

BOLIN CREEK WATERSHED RESTORATION COLLABORATION

Carrboro Century Center

April 13, 2024

Welcome!

- Agenda
 - 2022-24 319 Project Presentation
 - Project Documentary
 - Urban Sustainability Solutions initiatives
 - Panel/Q&A
 - Topic Tables



Start at the end...Lessons Learned

- Three HOAs pursued a shared stormwater solution and will continue to partner to maintain it.
- Water doesn't care about property lines. Stormwater issues are bigger than any entity can fix on their own, so partnering is key.
- 85% of land is private, so most stormwater issues are on private property.
- Where should private property owners and HOAs start?
- Understand the role, resources, expertise, and scope of the Town, County, and OWASA.





Native Plant Workdays

150 volunteers

1300 native plants

23 lb. riparian seed

Biodiversity

Resilience

Slow, Spread, Soak

Planting builds
stewardship



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Community Building

“I really enjoyed volunteering this past weekend!”

It was really cool to see people from the neighborhood working together to make the space greener.

I especially enjoyed getting to scatter seeds in the grassy areas- I can't wait to see what kind of wildflowers spring up.”



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“I really enjoyed myself and felt de-stressed as I planted.

I appreciate all the cooperation in the community as well; everyone worked together and had a fun time.

I also am thankful for the donuts!”



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8-Year History of the Carrboro Stormwater Collaborative

2016

- Erosion behind Amber Court
- Phase 2 Bolin Forest hired engineer to give recommendations

2017

- A rainy year! Large tree on scoured bank fell on adjacent home; very close to injuring a young child



2017 (cont'd)

- Approached and engaged 2 neighboring HOAs to do an assessment across parcels
“Stormwater runoff doesn’t care about property lines...”

2018-2019

- Partnered with Piedmont Conservation Council (PCC) and Orange County Soil & Water Conservation District to submitted a grant proposal with 3 HOAs and municipal partners. Not funded.

2020

- Regrouped with PCC, Soil & Water, and Randy Dodd; brainstormed other options

2021

- Town led EPA 319 grant development with neighborhood champions, invited community partners to submit interest and letters of support, proposal submitted to NC DEQ/EPA. Very fortunate, this grant was awarded.



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Built a team ...

- **3 HOAs, 7 homeowners, champions, residents, volunteers, adjacent HOAs**
 - Meg Molloy, Christopher Sandt
- **Town of Carrboro**
 - Randy Dodd, Debbie Shoffner, Heather Holley, Emily Cochran (Stormwater), Sungate Design (Town Engineer), others
- **Kris Bass Engineering**
 - Simon Gregg
- **Fluvial Solutions**
 - Peter Jelenevsky
- **NC Cooperative Extension**
 - Mitch Woodward
- **Orange County**
 - Christopher Sandt, Jessica Perrin, Bradsher Wilkins, others
- **OWASA**
 - Nick Rogers, Mary Tiger, Mary Darr, others
- **Friends of Bolin Creek**
 - Julie McClintock, others
- **UNC EcoStudio**
 - Abby Overby
- **Carrboro High School**
 - Stefan Klakovich, students
- **Urban Sustainability Solutions**
 - Michael Dupree
- **NC Department of Environmental Quality**
 - Rishi Bastakoti
- **EPA Office of Water**



Invited commitments & contributions

Cash

- Each private property owner contributed funds (3 HOAs and 7 homeowners)
- Friends of Bolin Creek contributed funds for UNC intern to create video
- Soil and Water Community Conservation Assistance Program grant for native plants

“In-Kind” support, Volunteer time

- HOA board meetings, homeowner meetings & agreements
- Legal agreement principals, exhibits, documents
- Planning and communications
- Professional services and consultation
- 3 Workdays (cleared small trees before construction, 2 planting workdays)
- 3 Educational workshops (Diverting Downspouts, 4 S’s of Stormwater; Landscaping for stormwater management)
- Filming/archiving education on web
- Intern hours

Voluntary adoption of best practices on HOA and homeowner property



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Understanding Who Is Responsible

- At the stage of grant application, partners had a series of discussions and meetings and agreed in principle to apply for the grant and its scope. **Letters of commitment** were provided and the Town submitted the grant application.
- Upon notification of grant award, partners and Town of Carrboro entered into **Memorandum of Agreements (MOAs)**.
- Now that construction is complete, landowners are developing and recording **easements and a joint maintenance agreement & schedule and maintenance reserve funds** to ensure that the Regenerative Stormwater Conveyance (RSC) is maintained.



