Stormwater Control using Stream “Restorations”

June 22, 2023

by Ken Bawer (kbawer@msn.com)

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

What is a stream “restoration”?

- Engineering projects that try to stabilize eroding stream banks

(Montgomery Parks web site)

Solitaire Court, Gaithersburg video (3:44)

"I do not understand how this is legal."

https://youtu.be/NvTvPnG6Qs8

“If we can’t transcend our instinct to conquer nature, there won’t be much nature left to conquer.”

Tad Friend, “Hunting the Hunters,” The New Yorker, May 22, 2023

The Inconvenient Truth: Stream "Restorations" Don't Restore Streams

- Restore: to bring back to a former state
- Can't ignore the damage we can see

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

Examples of Stream “Restoration” Projects

Stream “Restorations” Don’t Restore Streams

Asbury Methodist Village, Montgomery County

Tree in winter

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

Stream “Restorations” Don’t Restore Streams

Upper Watts Branch, Rockville

(“Stream restoration” in Upper Watts Branch, Rockville; photo by City of Rockville)

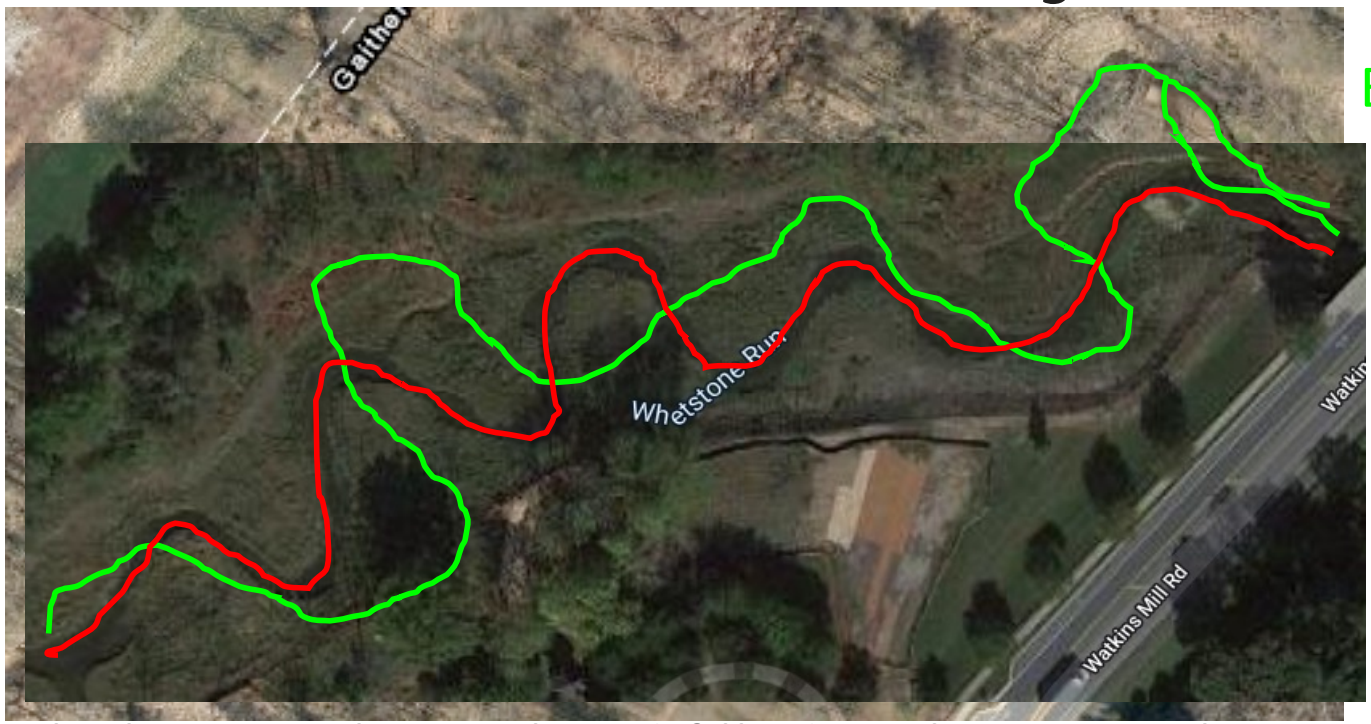
Stream “Restorations” Don’t Restore Streams

Whetstone Run, Gaithersburg

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

Stream “Restorations” Don’t Restore Streams

Whetstone Run, Gaithersburg



(https://earthexplorer.usgs.gov/)

(Google Maps

- Dug a whole new channel and filled in the natural one.
- The more they engineer the stream - the longer the project - the more money they make.

