

Riparian Buffer Establishment in Urban Watersheds

Chris Tinklenberg, PWS – Kimley-Horn
Fort Mill, South Carolina

Jacey Meador – City of Charlotte
Charlotte, North Carolina



Kimley»Horn



What comes to mind when you hear the term “Stream Restoration?”



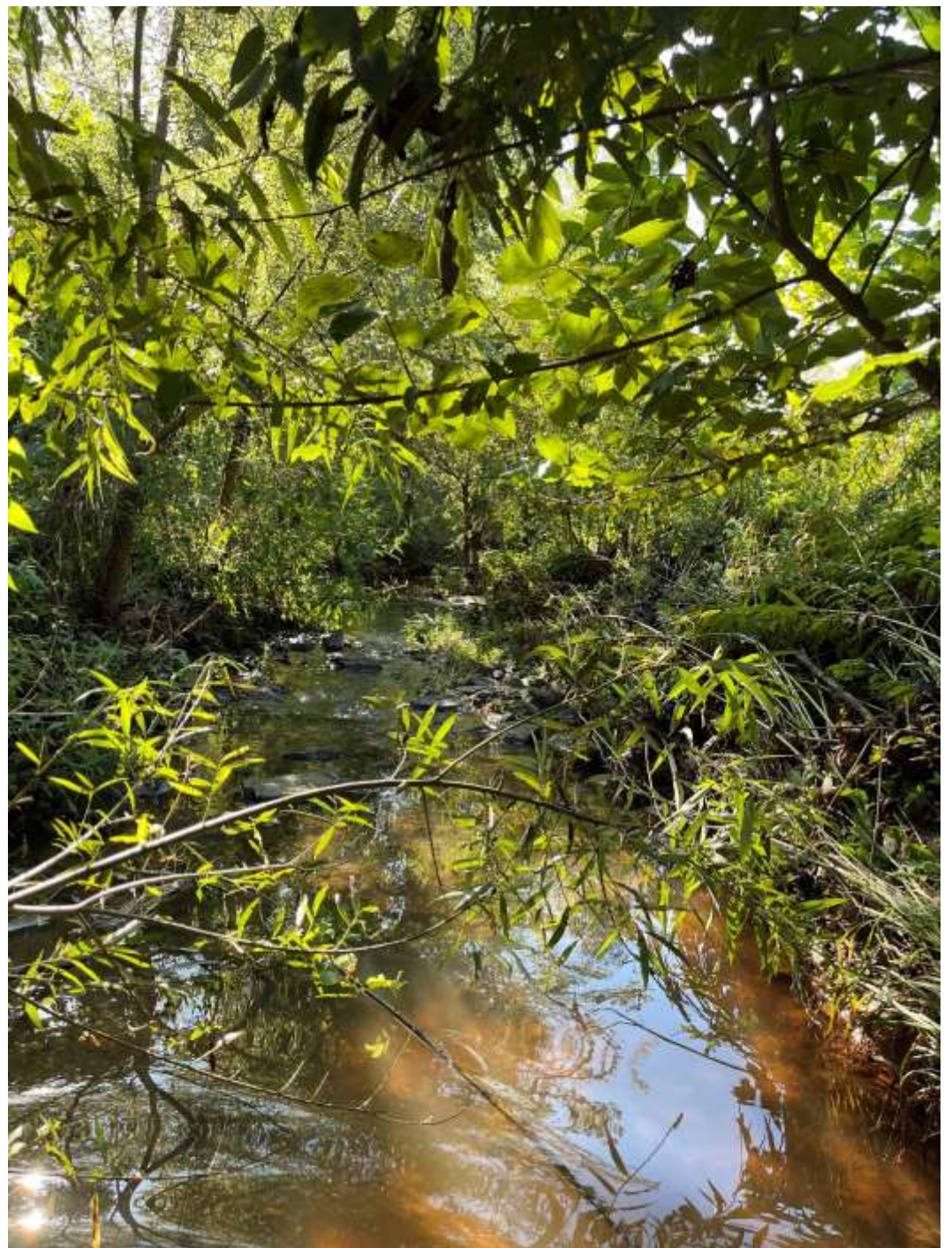
What comes to mind when you hear the term “Stream Restoration?”