Goal of the Project

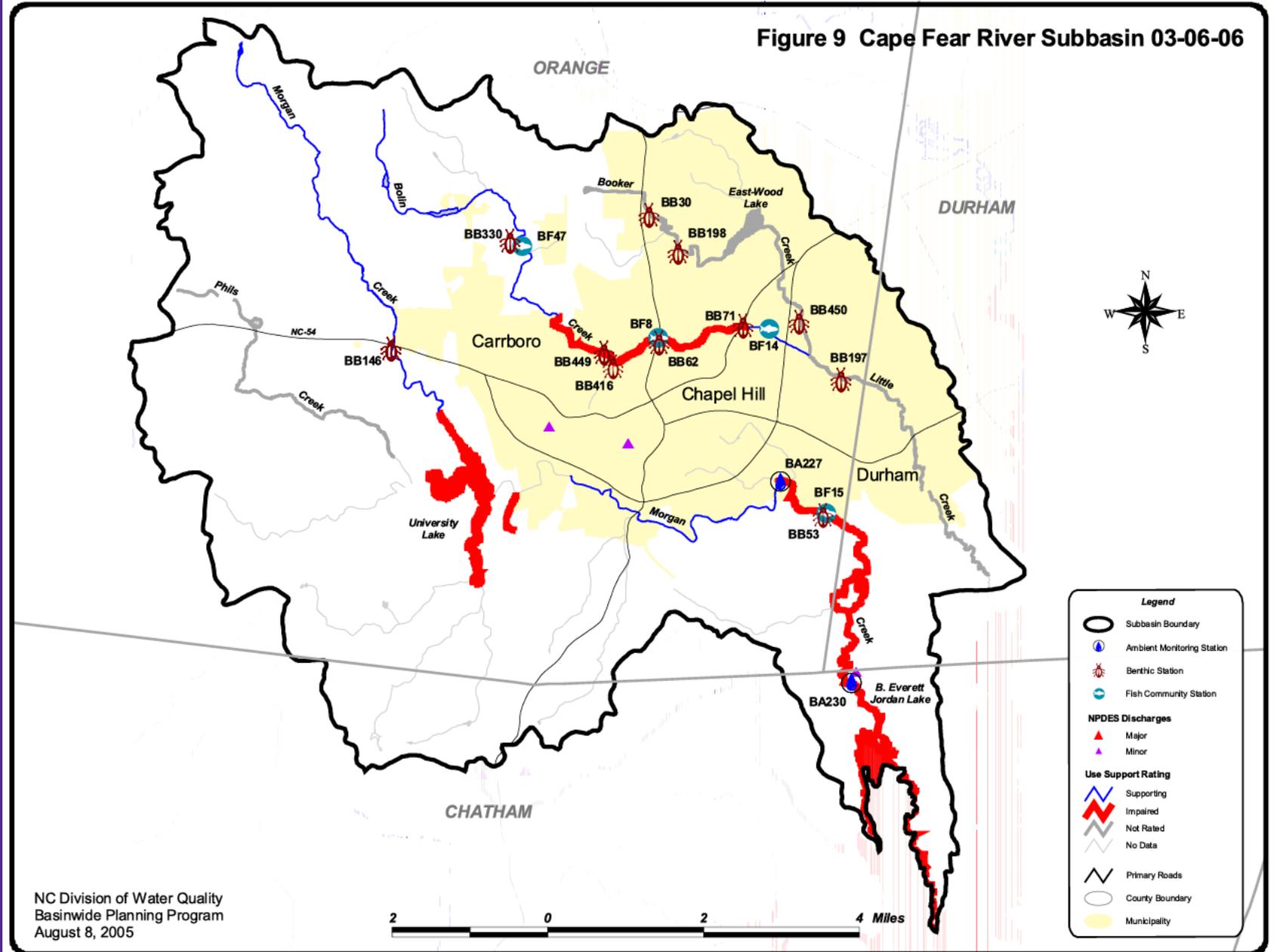
Reconstruct and stabilize 1,000 feet of two eroding ephemeral channels; improve streambank vegetation; treat other areas in the 11 acre watershed.

