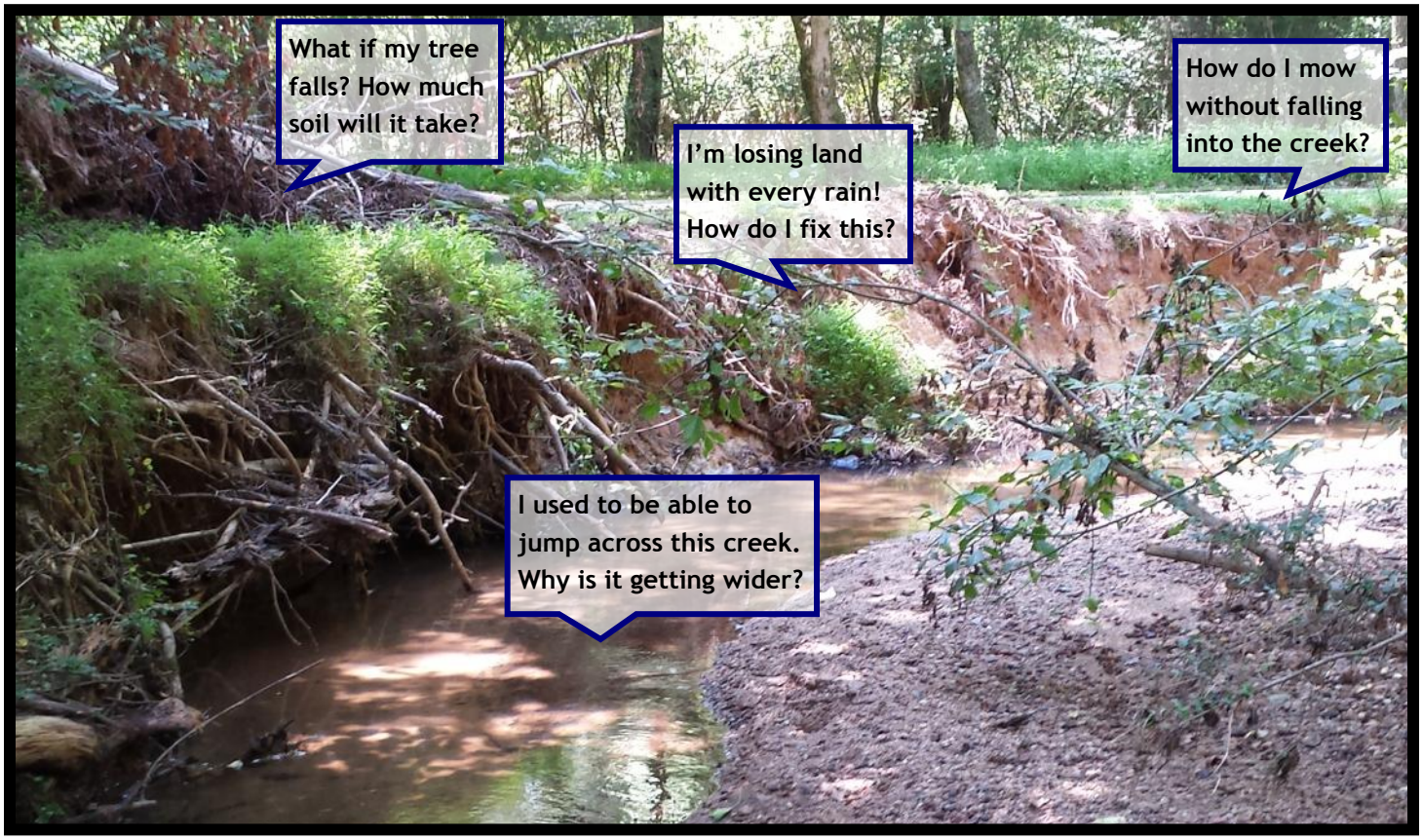
Small-scale Solutions to Eroding Streambanks



Do you have a stream on your property that is losing land in large or small chunks (aka erosion) during or after storm events? Maybe the stream has started cutting deeper into the channel, creating more of a gully. Have you wondered why your streambank seems to be changing rapidly?

NC is urbanizing. We have more homes, commercial buildings, parking lots, and roads and less forested landscapes to slow down rainwater runoff. So there is less water going into the ground and more stormwater flowing to our local streams. Increased volume means increased velocity within the stream. How much stormwater is added to creeks? In a 1" rain an acre parking lot can drain 27,000 gallons of rainwater to local streams. With annual rainfall of 40", depending on where you live in NC, that adds up to a lot of water! All this extra stormwater runoff erodes streambanks and is the largest source of sediment and pollution in the urbanized areas of NC.

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http://go.ncsu.edu/backyardstreamrepair

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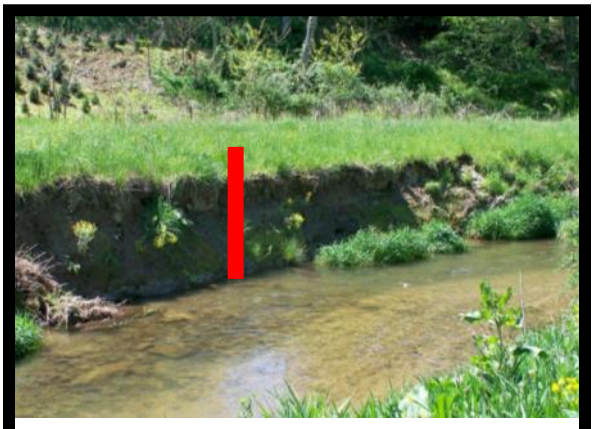
Riparian buffers, streamside forests, and shoreline gardens all refer to the vegetated area along the water's edge. There are all kinds of benefits to you, your downstream neighbors, and the surrounding environment when plants with deep roots are growing on the creek bank.