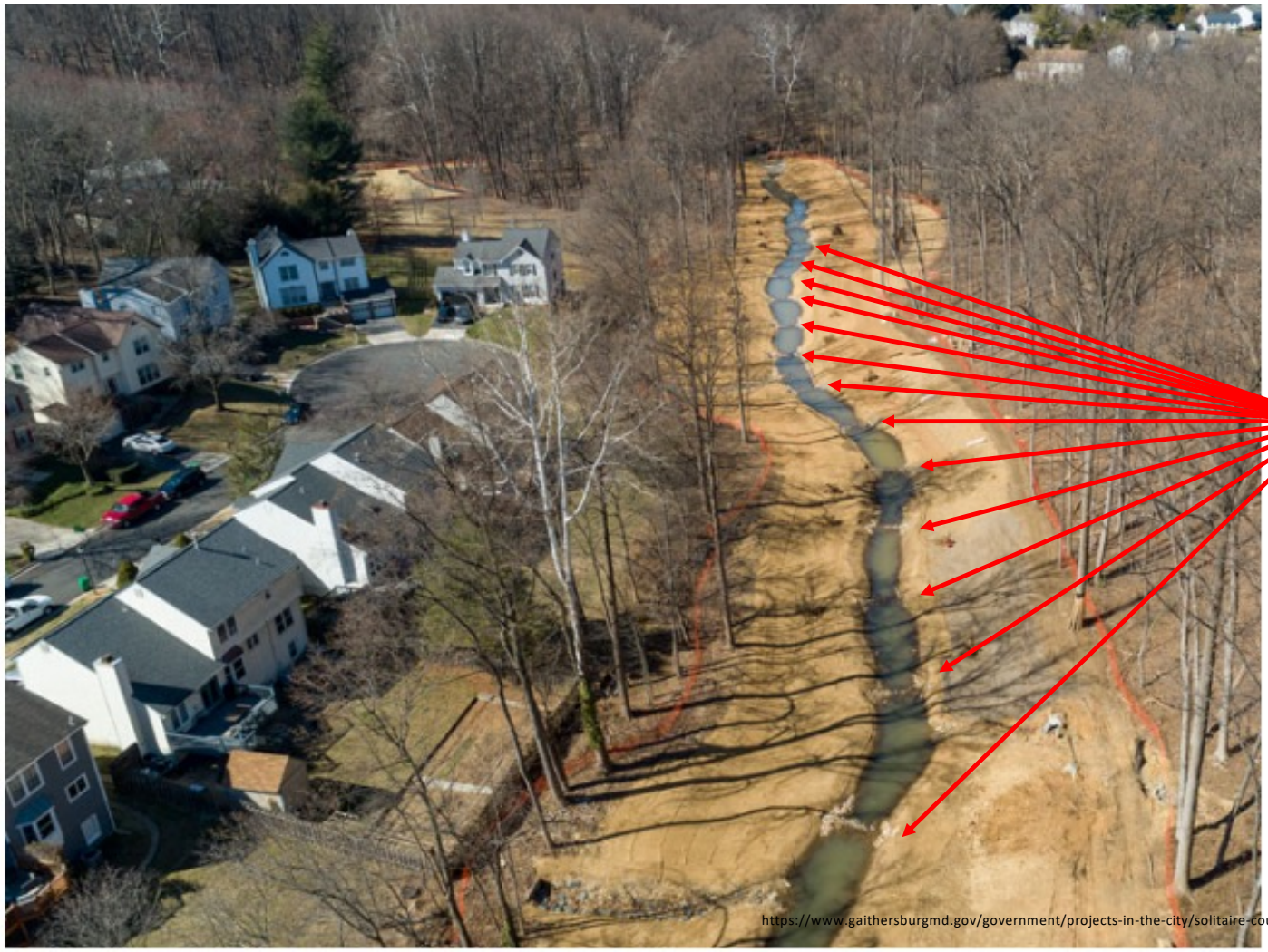
Columbia, MD

Stream “Restorations” Don’t Restore Streams

Stream “Restorations” Don’t Restore Streams

Solitaire Court, Gaithersburg

Solitaire Court stream “restoration”, Gaithersburg



https://www.gaithersburgmd.gov/government/projects-in-the-city/solitaire-court-stream-restoration-project

Stream “Restorations” Don’t Restore Streams

Solitaire Court, Gaithersburg

(Photo by R.Portanova, 2/7/2022)

Font Hill Tributary Stream Restoration, Howard Co. - before

https://data.howardcountymd.gov/InteractiveMap.html?Workspace=HistoricAerials, 2017 Aerial Photo

