
Constructed wetland to mitigate P losses from hotspots in agricultural areas

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Most constructed wetlands (CWs) in Sweden have been designed to retain nitrogen (N) and not phosphorus (P), which has resulted in limited knowledge about their effectiveness as P traps. A designed CW for P retention was built in August 2009 at an agricultural site in central Sweden. A catchment characterisation demonstrated that a horse paddock close to the wetland substantially increased the risk for high P loads to the CW. Extracted P in an acid ammonium lactate solution from topsoil samples was at some areas more than 500 mg P-AL kg soil⁻¹. Simultaneously, the degree of P saturation in the same soil extracts was locally high. Ten years flow-weighted averages of total phosphorus (TP) and total nitrogen (TN) in subsurface run-off water were 0.5 and 6.3 mg L⁻¹, respectively.

The CW consisted of a one meter deep sedimentation basin with the length of 27 m, and two shallow (0.3 m) vegetation filters with a total length of 72 m. The CW was formed as a curved long-narrow opening of the culvert and the surface area was rather small (0.28% of the 35-ha catchment). Flow proportional water samples were analysed every fortnight and continuous water flow was measured at both the wetland inlet and outlet. Both particulate bound phosphorus (PP) and dissolved reactive phosphorus (DRP) retention were estimated. During spring flood, high frequency water samples were collected as it is a critical period for P loss from agricultural areas in Sweden. Sedimentation traps showed an average gross sedimentation rate of 4.2 g d.w. month⁻¹ in the sedimentation basin and 0.8 g d.w. month⁻¹ in the first vegetation filter. This indicates that most of the particles and P was trapped closer to the inlet.