- **WHY?:** helps neighborhood and **geomorphic instability** and associated erosion is a driver of stream health impacts;
- **DESIRED OUTCOME:** Not only stabilize these channels, but also demonstrate an effective solution for similar sites; be an example for other neighborhoods.
- Significant focus on **partnership between stakeholders and education and action by HOAs and homeowners** of what to do to reduce and manage stormwater runoff.



About Bolin Creek

- Listed on the state and federal **impaired waterbodies 303(d) list**, based primarily on aquatic biology (aquatic insects)



About Bolin Creek

- Condition has deteriorated due to:
 - Excessive stream bed/bank scouring, loss of trees along stream banks and adjacent riparian areas
 - More frequent intense rain events
 - Stormwater runoff from impervious area(s) within the watershed Habitat degradation
 - Toxicity (pollutants)
 - Occasional low flow conditions, resulting in low dissolved oxygen



Source: Town of Carrboro

319 Grant

- Selected for funding by DEQ and EPA
 - Total amount: **\$258,036**
 - Federal: **\$150,000**
 - Non-federal: **\$108,036 ***
- Neighborhood champions- planning, partnership building, communications, education
- Town of Carrboro- grant application, administration, planning, education



Strategy and Timeline

Technical Scope:

- Perform **topographic and property surveys** to support engineering design work
- Conduct **design work** for ephemeral channel restoration
- Use **Regenerative Stormwater Conveyance**, stream channel repair, energy dissipation, erosion control, outfall treatment, log vanes, stone, step pools, and other natural grade control/stabilization and riparian improvement

