
Assessing the effect of constructed wetlands on non-point source nitrogen removal

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The Swedish E.P.A. has estimated that the 6000 ha wetlands that will be constructed in agricultural landscapes by 2012 will reduce the load to the Baltic Sea by 450 tonnes of nitrogen (N) (NV 2008). It has been suggested that with stricter guidelines for wetland location and design, the nitrogen removal per hectare of wetland could be substantially increased. This paper presents results obtained from a scenario analysis of the N load reduction that could be achieved if 6000 ha constructed wetlands would be constructed with improved guidelines.

Four different scenario simulations were run with a combination of two different assumptions regarding nitrogen load (% agricultural land in catchment) and removal rate constant. Transport calculations were based on nutrient loss estimations made in PLC 5 using the hydrological model HBV-NP (catchments of about 250 – 400 km²), and wetland N removal was calculated according to the method used by Arheimer and Wittgren (2002) and Tonderski et al. (2005). Minimum and maximum removal rate constants were estimated from data obtained from Swedish wetland monitoring programs.

It was estimated that a maximum load reduction of 1200 tonnes N could be achieved with 6000 ha new wetlands, with large regional differences. The results are compared with a recent estimate of 110 tonnes N and 9 tonnes phosphorus (P) transport reduction resulting from 4135 ha existing wetlands constructed with subsidies in Sweden (Brandt et al. 2009). In both cases, the calculations are sensitive to assumptions regarding catchment size and nutrient loss as well as wetland removal effectiveness. A more detailed analysis of the relative effect of different assumptions is presented in this paper.

References

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