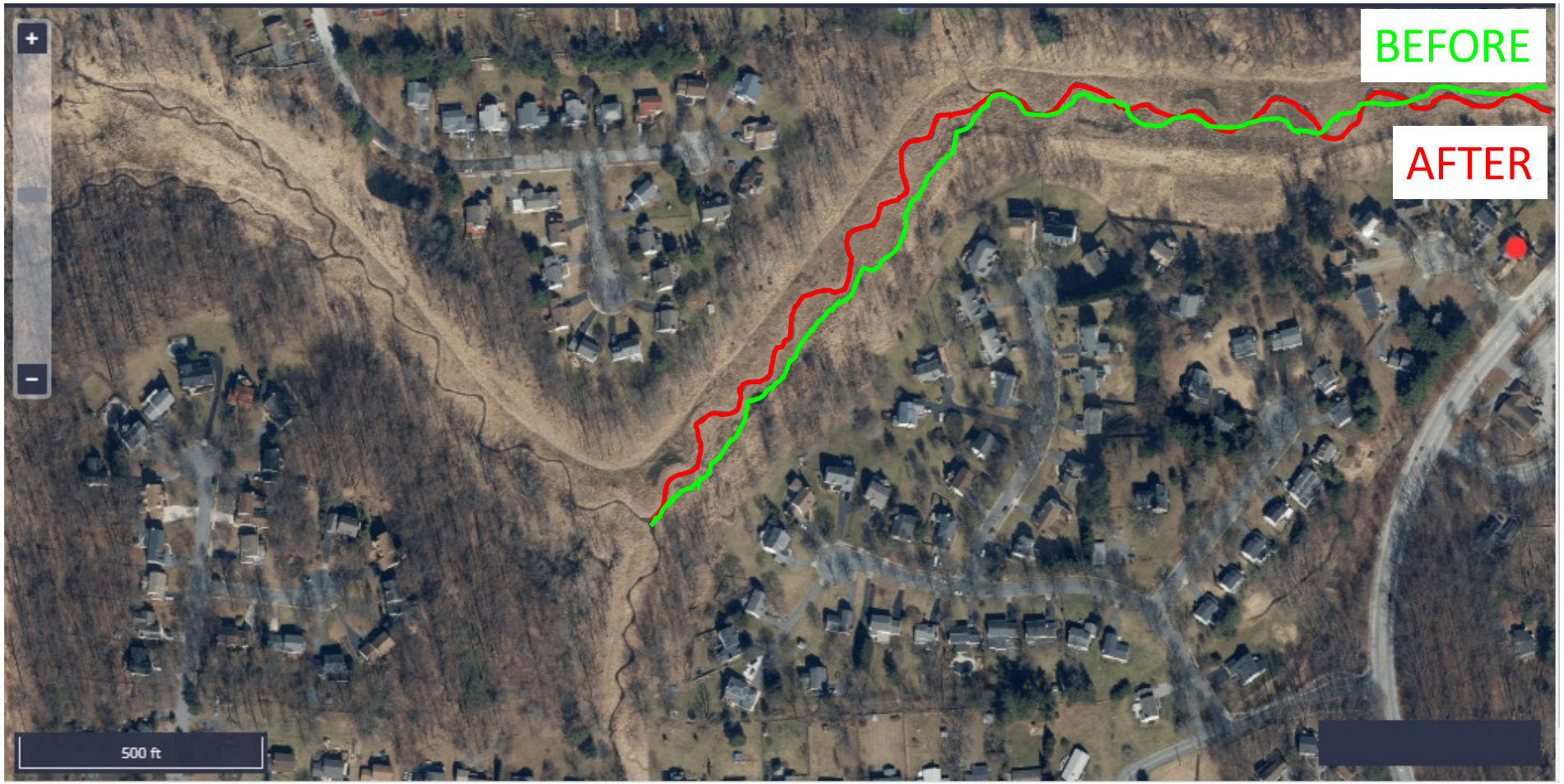
Font Hill Tributary Stream Restoration Ho Co. - after

https://data.howardcountymd.gov/InteractiveMap.html?Workspace=HistoricAerials 2022 Aerial Photo

Font Hill Tributary Stream Restoration Ho. Co. - after

https://www.google.com/maps/@39.2728769,-76.8703021,525m/data=!3m1!1e3

Font Hill Tributary Stream Restoration Ho. Co. - after



https://data.howardcountymd.gov/InteractiveMap.html?Workspace=HistoricAerials 2022 Aerial Photo

Stream “Restorations” Don’t Restore Streams

https://www.youtube.com/watch?v=ix42pr9t3ts

Scotts Level Branch Stream Restoration Project

St. Charles Parkway Stream “Restoration”, Charles Co, MD

https://www.charlescountymd.gov/our-county/infrastructure-capital-services/npdes-project/st-charles-parkway#ad-image-0

St. Charles Parkway Stream “Restoration”, Charles Co, MD

https://www.charlescountymd.gov/our-county/infrastructure-capital-services/npdes-project/st-charles-parkway#ad-image-0

