Stormwater Control & Stream Restoration: What Works and What Does Not

January 15, 2024

Ken Bawer (kbawer@msn.com)

V.119_for Del. Wu

Photo by K. Bawer, 10/21/2021)

Full Disclosure

I have no financial interest in the practice of stormwater control or stream “restorations.”

In The News

“Chopping down trees to save the bay? The battle over a Howard County stream restoration”

Krishna Sharma
The Baltimore Banner
Published 11/3/2023 5:30 a.m. EDT
https://www.thebaltimorebanner.com/community/climate-environment/stream-restoration-howard-county-plumtree-branch-EZWMOFQ4ONFNHPPNKTBIKQXGBM/?schk&rchk&mc_cid=9a3781df72

Plumtree Branch

ADD QUOTE

“Environmental groups concerned by upcoming construction along Herring Run in Northeast Baltimore”

By Christine Condon
Baltimore Sun
Last Updated: Oct 13, 2023 at 7:33 pm
https://www.baltimoresun.com/news/environment/bs-md-herring-run-stream-restoration-criticism-20231013-7p536tjh2vhzrfqymjgqustiq4-story.html

Chesapeake Bay Foundation has taken Balt. City and County to court re. MS4 permits that don’t meet required water quality standards

ADD QUOTE

“Environmentalists scrutinize Baltimore over plan to cut swath of old-growth trees from Herring Run”

David Collins, I-Team Reporter, WBAL TV
https://www.wbaltv.com/article/herring-run-cut-trees-plan-scrutinized-baltimore/45499333

ADD QUOTE

In The News

“

“Stream restoration draws fire for plan to carve up Baltimore forest”

Timothy B. Wheeler Nov 8, 2023, Chesapeake Bay Journal
https://www.bayjournal.com/news/pollution/stream-restoration-draws-fire-for-plan-to-carve-up-baltimore-forest/article_6a4eb704-71cf-11ee-9a25-939480d99308.html

ADD QUOTE

“Restoration of Baltimore’s Stony Run is failing again, residents and scientists say”

After millions of dollars spent on re-channeling the stream to slow runoff, critics say a new approach is needed

BY PEDER SCHAEFER,
December 23, 2023, BaltimoreBrew
https://www.baltimorebrew.com/2023/12/23/restoration-of-baltimores-stony-run-is-failing-again-residents-and-scientists-say/

”In 2006, the city launched a Stony Run erosion control project using $10 million in city, state and federal funds. …A few years later, powerful rain storms overwhelmed the system and crews had to return and put the streamside boulders back in place. A few years after that, another set of rainstorms bashed the boulders out of line, this time costing $500,000 to repair.”

AGENDA

- Residents' concerns & needs
- How green stormwater control can help
- Regulatory drivers of stormwater control
- Out-of-stream vs. in-stream stormwater control
- What is a stream "restoration"?
- Montgomery County specifics
- Summary

Solitaire Court, Gaithersburg video (3:44)

https://youtu.be/NvTvPnG6Qs8

Fall 2021

(https://youtu.be/NvTvPnG6Qs8)


DEERE
0:16 / 3:44
CC


0:35 / 3:44

Solitaire Court, Gaithersburg video (3:44)

Solitaire Court, Gaithersburg video (3:44)

Solitaire Court, Gaithersburg video (3:44)

AGENDA

- Residents' concerns & needs

Residents' Concerns & Needs

AGENDA

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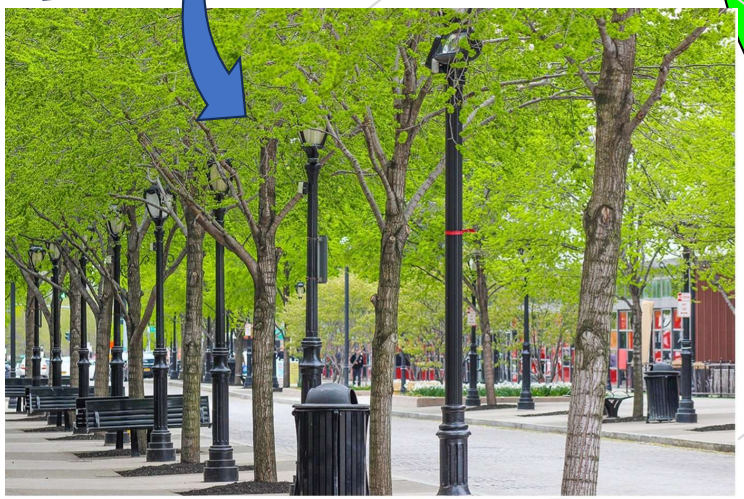
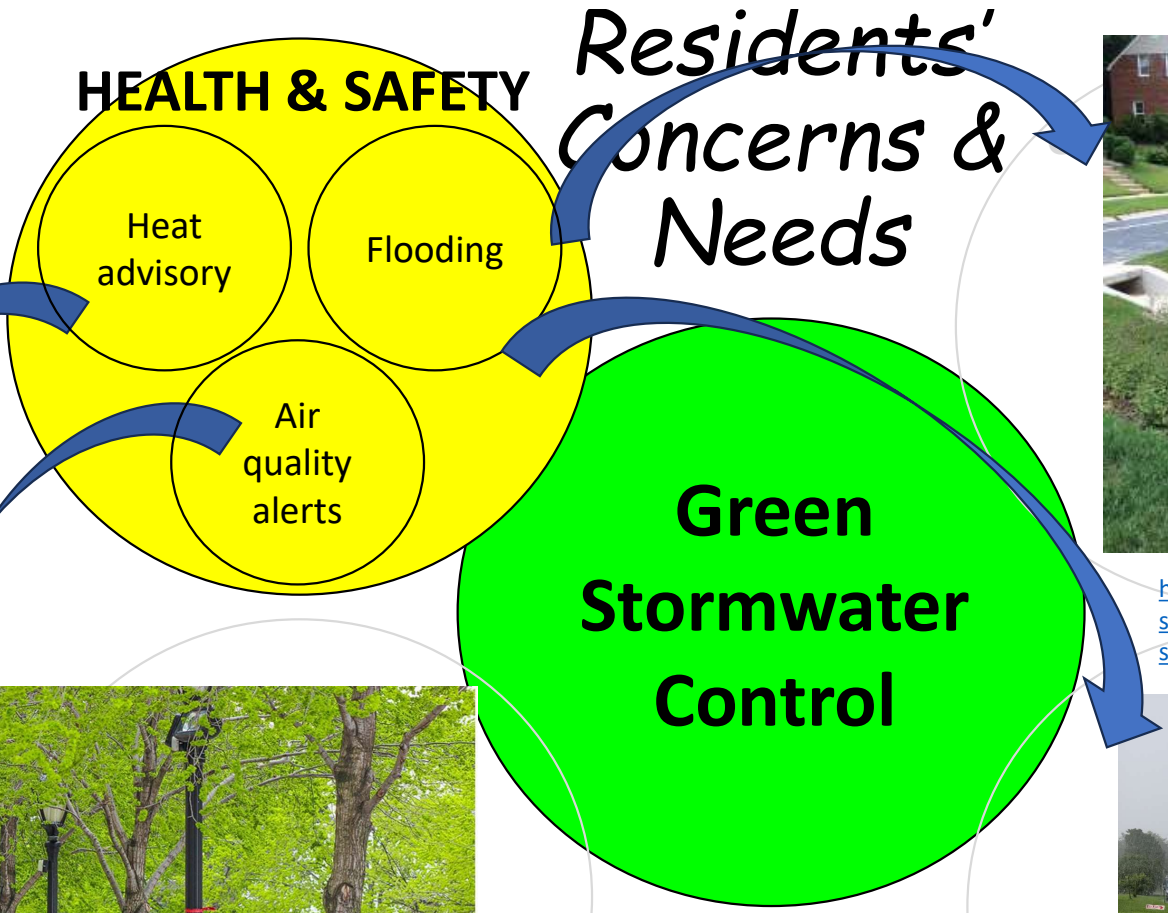
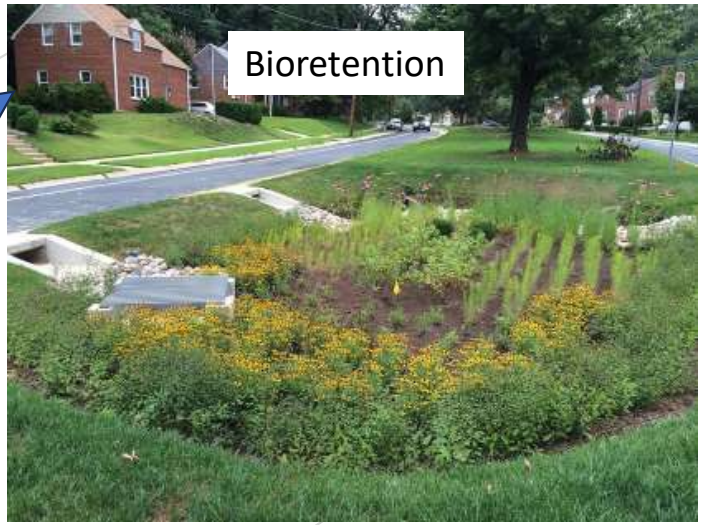
- -
- How green stormwater control can help


Residents' Concerns & Needs
HEALTH & SAFETY
RESPONSIBLE GOVENMENT SPENDING
Green Stormwater Control
JOBS
LIVABLE COMMUNITIES



11 Benefits of Street Trees
insights.jonite.com





https://www.montgomerycountymd.gov/water/Resources/Files/restoration/green-streets/Fact_Sheet_GS_DennisAvenue_DNR.pdf

(By permission of Ernest Maier company)

Residents' Concerns & Needs

Trees increase property values, save energy & lower bills. (realator.com*)

Green Stormwater Control

RESPONSIBLE GOVENMENT SPENDING

- Value for taxes paid
- Property values

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

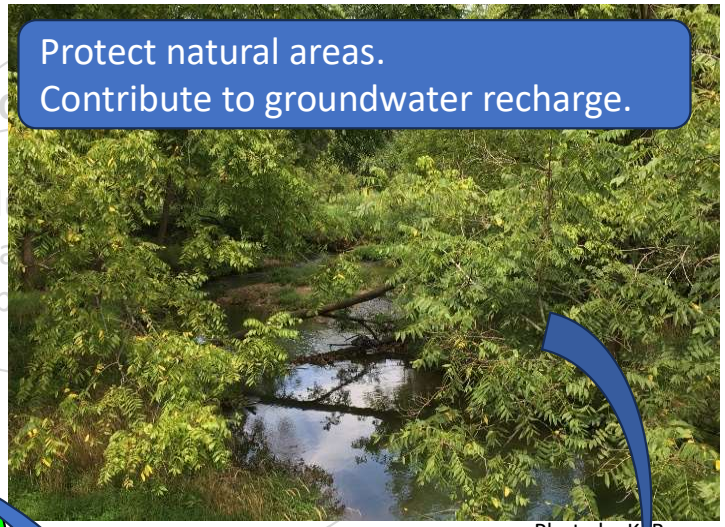
https://www.scenic.org/why-scenic-conservation/placemaking-and-community-planning/tree-conservation-and-native-planting/benefits-of-trees/

