



Outfalls, Gullies, and Defining Success

Designing for Functional Uplift in Degraded Urban Streams



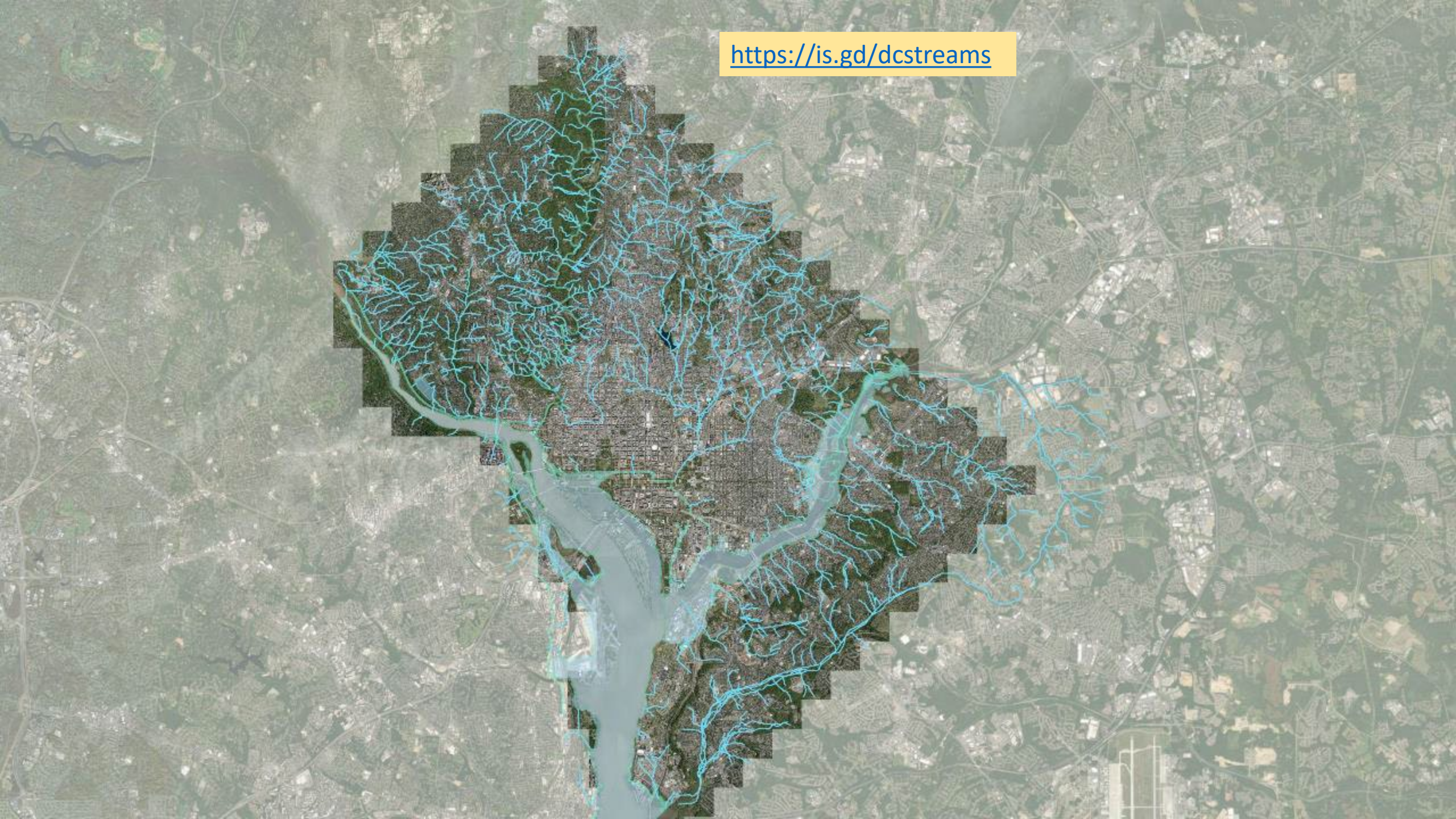