**When
do vegetation
and riparian
buffers come to
mind?**



Presentation Goals



Riparian Buffers

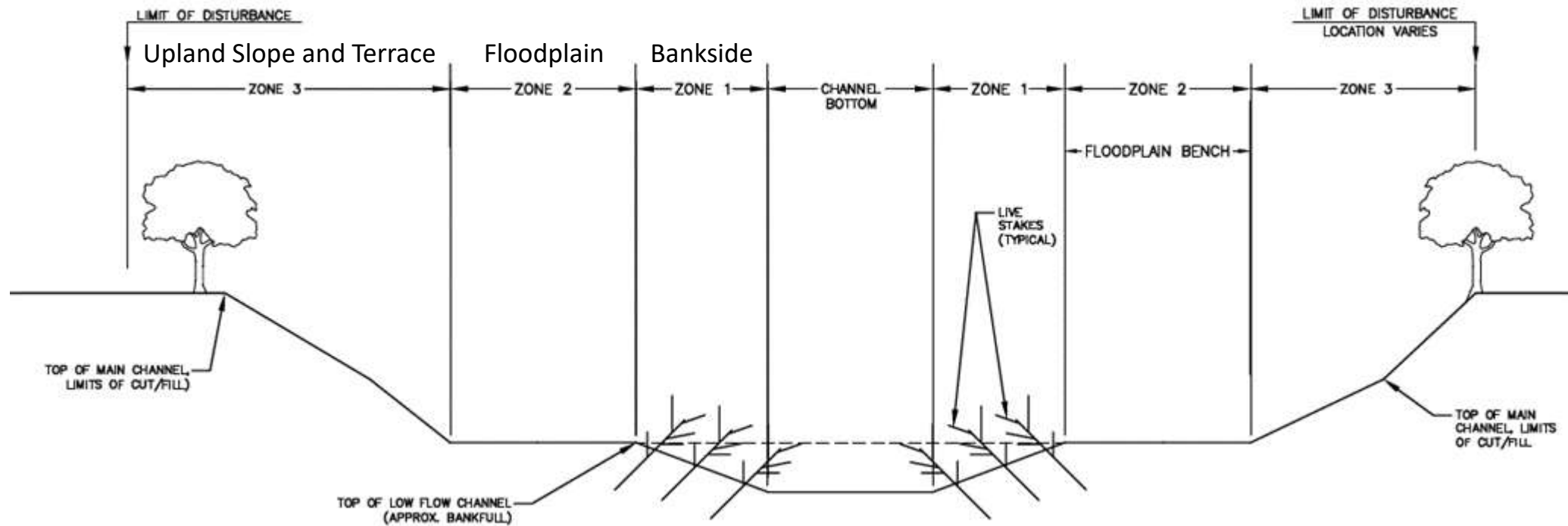


Why are they important in an Urban environment?

Ecological uplift

- Stabilizes and protects the restored stream and structures
- Reduces flooding and erosion in a flashy urban system
- Provides habitat for terrestrial wildlife
- Helps restore aquatic habitat
- Encourages biodiversity

Stream Zones and Typical Veg Plan



- How do we apply this in an Urban environment?
- Should we be using one standard for every project or customize to each site?

Stream Zone/Habitat Type: Bankside Areas

- Areas directly adjacent to the wetted stream channel
- Woody species planted as livestakes at high density
- Herbaceous species planted as plugs
- Restoration Concerns
 - Flood flows
 - Slow/weak root networks = bank failure

TYPICAL WOODY SPECIES

Black and Carolina willow

Silky dogwood

Elderberry

Alder

TYPICAL HERBACEOUS SPECIES

Soft rush

Sedges

INVASIVE SPECIES

Porcelainberry

Kudzu

Japanese hops



Stream Zone/Habitat Type: Floodplains

- Areas beyond bank slopes but within flood prone areas
- Typical woody species, planted as a mix of bare root, containerized, and ball and burlap
- Typical herbaceous species as riparian seed mix
- Restoration Concerns
 - Drought
 - Soil compaction
 - Bare root shading by herbaceous layer
 - Beavers

TYPICAL WOODY SPECIES

Box elder

River birch

American sycamore

Cottonwood

TYPICAL HERBACEOUS SPECIES

Beggar's tick

Jewelweed

River oats

Partridge pea

INVASIVE SPECIES

Chinese/Japanese privet

Autumn/Russian olive

Japanese knotweed

Oregon-grape

Multi-flora rose

Microstegium





How do we apply typical planting plans in an Urban Environment?

