

Urgency application: Impact of summer flooding on floodplain biodiversity via nutrient deposition (NE/F009232/1) Principal investigator: Prof David Gowing, Open University

Background: The fluvial floods of June/July 2007 were some of the largest on record in the UK. They deposited substantial amounts of sediment across floodplains and thus raised questions about whether floodplain habitats would be impacted by eutrophication through phosphorus enrichment. In particular, did summer floods deposit sediments with high phosphorus content due to waste-water treatment works being overwhelmed by intense rainfall? To address these questions, a small Urgency bid was requested. NERC contributed £13,139 towards the costs of sample collection (4 days PI + 8 days consultant + T&S) plus subsequent analysis (lab costs) and interpretation (4 days PI time). In total, 100 samples of sediment, soil or hay were analysed.

- Objectives:**
1. To estimate the amount per hectare of total phosphorus, available phosphorus and basic cations delivered as sediment following a substantial summer flood.
 2. To assess the importance of the summer-flood delivered sediment in the context of a floodplain grassland's nutrient budget.
 3. To assess the likely impact of higher frequency summer flooding on the biodiversity.

Methods: Species-rich floodplain meadows were identified as the habitat most at risk from eutrophication in five catchments that had experienced floods (Thames, Severn, Trent, Ouse, Derwent). A total of 10 sites were visited in August 2007 to collect samples of sediment, soil and hay as soon as possible after the flood waters retreated. Samples were dried, then analysed to measure concentration of phosphorus and cations.

Results: Total phosphorus levels varied widely. Some sites received no measurable sediment even though they had been inundated, whilst other sites received as much as 500 kg P per hectare in total (Fig. 1.) On these sites, deposition of Olsen extractable phosphorus varied from 1 to 32 kg P/ha and deposition of potassium ranged from 2 to 270 kg K/ha.

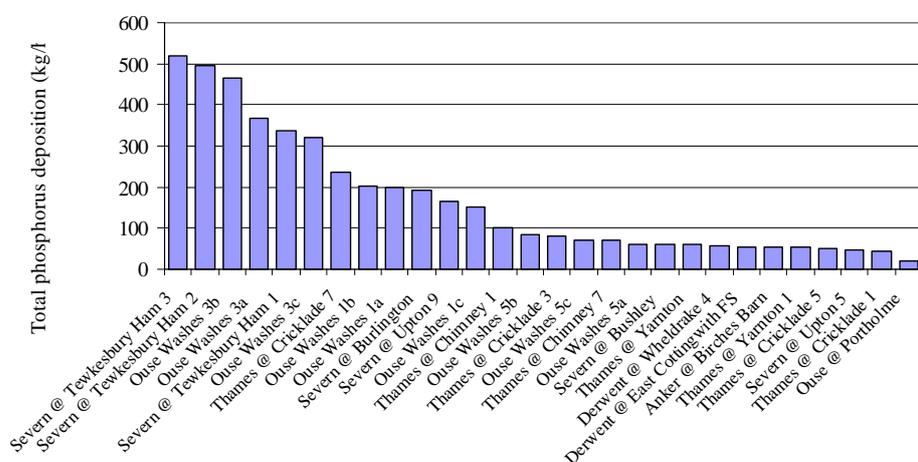


Figure 1. The total phosphorus deposited in sediment per unit area across a range of sites.

Discussion

Previous data have shown phosphorus export in hay to be c. $6 \text{ kg P ha}^{-1} \text{ y}^{-1}$, suggesting it could take about 5 years to balance just the readily available phosphorus (30 kg/ha) in the new sediment. Considering the total phosphorus deposited, a proportion of which would be mobilised over time, the time frame could be much longer (up to 35 years) and therefore regular floods on this scale would threaten the conservation value of the grassland.

The concentration of total phosphorus in the summer-flood sediments was not significantly different to winter-collected samples overall, but the extreme values were higher.

Longer-term studies of these habitats are required to discern what proportion of the deposited phosphorus becomes plant available with time and to identify the return periods of different deposition events. Linking biogeochemical studies to the predictions of climate models would allow the threat to the conservation value of floodplains to be further quantified.