Stream “Restorations” in Prince George’s County

Tinkers Creek, Prince George's County

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

Tinkers Creek, Prince Georges County

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

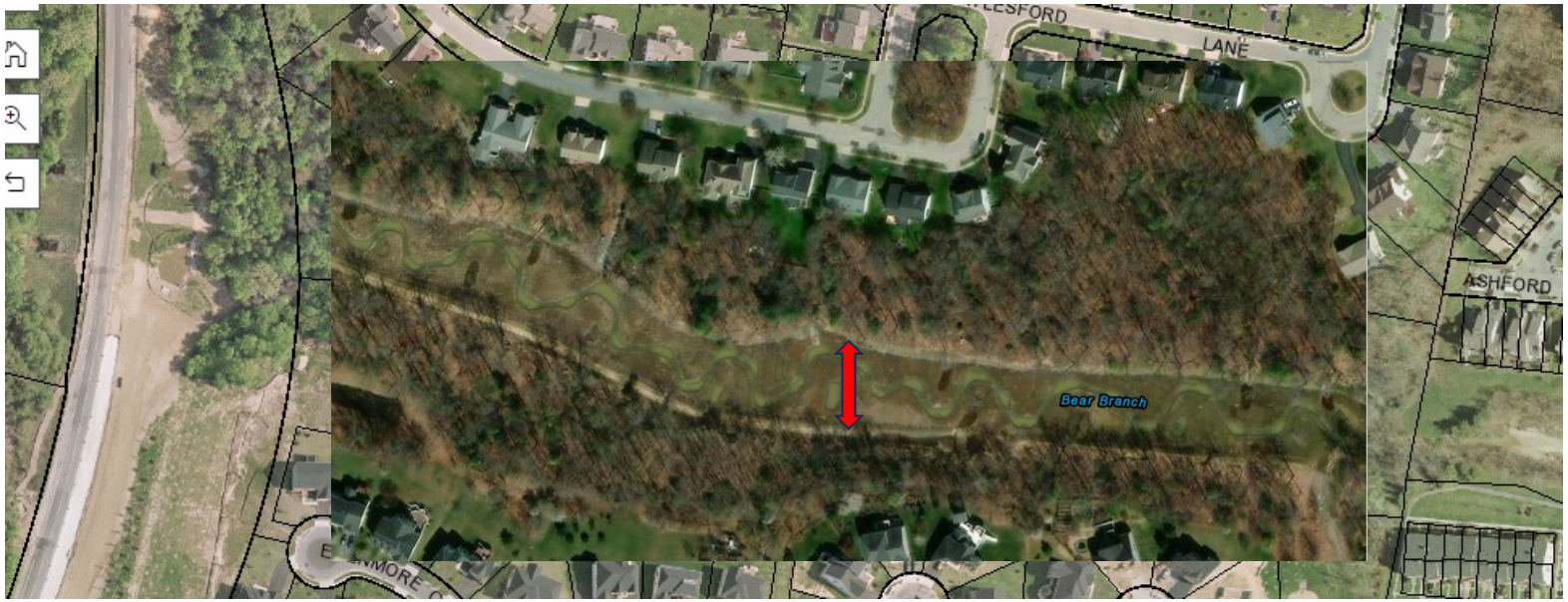
Bear Branch, Prince Georges County

"Before"

2005; https://www.pgatlas.com/

Bear Branch, Prince Georges County

"After"



BEFORE: PGAtlas.com, 2005 Color with property lines
AFTER: https://earthexplorer.usgs.gov/

Bear Branch, Prince Georges County

"After"

Bear Branch Stream Restoration

Status: Under Construction
Stakeholders:
- Department of Natural Resources (DNR)
- City of Laurel
- Villages of Wellington HOA

Estimated Completion: May 2022
Grant Funding: $1.75M

Design Approach:

Floodplain Reconnection
Creation of Wetland Complexes
Grade Controls
Toe Wood Protection

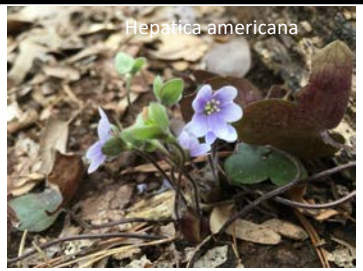
https://www.princegeorgescountymd.gov/DocumentCenter/View/37900/GS-2021-Day-4-Restoration-projects-12-PM

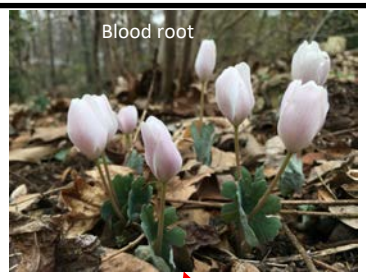
Bear Branch, Prince Georges County

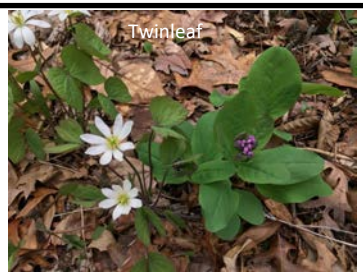
https://www.pgatlas.com/

Collateral damage

Collateral damage: wildflowers & animals destroyed







All photos by K. Bawer except middle)

Collateral damage

(photo by R. Portonova, 6/10/2022)

