



# Soil Facts

## *Agricultural Riparian Buffers*

In general, a riparian forest buffer system controls the stream environment.

### Buffers:

- Protect water resources from nonpoint source pollutants, such as sediment and nutrients.
- Moderate fluctuations in stream temperature.
- Control light quantity and quality in the stream.
- Enhance habitat diversity.
- Stabilize stream banks and modify channel morphology.
- Enhance food webs and species richness.

### Introduction

Natural riparian buffers are the grasses, trees, shrubs or other vegetation growing along streams. In North Carolina, natural riparian buffers are forested.

Many factors determine the effectiveness of riparian buffers in removing agriculturally derived pollutants. However, the most important factor is hydrology: how the water moves through or over the buffer.

Sediment and sediment-associated pollutants, such as phosphorus, bacteria, and some pesticides, move to surface waters almost exclusively by surface runoff. When surface runoff is sufficiently slowed, sediment will settle out. If the runoff water does not spread over the buffer, it will move through the buffer in channels. Channels allow water to move almost as quickly through a buffer as it does from the field, thereby making the buffer ineffective at pollutant removal.

Grass buffers should be used in the riparian buffer system because they are more effective than forests in spreading water and removing sediment and sediment-associated pollutants.

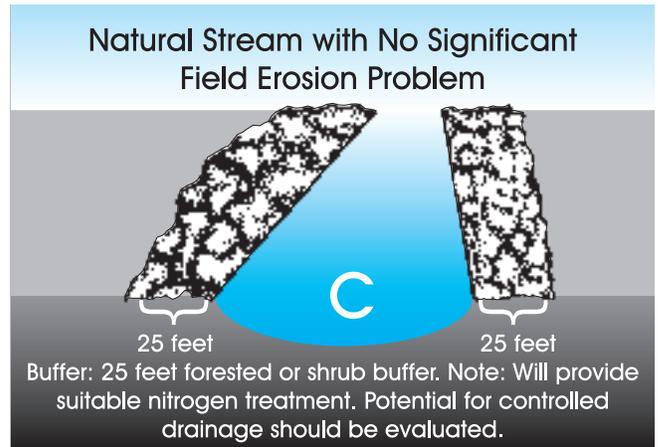
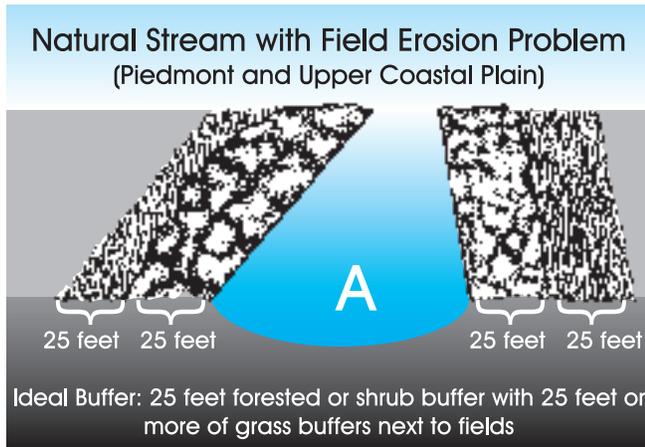
Most nitrogen from agricultural fields moves quickly into the soil as nitrate. Nitrate is very mobile in the soil. Any nitrate not used by the crop or the soil organisms continues to move through the soil and into the shallow ground water below the soil surface. Even when farmers follow best management practices, 20 to 40 pounds of nitrogen per acre per year routinely move into the shallow groundwater under agricultural fields, according to research done at NC State University.

To remove nitrate from groundwater before it reaches surface water, the groundwater must enter a zone where plant roots are or have been active. These plant roots may either absorb the nitrate for use in plant growth or, more importantly, provide an energy source for bacteria that convert nitrate-nitrogen to harmless nitrogen gas. This process, denitrification, occurs almost exclusively in water-saturated zones where abundant organic matter is present.

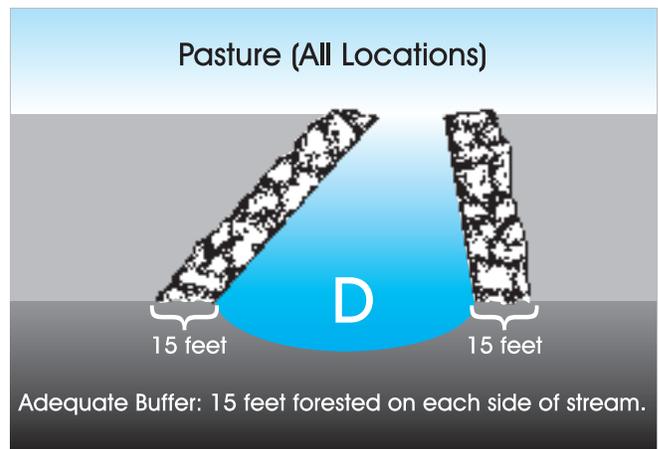
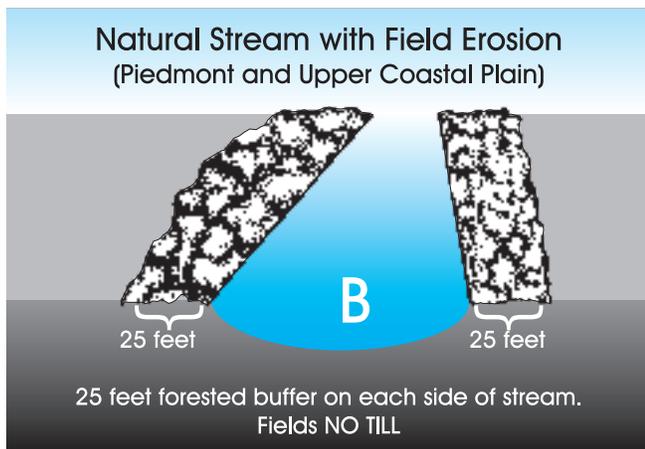
Riparian forest buffers reduce nitrogen under most conditions. Typically, denitrification rates measured in coastal plain forested riparian buffer areas are generally between 18 to 55 pounds of nitrogen per acre per year.

When conventional tillage is used in areas with moderate erosion potential, riparian buffers should consist of 25 feet of forested or shrub riparian buffer (from the edge of the stream outward) and enough grass buffer to control erosion. In the piedmont and upper coastal plain (A), the width of the grass buffer will probably need to be at least 25 feet. Accumulated sediment must be removed or the grass buffers will fail over time.

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Where the majority of sediment and sediment-associated pollutants, such as phosphorus and pesticides, are controlled by no-till in the piedmont and upper coastal plain locations (B), or by the flat topography of the lower and middle coastal plain (C), 25 feet of forested riparian buffer or shrub buffer are considered sufficient to reduce nitrate-nitrogen. No grass buffers are recommended.



For well-maintained pastures, where the pollutant of concern is nitrogen, a fenced, 15-foot buffer is considered sufficient (D). It is necessary to fence cattle out of streams to reduce streambank degradation and nutrient deposition. Fifteen feet of buffer is considered sufficient to reduce the low levels of nitrate moving into the stream.

*Prepared by  
Deanna L. Osmond and J. Wendell Gilliam  
Department of Soil Science*

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