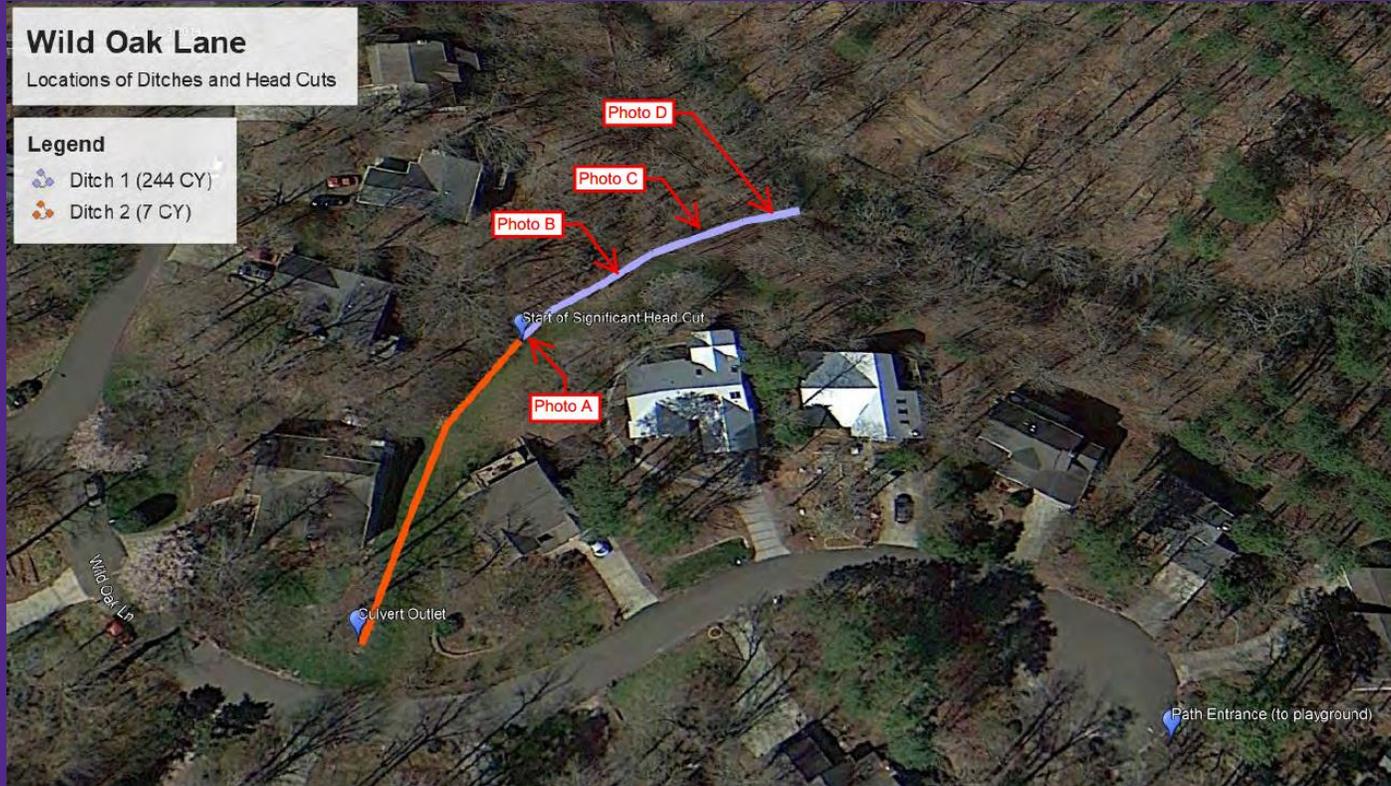


Wild Oak Lane

Locations of Ditches and Head Cuts

Legend

- Ditch 1 (244 CY)
- Ditch 2 (7 CY)



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Timeline

TIMELINE:

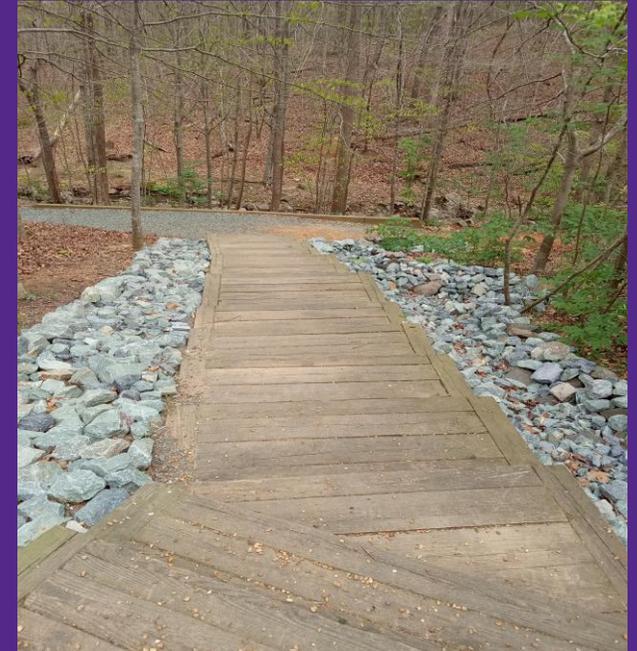
- **First Phase (2022-23)**
 - Topographic/property surveys and engineering design
 - Release construction bid, prepare for construction
 - Begin public education workshops and actions by HOAs and homeowners
 - Determine easement requirements
- **Second phase - construction (2023)**
- **Third phase – plantings, grant closeout (2024)**

Public education and action on HOA & homeowner properties throughout the grant period



Bolin Creek Drive Before and After

(cont'd)



Public Works staff make improvements at the end of Bolin Forest Drive to better manage runoff and erosion.