JOBS

Residents' Concerns & Needs

Tree Lined Street Neighborhood | Street trees, Tree line, Street pinterest.com

mrsc.org



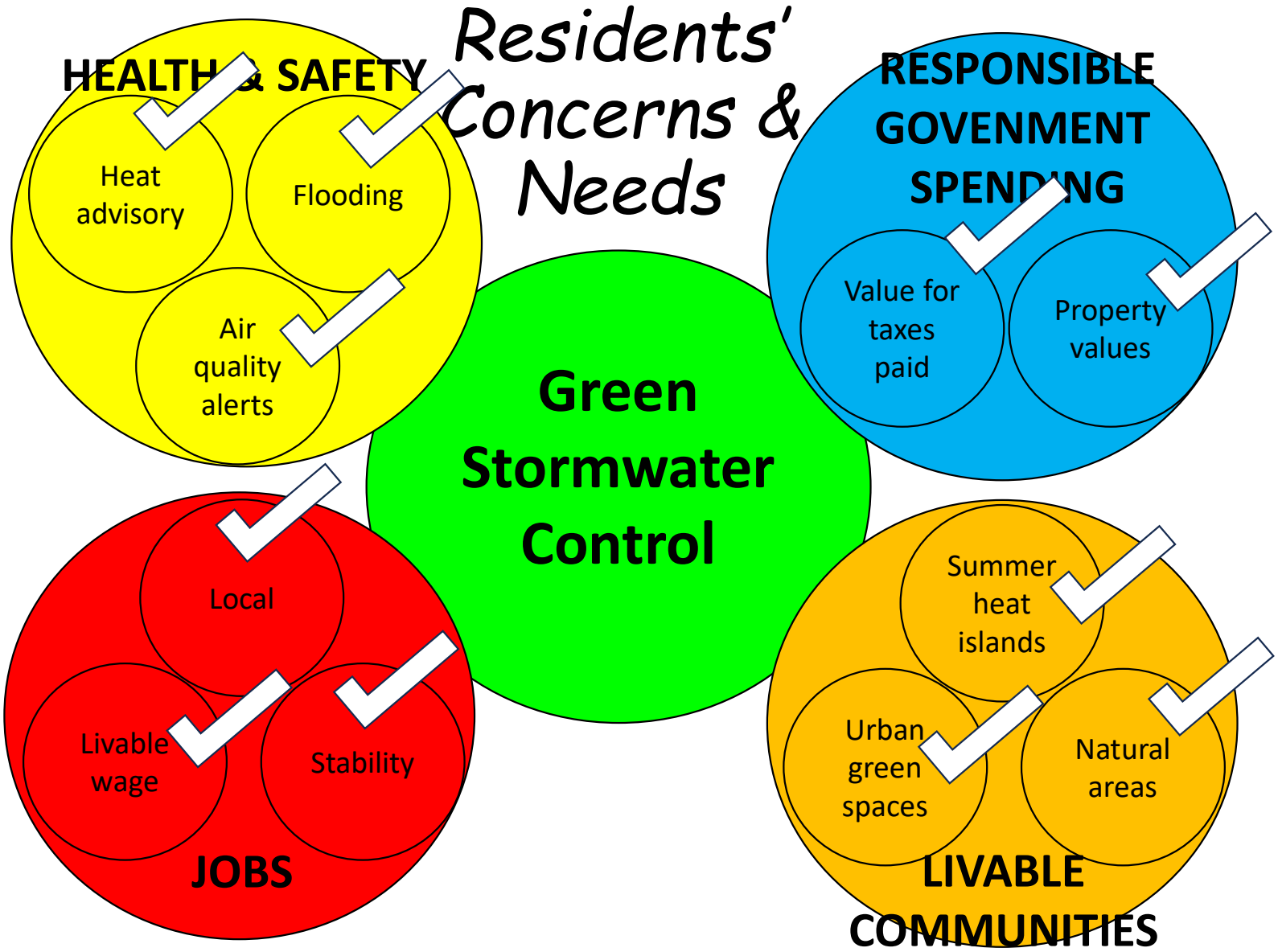
Protect natural areas.
Contribute to groundwater recharge.

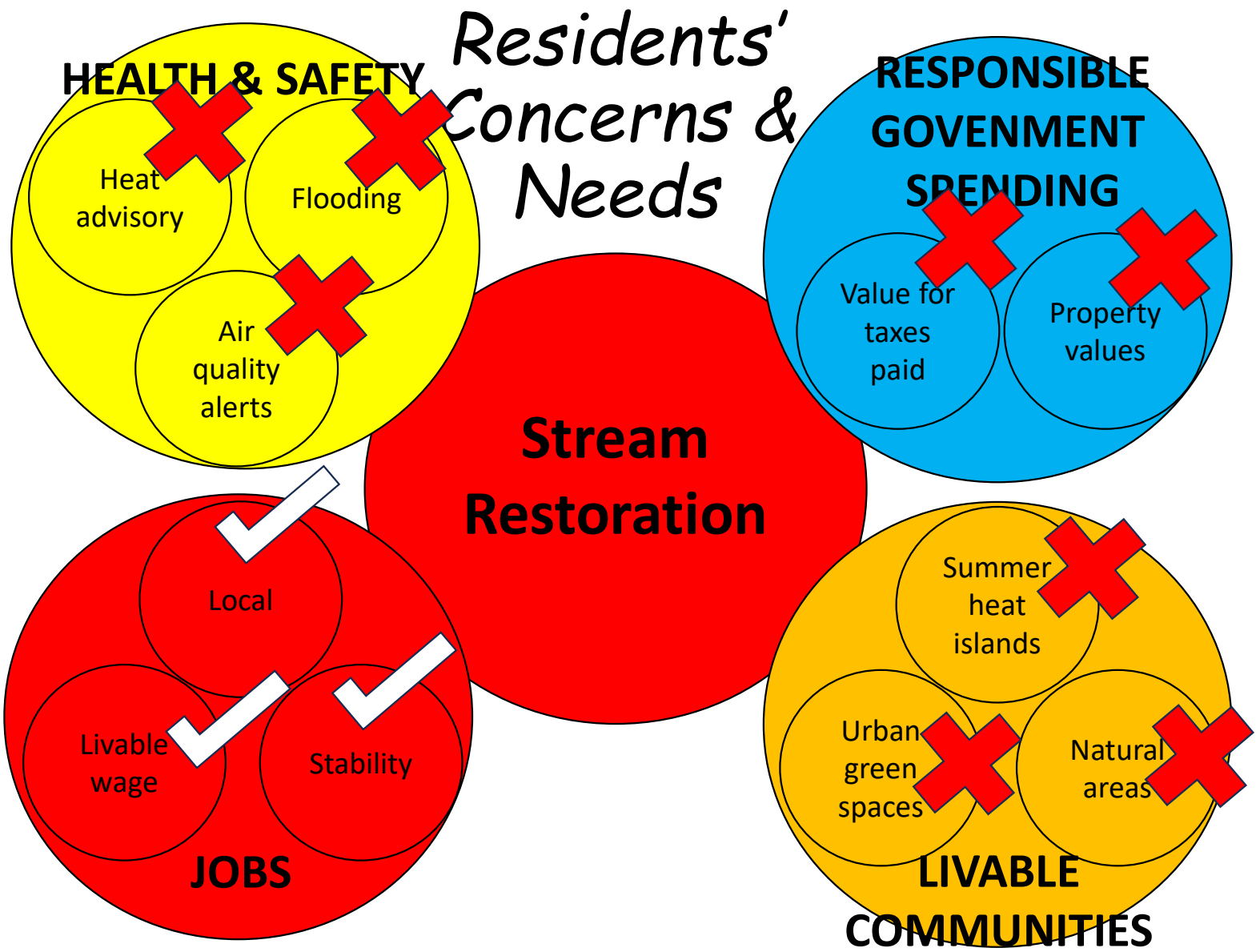
Photo by K. Bawer

Green Stormwater Control

- Summer heat islands
- Urban green spaces
- Natural areas

LIVABLE COMMUNITIES


Residents' Concerns & Needs
HEALTH & SAFETY
Heat advisory
Flooding
Air quality alerts
RESPONSIBLE GOVENMENT SPENDING
Value for taxes paid
Property values
Green Stormwater Control
Local
Livable wage
Stability
JOBS
Summer heat islands
Urban green spaces
Natural areas
LIVABLE COMMUNITIES


Residents' Concerns & Needs
HEALTH & SAFETY
Heat advisory
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RESPONSIBLE GOVENMENT SPENDING
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Property values
Stream Restoration
Local
Livable wage
Stability
JOBS
Summer heat islands
Urban green spaces
Natural areas
LIVABLE COMMUNITIES

AGENDA

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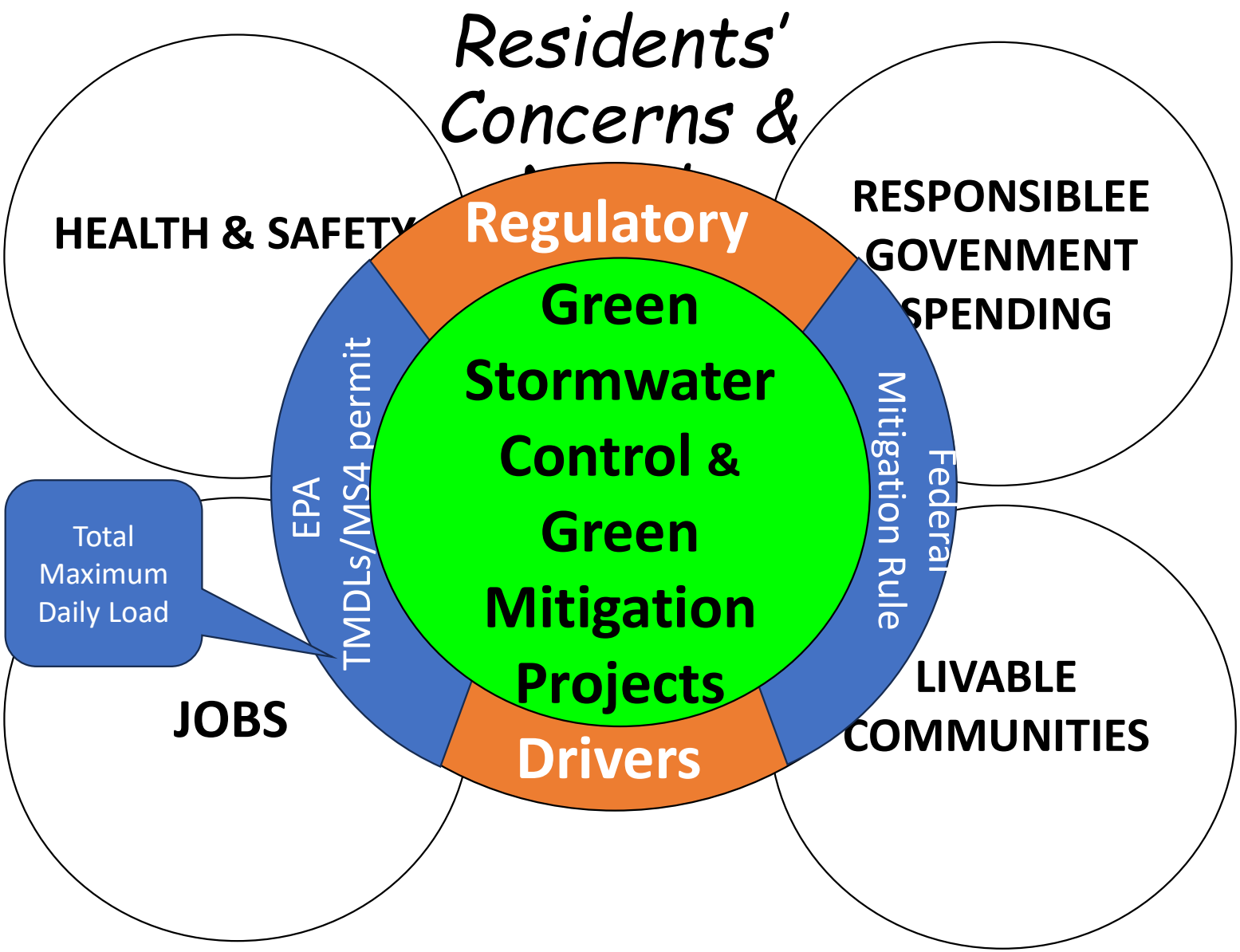
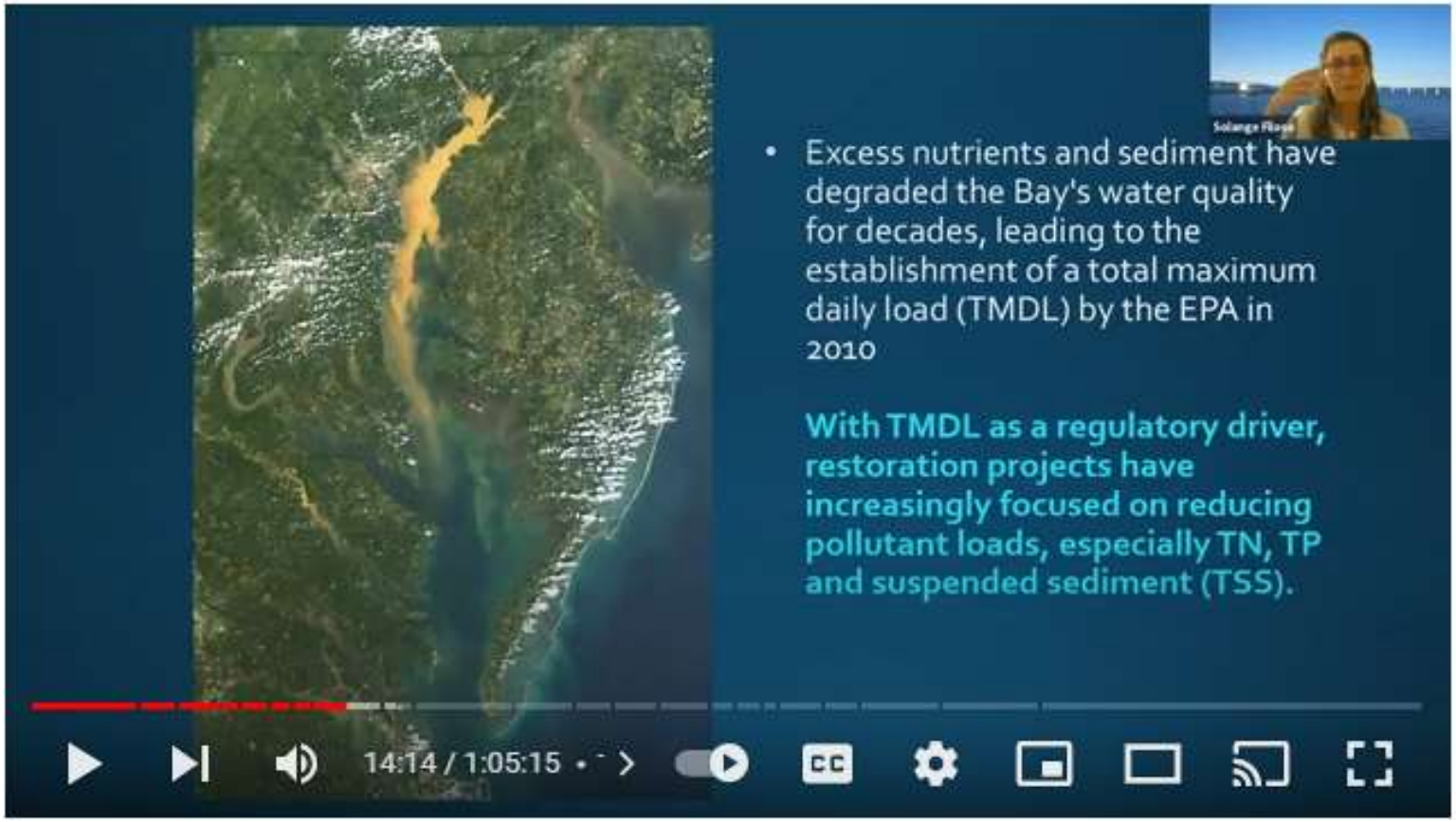
- Regulatory drivers of stormwater control projects


