Recovery of Lake Varese: Reducing trophic status through internal P load capping.

Journal Details

Title: *Recovery of Lake Varese: reducing trophic status through internal P load capping (2013).*

Authors*: Crosa, G. , Yasseri , S., Nowak, K.E., Canziani, A., Roella, V. & Zaccara, S.*

Journal: *Fundamental and Applied Limnology (2013), 183(1), p 49-61.*

Location of Research: *University of Insubria, Varese, Italy.*

Results: *Phoslock successfully bound phosphorus in Lake Varese, where previously other in-lake remediation actions had failed.*

Summary of Findings

Large scale mesocosm trials were undertaken with Phoslock on Lake Varese in Northern Italy. The lake is one of the first and most evident examples of cultural eutrophication in southern Europe. Phoslock was added to 3 controlled enclosures (15m in depth) in the lake over a 12 month period during 2009-2010 in order to test if it would significantly reduce the internal phosphorus loading (estimated to be greater than 5 t yr^{-1}) and assist with reversing the eutrophic status.

The results from the enclosure experiment dosed with Phoslock showed that there was a greater than 80% reduction of phosphorus in the water column and , from January onwards, the settled Phoslock controlled the phosphorus release from the sediments. This prevented a sharp increase in total phosphorus concentrations to values exceeding 0.28 mg phosphorus l^{-1} that took place from August until October in the untreated enclosures. As well as the Phoslock treated enclosures proving to be efficient in controlling the phosphorus fluxes from the lake sediments, low levels of dissolved oxygen were maintained in the bottom layer of the lake.

The results presented in the study show that the use of Phoslock was successful in significantly binding phosphorus from the water column and reducing the internal dissolved phosphorus load. It also highlighted the failure of the previous in-lake remediation actions (hypolimnetic water withdrawal and oxygen injection). Due to the historical input of phosphorus to the lake, it is likely that more time was needed to achieve a significant reduction in anoxic conditions. During the summer thermal stratification period is likely to be more than one year due to the delay in the chain of the top-down time related control mechanisms caused by the phosphorus reduction in the water column following the subsequent path: 1) reduction of phosphorus, 2) decrease of algal biomass production, 3) decrease of hypolimnetic oxygen consumption, and 4) decline of phosphorus sediment release. At the same time, to restore this lake more rapidly, in addition to in-lake remediation action (sediment capping layer), the external load of total phosphorus associated with suspended solids needs to be reduced as much as is practically possible.