



# Mitigation Banking – Past, Present and Future

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# BACKGROUND OF MITIGATION

Clean Water Act Passed in 1972,  
amended in 1977 & 1987

- Its objective is to restore and maintain the chemical, physical, and biological integrity of the nation's waters
- Regulated Primarily through Sections 401 and 404 of the Clean Water Act
- Mitigation is used to offset unavoidable impacts to natural resources that fall under Federal Jurisdiction (and sometimes State)
- “No Loss” vs “No Net Loss of Aquatic Function”



## Compensatory Mitigation

“..the restoration, establishment, enhancement, and/or preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved” (USACE, 2008)

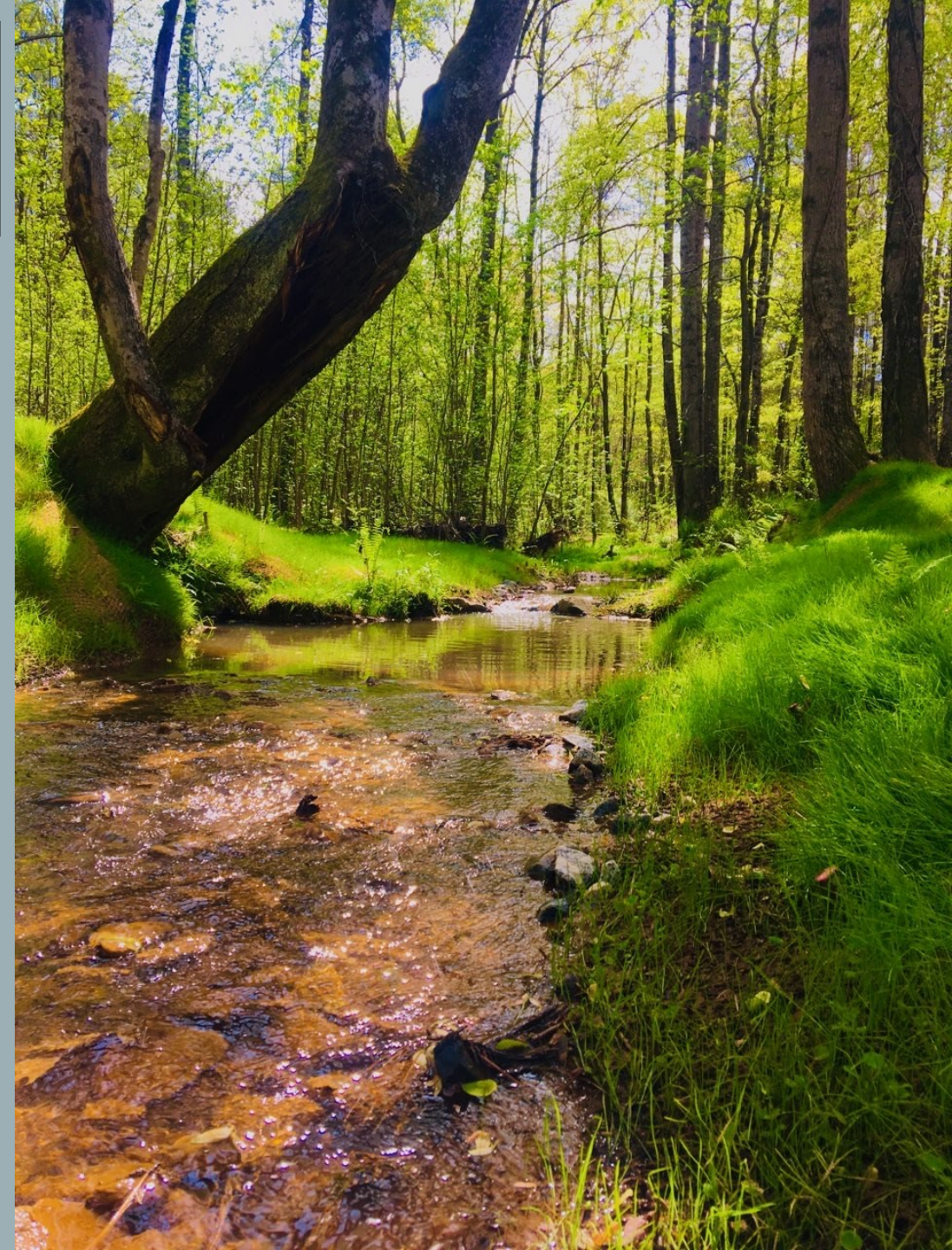


# WHAT IS MITIGATION AND HOW DOES IT WORK?

- Offsets unavoidable impacts to natural resources
- Environmental mitigation consists of a crediting system established by state and federal agencies through the allocation of “debits” and “credits.”
  - Debits occur when natural resources are destroyed.
  - Credits are awarded once a natural resource has been improved and/or preserved.
  - These credits are exchanged in private transactions in a supply/demand marketplace.
- Small-Scale vs. Large-Scale
  - - Permittee-Responsible Mitigation Projects
  - - In-Lieu Fee Program
  - - Mitigation Banks

# WHO NEEDS MITIGATION?

- Georgia Department of Transportation
- Commercial and Industrial Development
- Pipeline & Utility Companies
- Counties and Cities
- Reservoirs
- Residential Development



