

Reduced P losses after implementation of mitigation measures in a small agricultural catchment in Sweden

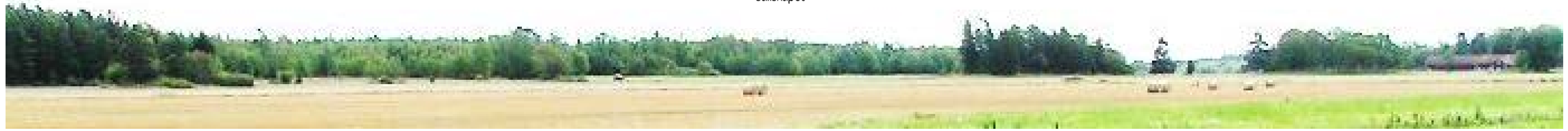
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Aim:

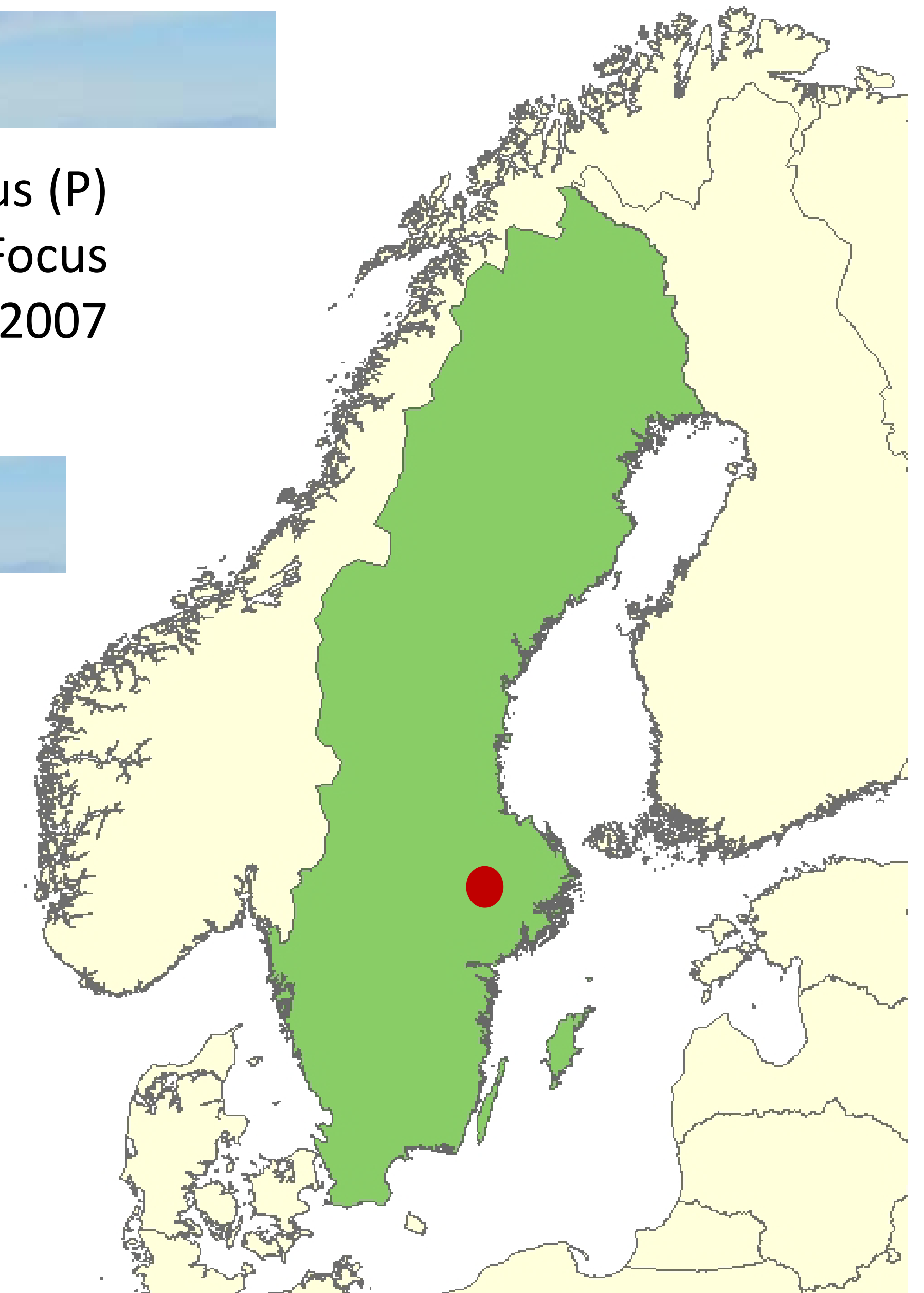
The aim of this study was to study the effects of implemented mitigation measures on losses of phosphorous (P) in a Swedish agricultural catchment dominated by heavy clay soils. The study was run within the project 'Focus on Phosphorous', where farmers, agricultural advisers, researchers and authorities have cooperated since 2007 in order to find and implement effective strategies to reduce P losses from agricultural land to water.

