippe G. Vidon, and Joseph G. Gallela. 2021. Tree Trade-offs in Stream Restoration Projects: Impact on Riparian Groundwater Quality. Study funded by Chesapeake Bay Trust. March 2021. Accessed at https://cbtrust.org/grants/restoration-research/ on 6/10/23.

Observation:

This report concludes that tree removal during stream restoration resulted in long-term degradation of groundwater quality. Shallow groundwater will eventually discharge as surface water runoff, carrying these pollutants into streams and lakes.

Lave, Rebecca and Doyle, Martin, 2021, "Streams of Revenue: The Restoration Economy and the Ecosystems it Creates," January, 2021, The MIT Press [Keywords: stream restoration banking]

- *"While Congress likely assumed that the regulatory agencies implementing the CWA—the U.S. Army Corps of Engineers (Corps of Engineers) and the Environmental Protection Agency (EPA)—would deny many permits to prevent harm to these ecosystems, the vast majority of permits have been granted, as the agencies have yielded to the political costs of limiting development, be it new homes, factories, or roads. Rather than deny permits altogether to protect the nation's freshwater ecosystems, the agencies arrived at a workaround known as the mitigation sequence: avoid impacts, reduce impacts, and only then compensate for any unavoidable impacts. In practice, however, it turned out to be far more politically palatable to let developers offset their project's impacts on a stream by restoring a comparable stream elsewhere than to ask them to rework the project to avoid or reduce its impacts altogether." (pp. 6-7)*
- *"As defined in North Carolina's mitigation regulations, preservation produced the lowest number of credits on a given site, and enhancement carried a medium number of credits. The maximum number of credits was only available if mitigation bankers reconfigured the existing channel. Regulators thus created a powerful economic incentive for full reconstruction rather than preservation or enhancement. (p. 123) [Is this true in MD?]*
- *"Instead of having to compare the biological, chemical, and physical particularities and interconnectivities of the two sites, stream mitigation banking in North Carolina calls out*

a relatively narrow range of physical characteristics…. P. 124 [how is equivalence defined in MD or by COE?]

- *"Equivalence is thus reduced to criteria that are relatively easy to measure and control. Biology and chemistry, not to mention more complex physical characteristics (e.g., groundwater connectivity) are excluded from consideration because channel form is considered an adequate proxy for them…. This highly simplified equivalence makes mitigation look simple, and effectively takes concerns about ecological uncertainty…off the table. (p. 124)*
- *"…[scientists] do not consider stability to be a proxy for the overall chemical, biological, or physical health of a steam." (p. 125)*
- *"…this political-economic system led to… an artificial hydroscape bearing the signature of regulation rather than natural processes. …Stability equals success." (p. 137)*
- *"From the bankers' and designers' point of view, this meant that stability was the only target." (p. 138)*
- *"…it is not at all clear that current stream restoration practices actually work (see chapter 3)." (p. 140)*

Mayer, Paul M., Michael J. Pennino, Tammy A Newcomer-Johnson, and Sujay S. Kaushal. 2022. Long-Term Assessment of Floodplain Reconnection as a Stream Restoration Approach for Managing Nitrogen in Ground and Surface Waters. Urban Ecosystems Vol. 25, p. 879-907. Accessed at https://link.springer.com/article/10.1007/s11252-021-01199-z on 5/8/23.

Observation:

This article states that stream restoration can be an important component of holistic watershed management "if stream restoration and floodplain reconnection can be done in a manner to resist the erosive effects of large storm events."

Myers, Doug. 2023. Chesapeake Bay Foundation. Testimony to the CA Board Meeting on January 12, 2023. Video available at https://www.youtube.com/watch?v=8p8M7ebpl9o, beginning at time stamp 1:50:00.