- Improves bank stability and reduces erosion, saving property from washing.
- Adds aesthetic value to property.
- Creates a sense of place and reduces noise.
- Costs less to maintain than turf - no need for mowing, watering, and fertilizing.
- Slows surface stormwater flow.
- Intercepts pollution - fertilizer, pesticides, heavy metals, etc.
- Allows sediment to settle out before clouding up a waterway.
- Cools stormwater runoff heated by sunlight on hard surfaces.
- Shade moderates water temperatures for aquatic species.
- Provides habitat for many types of wildlife (butterflies, hummingbirds, frogs, dragonflies).

Being around water brings a sense of calm and relaxation. Most people living near water want a clear view and remove all the landscape. Why not? If you live near the water, you want to see it! But what if all your upstream neighbors want that too? Often times we don't realize that by simply removing vegetation or keeping an area only in turf grass next to the creek we actually contribute to erosion, increase the likelihood for flood damage, and decrease the available habitat for wildlife. **There is a compromise; utilize the right plant for the right place to create a shoreline garden.**

Before you consider altering your streambanks, you need a clear image of what a healthy, stable stream looks like. It can be difficult to find healthy streams in urban areas to use as an example. Study the two photos below. Which one looks like it is stable, meaning the banks are not eroding. Is there shade on either stream?



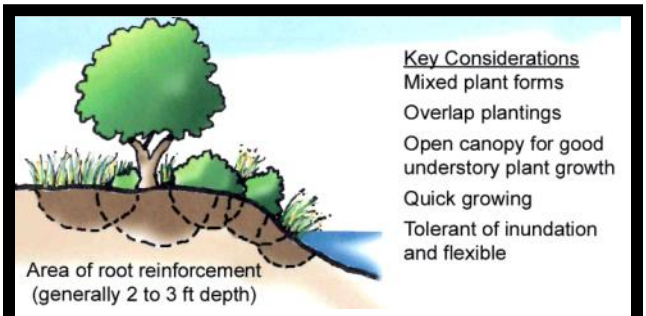
Vertical banks more than 1' = unstable.

Gently sloped banks = stable. © L. England

The one on the left has banks that are very steep and could be a safety issue; especially if you were on a mower! The one on the right has a more gentle slope and vegetation extending to the water's edge for easier and safer access.

Fluctuating streams that rise and fall quickly during and after rainfall events can saturate and loosen soil. Plant roots hold soil but their effectiveness relates to their root depth (turf grass may only have 4”-6” deep roots). Unanchored soil will continue to wash away until it finds a stable point that is difficult to erode...usually bedrock. This may take a few storms or decades to see significant impact but the damage is inevitable.

A mix of native trees, shrubs, flowers, ferns, and grasses at varying heights provides a tangled mix of different root structures that help to hold soil to the banks along with all kinds of other benefits to the environment.



Many herbaceous plants have fibrous root systems and protect banks from surface erosion. Woody species with deeper roots will be better at increasing soil cohesion and reducing mass slope failure. The best approach is a combination of plant types. © Gary Bentrup

Step 1: Evaluate Streambank

Take a stroll along your streambank and observe the current conditions. A publication to help examine your creek more in depth is Stream-A-Syst (ftp://ftp.wcc.nrcs.usda.gov/wntsc/strmRest/StreamASyst2001.pdf)

Questions to ask about your stream:

- Does your stream flow year-round, seasonally or only during rain events?
- Does the stream rise and fall quickly with rainfall events?
- Does the soil along the bank slide off after rain events?
- How deep and wide is the creek?
- Are there any culverts or drainage pipes flowing into your stream?
- Is the stream straight or does is meander through the landscape?
- Does your shoreline have a variety of plant types?
- Do you know if the plants are native vs. invasive?
- What kind of root structure do existing plants have?

An example of a highly erosive, unstable streambank. © Bill Lord

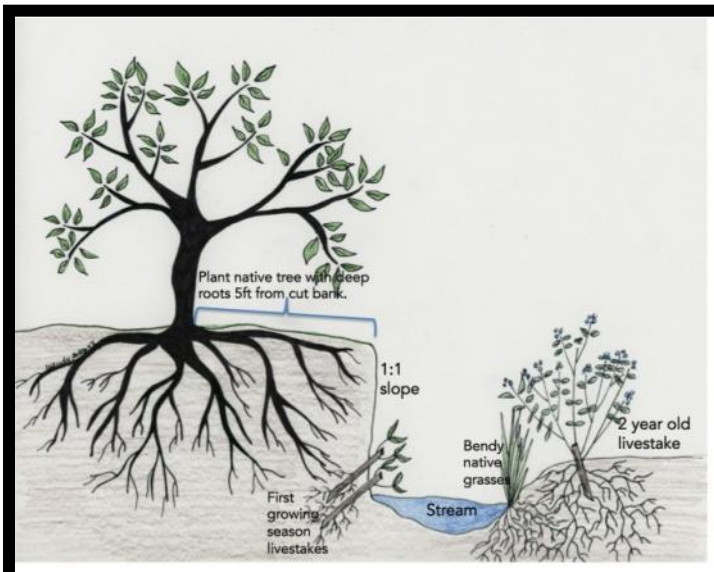
Step 2: Determine Options

There are many different ways to manage streambanks. Choose from one of the following options to stabilize a streambank.

Option 1: Do nothing and let it grow wild up to 15' from water's edge. Allow whatever seeds are in the soil, as well as what washes from upstream neighbors, to establish on the streambank.
Optimal time of year: This can be done anytime of year.
Pros: No work and no costs.
Cons: Undesirable plants (invasives such as kudzu) can take over the area. It can look weedy and still erode for several years until plants mature.
Next step: Do nothing, you're done with this guide.

Option 1: This landowner is letting vegetation grow 15' from water's edge before mowing.

Option 2: Plant native vegetation without grading.
Start planting native trees 5' from edge of bank; regardless of slope (see illustration below). Plant livestakes (cuttings of native trees and shrubs; see pages 13-14) every 3' along the water's edge. Only plant in rows as high as the soil is saturated. Soil may still slough off but as plants grow, the root mass will begin to hold the soil together.
Optimal time of year: Dormant season or October-March.
Pros: Cost-effective and slows erosion.
Cons: May be a temporary fix and land can still be lost.
Next step: Skip to plant selection on pages 12-18. Look over maintenance suggestions on page 19.