Residents' Concerns &
HEALTH & SAFETY
RESPONSIBLEE GOVENMENT SPENDING
Regulatory
Green Stormwater Control & Green Mitigation Projects
EPA TMDLs/MS4 permit
Federal Mitigation Rule
Drivers
Total Maximum Daily Load
JOBS
LIVABLE COMMUNITIES

Problem: excess nutrients and sediment in Bay



("Stream Restoration: Is it Helping Our Streams and the Chesapeake Bay?" Solange Filoso, U MD, Chesapeake Biological Laboratory, April, 21, 2021, https://www.youtube.com/watch?v=1BowrQkMfaE)

Direct Regulatory Drivers: MS4 Permits for urban/suburban areas

Mo County MS4 Permit

Mo Parks MS4 Permit

Maryland's NPDES Municipal Separate Storm Sewer System (MS4) Permits

https://mde.maryland.gov/programs/Water/StormwaterManagementProgram/Pages/MS4-Landing.aspx)

(From wcfcourier.com)

(https://www.youtube.com/watch?v=UwYk9x8ldw8)

AGENDA

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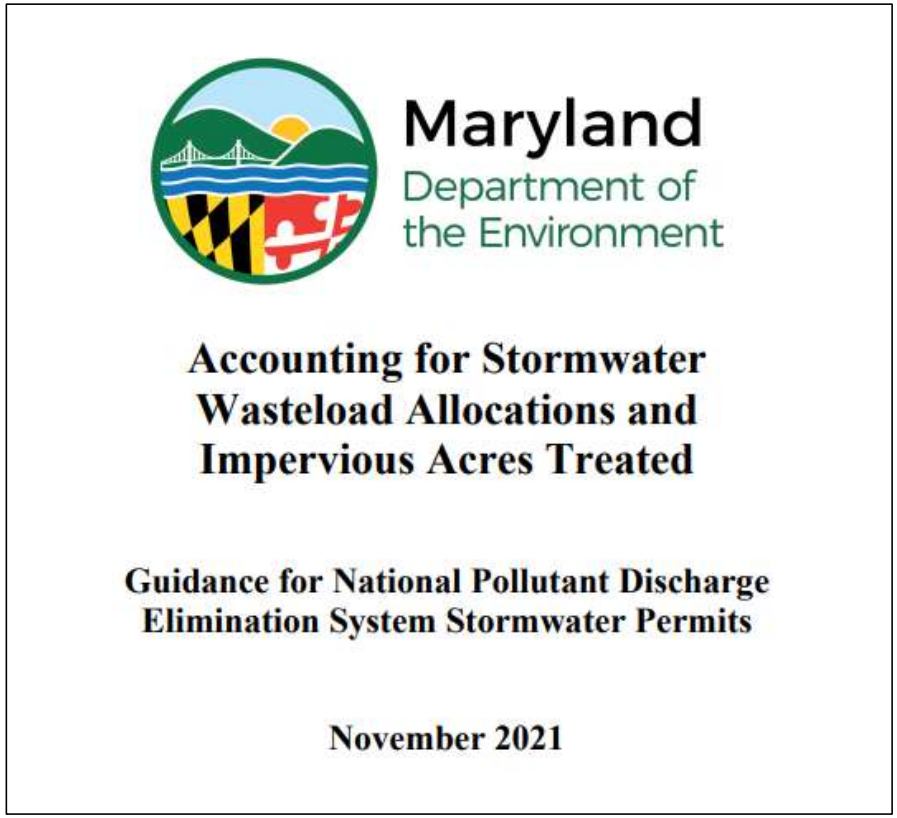
- Out-of-stream vs. in-stream stormwater control

Stormwater Control Practices

- MS4 Permit “Accounting Guidance” document.
- Long list of practices that can be used to meet the MS4 Permit.



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

Out-of-stream methods: all except one

Table 1. EIA_f and Load Reductions for Alternative BMPs

BMP	Load Reductions (lbs/unit/yr)			EIA_f
	TN	TP	TSS	
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	0.00	0.00	100	0.004
2 passes/week	0.00	0.00	201	0.008
Storm Drain Cleaning				**Per Ton Removed**
Organic	4.44	0.48	400	0.17
Inorganic	3.78	0.84	1,400	0.25
Floating Treatment Wetlands (% of pond wet surface area covered by FTW)				**Per Impervious Acre**
FTW1 (10%)	0.10	0.02	74	0.008
FTW2 (11-20%)	0.22	0.05	151	0.017
FTW3 (21-30%)	0.32	0.07	225	0.026
FTW4 (31-40%)	0.43	0.09	295	0.034
FTW5 (41-50%)	0.53	0.11	369	0.042
Land Cover Conversion				**Per Acre of Land Cover Converted**
Forest Planting	11.12	1.78	2,805	1.10
Riparian Forest Planting	14.34	2.50	4,411	1.50
Conservation Landscaping	5.24	0.53	0.00	0.37
Riparian Conservation Landscaping	6.75	0.74	0.00	0.50

BMP	Load Reductions (lbs/unit/yr)			EIA_f
	TN	TP	TSS	
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

(Copied from "Accounting Guidance" document)

Out-of-stream methods (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.

(Copied from "Accounting Guidance" document)

Out-of-stream methods

Mo Co DEP Green Streets Program

Bioretention

Grass Swale

Green roof (by realfarmacy.com)

Permeable Pavement

Mo Co DEP RainScapes Program

Conservation Landscaping

Planting trees (by mrtreeservices.com)

(Photos by Montgomery County DEP)

Out-of-stream methods

Bioretention at the Universities at Shady Grove, Montgomery Co.

Photo by K. Bawer, 10/21/2021)

In-stream stormwater control methods

- Stream “restoration”

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

There is only one in-stream stormwater control method.

AGENDA for legislators

- -
- Costs of not addressing
- -
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- -
- What is a stream “restoration”?

What is a stream “restoration”?

- Engineering projects that try to stabilize eroding stream banks

(Montgomery Parks web site)

What is a stream “restoration”?

- A stream ”restoration” typically involves a mix of“:
  - changing a stream’s natural meander pattern
  - using heavy boulders sometimes on top of plastic sheeting to armor-plate sections of the stream bank
  - scraping away stream bank & forest soil
  - dumping fill material into the stream channel to raise its level
  - clearcutting a steam valley and then removing tons of soil to lower the stream valley closer to the stream level
  - filling in the stream channel and moving it to a different location.

TO BE CLEAR: Infrastructure protection projects are necessary…

(from Robert Hilderbrand, U. of MD, presentation for Appalachian Lab Series on 3/4/2021)

…but these are not really stream "restorations."
Per Maryland Dept. of the Environment (MDE), "…projects that are primarily designed to protect public infrastructure by bank armoring or rip rap do not qualify for a [MS4 permit] credit."
(2021 Accounting Guidance, p. 69)
https://mde.maryland.gov/programs/water/StormwaterManagementProgram/Documents/Final%20Determination%20Dox%20N5%202021/MS4%20Accounting%20Guidance%20FINAL%2011%2005%202021.pdf

Types of stream “restorations”

REFERENCE: ”A Unified Guide to Crediting Stream and Floodplain Restoration Practices in the Chesapeake Bay Watershed,” pp. 14-15, https://chesapeakestormwater.net/resource/a-unified-guide-to-crediting-stream-and-floodplain-restoration-practices-in-the-chesapeake-bay-watershed/

(By K. Bawer)

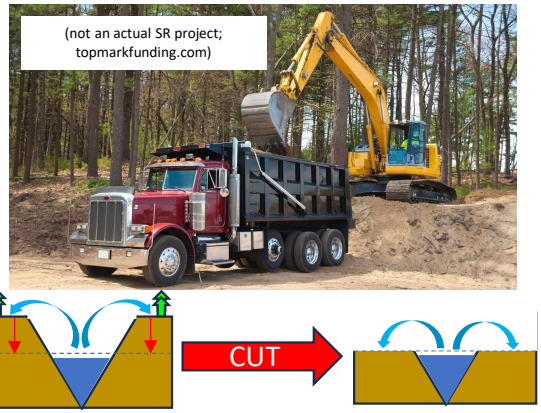
- Prevented Sediment (Natural Channel Design) - *Crediting Protocol 1* - Credit for Prevented Sediment [erosion] during Storm Flow.

- Hyporheic Exchange (wet channel Regenerative Stormwater/Step pool/Stream Conveyance - RSC) - *Crediting Protocol 2* - Credit for Instream and Riparian Nutrient Processing [denitrification] during Base Flow.

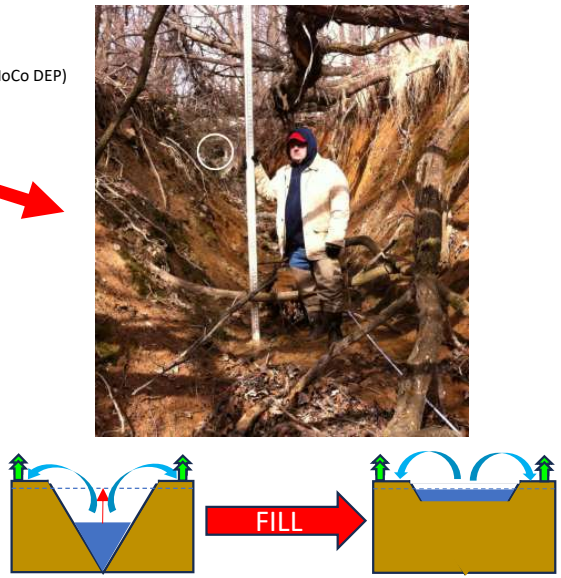
(Regenerative Stormwater Conveyance at Asbury Methodist Village; https://www.youtube.com/watch?v=hGZN-L0Qrj0)2

Types of stream "restorations"

- Floodplain reconnection - *Crediting Protocol 3* - Credit for Floodplain Reconnection Volume [sediment and nutrient removal attributable to floodplain deposition, plant uptake, denitrification and other biological and physical processes.]
  - Legacy Sediment Removal (FR-LSR) – CUT
  - Raising the Stream Bed (RSB) - FILL



(MoCo DEP)



- Concept:
  - Trying to recreate pre-colonial environment.
  - "Both sediment and nutrients are effectively trapped by floodplains during larger storms, where they may be stored for many decades"

Per 2020 Protocols 2 and 3 Guidance:
https://d18lev1ok5leia.cloudfront.net/chesapeakebay/documents/FINAL_Approved_Group_4_Memo_10.27.20.pdf

False promise of stream "restorations"

- Try to recreate pre-colonial environment - impossible given current watershed development and population.
- "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."
  - Per Chesapeak Bay Program report: Scientific and Technical Advisory Committee (STAC). (2023). Achieving water quality goals in the Chesapeake Bay: A comprehensive evaluation of system response [CESR] (K. Stephenson & D. Wardrop, Eds.). STAC Publication Number 23-006, Chesapeake Bay Program Scientific and Technical Advisory Committee (STAC), Edgewater, MD. 129 pp. https://www.chesapeake.org/stac/wp-content/uploads/2023/05/CESR-Final-update.pdf
  - Same is true of local streams.

The fallacy of stream “restoration” Floodplain Reconnection

- Washes trash & toxins from developed areas into floodplains.

gettyimages.es

Uses forested stream valleys as stormwater management facilities.