Observation:

Mr. Myers repeatedly stressed that it is useless to attempt stream restoration if you do not first address the source of the problem, which is increased runoff. The Elkhorn Branch project will not control runoff. At the end of Mr. Myers presentation, he was asked if, in his expert opinion, it would be better to do the project and see what happens, or if it would be better to do nothing. Mr. Myers stated that the evolving science says that it would be better to do nothing, and let the stream heal itself. This recommendation was rejected by the Columbia Association staff, none of whom had any relevant qualifications. It was quite obvious that CA had been offered a substantial sum of money to allow the project to proceed, and their appetite for an increase in revenue far outweighed their interest in preserving trees in their Open Space.

Palmer, Margaret A., Solange Filoso, and Rosemary M. Fanelli. 2013. From Ecosystems to Ecosystem Services: Stream Restoration as Ecological Engineering. Ecological Engineering, Vol. 65, Pgs. 62-70. Accessed at https://pubag.nal.usda.gov/catalog/5378506 on 4/30/2023.

Observation:

This article concluded that urban stream restoration does not result in net annual benefits in reduction of nitrogen. With respect to retention of sediment, the article concludes that this does occur initially, but it will decrease over time. In addition, the article documented that loss or damage of riparian forests and pulses of sediment released during construction may offset other project benefits. Therefore, the article concluded that use of approaches that require substantial ecosystem modification to enhance a limited number of biophysical processes should be limited to the most degraded systems, and then only after less invasive approaches, such as upland reforestation, reduced lawn fertilization, and better stormwater management at the source of runoff generation have been exhausted.

Palmer, Margaret A., K.L. Hondula, and Benjamin J. Koch. 2014. Ecological Restoration of Streams and Rivers: Shifting Strategies and Shifting Goals. Annual Review of Ecology, Evolution, and Systematics 45:247-69. Accessed at https://www.annualreviews.org/doi/10.1146/annurev-ecolsys-120213-091935 on 5/7/2023.

Observation:

This is probably the key article that documents failures of stream restoration projects to meet almost every metric of success. The study involved an assessment of reported monitoring results in 644 streams. The article documents that the projects usually improve habitat, substrate, and channel form, but this is because these measures have recently been physically manipulated as part of the restoration. These are not measures of the long-term condition of the stream, and others researchers have documented that these manipulations do not last if runoff is not controlled. With respect to stability, the study found that less than half the projects showed improvements in channel stability compared to pre-restoration conditions, even though the projects had used rip-rap and boulders to try to stabilize the streams. Improvements in water quality metrics were only met 7% of time. The projects did improve indicators of hydrologic or biogeochemical processes, but these were not accompanied by any increased aquatic biodiversity or recovery of sensitive species. This was a common finding in other articles – that, although the metrics showed improvements in habitat, channel form, substrate, and velocity, these improvements were not accompanied by improvements in biodiversity. There was also no improvement in taxa richness, except for one area where the increase in taxa was due entirely to the addition of some taxa that are tolerant or urban stream conditions.

Palmer, Margaret. 2023. University of Maryland. Email to Bob Dover regarding NCD Stream Restoration Methodology. May 7, 2023.

Observation:

Because Dr. Palmer's article was developed in 2014, Bob Dover of Columbia, Maryland, contacted her by email in May, 2023, to notify her that he intended to use the article to oppose a proposed project, and to determine whether the statements and conclusions made in the article still reflect her current opinions about the effectiveness of stream restoration. She responded "Yes, they absolutely do."

Ruck, Chris. 2023. Suburban Case Study: Flatlick Branch (Fairfax, VA) Stream Restoration Project.

Observations:

The study included monitoring of multiple parameters beginning in 2008, with construction occurring in 2017. It concluded that measurement of some parameters showed improvements following restoration, while others showed declines. The declines were found in physiochemical (temperature, conductivity, pH, and dissolved oxygen) and biological parameters (benthic macroinvertebrates and fish assemblage). Improvement was shown in floodplain connectivity and stability, as well as concentrations of nitrogen, phosphorus, and total suspended sediment.

