Summary Document

Assessing the mode of action of Phoslock® in the control of phosphorus release from the bed sediments in a shallow lake (Loch Flemington,UK).

Journal Details

Title: *Assessing the mode of action of Phoslock® in the control of phosphorus release from the bed sediments in a shallow lake (Loch Flemington, UK) (2013).*

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Location of Research: *Centre for Ecology & Hydrology, Scotland, UK.*

Results: T*he study showed that with the use of Phoslock, there was a significant increase in the "apatite bound phosphorus" in the sediments and less "free phosphorus" that is utilised by algae. Therefore, with the use of Phoslock, the phosphorus that was once available for algal growth was now in a form that was unusable, hence a significant reduction in the concentration of algae growing in the water body.*

Summary of Findings

This publication is based on the work undertaken by Sebastian Meis as part of his PhD project at the UK's Centre for Ecology and Hydrology and Cardiff University. The paper quantifies the effects of Phoslock on sediment element composition and phosphorus fractionation (one year pre- and post application) at Loch Flemington, UK.

Loch Flemington is a high alkalinity, eutrophic lake situated in the Kildrummie Kames Site of Special Scientific Interest (SSSI), United Kingdom. It has a surface area of 15 ha, and a mean and maximum depth of 0.75 m and 2.9 m, respectively. The lake has no natural surface water outlet and has one surface water inlet, the Croy Burn. Water leaves the lake by evaporation and by draining through the permeable gravel along the northwest shore, leading to an estimated water retention time of around 40 days (May et al., 2001).

Five sediment cores were collected 8 and 5 months pre-application (July 2009 and October 2009) and 4, 7 and 12 months post-application of Phoslock (July 2010, October 2010 and March 2011). The cores were sectioned (2cm slices) on site, transported at <4°C and frozen once in the laboratory. The sediment was analysed for major elements (including Al, Ca, Fe, Mn) with an inductively coupled plasma optical emissions spectrometer (ICP-OES), while trace elements (including La) were analysed using an inductively coupled plasma mass spectrometer (ICP-MS). Sediment phosphorus (P)-extraction was conducted on sediment samples from all sampling dates over the top 10 cm of the core. The sediment P-extraction scheme followed Hupfer et al. (1995), based on Psenner et al. (1988).

The authors found that the application caused a significant increase in the mass of phosphorus (P) present in the more refractory "apatite bound P" fraction compared to the mobile fraction, ensuring that there was less "free P" for the use by algal species (such as cyanobacteria). The use of a conceptual model was also proposed by the authors for the use of P-capping agents such as Phoslock in lake remediation projects in order to increase cost-effectiveness and reduce non-target effects by applying multiple smaller doses compared to a single high dose.