Methods:

Since 1994 water flow is measured continuously and water samples are collected manually every fortnight at the stream outlet of the catchment. In addition, an equipment for flow-proportional sampling was installed in 2007. Both total and dissolved forms of P have been analyzed in the water samples.

Several mitigation measures were implemented in the area during 2009-2010:

- Sediment and vegetation were removed from the mainstream (2009)
- 7 % of the total arable land was converted into buffer zones (2010)
- Autumn tillage of arable land decreased from 7 % in 2009 to 2 % in 2010.
- About 90 % of the arable land was structure limed with 4000 kg lime ha⁻¹ corresponding to 800 kg Ca(OH)₂ ha⁻¹ (2010)



Results:

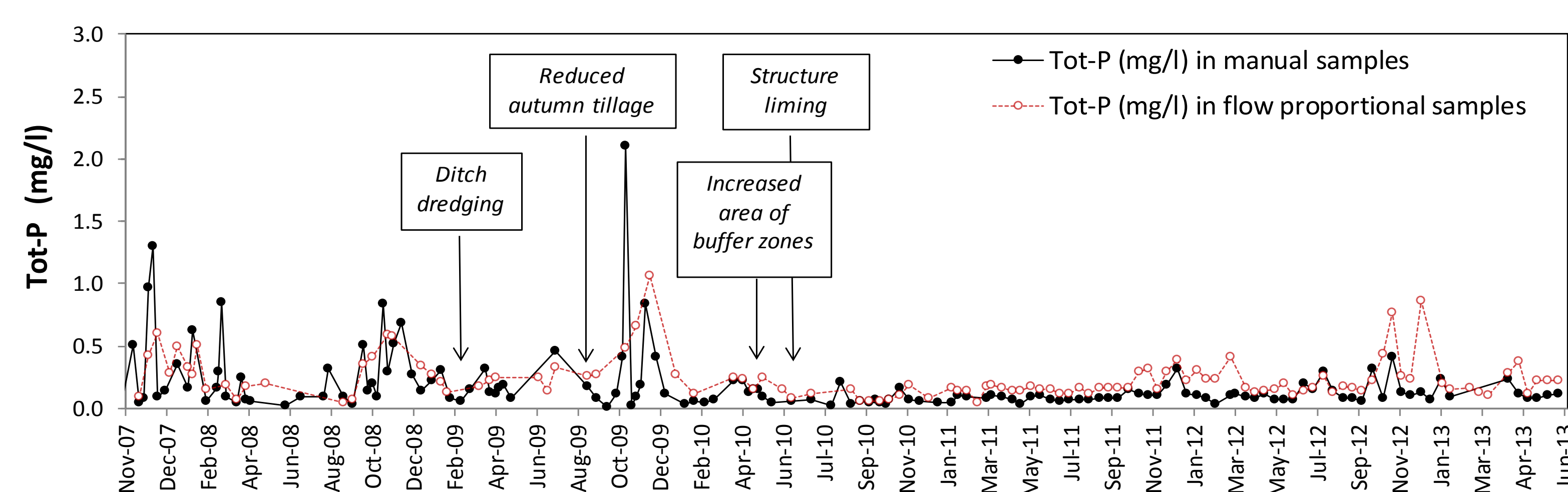


Figure 1. Concentrations of total phosphorous (tot-P) in manual samples and flow proportional samples during November 2007 – June 2013.

