

Construction Benefits of Beaver Dam Analogs



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Who am I?

- Graduate of Virginia Tech
- Ecologist with 25 years experience in assessment, design and construction
- Bug and fish geek who always loved playing in the streams as a kid
- I'm a big picture person who likes to see how all aspects of a project come together



What is a Beaver Dam Analog?



Why Beaver Dam Analogs?

- Beavers use locally sourced natural materials to create diverse habitats that also improves water quality
- How do we emulate what they do and to what extent
- What are our restoration goals
 - Nutrient processing/flood control
- How do we make them sustainable/we don't maintain on a daily basis/what are our longevity goals
- Why this site
 - Low slope of the project site=low risk
 - Is there available material
 - Is the existing vegetation tolerant of flooding
- ***Does this design work in this stream?***



Problem



Beards Creek

- SW of Annapolis, Maryland
- South River watershed
- Surrounded by suburban development
- Small second order stream
- Fed by 2 stormwater management facilities
- Tidally influenced
- Forested
- 238-acre drainage area
- 29% impervious surface
- ~1,500 linear feet of stream restoration
- Designed by Biohabitats
- Construction procured by Arundel Rivers with CBT trust fund \$

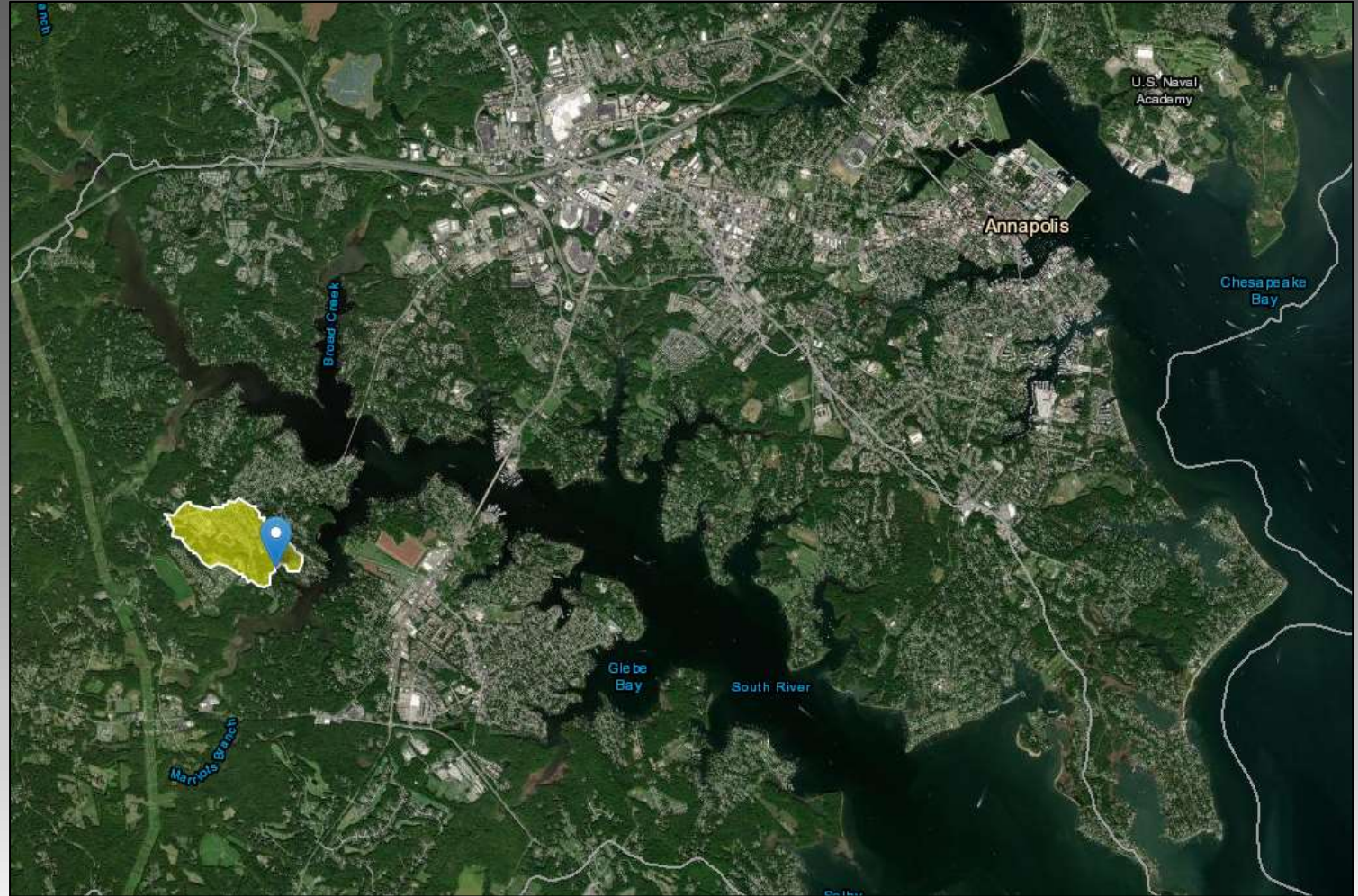


Image courtesy of USGS Stream Stats

Beards Creek



Preconstruction



How do we get from this...



...to this?



...and what are we accomplishing?

Design

- Baseflow channel
- Cross Section: 8-12' width x 0.2' depth
- Discharge: 1 cfs (2yr=31-44cfs)
- Shear Stress
 - In-channel:: 0.7-1.3lb/sf
 - Floodplain: <1lb/sf
- Velocity: ~4.7f/s

NUTRIENT REDUCTIONS

	Protocol 1	Protocol 2	Protocol 3	Total (Protocol 1-3)
Nitrogen (TN) (lbs/yr)	220.6	337.16	201.9	759.6
Phosphorus (TP) (lbs/yr)	101.6	-	22.8	124.4
Sediment (TSS) (lbs/yr)	11,804.8	-	6778.0	18,528.9
Sediment (TSS) (tons/yr)	5.9	-	3.4	9.3

Construction



Construction



Challenges

- Groundwater/Mud
- Stakeholders (regulatory agencies/neighbors)
- Tree preservation (tree removal during construction vs tree loss if nothing is done)
- Sequence of construction/closure period constraints
- Access



Post-Construction



Post-Construction



Post-Construction



Before/After



Before/After



Before/After



Before/After



Before/After



Before/After



Reflection

What did/can we do better than a beaver?

- We can monitor, adapt and improve just like a beaver
- We can improve the transitions to maintain fish passage
- Greater frequency of dams to increase floodplain connectivity
- We can quantify benefits through monitoring
- We can use bigger materials (we have excavators with hydraulic thumbs)
- We can more selectively use materials and import large materials to preserve the surrounding riparian habitat
- We can take TMDL and MS4 credit



Benefits

- Reduced environmental footprint
- Use of on-site materials
- Quicker construction timeframe/production rates
- Multiple structures with little drop and reduced scour
- More expansive floodplain reconnection
- Increased sediment trapping
- Tree preservation
- Increased riparian wetlands





THANK YOU!

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