Of the improvements, floodplain connectivity is a physical parameter that is easy to accomplish with earth-moving equipment and, while some supporters of stream restorations claim that this will lead to chemical and biological improvements, it is not, in itself, a measurement of chemical or biological improvements. The same statement can be made for stability, which was not even based on measurements, but only on visual observations.

The claimed "improvements" in nitrogen, phosphorus, and total suspended sediment were more concerning. The lead investigator made sure to link these gains to the TMDL mass that was credited, and to provide a gigantic green "checkmark", to draw attention to this success. Unsurprisingly, there was no gigantic red "checkmark" placed next to the graphics that showed parameters for which there were no improvements. However, when viewing the actual data for the nitrogen, phosphorus, and sediment measurements, it is quite obvious that the concentrations for all three parameters were already in sharp decline between 2008, the beginning of monitoring, and 2017, the year of construction. Even though the author makes sure to indicate the TMDL credits he was able to claim, there is actually no evidence that the project, on its own, caused TMDL reductions of any kind.

Scientific and Technical Advisory Committee (STAC), 2023. An Independent Report from the Scientific and technical Advisory Committee (STAC), Chesapeake Bay Program, Annapolis, Maryland, May, 2023.

Observation:

Disappointing project- and watershed-specific results are reflected in the overall results for the Chesapeake Bay, as reported in the 2023 Independent Report from the Scientific and Technical Advisory Committee (STAC) of the Chesapeake Bay Program. The report, commonly called the Comprehensive Evaluation of System Response (CESR) report, found that decades of efforts to improve water quality and ecological function in the Bay through load reductions in TMDL and other programs have not been successful. One particularly relevant statement, from Page 75 of the Findings of that report, is "To date, efforts to reduce nonpoint sources have not produced sufficient levels of BMP implementation to meet the TMDL, and the implementation that has occurred may not be producing the pollutant reductions expected" (emphasis added).

This is a critical statement. The entire purpose of this "implementation that has occurred" is to achieve these pollutant reductions. As discussed above, this "implementation" has enormous financial costs, as well as adverse impacts to the ecology and the residents. If it turns out that this implementation is not producing the "pollutant reductions expected", as stated in the Findings of the CESR report, then all of the financial costs and the adverse impacts to ecology and residents have been for naught.

In testimony in favor of the Maryland Whole Watershed Act before the Environment and Transportation Committee of the House of Delegates in January, 2024, representatives of the stream restoration industry, and others who favor stream restoration projects, cited the CESR report in claiming that the reason for the failures to meet the TMDL were entirely due to not having done enough stream restoration projects, and not having done them of a large enough scale. However, if the Findings of the CESR report, that these projects are not delivering the

expected pollutant reductions, is correct, then implementation of more and larger projects will only waste money, cause damage to existing ecological systems, and adversely impact property values in residential neighborhoods.

Shields, Douglas, online webinar still active in 2025, "Stream Restoration: What Works and What Doesn't Work," webinar sponsored by American Society of Civil Engineers (https://www.asce.org/education-and-events/explore-education/on-demand-webinars/stream-restoration--what-works-and-what-doesn-t-work/)

Following is a quote from the description of the webinar:

- *However, few projects are monitored, and many that have been monitored have performed poorly. Accordingly, the ability of stream restoration engineers to deliver promised benefits is in question.*

Simmons, R. H., 2020_1, "Why Natural Channel Design Projects are Incompatible With Natural Resource Protection and the Preservation of Native Biodiversity," R. H. Simmons, Natural Resources Manager, City of Alexandria; presentation to Montgomery Stormwater Partners Network on July 13, 2020: Accessed at https://drive.google.com/file/d/11oDj0emKLFP1ecRCUKEkKjHozmpAHyDw/view?usp=sharing and https://drive.google.com/file/d/1ud14WcJPU4u18bUPl-2WQFMYK2THP8Ct/view?usp=sharing

Simmons, R.H, 2020_2, "A Review of Little Hunting Creek Watershed, Paul Spring Segments 1 & 2 (Brickelmaier Park and Goodman Park), Hollin Hills Stream Restoration 100% Plans," in Northern Virginia, March 2020.