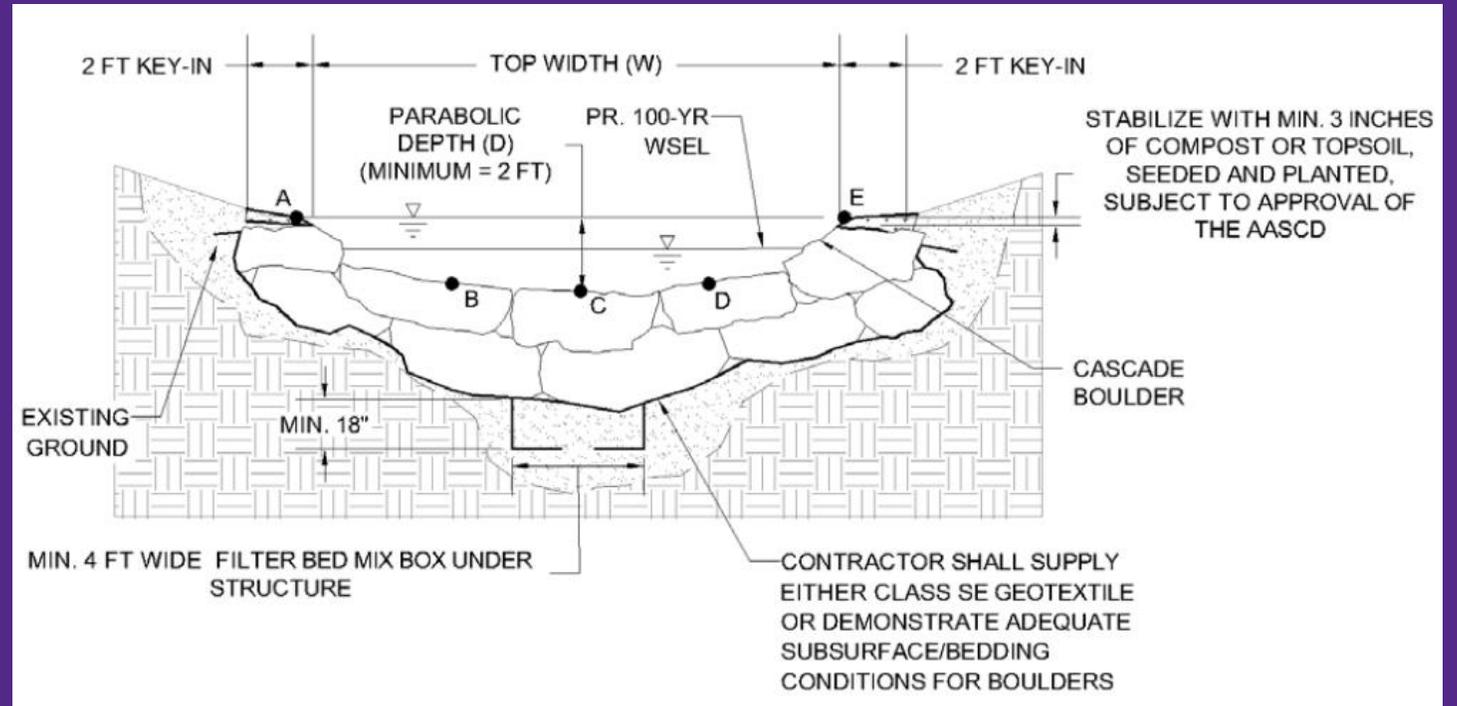
Regenerative Stormwater Conveyance

- Method for stabilization of eroded gullies
 - Ephemeral channels
 - Stormwater outfalls
- Sandy media provides filtration of surface water pollutants
- Rock structures create a stable profile and cross-sections



Design Specifications

- Current Guidance from Anne Arundel Co., Maryland
- North Carolina SCM crediting coming soon
- Design flow rate-100-year, 24-hour event
- Other specifications include: slopes, width, and stone size



Runoff Calculations and Climate Change

- Runoff methods, Rational and SCS CN Method, were evaluated to determine the most conservative method for the site.
 - Rational more conservative for small storms
- The effect of choosing the 90th percentile rainfall intensity value was evaluated.
 - This increased the runoff rate by approximately 10% increase.
- Final design storm peak flow estimations.
 - 10-50% higher than the standard peak flow estimation methods.



LOCATION/ STORM EVENT	WILD OAK LN.	SUB WS FOREST CT.	SUB WS WILD OAK CDSK.	AMBER CT.	PATHWAY DR. OUTFALL	BOLIN CREEK DR. OUTFALL
2-YR, 24-HR (CFS)	17.8	13.9	3.4	26.5	2.5	3.1
10-YR, 24-HR (CFS)	22.5	17.6	4.4	33.6	3.1	3.9
100-YR, 24-HR (CFS)*	31.5	23.1	5.5	48.3	3.9**	5.9