Option 2: Plant diverse, native flora without changing the grade (above left illustration). Above right photo shows livestakes installed every 1' on existing slope to create snag and quick root mass (© N. Alexander).

Option 3: Grade banks to a 3:1 slope and plant. Most ideal for a stable bank. Take time to plan whether you will do the work yourself or hire someone, select type of plants you want (or copy the design on page 16) and determine how you will maintain the appearance you want (tips on page 19).
Optimal time of year: Dormant season or October-March.
Pros: Safer, stable banks, not losing land and attractive.
Cons: Financial investment and potential soil compaction from heavy equipment.
If choosing Option 3, the next steps are:

Option 3: A stream site in Newland, NC. The landowner's home is less than 20' from the water with 2'-3' vertical banks (above left photo). Above right photo shows newly graded, stabilized and planted bank.

A) Contact your local technical resource: You may need a permit or help determining where to start work near the stream (called Ordinary High Water).

- **Army Corps of Engineers (Pre-Construction Notification, Section 404 Permit and Ordinary High Water determination)**
  www.saw.usace.army.mil/Missions/RegulatoryPermitProgram.aspx
- **NC Cooperative Extension** http://go.ncsu.edu/backyardstreamrepair
- **NC Division of Soil and Water Conservation** www.ncagr.gov/SWC/
- **NC Division of Water Resources** http://portal.ncdenr.org/web/wq/401bufferpermitting
- **Local government** (to determine if any buffer rules apply)

After complying with local and state requirements...

B) Determine 3:1 slope: A "three-to-one slope" (33.5% or 18˚) is considered the ideal, stable slope.

To calculate a 3:1 slope for grading a streambank, measure the change in elevation (from Ordinary High Water mark to top of the bank). Multiply that height measurement by 3. Then measure the multiplied distance from the bank into the landscape and mark it.

For a bank that is 2' high, multiply by 3. 2' x 3' = 6'
Measure 6' back into the landscape and flag it. Grade between the landscape flag and the Ordinary High Water flag (depicted as red circles above).

C) Acquire Stabilization Supplies: Temporary and permanent seeds are needed along with other erosion control materials until vegetation establishes.

Permanent Seed Mixes
Apply at 15-20 lbs per acre of streambank disturbance (per specifications of seed supplier). Mixes can include but not limited to: Deertongue, VA Wild Rye, Big Bluestem, Fox Sedge, Partridge Pea, Switchgrass, Blue Vervain, Autumn Bentgrass, Ox-eye Sunflower, Little Bluestem, Purpletop, Boneset, Soft Rush, Giant Ironweed, Black-eyed Susan, Joe Pye Weed, Great Blue Lobelia, Wild Bergamont.

Temporary Seed and Specifications			
Common Name	**Scientific Name**	**Rate per acre**	**Optimal Plant Date**
Rye Grain	*Secale cereale*	30 lbs	Aug 15 - May 15
Browntop Millet	*Urochloa ramosa*	10 lbs	May 15 - Aug 15
Partridge Pea	*Chamaecrista fasciculata*	10 lbs	Mar - May

Examples of suppliers with native, perennial mixes for NC streambanks.

- **www.ernstseed.com** ERNST Conservation Custom Mix, ERNST Riparian NC Mix
- **www.green-resource.com** Custom Riparian Seed mix
- **www.mellowmarshfarm.com** MMF Riparian Seed Mix, MMF Pollinator Mix

Straw
Use an average of 1 bale for 800-900 square ft at 1/2”-3/4" deep.
(*Source: http://efotg.sc.egov.usda.gov/references/public/NC/NC342_CriticalArea_04-2014.pdf)*

Coir Matting
Heavy biodegradable matting - 700 gram, 6.5’ x 160’ (check with local supplier for availability options).

Stakes
Need biodegradable 12” eco-stakes (~80-90 per roll of matting) and 2’ oak stakes (~60-70 per roll of matting).

Note: These materials can be purchased from erosion control companies and landscape/farm supply stores.

Other Helpful Tools
Mallets, shovels, tampers, rakes, seed spreaders, and volunteers.