## WHY USE MITIGATION BANKS?

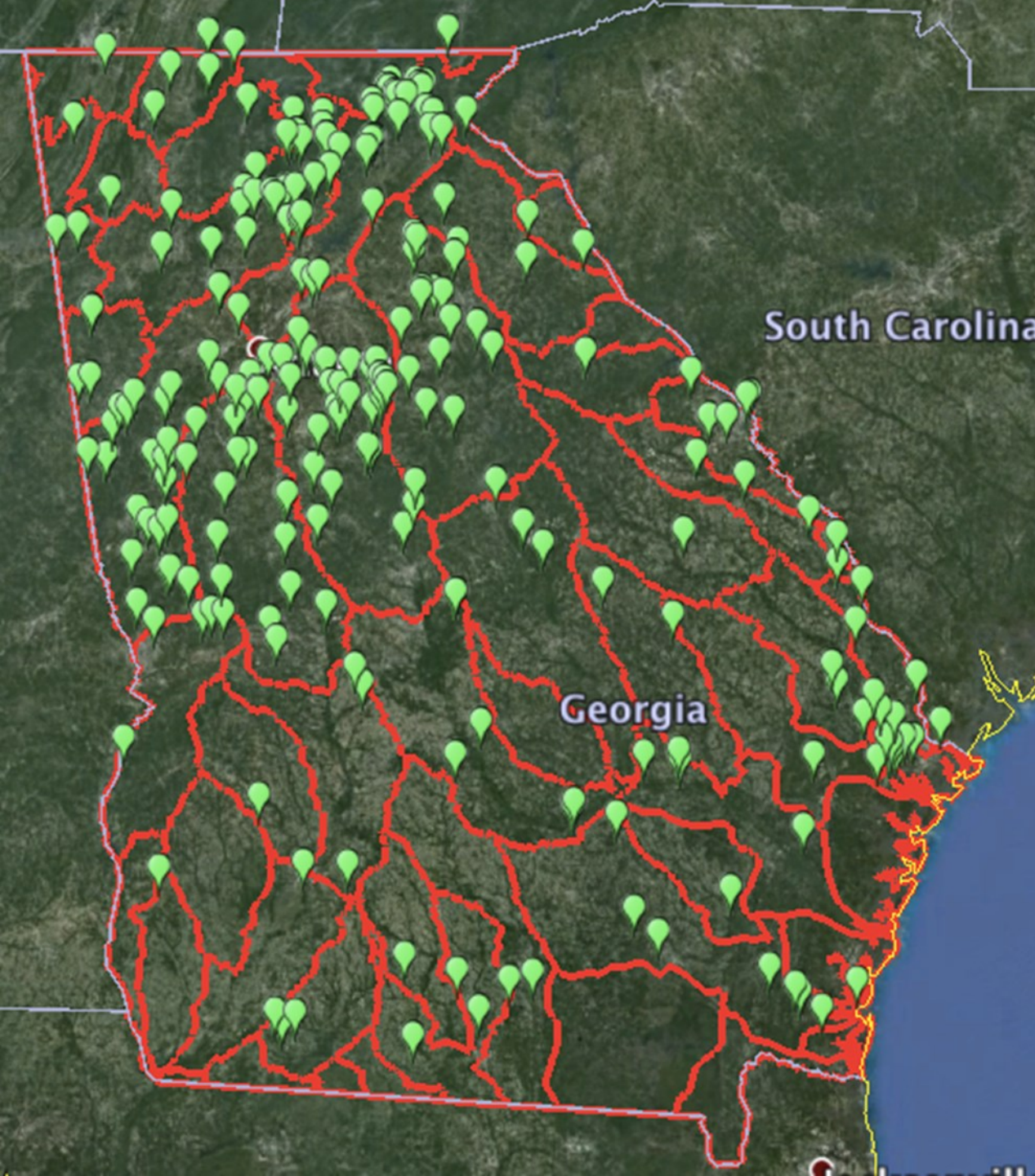
### Performance Based

- Utilize SQT and HGM

### Incorporate multi-resource agency process

- Interagency review team
  - USACE
  - USFWS
  - GAEPD
  - USEPA

More likely to achieve desired long-term  
outcomes

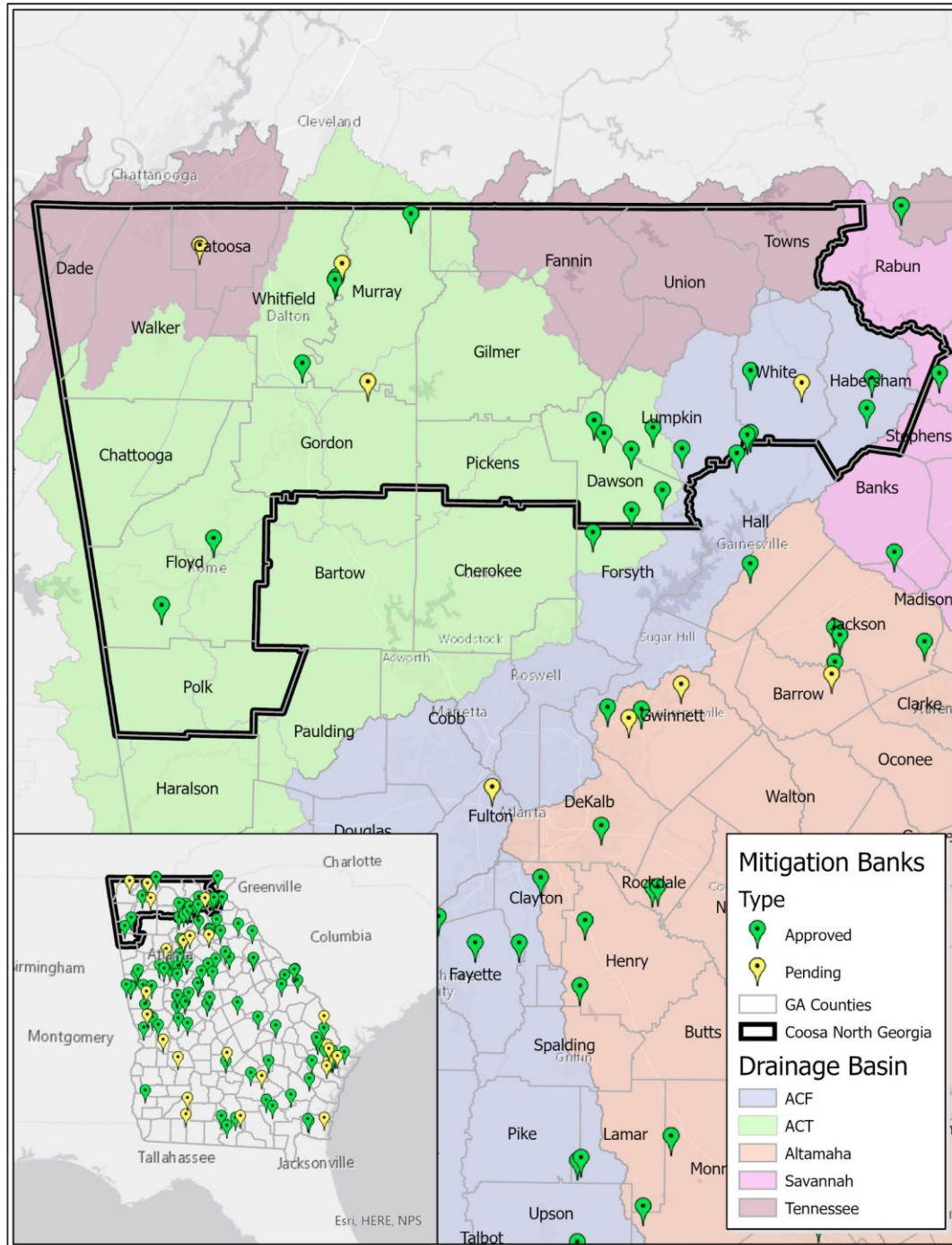


## **WHERE ARE THESE MITIGATION BANKS LOCATED IN GEORGIA?**

- Typically located near demand for impacts
- Requires market studies and 10+ year forecasts



# COOSA – NORTH GEORGIA WATER PLANNING REGION



- **Approved Banks – 17**
  - '04 SOP
    - ~351, 200 Stream Credits
    - ~140 Wetland Credits
  - '18 SOP
    - 4.29 Riverine/Lacustrine Fringe
  
- **Pending Banks – 4**
  - Data unavailable



# Compensatory Mitigation Standard Operating Procedure

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## 2004 (legacy w/ grandfathered credits)

- Activity based
- Credit generation predetermined
- Non-specific credit types
  - Stream
  - Wetland

## 2018 (Current functioning SOP)

- Functionality based
  - Utilizes the Georgia Interim Stream Quantification Tool (SQT) and Georgia Interim Freshwater Wetland Hydrogeomorphic Method (HGM).
  - Quantifies functional lift of proposed activities
- Credit generation assessed at interim and final performance
- Specific crediting for accurate resource replacement

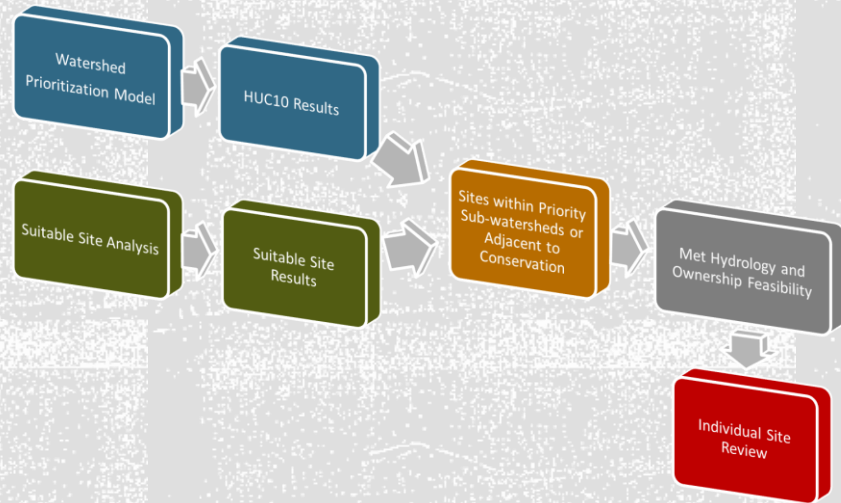


# WHERE CAN SOMEONE USE THESE CREDITS?

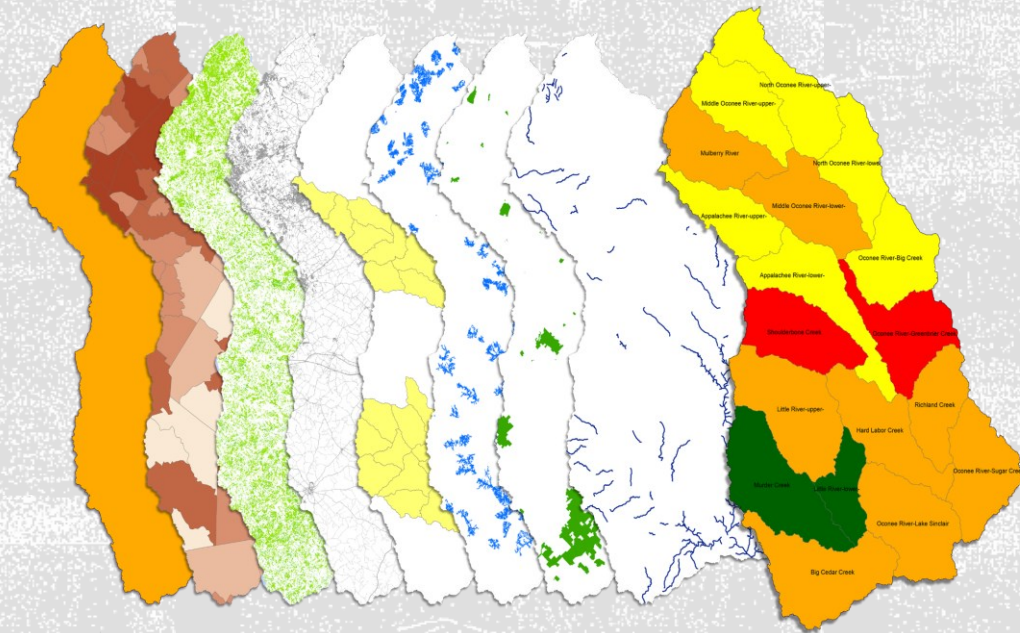
- Primary Service Areas
- Secondary Service Areas
- In-Lieu Fee Program
- Permittee Responsible Mitigation

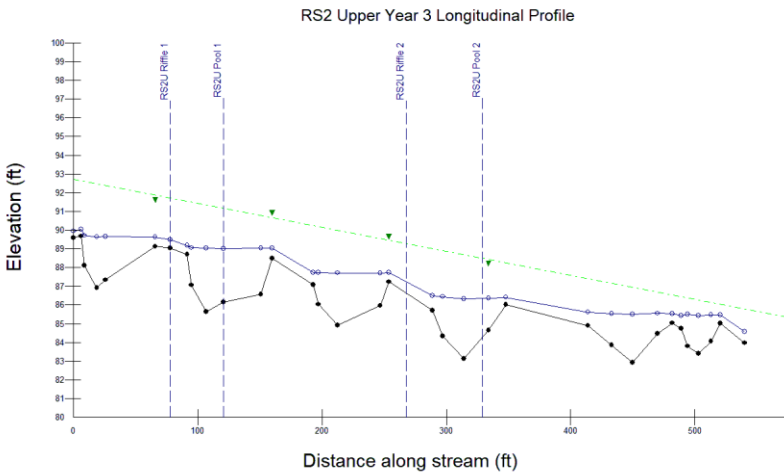


# WHAT IS THE MITIGATION BANK / IN-LIEU FEE DEVELOPMENT PROCESS?



- Site Selection Rankings
  - Desktop and Field Verification
- Initial Site Inspections and Landowner Outreach / Acquisition
- Draft Prospectus / Prospectus Documents (90 – 120 days)
- Draft Banking Instruments (90 days)
- Final Banking Instrument (45 days)
- Conservation Easement Coordination
- Typical Timeline now takes 2.5 – 4 years





# CONSTRUCTION OVERSIGHT AND RE-FORESTATION

- **Planting Plan Creation & Implementation**
  - Species Diversity determination & Zonation
  - Planting Schematics (rows vs grid vs randomized)
  - Soil Analysis
  
- **Stream Channel Grading Oversight**
  - Checking Table 2 Measurements
  - Checking alignments
  - Identifying needs for design adjustments



# STREAM RESTORATION CONSTRUCTION



- Stream Quantification Tool (SQT)

- Physical Parameters

- Geomorphological Surveys
- BEHI Surveys
- Hydrology
- Floodplain Connectivity
- Large Woody Debris surveys

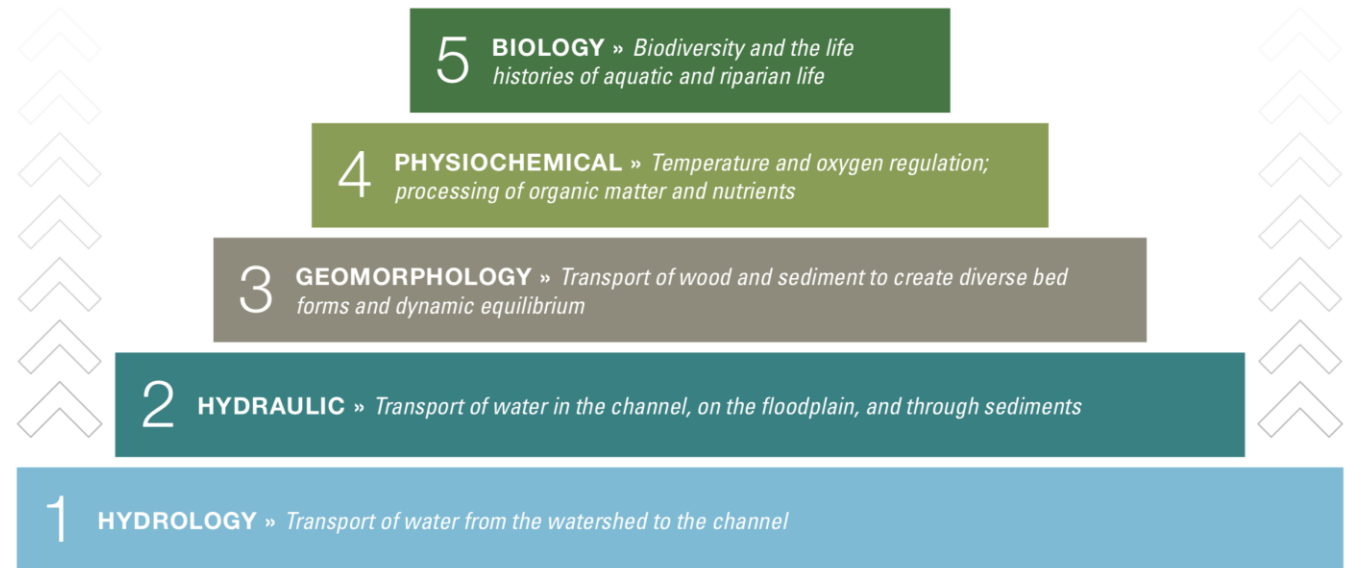
- Chemical Parameters

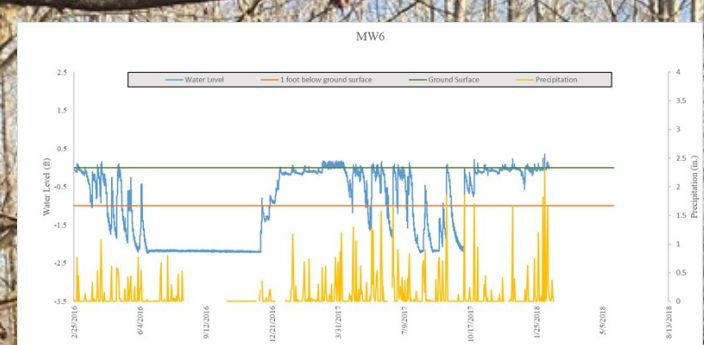
- Fecal / E. coli Sampling
- In-situ Sampling
  - Dissolved Oxygen, Temperature, Turbidity, etc
- Nutrient Sampling