* Estimated using the SCS CN Method

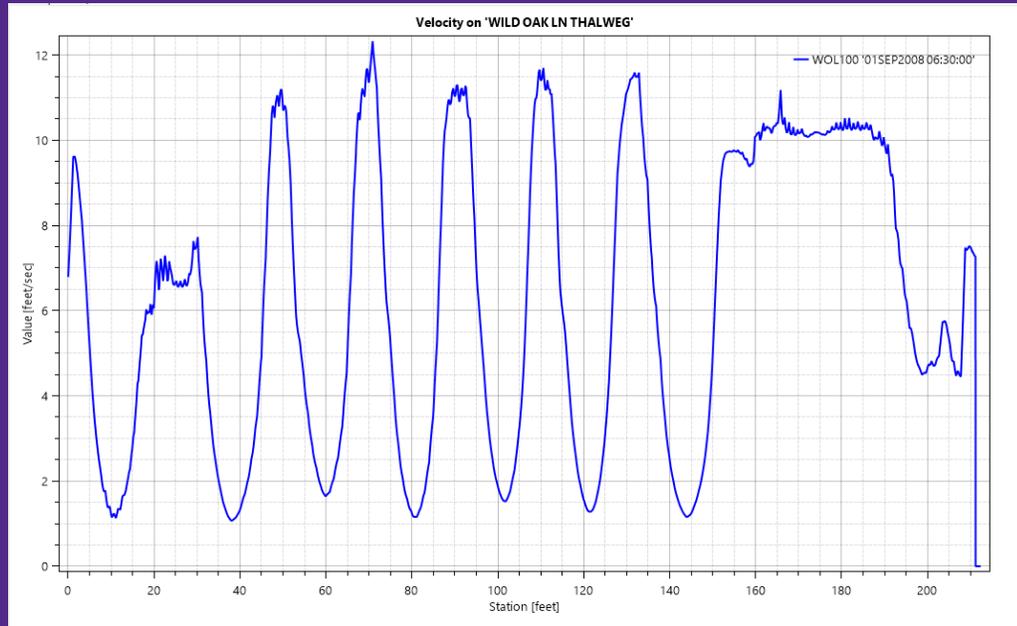
** The Rational Method overpredicts the CN Method for this watershed, so the higher value will be used.



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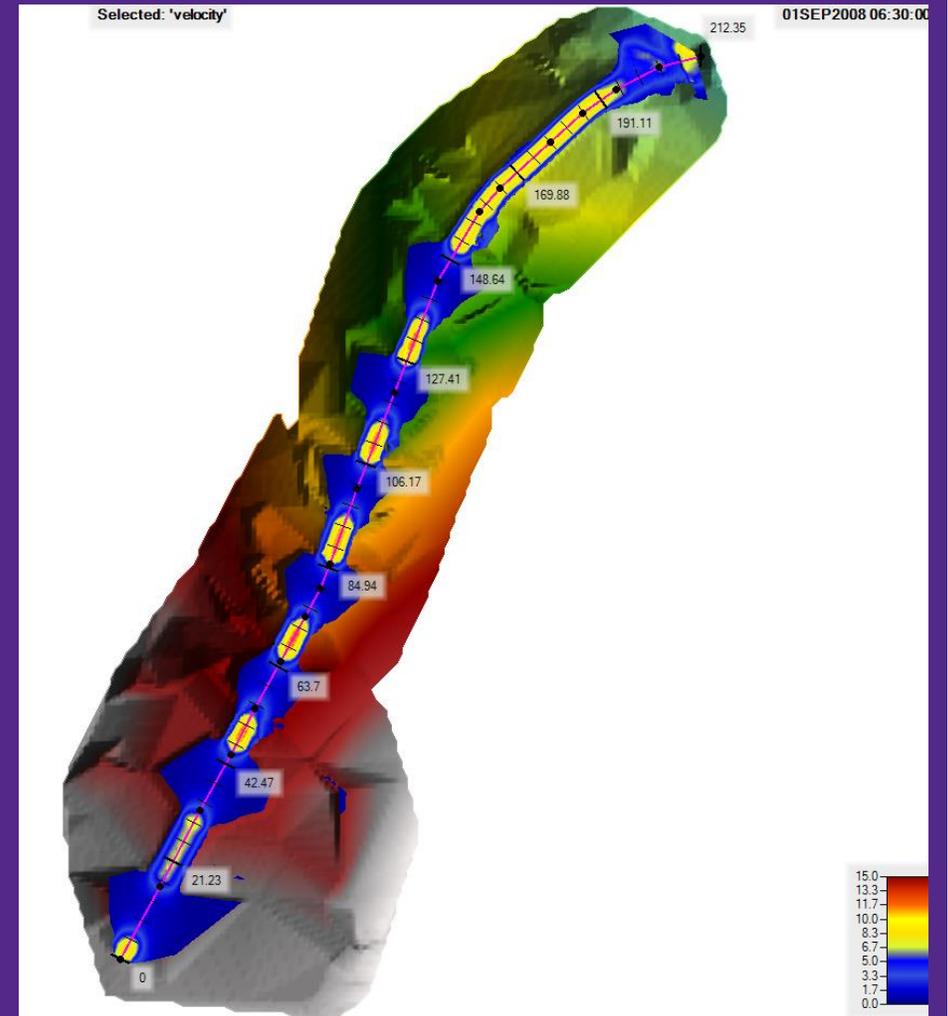
Multi-Dimensional Simulation Analysis