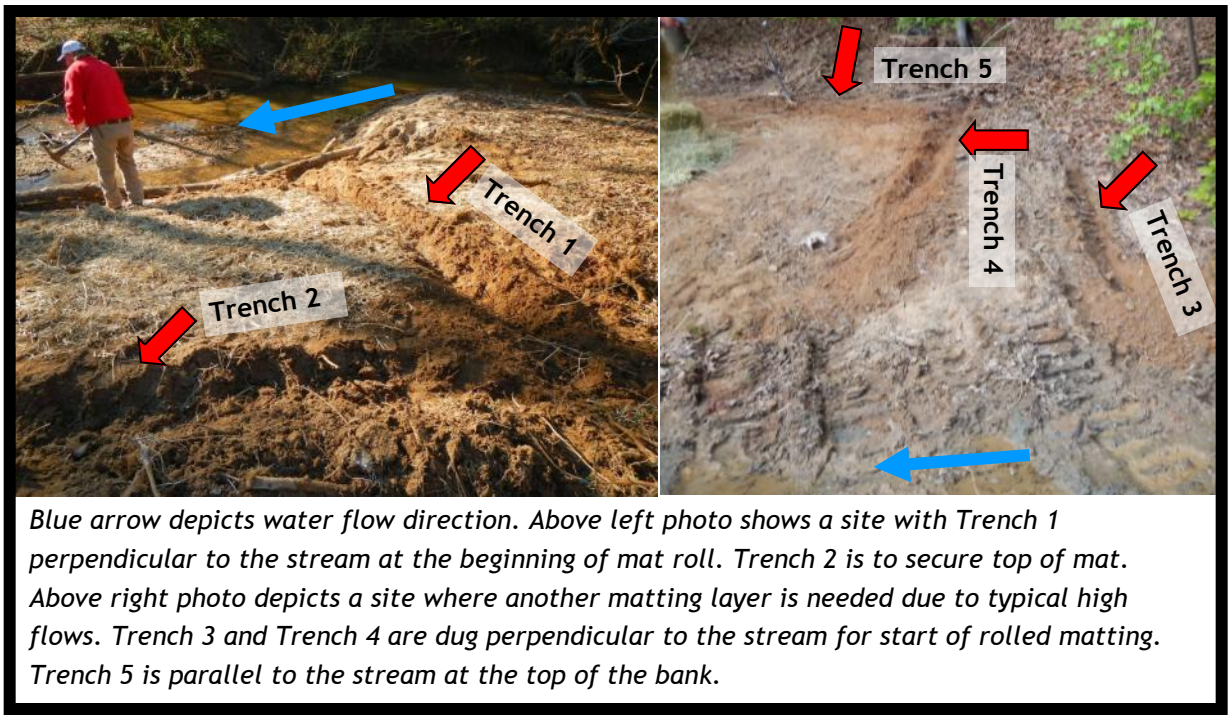

Add a small roofing nail to end of 2’ stake for grip to hold down matting.

D) Grade bank(s) to appropriate slope (3:1 is ideal). Equipment is helpful but this can also be done by hand (very labor intensive). Avoid dropping sediment into water. Keep equipment out of water unless a permit was approved.

E) Seedbed Preparation.
Disturbed soils within riparian areas should be lightly raked to provide maximum soil contact for seed germination and seedling growth. Surface soils should be loose enough for water infiltration and root penetration.

F) Dig a trench on the upstream end.

A trench should always start on the upstream end of your project to prevent overland flow and high water streamflow from cutting under the matting. Dig a 6.5' trench line perpendicular to the stream from the water's edge for the width of matting. Another trench line should be dug along the top of where matting will be laid for the entire reach length; parallel to the stream.



Blue arrow depicts water flow direction. Above left photo shows a site with Trench 1 perpendicular to the stream at the beginning of mat roll. Trench 2 is to secure top of mat. Above right photo depicts a site where another matting layer is needed due to typical high flows. Trench 3 and Trench 4 are dug perpendicular to the stream for start of rolled matting. Trench 5 is parallel to the stream at the top of the bank.

G) Spread temporary and permanent seed mix with spreader for more uniform planting.

Choose temporary seed based on time of year (chart on page 7) and select permanent seed. Many seed suppliers can pre-mix temporary and permanent seed together. Seed suppliers can assist you with a rate per square foot based on the seeds you select.

H) Lightly cover seed with straw.

Purpose: to lightly cover seed, provide moisture for growth and protect seed from scavenging birds.

Should be able to see soil through straw like inset photo.

I) Start coir matting in trench. The following sequence of photos demonstrate how to install matting.

Matting 1) Lay start of matting in trench and tamp in 2' oak stakes with nail on end. Add every 1.5' to top of trench. Overlap extra matting rolls by 1'.

Matting 2) Roll out matting and tamp down oak stakes every 4' at water's edge. Follow the contours of streambank with matting constantly touching soil. Do not pull taut.

Matting 3) Add 2' oak stakes every 10' to top of matting. Randomly hammer in eco-stakes every 4'-6' feet throughout the matting as well as along the top edge.

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.

Step 4: Choosing the Right Plants

Plants for streambanks should be selected based on soil moisture, sun, height and width or spread. Choose native plants for best results.

<u>Tips for planning a shoreline garden:</u>

- View: Consider the views you want to maintain and frame a "view corridor" from your home. Utilize vegetation that will vary in height as it matures. You can limb up trees and shrubs to see the water but use proper pruning practices. The more plants growing, the more root mass stabilizing the streambank.
- Plant Location: Choose plants according to their moisture tolerance. Plants in **Zone A** are located at the water's edge and will have wet roots 99% of the time. Plants in **Zone B** may only be wet 67%-99% of the time; such as during storm events or seasonal inundation. Soil saturation could vary from 1'-6' away from the water's edge. (Tip: Dig a 1' deep hole. Try to make a ball; if it crumbles...it's not saturated). Plants in **Zone C** prefer a drier soil condition but must be adapted to seasonal flooding.

Planting zones: A = Herbaceous, B = Livestakes and C = Containers.

- Foliage: Do you want to attract certain birds and butterflies? Do you want seasonal color throughout the year? Adding texture, form and habit can produce interesting plant patterns. Choosing a variety of deciduous and evergreen provides seasonal interest.

- Spacing: There are two ways to space plants; 1) over planting for quicker root mass to hold soil or 2) space according to future mature height and width (aka spread). Plant in groupings of species for a garden or landscaped feel. Research shows you'll keep it, if you love it! Use a variety of plant sizes to save costs but keep in mind they will increase in size (ex. plugs, bare root seedlings, livestakes, and containers).
- Inventory: Onsite plants may be transplanted. Avoid planting and try to eliminate non-native invasives, which are plants that tend to out-compete everything and become a monoculture.

Common Non-native Invasives

Ailanthus altissima (Tree-of-Heaven)
Albizia julibrissin (Mimosa)
Elaeagnus umbellata (Autumn Olive)
Fallopia japonica (Japanese Knotweed)
Hedera helix (English Ivy)
Lespedeza cuneata (Korean or Sericea Lespedeza)
Ligustrum sinense (Chinese Privet)
Microstegium vimineum (Japanese Stiltgrass)
Paulownia tomentosa (Princess Tree)
Pueraria lobata (Kudzu)
Rosa multiflora (Multiflora Rose)

Japanese Knotweed (Fallopia japonica) is rapidly growing along a newly graded site. It spreads by underground rhizomes, up to 30' away from the parent plant, as well as from seed and plant parts that float downstream.

Optimal Plant Scheduling

- Stream edge herbaceous transplants or plugs - plant after last Spring frost
- Livestakes and bare root seedlings – Winter
  When plants are dormant (October - March) and before bud break.
- Containers – anytime of year
  Avoid Summer = requires 1" watering or rainfall per week; difficult to irrigate

Planting in Matting

Make an X cut with a knife in matting. Dig a hole deep enough for plant. Take plant out of pot, loosen roots and put in hole. Put dug out soil back around plant.

