

URBAN PHOSPHORUS SPECIATION AND EXPORT LOADS: A PAIRED SEWERSHED FIELD AND MODELING STUDY

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In this study, annual and seasonal loads of phosphorus (P) exported from two neighbouring urban sewersheds (AJE and AJW) discharging into Lake Ontario were estimated. The following different chemical pools of P were considered: total P (TP), particulate P (PP), and dissolved P (DP), that in turn were divided in their respective reactive (R) and unreactive (U) fractions. The AJW sewershed is more residential while AJE is dominated by commercial and industrial land cover. A load-flow regression model coupled to the Stormwater Management Model (PCSWMM) was calibrated against measured flow and P speciation data and used to derive seasonal export concentrations (ECs) for the two sewersheds. The annual P loads from the sewersheds were significantly different (AJE: 0.61 ± 0.05 kg/ha/year; AJW: 0.39 ± 0.07 kg/ha/year). Relative to AJE, the TP loads from the more vegetated AJW were enriched in both total DP (TDP) and reactive DP (DRP). Overall, the TP loads were dominated by PP (83-91% of TP), with slightly higher PP contributions for AJE. Our chemical extraction results further simplified that close to half (38-47%) of the PP loads were comprised of reactive P forms. The large contribution of PRP to the TP loads indicates that DRP alone may not provide a reliable measure of the potentially bioavailable P exported from urban areas to downstream aquatic environments.