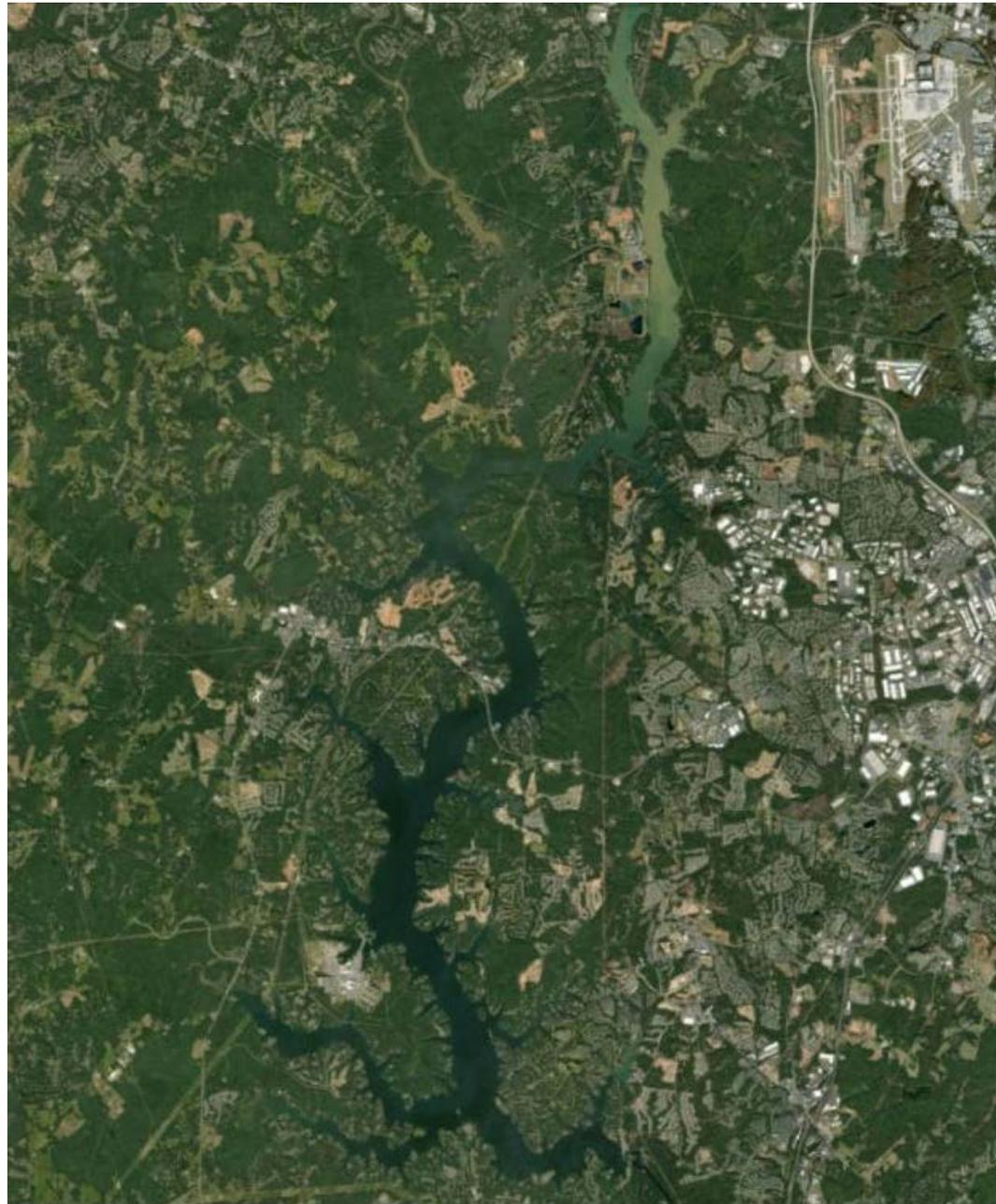


Lake Wylie Native Plants Internship Final Report

By Ella Wickliff

UNC Charlotte Department of
Geography and Earth Science



Source: Google Earth

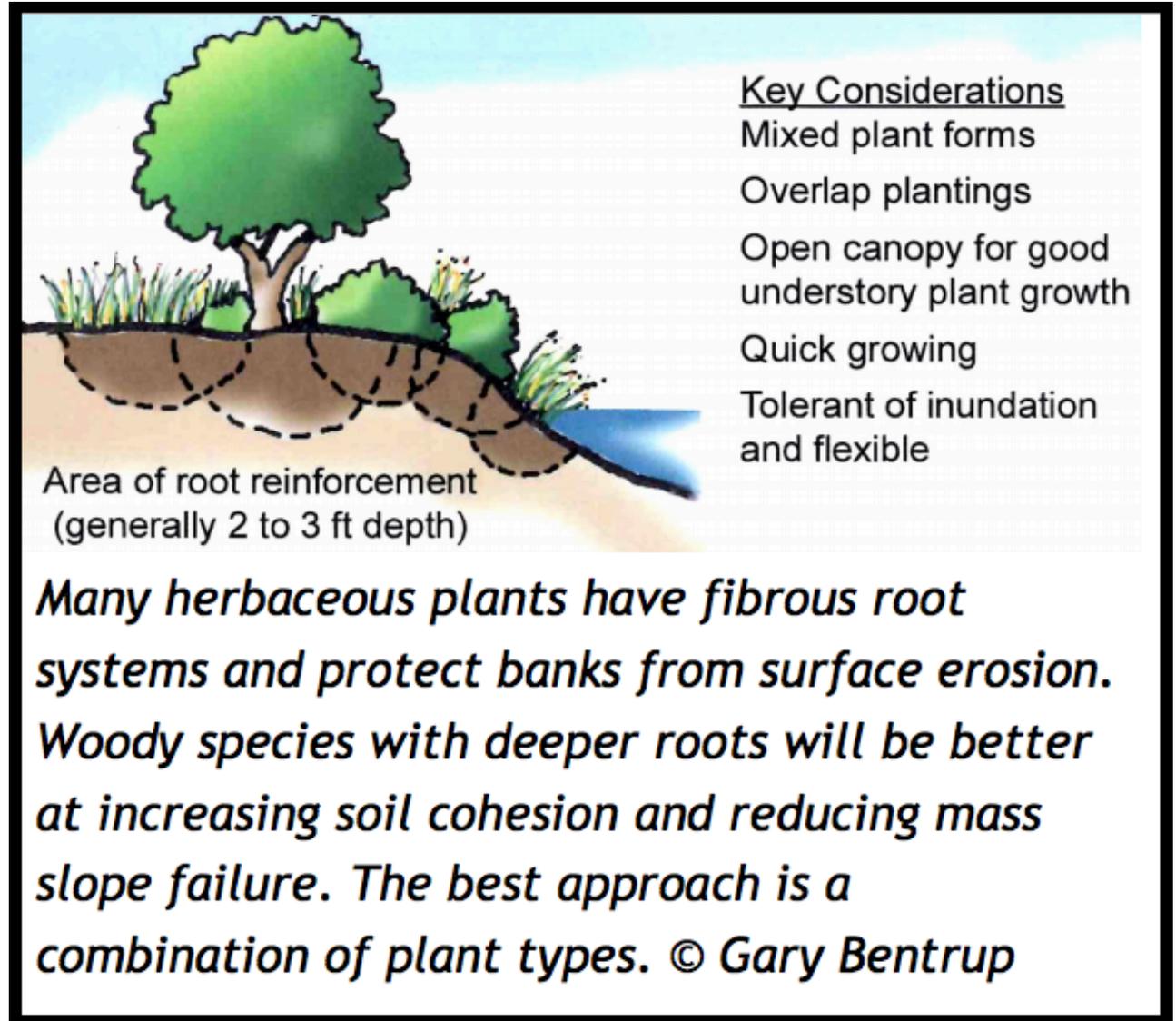
Shoreline Management

- Lake “aging”
- Human activity
- Proper watershed management at the shoreline of lakes and streams is important.
- 325 miles of Shoreline
 - 227.86 in South Carolina
 - 97.14 in North Carolina



Benefits of Native Shoreline Vegetation

- Variety of types and ages of plants, including trees, shrubs, grasses, and groundcovers
- Native plants are adapted to:
 - Local rainfall
 - Climate
 - Insects
 - Soil conditions
- Require less watering and pesticides



How will native plants improve sedimentation?