Sun Conditions	
F	Full Sun 6+ hours
P	Partial Sun 2-6 hrs
S	Shade <2 hrs

Bloom Color	
Blu	Blue
Bur	Burgundy
Crm	Cream
Grn	Green
Org	Orange
Pnk	Pink
Pur	Purple
Red	Red
Wht	White
Yel	Yellow

D/E	Deciduous (D) / Evergreen (E)

Wet Code		
OBL	Zone A	Obligate Wetland: Found in wet zones 99% of time. Plant roots tolerate saturation.
FACW	Zone B	Facultative Wetland: Usually occur in 67%-99% of time in wetlands, but occasionally found in non-wetlands (ex. fluctuating river levels).
FAC	Zone B/C	Facultative: Equally likely to occur in wetlands or non-wetlands; estimated probability 34%-66%.
FACU	Zone C	Facultative Upland: Usually occur in non-wetlands 67%-99% of time, but occasionally found in wetlands 1%-33% of time.
UPL	Zone C	Obligate Upland: Occur almost always in non-wetlands 99% of time.

Zone A: Herbaceous plants

A sampling of herbaceous plants that can bend with the river flow at the water's edge (wet code = OBL and FACW).

Type	Common name	Botanical name	Sun	Height x Width	Wet Code	Bloom Time	Bloom	D/E	Features
FERN	Chain Fern	*Woodwardia areolata*	P-S	1'-2'	OBL			D	Amphibian shelter
GRASS	Sweet Flag	*Acorus calamus*	F-P	2'-4'	OBL		Crm, Yel	E	Iris-like leaves, flowers not showy
GRASS	Fringed Sedge	*Carex crinita*	P-S	4'	OBL			E	Drooping seed heads
GRASS	Southern Waxy Sedge	*Carex glaucescens*	F	2'-4'	OBL		Blu	E	Food source for waterfowl
GRASS	Spike Rush	*Eleocharis quadrangulata*	F-P	2'	OBL			E	4-sided rush
GRASS	Soft Rush	*Juncus effusus*	All	3'x1'	FACW			E	Clump-forming
PERENNIAL	Swamp Milkweed	*Asclepias incarnata*	F-P	2'-4'	OBL	Jun-Oct	Pnk	D	Pollinator
PERENNIAL	Hardy Hibiscus	*Hibiscus moscheutos*	F	3'x2'	OBL	Jul-Sept	Red	D	Bird, butterflies, hummingbirds
PERENNIAL	Blue Flag Iris	*Iris virginica*	F-P	2'	OBL	May	Blu, Wht	D	Bird, butterflies, hummingbirds
PERENNIAL	Cardinal Flower	*Lobelia cardinalis*	F-P	3'-5'	FACW	May-Oct	Red	D	Hummingbird, pollinator

Zone B: Livestakes

Livestakes are cuttings from certain native, dormant trees and shrubs. They are inexpensive and hardy. The ones listed below have proven successful (wet code = OBL and FACW).

Common Name	Botanical Name	Sun	Height x Width	Wet Code	Bloom Time	Bloom	D/E	Features
Buttonbush	*Cephalanthus occidentalis*	F-P	10'x5'	OBL	Jun-Aug	Wht	D	Fall reddish flowers, yellow leaves, fragrant
Silky Dogwood	*Cornus amomum*	F-S	6'-10'	FACW	May-Jun	Wht	D	Attracts birds, hummingbirds, pollinators
Red Twig Dogwood	*Cornus sericea (C. stolonifera)*	F-P	15'	FACW	May-Jun	Wht	D	Attracts birds, hummingbirds, pollinators
Ninebark	*Physocarpus opulifolius*	F-S	8'x10'	FACW	Spring	Wht, Pnk	D	Yellow-bronze fall leaves, exfoliating bark
Silky Willow	*Salix sericea*	F-S	12'	OBL	Spring	Grn, Yel	D	Wildlife, fast growing, establishes quickly
Elderberry	*Sambucus canadensis*	F-P	5'-12'	FACW	Jul	Wht	D	Edible

Buttonbush

Red Twig Dogwood

Ninebark
© David Emmitt

Elderberry

Silky Dogwood
© Jon Calabria

Silky Willow
© Alan Cressler

Harvesting Livestakes

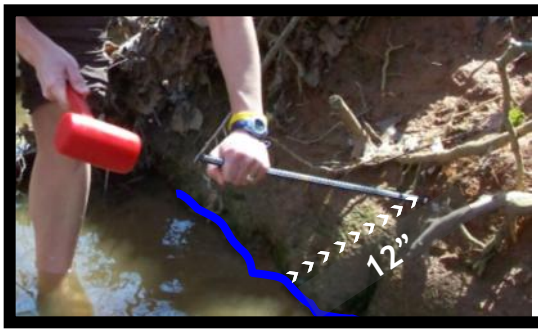
Best time to cut and plant livestakes: November-February

1. Cut stakes from long, upright branches (2' long x thumb-width in diameter). Remove no more than 5% of the parent plant.
2. Make an angled cut on the branch just below a leaf node. Measure about 2' and make a straight cut above a leaf node.
3. Immediately remove leaves and small branches after cutting stakes. Any extra pieces or "whips" can be pushed into the streambank as well.
4. Keep livestakes wet in a bucket until ready to plant. Never leave stored livestakes in the sun or let them dry out. For best results, plant livestakes within 24 hours of harvest. Make sure to keep them upright, if planted upside down they will not grow.

Planting Livestakes Along Creekbanks

Helpful Materials:

Gloves
Smooth metal rod
Livestakes in bucket of water
Hammer (dead blow, mallet, etc.)
Hand pruners or loppers



Step 1: Within the first 12" above the current water level, angle the metal rod perpendicular to the bank. Hammer a pilot hole and pull metal rod back out after starter hole is made. Livestake will go in starter hole; perpendicular to the bank.

