

Strategies and Practical Applications for BMP Spatial Targeting in Canadian Prairie Watersheds to Maximize Water Quality Benefits

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Lake eutrophication remains a pressing issue in Canada and reducing non-point source nutrient loading on agricultural landscapes through the implementation of Beneficial Management Practices (BMPs) or Natural Infrastructure (NI) is crucial. However, it is also of great importance to maintain agricultural productivity, which is a major economic driver in the Canadian Prairies, and to maximize the impacts of investment given limited project funding. To address these challenges, the International Institute for Sustainable Development (IISD) has developed a Prioritize Target and Measure Application (PTMApp) model to evaluate BMP scenarios in the Swan Lake study area watershed, as part of Agriculture and Agri-Food Canada's Living Lab Eastern Prairies.

The PTMApp model assesses non-point source nutrient loading, BMP feasibility, and nutrient reductions under various rainstorm events, such as 1-in-2 and 1-in-10 year 24-hour events. In this application of the PTMApp model, two additional important characteristics of Canadian Prairie hydrology were accounted for: BMPs are evaluated using a 1-in-2-year spring runoff instead of a rainstorm event to strike a better balance between event frequency and nutrient loading, and non-contributing areas for average annual hydrologic conditions have been identified. HEC-HMS and HEC-RAS 2D hydrodynamic models have been developed for the Swan Lake and neighboring watersheds to inform these model inputs within PTMApp. This demonstrative modeling effort provides a foundation by which future PTMApp or similar models may be developed within the Canadian Prairies to better inform BMP or NI prioritization and selection by watershed managers. Furthermore, IISD plans to share guidance on strategies for PTMApp model development in Canadian Prairie watersheds, including examples of model output interpretation and applications for its users, in an upcoming in-press publication (Simoes et al., 2023). This effort aligns with IISD's recently launched Natural Infrastructure for Water Solutions initiative, which in addition to improving NI adoption, funding, and related policy, aims to develop resources to create a more compelling business case for NI.