Urban Challenges

- Power lines
- **ROW**
- Property boundaries
- **Encroachments**
- Development
- Flashy systems
- Urban impacts on soil development
- **Storm water outfalls**
- **Multi-purpose land use**
- **Valley constraints**
- **Invasive species**



Stormwater outfall encroachment from a new development



Solutions to Urban Challenges

Challenges	Solutions
Overhead utilities(electric)	Vary woody species planted based on maximum allowable tree heights
Underground utilities (gas, water/sewer)	Remove woody species from plans, choose hardy herbaceous species, add pollinators that provide stability, coverage and diversity even when mowed
Encroachments (aesthetic)	Consider aesthetics along boundaries to appease property owners and discourage unwanted maintenance. Choose more functional (pretty or edible plants) that people can enjoy. Ex. Persimmon, Dogwood
Encroachments (other)	After encroachments are resolved, choose new plants carefully for the previously disturbed area. Ensure aesthetics and diversity are intact
Flashy hydrology	All plants need to be planted prior to releasing a contractor or considering a site complete. The right plants strengthen the banks against erosion and stabilize it early on to prevent warranty (or non-warranty) repairs

Specific Solutions to Erosion



Extend planting season for toe of slope protection...

Utilize tubelings of the same species used for live stakes.

Benefits:

- Provides woody root protection, at the toe of the slope, up to 8 months earlier.
- Extends “live stake” planting season beyond dormant season.

Limitations:

- Use near water's edge in place of first row of live stakes; roots must stay wet!
- Expect it to cost a little more, but it is well worth the investment!



For more information ask HARP!

Specific Solutions to Erosion and Monocultures



Historic Stewart Creek Phase 3 – Charlotte NC
Tubelings installed in June 2023
Photos taken August 1, 2023



How to Adapt and Prioritize Planting Plans



- Pre-construction:
 - Identify existing invasive species
 - Walk the site with a vegetation expert and identify appropriate vegetation communities, species, and expected growing environments
 - Create vegetation management plan
- During construction:
 - Prep soils
 - Obtain a right of entry on PO property to treat invasives outside the LOD
 - Walk the site with a vegetation expert
- Post-construction:
 - Treatment plan in place
 - Walk the site with a vegetation expert and adapt planting plan where needed



City View

- Watershed primarily consists of highway, light industrial, and parking lots
- Two stormwater outfalls along a single reach
- Bound by a culvert
- Adjacent sewer easements

Reach 1 - Zones A and B - Riparian Mix (20 lbs/acre)

Common Name	Scientific Name	Percent Mix
Blackeyed Susan	<i>Rudbeckia hirta</i>	20%
Soft Rush	<i>Juncus effusus</i>	10%
Fox sedge	<i>Carex vulpinoidea</i>	10%
Deertongue	<i>Panicum clandestinum</i>	8%
Partridge Pea	<i>Chamaecrista fasciculata</i>	10%
Pennsylvania Sedge	<i>Carex pensylvanica</i>	5%
Redtop Panicgrass	<i>Panicum rigidulum</i>	5%
River oats	<i>Chasmanthium latifolium</i>	5%
Broomsedge	<i>Andropogon virginicus</i>	5%
Golden Tickseed	<i>Coreopsis tinctoria</i>	5%
Little Bluestem	<i>Schizachyrium scoparium</i>	5%
Riverbank Wildrye	<i>Elymus riparius</i>	2%
Switchgrass	<i>Panicum virgatum</i>	2%
Sideoats Grama	<i>Bouteloua curtipendula</i>	4%
Blue Grama	<i>Bouteloua gracilis</i>	4%

Reach 3 - Zones A and B - Riparian Mix (20 lbs/acre)

Common Name	Scientific Name	Percent Mix
Blackeyed Susan	<i>Rudbeckia hirta</i>	6%
Deertongue, 'Tioga'	<i>Panicum clandestinum</i>	12%
New England aster	<i>Aster novae-angliae (Symphyotrichum n.)</i> , PA Ecotype	3%
Soft Rush	<i>Juncus effusus</i>	6%
Virginia Wildrye	<i>Elymus virginicus</i> , AR Ecotype	15%
Riverbank Wildrye	<i>Elymus riparius</i> , PA Ecotype	15%
Gray Goldenrod	<i>Solidago nemoralis</i> , VA Ecotype	3%
Little Bluestem, 'Camper'	<i>Schizachyrium scoparium</i> , 'Camper'	12%
Redtop Panicgrass	<i>Panicum rigidulum</i> , Coastal Plain NC Ecotype	12%
Partridge Pea	<i>Chamaecrista fasciculata</i> , PA Ecotype	5%
Narroleaf Mountainmint	<i>Pycnanthemum tenuifolium</i>	3%
Purple Coneflower	<i>Echinacea purpurea</i>	5%
Sensitive Fern	<i>Onoclea sensibilis</i>	3%

