PHOSPHORUS SATURATION OF SOILS IN AGRICULTURAL RIPARIAN BUFFER STRIPS

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Background

- Riparian buffers can be effective at removing phosphorus (P) from **overland flow** originating from agricultural land and therefore can be a useful tool in ameliorating diffuse pollution. This occurs predominantly through deposition of sediment-associated P.
- Their role with regard to **subsurface P movement** is less clear, but this pathway can be important (Heathwaite et al., 2005; Heckrath et al., 1995; Turner and Haygarth, 2000). Removal can occur through **adsorption** of P to soil particles and **uptake** by plants and microbes.
- It is important that the potential of riparian buffers to store P is well understood in order that they can be managed optimally. A key factor in this is the **longevity** of their **storage potential** and overall remaining capacity.
- The timescales over which buffer efficiency and storage capacity changes is uncertain, and varies depending on many factors including land use and soil type.

Examples of riparian buffer strips

Hypothesis

Our hypothesis is that the potential of buffer strips to remove and store P by subsurface adsorption to soils varies depending upon properties including soil type, buffer age and P loading. These properties will influence and be influenced by factors including quantity of P already adsorbed by soil (i.e. remaining adsorption capacity), forms of P in runoff and upslope land use (e.g. arable or grassland).

Aims

1. To measure the degree of P saturation in buffer zone soils of different age.
2. To measure the degree of P saturation in buffer zone soils adjacent to both arable and grassland fields.
3. To determine the remaining capacity of the riparian buffers studied to adsorb P.
4. To determine the potential for solubilisation of P stored in buffer zone soils.

Study sites and sampling

The work will be carried out at sites within the Defra Demonstration Test Catchment (DTC) Project catchments, namely the Hampshire Avon, the Wensum and the Eden (see Figure 1). The objectives of the DTC project are to provide a research platform from which an integrated assessment of the effectiveness of potential mitigation measures such as buffer strips for reducing diffuse pollution from agriculture can be developed.

Six riparian buffer sites will be selected in each catchment, three adjacent to arable land and three adjacent to grassland, and each will be of different age.

At each site soil samples to 30cm depth will be collected along a transect perpendicular to the slope of the land. Each transect will comprise five sampling points, two within the agricultural field and three within the buffer zone.

Two sampling assays will be carried out, one in summer 2010 and one in winter of 2010/11.

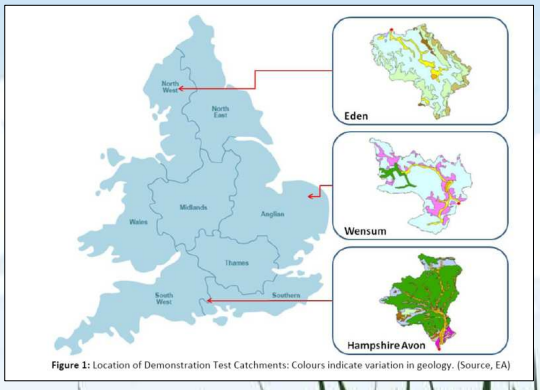

Figure 1: Location of Demonstration Test Catchments: Colours indicate variation in geology. (Source, EA)

Methods

Two soil depth fractions will be analysed: 0-7cm and 7-30cm.
Soil samples will be analysed for water extractable reactive and total P, Olsen P, total P, pH and organic matter.
The degree of soil P saturation will be determined by ammonium-oxalate extraction of P, Fe and Al.
Phosphorus sorption and desorption characteristics will be assessed using the equilibrium based Freundlich and Langmuir models.
P solubility will be assessed using a range of analyses including the FeO strip method.

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