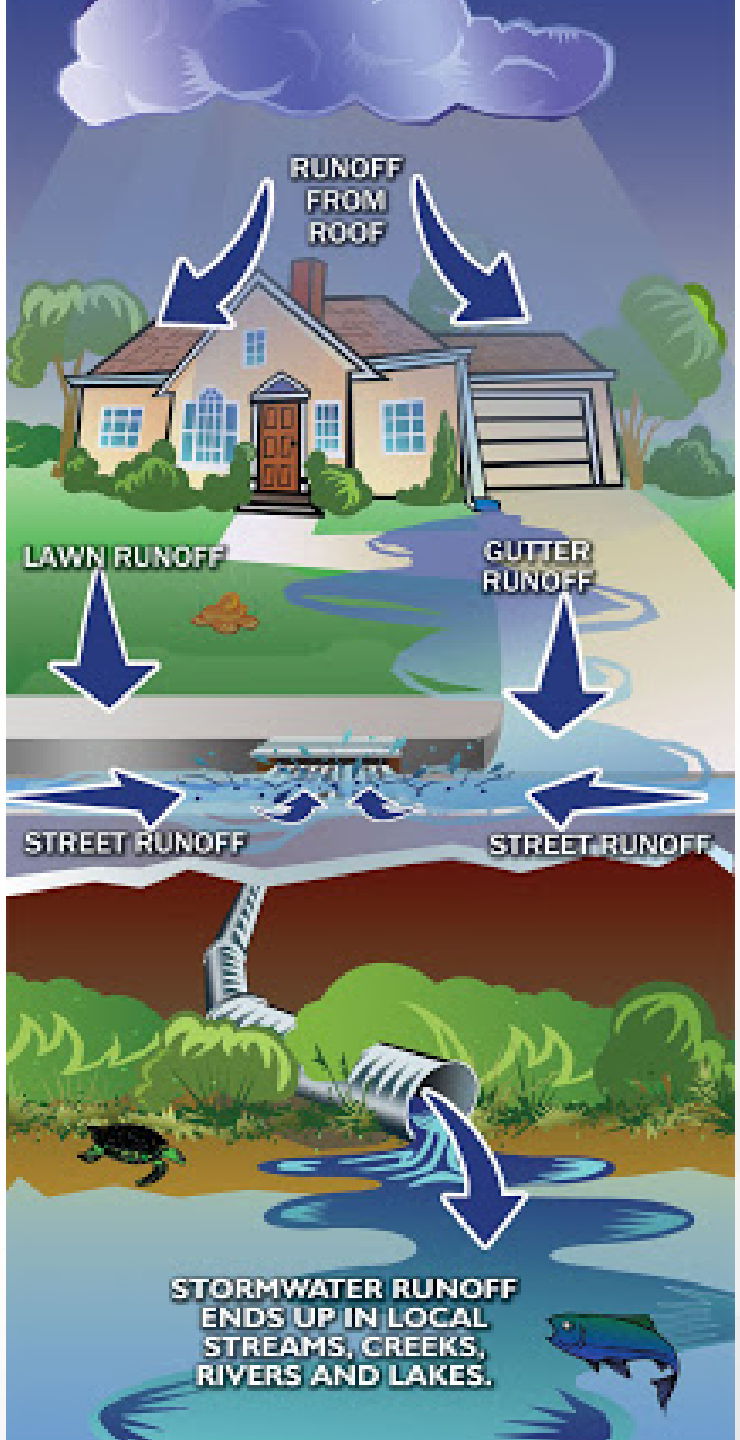
Getting an Education on Nutrient Management: Green Infrastructure Initiatives to Meet Regulatory Requirements

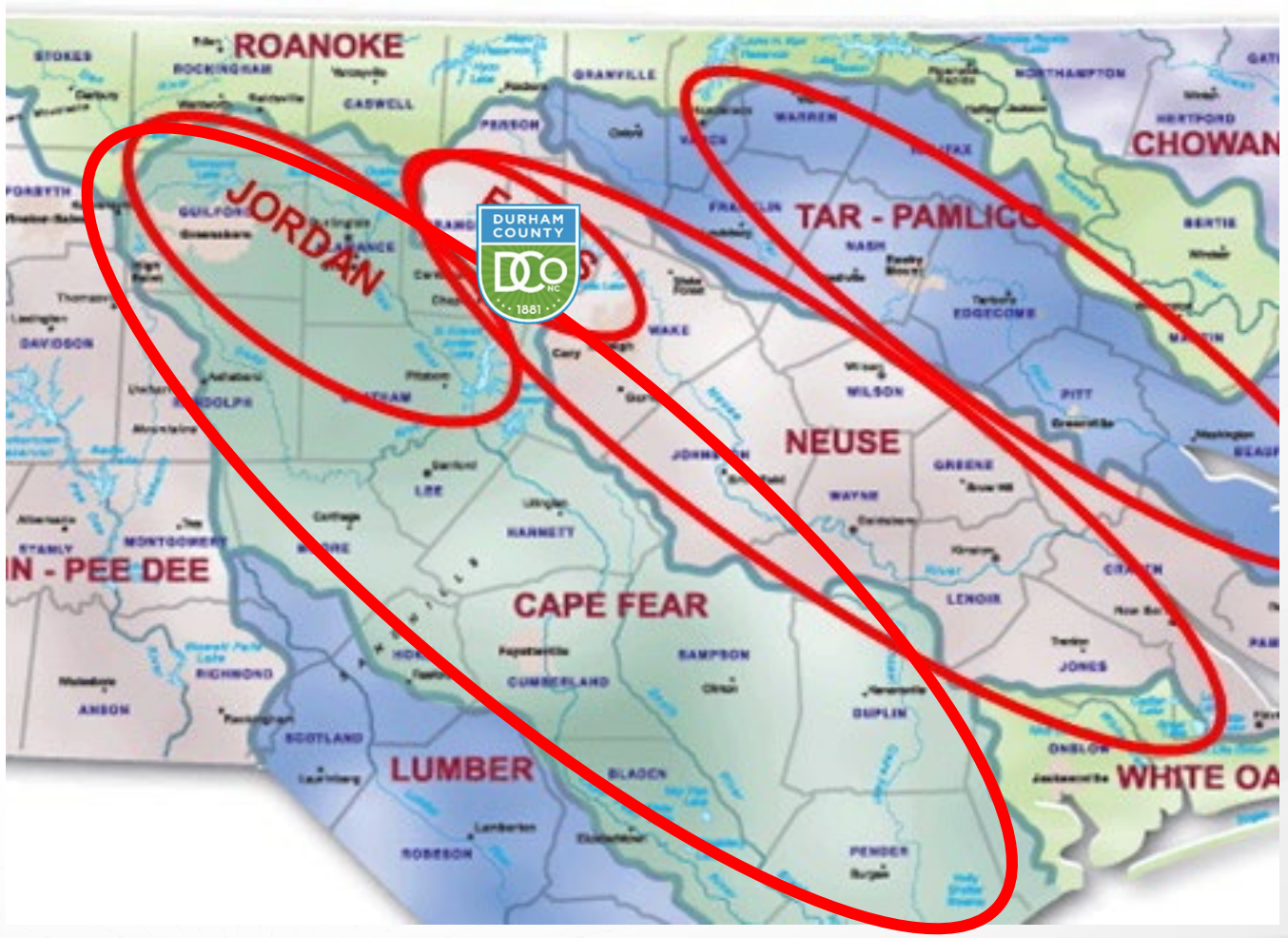
Today's Presentation

- Background
- Stormwater Concerns
- Utility Development
- Alternative Compliance
- Nutrient Management Study
- Project Identification
- Funding
- Outreach
- Design
- Construction



