

Case Study 6.2 Investigating the nutrient budget of the Oxford Meads, Oxfordshire

To understand the nutrient dynamics at a site, it is useful to establish the nutrient budget. This helps to clarify the main P inputs and offtakes in order that the site can be managed to remain in nutrient balance, with P inputs not exceeding offtake. Big floods (as demonstrated in Case Study 6.1) can bring in very large quantities of P, which need to be balanced by prompt management the following year to avoid changes in the plant communities.

In order to do this on the Oxford Meads, samples of soil and hay were collected from Pixey, Yarnton, Oxy and Cassington (part of the Oxford Meadows SAC), as well as the nearby New Marston Meadows SSSI, 2008. A vegetation survey was also carried out.

Soils

Three soil samples were taken from each of the six botanical monitoring blocks across the Meads. An additional 24 samples were taken from areas not well-represented by the monitoring blocks, and four additional samples were taken from New Marston Meadows SSSI. Sample sites were located within a range of plant communities. Soil samples were taken from the top 100 mm of the profile and each sample was composed of 12 separate 10 mm diameter cores, combined into a single pooled sample to smooth out fine spatial heterogeneity in soil properties. The soil was oven dried in Open University soil laboratories at 40°C, ground to pass through a 2 mm sieve and analysed for pH, total phosphorus, extractable phosphorus using the Olsen method and major cations (Ca^{2+} , K^+ , Mg^{2+} , Na^+).



Soil samples were taken from within a 1 x 1 m area. © Mike Dodd



Vegetation (hay yield and composition)

At each of the soil-sample locations, the vegetation within one square metre was cut to 30 mm above ground level and weighed. A subsample (350 g) was then selected and rapidly dried in a fan oven. The dry weight was determined to calculate yield, then the sample was ground and digested in perchloric acid and analysed for N, P, Ca, K, Mg and Na.

Sediments

Nutrient traps made from pieces of astro turf (designed to mimic the roughness of grass) were set out across the meads to measure sediment deposition. Fourteen traps were spread across Yarnton and Pixey Meads in December 2007 and retrieved in April 2008. The traps were returned to the laboratory where the sediment was weighed to estimate the amount of silt deposited per hectare and then analysed for phosphorus (both total and extractable content).

Results

The data collected enabled a description to be made of the nutrient status of the meads during 2008, and provided a reference data set against which future changes can be compared (see Figure 6.4). The nutrient status of a floodplain meadow is highly dynamic and it is a function of the site's hydrology. The size of the last flood and the interval since it occurred are major determinants of the system's phosphorus status.

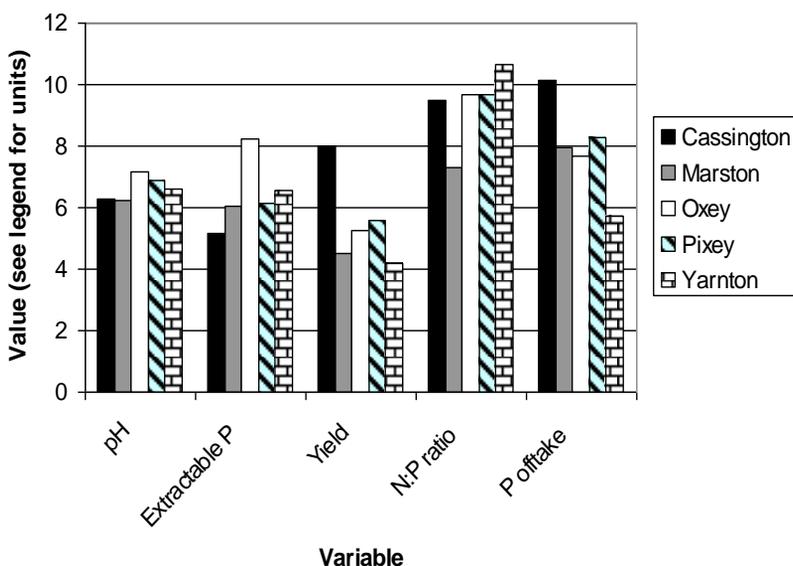


Figure 6.4 Five soil and hay variables at different floodplain meadows. pH is in standard units; extractable phosphorus (P) is mg/kg^{-1} by the Olsen method; yield is t/ha ; N:P ratio is dimensionless; phosphorus offtake is kg/ha .