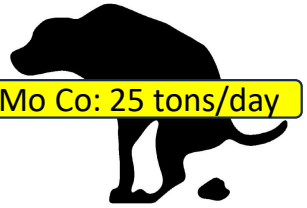
dreamstime.com

“…rain gardens can intercept pollutants before they reach rivers. Sediment picked up by storm water can carry toxic compounds and cloud river water, harming aquatic plants and fish, Sherard said. Dog waste and trash can also get washed into local waterways. Rain gardens also create green spaces in cities.” https://www.washingtonpost.com/climate-solutions/2023/12/10/rain-garden-cities/

Pesticide

istockphoto.com

clipart-library.com



Mo Co: 25 tons/day

selectsalt.com

The fallacy of stream “restoration” Floodplain Reconnection

Raising the Stream Bed (RSB) - FILL method

- More frequent over-bank flooding will kill existing trees & other sometimes rare plant community types that can’t survive water-logged soil.
- Any replanted flood-plain species (sycamore, box elder, etc.) will take 100 years or more to replace ecological benefit of original trees.

The fallacy of stream "restoration" Floodplain Reconnection

Raising the Stream Bed (RSB) - FILL method

- Before reconnection project, floodplains only flood during major storms. Then, floodplain soil & trees absorb stormwater.
- This method allows more frequent FP flooding, more frequently saturating flood plain soil like a wet sponge. If sponge is already fully saturated, water added during next large storm, will just flow off, possibly flooding surrounding properties.

Bear Branch Stream Restoration with Floodplain Reconnection

Prince George's Co.

https://www.princegeorgescountymd.gov/sites/default/files/media-document/dcv37900_gs-2021-day-4-restoration-projects-12-pm.pdf

huffingtonpost.com

The fallacy of stream "restoration" Floodplain Reconnection

Raising the Stream Bed (RSB) - FILL method

timesunion.com

- More floodplain flooding increases risk to adjacent properties, roads, bridges, etc.
- What is the government liability for cost, safety, and loss of property value?

The fallacy of stream “restoration” Floodplain Reconnection

vecteezy.com

MARYLAND DEPARTMENT OF AGRICULTURE

Mosquitoes and Disease

Dengue (Break-Bone Fever)
Encephalitides
Malaria
Yellow Fever
Zika

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

- Results in pools of stagnant water.
- Case of locally acquired malaria reported in Maryland, August 21, 2023.
  https://www.cnn.com/2023/08/18/health/malaria-maryland/index.html

Stream restorations don't address the root cause

- Root cause of stream degradation: uncontrolled stormwater runoff from impervious upland surfaces (roofs, roads, parking lots, etc.)
- Firehoses into streams causing erosion.

(From wcfcourier.com)

(https://www.youtube.com/watch?v=UwYk9x8ldw8)

Stream “Restoration” Examples

The stream “restoration” industry and proponents say,
“It’s not fair to show pictures of the construction process.”

Really?

People need to know exactly what is being done to their natural areas

Stream “Restorations” Don’t Restore Streams

Longfellow stream “restoration,” Columbia, MD

Stream “Restorations” Don’t Restore Streams

Stream “Restorations” Don’t Restore Streams

Nature Forward (formerly ANS), Chevy Chase

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

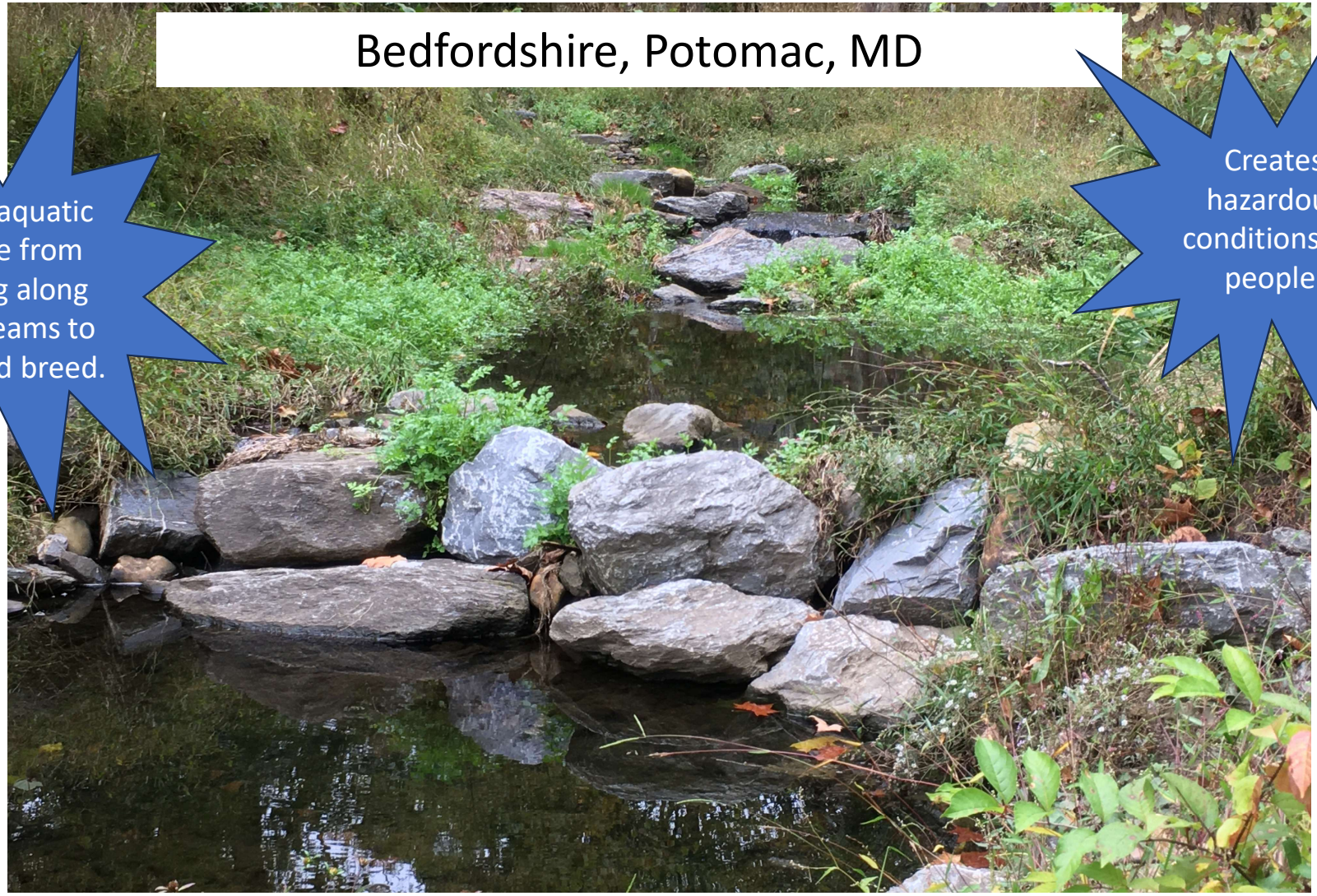
“Stream Restorations” don’t restore streams

Falls Reach, Potomac, MD

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

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

Stream “Restorations” Don’t Restore Streams



(By K. Bawer, 10/17/2023)

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)

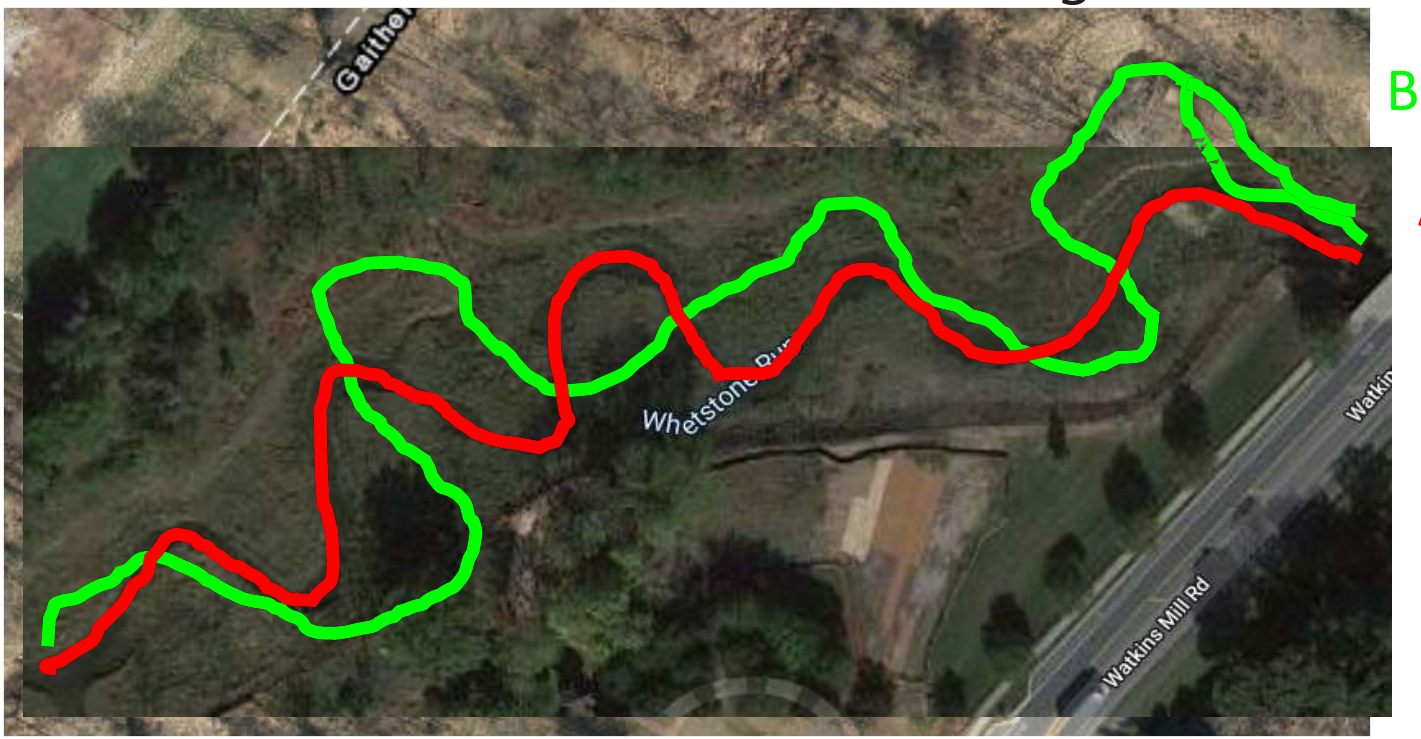
“It will take a year or two for the park to fully revegetate,” City of Gaithersburg

(5/03/2021; by K.Bawer)

(8/28/2023; by K.Bawer)

Stream “Restorations” Don’t Restore Streams

Whetstone Run, Gaithersburg



- Dug a whole new channel (red) and filled in the natural one (green).
- The more they engineer the stream, the longer the project, the more money they make. The jurisdiction also gets more MS4 permit credits.

Stream “Restorations” Don’t Restore Streams

Mayberry Stream Restoration on Bear Branch, Carroll Co. - after

(https://www.carrollcountymd.gov/media/16472/mayberry-stream-restoration.pdf)

Stream “Restorations” Don’t Restore Streams

Solitaire Court, Gaithersburg

At this same location before construction, none of the houses were visible through the narrow strip of forest.

Stream “Restorations” Don’t Restore Streams

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

Stream “Restorations” Don’t Restore Streams

Nash Run, Howard Co.

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

Stream “Restorations” Don’t Restore Streams

Dead Run, Howard Co.

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

Stream “Restorations” Don’t Restore Streams

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

Scotts Level Branch Stream Restoration Project

Stream “Restorations” Don’t Restore Streams

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” Don’t Restore Streams

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” Don’t Restore Streams

Tinkers Creek, Prince George’s County

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

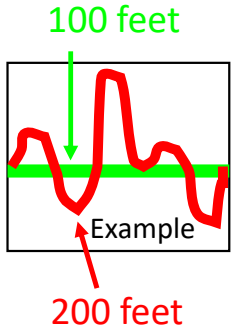
Stream “Restorations” Don’t Restore Streams

Bear Branch, Prince Georges County - AFTER

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

Stream “Restorations” Don’t Restore Streams

Bear Branch, Prince Georges County



(https://www.pgatlas.com/)

Stream “Restorations” Don’t Restore Streams

Beaver Creek – Jackson Property Restoration Area, Washington Co.

https://wcconservation.wpengine.com/stream-restoration/beaver-creek-jackson-property/

Stream “Restorations” Don’t Restore Streams

https://arundelrivers.org/restoration_projects/broad-creek-health-dept-outfall-stabilization-1/

Stream “Restorations” Don’t Restore Streams

Broad Creek Park Gully Restoration 2, Annapolis - Construction

https://arundelrivers.org/restoration_projects/broad-creek-health-department-gully-restoration-phase-2/

Stream “Restorations” Don’t Restore Streams

Broad Creek Park Gully Restoration 2, Annapolis - Construction

https://arundelrivers.org/restoration_projects/broad-creek-health-department-gully-restoration-phase-2/

Impact of non-native invasive plants

Impact of non-native invasive plants

Stream construction projects are major vectors for the growth and spread of non-native invasive plants that completely engulf sites following major soil disturbance.