Water Clarity

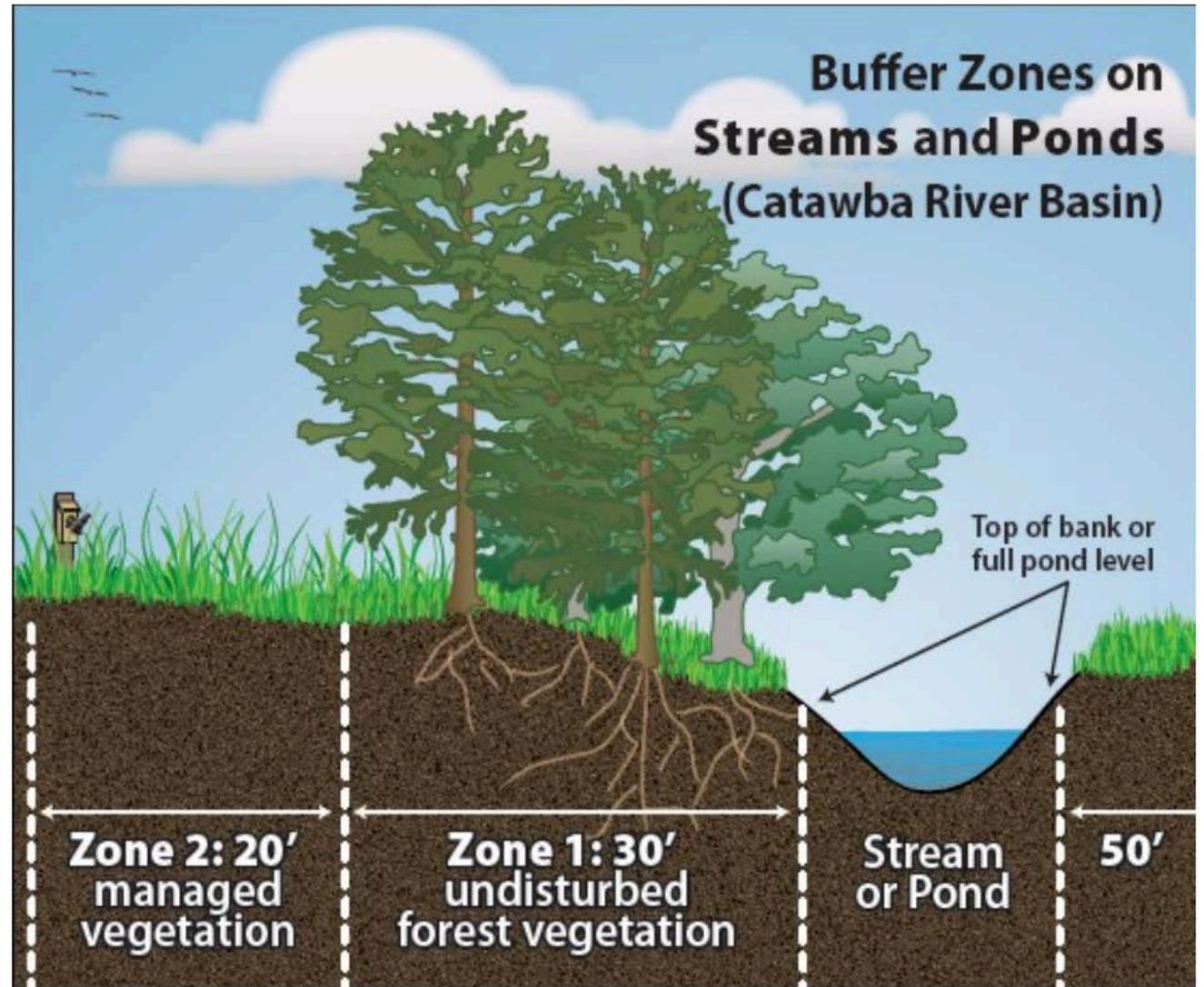
- Determined by:
 - The abundance of phytoplankton
 - Organic color
 - Organic and inorganic suspended particles
- Directly affects aquatic plant and animal conditions.



Source:heraldonline.com

Riparian Zones as Nutrient Filters

- Sediment inputs and nutrient inputs to lakes are linked.
- Rooted aquatic plants uptake phosphorus (P) and nitrogen (N) from sediments.
- Available forms of N and P are normally in very low concentrations in the open lake water, especially during the growing season.



Source: NC DWQ Catawba River Fact Sheet

How will native plants improve sedimentation?
Cont.

- Bottom sediments act as a nutrient source and anchoring point.
- Deposition promotes growth.
- Erosion does not support growth .



© NC Cooperative Extension



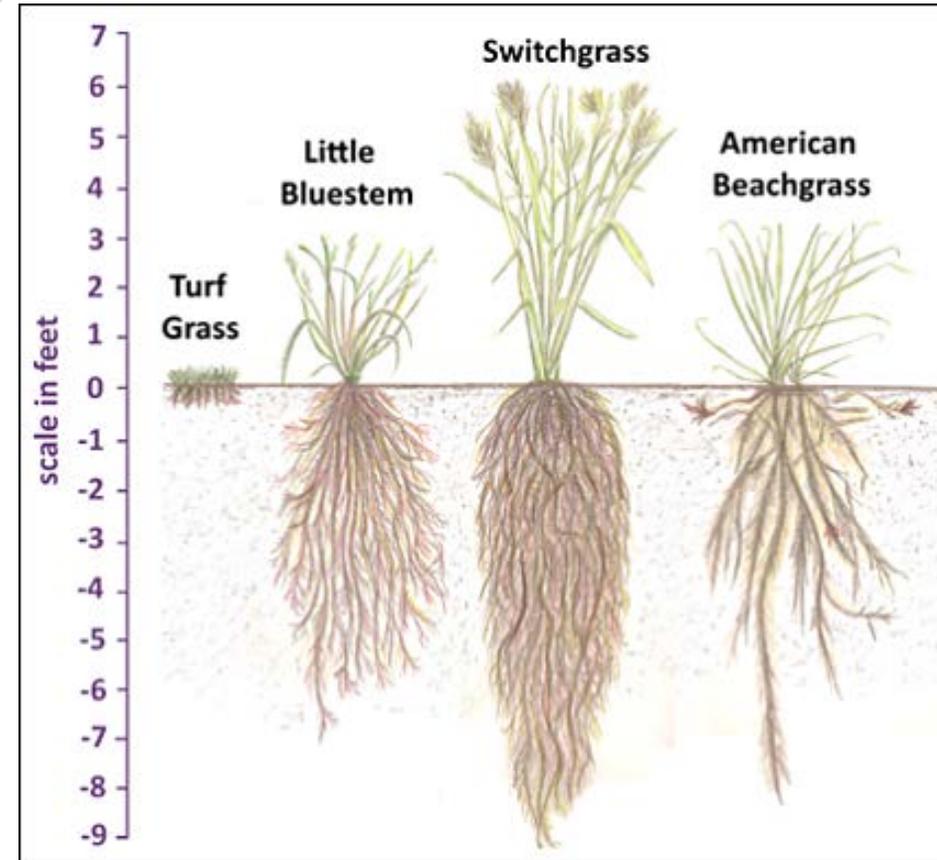
How will native plants improve water quality?