What happens to the fish? See next slide

https://www.montgomerycountymd.gov/water/streams/fish.html

Fish pulverized by the pumps

"Aquatic life would either be prevented from passing the project reach or pulverized by the pumps." ("Stream Restoration Design", USDA National Engineering Handbook)

https://www.youtube.com/watch?v=-4u8fJ5KtaA

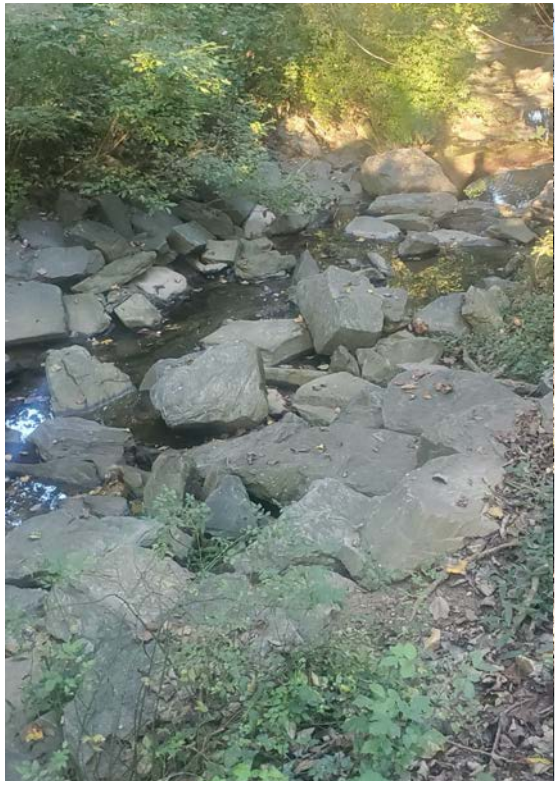
Bear Branch Stream Restoration, PG Co. - Pump around operations

Stream “Restoration” Failures

- Companies only guarantee their work for one year.
- After that, taxpayers pay the bill.

Stream “restorations” fail

Josephs Branch, Kensington

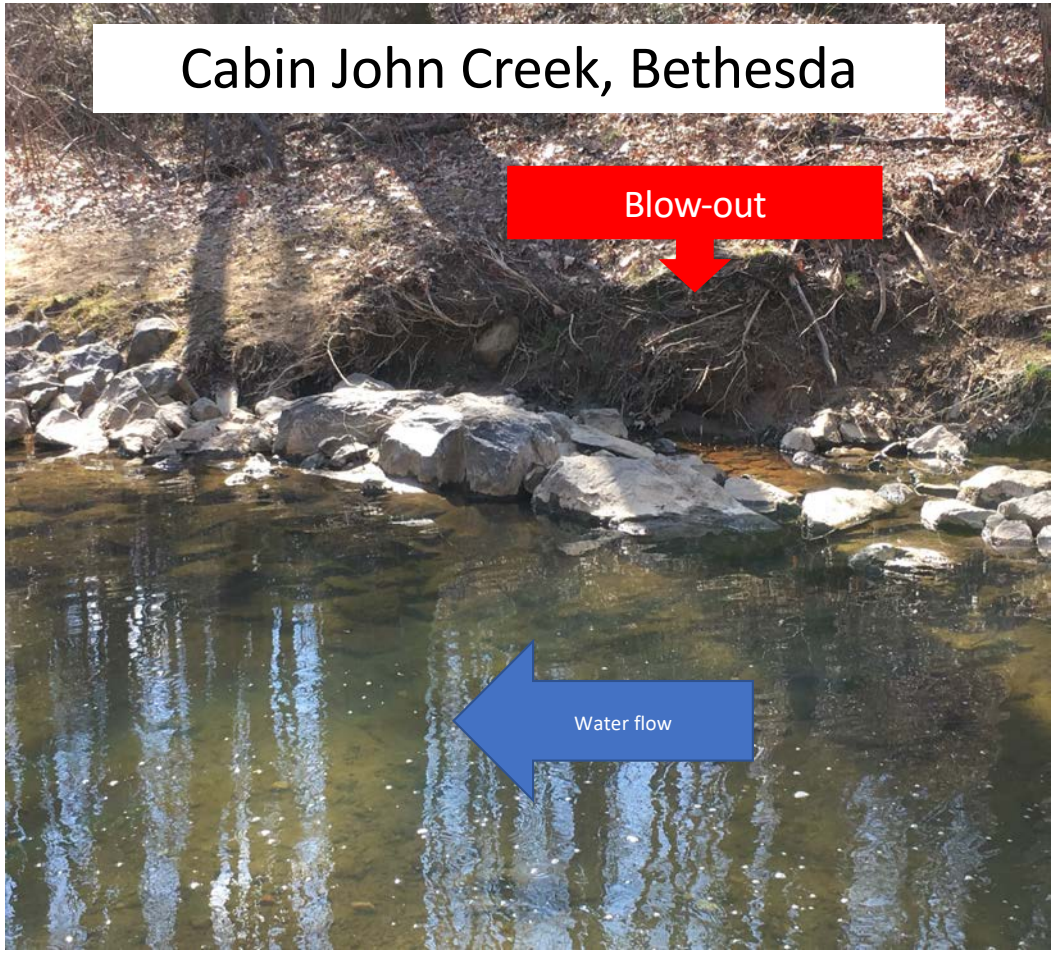


Joseph’s Branch Stream (by J. Marcis, 9/14/2022)

Joseph’s Branch Stream (by K. Bawer,)

Joseph’s Branch during rainstorm (Photo by K. Bawer)

Stream “restorations” fail



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

Stream “restoration” failures

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

Stream “restoration” failures

(By K. Bawer, 11/23/2021)

Stream “restoration” failures

Annapolis Landing in Riva, Anne Arundel Co.

