Riparian Buffer Design Tool for Cropland: Lotic Systems

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Abstract

Riparian areas function as a buffer between the upland and the aquatic systems. This area is unique in its structure and the services it provides intercepting non-point source (NPS) pollution from the upland. In some cases additional buffer width may be required or sought. Riparian buffer strips are a beneficial management practice (BMP) eligible for cost-shared funding under government programs. However, little information is available to assist landowners in appropriate location or design considerations. This project aims to create a riparian buffer design tool to be utilized on lotic (flowing water) systems in cropland settings. This tool will consist of a flow chart and accompanying key. The flow chart along with air photographs, soils maps and discussions with the landowner will help to determine where on the landscape a buffer should be located. The final product will include case studies and guiding documents for technical staff to utilize when assisting landowners with their riparian buffer strips.

Introduction

Riparian areas are the transitional zone between the upland and aquatic systems and act to intercept nutrients and sediments otherwise entering waterbodies, as well as providing habitat and increased biodiversity. Additional buffer area seeded adjacent to the riparian area can act to intercept those nutrients and sediments in an effort to improve water quality and retain riparian health and function. Riparian buffer strips as a BMP are eligible for cost-shared funding under the National Farm Stewardship Program (NFSP). Numerous studies have been undertaken to determine the effectiveness of riparian buffer strips in reducing levels of nutrients and sediments in runoff water from agricultural land. Less is known about the extent at which buffers function in comparison to pre-buffer conditions (Dosskey, 2001). The majority of studies focus on within-filter buffer functions (Dosskey, 2002), are plot scale, and involve simulated rainfall events (i.e. Lee et al., 2000). Understanding the effectiveness of buffers at the landscape or watershed scale is incomplete (Polyakov et al., 2005) and the ability of buffer strips to have a significant impact on water quality at the watershed scale is still in question. Studies linking buffer implementation to improvements in stream water quality are lacking (Dosskey, 2001), and long term effectiveness of buffers is relatively unknown. Furthermore, the majority of research has taken place under rainfall runoff conditions whereas snowmelt runoff is the dominant process in Prairie Canada.

In order for a buffer to function it needs to be situated in a location which intercepts water flow. Ideal buffer strip design would incorporate a minimum effective width (Dosskey, 2002) attempting to take the least amount of land out of production while still achieving effective reduction in NPS pollution. Challenges remain in determining this width and the vegetation type to occupy riparian buffers. The ability of a buffer to function effectively is dependent on a number of design factors including the width, length, and location of the buffer, as well as the composition and density of the vegetation (Fisher and Fischenich, 2000; Dosskey et al., 2005; Melcher and Skagen, 2005). Few criteria are obtainable for buffer design and establishment and there are limited technical resources for field staff and landowners.

The objective of this project is to create a decision support tool to determine where on the landscape a buffer should be located and the design specifications.

Development of Buffer Design Tool

In the spring of 2007 sites were selected in Saskatchewan in the areas of Biggar and Melfort. Site visits were used to identify areas with lotic systems. Sites were then used as case study examples in development of the systems approach which includes a flow chart (figure 1) and key (not shown).

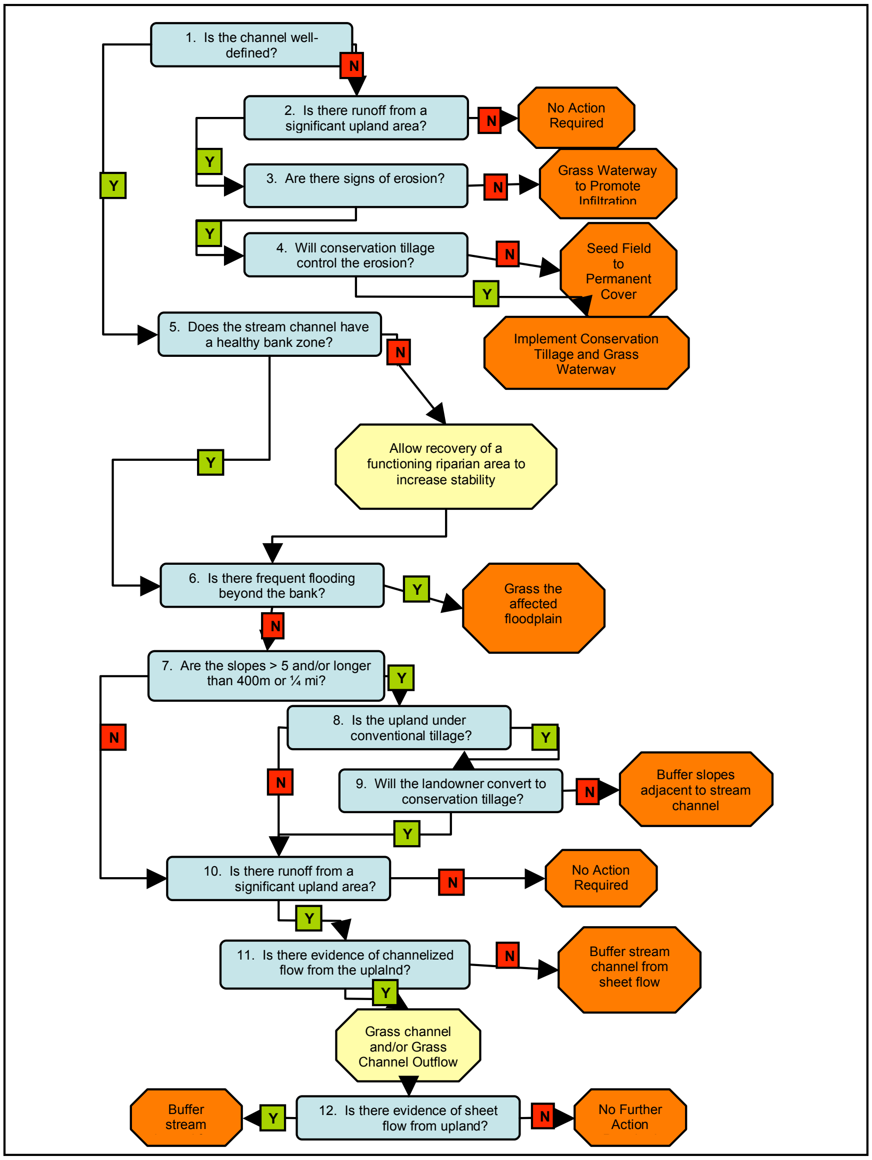

Figure 1: Flow chart to aid in determining necessity and appropriate location of buffer strip

A process of revision is necessary to improve the key and to consider characteristics including soil type, slope, vegetation, and upland management.

Future Work

Development of the flow chart and key were Phase 1 in a 3 part project. This project will require revision and adaptation as new science and research improve the understanding of buffer strip function and effectiveness in prairie environments. Phase 2 of this project will utilize the tool in developing 5 sites across the prairies where buffer strips can be established. Phase 3 of the project will combine the key, flowchart and case studies into a workbook and training material for technical staff.

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