Canopy created by trees, shrubs and herbaceous vegetation:

- Moderates the impact of heavy rains
- Shades the shoreline to reduce water temperature
- Produces organic matter and woody debris

Root systems:

- Give structure to the soil
- Hold soil in place
- Direct rainfall down into the soil instead of over the soil
- Extract nutrients and filter contaminants from the soil



Source: Mass.gov

Economic Benefits

- Crucial components of water quality, flood resiliency, and ecosystem protection.
- Clean water and healthy ecosystems:
 - Reduce costs for drinking water systems.
 - Enhance recreational opportunities.
 - Provide clear water for swimming and wildlife.
 - Enhance shallow shoreline ecosystems, the most productive ecosystems in the lake.
 - Protect and increase property values.



A shoreline garden in Boone, NC.

Source: NC Cooperative Extension Backyard Stream Repair Program
© NC Cooperative Extension

How will native plants improve Wildlife Habitat?

- Convert sunlight and chemical elements into living plant tissue.
- Replenish the aquatic environment with oxygen.
 - Aquatic plant stands change daily dissolved oxygen content in surrounding waters by as much as 12 mg/L
 - Photosynthesis in daylight- dissolved oxygen supersaturation
 - Respiration at night- depletes dissolved oxygen



Soft Rush © NC Cooperative Extension



Pickerelweed

Example Projects



Source: Minnesota DNR



Source: Solitude Lake Management



Source: Charlotteagenda.com

Shorescaping with Native Plants

Recommendations to homeowners

Homeowner Recommendations



SHORESCAPING LAKE WYLIE

A shorescape is a landscaped shoreline that uses attractive, native, plants to protect and beautify the waterfront.

A well designed shorescape uses native plants along the shoreline to decrease shoreline erosion, enhance water quality, and provide solutions for invasive weeds and wildlife management.

A shorescape can use a mixture of flowering plants that can serve as a waterfront garden that improves the appearance of shorelines and adds value to the property.



What Can You Do?

- ✦ Choose a diversity of plant types and sizes: try to include ground covers, grasses, flowering perennials, shrubs and trees.
- ✦ When purchasing plants, check the scientific names and match them to Native plant recommendations listed at <https://tinyurl.com/y9mvuc8g> see examples below.
- ✦ Plant trees in Fall and Spring.
- ✦ Plant close together for less potential weed invasion to the shorescape.
- ✦ Cut back and harvest the plant crowns once each year prior to the spring growing season.
- ✦ Avoid planting in a straight line- group plants in a naturalistic way.
- ✦ Plant for future growth and leave space for filling out.
- ✦ Place shorter plants in the front and taller plants in the back.
- ✦ Pay attention to the directions that come with the plant (sun/shade, soil moisture requirements etc.).
- ✦ Avoid pesticides and fertilizers on the shorescape because of the potential for runoff into the water.
- ✦ Avoid pipes or stormwater conveyances that will be blocked by planting.
- ✦ Weed control is best done by hand pulling and, if herbicides are necessary, it is best to use herbicides labeled for aquatic use.
- ✦ Create a no-mow area around the water's edge 30 ft. or more.
- ✦ Mowed or cut plant material should not be left in place or allowed to wash into the water.

Learn More

For More Information
 Lake Wylie Marine Commission
www.lakewyliemarinecommission.com
 Share your pictures with us @lakewylie

Where to plant	Type of plant	Common name	Native plant species name	Image
At the water line	Herbaceous perennial	Pickersweed	<i>Portulaca cordata</i>	
At the water line	Perennial grass	Soft Rush	<i>Juncus effusus</i>	
On the slope	Annual	Swamp Sunflower	<i>Helianthus angustifolius</i>	
On the slope	Deciduous shrub	Buttonbush	<i>Cephalanthus occidentalis</i>	
Upland of slope	Live stake tree species	Black Willow	<i>Salix nigra</i>	

Carolina Yards Plant Database

Welcome to the Carolina Yards Plant Database which contains nearly 300 plants that are suited to growing in South Carolina. Plants were selected with the principles of environmental landscape design in mind. Remember, good landscape design hinges on choosing the right plant for the right place.

Use the search options below to make an informed decision when selecting plants. All search fields are optional; you may choose one or more search criteria. If you receive insufficient results, try searching on fewer fields. [Click here to determine which planting region your county is in, and watch for more search tips coming soon!](#)

Home	Name Search	Browse by Region	Browse by Type	Browse by Photo	Advanced
----------------------	-----------------------------	----------------------------------	--------------------------------	---------------------------------	--------------------------

Search the Plant Database

REGION	Select	<i>Which part of South Carolina are you in?</i>
SC NATIVE	Select	<i>Are you looking for a plant native to South Carolina?</i>
PLANT TYPE	Select	<i>What kind of plant are you looking for?</i>
SUNLIGHT	Select	<i>How much sunlight shines in your yard?</i>

Source:

<https://www.clemson.edu/extension/carolinayards/plant-database/index.html>

Groundcovers

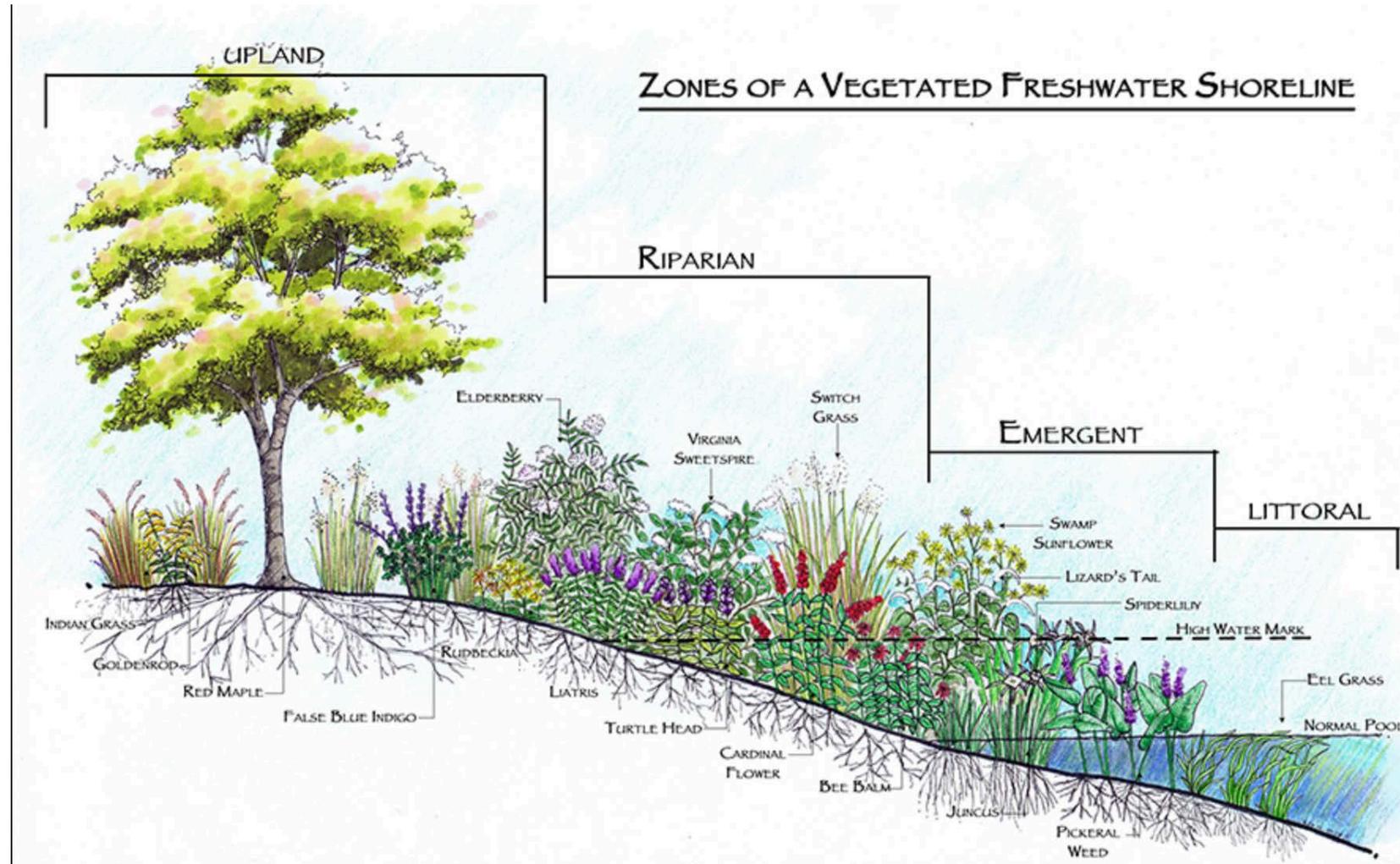
- Low-growing plant species, 3 feet tall or shorter.
- Spreads to form a relatively dense layer of vegetation.
- Reduce soil erosion and provide habitat.
- Can be planted in wooded areas of yard where grass will not grow.
- Turfgrasses can be replaced with groundcovers to reduce watering and maintenance.