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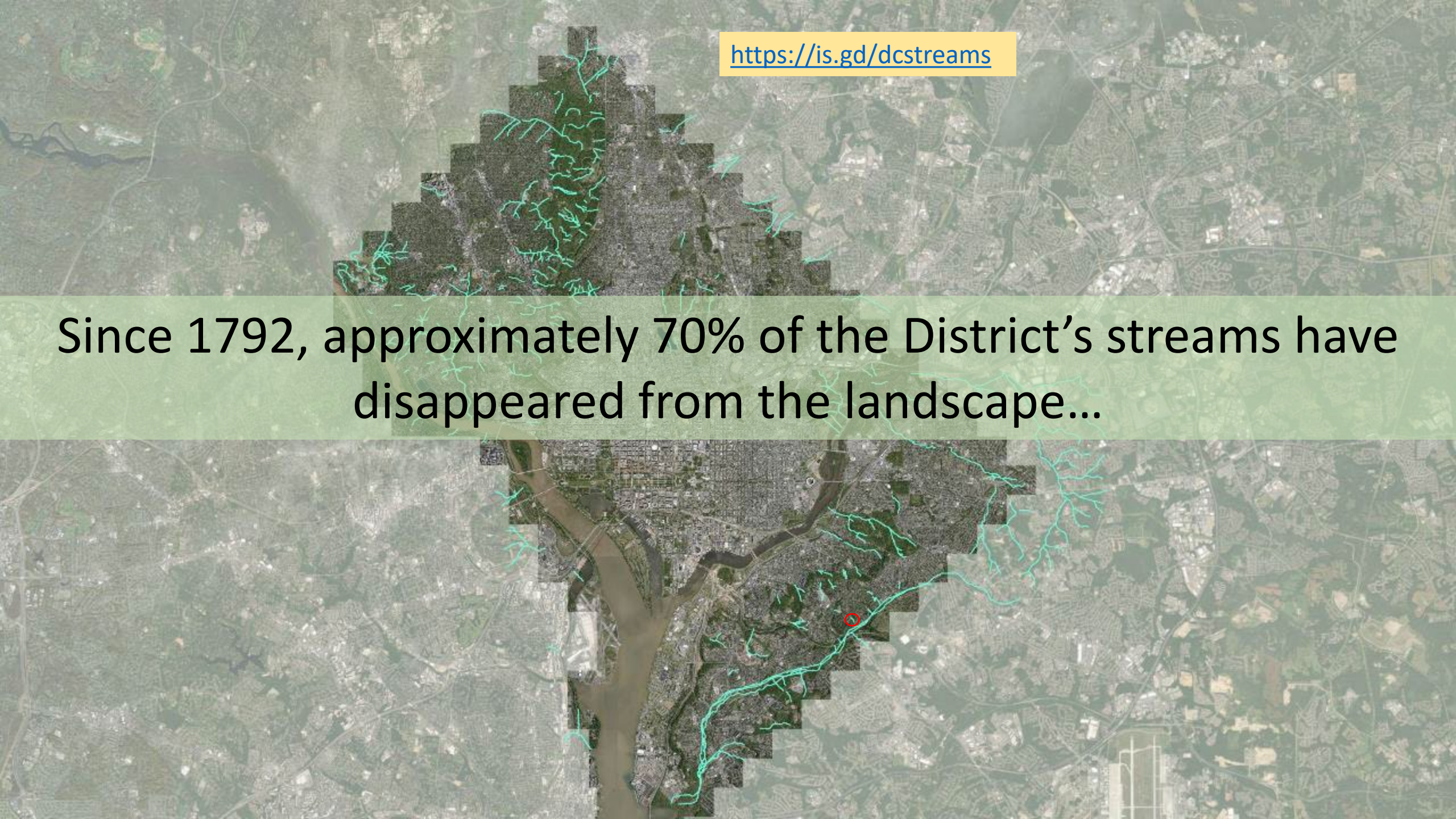
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<https://is.gd/dcstreams>



