HB 942 Wetlands and Waterways Program – Authorizations for Stream Restoration Projects

House Environment & Transportation Committee

March 3, 2023

Sharon Boies - Position: Support.

Following is a list of references with extracts of press articles and scientific papers supporting my testimony on HB 942 Wetlands and Waterways Program – Authorizations for Stream 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

> o "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 orresponding 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

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

> o "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
>
> o "Urban stormwater runoff, delivered through conventional drainage systems, is a complex enviromental flow problem that can, in large part, be solved by harvesting stormwater before it reaches aquatic ecosystems." P. 8
>
> o "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

• 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/environment/bs-md-stream-restoration-20200102-hqwyeoa4m5bgfhtxybgdalrhby-story.html. Baltimore Sun. January 2, 2020.

> o "...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."

o "...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.'"

o "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."

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, 2020 (https://cbtrust.org/wp-content/uploads/Hilderbrand-et-al_Quantifying-the-Ecological-Uplift.pdf)

o "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.

o "We sampled 40 urban stream restorations across the Piedmont and Coastal Plain physiographic regions in the grater Baltimore/Washington DC Metropolitan area of Maryland.

o 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.

o Unfortunately, the ecological aspects rarely improved despite the improved physical measures.

o 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.

o 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

o 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.

o 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."

o "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."

• "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, February 9, 2020, Prepared by Jesse Iliff, Wayne Martin, and Sarah Giordano, ARF

- "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)

• Kaushal, Sujay S. et. al., 2018, "Tree Trade-offs in Stream Restoration Projects: Impact on Riparian Groundwater Quality," University of Maryland, State University of New York ESF, Maryland Department of Transportation State Highway Administration, 2018 Presentation.

- Groundwater sampling studies of five Maryland streams (including Paint Branch) showed that sites where trees were removed had higher riparian groundwater nutrient concentrations than sites where no trees were removed. They also cite many other studies that show increased nutrient concentrations after tree removal in watersheds.

• Noe, G.B., C.R. Hupp, E.R. Schenk, and N.R. Rybicki., 2013, "Science Summary—Sediment and Nutrient Trapping in the Floodplain of Difficult Run, Virginia, and Implications for the Restoration of Chesapeake Bay." U.S. Geological Survey.

- "Nitrate production by floodplain soils is minimized where the forests are shady, trees are most abundant, and herbs and grasses are least abundant."

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

- "Improvements in the five metrics within the water quality category (Table 2) were found for only 7% of the channel reconfiguration projects and for none of the in-stream channel projects (Table 2)." P. 259

- "Unfortunately, recovery of biodiversity was rare for the vast majority of stream restoration projects." P. 259

- "Unlike diversity, taxa richness is not a particularly informative indicator of project outcome because it does not distinguish between tolerant and intolerant taxa. One of the most comprehensive studies of restoration outcomes (24 channel reconfiguration projects assessed) reported no significant change in diversity for two-thirds of the projects and only a slight increase

in taxa richness in the other third that was associated with the addition of a few tolerant taxa characteristic of urban streams (Tullos et al. 2009).” P. 262

o “A recent study has shown that watershed-scale, out-of-channel management practices to restore urban streams can be quite successful... (Smucker & Detenbeck 2014).” P. 262

o “We found that the highest success rates biologically were for those projects that involved a primary focus on enhancing the riparian zone as the restoration action. Typically, these involved either planting native vegetation or removing nonnative vegetation.” P. 262.

o “...the problematic ecological outcomes of many or most structurally based restoration projects are only now becoming more widely acknowledged. ... We show that a major emphasis remains on the use of dramatic structural interventions, such as completely reshaping a channel, despite growing scientific evidence that such approaches do not enhance ecological recovery, and the data we assembled (Table 2) suggest they are often ineffective in stabilizing channels when stability is the primary goal. Efforts at the watershed and riparian scales that target restoration of hydrological processes and prevention of pollutants from entering the stream appear to offer the most promise.” P. 262

o “Restoration is hard, and forestalling the socio-economic incentives to invent new ecosystems rather than restore existing ones or to manipulate channels rather than rehabilitate watersheds will require great revolutions indeed.” P. 263

• Pedersen ML, Kristensen KK, Friberg N (2014), “Re-Meandering of Lowland Streams: Will Disobeying the Laws of Geomorphology Have Ecological Consequences?” PLoS ONE 9(9): e108558. doi:10.1371/journal.pone.0108558. (brackets added to extract below)

o “Despite significant differences in physical habitat conditions, macroinvertebrate taxonomic richness, abundance and diversity showed a similar lack of response in channelized and restored reaches. A similar absence of response was reported from a meta-analysis study of 24 projects by Miller et al. Ernst et al. found that only one macroinvertebrate metric responded to restoration in small forested headwater streams in the Catskill Mountains in New York State.”

o “Such a lack of response is consistent with the results of numerous other studies recording little or no response of macroinvertebrates to restoration. Lepori et al. concluded that local scale restoration had little effect on macroinvertebrate communities compared to watershed scale factors. In a meta-analysis of stream restoration projects from 1975to 2008, Palmer et al. found that only 2 of 78 restoration projects generated increases in macroinvertebrate diversity.”

o “More investigations should be carried out with focus on developing biological indicators of habitat improvements. Macroinvertebrates are an important organism/functional group in streams, but their mixed response to restoration and habitat improvement suggests that other organism groups should be included [such as native plant diversity, habitat quality, soil microorganisms, etc.].”

• 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/

o “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.””

o 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?””

• 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, unpublished report.

o “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.”

o “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.”

o “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.”

• Wheeler, Timothy B., “Stream restoration techniques draw pushback,” Bay Journal, Oct.7, 2020, (https://www.bayjournal.com/news/pollution/stream-restoration-techniques-draw-pushback/article_ffc96960-0895-11eb-b36f-

efa466158524.html?utm_medium=social&utm_source=email&utm_campaign=user-share); extracts below

> o In addition to reducing sediment and nutrient pollution, stream restoration projects are supposed to provide "ecological uplift" to degraded streams, bringing back long-lost aquatic insects and fish like trout, which need cold, clear water to maintain their populations.
>
> o In reviewing 40 different projects across Maryland, researchers at the University of Maryland laboratory didn't find many ecological benefits. The number and type of aquatic insects — food for fish and key indicators of stream health — didn't improve.
>
> o According to ecologist Bob Hilderbrand, the study's lead author, there's evidence that a tream's ecosystem can benefit from restoration if the stream wasn't severely impaired to begin with. But in badly degraded urban and suburban streams, he added, "there's not much evidence ... that we can bring the ecology back."
>
> o And in some cases, he said, his research suggests the aquatic habitat and life in streams that have undergone restoration work actually wind up worse off than if left alone.
>
> o Hilderbrand said his team's study didn't look specifically at how tree removal during restoration affected a stream's ecology. But he noted that even if contractors replace the cleared vegetation along the banks, which is customary in restoration projects, "it's going to take decades for those trees to become re-established."
>
> o With their root networks, trees help prevent stream bank erosion. They also soak up rainfall, helping to keep nutrients and sediment from washing off into a stream during a storm. In dry weather, they shade the water from the sun, keeping the temperature down to help sustain fish and amphibians.

I urge the Committee's FAVORABLE report on HB942.

Thank you for your consideration.

Sharon Boies

Columbia, MD