(From R. Simmons)

Impact of non-native invasive plants

Falls Reach, Potomac, MD

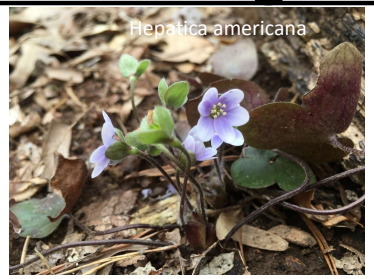
(Photo by K. Bawer on 3/19/2019)

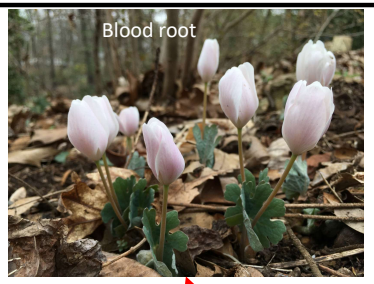
(By K. Bawer, 10/24/2023)

Impact of non-native invasive plants

(By K. Bawer, 10/17/2023)

Collateral damage: wildflowers & animals destroyed





All photos by K. Bawer except middle)

Collateral damage at Whetstone Run stream “restoration”

What happens to the fish? See next slide

https://dnr.maryland.gov/fisheries/documents/Freshwater_Poster.pdf

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

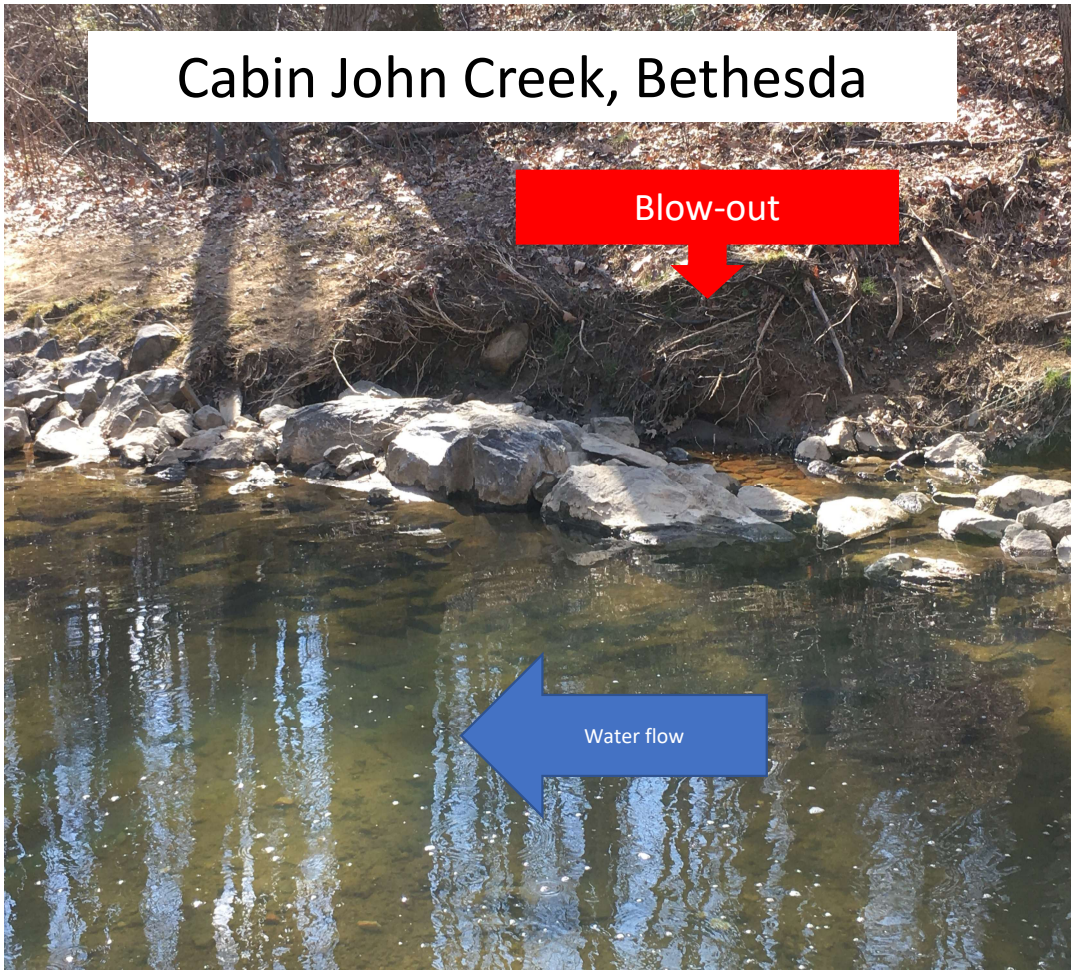
Stream “restorations” fail…

Josephs Branch, Kensington

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)

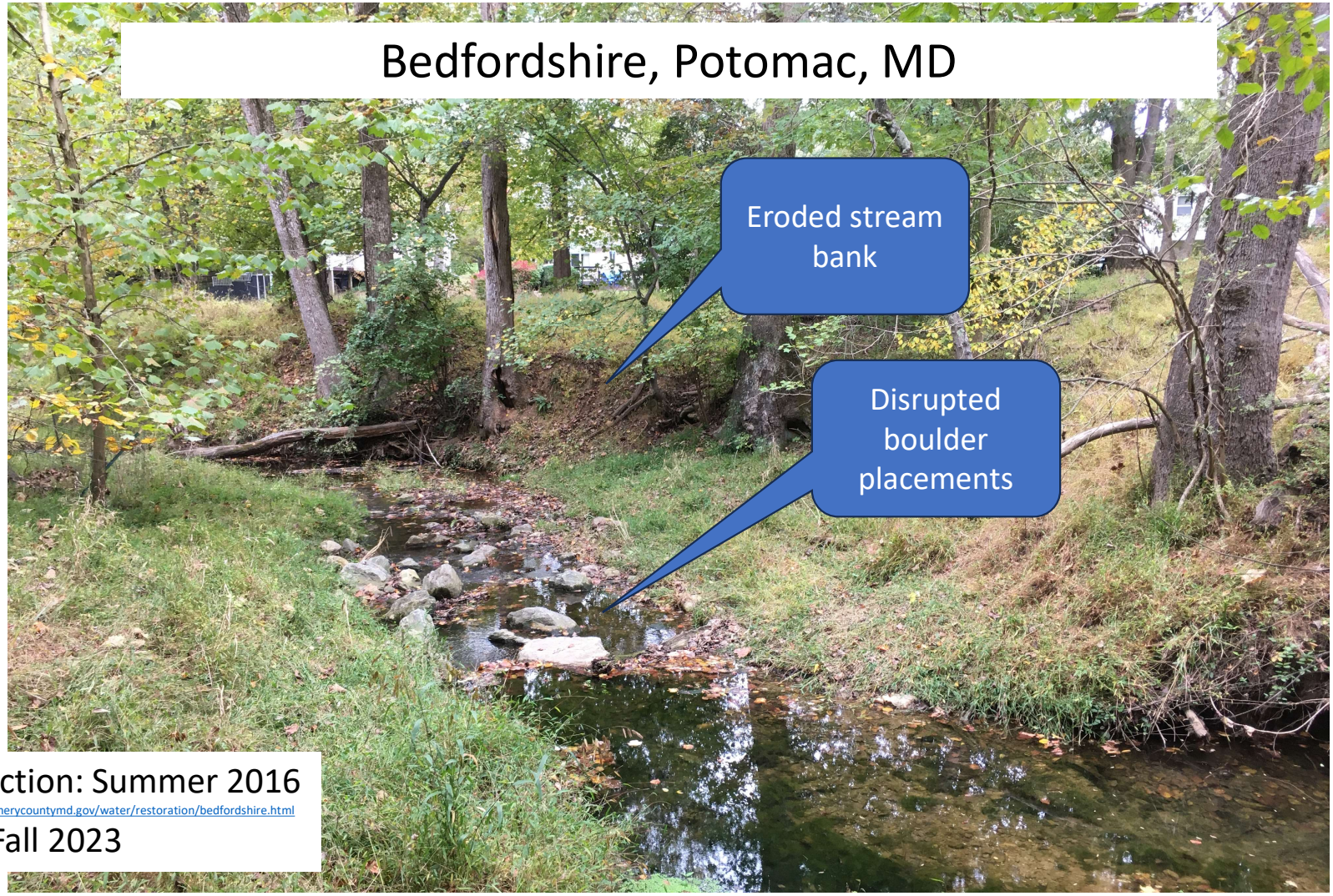
Stream “restoration” fail

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

Stream “restoration” failures

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

Stream “restoration” failures



- Construction: Summer 2016
  https://www.montgomerycountymd.gov/water/restoration/bedfordshire.html
- Photo: Fall 2023

(By K. Bawer, 10/18/2023)

Stream “restoration” failures

(By K. Bawer, 10/17/2023)

Stream “restoration” failures.

Old Farm Creek Tributary, North Potomac

(by K. Bawer, 4/26/2021)

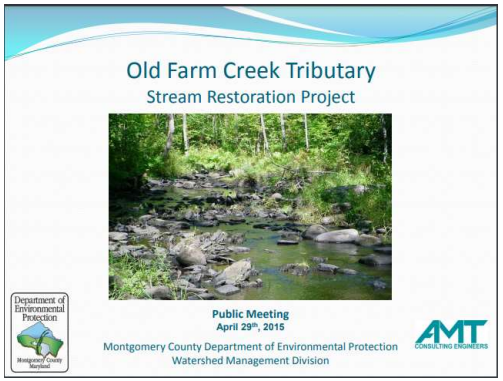
Stream “restoration” failures

Old Farm Creek Tributary, North Bethesda

Current Stream Condition

https://www.montgomerycountymd.gov/DEP/Resources/Files/downloads/restoration/oldfarm-creek-neilwood/WRE12-26%20Old%20Farm%20Creek%20Public%20Meeting%20Presentation%20Final.pdf

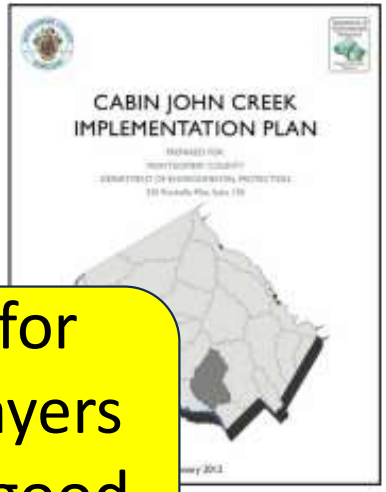
Stream “restoration” failures



Old Farm Creek Tributary

Project Selection

- Constructed in early 1980s
- Located in a key watershed (Cabin John Creek) for stream restoration
- Erosion of banks threatening utilities and natural resources
- History of previous repairs
- Opportunity fo[illegible]ter quality and ecological i[illegible]



This is a previous “restoration”

Past project failed.

This is a failed past “restoration” project! Evidence they don’t work. Throwing good money after bad.

Repair scheduled for 2024 will cost taxpayers $800 K*. Throwing good money after bad.