- Biological Parameters

- Macroinvertebrate Sampling
- Fisheries Sampling
- Wildlife Observations
- Tree / Shrub Growth, Density, and Canopy Cover
- Stream Channel Vegetation / Livestakes - Density & Canopy Cover
- Habitat Assessments

# AS-BUILT & ANNUAL MONITORING / REPORTING: STREAM PARAMETERS





# AS-BUILT & ANNUAL MONITORING / REPORTING: WETLAND PARAMETERS

- Biotic Parameters
  - Vegetation Surveys
    - Tree / Shrub Growth, Density, and Canopy Cover
    - Herbaceous Hydrophytic Cover Index (HCI)
    - Prevalence Index
  
- Abiotic Parameters
  - HGM Analysis
  - Hydrology
  - Iris Tubes
  - Hydric Soil Indicators
  - Bulk Density Sampling
  
- Upland Buffer Parameters
  - Vegetation Surveys
    - Tree / Shrub Growth, Density, and Canopy Cover



# SITE MAINTENANCE

- Vegetative Management Plans
  - Pre-Implementation & Post-Implementation:
    - Replanting
    - Mowing
    - Herbicide
    - Invasive Species Control
    - Soil amendments (fertilizer, organics, etc)
- Nuisance Animal Maintenance
  - Deer
  - Rodents
  - Beaver
  - Hog
- Stream Channel or Structure Failure
- Trespass Maintenance





# CREDIT SALES & LONG TERM MANAGEMENT

## Credit Release Schedules:

- Credit Release does not equate to income

## Credit Sales:

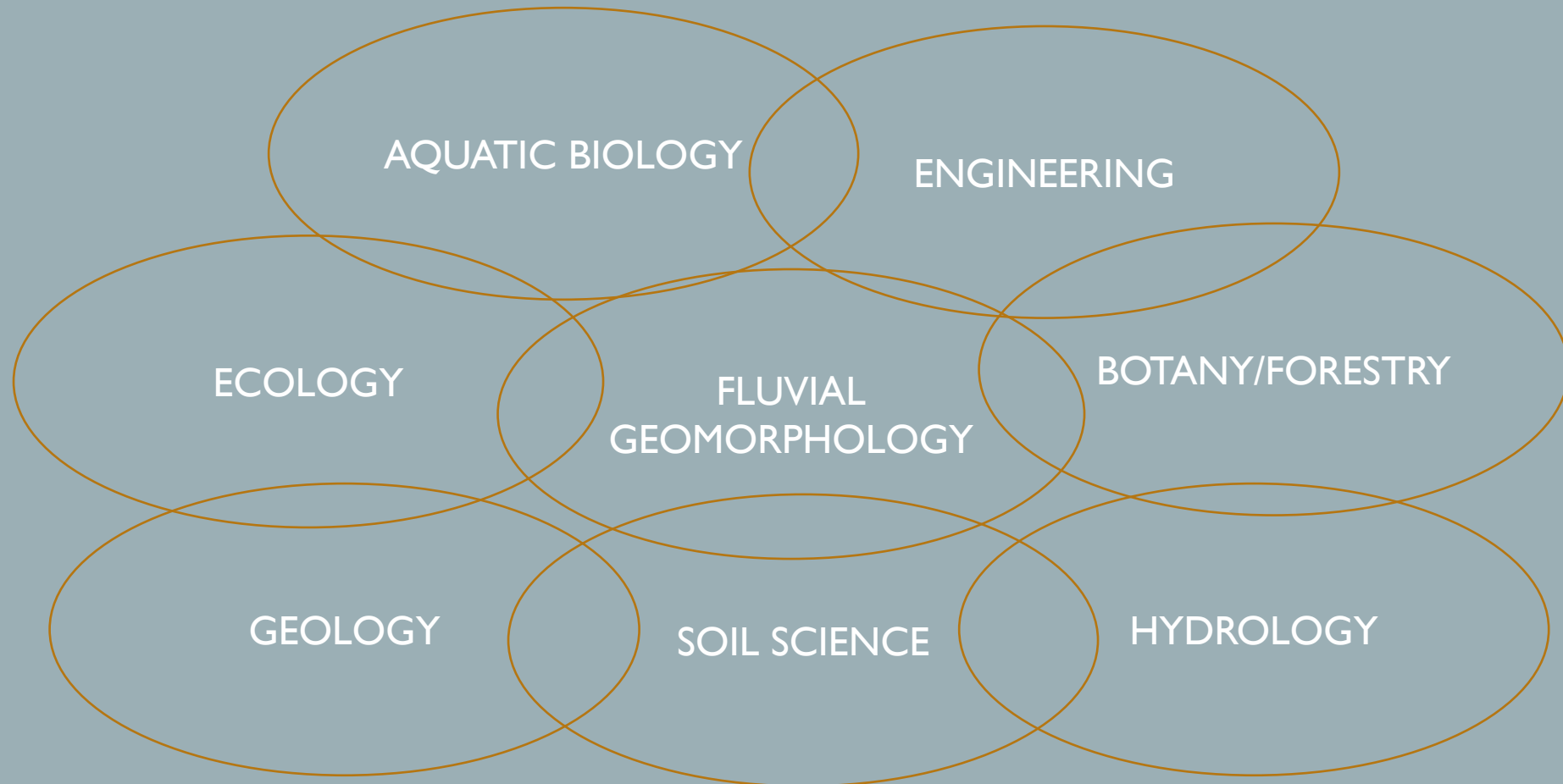
- Supply Credit Ledger to the agencies annually
- Brokering services

## Long Term Management:

- Establish non-wasting endowments for management of site in-perpetuity.



# ECOSYSTEM RESTORATION: AN INTERDISCIPLINARY SCIENTIFIC APPROACH



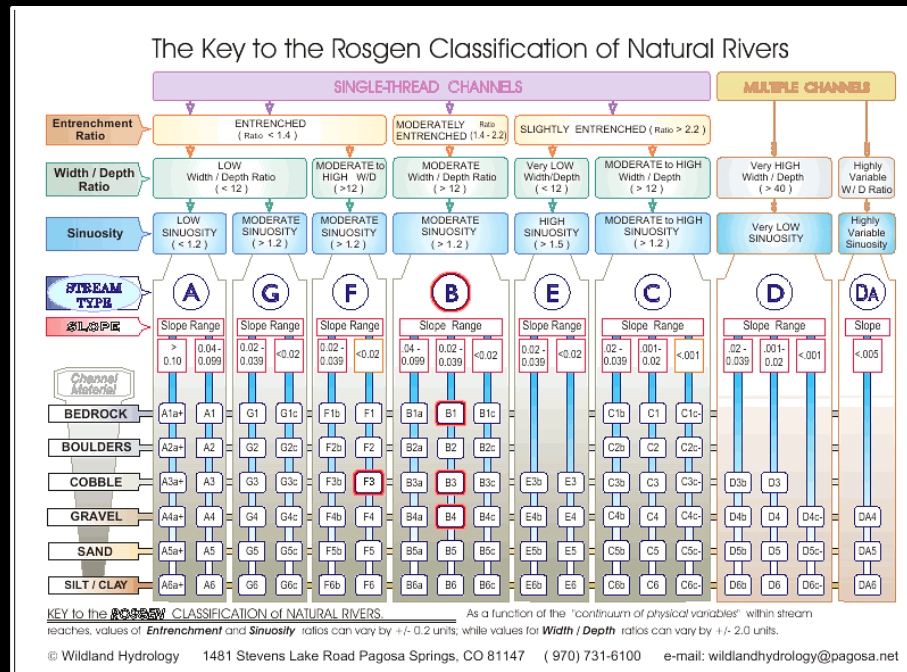
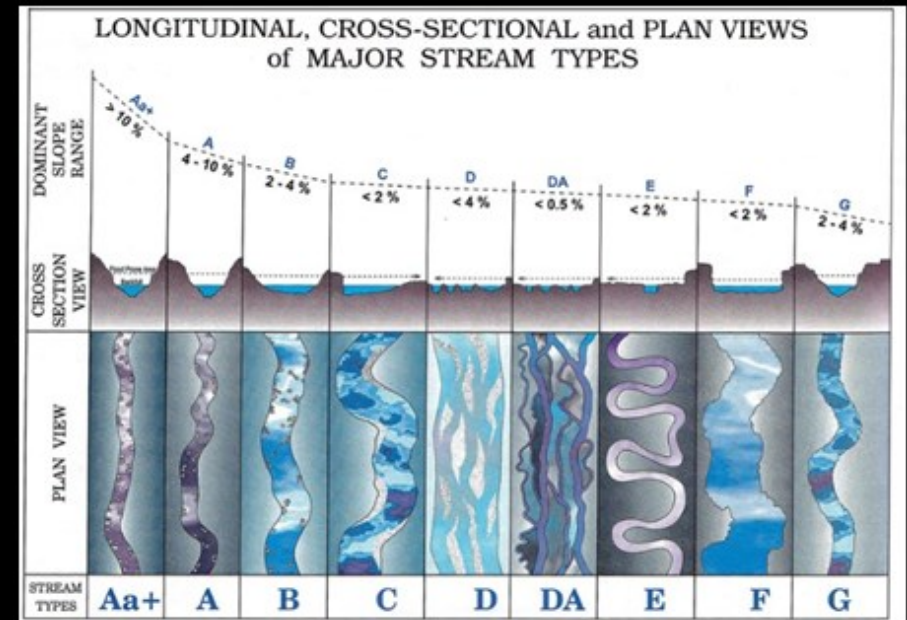
# STREAM RESTORATION

Actions that convert an unstable stream channel to a natural stable condition (original state or reference state).