Step 2: Orient livestake with leaf buds facing upward (pointed end goes into the ground). Hand push or gently hammer livestake ¾ of the length into the bank. Make sure to leave 3"-4" sticking out of ground above soil line. If the top of the stake is smashed, make a clean cut for faster and healthier healing of the livestake.

Step 3: Plant first row every 3' minimum. Stagger another row a few feet up in a triangular pattern and begin again. As long as the soil is saturated, livestakes can be installed.

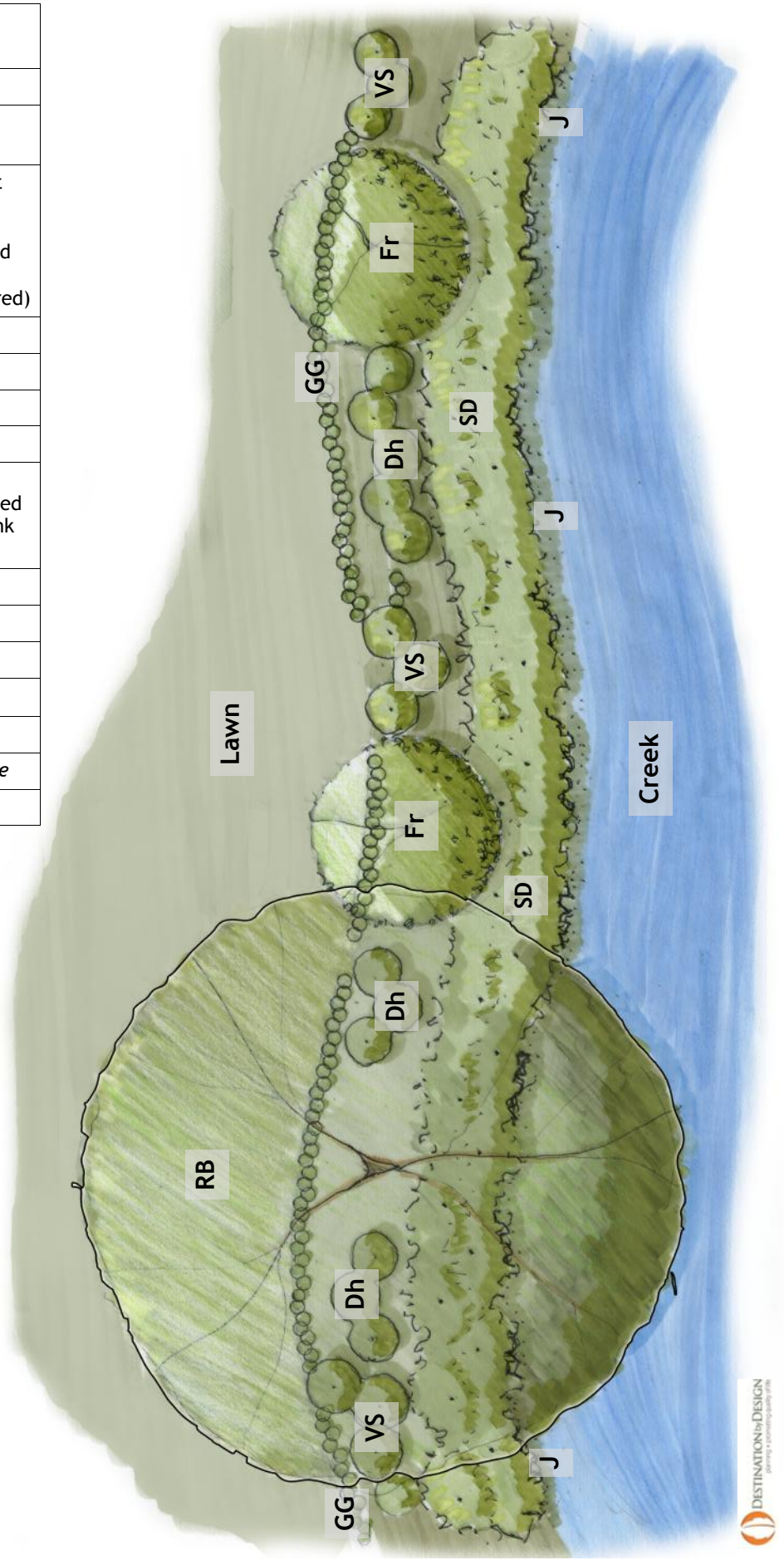
Buying Livestakes in NC

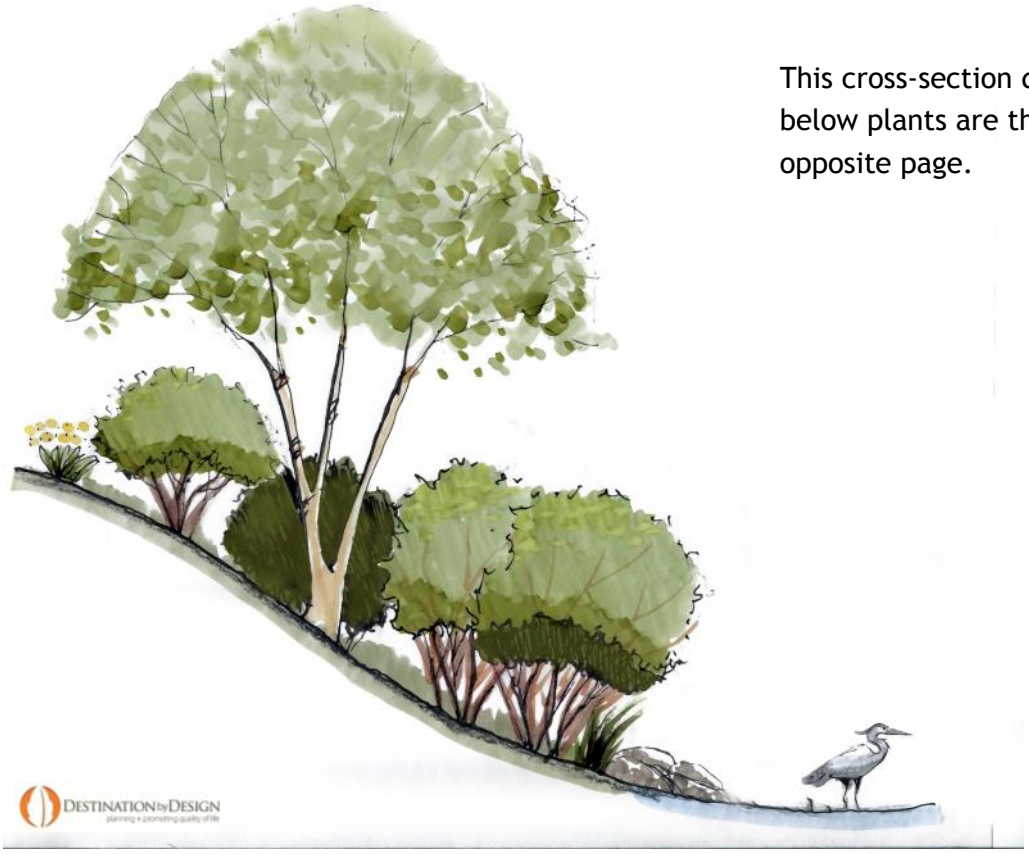
- **Carolina Wetland Services, Inc.;** Charlotte, NC
  (704) 527-1177 www.cws-inc.net
- **Coastal Plain Conservation Nursery**; Edenton, NC
  (252) 482-5707 www.coastalplainnursery.com
- **Deerwood Nursery**; Zirconia, NC
  (828) 606-3625 www.deerwoodnursery.com
- **Foggy Mountain Nursery**; Creston, NC
  (336) 384-LEAF www.foggymtn.com
- **Lumber River Native Plants**; Gibson, NC
  (336) 601-8787 www.ncnativeplants.com
- **Mellow Marsh Farm**; Siler City, NC
  (919) 742-1200 www.mellowmarshfarm.com
- **Native Roots Nursery**; Clinton, NC
  (910) 385-8385 www.nativerootsnursery.com

Zone C) <u>Containers</u> (wet code = OBL, FACW, FAC, FACU, and UPL)

Type	Common name	Botanical name	Sun	Height x	Wet Code	Bloom Time	Bloom	D/E	Features
GROUNDCOVER	Allegheny Spurge	*Pachysandra procumbens*	P-S	6"	UPL	Mar-May	Wht	E	Fragrant
GROUNDCOVER	Green and Gold	*Chrysogonum virginianum*	P-S	1'x1.5'	UPL	May-Oct	Yel	D	Nectar producer
GROUNDCOVER	Dwarf Huckleberry	*Gaylussacia dumosa*	P	3"-15"	FAC	Spring-Summer	Wht	S	Rhizome spreader
PERENNIAL	Black-eyed Susan	*Rudbeckia hirta*	F-P	2'x1'	FACU	Jun-Oct	Yel	D	Birds love the seed in Fall, pollinators
PERENNIAL	Virginia Spiderwort	*Tradescantia virginiana*	P-S	3'x1.5'	FACU	May-Jul	Blu, Pur	D	Pollinators
SHRUB	Beautyberry	*Callicarpa americana*	P	6'x3'	FACU	Jun-Aug	Wht, Pnk	D	Fall clustered berries, bird