Location, Location, Location

- Durham County is split between two major river basins
- **Cape Fear River Basin** (Southern Durham County)
- **Neuse River Basin** (Northern and Southeastern Durham County)

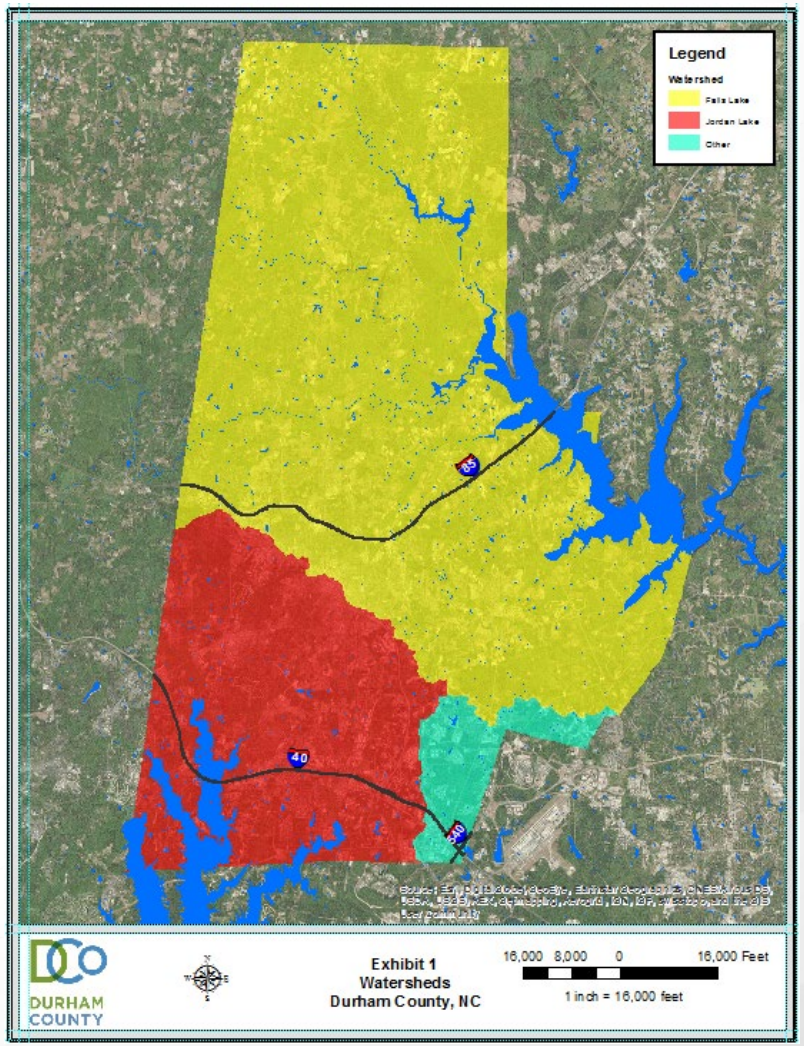


Pollutants in North Carolina Waterbodies

- North Carolina Department of Environmental Quality (NCDEQ) water quality modeling
- Determination that Jordan Lake and Falls Lake have excessive levels of Nitrogen and/or Phosphorous
- Delegated them to be “Nutrient Sensitive Waters” (NSW)

Nutrient Sensitive Water and Special Watershed Programs

- Nutrient Sensitive Water Management Strategies are adopted legislation
- Local municipalities and counties are required by law to comply with the nitrogen and/or phosphorous reductions required by the State
- Durham County must comply with three separate rules:
  - ★ Neuse River Basin Nutrient Strategy
  - ★ Falls Lake Nutrient Management Rules
  - ★ Jordan Lake Nutrient Management Rules



What does Durham County have to do?

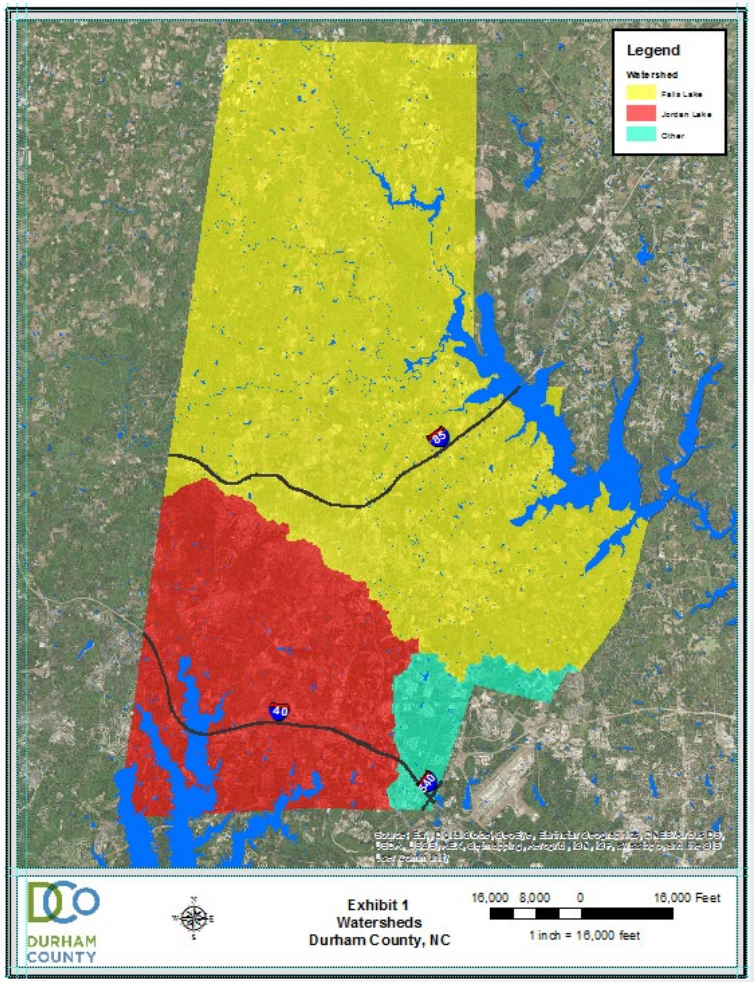
Reduce nutrients entering our waterways!

How?

- Require new development to meet nutrient rules on-site
- Design and construct stormwater control measures to help treat runoff before entering the stormwater system
- Purchase undeveloped land for conservation
- Retrofit old stormwater measures to function better for water quality

Durham County Watersheds and Compliance Costs

- Neuse River - including Falls Lake & Remainder
- Cape Fear River - including Jordan Lake
  - Neuse River Rules = No New Cost
  - Falls Lake Rules (estimated costs):
    - Stage 1 = $666,500 (IAIA)
    - Stage 2 = $67,000,000 (**approx. 2026-2041**)
  - Jordan Lake Rules (estimated costs):
    - Stage 1 = No New Cost
    - Stage 2 = $5,900,000 (**on hold**)



Stormwater Program Guiding Principles

Rules Compliance

Durham County's ultimate goal is to be in compliance with the Falls and Jordan Rules

Efficiency

Recognizing these are taxpayer dollars, seeks to get the best bang for your buck.

Resiliency

The County seeks out opportunities to address not only water quality, but the effects of climate change and flooding

Environmental Justice

Where possible, the County prioritizes underserved areas and populations for projects to improve watershed health.