Following are some quotes from the study:

- *"While the Clean Water Act has accomplished many great things and benefited society, of late it has driven some unintended negative consequences by inducing inappropriate stream restoration projects. The driving force behind most geomorphic stream restoration projects in the Chesapeake Bay Watershed in recent years is local jurisdictions seeking to find ways to meet Clean Water Act requirements focused on reducing nutrient and sediment loads - principally Chesapeake Bay and individual river/stream Total Maximum Daily Load (TMDL) requirements, but also Municipal Separate Storm Sewer Systems (MS4) permits. TMDLs for sediment are set based upon what is necessary to reduce phosphorus loading because phosphorus is transported to the Bay in large quantities adsorbed to sediments."*
- *"Managing excess phosphorus (P) delivery is probably the greatest concern. The most important measures to curb excess phosphorus sediments are by improved agricultural practices, sanitary sewer rehabilitation, and better urban stormwater runoff management. So-called stream restoration projects, however, do not actually target phosphorus-rich deposits."*
- *"The stream bank and channel sediments that geomorphic projects prevent from eroding can be rich in phosphorus if they consist of recent erosion of topsoil (i.e., through inadequate silt fencing around soil disturbance of cropland), erosion of floodplain overbank deposits, and the like. Conversely, eroding geologic materials in upper headwater streams typically have minimal phosphorus in them compared to mid and*

lower stream reaches that contain floodplain sediments. Yet, headwater streams are often targets for geomorphic restoration work because substantial erosion can occur there."

Simon, A., M. Doyle, M. Kondolf, F.D. Shields, B Rhoads, G. Grant, F. Fitzpatrick, K. Juracek, M. McPhillips, and J. MacBroom. 2005. How Well do the Rosgen Classification and Associated "Natural Channel Design" Methods Integrate and Quantify Fluvial Processes and Channel Response? Abstract from conference paper. DOI publication 10.1061/40792(173)584. Accessed at https://www.usgs.gov/publications/how-well-do-rosgen-classification-and-associated-natural-channel-design-methods on 5/10/23.

Observation:

This abstract from a conference presentation challenged the idea, of David Rosgen, that classification of streams and "natural channel design" are equivalent or superior to the science of fluvial geomorphology. The authors lamented that "para-professional training" had empowered individuals and groups with limited backgrounds to re-engineer entire stream systems. The abstract concluded that, while the system makes it easy to communicate between practitioners, but that does not justify its use for engineering design or for predicting river behavior, and its use for designing mitigation was beyond its technical scope.

Simon, A., M. Doyle, M. Kondolf, F.D. Shields Jr., B. Rhoads, and M. McPhillips. 2007. Critical Evaluation of How the Rosgen Classification and Associated ''Natural Channel Design'' Methods Fail to Integrate and Quantify Fluvial Processes and Channel Response. Journal of the American Water Resources Association (JAWRA). Vol. 43, Number 5, Pg. 1117-1131. Accessed at https://naldc.nal.usda.gov/download/7764/PDF on 5/10/23.

Observation:

The purpose of the article was to "present a critical review, highlight inconsistencies, and identify technical problems of Rosgen's natural channel design approach to stream restoration." The text states that Rosgen's training business has "empowered individuals and groups that may have limited backgrounds in stream and watershed sciences to engineers modifications of streams whose scientific underpinning is based on 50-year-old technology never intended for engineering design."

Southerland, Mark, Chris Swan, and Andrea Fortman. 2017. Meta-Analysis of Biological Monitoring Data to Determine the Limits on Biological Uplift from Stream Restoration Imposed by the Proximity of Source Populations. Study funded by Chesapeake Bay Trust. September 2017. Accessed at https://cbtrust.org/grants/restoration-research/ on 6/10/23.

Observation:

This report was largely inconclusive, but did conclude by saying that expectations for biological uplift from stream restorations should be tempered. The report was mostly setting the stage so that the chief investigator could ask for more funding for more studies.