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Since 1792, approximately 70% of the District's streams have disappeared from the landscape...



Defining the urban headwater problem

1. Many urban headwaters have been lost permanently.
2. Remaining sites have been converted to stormwater conveyance (outfalls and gullies).
3. Urban valleys now regularly receive peak flows above and beyond any historical reference flood.
4. By nearly any metric they offer poor aquatic habitat (if any!).
5. They are a tremendous burden on downstream waters.





Site Characteristics

- Watershed = 43 acres (0.07 sq mi)
- Impervious = 35%
- Flow regime = Weak perennial (<1cfs)
- Mainstem length = 450 ft
- Mainstem slope = 5-10%
- Project size = 0.9 acre



Community Assessment and Need

- Project follows years of ongoing engagement with the community
- Environmental Justice Area
- Nearest fishable waterway (4-5 miles via car)
- Nearest forested walking trail (40 minute walk)

Saturday Environmental Academy Students (2023)



Stream Assessment and Need

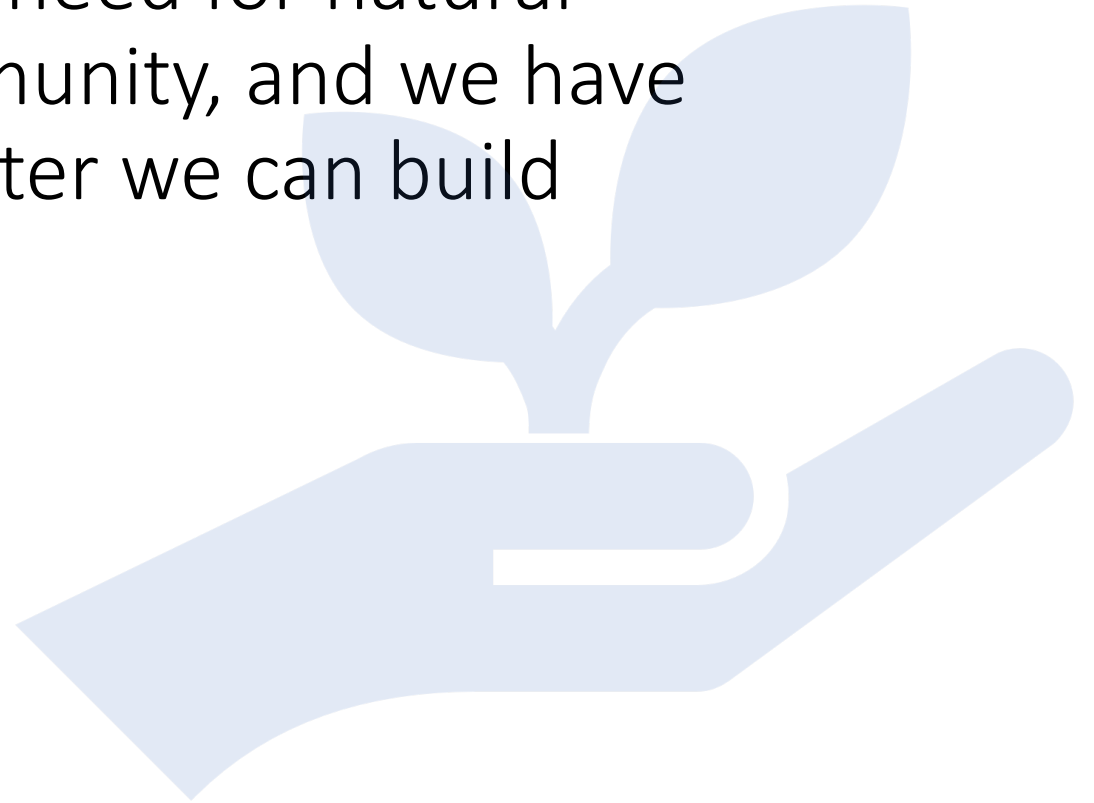
- ⊗ 35% impervious drainage
- ⊗ Fully entrenched
- ⊗ No variety in depth of features
- ⊗ Stream incised below gravel = no substrate
- ⊗ Presence of sewage
- ⊗ No storage of sediment, wood, or other organics
- ⊗ No fish, no benthics



Conclusion: there is broad need for natural habitat accessible to community, and we have a sustainable source of water we can build around.



So we move forward!