Zone C - Sewer Easements (15 lbs/acre)

Common Name	Scientific Name	Percent Mix
Sideoats Grama	<i>Bouteloua curtipendula</i>	25%
Blue Grama	<i>Bouteloua gracilis</i>	25%
Little Bluestem	<i>Schizachyrium scoparium</i>	15%
Partridge Pea	<i>Chamaecrista fasciculata</i>	10%
River oats	<i>Chasmanthium latifolium</i>	8%
Blackeyed Susan	<i>Rudbeckia hirta</i>	8%
Redtop Panicgrass	<i>Panicum rigidulum</i>	5%
Purpletop	<i>Tridens flavus</i>	2%
Rough Dropseed	<i>Sporobolus clandestinus</i>	2%

Zone A - 3' on center

Common Name	Scientific Name	Distribution	Spacing
Silky Willow	<i>Salix sericea</i>	30%	Live Stake
Silky Dogwood	<i>Cornus amomum</i>	30%	Live Stake
Elderberry	<i>Sambucus canadensis</i>	10%	Live Stake
Black Willow	<i>Salix nigra</i>	5%	Live Stake
Tag Alder	<i>Alnus serrulata</i>	25%	Tubeling

Zone B - 8' to 12' on center (Tubelings)

Silky Dogwood	<i>Cornus amomum</i>	10%	Tubeling
Spicebush	<i>Lindera benzoin</i>	10%	Tubeling
River Birch	<i>Betula nigra</i>	10%	Tubeling
Eastern Redbud	<i>Cercis canadensis</i>	10%	Tubeling
Inkberry	<i>Ilex glabra</i>	10%	Tubeling
Willow Oak	<i>Quercus phellos</i>	10%	Tubeling
Sycamore	<i>Plantanus occidentalis</i>	5%	Tubeling
Button Bush	<i>Cephalanthus occidentalis</i>	5%	Tubeling
Red Chokeberry	<i>Aronia arbutifolia</i>	5%	Tubeling
Red Oak	<i>Quercus falcata</i>	10%	Tubeling
Shagbark Hickory	<i>Carya ovata</i>	5%	Tubeling
Yellow Poplar	<i>Liriodendron tulipifera</i>	5%	Tubeling
Persimmon	<i>Diospyros virginiana</i>	5%	Tubeling

Zone A - Woody Stems (Ball and burlap, 1-3 gallon)

Common Name	Scientific Name	Distribution	Spacing
American Sycamore	<i>Platanus occidentalis</i>	23%	40'
Willow Oak	<i>Quercus phellos</i>	8%	40'
River Birch	<i>Betula nigra</i>	13%	40'
Tulip Poplar	<i>Liriodendron tulipifera</i>	8%	40'
Tag Alder	<i>Alnus serrulata</i>	18%	20'
Red Chokeberry	<i>Aronia arbutifolia</i>	5%	20'
Hearts-a-burstin'	<i>Euonymus americanus</i>	5%	20'
Horse Sugar	<i>Symplocos tinctoria</i>	4%	20'
Winterberry	<i>Ilex verticillata</i>	4%	20'
Common Pawpaw	<i>Asimina triloba</i>	4%	20'
Spicebush	<i>Lindera benzoin</i>	4%	20'
Southern Arrowwood	<i>Viburnum dentatum</i>	4%	20'



la
ve
al

Summary

- Vegetation should be prioritized during design and construction.
- Treating invasives pre-construction, during construction, and post-construction will help set up the project for future success.
- Evaluate the species naturally occurring before design. Consider seed banks and do not include them in the planting plan.
- Partner with vegetation experts! Walk the site pre-, during, & post-construction.
- Be flexible and adaptable to specific site conditions. The planting list is a great place to start, but make sure the planting contractor is knowledgeable and can provide appropriate suggestions based on a site evaluation.
- Urban environments have many challenges: ROW limits, PO input, steep slopes, and smaller zones; these challenges need to be thought through when designing the planting plan – species and size of plants. Steep slopes might be in a design spec and the plants need to be adapted to site conditions, not only going off the "zone" specs.
- Be open to adding in more diversity of plants. A great place to do this is in ROW or in the riparian mix. Add more pollinator species that bloom at different times of the year.