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

“Stream restoration” failures, continued

Lower Booze Creek, Potomac, MD

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

Scientific Evidence that Stream "Restorations" Don't Work"

Scientific Evidence that Stream "Restorations" Don't Work

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

"…restorations usually end up with no better, and often worse, benthic macroinvertebrate responses [which is an industry-standard for measuring in-stream biology] than were the stream left alone."

Dr. Robert Hilderbrand, University of Maryland

What does the science say about effect of stream "restoration" on stream biology?

- The results of stream "restorations" rarely, if ever, show evidence for biological improvement for aquatic organisms
  (References on next page)

(https://www.montgomerycountymd.gov/DEP/Resources/Files/downloads/water/advisory-group/ms4-ppp-wqag-pres-2014.pdf)

Stonefly

Black Fly and Chironomid Larvae

Blacknose Dace

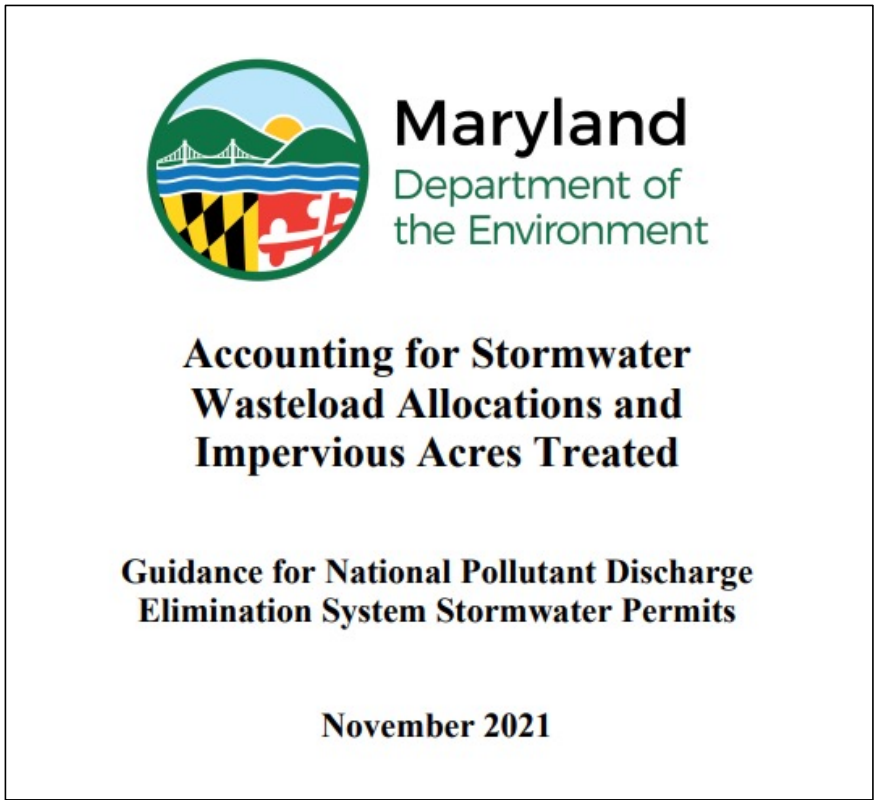
- References:

  - Hilderbrand, Robert H., et. al., "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
  - Jepsen, R., Caraco, D., Fraley-McNeal, L, Buchanan, C., and Nagel, A. 2022. "An Analysis of Pooled Monitoring Data in Maryland to Evaluate the Effects of Restoration on Stream Quality in Urbanized Watersheds: Final Report." ICPRB Report 22-2. Interstate Commission on the Potomac River Basin, Rockville, MD. https://www.potomacriver.org/wp-content/uploads/2022/06/ICP-22-1_Jepsen.pdf
  - Kaushal, Sujay S. et. al., 2018, "Tree Trade-offs in Stream Restoration Projects: Impact on Riparian Groundwater Quality," University of Maryland, State University of New York ESF, Maryland Department of Transportation State Highway Administration, 2018 Presentation (https://cbtrust.org/wp-content/uploads/Kaushal-and-Wood_UMD_061219.pdf)
  - Laub, B.G, McDonough, O.T, Needelman, B.A., Palmer, M.A., "Comparison of Designed Channel Restoration and Riparian Buffer Restoration Effects on Riparian Soils," Restoration Ecology, Vol. 21, Issue 6, November 2013 (https://onlinelibrary.wiley.com/doi/abs/10.1111/rec.12010)
  - Palmer, M. A. et. al., 2014, "Ecological Restoration of Streams and Rivers: Shifting Strategies and Shifting Goals," Annual Review of Ecology, Evolution, and Systematics. 2014. 45:247–69 (www.ecolsys.annualreviews.org or www.annualreviews.org)
  - (Pedersen ML, Kristensen KK, Friberg N (2014), "Re-Meandering of Lowland Streams: Will Disobeying the Laws of Geomorphology Have Ecological Consequences?" (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4180926/)