- Wild Oak Ln. 2-yr, 24-hr storm velocity results.



FEATURE	PROPOSED MATERIAL	PERMISSIBLE VELOCITY (FT/S)	VELOCITY RESULT (FT/S)	STABILITY ASSESSMENT
POOL	Graded loams and cobbles	3.75	1.8-3.0	Stable
RIFFLE	d ₅₀ of 9 in. stone	7-11	6.5-8.0	Stable
CASCADE*	d ₅₀ of 30 in. stone	14-18	8.0-12.5	Stable

* Permissible velocity for d₅₀ of 24 in. stone



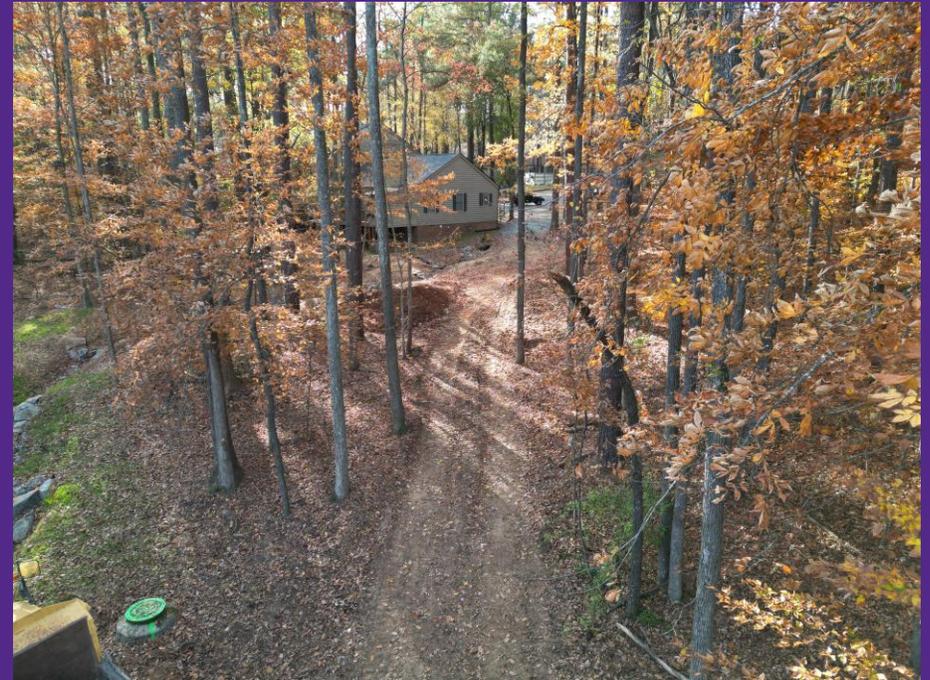
Construction

- Installation of the media bed
- Overlain with foundation rock
- Followed by cascade stone



RSC.....

- Create **temporary pools** on Forest Court property with **native structures and vegetation** for wildlife benefit and regrade area that has been washed out due to high water volume from culvert and downspouts



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