

Katherine Wotherspoon: The effect of phosphorus addition and cutting date on the nutrient dynamics and species composition of floodplain meadows



Many studies have investigated the impact of nitrogen (N), phosphorus (P) and potassium (K) on floodplain meadows in terms of vegetation production, composition and species richness, however few have investigated the impact of P addition on plant N uptake and N mineralization. It has been suggested by numerous researchers that net N mineralization increases with increasing P availability in the soil, which implies the effects of N could be enhanced by P, however this has never been tested on floodplain meadow vegetation community MG4 (*Alopecurus pratensis*- *Sanguisorba officinalis*).

This project tested the hypothesis that net nitrogen mineralization increases with increasing phosphorus availability in the soil, and has been investigated by means of a field P addition experiment in conjunction with performing multiple cuts throughout the growing season to determine the optimum time for maximum nutrient removal. The biomass harvested was tested for N and P content and total N and P off-take from April to July has been plotted. A laboratory experiment was also used to test for N mineralization by adding P to soil cores and analysing KCl extracts for nitrate and ammonium content following incubation.

The field experiment revealed that the addition of P in combination with N produced a significant increase in vegetation N off-take, and that P was also significant in explaining plant species composition. The incubation experiment demonstrated that P addition increased N mineralization in the soil cores where significantly increased levels of NH_4^+ were detected with increasing P concentration. Above-ground biomass was primarily limited by N alone, although the increase in N off-take with P and N addition indicated co-limitation. The cutting trial revealed that peak nutrient off-take occurred later in the growing season with the addition of P; optimum cutting date in terms of maximum nutrient removal was mid-June for unfertilized plots and mid-July for P fertilized plots indicating that cutting date should be flexible on this vegetation type.

The Experimental Plots