Non-destructive Alternatives to Stream “Restorations”

Non-destructive Alternatives to Stream "Restorations"

- MS4 Permit "Accounting Guidance" document
- Long list of non-destructive practices" can be used to meet the MS4 Permit instead of "stream restorations".

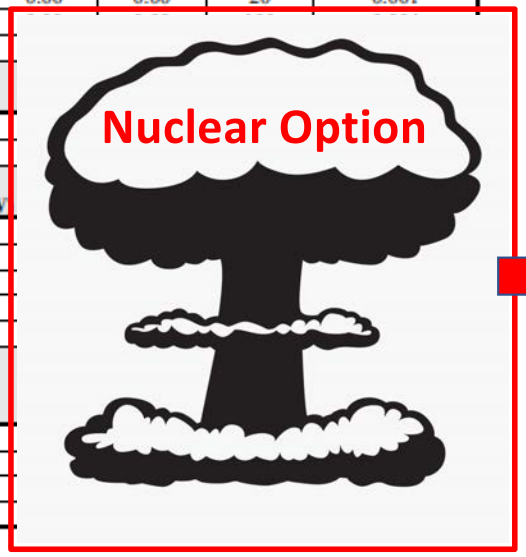


https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Documents/Final%20Determination%20Dox%20N5%202021/MS4%20Accounting%20Guidance%20FINAL%2011%2005%202021.pdf

Non-destructive Alternatives to Stream “Restorations”

Table 1. EIA_f and Load Reductions for Alternative BMPs

BMP	Load Reductions (lbs/unit/yr) TN	TP	TSS	EIA_f
Advanced Sweeping				**Per Mile Swept**
1 pass/12 weeks	0.00	0.07	401	0.027
1 pass/8 weeks	0.26	0.14	802	0.059
1 pass/4 weeks	0.36	0.21	1,203	0.087
Spring 1 pass/1-2 weeks else monthly	0.36	0.28	1,404	0.106
Spring & Fall 1 pass/1-2 weeks else monthly	0.73	0.34	2,005	0.148
1 pass/2 weeks	0.73	0.34	2,206	0.156
1 pass/week	1.09	0.55	3,209	0.235
2 passes/week	1.46	0.69	4,211	0.304
Mechanical Broom Sweeping				**Per Mile Swept**
1 pass/4 weeks	0.00	0.00	20	0.001
1 pass/week				
2 passes/week				
Storm Drain Cleaning				
Organic				
Inorganic				
Floating Treatment Wetlands (% of pond wet surface area covered by FTW				
FTW1 (10%)				
FTW2 (11-20%)				
FTW3 (21-30%)				
FTW4 (31-40%)				
FTW5 (41-50%)				
Land Cover Conversion				
Forest Planting				
Riparian Forest Planting				
Conservation Landscaping				
Riparian Conservation Landscaping				



BMP	Load Reductions (lbs/unit/yr) TN	TP	TSS	EIA_f
Table 1 Continued				
Forest Conservation	10.57	1.10	2,465	0.46
Impervious Surface Reduction	6.96	0.45	5,241	0.71
Street Trees	3.10	0.76	1,404	0.40
Urban Tree Canopy Planting	3.20	0.50	206	0.28
Urban Soil Restoration of Compacted Pervious Surfaces (soil excavation depth in inches)				**Per Acre of Soil Treatment**
Level 1 (15 inches)	4.4	0.72	278	0.40
Level 2 (20 inches)	8.9	1.44	557	0.80
Urban Soil Restoration of Removed Impervious Surfaces (soil excavation depth in inches)				**Per Acre of Soil Treatment**
Level 1 (15 inches)	13.7	0.7	1,696	0.91
Level 2 (20 inches)	15.0	0.77	1,864	1.00
Septic[1]				**Per System**
Septic Pumping	0.00	0.00	0.00	0.02
Septic Denitrification	0.00	0.00	0.00	0.16
Septic to WWTP Connection	0.00	0.00	0.00	0.23
Shoreline Management[2]/Stream Restoration and Outfall Stabilization[3]				**Per Linear Foot**
Shoreline Management (Default Rate)	0.173	0.122	328	0.04
Stream Restoration (Planning Rate)	0.075	0.068	248	0.02
Outfall Stabilization (Planning Rate)	0.075	0.068	248	0.02
Elimination of Discovered Nutrient Discharges from Grey Infrastructure[4]				**Per Discharge**
Elimination of Eight Approved Discharge Types	Protocol	Protocol	0.00	Individually Calculated