Stack, B., 2019, "Chesapeake Bay Program Stream Restoration Credits: Moving Toward Functional Lift?", Bill Stack, PE, Deputy Director of Programs, Center for Watershed Protection,

September 12th, 2019; https://www.cwp.org/chesapeake-bay-program-stream-restoration-*credits-moving-toward-functional-lift/*

Following are some quotes from the study:

- *"I helped lead the effort in developing the Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects with Tom Schueler of the Chesapeake Stormwater Network. …I can no longer hide from the turmoil that I helped to create in the stream restoration industry. …This action unleashed an unprecedented flurry of stream restoration projects identified in Watershed Implementation Plans and MS4 implementation plans across the Bay watershed which are now being implemented by a thriving billion-dollar stream restoration industry comprised of engineers, hydro-geomorphologists and a few biologists. I forgot to mention big-time financiers. Also, take notice of what I said about "few biologists.""*
- *The Expert Panel noted "the root causes of stream bank erosion: impervious cover. …As a result, municipalities are spending enormous amounts of money on projects that generate the necessary water quality credit but have no real impact on stream function. …Perhaps [change] will come after we spend billions of dollars on these projects and the taxpayers ask "why can't I catch fish in this stream?""*

Stowe, Edward S., Petersen, Kelly N., et. al., 2023, "Stream restoration produces transitory, not permanent, changes to fish assemblages at compensatory mitigation sites," Restoration Ecology, Volume 31, Issue 5, Jul 2023, https://onlinelibrary.wiley.com/doi/10.1111/rec.13903 and https://onlinelibrary.wiley.com/doi/epdf/10.1111/rec.13903

Following are some quotes from the study:

- *Analyzed results from 23 compensatory mitigation projects. Concluded that stream "restoration" produces only transitory, not permanent, changes to abundance and species richness of fishes, especially to sensitive taxa and in urban systems.*
- *"Modeling results indicated that abundance and species richness of fishes generally increased in the first years after restoration before decreasing to baseline levels by the seventh year."*
- *"Stream restoration utilizing Natural Channel Design should not be expected to produce permanent changes to fish communities, especially to sensitive taxa and in urban systems."*
- *"Our analysis indicates that reach-level manipulation of streams [by stream restorations] should not be expected to induce long-term changes in fish communities"*

Thompson, Tess, and Eric Smith. 2021. Improving the Success of Stream Restoration Practices – Revised and Expanded. Study funded by Chesapeake Bay Trust Award #13970. June 2021. Accessed at https://cbtrust.org/grants/restoration-research/ on 6/10/23.

This report concludes:

- *There are few studies that support the supposed benefits of stream restoration.*
- *Attempting these projects in urban watersheds will limit the potential for biological improvements.*

- *In-stream improvements to reduce channel erosion, sedimentation, and nutrient reduction will not be effective if excessive runoff is not controlled.*
- *Efforts to limit channel migration are opposed to the normal functions of streams, and will therefore limit ecosystem health.*
- *The practice of stream restoration has far outpaced the science. Practitioners base their efforts on their own personal experience, which is not written and not made available for study. Where they have been made available, they are non-quantitative and anecdotal.*

Welty, Claire, Andrew J. Miller, and Jonathan M. Duncan. 2021. Quantifying the Cumulative Effects of Stream Restoration and Environmental Site Design on Nitrate Loads in Nested Urban Watersheds Using a High-Frequency Sensor Network. Study funded by Chesapeake Bay Trust Award #15828. 2021. Accessed at https://cbtrust.org/grants/restoration-research/ on 6/10/23.

Observation:

This report concludes that stream restorations did not provide any reductions in nitrate loads.

Wood, Kelsey L., Sujay Kaushal, Phillippe G. Vidon, Paul M. Mayer, and Joseph G. Galelle. 2022. Tree Trade-Offs in Stream Restoration: Impacts on Riparian Groundwater Quality. Urban Ecosystems. Abstract accessed at https://cfpub.epa.gov/si/si_public_record_Report.cfm?Lab=CPHEA&dirEntryId=355730 on 5/8/2023.