Stormwater Utility Fee

- 14,875 parcels billed in 2020-21 fiscal year
  - Tiered Residential Structure
  - NSFR for Commercial, Industrial, Gov't, etc.
- Initial fee reduced to 1/3 based on financial burdens associated with COVID-19 to $24 per ERU per year (ERU = 4,300 sq ft)
- Annual increases – $80 per ERU in FY2025

Interim Alternative Implementation Approach

- Falls Lake Rules Stage I
- Joint Compliance (under the Rules)
- Financial Approach vs Nutrient Loading Approach
- Administered through the UNRBA

Member	Annual Funding Level	Member	Annual Funding Level
Town of Butner	$23,393	Town of Hillsborough	$34,221
City of Creedmoor	$16,926	Orange County	$161,943
City of Durham	$337,587	Person County	$114,394
Durham County	$133,300	City of Raleigh	$466,081
Franklin County	$19,058	Wake County	$88,968
Granville County	$100,453	Town of Wake Forest	$13,692

- Durham County Commitment = $133,300/year

IAIA Compliance

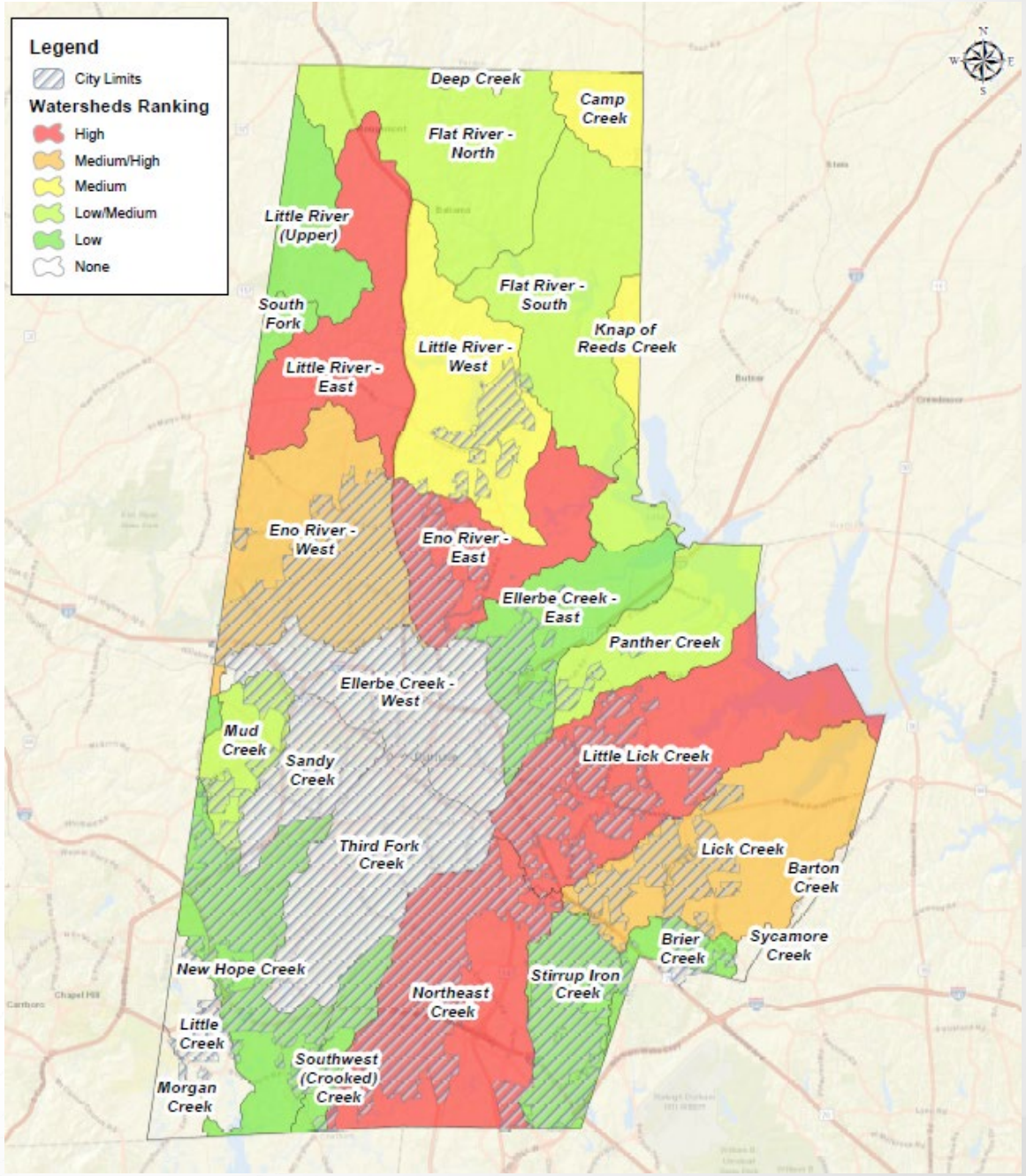
- Durham County Commitment = $133,300/year
- Compliance May Be Reached Through:
  - Self Funding Projects – all aspects (Planning, Land Acquisition, Construction, etc)
  - Inter-Local Agreements – joint funding projects
  - Funding Existing Programs – specific to water quality/watershed improvement
  - Contribute to a Pool of Program Funds

Nutrient Management Study

- Desktop/GIS analyses to identify high priority watersheds for implementation
- Develop prioritization rubric in alignment with four program priorities
- Identify structural nutrient management projects for near-term implementation
- Develop framework for identification and prioritization of future projects