- Considers recent and future watershed conditions

## Reasons for Restoration:

- Biodiversity Support
- Recreation
- Flood Management and Landscape Development
- Erosion Control



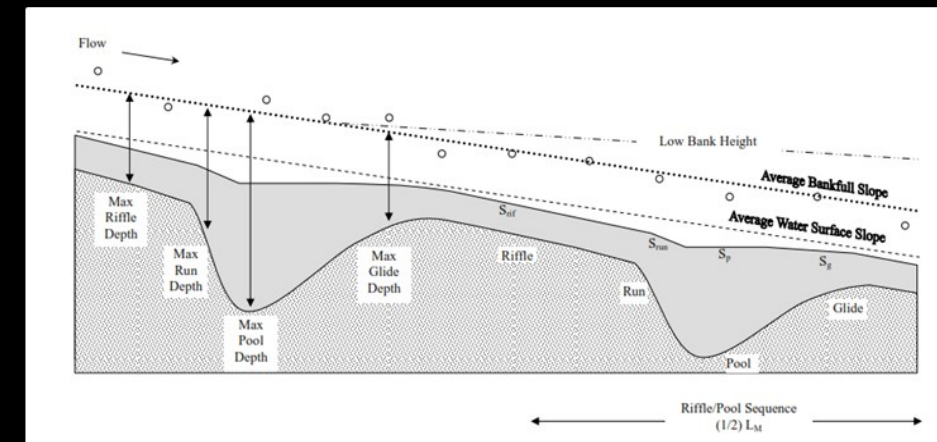
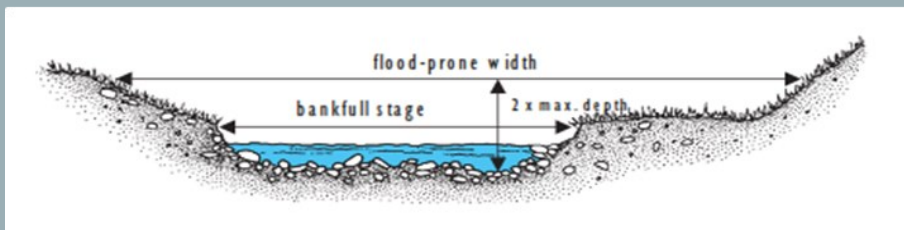
# GEOMORPHOLOGY

## Geomorphic Field Studies

- Vegetation Plots
- Longitudinal Profile
- Riffle Cross-Section
- Active Riffle Pebble Count

## Geomorphic Analysis

- Vegetation Community Composition
- Shear Stress
- Velocity
- Shear Velocity
- Particle Distribution
- Stream Power





# PHYSICOCHEMICAL

Dissolved Oxygen

Turbidity

Conductivity

pH

Nutrients

    Nitrogen

    Phosphorus

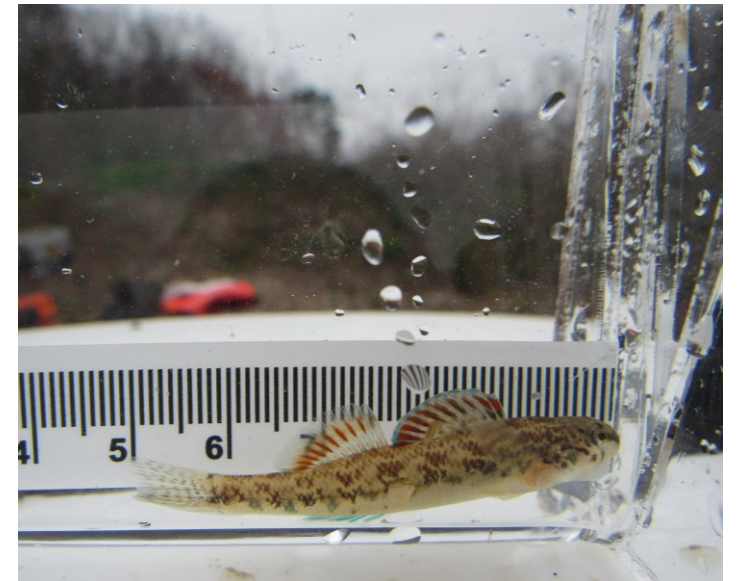
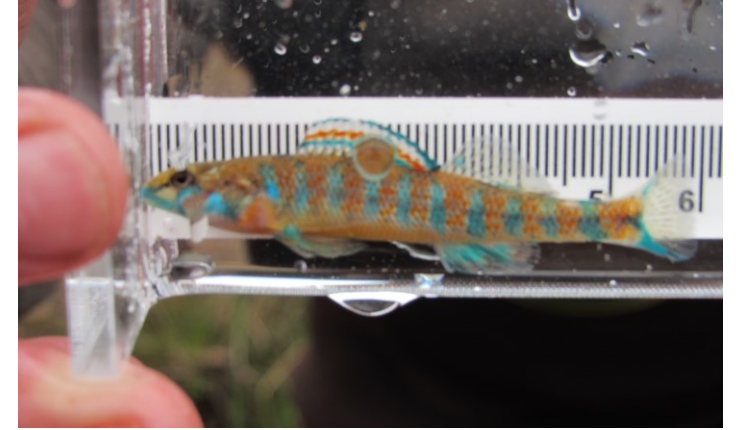
Fecal contamination

    Fecal coliform

    E. coli

# BIOLOGY

- Macroinvertebrates and Fish
  - How can you tell when improvements occur?
    - Biological Monitoring
    - Meaningful metrics
  - What structures mimic nature?
  - Endangered species considerations



# STREAM RESTORATION HABITAT STRUCTURES



# STREAM RESTORATION CONSTRUCTION

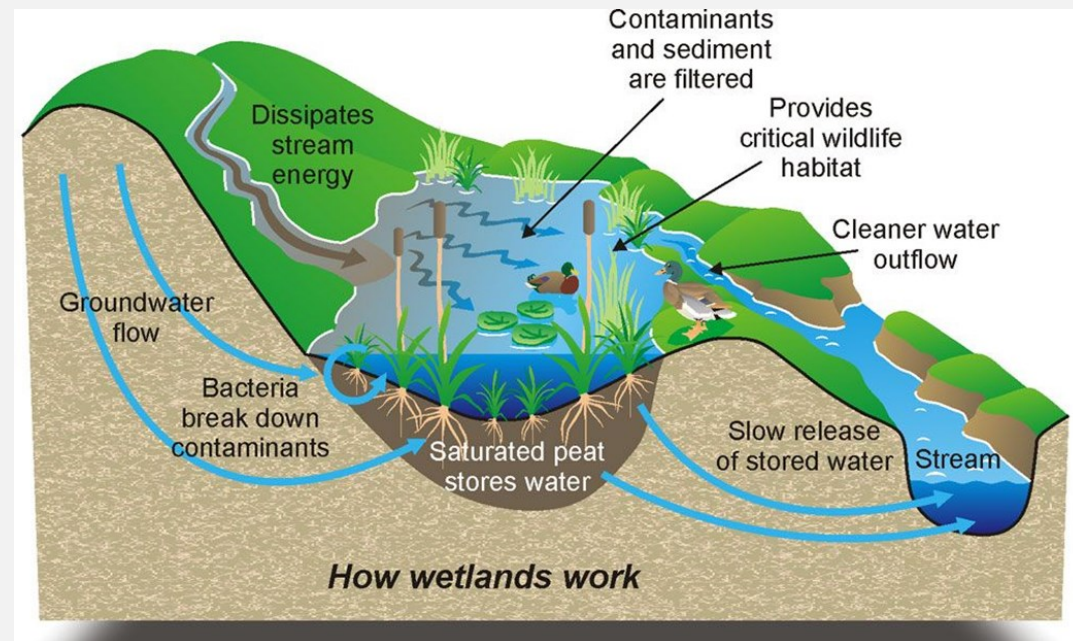
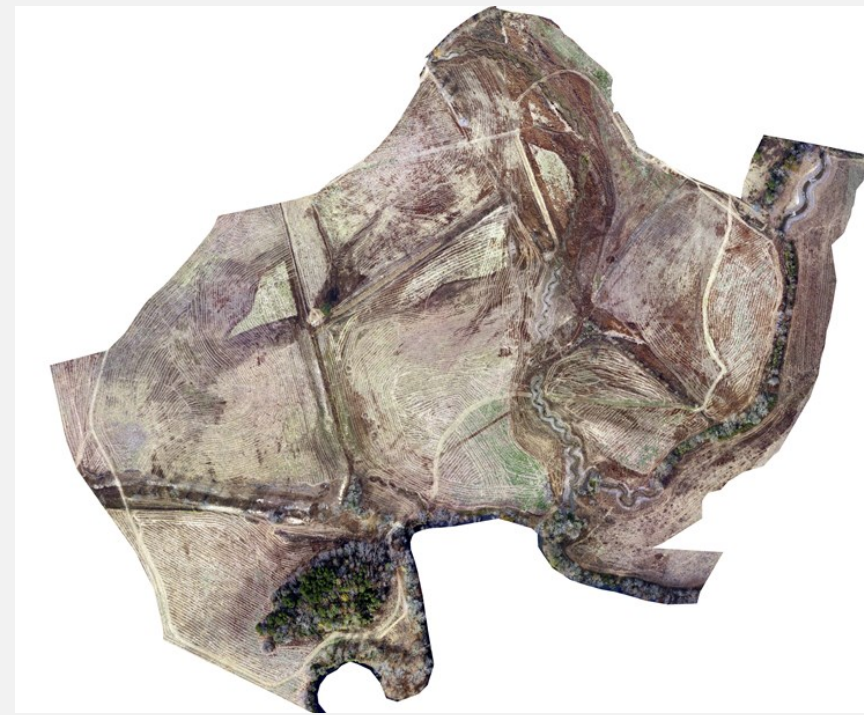


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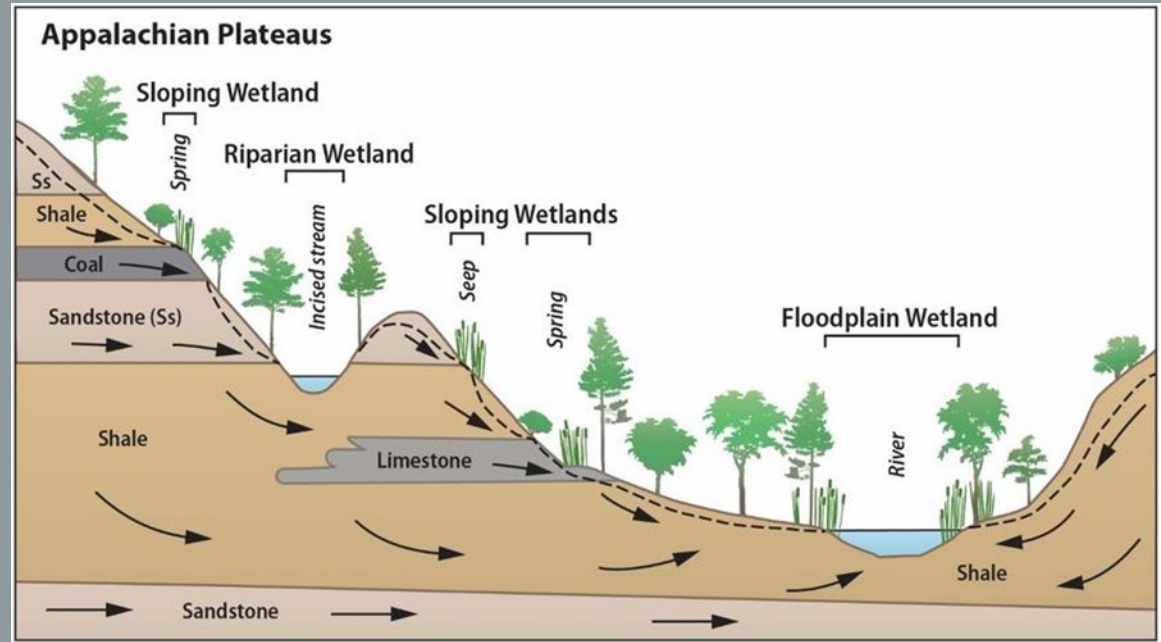
# WETLAND RESTORATION APPROACH

- Hydrology
  - What is the correct “bullseye”?
- Soils
  - How do the soils affect hydrology?
  - What level of disturbance has occurred?
  - How long will hydric soils take to form?
- Vegetation
  - What are the correct species?
  - How many do you plant?
  - How do you keep them alive?