Observation:

The article states that "riparian tree removal can lead to significant groundwater quality impacts", and that "where possible mature trees and soil profiles should be conserved".

Attachment 3: Engineered Stream "Restorations" Fact Sheet

(Coalition to Stop Stream Destruction, 2/212026, v146 r00)

1. WHAT? They are civil engineering projects that **destroy natural areas,** converting streams into engineered stormwater conveyances using heavy equipment to clearcut forests, dig artificial channel shapes, and dump fill material into streams. Use the QR code to **see videos** of these harmful engineered stream projects.

2. WHERE? Usually in public land like parks that do not require public approval and are hidden from street view.

3. WHY? Engineered stream "restorations" try but **fail to stop stream erosion** or improve water quality or stream ecology**. Their unattainable goal - to recreate "natural" or "historical" pre-colonial conditions - is impossible given today's land use & climate.[i] Governments hide the real drivers of engineered steam "restorations" - not environmental concern, but EPA regulations (MS4 permit & TMDL goals) and construction "mitigation" laws[ii]. Despite industry & government disinformation[iii], "restorations" are not required by law. There are many nondestructive out-of-stream alternatives (see #6).[iv]

**** ROOT CAUSE OF STREAM EROSION?** Upland (out-of-stream) stormwater runoff from impervious surfaces like roads, parking lots, etc. that firehoses into steams. Engineered stream "restorations" **don't address this root cause of erosion**.

4. WHO INITIATES? Local or state governments for pollution laws; private companies for construction "mitigation."

5. HOW SOLD TO THE PUBLIC? Greenwashing & disinformation[v] to the public and elected officials are used to claim stream "restorations" are both necessary and desirable. Click for a **presentation** or use QR code:

0 **a.** Local, state, and federal governments and the $25B industry **ignore the science** and Chesapeake Bay Program Report[vi] that stream "restorations" do not stop erosion. Published papers[vii] analyzed over 700 "restorations" to show that water quality and ecological function are not improved (even though "…biological benefit is an assumed condition for the permitting and crediting of stream restoration projects"[viii]), are sometimes worse, and less than half stopped stream erosion – less than a coin toss. A few claims of "successful" projects (if they even exist) are outliers.

b. Proponents **falsely claim** that 1) studies[ix, x, xi] prove upland projects cannot stop stream erosion – in fact, these studies only show that too few properly sized projects were built, and 2) there are not enough upland areas for stormwater control, even when not evaluated or only considering the same watershed or meets-minimum projects done in public areas/ROWs.

c. Governments **ignore or trivialize adverse consequences**[xii] by hiding tree numbers cut, claiming that wildlife habitat loss by forest clearcutting is temporary and quickly mitigated by planting saplings,[xiii] that invasives will be removed and then successfully controlled, concealing that small animals will be crushed or buried alive, and hiding the loss of property values due to viewshed destruction, increased traffic noise, and decreased shade, privacy, and nature-based recreation.

d. They **hide negative consequences** from floodplain reconnection[xiv] "restorations" like more flooding due to runoff from more frequently saturated floodplains and loss of evapotranspiration from cut trees, death of trees due to water-logged soil, more mosquitoes, and deposition into floodplains of toxins in stormwater that are hazardous to animals and children.

e. Governments falsely claim that **photos of washed-out engineered "restorations"**[xv] that failed to stabilize streams and that require costly taxpayer-funded repairs[xvi,xvii] are cherry-picked, yet they provide no scientific evidence to the contrary.

f. To justify "restorations," they claim stream erosion rates using bogus theoretical, irreproducible calculations[xviii].

g. To promote "restorations," governments falsely conflate the need for infrastructure and property protection (e.g., exposed sewer lines and backyard erosion) which can be done via spot repairs without the need for stream "restorations."[xix]

h. Governments[xx] & Chesapeake Bay Program's STAC[xxi] make baseless claims that engineered "restorations" are cheaper (install + life cycle cost) than 20 less expensive out-of-stream stormwater control practices per MD Dept. of Environment.[xxii]

6. SOLUTION? Control stormwater outside of streams with **non-destructive, upland practices** such as roadside bioretentions, rain gardens, permeable pavement, etc.[xxiii] in already disturbed, developed areas. Many are cheaper than engineered stream "restorations" and provide co-benefits like reducing urban flooding and heat islands, providing green spaces, increasing property values, and protecting streams & floodplains from toxins in stormwater.

