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Using ^{137}Cs and modelling (WATEM, TillEM, DirTillEM) to estimate tillage and water erosion within a hummocky podzolic landscape in Atlantic Canada

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Total soil erosion is the result of all soil erosion agents – wind, water and tillage. In Canada, the risk of soil erosion is expected to be greatest in regions where highly erosive cropping and tillage systems are used on highly erodible landscapes – such as the potato growing regions of Atlantic Canada. However, no previous studies have looked at the combined impacts of tillage and water erosion on soil and crop productivity in this region. Therefore, the objective of this project was to estimate and model the relative contributions of tillage and water erosion within intensive potato production in the eastern Canadian province of New Brunswick using cesium-137 (^{137}Cs) and two established models: i) the water erosion component of the Water and Tillage Erosion Model (WATEM_W); and ii) the Tillage Erosion Model (TillEM). Preliminary analyses show that the pattern of ^{137}Cs estimated soil erosion was not strongly correlated with either TillEM (r = 0.35***) or WATEM_W (r = 0.41***). Therefore, a new tillage erosion model (DirTillEM) was developed to account for the apparent effect of tillage direction, lateral tillage translocation, and field boundaries on soil redistribution at this field site. The pattern of ^{137}Cs estimated soil erosion was correlated best with DirTillEM (r = 0.58***) and when DirTillEM and WATEM_W were combined (0.62***). Our results suggest that both tillage and water erosion are major erosive agents at this field site, but that tillage erosion is the dominant soil redistribution process. Also, tillage direction, lateral translocation and field boundaries were significant

factors and should be considered in future modelling efforts.