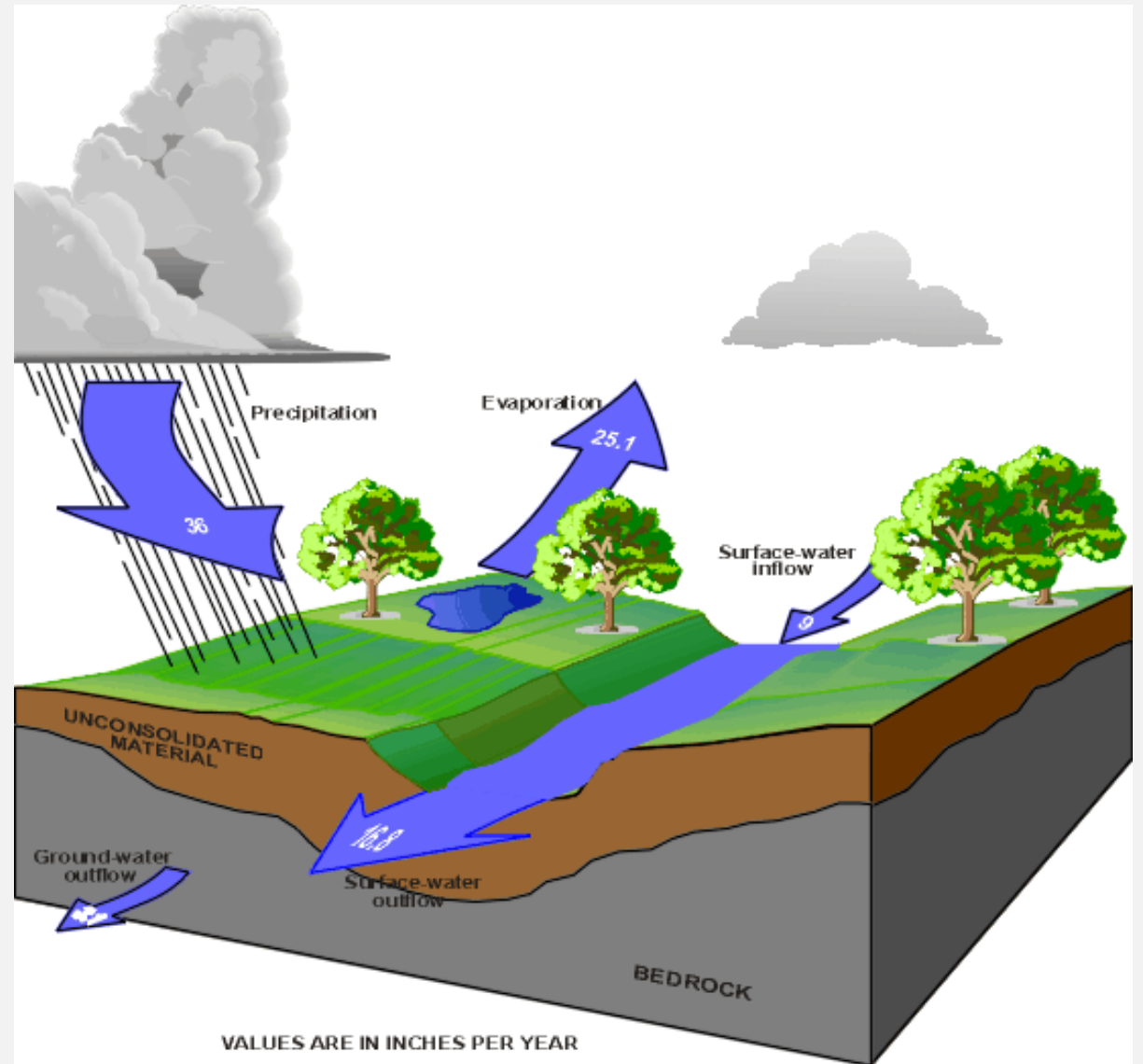
# METHODOLOGIES

- What type of wetland are you working in?
  - Slope
  - Riverine
  - Depression
- How did soils on site historically form?
- What is the correct methodology given current and historic conditions?
  - Natural channel design
  - Stream-Wetland complex restoration
  - Plugging ditches



# MODELING

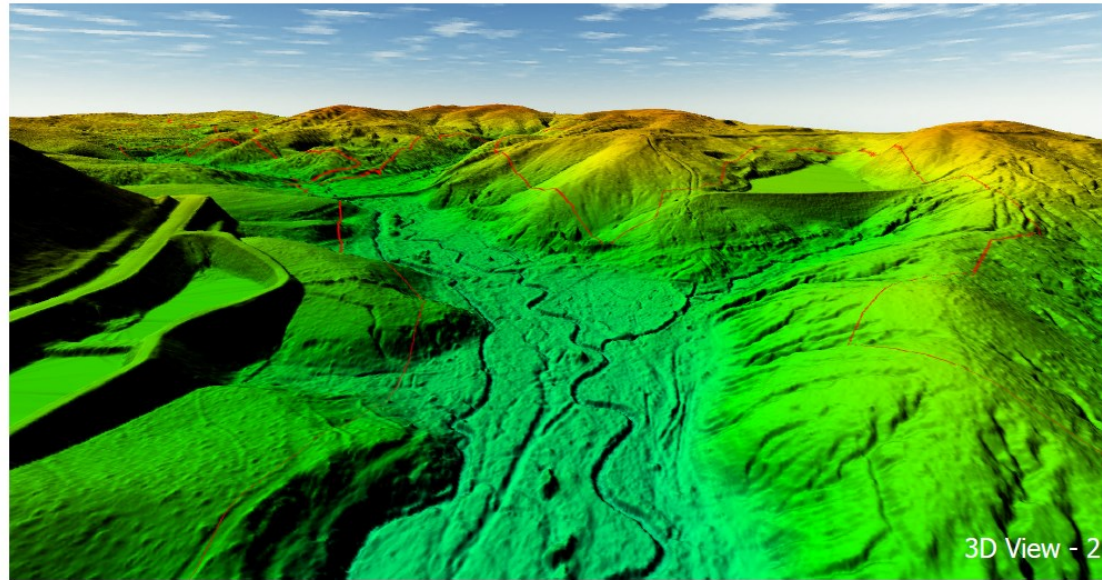
- Water Budget
  - Precipitation
  - Groundwater Input
  - Groundwater Output
  - Evapotranspiration
  - Surface water input
  - Surface water output



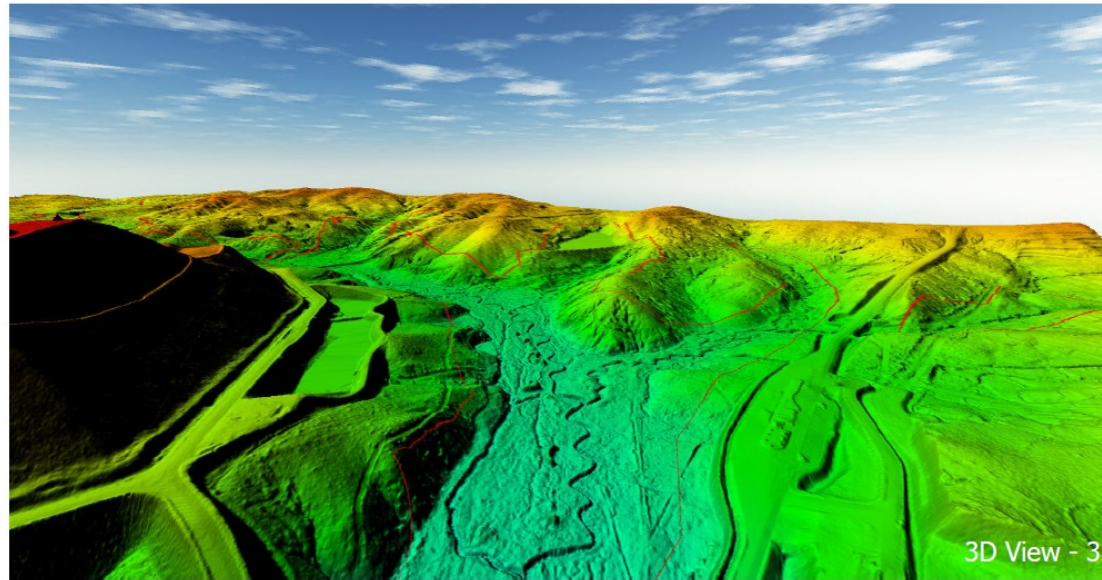
(USGS)

# Light Detection and Ranging (LiDAR) / Drones

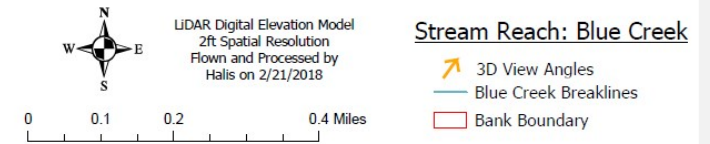
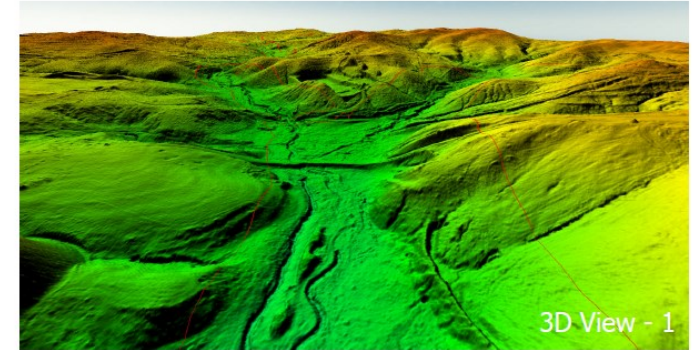
## [Soque River Mitigation Bank](#)