Source: north creek nurseries



Chrysogonum virginianum

Zones of a Vegetated Freshwater Shoreline

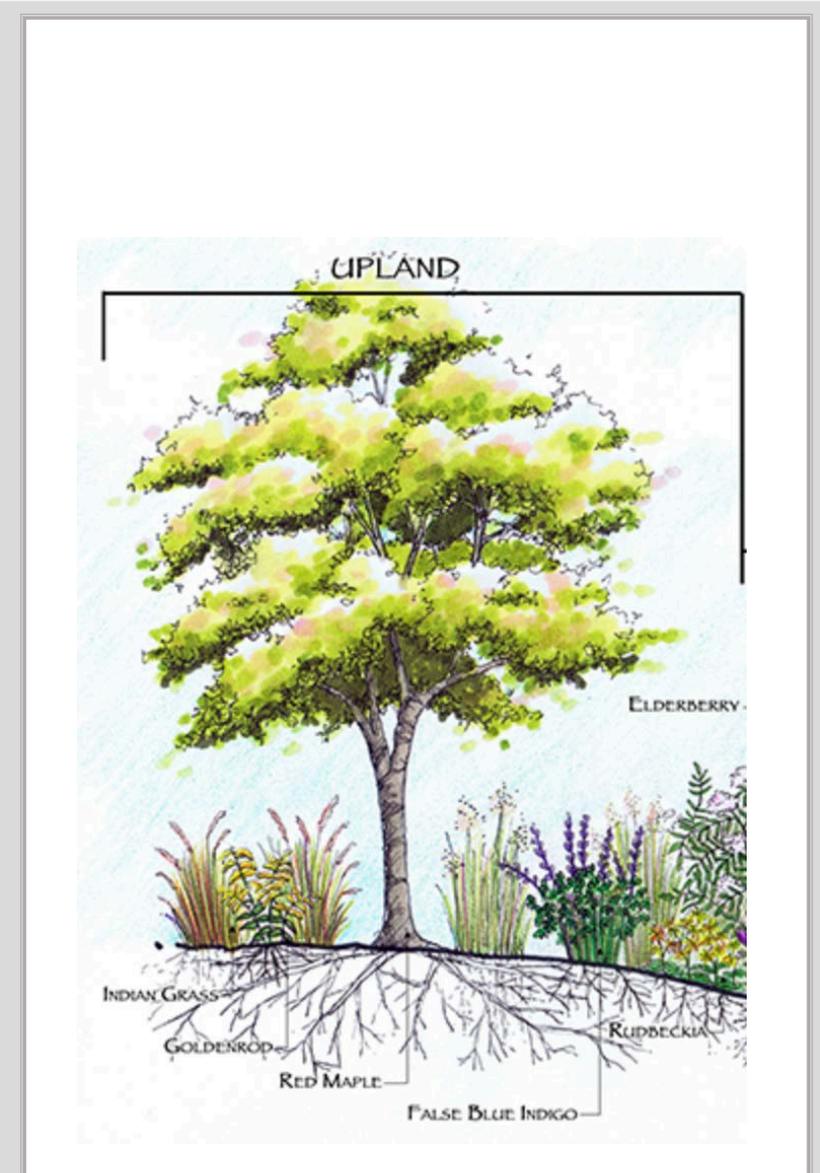


Source: <https://hgic.clemson.edu/factsheet/shorescaping-freshwater-shorelines/>

The Upland Zone

The part of the bank slope above the riparian zone where soils do not stay permanently moist.

- Often dry because the slope forces water to runoff.
- Need plants that are very drought tolerant.
- Perennials and grasses are best.

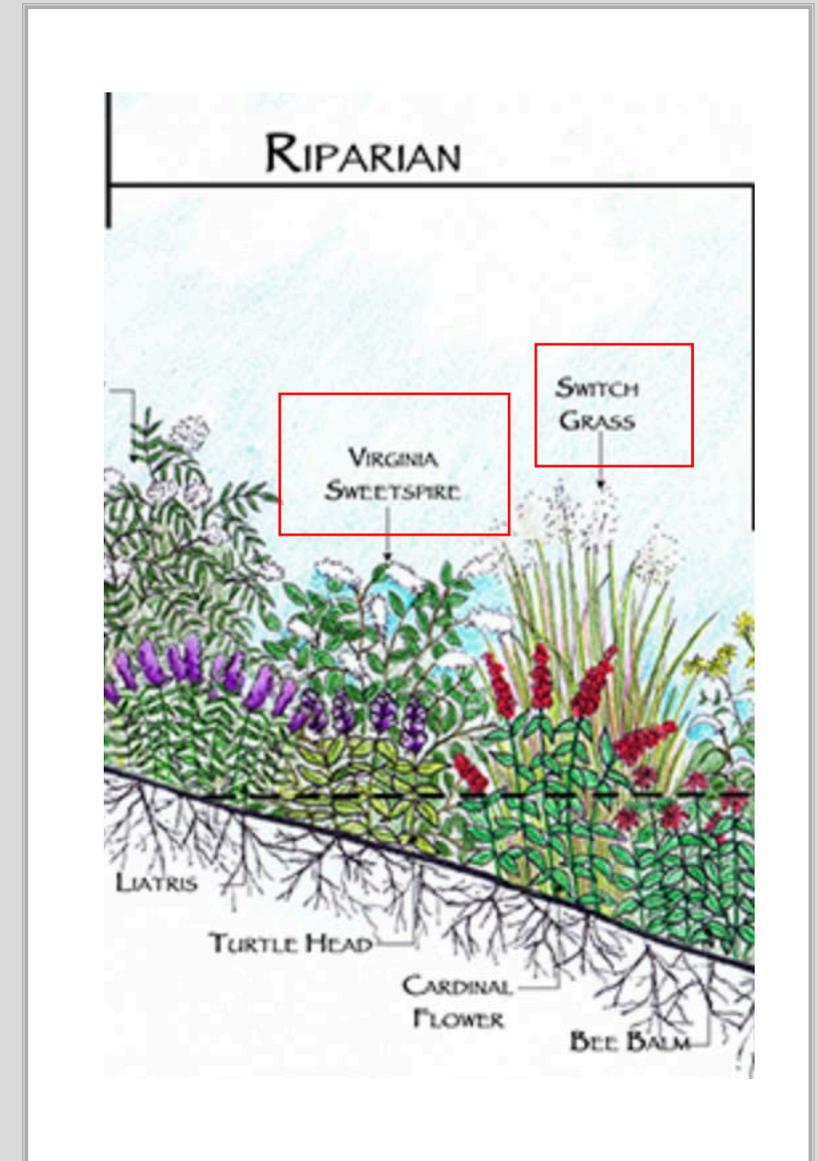


Source: Clemson freshwater shorelines

The Riparian Zone

Part of the bank slope that lies above the water surface.

- Soil remains permanently wet and saturated.
- Often inundated when lake levels rise during storms.
- Plants need moist soils and can withstand extended periods submerged under water but prefer to grow at or just above the water line.