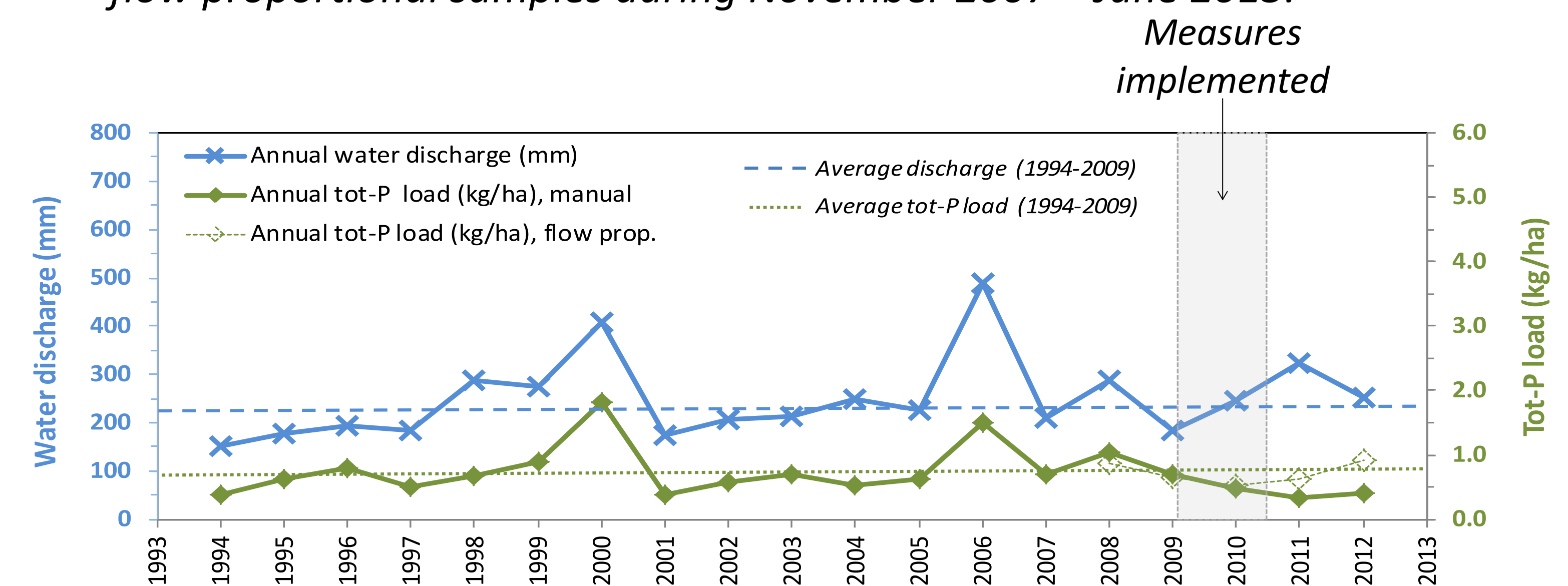


Figure 2. Annual water discharges (mm) and annual loads of total P (kg/ha) from the catchment area.

P concentrations

Reduced total P concentrations have been observed in manual collected samples since June 2010 (Figure 1).

In flow proportional samples total P concentrations were low in June 2010 - September 2011, but peaks occurred during high water flow in fall 2012 (Figure 1).

P loads

Despite quite large water discharge in subsequent years after the implementation of mitigation measures, annual total P load calculated on manual samples were halved in 2011 and 2012 compared to the long term average (Figure 2).

However, when calculating annual total P loads on flow proportional samples no significant changes were observed in 2011 and 2012 compared to previous years.

Conclusions:

- Decreased P concentrations were observed in both manual and flow proportional samples after the implementation of several mitigation measures in the area. When calculating P loads on manual samples, annual total P loads were halved in 2011 and 2012 compared to long time average, despite quite large annual water discharges during those years.
- The results indicate that the measures implemented affected the P leaching in the area, although the effect of each measure could not be determined separately in this study.