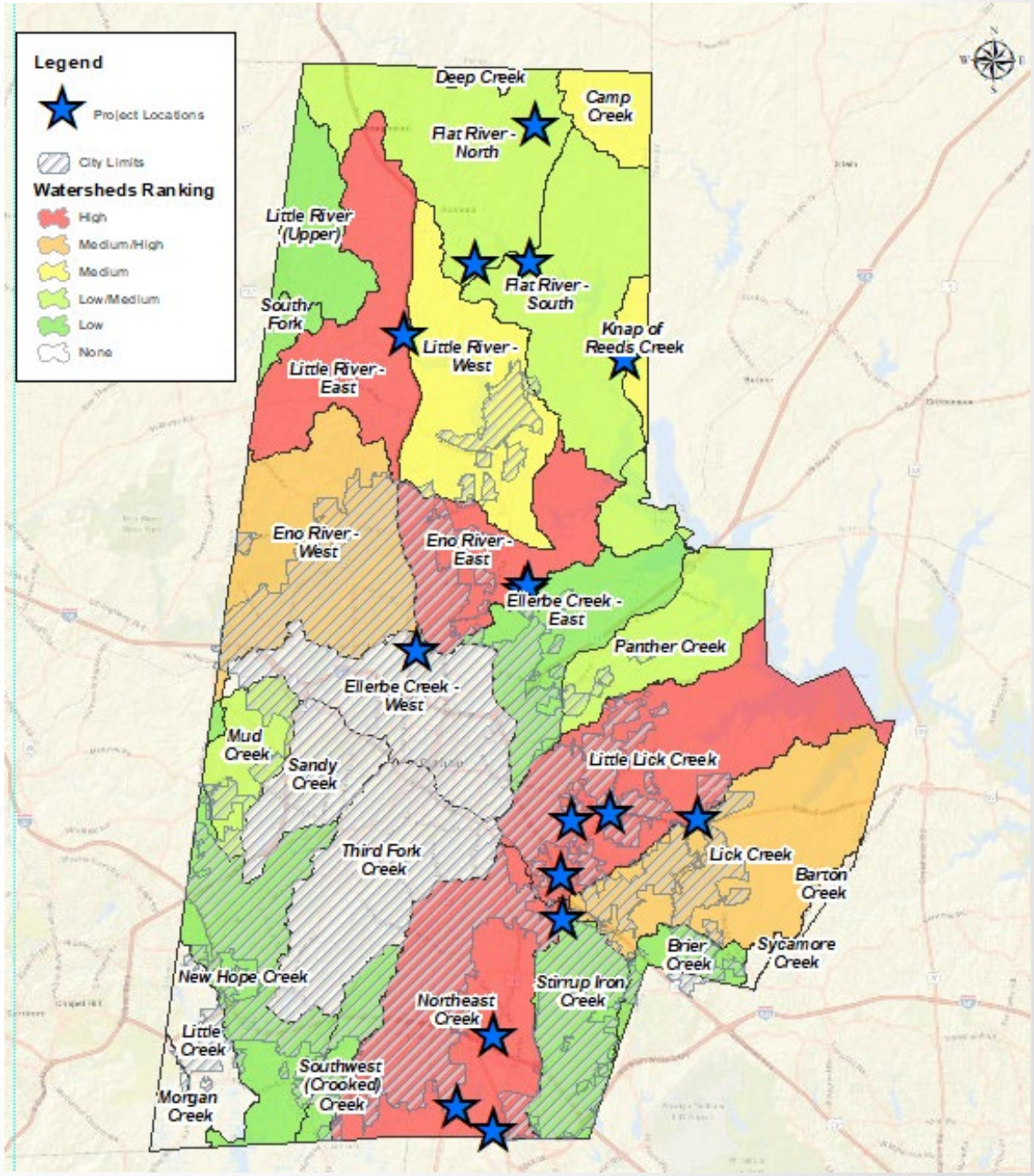
Countywide Desktop Analyses

- Analyses
  - Floodplains
  - Impervious area
  - Riparian corridor
  - Stormwater control measures (SCMs)
  - Land conservation
  - Property ownership
- Watershed prioritization



Project Identification

- 15 desktop identified projects
- Focus in high-priority watersheds
- Distribute projects throughout County
- Include variety of nutrient management strategies
  - New SCMs
  - Retrofit SCMs
  - Stream enhancement and floodplain connection
  - Riparian buffer and stream restoration



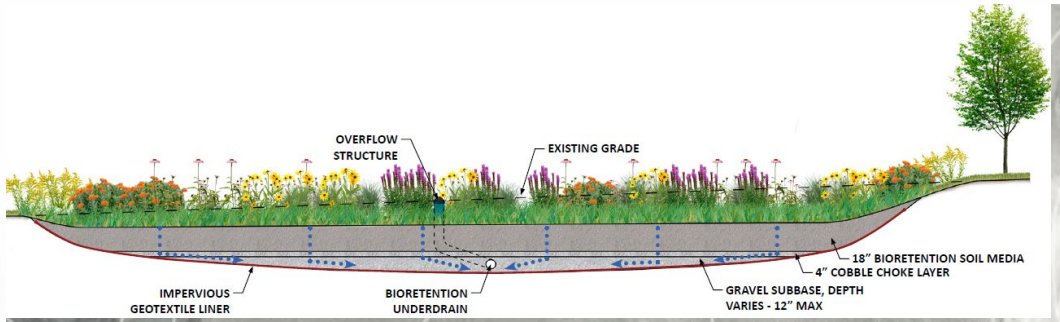
Project Selection

- Focus on visible projects for community
- Ground-truth projects for feasibility
- Identified six (6) sites for near-term implementation
  - Concept design
  - Cost estimate
  - Nutrient reduction (SNAP tool)
  - Rubric scoring

Rubric Scoring

Category	Criteria	Rating	Weighting Factor	Durham Public Schools Operations	Little River Community Complex	Mangum Elementary School	Neal Middle School	Oak Grove Elementary School	Whispering Pines Mobile Home Park
Water Quality Treatment									
	Nutrient Reduction (Total lbs) - Compliance	1 - 5	3	9	6	3	9	6	15
	Targeted Watershed - Compliance	1 - 5	1	5	5	2	5	5	5
Community Enhancement									
	Public Education- Efficiency	0 - 2	1	0	0	2	2	2	0
	Recreation Creation/Enhancement - Efficiency	0 - 3	2	0	6	0	0	0	4
	Environmental Justice/Equity - Environment Justice	0 - 5	2	2	0	10	2	6	10
Implementation Constraints									
	Property Ownership - Efficiency	1 - 3	3	9	6	9	9	9	3
	Site Accessibility for Construction and O&M - Efficiency, Resiliency	1 - 3	1	3	1	1	3	3	1
	Permitting Requirements - Efficiency	1 - 3	1	3	3	3	3	3	1
	Constructability - Efficiency	1 - 3	1	3	3	3	3	3	1
Public Safety & Public Property Considerations									
	Flood Protection or Reduction - Efficiency, Resiliency	1 - 5	1	1	1	1	1	1	5
	FEMA Floodplain - Efficiency, Resiliency	1 - 5	1	0	0	0	0	0	3
Costs - Constuction and Maintenance									
	Cost Benefit - Efficiency	1 - 3	5	15	5	5	15	5	15
	Maintenance - Efficiency, Resiliency	1 - 3	1	1	1	1	1	2	1
Multi-Layer									
	Bonus for Achieving >1 of Counties Priorities - Efficiency	0 - 4	4	16	12	16	16	16	16
				TOTAL SCORE					
			Total Maximum Score	**67**	**49**	**56**	**69**	**61**	**80**

Neal Middle School – Bioretention



PROPOSED BIORETENTION AREA (APPROX. 4,800 SF)

BIORETENTION CROSS SECTION LOCATION

REMOVE AND REPLACE 52 LF OF 24" RCP

PROPOSED CHANNEL STABILIZATION MEASURES (APPROX. 180 LF)