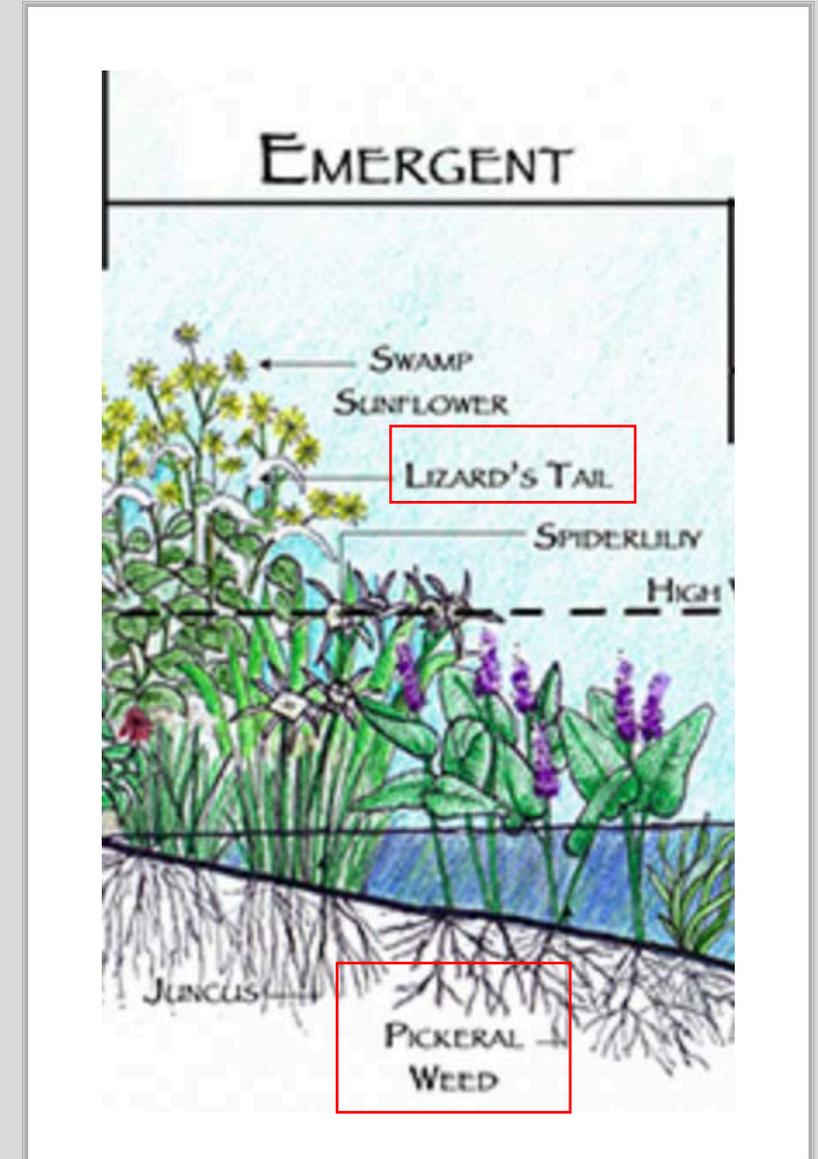


Source: Clemson freshwater shorelines

The Emergent Zone

The part of the bank slope that lies below the water line but is shallow enough emergent aquatic plants root in the submerged soil and grow upward above the surface of the water.

- Most are perennials.
- Strongly rooted.
- Many need mud flats for seeds germination
- Spread into deeper water by sprouting from rhizomes (expanding roots or underground stem systems).

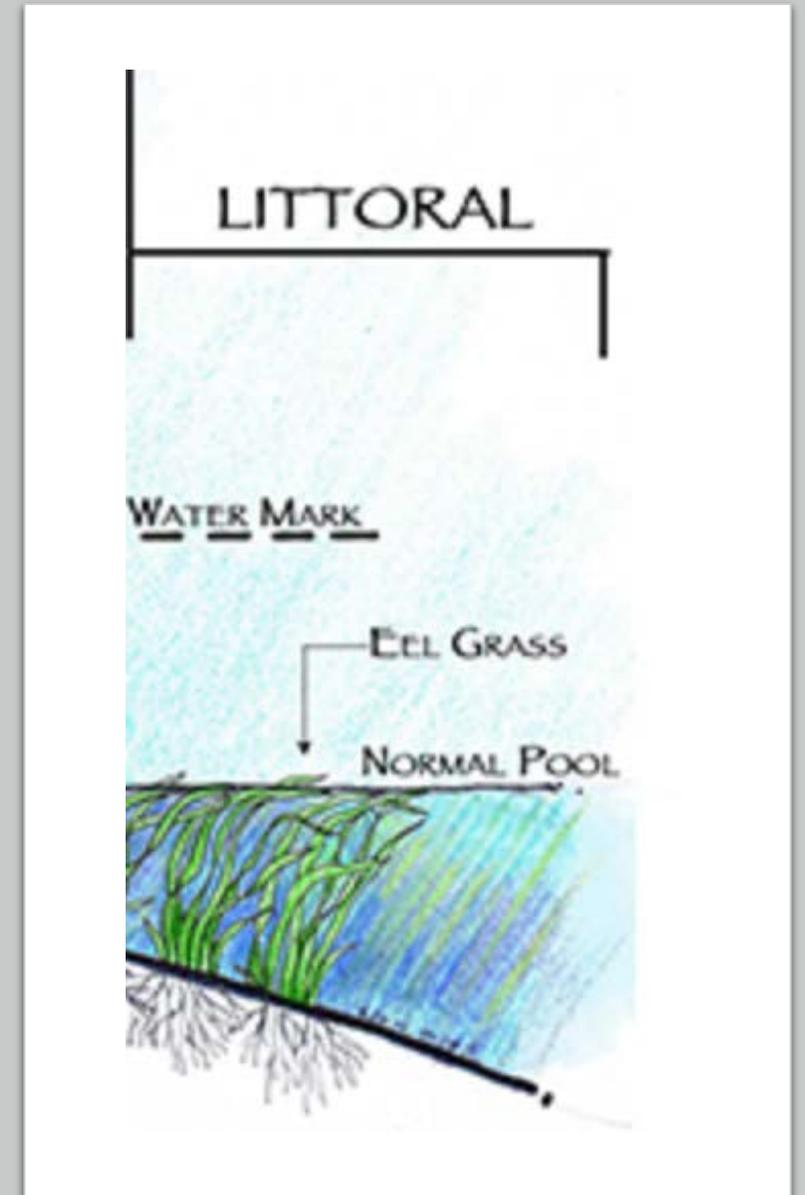


Source: Clemson freshwater shorelines

The Littoral Zone

The area below the water line too deep for emergent plants but shallow enough to receive sunlight that encourages plant growth.

- 1- 4 feet deep.
- Many aquatic plants that grow in the littoral zone can be invasive, so it is important to manage submersed and floating-leaved vegetation.



Source: Clemson freshwater shorelines



Source: commons.wikimedia.org

Aquatic Plant Ecology

Aquatic plant distribution and abundance determined by size of littoral zone.

Littoral zone is affected by:

- Water clarity
- Trophic state
- Water chemistry
- Substrate type
- Wind action

Several studies have suggested the optimum aquatic plant coverage in lakes for healthy fish populations ranges from 15–85%.