(* 4-29-15 Public Meeting Presentation for Old Farm Creek project by DEP, https://www.montgomerycountymd.gov/DEP/Resources/Files/downloads/restoration/oldfarm-creek-neilwood/WRE12-26%20Old%20Farm%20Creek%20Public%20Meeting%20Presentation%20Final.pdf)

Stream “restoration” failures

Grosvenor Luxmanor Stream “Restoration,”Mo Co

Existing Photos

Current Stream Condition

Existing Photos

Current Stream Condition

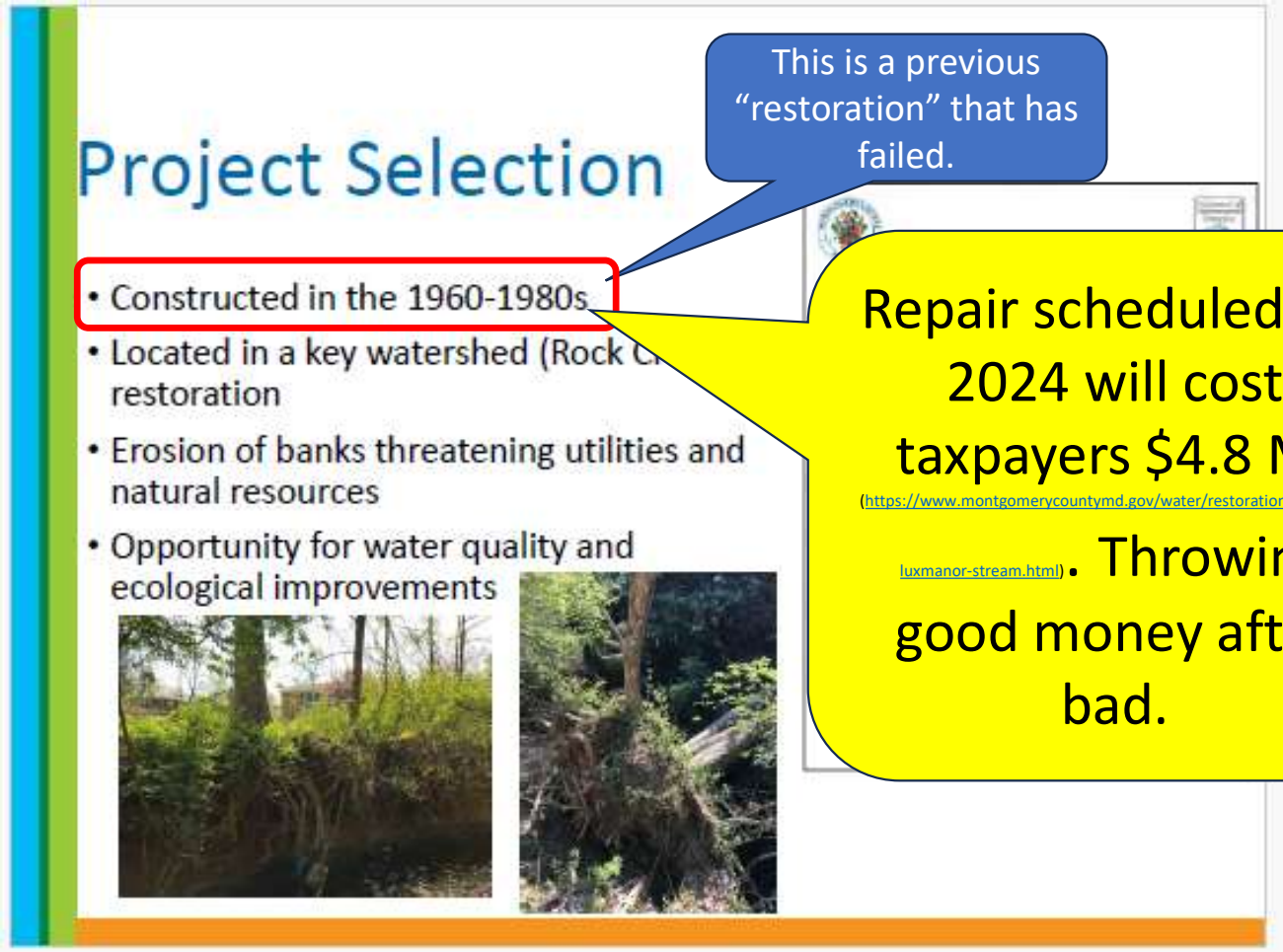
Wildwood Manor, south of I-270

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

Stream “restoration” failures

Grosvenor Luxmanor Stream “Restoration,”Mo Co

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



Stream “restoration” failures

Lower Booze Creek, Potomac, MD
Two different locations.

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

Stream “restoration” failures

Annapolis Landing in Riva, Anne Arundel Co.

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

Stream “restorations” don’t stop erosion

Bacon Ridge Branch at Elks Camp Barrett, Anne Arundel Co. - after

THE SCIENCE

Scientific Evidence that Stream “Restorations” Don’t Work

Scientific Evidence that Stream "Restorations" Don't Work

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

Water quality does not improve

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

Biology does not improve

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

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)

Scientific Evidence that Stream "Restorations" Don't Work

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

Ecology does not improve

"There simply were few ecological differences between restored and unrestored sites. In fact, the unrestored sections upstream [from the restoration sites] were often ecologically better than the restored sections or those downstream of restorations." Hilderbrand, Robert H., et. al.,2020, "Quantifying the ecological uplift and effectiveness of differing stream restoration approaches in Maryland," Final Report Submitted to the Chesapeake Bay Trust for Grant #13141, (https://cbtrust.org/wp-content/uploads/Hilderbrand-et-al_Quantifying-the-Ecological-Uplift.pdf

"…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."
Personal communication on 3/6/2023

Scientific Evidence that Stream "Restorations" Don't Work

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

Biology does not improve

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

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

Scientific Evidence that Stream "Restorations" Don't Work

- Other scientific research also says that the results of stream "restorations" rarely, if ever, show evidence for biological improvement for aquatic organisms. (References on next page)

Stonefly

Black Fly and Chironomid Larvae

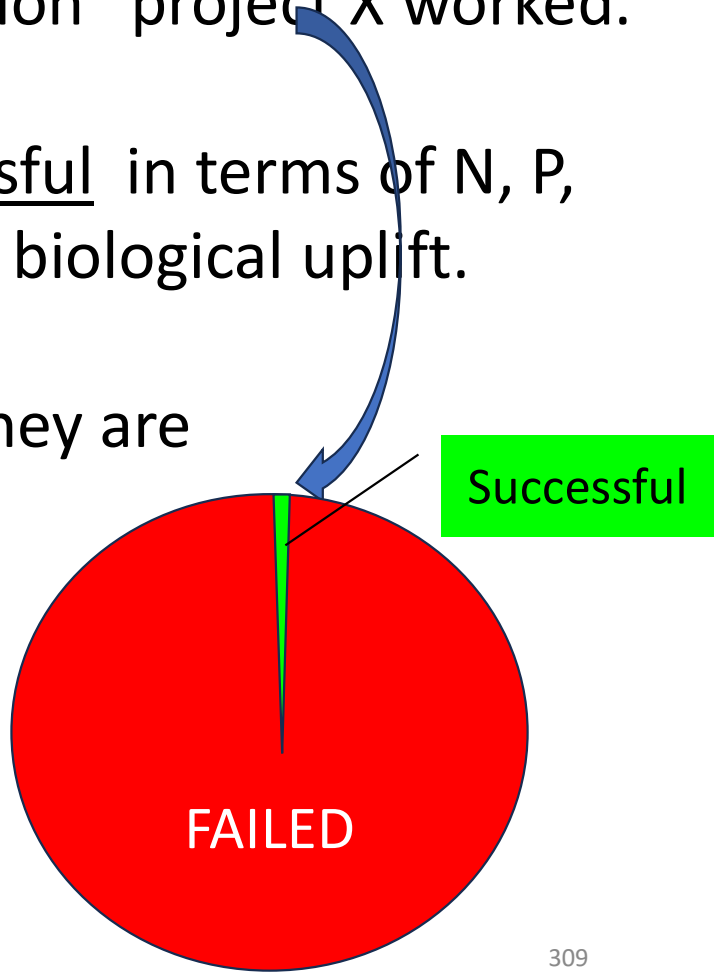
Blacknose Dace

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

- References:
  - Hilderbrand, Robert H., et. al., 2020, “Quantifying the ecological uplift and effectiveness of differing stream restoration approaches in Maryland,” Final Report Submitted to the Chesapeake Bay Trust for Grant #13141, (https://cbtrust.org/wp-content/uploads/Hilderbrand-et-al_Quantifying-the-Ecological-Uplift.pdf
  - Jepsen, R., Caraco, D., Fraley-McNeal, L, Buchanan, C., and Nagel, A. 2022. “An Analysis of Pooled Monitoring Data in Maryland to Evaluate the Effects of Restoration on Stream Quality in Urbanized Watersheds: Final Report.” ICPRB Report 22-2. Interstate Commission on the Potomac River Basin, Rockville, MD. https://www.potomacriver.org/wp-content/uploads/2022/06/ICP-22-1_Jepsen.pdf
  - Kaushal, Sujay S. et. al., 2018, “Tree Trade-offs in Stream Restoration Projects: Impact on Riparian Groundwater Quality,” University of Maryland, State University of New York ESF, Maryland Department of Transportation State Highway Administration, 2018 Presentation (https://cbtrust.org/wp-content/uploads/Kaushal-and-Wood_UMD_061219.pdf)
  - Laub, B.G, McDonough, O.T, Needelman, B.A., Palmer, M.A., 2013, “Comparison of Designed Channel Restoration and Riparian Buffer Restoration Effects on Riparian Soils,” Restoration Ecology, Vol. 21, Issue 6, November 2013 (https://onlinelibrary.wiley.com/doi/abs/10.1111/rec.12010)
  - Palmer, M. A. 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/)

What about Stream "Restoration" Successes?

- "I have a paper that says stream "restoration" project X worked."
- Not surprising if a few projects are successful in terms of N, P, and sediment reduction, and maybe even biological uplift.
- But the current research would say that they are outliers - the rare exceptions rather than the rule.

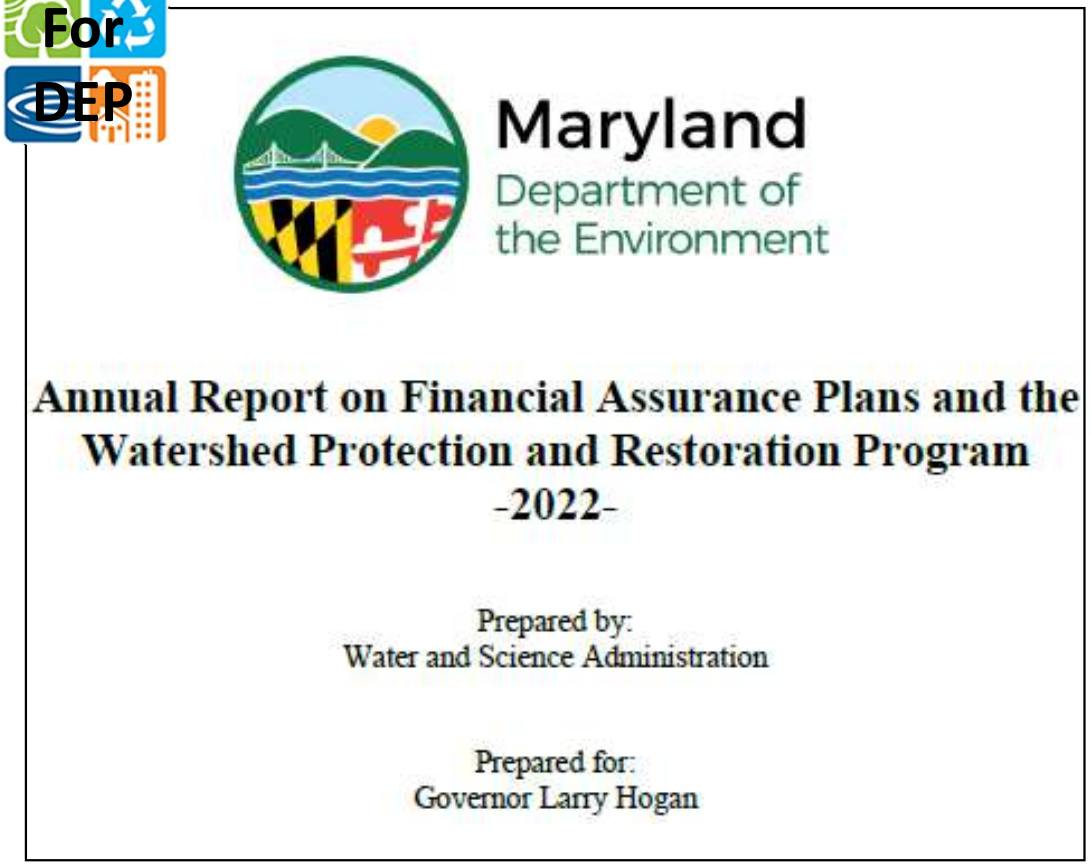


COST:

Out-of-stream stormwater control
vs.
Stream “restorations”

Cost: MDE Annual Report on Financial Assurance Plans

For DEP


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

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

1. Green Roof, Extensive
2. Rainwater Harvesting
3. Dry Well
4. Shallow Wetland
5. Pocket Wetland
6. Surface Sand Filter
7. Dry Swale
8. Other
9. Redevelopment
10. Forestation on Pervious Urban (i.e., Forest Planting)
11. Riparian Forest Planting
12. Urban Tree Canopy
13. Septic Denitrification
14. Septic Connections to WWTP
15. Shoreline Management
16. Catch Basin Cleaning (i.e., Storm Drain Cleaning)
17. Mechanical Street Sweeping
18. Regenerative/Vacuum Street Sweeping (i.e., Advanced Street Sweeping)
19. Nutrient Credits [Trading]
20. Septic Pumping

20 different practices for MS4 Permits are MORE cost effective than stream "restorations."

Average Cost/Acre: MDE 2022 Annual Report on Financial Assurance Plans*

For DEP

20 out-of-stream practices that are cheaper than stream "restorations."

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

* Appendix C Tables
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

Stream “restorations” are “cost-effective” says the industry, but…

- MDE 2022 Annual Report on Financial Assurance Plans says 20 non-stream restoration practices are cheaper.