## [Rocky Creek Mitigation Bank](#)



## Blue Creek 3D Map Series: LiDAR



ADVANCES IN TECHNOLOGY

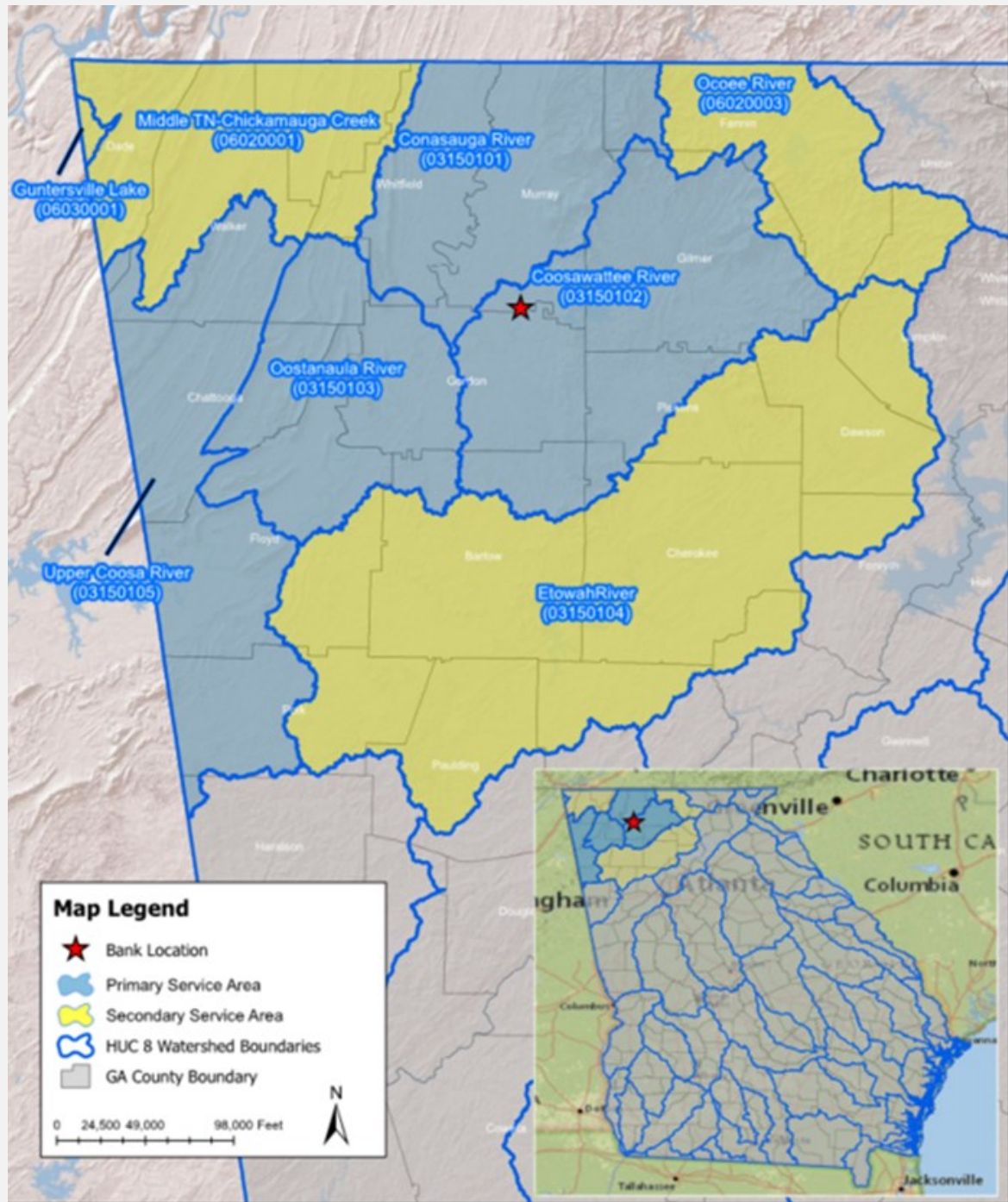
RELATES TO COOSA-  
NORTH GEORGIA  
REGIONAL WATER  
PLAN?

**Table ES-1: Goals for the Regional Water Plan**

Number	Goal
1	Plan for appropriate levels of water storage, water sources, and long-term supply to meet anticipated need for local communities.
2	<u>Minimize adverse effects</u> to local communities and adjacent regions, and, when possible, <u>enhance natural systems</u> .
3	Ensure that management practices <u>support economic development</u> and optimize existing water and wastewater infrastructure.
4	Promote alternative technologies that conserve, return, and recycle water; <u>protect water quality</u> ; and ensure <u>adequate capacity for water storage</u> within the Region.
5	Promote properly managed wastewater discharges.
6	Educate stakeholders in the Region on the importance of water resources, including water conservation, efficiency, and pollution prevention.
7	Identify practices that <u>reduce nonpoint source pollution and control stormwater to protect and enhance water quality and ecosystems in lakes and streams</u> , particularly those in priority watersheds and listed streams.
8	Develop an ongoing adaptive management approach to measure, share, and evaluate water use data and information.

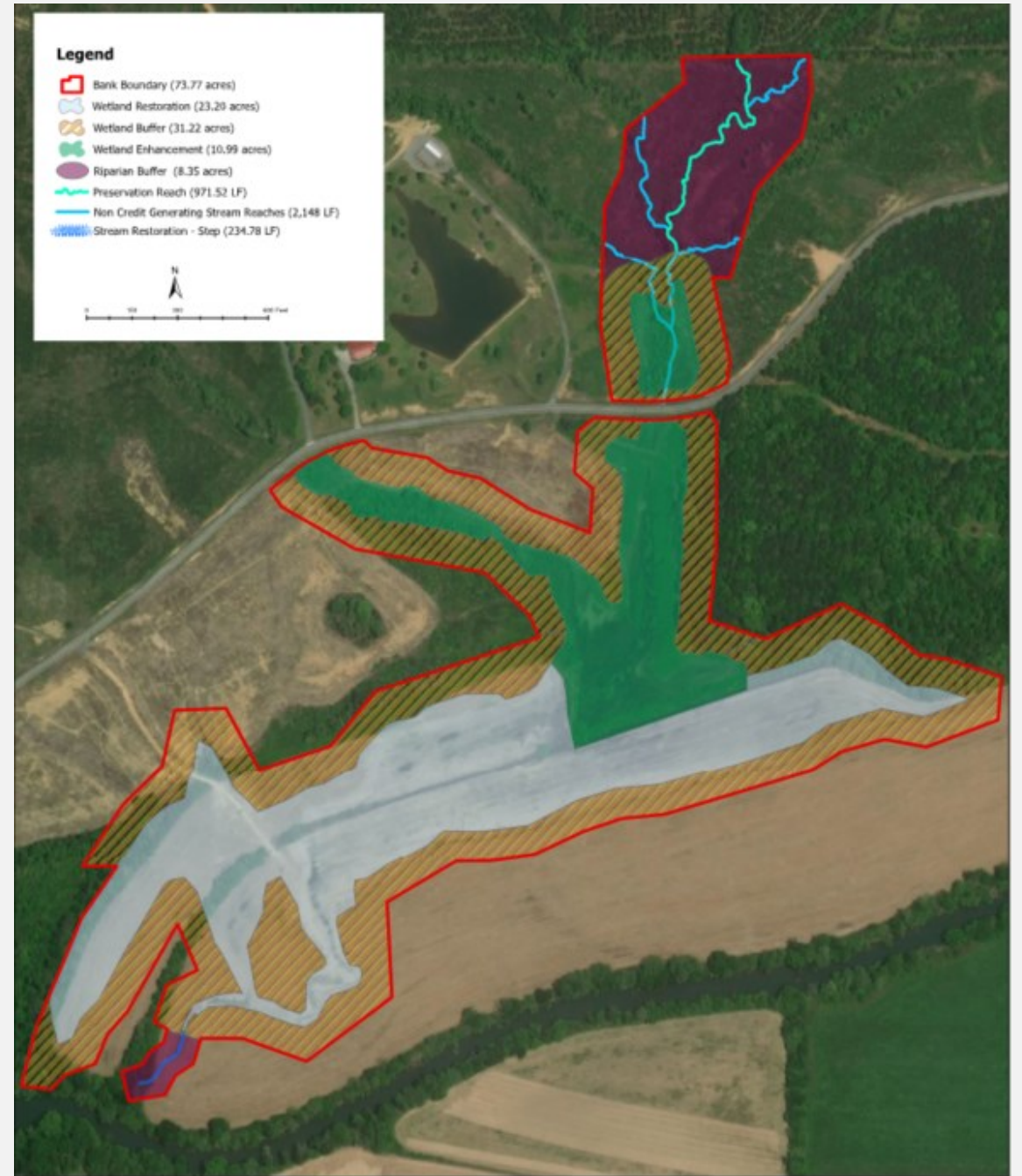
# COMPENSATORY MITIGATION....

- Promotes reforestation
  - 100' Upland Buffer
  - 200' Riparian Buffer
  - Re-establishes native flora
  - Incorporates invasive species removal
- Increases Water Storage
  - Incised channels can assess floodplain
  - Increase residence time
  - Floodwater abatement
- Reduces suspended sediment
  - Riparian corridor re-established
  - Erosive properties addressed and limited
  - Decreased suspended sediment within tributaries
- Promotes Biodiversity
  - Incorporate habitat structure within design
  - Establish appropriate vegetative species composition
- Reduces Nutrient Loads
  - Increased filtration in restored wetlands
  - Promotes increased filtration through established vegetative buffers



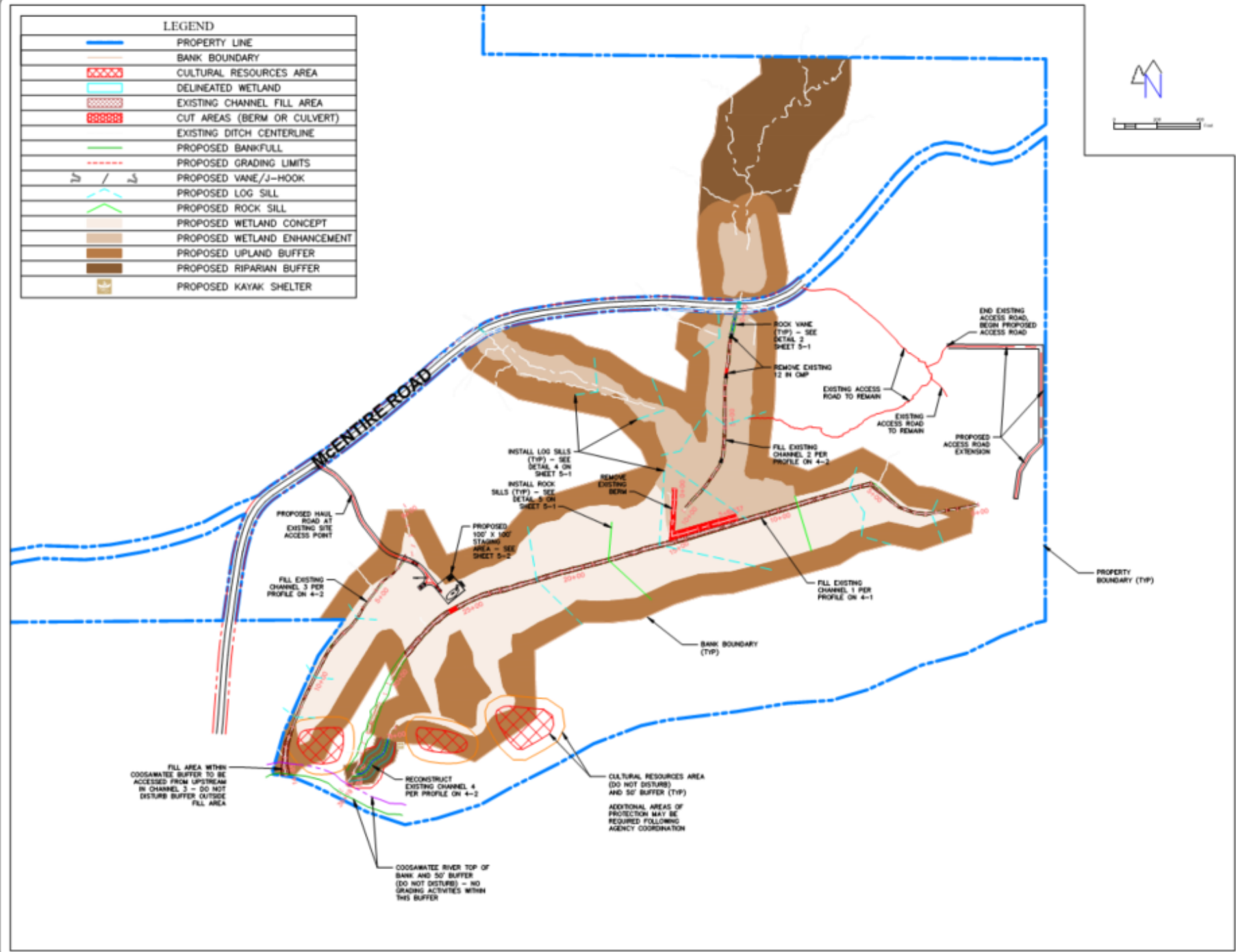
## BANK SUMMARY

Location Information		
Nearest Intersection:	McEntire Rd	
Nearest Town:	Resaca	
County:	Murray	
State:	Georgia	
HUC-8 Watershed:	Coosawattee (03150102)	
Level III and IV Ecoregions	67 – Ridge and Valley 67g – Southern Shale Valleys	
Latitude/Longitude	34.616934/ -84.772716	
Mitigation Treatment Type	Aquatic Resource Type	
	Stream	Wetland
Preservation	971.52 LF	-
Enhancement	-	10.99 acres
Restoration	234.78 LF	23.20 acres
Buffer Preservation	7.65 acres	-
Buffer Enhancement	-	11.35 acres
Buffer Restoration	0.70 acres	19.87 acres
<b>Total Bank Acreage</b>	<b>73.77 acres</b>	