Lake Wylie Native Plants

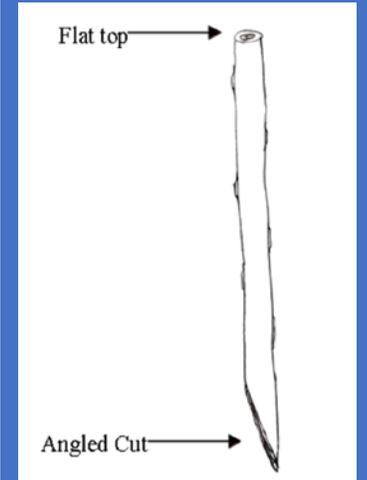


Source: EZ Construction

All plants recommended:

- Have to potential to reduce erosion.
- Can survive fluctuations in soil moisture.
- Native to NC/ SC.
- Low maintenance.
- Typically wetland or “rain garden” plants.
- Live stakes (stem cuttings taken from trees during dormant season)

native_plants_ex_monitoring spreadsheet
database, references and a list of local
native plant nurseries



Source: Penn
State Extension

Great resource
for shoreline
native plants
and information:
Charlotte-
Mecklenburg
BMP Manual
Plant List



Green and Gold



Silky Dogwood
© Jon Calabria



Buttonbush



Virginia Sweetspire

© NC Cooperative Extension

LWMC Native Plant Project Implementation

How long until results start to show?

- Hand-planted riparian buffer in Maine, had a survival rate of less than 50% in the first year.
- Natural mortality of at least 10% is common in the first several years of buffer establishment.
- Survival of the plantings is directly related to obtaining healthy, climate-adapted seedlings.
- Timing of the planting can be another critical factor.



Common Problems

- Watering will be necessary in the initial year.
- Some seedling mortality is expected.
- Replanting may be necessary.
- In the first year, expect additional volunteer plants to grow.
- Some plants can die back but may sprout from the base of the plant; give plants a season before giving up and replacing.
- It may take more than a year for permanent seed to germinate and begin to grow.
- It may take a few seasons to a few years for plants to establish; depending on the plant.
- Throughout the year sediment and debris may deposit on matting.



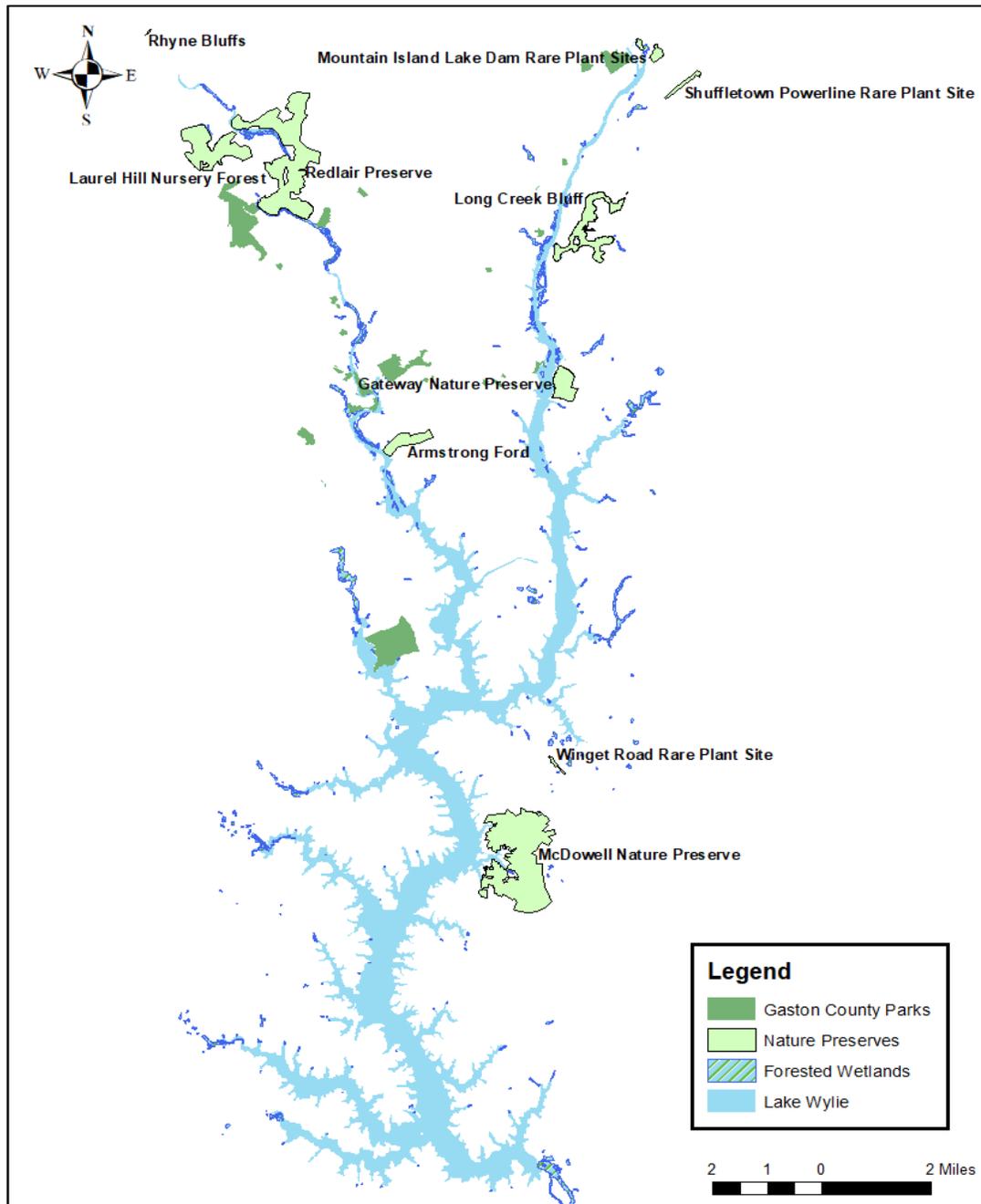
Source: Penn State Extension

Which areas of Lake Wylie would be best to start?

- Vegetated test plot along an area easily accessible to the public, i. e. McDowell Nature Preserve.
- South Carolina shoreline has no riparian buffer protections and may make the biggest impact.
- For stabilization purposes, live stakes may be the quickest, most effective first step.
- Initially, to assess the ability of plants to grow on the Lake Wylie shore, plants should be planted on low slopes along the shoreline to avoid eroding conditions.
- May have a lower maintenance cost and higher success rate to plant at lake shoreline than typical riparian buffer areas because less watering is required and plants will often come up without planting.



Source: southcarolinialakes.info



Which areas of Lake Wylie would be best to start? *Cont.*

- Basin size, shape, and depth determine to a large degree the distribution of sediments in a lake and therefore the distribution of aquatic plants.
- Wave action and currents erode a terrace along the shoreline, leaving coarse material in shallow water and depositing finer materials in deep water.
- Large lakes with many bays or coves may develop an extensive littoral zone because these areas are protected from strong waves and currents.

Site Preparation

- Plant on cleared ground to avoid competition from other plants.
- Clear by pulling, tilling under or spraying with a general herbicide.
- Planting times:
 - Avoid Summer
 - Stream edge herbaceous transplants or plugs
 - After last Spring frost
 - Livestakes and bare root seedlings
 - October – March before bud break
 - Containers
 - Anytime of year

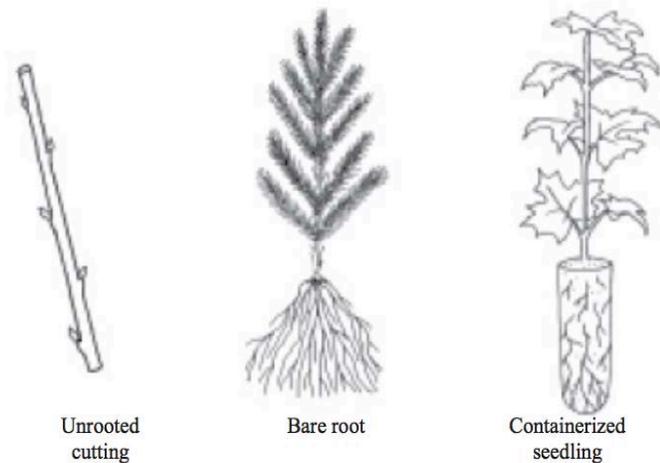


Figure 1. Types of seedlings.

A great resource for planting steps:

<http://ncforestservice.gov/publications/BYSRGuide2015.pdf>

How would the project be monitored? Metrics of success?

