



Riverbanks, shorelines, riparian buffers, and river habitat are critically important when planning any riverfront project.



# Natural

## River Edges



### DEFINITIONS

#### Riparian buffer

A permanent naturally vegetated area located adjacent to a stream, river, lake, pond or wetland.

#### Morphology

Deals with the form of living organisms, and with relationships between their structures.

#### Hydrology

Encompasses the occurrence, distribution, movement, and properties of the waters of the earth and their relationship with the environment within each phase of the hydrologic or water cycle.

#### Permaculture

A system of cultivation intended to maintain permanent agriculture or horticulture by relying on renewable resources and a self-sustaining ecosystem.

### Intent

Riverbanks, shorelines, **riparian buffers**, and river habitats are critically important when planning any riverfront project. Other important components of ecosystem function that should be considered include geology, **morphology**, **hydrology**, and land cover. Along the river, there are many opportunities for integrated regenerative design, stormwater management, habitat restoration, public access, stewardship, and redevelopment.

### Key Concepts

#### BUFFER TYPOLOGY 1

#### Dense Urban Development Buffer Zone

In a dense urban development, a buffer zone should include design and development techniques that will provide and enhance the following: integrated green infrastructure, stormwater management practices, improved trail access, improved habitat corridor with increased vegetative types such as meadows and transitional woodlands, as well as increased tree canopy, open space amenity, integrated design of waterfront access and hardscape elements, marina access, and provision of ecosystem services.

#### BUFFER TYPOLOGY 2

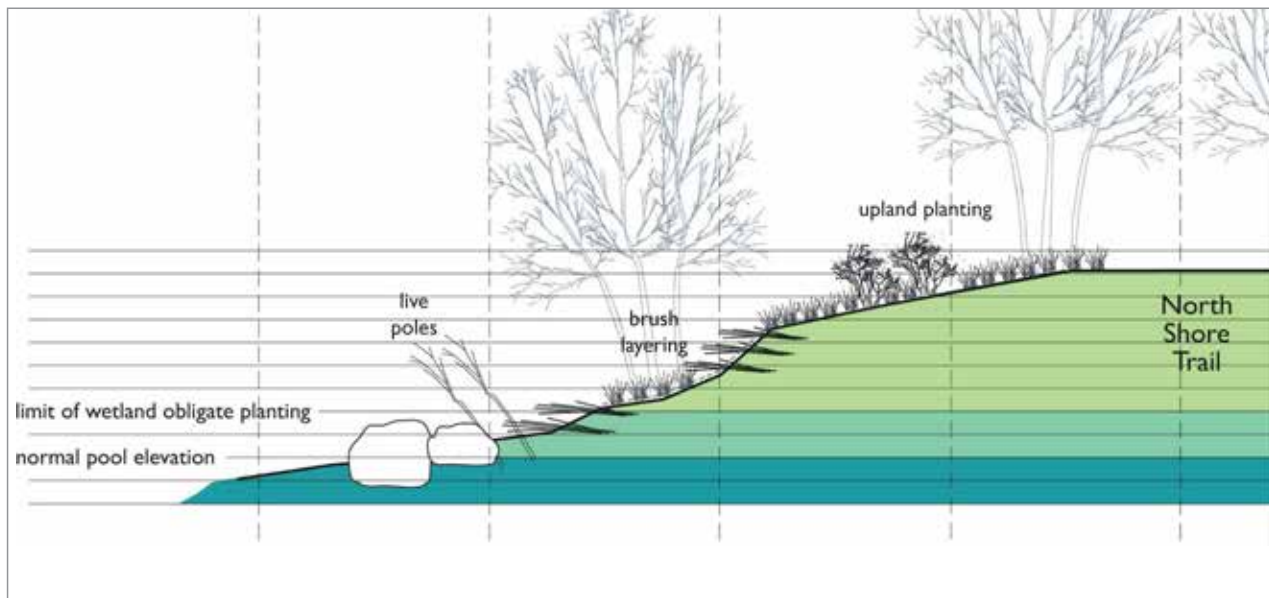
#### Mixed Industrial and Residential Buffer Zone

In a residential or mixed light industrial development, a buffer zone should include design and development techniques that will provide and enhance the following: provision of ecosystem services; integrated green infrastructure; ecological restoration; stormwater management practices; improved public trail access; improved and widened habitat corridors; open-space and recreational amenities, including low-impact water (kayak) access; environmental education opportunities integrated with neighborhoods and schools and **permaculture** and regenerative landscapes.

