# The influence of vegetation on nitrogen retention in a long-term experimental wetland study

Per Magnus Ehde[a], Stefan E. B. Weisner[a]

[a]Wetland Research Centre, Halmstad University, Halmstad, SWEDEN (Per_Magnus.Ehde@hh.se-Stefan.Weisner@hh.se)

## INTRODUCTION

The presence of plants has been shown to enhance nitrogen removal in wetlands (Bachand and Horne 2000). Toet et al. (2005) found a higher nitrogen removal in wetland compartments with emergent plants than with submersed plants. Denitrification is considered to often be the main process that remove nitrate in wetlands. Plants can supply denitrifying bacteria with organic carbon and suitable attachment surfaces, as well as promote the development of anaerobic zones favouring denitrification (Weisner et al. 1994). Results from microcosm studies have shown that the potential for denitrification is specific for different plant species (Bastviken et al. 2005).

Wetlands may typically be dominated by different kinds of vegetation. We have recently presented results from an experimental wetland area where we show that nitrogen retention during the first three years after construction was higher in wetlands with dense emergent vegetation than in wetlands dominated by more mixed vegetation (Bastviken et al. 2009). The purpose of the present study was to investigate if the effect of different vegetation types on nitrogen removal persisted during a longer time period (6 years) in the same experimental wetlands.

## METHODS

In 2002, 18 ponds were constructed with similar shape and size. They received groundwater with a high nitrate-N concentration (about 11mgl−1). Six of them were planted with submersed plants, 6 with emergent plants and 6 were controls where the vegetation was allowed to develop freely. The nitrogen retention for the years 2002-2005 have been evaluated earlier (Bastviken et al. 2009). In this presentation the results for the years 2007-2008 will be shown. All sampling were grab samples. The flow and temperature was measured at the sampling time manually in all wetlands. All samples were taken at periods with no rain as the influence of rain on the concentrations of nitrogen in the ponds is difficult to estimate accurately. Rain was continuously measured at the site and in some of the ponds we had automatic measurements of temperature at 6 hours interval.

In 2003-2006 two different flows were used. In 2006, the depth was increased from 50 to 80 cm and the flow was adjusted to be the same for all ponds with residence time of 4 days.

## RESULTS AND DISCUSSION

In this study all of the 18 ponds received the same water to the inlet with the same amount of nitrogen at the same temperature and at approximately the same flow. The only thing that differs among the ponds is the vegetation. In this way the influence of the vegetation on the retention can be evaluated.

It is also important to study the development of the ponds over the years. The ponds were constructed in 2002 and planted in spring 2003 and have been investigated since.

The data has not yet been finally evaluated. From Figure 1 you can see the mean total nitrogen concentration in the summer (June - August) of 2008 in the outlets from the ponds which were originally planted with emergent, submersed or no plants, respectively. The concentrations are rather similar in the 3 types of ponds but are generally lower in the 6 ponds planted with emergent plants. This indicates that the ponds that were planted with emergent vegetation still, after 6 years, have higher nitrogen retention than the other ponds.

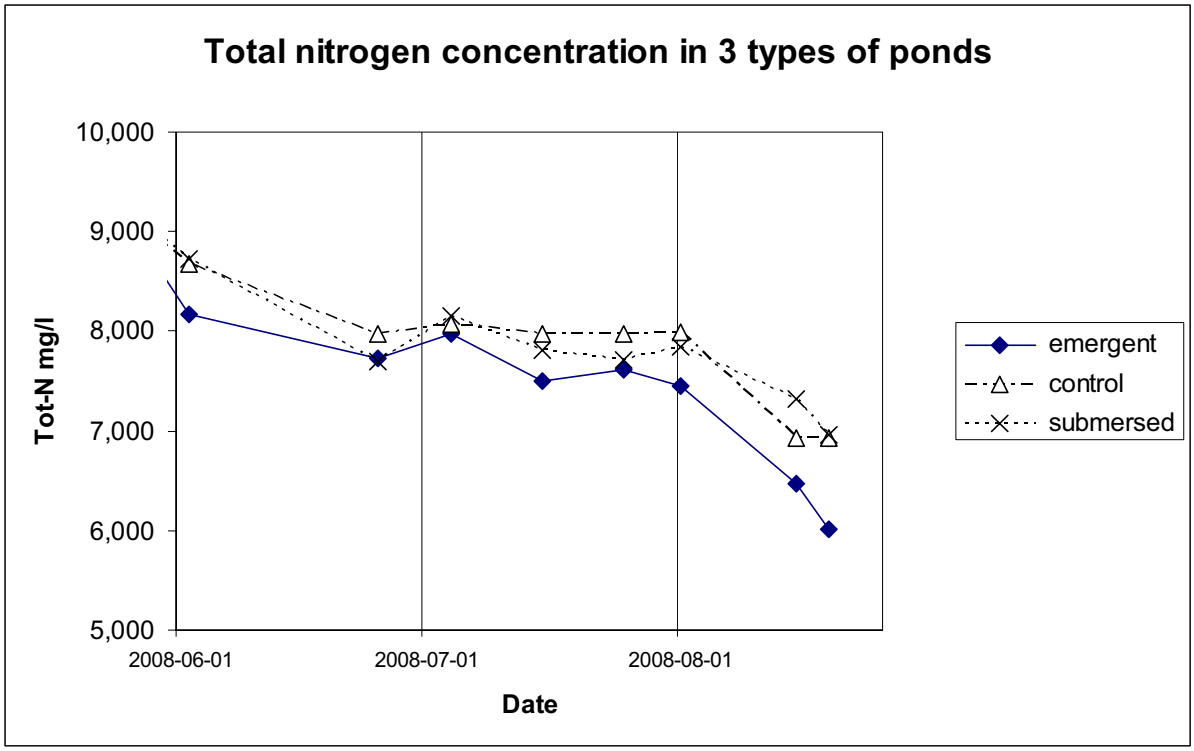


**Fig. 1. Total nitrogen concentration in outlets from ponds with emergent vegetation, freely developing vegetation (controls) and submersed vegetation, average of 6 ponds each.**

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