- Monitoring data:
 - Rain gage
 - Erosion Pin
 - % vegetated cover along shoreline
 - % species frequency in defined shoreline vegetation quadrat



Source: allamakeeswcd.org

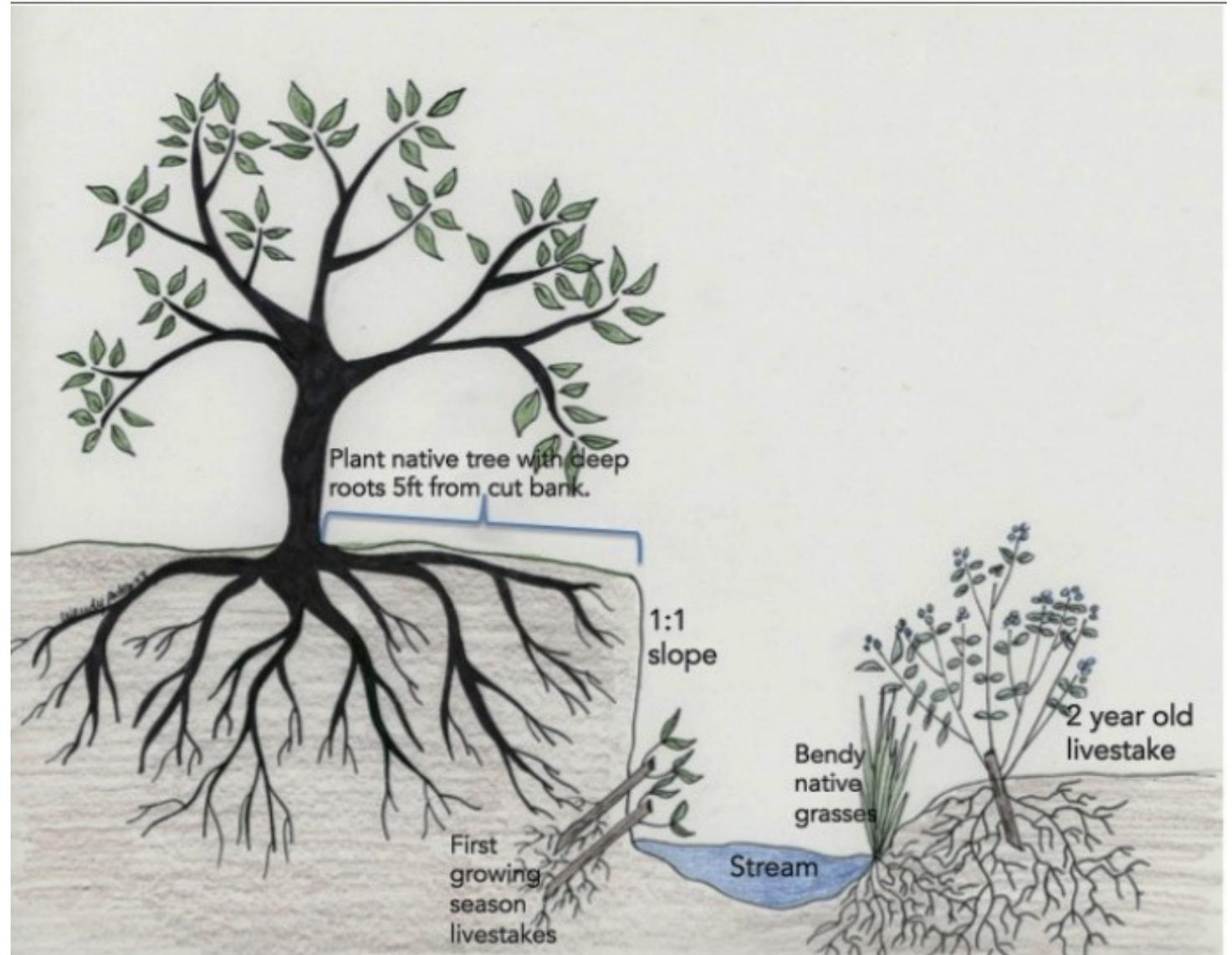


Source: weathershack.com

See example monitoring data sheet for more information

LWMC Project Recommendations

- Determine site and length of shoreline for planting.
- Width of riparian buffer, about 30 feet wide from edge of water.
- Focus on wetland plants that grow at the water's edge because they can survive fluctuating shorelines.
- Supplier of Live Stakes and erosion control fabric in the Charlotte area- Carolina Wetlands Services, all seeds harvested locally, offers quantity discounts.



(© N. Alexander) Source: NC Cooperative Extension Backyard Stream Repair Program

Erosion Control Fabrics

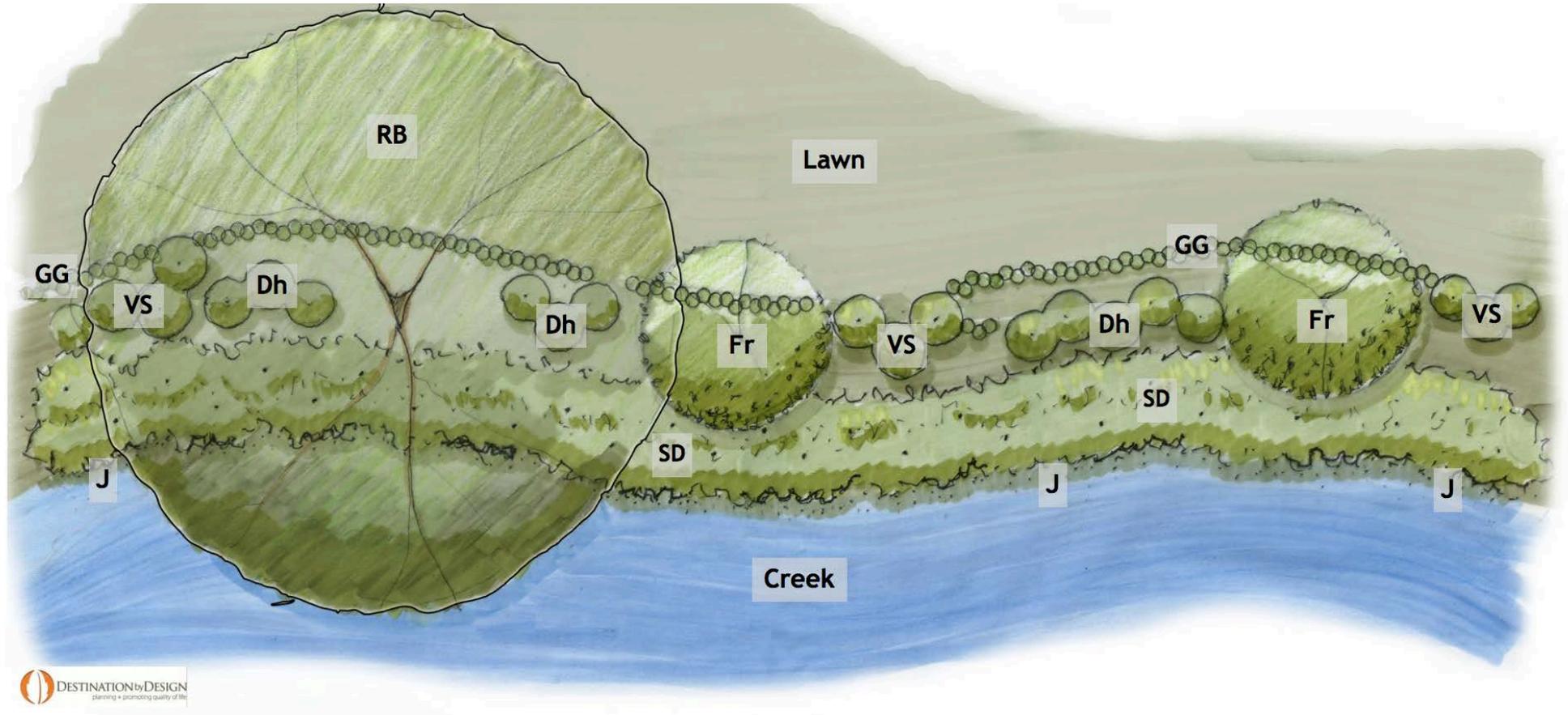
- 100% biodegradable fabric holds soil in place while plants take root.
- Plants can easily be installed through a cut in the fabric.
 - Coir (coconut fiber)
 - Jute
 - Wood Fiber
 - Sold by York County Conservation district
- Straw blankets for short-term needs
 - Biodegrade 60 days- 10 months
 - Best used in upland plantings



Matting 4) Once all the matting is laid out and secured with stakes, cover trenches with a few inches of soil, tamp it down and lightly cover top edge with straw to undisturbed landscape.