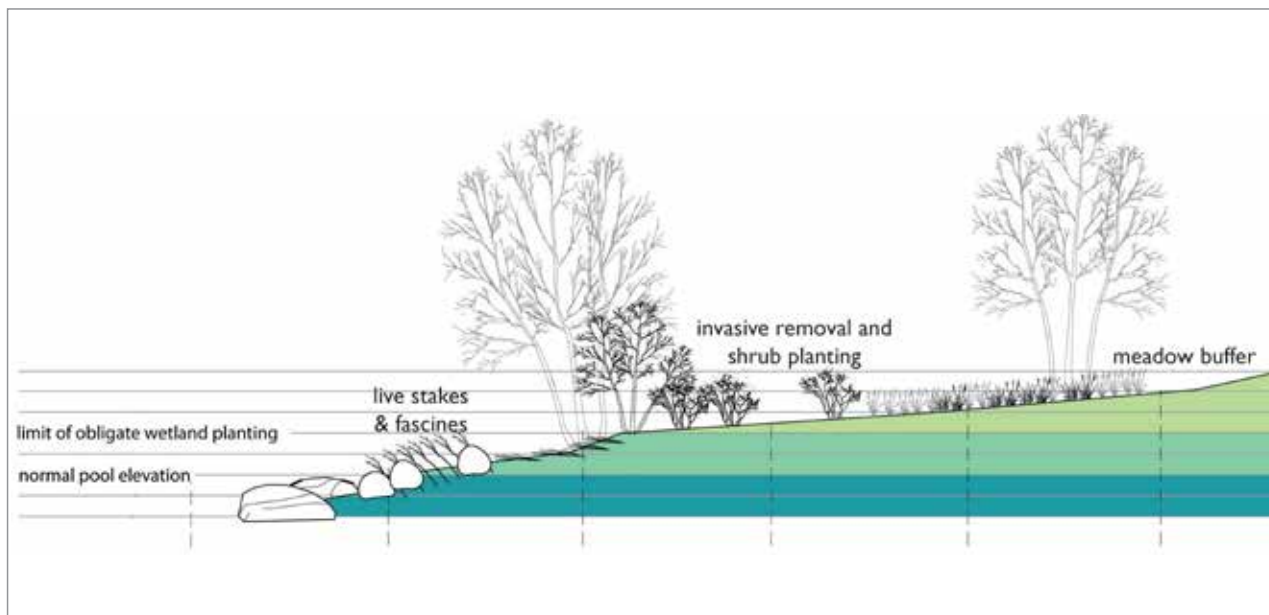


## Ecological Conservation and Open-Space Buffer Zone

For open spaces along the river, a buffer zone should include design and development techniques that will provide and enhance the following: provision of ecosystem services, ecological restoration, conservation and improvement of biodiversity, increased habitat corridor potential, improved public trail access, open-space amenities, and environmental education.



Typical river section showing steep bank stabilization underneath fairly continuous layer of canopy trees. Andropogon 2006



Typical shallow bank stabilization with invasive management. Andropogon 2006

## Guidelines

### Recommended for Open-Space Buffer Typologies

Taken from: The Montgomery County, Pa., Guide for Riparian Corridor Conservation

#### DEFINITIONS:

##### Riparian buffer

A permanent naturally vegetated area located adjacent to a stream, river, lake, pond or wetland.

- 1.1 The wider the **riparian buffer**, the more benefits it provides in terms of wildlife habitat, water temperature modulation, protection from nonpoint sources of pollution, flood mitigation, sediment removal, and bank stabilization.
- 1.2 The **riparian buffer** should be no less than 75 feet at its narrowest, with three zones of buffer from the stream edge inland.
  - 1.2a The first zone should be undistributed forest to provide food, shade for the water body, and slope stability.
  - 1.2b The second zone should consist of managed woodland that allows for infiltration, filtration of sediment and nutrients and nutrient uptake by plants.
  - 1.2c The buffer area on the upland side should include a sheet flow of rainwater runoff to maximize vegetative and soil contact with the runoff.
- 1.3 The riparian corridor should be uninterrupted, helping to reduce the concentrated flows to the water body and providing continuous habitat for birds and other wildlife species that require undisturbed access to food, shelter and water.
- 1.4 Trees are the most important element in a riparian corridor for removing nutrients, stabilizing the soil, modifying water temperature and providing food for aquatic organisms.
- 1.5 Recreation in the buffer should be balanced with the effects this will have on existing features, especially in terms of excess nutrients, contaminants and chemicals, including pesticides, fertilizers, and herbicides.

#### FURTHER INFORMATION

*Riparian Buffer Width, Vegetative Cover, and Nitrogen Removal Effectiveness: A Review of Current Science and Regulations*

*Riparian Buffers: What Are They and How Do They Work?*

*Riparian Buffer Issue Paper No. 2: Buffer Width*

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In an urban setting, such as Buffer Typology 1, there are likely to be great variations on river edge condition that may prohibit developing deep buffers due to the topography and the slope of the site. A true riparian buffer in an urban environment will be costly and difficult to achieve. In these cases, it is recommended that natural systems are restored to the best possible state while incorporating recreational amenities along the rivers.