Riparian/Forested Buffer

Photo Source: NRCS

Practice Description

Riparian buffers are natural or constructed ecosystems along a shoreline, wetland, or stream where trees, grasses, shrubs, and herbaceous plants filter pollutants from stormwater runoff and shallow groundwater flow prior to discharge to receiving waters. Buffers are designed to remove sediment and other insoluble contaminants from runoff, to allow increased time for infiltration of soluble nutrients and pesticides, and to protect aquatic habitat by providing shade to watercourses to help maintain temperature norms and sound barriers to or from outside areas. Buffer zones also provide natural visual aesthetics for all land disturbance activities. Where natural buffer zones are not present or are inadequate, artificial buffer zones may be engineered using silt fences, diversions, vegetative practices and other BMPs. For additional information on Stream Protection, review the final section of Chapter 4 of Volume 1.

There are three primary types of buffers: water pollution hazard setbacks, vegetated buffers, and engineered buffers. Water pollution hazard setbacks are areas separating potential pollution hazards from waterways. Vegetated buffers are natural areas that divide land uses or provide landscape relief. Engineered buffers are specifically designed to treat stormwater before it enters streams, lakes, or wetlands.

Planning Considerations

Buffers can be applied to new development through the establishment of specific preservation areas and by sustaining management through easements or community

associations. For existing developed areas, an easement may be needed from adjoining landowners. A local ordinance can help set specific criteria for buffers to achieve stormwater management goals.

Buffer zones will vary depending on location and application. In some cases, their water quality objectives may be combined with a screening function for the noise and visual pollution of construction activities. Separate criteria will apply for various forms of land-disturbing activities:

1. Activities adjacent to a perennial stream or permanent water body
2. Silvicultural operations
3. Construction or other land-disturbing activities
4. Agricultural activities

The State of Mississippi does not require formal designs or plans for buffers except in the case of activities adjacent to a permanent water body, in which case a description of the water body, slope of adjacent land, and erodibility of soils in the area will be provided to support buffer zone width selection. If an artificial buffer zone is required, pertinent design information will be provided.

Design Criteria

For optimal stormwater treatment, the following buffer designs are recommended. The buffer should consist of three lateral zones: a stormwater depression area leading to a grass filter strip that, in turn, leads to a forested buffer. The stormwater depression is designed to capture and store stormwater during smaller storm events and bypass larger storm flows directly into a channel. Runoff captured within the stormwater depression can then be spread across a grass filter designed for sheet flow conditions. The grass filter then discharges into a wider forest buffer designed to have zero discharge of surface runoff to the stream or full infiltration of sheet flow.

In general, a minimum width of at least 150 feet is recommended to provide adequate stream protection. The three-zone buffer system, consisting of inner, middle, and outer zones, is an effective technique for establishing a buffer. The zones are distinguished by function, width, vegetative target, and allowable uses.

- The inner zone protects physical and ecological integrity. It consists of a minimum of 25 feet plus wetland and critical habitats. The vegetative target consists of mature forest. Its allowable uses are restricted to flood controls, utility rights-of-way, footpaths, etc.
- The middle zone provides distance between upland development and the inner zone. It is typically 50 to 100 feet depending on stream order, slope, and 100-year floodplain. The vegetative target for this zone is managed forest. Usage is restricted to some recreational activities, some stormwater BMPs, and bike paths.

– The outer zone is the first zone to encounter runoff. It functions to prevent encroachment while slowing and filtering backyard runoff. The outer zone's width is at least 25 feet and, while forest is encouraged, turf-grass can be a vegetative target. The outer zone's uses are unrestricted. They can include lawn, garden, compost, yard wastes, and most stormwater BMPs ("Riparian Buffer," USEPA 2006).

Construction and Installation

General

Runoff from the disturbed areas should not be channeled into the buffer zone, but rather allowed to spread out over the entire buffer zone length. For concentrated flows, a level spreader may be required to allow for the proper functioning of the buffer zone.