7. COST vs. NATURE? Even if some upland stormwater controls are more expensive, **our natural areas must be protected**.[xxiv]

8. HOW TO FIX ERODED STREAM BANKS? There is evidence that streams self-heal[xxv] and self-stabilize once upland runoff is controlled.[xxvi]

---

[i] Just as the Chesapeake Bay Program's "Comprehensive Evaluation of System Response" (CESR) report 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," so too it will be impossible to restore local streams to "natural" or "historical" pre-colonial conditions.

[ii] MS4 permits for stormwater runoff pollution control and mitigation projects to offset damage done e.g. by proposed Beltway widening.

[iii] "Why is this work required?" in "FAQs, Miracle Drive," by Montgomery Co. DEP. https://greenmiracledrive.com/wp-content/uploads/2023/05/Miracle-Drive-FAQ_0526.pdf

[iv] Allowed MS4 permit practices in Maryland are listed in the MDE Accounting Guidance document: https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Documents/Final%20Determination%20Dox%20N5%202021/MS4%20Accounting%20Guidance%20FINAL%2011%2005%202021.pdf

[v] Presentations by governments and industry falsely promise stream & ecological restoration and water quality improvement. But, in a private meeting for Stormwater Partners (1/16/2024), Montgomery Co. DEP admitted that "We have not seen benthic [macroinvertebrate] improvement in any of our stream restorations." BMIs are a measure of stream health.

[vi] In their Step 3: Estimate restoration reduction efficiency, The Chesapeake Bay Program's (CBP) Expert Panel Report states that, "In the last step, sediment and nutrient load reductions are conservatively reduced by 50% to account for the presumed [in]efficiency of stream restoration practices." https://chesapeakestormwater.net/wp-content/uploads/2022/07/9928-1.pdf.

[vii] 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); 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; Southerland, M., et. al., 2021, "Vertebrate Community Response to Regenerative Stream Conveyance Restoration as a Resource Trade-Off," CBT Research Grant; https://cbtrust.org/wp-content/uploads/FINAL-Report-for-18002-Tetra-Tech-CBL-CBT-RR-Vertebrates-in-RSCs-30SEP2021-Submitted-to-CBT.pdf; Carr, J., Hart, D., McNair, J., 2006, "Compilation and Evaluation of Stream Restoration Projects: Learning from Past Projects to Improve Future Success," Drexel Univ., Submitted to Penn Foundation. https://ansp.org/research/environmental-research/projects/restoration/

[viii] Chesapeake Bay Program's (CBP), STAC Workshop Report, 2024, "The State of the Science and Practice of Stream Restoration," https://www.chesapeakebay.net/files/STAC-Report_Stream-Restoration_24-006-1.pdf; objective of Clean Water Act is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." https://www.govinfo.gov/content/pkg/USCODE-2018-title33/pdf/USCODE-2018-title33-chap26.pdf

[ix] Williams, B. et al., (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

[x] Thompson, T. W. et al., (2023) "Effectiveness of stormwater management practices in protecting stream channel stability," presented at the 2023 Maryland Water Monitoring Council Annual Conference. https://drive.google.com/file/d/1isYAs58zVsLJ9H1VOiu4PvzMuYvSplf3/view

[xi] Hopkins, Kristina G., et. al., 2022, "Lessons learned from 20 y of monitoring suburban development with distributed stormwater management in Clarksburg, MD," Freshwater Science, volume 41, number 3, Sept.2022. https://www.journals.uchicago.edu/doi/full/10.1086/719360

[xii] References provided on request.