(clipartkey.com)

Non-destructive alternatives (continued)

Table 2. Stormwater BMPs for Upland Applications

Runoff Reduction (RR) Practices		Stormwater Treatment (ST) Practices	
Manual Reference	**Practice**	**Manual Reference**	**Practice**
Infiltration		**Ponds**	
M-3	Landscape Infiltration	P-1	Micro-Pool Extended Detention (ED)
M-4	Infiltration Berm	P-2	Wet Pond
M-5	Dry Well	P-3	Wet ED Pond
Filtering Systems[1]		P-4	Multiple Pond
F-6	Bioretention	P-5	Pocket Pond
M-2	Submerged Gravel Wetland	**Wetlands[2]**	
M-6	Micro-Bioretention	W-1	Shallow Wetland
M-7	Rain Garden	W-2	ED Shallow Wetland
M-9	Enhanced Filter	W-3	Pond/Wetland System
Open Channel Systems		W-4	Pocket Wetland
O-1	Dry Swale	**Infiltration[2]**	
M-8	Grass Swale	I-1	Infiltration Trench
M-8	Bio-Swale	I-2	Infiltration Basin
M-8	Wet Swale	**Filtering Systems**	
Alternative Surfaces		F-1	Surface Sand Filter
A-1	Green Roof	F-2	Underground Filter
A-2	Permeable Pavement	F-3	Perimeter Filter
A-3	Reinforced Turf	F-4	Organic Filter
Other Systems		F-5	Pocket Filter
M-1	Rainwater Harvesting		

Notes:
[1] A dry channel regenerative step pool stormwater conveyance system is considered a stormwater retrofit by the CBP Stream Restoration Expert Panel. This practice may use the BMP code SPSD and use the same pollutant load reductions as a filtering practice. The impervious area draining to these practices may be considered treated in accordance with the design rainfall depth treated (P_E) for crediting purposes.
[2] Stormwater wetlands, infiltration trenches, and infiltration basins are ST practices unless designed according to Section VI.

Expert Panel report for SR credits:
http://chesapeakestormwater.net/wp-content/uploads/dlm_uploads/2013/10/stream-restoration-short-version.pdf

What are some non-destructive alternatives?

Bioretention

Grass Swale

Green roof (by realfarmacy.com)

Permeable Pavement

Conservation Landscaping

Planting trees (by mrtreeservices.com)

(Photos by Montgomery County DEP)

MDE Financial Assurance Plan

Maryland
Department of the Environment

Annual Report on Financial Assurance Plans and the Watershed Protection and Restoration Program
-2022-

Prepared by:
Water and Science Administration

Prepared for:
Governor Larry Hogan

18 different out-of-stream practices that are MORE cost effective than stream "restorations."

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

Prince George's County, Maryland

PG: How much spent on stream “restorations”?

- 2015-2022
  - ~ $106.5M (Source: PGCO FAP)

- Will more stream “restorations” be done in Prince George’s Co.?

- Current MS4 Permit
  - $37.4 M over FY 23-24 (Source: PGCO FAP)

https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Documents/FAP-WPRP/2022_Submissions/DRAFT_to_MDE_PGCO%20FAP%20FY22_Permit_End_12_8_2022.pdf

SUMMARY – Reasons to oppose stream "restorations"

1. Stream "restorations" don't restore streams either physically or biologically, import foreign material, & destroy stream-side ecosystems – this complex web can't be recreated by bulldozers and & re-planted saplings.

(Photo by City of Rockville)

2. Stream "restorations" don't address the root cause of stream bank erosion: stormwater fire-hosing into streams from impervious surfaces such as roofs and roads. As a result, stream "restorations" get blown out.

(From Istockphoto.com)

SUMMARY, continued

Before Columbia Lake Elkhorn "stream restoration" (Photo by R. Bannister)

3. The science tells us that forests counteract global warming by sequestering carbon. Forests should not be cut for stream "restorations".

4. The way to "fix" streams is to control stormwater outside of streams by using non-destructive upland (out-of-stream) practices such as raingardens, bioswales, permeable pavement, tree planting, etc.

A series of bioretention facilities were installed to treat runoff from the road and sidewalk.

(Photos by Montgomery County DEP)

Actions – What Can Individuals & Groups Do?

- Ask elected officials for legislation to restrict the use of stream "restorations" statewide or in your County.

(Photo by City of Rockville)

Actions – What Can Individuals & Groups Do?

- Request meetings with elected officials
- Emails/calls from residents to local and state officials
- Letters to the editor (Post, Baltimore Sun, Ches. Bay Journal, etc.)
- Emails/calls to environmental groups: Ches. Bay Foundation, Ches. Bay Trust (awards grants for stormwater projects), Sierra Club, etc.
- TV/Radio stations

The End - Questions?

("Stream restoration" in Upper Watts Branch, Rockville; photo by City of Rockville)

Contact Ken Bawer: kbawer@msn.com