Out-of-stream practices

Stream “restoration”

- Should actually compare **lifecycle cost** = (cost of construction + maintenance + repair), but MDE has no data.

(Photo by Montgomery County DEP)

- Should also compare value of ecosystem services lost or gained, e.g. cooling effect of trees on utility bills.

(Photo by City of Rockville)

Then why are stream “restorations” done?

- Greenwashing by industry & government beginning with the term “restoration.”
- False “alternative facts” that they improve the environment and never fail.
- Company profits are trumping facts on the ground
- Some say regulations “require” them (they don’t) and encourage them (they do).
- False fear factors: need quick action to “stop the bleeding” & “repair the wound.”
- False “alternative fact” that they are cheaper than out-of-stream practices.
- False “alternative fact” that not enough space for upland stormwater control.
- “Convenience” is trumping destruction of natural areas.
  - don’t have to “sell” numerous property owners.
  - upland locations too difficult – underground pipes in the way.
- Politics is trumping the science.

"We got all the permits and approvals" – if MDE and USACE approved it, implies this must be a good project

- Only means it is legal, not good.
- The folks who fogged neighborhoods with DDT had permits.
- The folks who put lead in gas and paint had permits
- The people who sold Thalidomide had approvals

Then why are stream “restorations” done?

- Greenwashing by industry & government beginning with the term “restoration.”
- “Alternative facts” that they improve the environment and never fail.
- Profits are trumping facts on the ground.
- Some say regulations “require” them (they don’t) and encourage them (they do).
- Fear factor: need quick action to “stop the bleeding” & “repair the wound.”
- “Alternative fact” that they are cheaper than non-stream practices.
- “Alternative fact” that not enough space for upland stormwater control.
- “Convenience” is trumping destruction of natural areas.
  - don’t have to “sell” numerous property owners.
  - upland locations too difficult – underground pipes in the way.
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Then why are stream “restorations” done?

- Greenwashing by industry & government beginning with the term “restoration.”
- “Alternative facts” that they improve the environment and never fail.
- Profits are trumping facts on the ground.
- Regulations (state and federal) encourage them.
- Fear factor: need quick action to “stop the bleeding” & “repair the wound.”
- “Alternative fact” that they are cheaper than non-stream practices.
- “Alternative fact” that not enough space for upland stormwater control.
- “Convenience” is trumping destruction of natural areas.
  - don’t have to “sell” numerous property owners.
  - upland locations too difficult – underground pipes in the way.
- Politics is trumping the science.

Then why are stream “restorations” done?

“There’s not enough land for upland control.” Not true!!

Kensington, Montgomery Co, MD

(Photos by K. Bawer)

Then why are stream “restorations” done?

“There’s not enough land for upland control.” Not true!!

(By permission of, Ernest Maier company)

(Photos by Montgomery County DEP)

Kensington, Montgomery Co, MD

(Photos by K. Bawer)

(Photos by Montgomery County DEP)

AGENDA

- Residents' concerns & needs
- Costs of not addressing
- How green stormwater control & green mitigation projects can help
- Regulatory drivers of stormwater control & mitigation projects
- Out-of-stream vs. in-stream stormwater control
- Montgomery County specifics
- Summary

Stream “Restorations” Planned for Mo Co MS4 Permit

Detailed plans and permit applications not posted on web?
MDE/USACE permits awarded?

Project Name	Estimated Fiscal Year Completed	Location	Approx Construction Start Date
Clearspring Manor Stream Restoration	FY24	water/restoration/clearspring-manor.html	Oct-23
Grosvenor Luxmanor Tributary Stream Restoration	FY25	water/restoration/grosvenor-luxmanor-stream.html	Feb-24
Germantown Park Stream Restoration	FY25	https://www.montgomerycountymd.gov/water/restoration/germantown-park-phase-II.html	Feb-24
Glenallan Tributary Stream Restoration	FY25	https://www.montgomerycountymd.gov/water/restoration/glenallan.html	Jan-24
Old Farm Creek	FY26	https://www.montgomerycountymd.gov/water/restoration/old-farm-creek.html	Jul-24

COMPLETED: December 2022 (MC Parks)

Where is section between Tuckerman Access La. And Grosvenor Pl (east of Grosvenor Park Area) that received Forest Conservation Easement waiver from Planning?

Transferred to M-NCPPC. Who gets MS4 Permit credits? DEP does, per Amy & Frank

Montgomery County - COST:

Out-of-stream stormwater control
vs.
Stream “restorations”

Average Cost/Acre: MDE 2022 Annual Report on Financial Assurance Plans*

20 out-of-stream practices that are cheaper than stream "restorations."

	State Avg. Cost/Acre	Mo Co Avg. Cost/Acre	State Life Cycle Cost***	Mo Co Life Cycle Cost***
1. Green Roof, Extensive	$14,287	no data	no data	no data
2. Rainwater Harvesting	$15,767	no data	no data	no data
3. Dry Well	$24,951	no data	no data	no data
4. Shallow Wetland	$25,056	no data	no data	no data
5. Pocket Wetland	$ 6,236	no data	no data	no data
6. Surface Sand Filter	$14,877	no data	no data	no data
7. Dry Swale	$18,342	no data	no data	no data
8. Other	$30,962	no data	no data	no data
9. Redevelopment	$ 569	no data	no data	no data
10. Forestation on Pervious Urban	$ 7,644	no data		
11. Riparian Forest Planting	$31,374	no data		
12. Urban Tree Canopy	$ 6,327	no data		
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14. Septic Connections to WWTP	$ 114	no data		
15. Shoreline Management	$ 6,694	no data		
16. Catch Basin Cleaning	$22,210	no data		
17. Mechanical Street Sweeping	$ 7,376	no data		
18. Regenerative/Vacuum Street Sweeping	$ 7,372	no data	no data	no data
19. Nutrient Credits [Trading]	$ 30	no data	no data	no data
20. Septic Pumping	$ 1,140	no data	no data	no data
• Stream Restoration	$32,138	**$46,886**	no data	no data

We need this data!

We need this data!

We need this data!

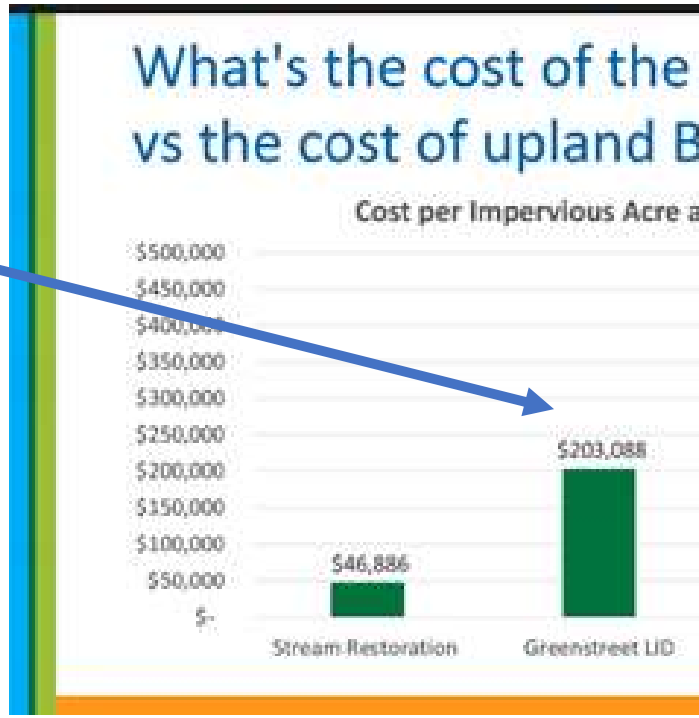
Lack of government transparency

***Life cycle cost = initial construction + maintenance + monitoring + repair; MDE does not collect this data

* Appendix C Tables 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

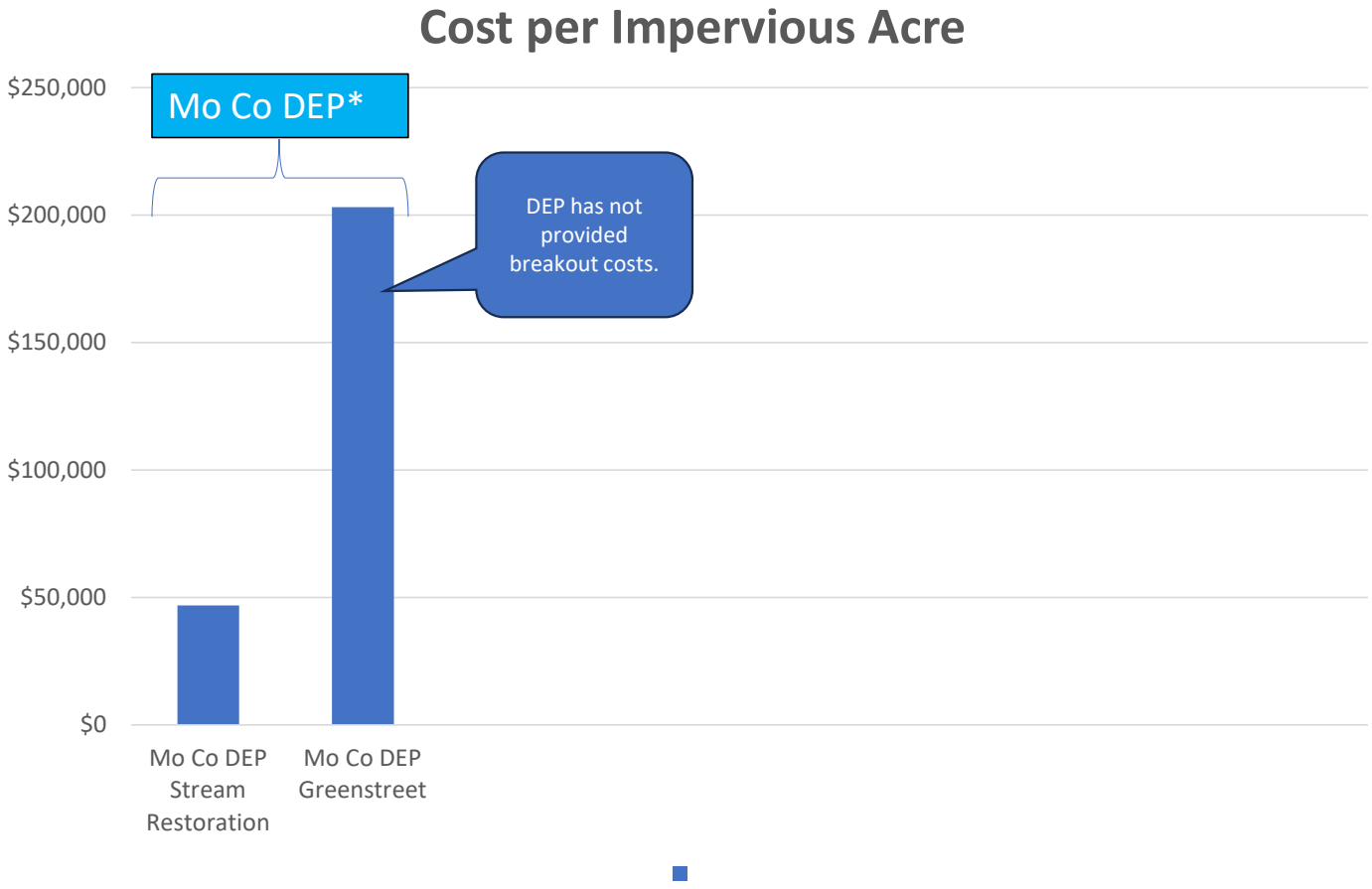
For DEP's misleading analysis to justify stream "restorations

1) lumps all Green Streets practices (below) into a single bar at $203,088/impervious acre treated – doesn't break out prices for:
   - Rain Gardens
   - Bioretentions
   - Tree Box Filters
   - Pervious Sidewalk, Permeable Pavers & Pavement Removal
   - Curb Extensions
   - Grass Swales



