To Whom It May Concern,

A study analyzing data from over 600 stream and river restoration projects across the United States found that more than 90% of stream restoration projects do not demonstrate any clear evidence of biological uplift—meaning a measurable improvement in the diversity, abundance, or health of aquatic organisms like macroinvertebrates or fish. (Bernhardt, E.S., Palmer, M.A., Allan, J.D., et al. (2005). "Synthesizing U.S. River Restoration Efforts." Science, 308(5722), 636–637. DOI: 10.1126/science.1109769)

Meanwhile, all stream restoration projects cause significant environmental damages via tree loss and other forms of habitat destruction. Despite heavy promotion of stream restoration by industry personnel, most projects in the study lacked any meaningful monitoring and the majority focused on physical form, such as bank stabilization and channel reconfiguration, rather than on improving water quality or biological health. Very few projects included quantitative assessments of success, making it difficult to evaluate their effectiveness scientifically. This should be a huge wake-up call for the restoration field and all regulating entities, as it provides strong evidence that stream restoration efforts must be better planned, more transparent, and more grounded in ecological science—with clear, measurable goals. Further, no credits or financial incentives should be granted without thorough documentation of meeting these goals.

It appears that many environmental organizations are supportive of stream restorations, largely because of skewed industry funding, as well as a lack of analytical expertise within the organizations. This is why measured scientific evidence must be the basis for creating any policy. Considering the data from prominent scientists is the only way to make reasonable decisions on this matter, as well as the only way to maintain integrity as a governing entity. Even though other agencies have failed to maintain this level of scrutiny, I strongly urge you to move to ensure that biological uplift outweighs ecological damages in a measurable way with each and every project.

Below are links to articles, studies, and reports evaluating actual results from past stream restoration projects, as compiled by Surface Water Hydrologist Bob Dover in response to the Elkhorn Branch Prospectus (which was later withdrawn shortly after many questionable claims were brought to the forefront of discussion). Any oversight lacking serious consideration of the results of these projects can and will lead to greater public concern over time. The public generally has not yet been made aware of the collateral damage of these "restorations" as documented by scientific analysis, but I am increasingly confident that it will be taken quite seriously, especially if beloved natural habitat is destroyed for no good reason. I hope you will find yourselves on the right side of history, and work to ensure that environmental policy serves only to reward proven biological uplift, as opposed to supporting the unjustifiable environmental destruction that has been demonstrated by most stream restoration.

Stream Restoration Observations:

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.

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.

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

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.

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.

Cohee, Gabe. 2023. Chesapeake and Atlantic Coastal Bays Trust. Email to Bob Dover regarding mass tree removal as part of stream restoration. June 12, 2023.

In response to a question about funding of stream restoration projects by the Chesapeake and Atlantic Coastal Bays Trust, Mr. Cohee responded that “As a fund source, we are very interested in protecting existing habitat and ecological functioning while supporting the restoration activities based on high levels of degradation. In response to my question about whether they would fund projects that involve up to 60 acres of tree removal, he responded “It is hard to say whether we'd support a project without further information and seeing an engineered design; however, it would be very detrimental to a proposal if this many acres of existing forest is being negatively impacted.” Then, he discussed the evolving state of the science about stream removal projects. He said “There are many new, more surgical approaches that can protect existing trees while meeting project goals. For example, if the goal of the project is to actively reconnect the stream to the floodplain, some upland trees that exist now may die overtime as new, more riparian appropriate species take hold. This shift in the regime can happen overtime to protect habitat, stream temperature, etc. while promoting more appropriate ecological functioning.”

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.

The Elkhorn Branch 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”.

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 says that “stream restoration alone is not appropriate for compensatory mitigation and should be seen as complementary to land-based best management practices”

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.

The Elkhorn Branch 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”. 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. 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.

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.

The Elkhorn Branch 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”.

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 this project will NOT control runoff, any in-stream structures are 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.

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

The study of more than 20 stream restoration projects documented that biological uplift goals were not met.

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 athttps://cbtrust.org/grants/restoration-research/ on 6/10/23. 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. With respect to the Elkhorn Branch project, this supports my claims that the contractor is deliberately not disclosing any studies or articles that provide any negative observations, because it is damaging to their business model.

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

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.

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.

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.

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." Since this project will NOT control runoff, the stream will still be subject to 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.

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. This 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.

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.

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, 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.

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. Because Dr. Palmer's article was developed in 2014, Bob Dover contacted her by email in May, 2023, to notify her that he intended to use the article to opposes 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."

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.

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 ResourcesAssociation (JAWRA). Vol. 43, Number 5, Pg. 1117-1131. Accessed at https://naldc.nal.usda.gov/download/7764/PDF on 5/10/23.

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.

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.

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. 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.

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”.

Thank you,

Sarah Kellett