SHRUB	Wild Hydrangea, Sevenbark	*Hydrangea arborescens*	P	3'-6'	FACU	Jun-Aug	Grn, Wht	D	Fast growing, short -lived, suckers
SHRUB	Fothergilla	*Fothergilla major*	F-P	10'x9'	FACW	Apr-May	Wht	D	Fall leaves yellow, orange and red-purple
SHRUB	Winterberry	*Ilex verticillata*	All	15'X10'	FACW	Jun-Aug	Wht	D	Birds eat berries after they freeze a few times
SHRUB	Virginia Sweetspire	*Itea virginica*	All	6'X6'	OBL	Jun-Jul	Wht	D	Butterflies, birds, pollinators
SHRUB	Doghobble	*Leucothoe fontanesiana*	P-S	4'x5'	FACW	April-May	Wht, Pnk	E	Fragrant flowers produce good nectar; good amphibian cover
TREE	Downy Serviceberry	*Amelanchier arborea*	F-P	25'x15'	FAC	Mar-May	Wht, Pnk	D	Fall gold to red-orange, birds
TREE	River Birch	*Betula nigra*	F-P	70'x60'	FACW			D	Exfoliating bark; fast-grower, bird
TREE	Fringetree	*Chionanthus virginicus*	All	20'x20'	FAC	May	Wht	D	Fruit attracts birds
TREE	Persimmon	*Diospyros virginiana*	All	30'-60'	FAC	May-Jun		D	Birds, butterfly, pollinators
TREE	Carolina Silverbell	*Halesia carolina or H. tetraptera*	F-P	30'x15'	FAC	Apr-May	Wht	D	Pollinators
TREE	Witch Hazel	*Hamamelis virginiana*	F-P	30'x25'	FACU	Oct-Nov	Yel	D	Birds

Example Streambank Design 150’long x 20’ wide			
Key	**#**	**Plant Species**	**Spacing**
J	75	Rush	(3'x1'; plant every 2')
SD	30	Silky Dogwood	(15'x6'; plant every 10' at water's edge with a second row 3'-4' on bank staggered)
VS	10	Virginia Sweetspire	(6'x6')
Dh	11	Doghobble	(4'x5')
Fr	2	Fringetree	(20'x20')
RB	1	River Birch	(70'x60')
GG	150	Green and Gold	(1'x1.5'; two rows staggered at top of bank every 1.5')
Seed Mix Across Entire Site			
	Plant Species		
	Black-eyed Susan, *Rudbeckia hirta*		
	White Clover, *Trifolium repens*		
	Buckwheat, *Fagopyrum esculentum*		
	Partridge Pea, *Chamaecrista fasciculate*		
	Browntop Millet, *Urochloa ramosa*		





This cross-section depicts a gentle slope. The below plants are those found in the design on the opposite page.