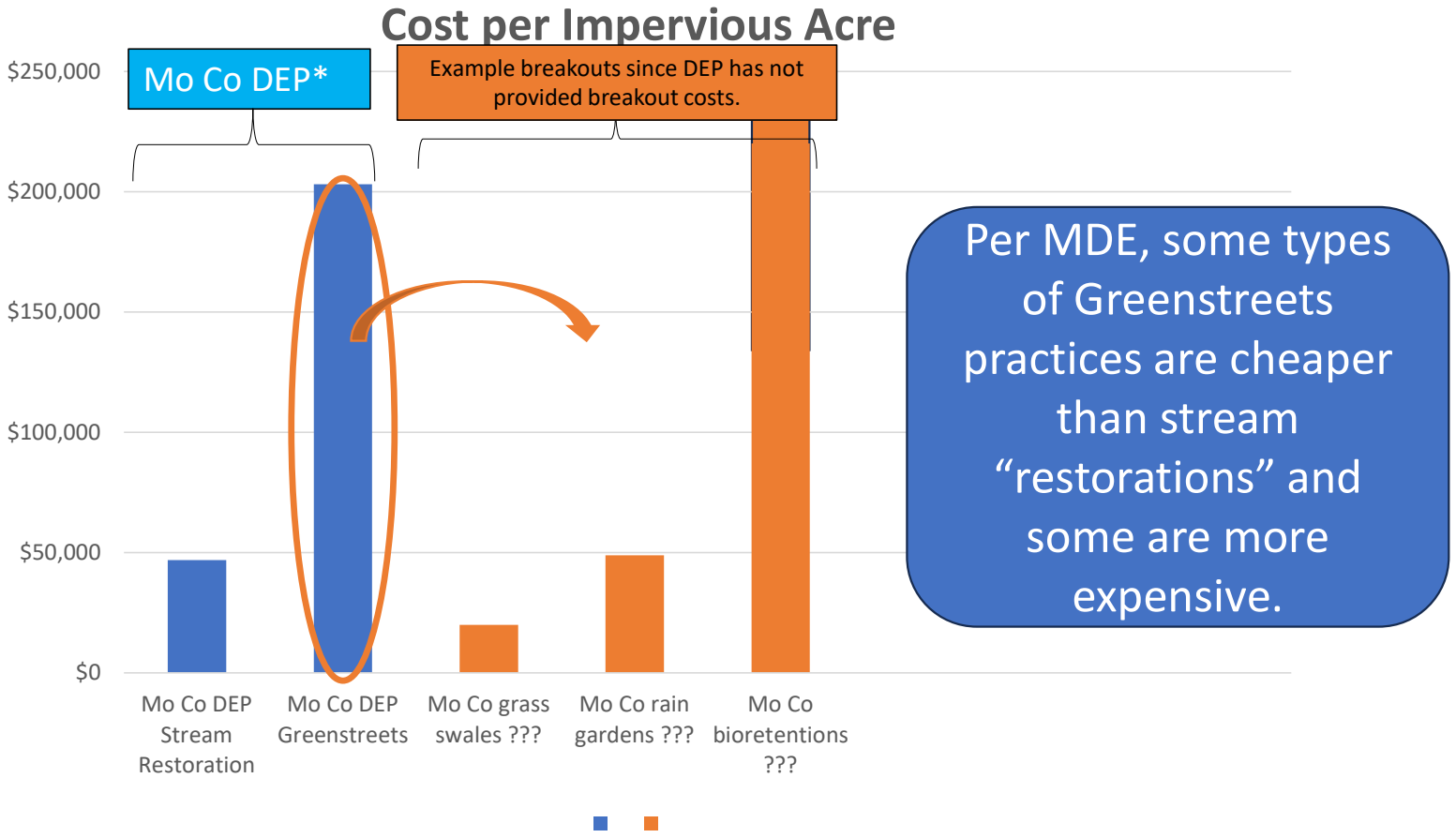
2) Does not compare with the 20 practices that are cheaper than stream "restorations"

DEP misleading analysis:



*Presented by DEP to WQAG (4/12/2021)

DEP misleading analysis:



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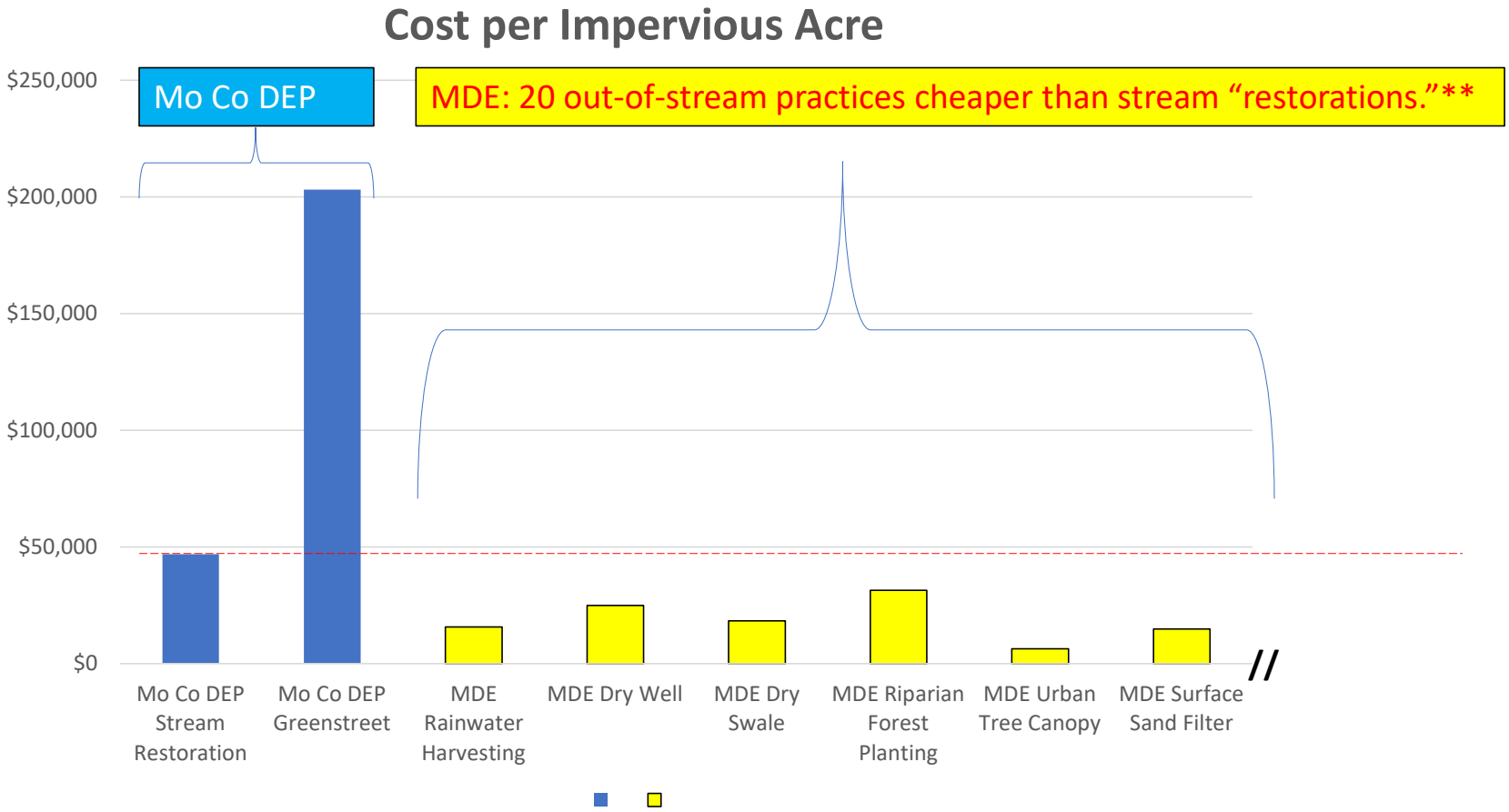


*Presented by DEP to WQAG (4/12/2021)

**MDE 2022 Annual Report on Financial Assurance Plans, * Appendix C Tables
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

“It seemed like a good idea at the time…”

- X-rays to size shoes

reddit.com

BANNED

clipartbest.com

- DDT fogging in neighborhoods

(pinterest.ca)

BANNED

clipartbest.com

- Thalidimide

blog.sciencemuseum.org.uk

BANNED

clipartbest.com

- Lead in paint and gas

(howchoo.com)

BANNED

clipartbest.com

“It seemed like a good idea at the time…”

- Lawn pesticides

wxxinews.org

BANNED IN MO CO

clipartbest.com

- Gas-powered leaf blowers

gardenhelpful.com

BANNED IN MO CO

clipartbest.com

Stream “restorations”

clipartbest.com

clipartbest.com

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

We All Agree On the Problem - We Disagree on the Solution

(Photo by City of Rockville)

OR

(Photos by Montgomery County DEP)

"It seems like we should design urban development to protect the streams and not the other way around." Tom Jordan, a senior scientist with the Smithsonian Environmental Research Center (BAY SCIENTISTS SAY STREAM RESTORATION NOT DELIVERING AS MUCH AS HOPED By Maryland Reporter | November 28, 2018, https://marylandreporter.com/2018/11/28/bay-scientists-say-stream-restoration-not-delivering-as-much-as-hoped/

SUMMARY – Reasons to incentivize out-of-stream stormwater control

1. They address a whole list of residents' concerns such as flooding, reducing heat islands, property values, urban green spaces, protecting natural areas.

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

(Photos by Montgomery County DEP)

2. The alternative - stream restorations – don't do the above. Direct observations and science say they don't work.

(Photo by City of Rockville)

SUMMARY, continued

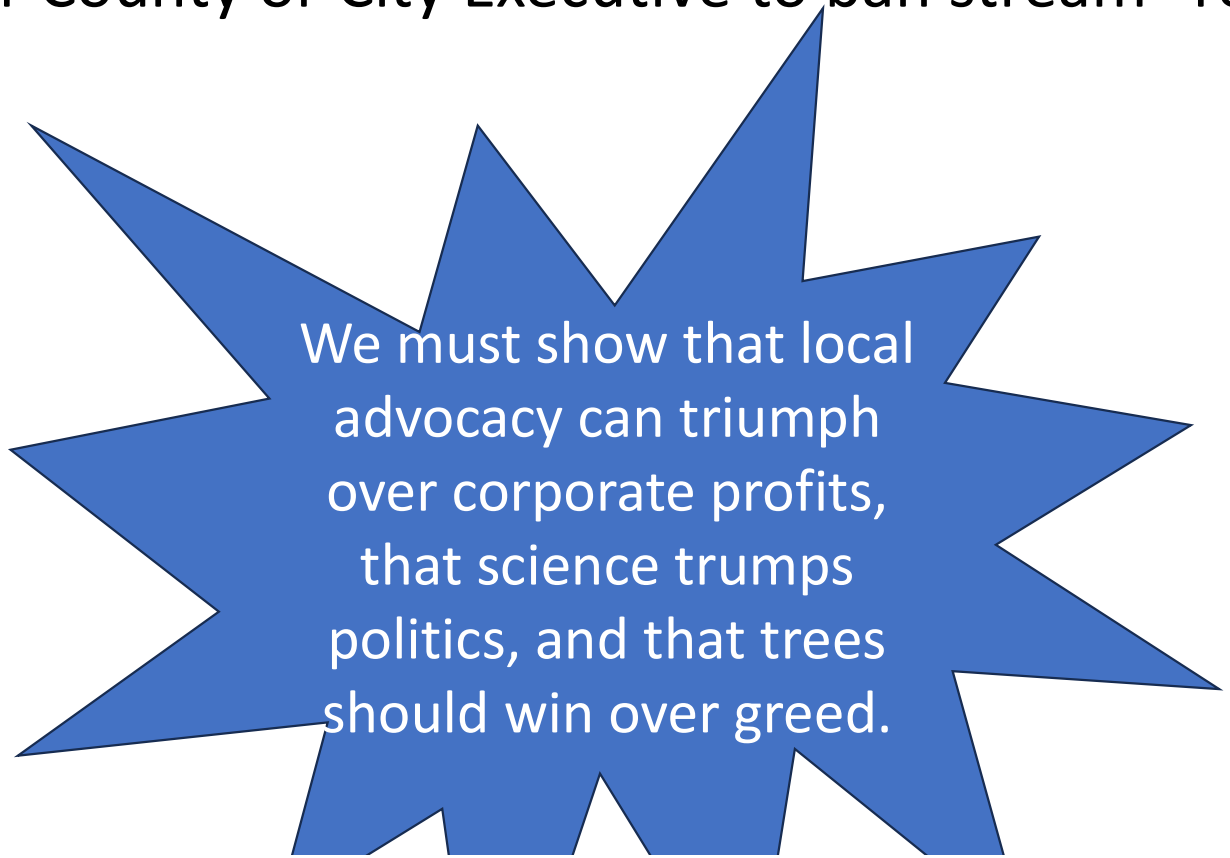
3. There are 20 out-of-stream stormwater control practices that are less expensive that stream restorations

4. Fix problem at the source: out-of-stream stormwater control is done in areas already disturbed – don't destroy natural areas.

Photo by K. Bawer, 10/21/2021)

CALL TO ACTION

- Ask your elected representatives to support legislation that will incentivize upland, out-of-stream stormwater control.
- Ask your County or City Executive to ban stream “restorations.”



CALL TO ACTION

Only resident outrage will stop stream “restorations

- Write a note/call elected officials demanding that stream “restorations” be banned:
  - Governor Wes Moore & Lt. Gov. Aruna Miller
  - County Executive and Councilmembers
  - City Mayor and City Council Members
  - State Delegates and Senator
  - U.S. Representatives and Senators
- Write letters to the editor
- TV/Radio stations – request coverage

Questions?

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

Contact Ken Bawer: kbawer@msn.com