[xiii] "Restoration" disturbances are not temporary. After clear-cutting, "…full ecological recovery, including soil stabilization and biodiversity restoration, can take several decades to over a century." https://forestry.com/education-and-community/educational-resources/clear-cutting-pros-and-cons-what-you-need-to-know/

[xiv] The floodplain reconnection techniques of "restoration" try to re-create pre-colonial conditions when stormwater more frequently overflowed stream banks and spread into a floodplain where eroded sediment is deposited. In the "Legacy Sediment Removal" method, the stream valley is clearcut then tons of soil are removed to lower the valley to the stream level. In the FILL method, material is dumped into a stream channel to raise its level closer to the valley floor (only to be eroded out again by uncontrolled stormwater runoff.)

[xv] Photos in Appendix 3, testimony on Montgomery Co. FY26 Capital Budget; MoCo DEP and Parks have no public list of storm intensity each project has experienced and which were damaged. https://drive.google.com/file/d/1DTOOLLm_Aei8lRpPoxPpnFvnTXWJW8eq/view?usp=drive_link

---

[xvi] Example of Montgomery Co. failed "restorations" repair cost per DEP: Lower Booze Creek, Potomac: repair = $3.6M.
[xvii] Stream "restoration" companies typically only guarantee their projects for one year since they know that these projects will be washed-out. After that, taxpayers foot the repair bill.
[xviii] Per CBP Expert Panel Report, theoretical erosion rate calculations have "…high variability when performed by different practitioners," and "restorations" are presumed to be at most 50% effective in stopping erosion. https://chesapeakestormwater.net/wp-content/uploads/2022/07/9928-1.pdf
[xix] False conflation: "What is stream restoration? What problem can it solve? …Erosion can also be harmful to public infrastructure (such as exposing a sewer pipe) and private property (such as a backyard in danger of eroding away into a stream). https://www.montgomerycountymd.gov/DEP/water/clean-water-montgomery/watershed/stream-restoration.html
[xx] Montgomery Co DEP claims "restorations" are cheaper than upland stormwater control practices (WQAG meeting, 4/12/2021). They misleadingly compare pricing for stream "restorations" vs. DEP's "Green Streets" program comprised of at least 7 different practices including Rain Gardens, Bioretentions, etc. DEP does not break out prices for these 7 practices for a true comparison of practices.
[xxi] CBP STAC Workshop Report, 2024, "State of the Science and Practice of Stream Restoration," p.47 https://www.chesapeakebay.net/files/STAC-Report_Stream-Restoration_24-006-1.pdf
[xxii]Per MD Dept. of the Environment (MDE) "Annual Report on Financial Assurance Plans" -2022- 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
[xxiii] Examples at MoCo DEP's site https://www.montgomerycountymd.gov/DEP/water/clean-water-montgomery/watershed/green-streets.html
[xxiv] Especially given global warming and some Climate Action Plans' goal to "Retain, increase, and restore terrestrial ecosystems including forests…." https://www.montgomerycountymd.gov/climate/Resources/Files/climate/climate-action-plan.pdf
[xxv] Prestegaard, K. 2023, "Urban Runoff and Channelization," STAC Workshop Report, 2023, "The State of the Science and Practice of Stream Restoration, https://www.chesapeake.org/stac/wp-content/uploads/2023/04/Prestegaard-Karen-panel-slides-2.pdf
[xxvi] Fraley-McNeal, et. al. (2021), "The Self-Recovery of Stream Channel Stability in Urban Watersheds due to BMP Implementation," https://cbtrust.org/wp-content/uploads/Self_Recovery_of_Stream_Channel_Stability_Final_Draft_03-23-21.pdf; streambank soil will slough off into streams during self-stabilization, but the science (note vi) shows that most stream "restorations" do not stabilize streams anyway, and photographic evidence shows that "restorations" are being eroded away by post-construction storms.