Riparian Zone Protocol: A Necessary Addition to an Existing Program

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NATURE, VIRGINIA'S ECONOMY, AND THE CLIMATE THREAT

Abstract

As temperature trends increase on Earth and the negative effects of anthropogenically driven climate change become clearer, the diversity and health of our natural resources continue to be threatened at a growing rate. Riparian zones, or streamside zones, are one of these natural resources that under normal conditions, provides an enormous variety of ecosystem services. Not only do they provide habitat, food, and shelter for organisms in the area, but they also act as biological and physical buffers to pollution and sedimentation. Climate change threatens the health of this natural buffer. As temperatures increase, the patterns of the season change causing abnormal flooding and drying, which both can be detrimental to the ecosystem (National Park Service, 2006). In the face of this problem, it will become necessary to consider what we plant and where in order to mitigate the effects of temperature change and choose appropriate species that will still be able to carry out ecosystem services (Kane et al. 2013). Virginia should add a riparian zone protocol to the Adopt-a-Stream program run by the Virginia Department of Conservation and Recreation to assist in the migration of plants, as well as restore existing resilient species and those plants that do well with invasive species. Volunteers can choose between planting in the riparian zone and submitting reports of the species they find to program coordinators. The protocol is designed to honor the financial needs of volunteers while giving them the necessary guidelines to collect useful and usable data for future use.

Climate Change and the Riparian Zone

•The riparian zone, "is the interface between terrestrial and aquatic ecosystems...they encompass sharp gradients of environmental factors, ecological processes, and plant communities" (Gregory et al. 1982)

•Prevent mass erosion and flooding, provide habitat and food for both terrestrial and aquatic organisms, create microclimates by providing shade or blocking wind, and act as passages or corridors for organisms on the move (Naiman and Decamps 1997)

•Plants and soil especially important because they provide waterways with physical and chemical barrier to sediments as well as excess nutrients and pollution (Naiman and Decamps 1997)

•Changing climate and increasing temperatures threaten the ability of this part of Virginia's ecosystems to function healthily and properly

Figure 1. View of Tyler Hanes Commons and the bare edges of the Westhampton Lake. Even on our campus we must consider the possible impacts of a weak riparian zone on our local water quality (Richmond 2012)

Climate change poses an enormous threat to the health of the riparian zone. The US National Fish and Wildlife Service reports that warmer temperatures will increase the transfer of compounds like ammonia and mercury from the water to the atmosphere as well as increasing the potency of algal blooms (Tillmann and Siemann 2007). Changes in temperature can also impact the cycles, as well as the amount, of freezing and melting of snow which alters the width and character of stream channels and the erosion of stream banks.

Temperature directly influences how plants retain and release oxygen and water in their leaves and increases in temperature will speed the rates of evaporation of surface water as well as the rates at which plants lose water through transpiration. Organisms will also be forced to migrate to more northern latitudes to find temperatures that are more suitable for their needs. This process will be especially difficult for plants which are essential for the success of an ecosystem (Tillmann and Siemann 2007).

Species to Watch

Native Species Against Invasive Species:

•The VADCR currently recommends that native species be planted as a way to fight off invasive ones. Reports suggest that 90 invasive plant species threaten Virginia's biodiversity and cost the state up to one billion dollars.
•EX: Hardwood trees can survive in the presence of invasive grasses.
- Chinese Silver Grass and Rough Bluegrass vs Black Walnut and Shagbark Hickory

Riparian Species:

•*Common Trees of Virginia Identification Guide*, Virginia Department of Forestry
•Includes herbaceous plants, ferns and fern allies, grasses, sedges, and reeds, vines, shrubs, small trees, and medium to large trees
•Suggestions include White Aster (*Aster umbellatus*), the Virginia Wild Rye grass *(Elymus virginicus*), and the American Beautyberry shrub (*Callicarpa americana*)

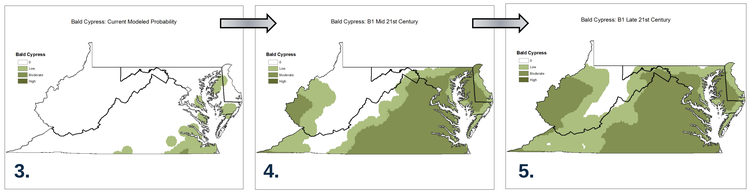
Recommended Uses	Native Regions	Minimum Light Requirements	Riparian Vegetation Zones
W = Wildlife	M = Mountains	S = Full Shade	1 = Emergent
H = Horticulture and Landscaping	P = Piedmont	P = Partial Sun	2 = Riverside Thicket
C = Conservation and Restoration	C = Coastal Plain	F = Full Sun	3 = Saturated Thicket
D = Domestic Livestock Forage			4 = Well-drained Forest

Figure 2: Native riparian plant key published by the Virginia Department of Conservation and recreation (VADCR)

Special Focus on Assisted Migration

- *Virginia Climate Action*, consider how the changing climate will impact the ranges of species over time

•Special interest in Bald Cypress (*Taxodium distichum*)…"currently found within Virginia's coastal plain, south of the James River...occurs along wet stream banks…By mid-century, both the lower and higher emissions scenario models project lowlands throughout Virginia could be climatically suitable for bald cypress based on temperature and precipitation related factors" (Kane et al. 2013)



Figures 3-5: Climate models show the increasing range of the Bald Cypress, a tree that does remarkably well in riparian zones. Type 1 volunteers should be especially encouraged to purchase this species as part of their Adopt-a-Stream efforts (Kane et al. 2013)

Riparian Zone Protocol

Adopt-a-Stream:

- Began in 1998
- Program run through the VA Department of Conservation and Recreation
- Use existing framework, add mandatory riparian component
- Originally designed to get volunteers to pick up trash
- Minimum two year commitment
- Some equipment such as bags and gloves can be borrowed from the State

Type I	Type II
Responsibilities: • Choose from recommended list of species to plant and maintain in designated area. • Can choose to take on responsibilities of Type II	**Responsibilities:** • Maintain detailed records of species within designated area and report back to the VADCR. • Can choose to take on responsibilities of Type I
Structure: •No minimum or maximum amount of species will be required to plant as part of the type I model •Designed as a way to honor financial needs of volunteers and not deter them from being a part of the program •Structure will ensure that invasive species are not planted. Purchase or planting of species not on the approved list will be allowed.	**Structure** •Volunteers must submit reports to the Adopt-a-Stream program at least 4 times per year (once per season). They are not limited to this number and will be encouraged to submit more than 4 reports. •Designed as a way to collect data representing trends over a whole year rather than submitting 4 reports that only represent the riparian zone during a single season.

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