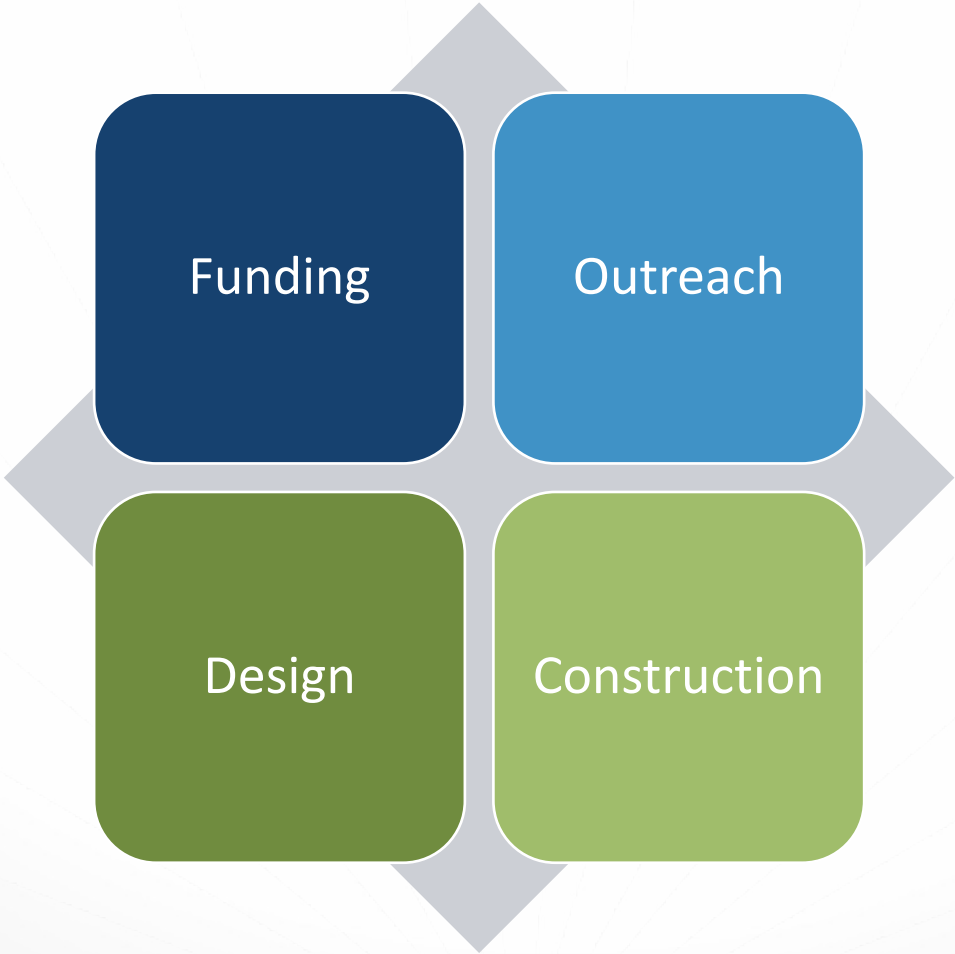
CHANNEL PROFILE LOCATION

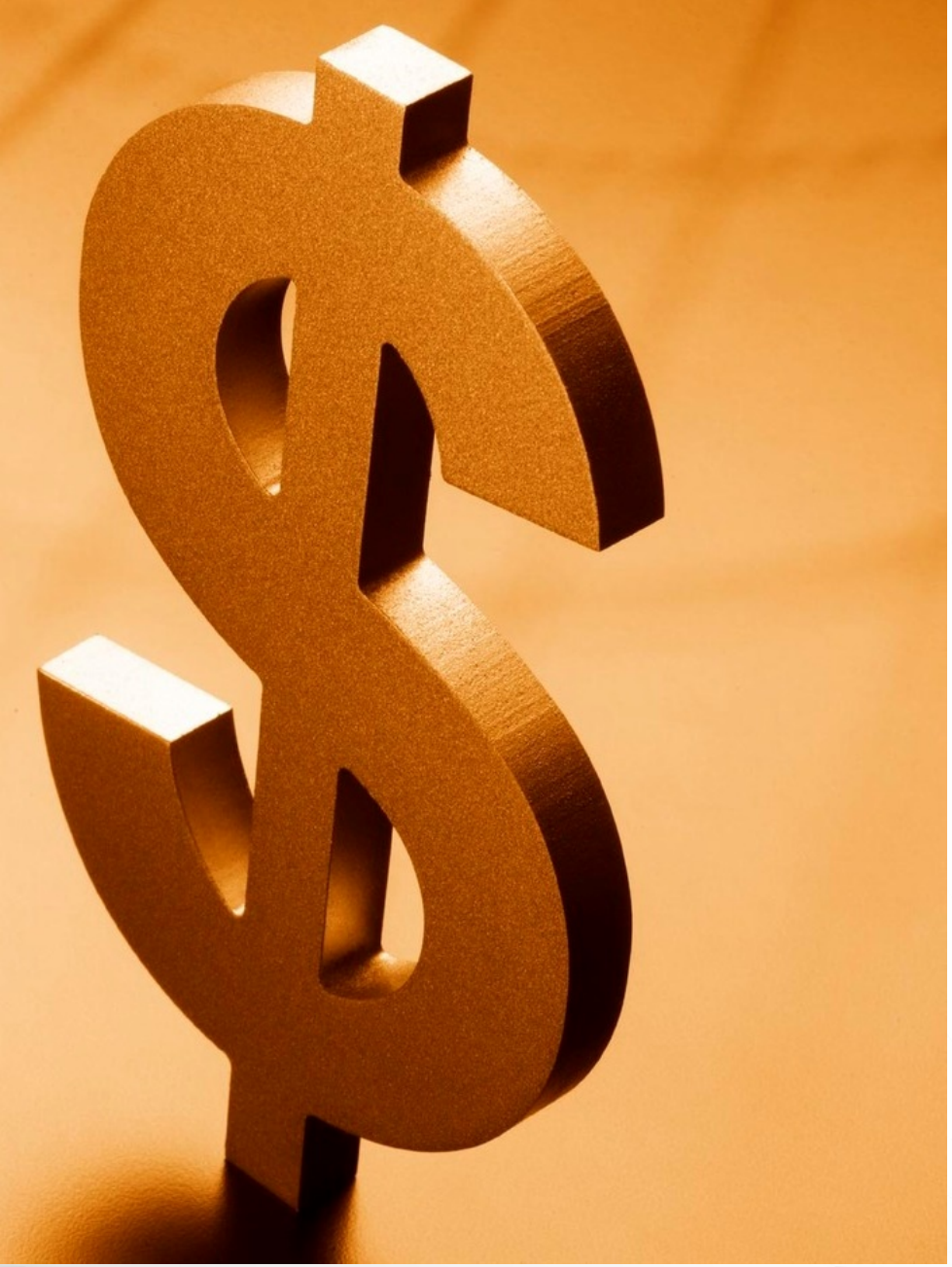
WAKE FOREST HWY

Neal Middle School

- Magnet school with STEM focus
- Coursework includes green architecture, energy and the environment, and design and modeling
- Incorporation of engineering design process in all subject areas
- Original building constructed in 1922
- Most recent renovation 2009-2011

Implementation





Funding

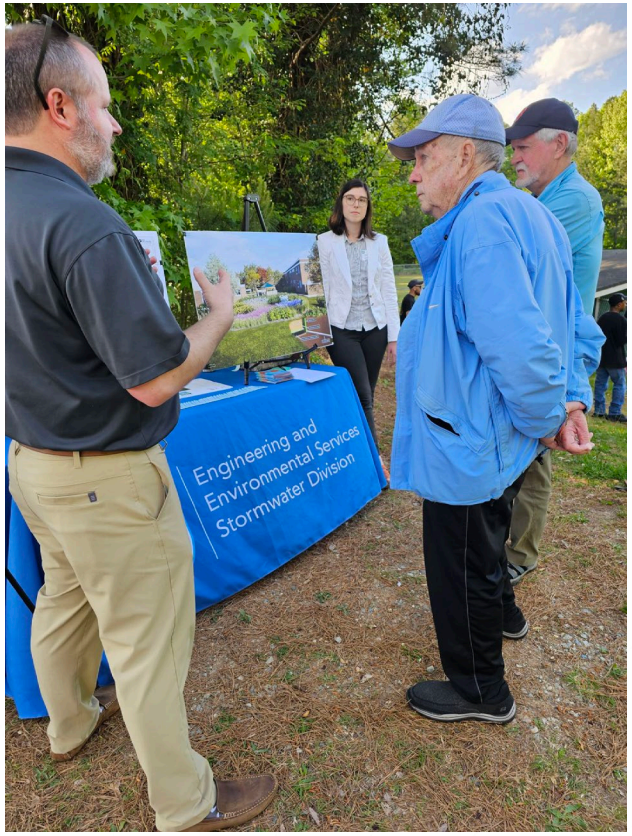
- Environmental Enhancement Grant (EEG) awarded by NC Attorney General's Office EEG program for $225,000
- Grant program created after a 2000 agreement between the AG's office and Smithfield Foods
- $2 Million in funding provided each year to be distributed for environmental projects that preserve natural resources and and ensure clean air and drinking water
- Balance funded by County Stormwater Utility

Outreach

- County's stormwater education specialist partnered with the design team to provide outreach to school staff and the community at large

Outreach Activities

Sports Night Info Session



Outreach Activities

Neal Middle School Open House and Meet the Teacher

Outreach

What is Stormwater?