Where a natural buffer zone is not available, or the required zone width is not attainable, provide flow barriers such as diversions, sediment traps, vegetative planting, and silt fences as needed.

Construction or Other Land-Disturbing Activities Adjacent to a Perennial Stream or Permanent Water Body

This represents the most stringent requirement that applies to buffer zones. At a minimum, a 150′ buffer zone will be left between the land disturbance activity and a water body. The buffer zone width may be greater than 150′ depending upon the soil type and slope of adjacent land.

Buffer Zones Adjacent to Permanent Water Bodies

Soil Erosion Hazard	Recommended Buffer Zone Width (Ft) (% Slope)		
	30	40	50
Slight			155
Moderate		170	200
Severe	170	210	250

**** Refer to County Soil survey for erosion hazard. MS Forestry Commission's Mississippi BMPs Handbook states that distances should be doubled for disturbed areas in municipal watersheds.**

Silvicultural Operations

Buffer zone requirements will adhere to the guidance provided by the Mississippi Forestry Commission (MFC) for silvicultural Best Management Practices including Streamside Management Zone and Filter Strip. For areas not adjacent to a permanent water body, a buffer zone of 15′ will be maintained on the perimeter of all silvicultural operations adjacent to property boundaries and public rights-of-way.

Construction or other Land-Disturbing Activities

For areas not adjacent to a permanent water body, a buffer zone of 15′ will be maintained on the perimeter of the construction site. This buffer zone will:

1. Reduce runoff velocities.
2. Filter sediment from runoff.
3. Act as a screen for "vision pollution."

4. Reduce construction and adjacent noise levels.
5. Reduce dust problems.
6. Improve the aesthetics of the area.

This type of buffer zone may be crossed by construction entrances, utilities construction, etc., but where natural vegetation is removed for these purposes, artificial buffer zone measures should be installed (e.g. construction entrance BMP, silt fence, diversion, etc.).

These post-construction measures should be incorporated into the design of the final post-construction landscape providing a permanent green strip on the perimeter of the completed project.

Common Problems

The table below describes some common obstacles to the best performance of riparian buffers at removing pollutants from stormwater and the design factors that can enhance their performance.

Factors that Enhance/Reduce Buffer Pollutant Removal Performance
("Riparian Buffers," USEPA 2006)

Factors that Enhance Performance	Factors that Reduce Performance
Slopes less than 5%	Slopes greater than 5%
Contributing flow lengths <150 feet.	Overland flow paths over 300 feet
Water table close to surface	Ground water far below surface
Check dams/level spreaders	Contact times less than 5 minutes
Permeable but not sandy soils	Compacted soils
Growing season	Non-growing season
Long length of buffer or swale	Buffers less than 10 feet
Organic matter, humus, or mulch layer	Snowmelt conditions, ice cover
Small runoff events	Runoff events >2 year event.
Entry runoff velocity less than 1.5 feet/sec	Entry runoff velocity more than 5 feet/sec
Swales that are routinely mowed	Sediment buildup at top of swale
Poorly drained soils, deep roots	Trees with shallow root systems
Dense grass cover, 6 inches tall	Tall grass, sparse vegetative cover

Maintenance

An effective buffer-management plan offers many aesthetic, environmental, and recreational benefits but must be adequately managed to function properly. The initial design should include establishment, management, and distinctions of allowable and prohibited uses in the buffer zones. Buffer boundaries should be well defined and visible before, during, and after construction. Without clear signs or markers defining the buffer, its boundaries can become invisible to local governments, contractors, and residents. In some cases, these sites may even be used as dumping grounds for those unaware of their purpose of protecting water quality. Regular clean-up and landscape maintenance will ensure that riparian buffers remain an asset to the community and build public support for the continued use of riparian buffers as a stormwater management practice (NCDENR, 2007). Particular attention must be paid to buffers designed to capture urban stormwater runoff. These sites will require more maintenance if the first zone is designated as a bioretention or other engineered depression area ("Riparian Buffer," USEPA 2006).