LEGEND	
	PROPERTY LINE
	BANK BOUNDARY
	CULTURAL RESOURCES AREA
	DELINEATED WETLAND
	EXISTING CHANNEL FILL AREA
	CUT AREAS (BERM OR CULVERT)
	EXISTING DITCH CENTERLINE
	PROPOSED BANKFULL
	PROPOSED GRADING LIMITS
	PROPOSED VANE/J-HOOK
	PROPOSED LOG SILL
	PROPOSED ROCK SILL
	PROPOSED WETLAND CONCEPT
	PROPOSED WETLAND ENHANCEMENT
	PROPOSED UPLAND BUFFER
	PROPOSED RIPARIAN BUFFER
	PROPOSED KAYAK SHELTER



General Notes

1	90% CONSTRUCTION PLANS	05/29/20
2	100% CONSTRUCTION PLANS	01/21/21
3		
4		
5		
6		
7		
8		
9		
10		
11		

No.	Revision/Issue	Date

**BLUEWAY**  
 1551 JENNINGS MILL DRIVE  
 SUITE 1400-B  
 WATKINSVILLE, GEORGIA 30677

Project Name and Address

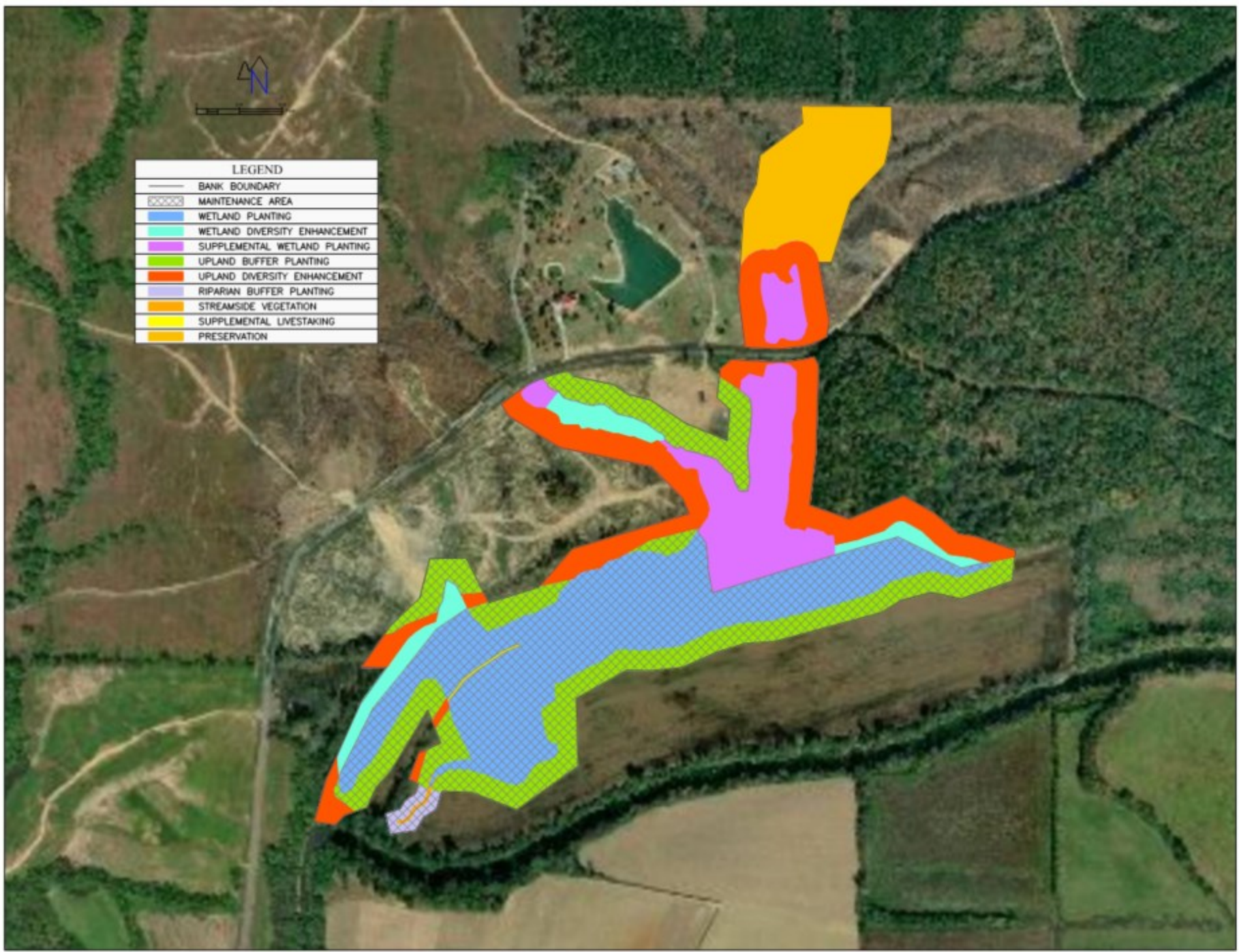
OLD CREEK PLACE  
 MITIGATION BANK  
 MURRAY COUNTY, GEORGIA  
 SAS-2018-00257

Sheet Description <b>PROPOSED LAYOUT</b>	Sheet <b>3-1</b>
Date 01/21/2021	Scale 1"=200'

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LEGEND	
	BANK BOUNDARY
	MAINTENANCE AREA
	WETLAND PLANTING
	WETLAND DIVERSITY ENHANCEMENT
	SUPPLEMENTAL WETLAND PLANTING
	UPLAND BUFFER PLANTING
	UPLAND DIVERSITY ENHANCEMENT
	RIPARIAN BUFFER PLANTING
	STREAMSIDE VEGETATION
	SUPPLEMENTAL LIVESTAKING
	PRESERVATION



General Notes

1	BOE CONSTRUCTION PLANS	05/29/20
2	100% CONSTRUCTION PLANS	01/21/21
3		
4		
5		
6		
7		
8		
9		
10		
11		
No.	Revision/Issue	Date

File Name and Address

**BLUEWAY**  
 1551 JENNINGS MILL DRIVE  
 SUITE 1400-B  
 WATKINSVILLE, GEORGIA 30677

Project Name and Address

OLD CREEK PLACE  
 MITIGATION BANK  
 MURRAY COUNTY, GEORGIA  
 SAS-2018-00257

Sheet Description	Sheet
PLANTING PLAN	6-2
Date	01/21/2021
Scale	1"=200'

Table 22. Stream Proposed Target Performance Standards				
Monitoring Variable	Monitoring Stations <sup>1</sup>	Monitoring Cycles/ Years	Interim Performance Standard <sup>a,b</sup>	Final Performance Standard <sup>a,b</sup>
<b>Channel Geomorphology</b>	CG1, CG2	Annually	The constructed channel morphology will remain within the approved design parameters related to cross-sectional area and width/depth ratio while maintaining stable and suitable stream types for three consecutive monitoring cycles.	The constructed channel morphology will remain within the approved design parameters related to cross-sectional area and width/depth ratio while maintaining stable and suitable stream types for two monitoring cycles from meeting interim performance standard.
<b>Flood Plain Connectivity</b>	CG1, CG2	Annually	Bank Height Ratio $\leq$ 1.2 AND Entrenchment Ratio $>$ 2.4 for C stream types for three consecutive monitoring cycles.	Bank Height Ratio $\leq$ 1.2 AND Entrenchment Ratio $>$ 2.4 for C stream types for three consecutive monitoring cycles from meeting interim performance standard.
<b>Large Woody Debris</b>	CG1 <sup>c</sup>	Annually	N/A	Achieve Existing Condition Large Woody Debris Field Value of 162
<b>Intermittent Hydrology</b>	CG1, CG2	Annually	Must document a minimum of continuous flow for 120 days for at least three consecutive monitoring cycles unless prevailing drought conditions are demonstrated. Sponsor will substantiate the relationship of the drought conditions to the hydrologic deficit documented on the site or additional monitoring cycles will be required to meet the milestone.	Minimum average of 150 stems per acre with a minimum 3-inch dbh. Volunteer stems can be counted toward targeted criteria if they (1) are of equitable size as planted stems at the time success is evaluated, and (2) identified on an approved volunteer list. Must maintain diverse vegetation with at least two dominant species (according to the 50/20 rule) with species composition from approved species list, while maintaining $<$ 5% of stems as non-native woody species. Must document a minimum of continuous flow for 120 days for at least five consecutive monitoring cycles from Year 0 unless prevailing drought conditions are demonstrated. Sponsor will substantiate the relationship of the drought conditions to the hydrologic deficit documented on the site or additional monitoring cycles will be required to meet the milestone.
<b>Forested Riparian Tree Survival and Growth</b>	RPs 1-3 (Permanent)	Annually	Minimum average of 150 stems per acre with an average dbh of 1-inch or greater. Volunteer stems can be counted toward targeted criteria if they (1) are of equitable size as planted stems at the time success is evaluated, and (2) identified on an approved volunteer list. Must maintain diverse vegetation with at least two dominant species (according to the 50/20 rule) with species composition from approved species list, while maintaining $<$ 5% of stems as non-native woody species.	Minimum average of 150 stems per acre with a minimum 3-inch dbh. Volunteer stems can be counted toward targeted criteria if they (1) are of equitable size as planted stems at the time success is evaluated, and (2) identified on an approved volunteer list. Must maintain diverse vegetation with at least two dominant species (according to the 50/20 rule) with species composition from approved species list, while maintaining $<$ 5% of stems as non-native woody species.
<b>Forested Stream Channel Vegetation Survival and Growth</b>	CG1, CG2	Annually	Must have a minimum of 50 percent woody stem cover using the modified convex densiometer method as outlined in Appendix D of the 2018 Draft Monitoring Guidelines, USACE	Must be a minimum of 80 percent canopy closure using the modified convex densiometer method as outlined in Appendix D of the 2018 Draft Monitoring Guidelines, USACE

<sup>1</sup>Refer to Figure 8 (Mitigation Plan) for proposed station IDs.

<sup>a</sup> Drought conditions will be defined as drier than normal conditions as determined by the Direct Antecedent Rainfall Evaluation Method and three-month departure from normal.

<sup>b</sup> "Dominant" defined by language found in the Regional Supplement for Eastern Mountain and Piedmont Region.