Stormwater is all water from precipitation that ends up on land. It can soak into the ground, become runoff, pool on land, or go down a storm drain. **Storm drains lead directly to nearby water sources such as lakes, rivers, or streams.**

Durham County Stormwater

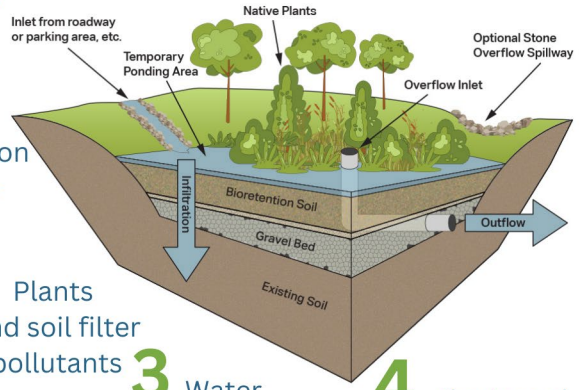
Our Priorities
Compliance, Efficiency, Resiliency, Environmental Justice

Managing stormwater is important to minimize flooding and prevent pollution that can damage the environment. **Stormwater is not treated, and it is important to prevent stormwater pollution.** You can do this by:

- Keeping storm drains clear of litter and yard debris
- Cleaning up outdoor pet waste
- Be mindful of outdoor chemical use- including fertilizers, pesticides, car washing, and disposing of chemicals
- Reporting illicit discharges to (919)-560-7008

Explore more at https://www.dconc.gov/stormwater

Bioretentions for Stormwater



1 The bioretention catches water

2 Plants and soil filter pollutants

3 Water flows through and then slowly absorbs

4 Plants and soil naturally break down pollutants

5 Cleaner water leaves the bioretention and enters the environment

Common stormwater pollutants:

- Oil
- Litter
- Fertilizer
- Pet Waste
- Pesticides
- Yard Clippings

A bioretention cell is a shallow depression in the ground filled with sandy soil, gravel, and native plants to filter polluted water runoff through natural processes. This can reduce flooding, provide a habitat for small wildlife, and results in healthier water and environment.

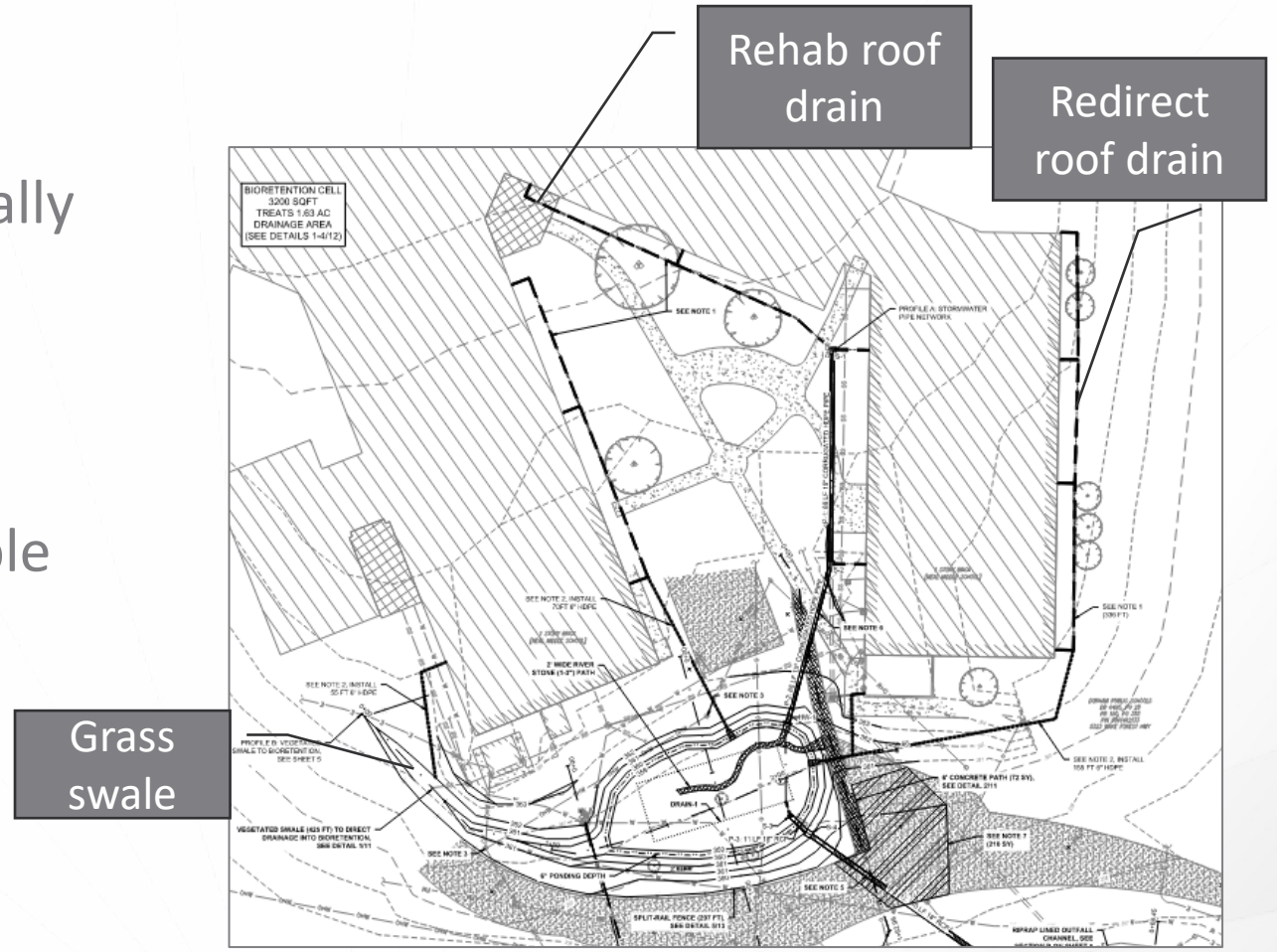
For more information on Durham County Stormwater, visit **https://www.dconc.gov/stormwater**

Design Goals

- Maximize treatment of impervious areas that currently do not drain to a SCM
- Enhance outdoor classroom for students
- Improve localized drainage for school
- Stabilize eroding channel downstream of site

Conveying Runoff to the Site

- Survey showed runoff generally bypassed the site
- 2009 renovation plans show location of roof drains
- Redirect roof drains as feasible
- Upgraded localized drainage



Conveying Runoff to the Site

Bioretention Area

- Rtank underdrain system installed to facilitate drainage from poorly draining in-situ soils
- Drainage media meets NC minimum design criteria spec
- Bioretention field lowered from design to avoid sanitary sewer conflict

Outdoor Classroom

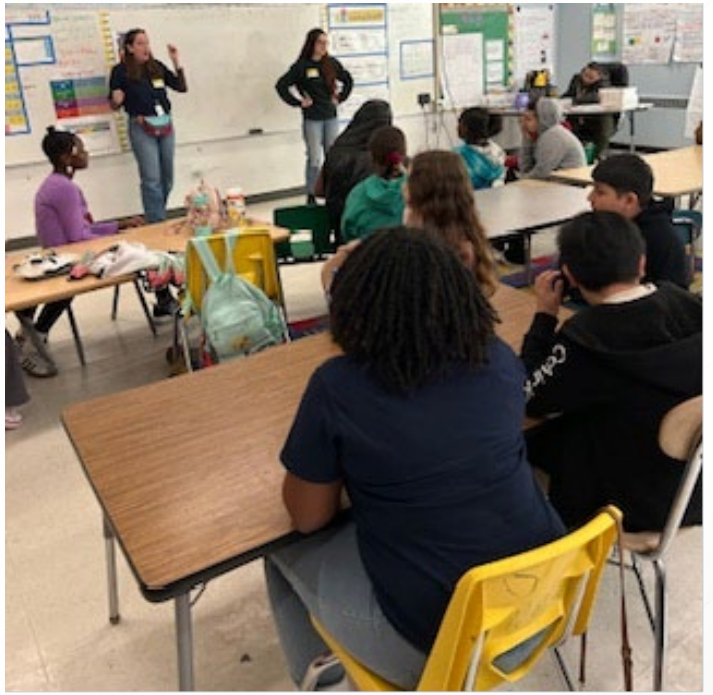
- Riverstone path for student access directly to bioretention area
- Plantings and basic maintenance can be completed by students
- Adjacent to existing outdoor classroom space

