

Groundwater flow in freshwater tidal marshes: a comparison of a natural and a restored marsh

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Numerous tidal marsh areas are being restored for flood protection and ecological development along the Scheldt estuary. Recently however, questions arise about the extent to which restored marshes deliver ecosystem services. Due to the historical land use of the restored marshes and the compacted polder soil, underlying the freshly accreted sediment, subsurface water flow might be altered, hereby affecting important ecosystem functions such as nutrient cycling, the source-sink function and the vegetation development in the marsh.

In this research, a combination of a newly developed method for in situ subsurface water flux measurements is used in combination with measurements of soil characteristics and groundwater head time series along a transect in both a natural and a restored marsh. Special attention is paid to the presence of organic matter and macro pores in the soil, and their effect on subsurface water flow.

The goal of this study is to map for the first time the physical movement of water in freshwater tidal marsh soils and to see if these movements differ in natural and restored marshes, with a focus on hydrologic factors affecting these movements. Ultimately, this research serves as a pilot study to evaluate different methods to assess subsurface hydrology in freshwater tidal marshes, with the prospect of conducting a larger study which could form the foundations for new approaches to design restored freshwater tidal marshes.