**Determining the Effective Use of Riparian Areas to Filter Sediments and Phosphorus**

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**Summary**

Riparian areas are promoted on the basis that as vegetated buffer strips (VBS) they filter sediments and nutrients in runoff from agricultural land. Although riparian areas may provide a variety of ecological goods and services, such as wildlife corridors and streambank stabilization, little evidence was found in this project to support their use as filters for sediments and phosphorus.

Field work for this project was carried out on 22 VBS sites in 7 studies areas across the Manitoba portion of the Lake Winnipeg Basin. In three studies of nitrogen and phosphorus in runoff, generally, significant reductions in nutrient concentrations were not observed as runoff passed through VBSs (Parts I-A, I-B and I-C of the Technical Report). Although reductions were measured in some cases, these were the minority; VBSs often had no filtering effect, and in some cases VBSs were a source of nutrients. The fact that reductions were measured in some cases, suggests that VBSs may have the potential to be designed and managed as filters for nutrients in runoff; however, the biophysical properties and processes that affect filtering performance are not well enough understood to support the development of design and maintenance criteria and guidelines. Poor filtering performance is believed to be largely due to the fact that the majority of runoff and nutrient loading to surface waters in this region occurs during spring snowmelt when the ground is frozen and nearly impermeable, and when the vegetation is unable to take up water and nutrients and may actually release nutrients. If it had been possible to measure flow-weighted mean concentrations (requiring runoff flow measurements) rather than simple mean concentrations, it is probable that the influence of snowmelt would have been larger, further diminishing the observed effectiveness of riparian VBSs as filters.

In a study of two of the 22 sites, where the soil was clearly thickened in the VBS, there was definite evidence that sediment and phosphorus had accumulated over the past 50 years (Part II of the Technical Report). However, in both cases, it was unclear if the filtering of sediment and phosphorus was the major cause of this accumulation. Furthermore, the sediment and phosphorus that had accumulated in the VBS was focused in a very small area relative to the size of the catchment; the amount that had accumulated may account for only a small proportion of what has been lost from the agricultural land. From this study, it is also believed that the physical conditions of a catchment and riparian area (topographic surface features) may have as much, if not more influence than biological conditions in the accumulation of sediment and phosphorus along field edges and riparian areas in this region. If this is in fact the case, it presents a broader, possibly more effective, approach to designing and managing riparian areas as VBSs.

A study of Decision Support Systems (DSS) for designing and managing riparian areas as VBSs was carried out (Part III of the Technical Report). One DSS was found to be superior, the revised Morgan-Morgan-Finney (MMF) Buffer model, and it was used as the basis for developing the DSS in this project. This DSS, and the others available, are not well suited for application in the Lake Winnipeg Basin, as they are designed to deal with rainfall-driven runoff over unfrozen ground, not snowmelt-driven runoff over frozen ground, the conditions which dominate runoff in this region. Further model development could be undertaken to make the necessary modifications to the DSS.

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