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Investigating methods of phosphorus recovery from eutrophic lakes through hypolimnetic withdrawal and purification

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As global reserves of phosphorus (P) become scarce, recycling of P will be key to sustainable food production in future. The hypolimnetic withdrawal and purification circuit (HWPC) is a novel method that aims to remove and capture P accumulated in the near-bottom water of eutrophic lakes. Similar to the basic principle of wastewater treatment, the lake water is treated for the precipitation of P and other elements, and the formed particles are collected in a filtering unit while the purified water flows back into the lake. The method has been tested in a pilot project at Lake Kymijärvi, southern Finland.

In the current study, we observed the efficiency of three different water treatments in the HWPC in terms of P precipitation: 1) water aeration; 2) aeration + Ca(OH)₂ addition; 3) aeration + tannin-based biopolymer addition. Moreover, we studied the chemical composition of the precipitate formed in each treatment to understand its potential for P recycling. The aim of the study was to provide a better understanding to further develop and apply techniques to recover and recycle P from eutrophic lakes.