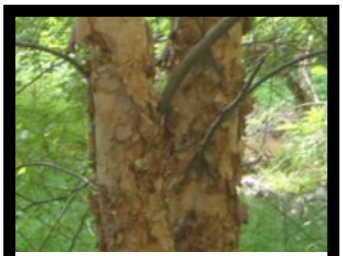
Fringetree

Rush

Green and Gold

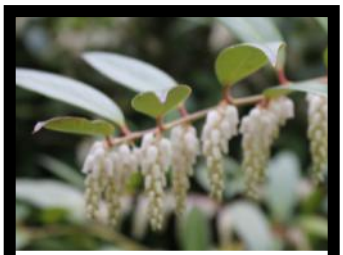
Silky Dogwood

Browntop Millet
© Jeff McMillian



River Birch

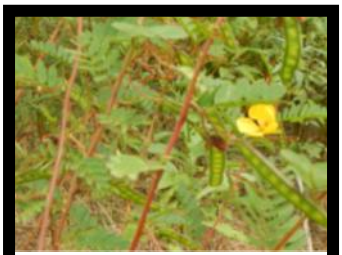
Virginia Sweetspire



Doghobble

White Clover
© Forest and Kim Starr

Buckwheat
© Koba Chan



Partridge Pea

Black-eyed Susan

Plant Expectations

In the first year, expect additional volunteer plants to grow. Learn to identify and decide whether to pull out or manage.

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.

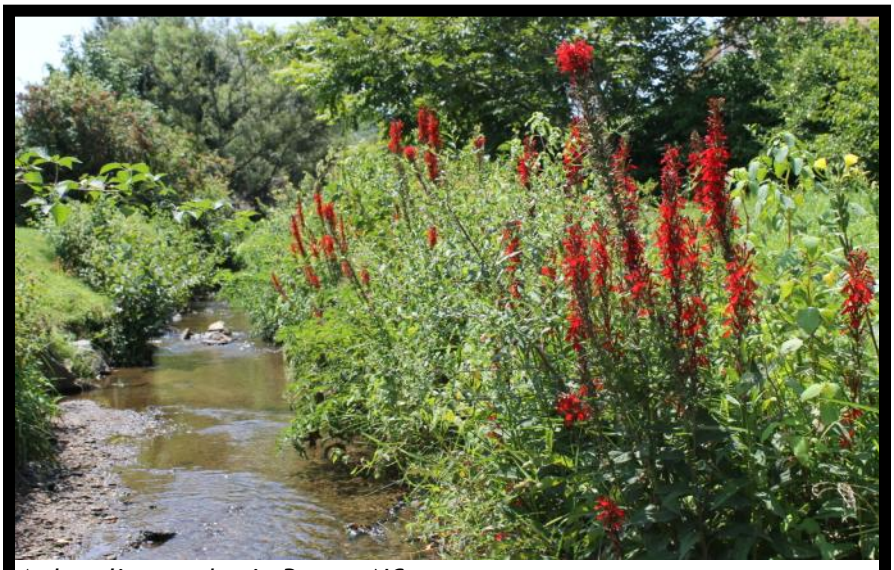
It may take a few seasons to a few years for plants to establish (grow beyond their root ball and not need 1" of water per week); depending on the plant.

Throughout the year sediment and debris may deposit on matting. It is okay to leave deposits in place as they often move on with another storm.

Soft Rush (Juncus effusus) and Jewelweed (Impatiens capensis, pictured above) will often come up along creek banks without planting. These two plants bend with river flows and stabilize banks at the water's edge.

Plant Selection

- **A Field Guide for the Identification of Invasive Plants in Southern Forests**
  http://www.srs.fs.usda.gov/news/456
- **Conservation Buffers: Design Guidelines for Buffers, Corridors, and Greenways.**
  http://www.bufferguidelines.net/
- **NC Native Plant Society**
  http://www.ncwildflower.org/
- **NC Forest Service, Urban and Community Forestry**
  http://ncforestservice.gov/Urban/Urban_Forestry.htm
- **North American Digital Flora: National Wetland Plant List**
  http://wetland_plants.usace.army.mil/
- **Riparian Vegetation Resource List (NCSU Stream Restoration Program website)**
  http://www.ncsu.edu/srp/riparian.html



A shoreline garden in Boone, NC.

Step 5: Maintaining Your Shoreline Garden

The best care is the least care when it comes to a stream buffer. Resist the urge to tidy up. Here are some typical maintenance suggestions.

☐ Install deer and beaver guards to protect plants from wildlife browsing for the first couple of years.

☐ Initial fertilization / liming - get a soil test to determine what the soil needs are.

☐ Visit streambank at least seasonally.

- ☐ Spring
- ☐ Summer
- ☐ Fall
- ☐ Winter

☐ Pick up litter and trash as it will most likely wash down from upstream.

☐ Observe plant survival rates to determine what needs to be replanted.

☐ Observe and ID invasive plants to determine your eradication management plan. If you keep up with what is supposed to be there, and get rid of what's not on your list, it will make for much easier maintenance in the future.

☐ Prune only as needed for future health of the tree. The object is to build a strong, below ground, root system to protect bank integrity and allow a dense canopy to shade the stream. If a large tree threatens to fall from a steep bank, you can cut the tree 10’ above the ground surface, and leave the root system in place. The “snag” that remains on the streambank will provide a great home for wildlife.

☐ Mowing - while not always needed or required, could be mowed at 6” once plants are established. This should be done in late Fall but watch for trees and shrubs (be very careful not to hit planned vegetation with weed eater as this will scar it and open the door to future disease and early plant death).

☐ Inspect after large rain events or flooding. Repair small eroded spots before they get worse. If large woody debris is going to dam the creek and cause inundation, remove a 2’ piece out of the log so water can flow through but leave the rest for fish habitat.

☐ Succession happens so eventually perennials will thin out due to shade from trees and shrubs.

Helpful tip: Google pictures of what was planted by season, so you know what you've got and don't accidentally cut down good vegetation!

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