Abstract

This thesis was an integrated part the EUTROPIA project[1], which aims at understanding processes and pressures governing the P-flux into the eutrophic lake Vansjø. The study was performed on data from Huggenes, a catchment with a stream that drains into Western Vansjø. This area is dominated by cultivated land (~ 85 %), of which the Huseby field was used as a case study site.

Soil samples were collected from different horizons and depths down to 2 m, and analyzed for pH, LoI, TC, TN and P-pools. Several parameters including P-fractions are also analyzed on samples of soil water and drainage water from the field, as well as of stream samples from the Huggenes stream. The temporal and spatial variation in chemistry in soil and water samples is assessed in an attempt to better understand the hydro-biogeochemical processes governing the P-mobility.

Total phosphorus concentrations in the studied agricultural soils were found to be high. The critical limit of Phosphorus Saturation Degree (PSD; 25 %) was exceeded in the Ap-horizon, and was close to the limit in the subsoil in which the drainage pipes are located. This indicates that the soil is susceptible for P-loss due to saturation. The water soluble phosphorus was, however, found to be low in the Ap-horizon, and below detection limit in the B and C- horizons.

Drainage pipes were found to be an important flow path for the transport of P due to P- transport down through the soil profile through macropores. The flow-weighted mean concentration in the drainage water from the Huseby field was found to be 60 µg/L.

Linear interpolation of total P- flux, based on runoff for three hydrological years (07/08, 08/09 and 09/10), was used to estimate the daily flux of total phosphorous (TP) from the Huggenes stream into Western Vansjø. More than ¾ of the TP flux occurred during the 36 days with highest runoff (above 90th percentile).

A larger P-flux in the year 07/08 may have been due to a warm winter with frequent and prolonged periods with temperatures above freezing, allowing for P-flux throughout the winter. For the other two years, which both had stable freezing conditions during winter, the peak of release was found to occur during snowmelt.

The distribution between P-fractions in the drainage pipes during snowmelt was found to be 80 % particulate bound (PP), 15 % bound to organic matter (DOM-P) and 5 % as free

[1] http://www.mn.uio.no/kjemi/english/research/projects/eutropia/index.html

reactive phosphorous (RP_F). The bioavailability of PP and DOM-P needs to be studied further in order to assess their fate and impact on eutrophication.

A Principal Component Analysis was performed, including the variables H^+, conductivity, alkalinity, Absorbancy at 400nm, Calcium, Magnesium, Sodium, Potassium, Nitrate, Sulphate, Chloride, PP, TP, Reactive Phosphorus raw, RP_F, DOM-P, Suspended solids (SS) and the explanatory variable runoff (mm). This PCA gave indications that TP and PP were strongly governed by runoff intensity, while RP_F and DOM-P were not.