Lessons Learned

- Define critical inspection items
- Ensure coordination between vendor and contractor if utilizing proprietary devices
- Utilities…
- Engage partners early and often
- Continued Education

Future Planned Outreach

- In-Classroom Education
  - Middle School State Science Curriculum



Future Planned Outreach

Signage

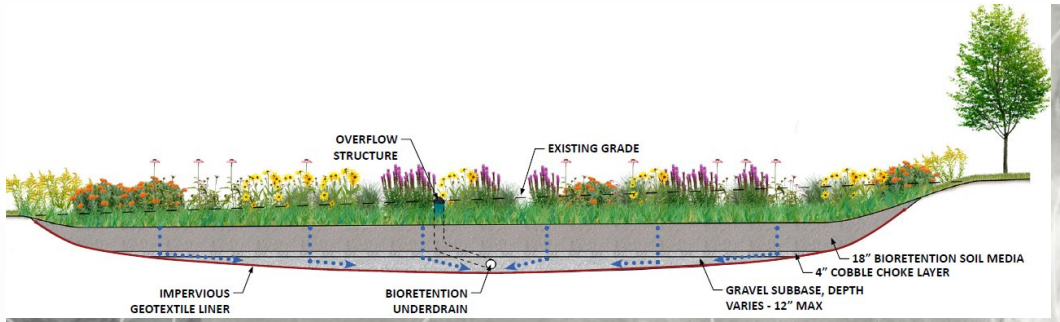
Future Planned Outreach

Getting Kids Involved and Invested

Headwall Painting Contest

Planting and Maintenance (BETC and/or NMS)

Neal Middle School – Bioretention



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CHANNEL PROFILE LOCATION

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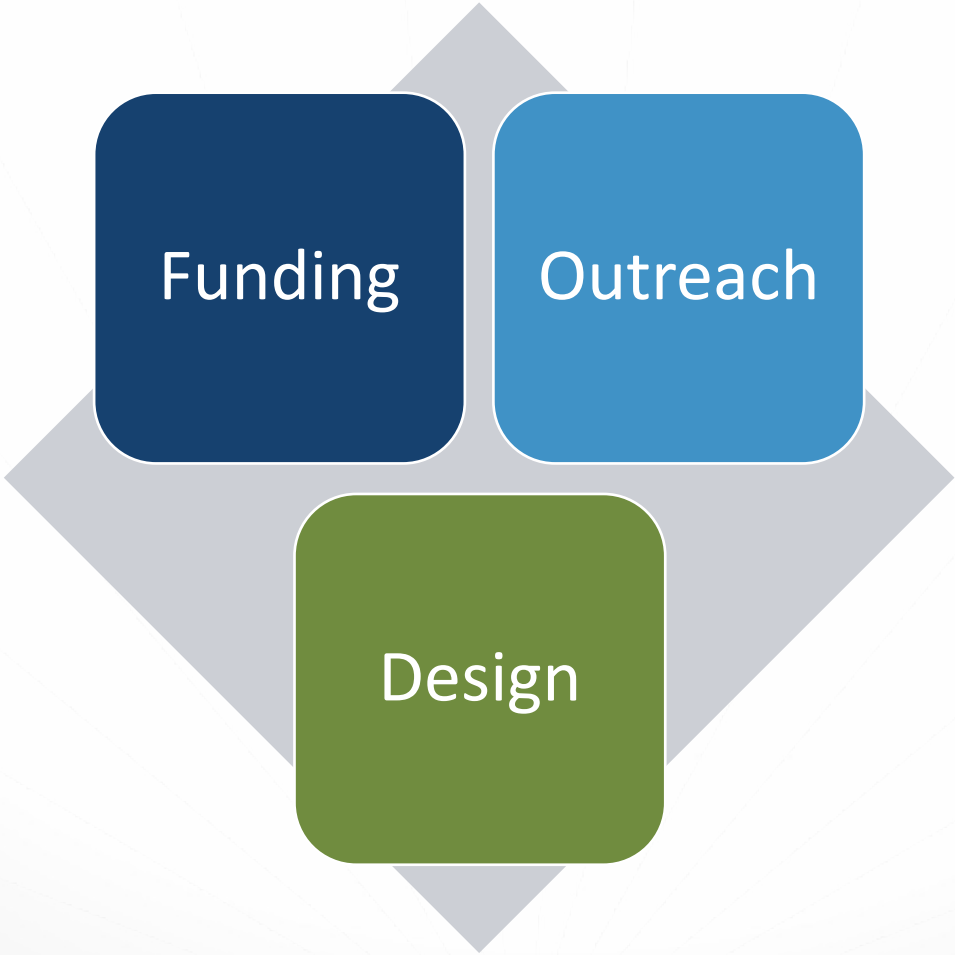
Whispering Pines – Stream Restoration

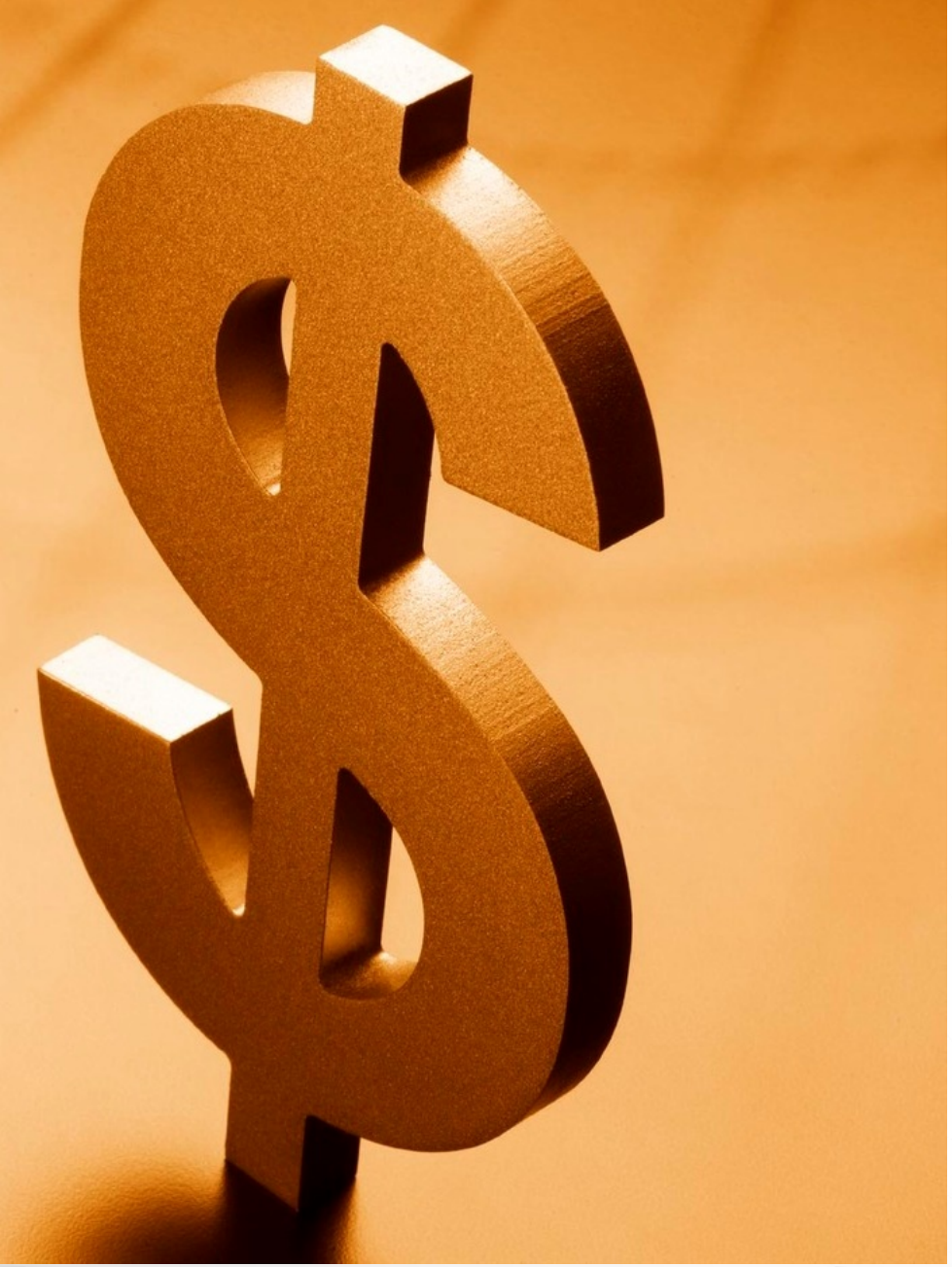
- Mobile Home Park (Suburban neighborhood)
- Located in the Falls Lake Basin
- Contains approximately 4 acres of untreated impervious areas located on private property.