What is the average cost and maintenance associated with these projects?

- Included cost of temporary biodegradable erosion control mat as plants take root.
- Need to determine project area to get a quote of true cost of erosion control fabric from most companies.



Adapted recommended planting number and species from Small- Scale Solutions to Eroding Stream Banks by NC Cooperative Extension and the North Carolina Forest Service.

Example Streambank Design 150' long by 20' wide						
Species	Number	Spacing	Cost	Total Cost	Seedling type	Nursery
Soft Rush	75	3' x 1' ; plant every 2'	\$0.75	\$56.25	aqautic plug	Carolina wetlands
Silky Dogwood	30	15'x6'; plant every 10' at water's edge with a second row 3'-4' on bank staggered	\$0.75	\$22.50	live stake	Carolina wetlands
Virginia Sweetspire	10	6'x 6'	\$4.00	\$40.00	1 gallon container	Carolina wetlands
Buttonbush	11	4' x5'	\$4.00	\$44.00	1 gallon container	Carolina wetlands
Salix Nigra	3	20 ' x 20 '	\$0.75	\$2.25	live stake	Carolina wetlands
Green and Gold	150	1'x1.5'; two rows staggered at top of bank every 1.5	\$4.50	\$675.00	3 1/2" x 5" containers	Carolina wild
Native grass seed mix (planting rate 1/2 lbs/1,000 square feet) need 1.5 lbs	1 5 lb bag		\$150.00	\$150.00		
Wildlife Fencing	100 ft		\$1.10/ ft	\$110.00		Wildlife fencing and tree protector costs estimated from WSU Experimental Riparian Buffer Site Installation and Maintenance Costs 2003-2005
Tree protectors	3		1.11 per tree protector	\$3.33		
Erosion control fabric	91.4 square feet		2.50/ square foot	\$2,467.80		
				Total project cost	\$3,571.13	

Maintenance Suggestions

- Install deer and beaver guards.
- Visit site seasonally.
- Pick up litter and trash.
- Observe plant survival rates.
- Determine what needs to be replanted.
- Observe and ID invasive plants.
- Keep up with what vegetation is supposed to be there.
- Inspect after large rain events or flooding.
- Repair small eroded spots before they get worse.
- Take pictures of what was planted by season.



Example of a tree protector

Photo by: J. Long NCRS

Sources of Funding

Tree Charlotte, *Tree It Forward*

<http://treescharlotte.org/volunteer/neighborhoods/>

Charlotte Public Tree Fund, Creek reLEAF

<http://www.charlottetreefund.org/event/creek-releaf-2018/>

North Carolina Forest Service, Urban and Community Forestry Grant

http://ncforestservice.gov/Urban/urban_grant_program.htm

Duke Energy, Catawba- Wateree Habitat Enhancement Program (CWHEP)

<https://www.duke-energy.com/community/lakes/services/cwhep>

Southeastern Partnership For Forests & Water Initiative, Lake Wateree Watershed Summit <https://www.state.sc.us/forest/sepfi.htm>

North Carolina Native Plant Society, Alice Zawadzki Land Conservation Fund or B. W. Wells Stewardship Fund

https://ncwildflower.org/about/scholarships_and_grants

National Wildlife Federation, Free native tree seedlings

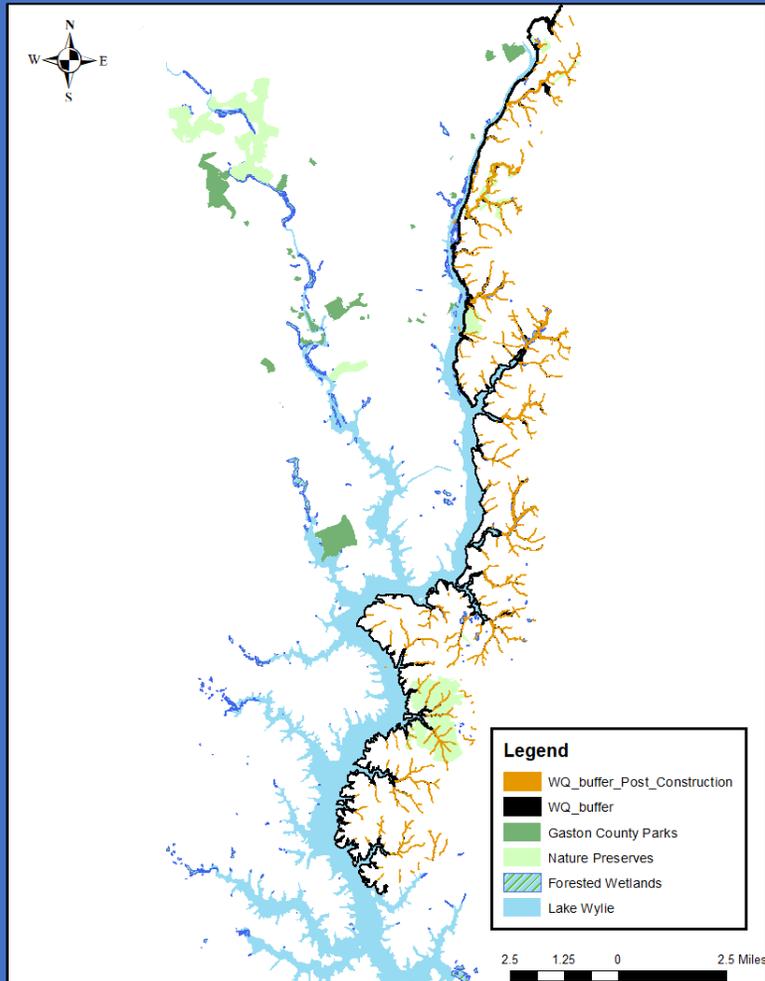
<https://www.nwf.org/Trees-for-Wildlife/Request-Trees>

Fund for Wild Nature <http://fundwildnature.org/proposal-dates-guidelines/>

Community Native Plant Sales

- Annual Tree Seedling Sale, Mecklenburg Soil and Water Conservation District
- The South Carolina Native Plant Society Upstate Fall Greenhouse plant sale, October 13 and 14, 2018

Recommendations for Next Steps



- Soil Characterization.
- Field Study of Lake Wylie to determine native vegetation already present at the shoreline.
- Planting test plots and monitoring.
- In-depth GIS analysis for planting site selection that characterizes shoreline landuses, vegetation cover and soil types.
- Detailed report to characterize sources of sediment entering Lake Wylie.
- Detailed report to evaluate shoreline erosion from wave action and evaluates the effectiveness of bio-engineering “soft structures.”
- Use social media, Annual Homeowner Shorescaping prize. Post native plant resources to homeowners on LWMC website.
- Partner with local nursery to have a native plant sale in the Lake Wylie community.

Summary Statements

- Focusing on building shoreline riparian cover may have the greatest effect on reducing sediment loading and stabilizing banks.
- There is a lack of pre and post implementation data that quantifies the effect of native shoreline vegetation for shoreline erosion, a project by LWMC with monitoring data is an exciting opportunity!
- A small area with test-plots may be helpful to answer these questions.



Source: southcarolinalakes.info