



Water quality impact assessment of agricultural Beneficial Management Practices (BMPs) simulated for a regional catchment in Quebec, Eastern Canada

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Water quality has become a matter of increasing concern over the past four decades as a result of the intensification of agriculture, and more particularly so in Canada where agriculture has evolved into the largest non-point source of surface water pollution. The Canadian WEBS project (Watershed Evaluation of Beneficial Management Practices, BMPs) was initiated in order to determine the efficiency of BMPs in improving the surface water quality of rural catchments, and the economic aspects related to their implementation on the same scale. In this contribution we use the integrated watershed modelling platform GIBSI (Gestion Intégrée des Bassins versants à l'aide d'un Système Informatisé) to evaluate the effects of various BMPs on sediment and nutrient yields and, in close relation to this, the surface water quality for the Beaurivage River catchment (718 km²) in Quebec, eastern Canada. A base scenario of the catchment is developed by calibrating the different models of the GIBSI platform, namely HYDROTEL for hydrology, the Revised Universal Soil Loss Equation (RUSLE) for soil erosion, the Erosion-Productivity Impact Calculator (EPIC) of the Soil and Water Assessment Tool (SWAT) for contaminant transport and fate, and QUAL2E for stream water quality. Four BMPs were analysed: (1) vegetated riparian buffer strips, (2) precision slurry application, (3) transition of all cereal and corn fields to grassland (grassland conversion), and (4) no-tillage on corn fields. Simulations suggest that riparian buffer strips and grassland conversion are more effective in terms of phosphorus, nitrogen and sediment load reduction than precision slurry application and no-tillage on corn fields. The results furthermore indicate the need for a more profound understanding of sediment dynamics in streams and on riparian buffer strips.