Implementation



Future Planned Outreach

Following the completion of 90% of the design, the County's stormwater education specialist and design team will conduct a community outreach meeting on-site to garner feedback and promote the project.



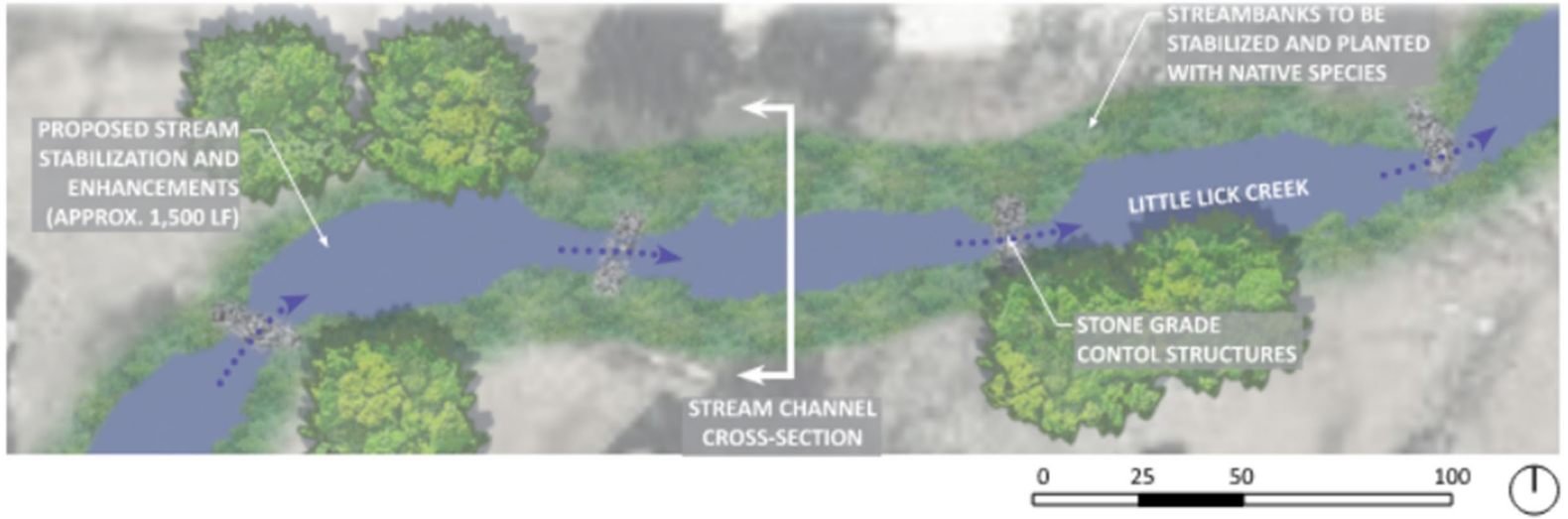
Funding

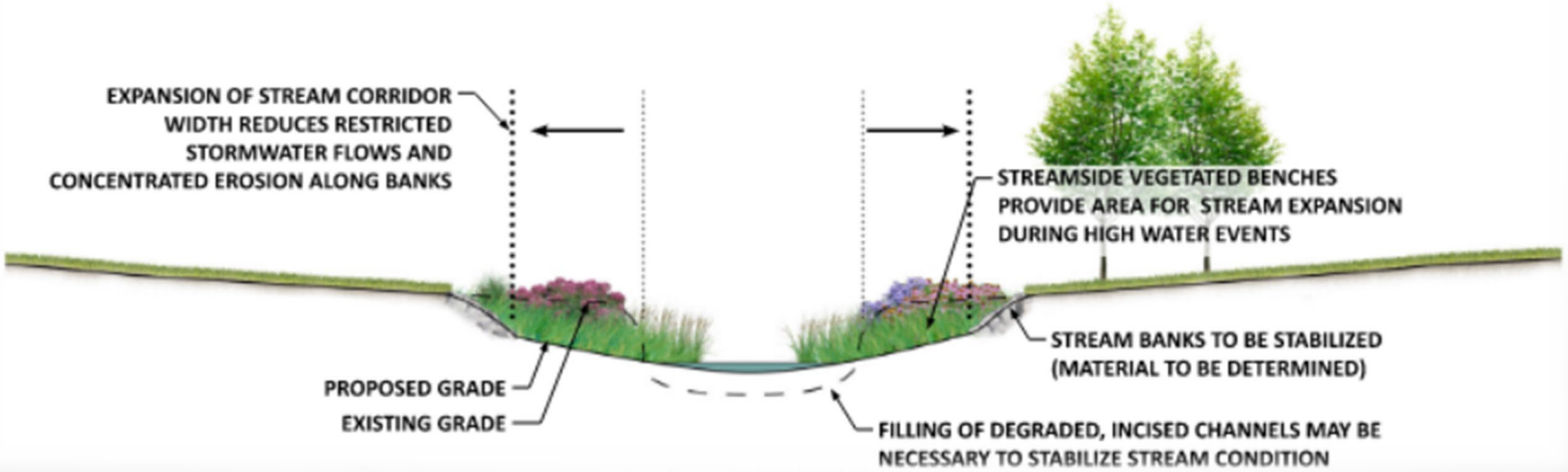
- Local Assistance for Stormwater Infrastructure Investments (LASII) Grant: $400,000 Planning Grant for Design, Permitting, and Outreach
- NC Division of Soil and Water Streamflow Rehabilitation Assistance Program (StRAP) Grant: $500,000 for Stream Restoration
- Balance funded by County Stormwater Utility
  - Seeking additional grant funding

Design Goals – Stream "Restoration"

- Stabilize/restore approximately 1,500 linear feet of stream utilizing natural channel design principles and in-stream structures.
- Grade a floodplain bench to reduce the localized flood frequency of 2-, 5-, and 10-yr storm events and promote floodplain connectivity.
- Restore the riparian buffer using native vegetation.

Design Goals – Stream "Restoration"





Design Goals – Water Quality Enhancements

- Install a ~1,500 sq. ft. bioretention/rain garden feature adjacent to the community recreation area.
- Redirect existing stormwater conveyance into the bioretention area.
- Existing concrete-lined swales with failing direct discharge outfalls will be converted to grass-lined bio-swales.
- Install educational signage promoting the protection of natural areas.

Questions?