<sup>c</sup>LWD to be performed along 100-meter reaches either extending within or beyond monitoring longitudinal profile reaches

**Table 23. Wetland Proposed Target Performance Standards**

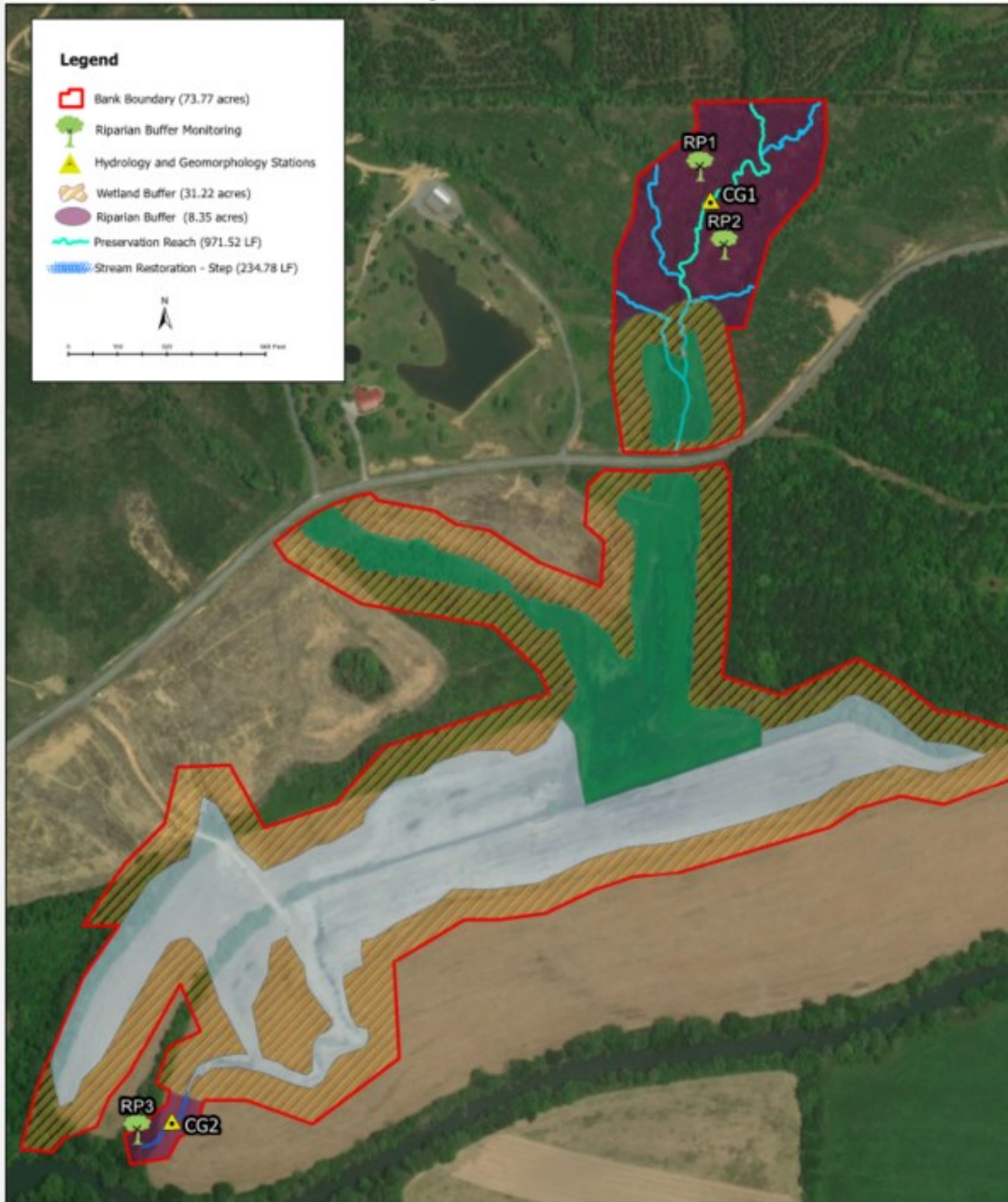
<b>Monitoring Variable</b>	<b>HGM Monitoring Unit<sup>1</sup></b>	<b>Monitoring Cycles/ Years</b>	<b>Interim Performance Standard<sup>a,b</sup></b>	<b>Final Performance Standard<sup>a,b</sup></b>
<b>Wetland Hydrology</b>	NME1, SME1, SME2a, SME2b, SME2c, SME3, SMR1a, SMR1b, SMR2, SMR3,SMR4a, SMR4b, SMR4c	Annually	Maintain hydroperiods for target duration saturation for identified soil types based on growing season (244 days) for at least 50% of the three monitoring years from Year 0 with normal or below normal precipitation. If drought conditions are present in any given year, the number of consecutive days of measured hydrology would be calibrated to drought conditions for comparison purposes. Additionally, hydroperiods documenting saturation greater than the approved range for soil series will receive an index value of no less than 1.0.	Maintain hydroperiods for target duration saturation for identified soil types based on growing season (244 days) for at least 50% of the six monitoring years from Year 0 with normal or below normal precipitation. If drought conditions are present in any given year, the number of consecutive days of measured hydrology would be calibrated to drought conditions for comparison purposes. Additionally, hydroperiods documenting saturation greater than the approved range for soil series will receive an index value of no less than 1.0.
<b>Wetland Vegetation Survival and Growth</b>	NME1, SME1, SME2a, SME2b, SME2c, SME3, SMR1a, SMR1b, SMR2, SMR3,SMR4a, SMR4b, SMR4c	Annually	Minimum average of 150 planted stems per acre with an average DBH of 1-inch or greater. Volunteer stems can be counted toward target criteria if they (1) are of equitable size as planted stems or larger at the time success is evaluated, (2) identified in an approved volunteer/planting list, and (3) coincide with desired native species composition.	Minimum average of 150 planted stems per acre with an average DBH of 3-inches or greater. Volunteer stems can be counted toward target criteria if they (1) are of equitable size as planted stems or larger at the time success is evaluated, (2) identified in an approved volunteer/planting list, and (3) coincide with desired native species composition.
<b>Wetland Vegetation Composition and Structure</b>	NME1, SME1, SME2a, SME2b, SME2c, SME3, SMR1a, SMR1b, SMR2, SMR3,SMR4a, SMR4b, SMR4c	Annually	For target vegetation stratum maintain (1) diverse vegetation with at least 3 dominant species according to the 50/20 rule, and (2) exotic/invasive plant species must represent less than 5% of the absolute vegetation cover across all strata	For target vegetation stratum maintain (1) diverse vegetation with at least 3 dominant species according to the 50/20 rule, and (2) exotic/invasive plant species must represent less than 5% of the absolute vegetation cover across all strata
<b>Large Woody Debris</b>	NME1, SME1, SME2a, SME2b, SME2c, SME3, SMR1a, SMR1b, SMR2, SMR3,SMR4a, SMR4b, SMR4c	Final Year	N/A	Achieve Large Woody Debris Index score of 1.0.

<sup>1</sup>Refer to Figure 9 (Mitigation Plan) for proposed station IDs.

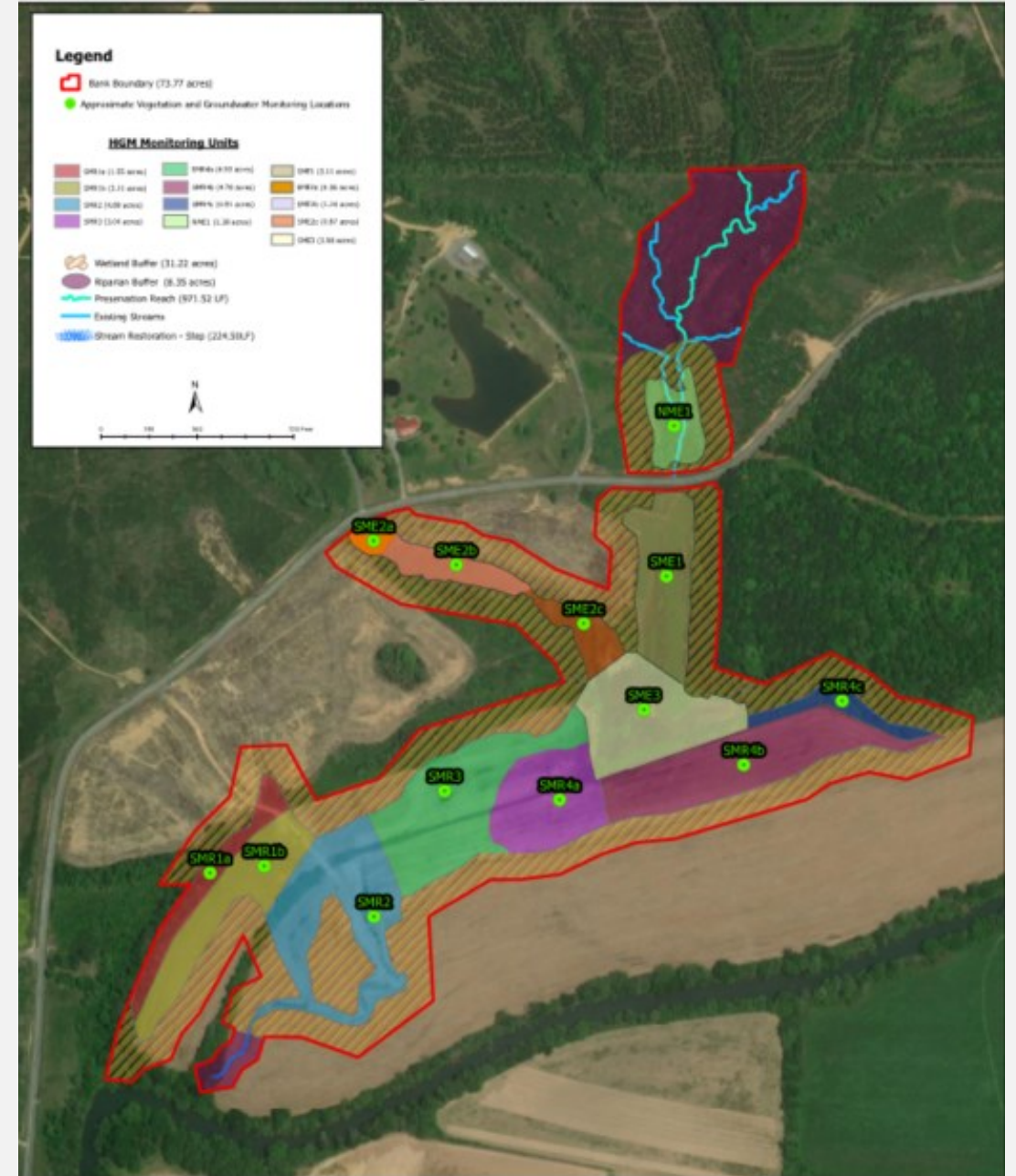
<sup>a</sup> Drought conditions will be defined as drier than normal conditions as determined by the Direct Antecedent Rainfall Evaluation Method and three-month departure from normal.

<sup>b</sup> "Dominant" defined by language found in the Regional Supplement for Eastern Mountain and Piedmont Region.

# Stream Monitoring



# Wetland Monitoring



# HIGHLIGHTS

- Mitigation products are getting better
  - Stream and Wetland
    - '04 SOP
    - '18 SOP
- New Markets are Emerging
  - Water Quality Trading
    - NPS Nutrient Credit (VA)
  - Carbon Crediting (CA)
    - Reduces CO<sub>2</sub>
    - Voluntary Offsets





QUESTIONS?

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