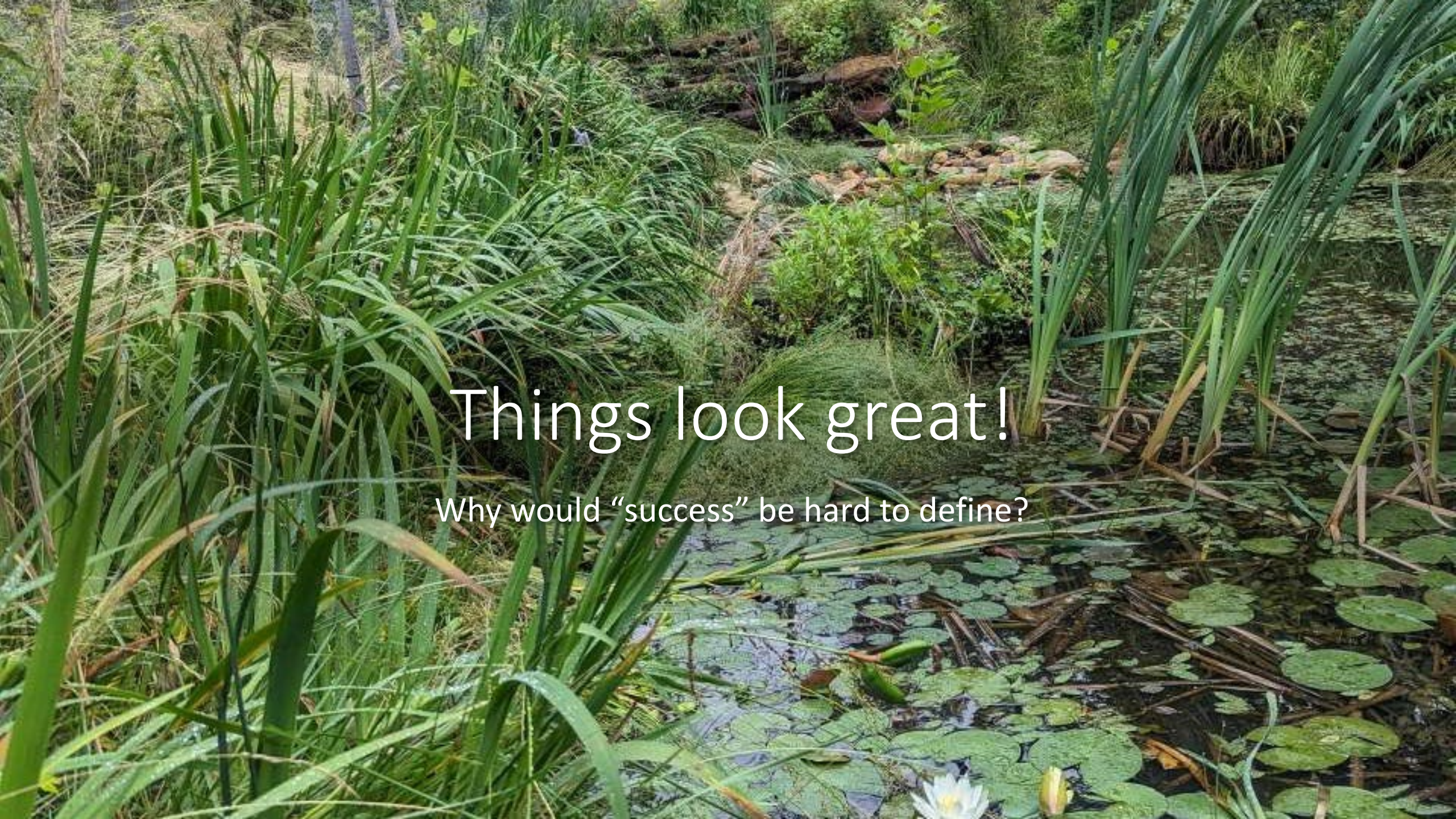


SOME TIME LATER...









Things look great!

Why would “success” be hard to define?



POLLUTION & SOLUTIONS

Bay scientists: Stream restoration benefits not clear cut

By Jeremy Cox Updated Mar 30, 2020

BAY SCIENTISTS SAY STREAM RESTORATION NOT DELIVERING AS MUCH AS HOPED

By Maryland Reporter | November 28, 2018 | News | | ★★★★★

NEWS

Alexandria leaders boiling mad over watered down stream restoration projects

Vernon Miles June 15, 2023 at 1:45pm

The Washington Post
Democracy Dies in Darkness

Contaminated, damaged streams in Chesapeake region at center of debate over cleanup

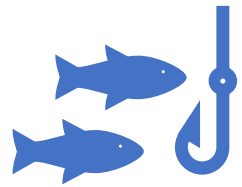


By Antonio Olivo

January 25, 2020 at 10:20 a.m. EST



The Urban Restoration Paradox



If you were to commission a biological sampling project at our site:

- The fishery index score would likely be **poor**
- Benthic macroinvertebrates integrity score would likely be **poor**
- Dissolved oxygen would likely be **low** most of the summer (<5 mg/L)
- Water temperatures would likely be **high**

CONTEXT MATTERS!

What do the metrics miss?

- Outfalls are water scarce, flashy, and likely will never achieve “biology” by that definition.
- The **transformation** from *absence* of aquatic habitat to the *existence* of aquatic habitat is enormously valuable and the single biggest return on investment we can achieve.
- Converting these sites from pollutant sources to sinks is measurably beneficial to downstream waters.



Undeniable transformation:

Since construction in 2020, the following have been documented for the first time at this site:

- **Fish***
- **Amphibians**
- **Waterfowl and Wading Birds**
- **Submerged Aquatic Vegetation, Emergent Wetland, & Forested Wetland**
- **Wildflowers and pollinators**
- **Beaver**

Environmental Justice

- This site is accessible to the community in the way they requested
- Critical forest was preserved as their highest priority
- While support is never unanimous, our work is appreciated.

The River Corps Program engages District residents, ages 18–24, through PAID classroom education and field-based experiences to gain technical skills needed to install, inspect, and maintain Green Infrastructure, and learn critical skills to secure employment.





A simple framework for success

Urban headwater framework

Guiding Principle: Create the possibility for aquatic life.

1. Improve the extent of water on the landscape
2. Promote stability
3. Create a habitat gradient between wet and upland
4. Provide floodplain functions

Conceive and execute through a community focused process.





Step Pool Stormwater Conveyance (SPSC)

- While many approaches could achieve success, we selected the SPSC approach.
- Nature-based retrofit practice in degraded gullies
- <https://is.gd/SPSCdesign>

Thank you and questions?

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Links:

Uncovering the History of DC's Streams

<https://is.gd/dcstreams>

Step Pool Stormwater Conveyance Design Guidelines

<https://is.gd/SPSCdesign>