

Master thesis project proposal

This MSc thesis project is a collaboration between the Norwegian Institute for Water research (NIVA) and Swedish University of Agricultural Sciences (SLU).

Objectives: The aims of this project are to (i) develop an empirical model to predict Ca-levels in recovering (acidified) lakes; (ii) to evaluate effects of reduced Ca (and lower Ca availability related to higher complexation with DOC) on aquatic biota and (iii) assess the need for restorative action.

Methods: The legacy of acid deposition has caused strongly declining Ca concentrations in Nordic lakes as well as increasing DOC concentrations. Currently, bulk Ca concentrations are low enough to cause Ca-limitation in sensitive aquatic biota. Ca is a key element for ecosystem functioning and is needed for growth and survival of aquatic species. It is an essential element for all life, especially zooplankton with their calcified exoskeleton-structures. The increase in DOC is especially concerning as it will bind some of already declining dissolved Ca, further stressing sensitive invertebrate species. Changes in invertebrate and zooplankton community structure will ultimately affect fish species composition and the viability of fish stocks. Mineral weathering rates in the surrounding catchment are too slow to assure sustainable replenishment of surface water Ca, and liming might be considered a restorative measure to protect aquatic life from Ca-limitation. This project will make use of existing data from long-term monitoring lakes in Norway and Sweden. With the monitoring data, a first step is to quantify current trends in Ca and supporting parameters. Based on the trend analysis, and the well documented interactions between Ca, Al and proton interactions with DOC, we will develop an empirical model to predict future trends of Ca and its availability for biota in lakes. The WHAM model will be used to describe equilibrium partitioning of Ca, Al and proton species. This empirical model will be linked to biota, more specifically invertebrate data. We will make use of an already assembled invertebrate database for Norway and Sweden (assembled by Gaute Velle UiB, ICP-Waters). This database will be coupled with the developed empirical model to investigate dose (i.e. Ca concentration) – response (i.e. biological responses) relationships. The results of this interdisciplinary approach will help prioritizing restorative action for aquatic biota in the face of lowered Ca in Norwegian and Swedish lakes.

You will, by the end of this project have good understanding of what drives changes in Ca and the importance of DOC for biological recovery in Nordic lakes. You will have really good experience in working with large datasets, statistical analysis, modelling experience and understanding processes related to recovery from acidification and how that will connect to the Water framework Directive. You will be in forefront of understanding why biota is not returning to pre-acidification state.

Start: Beginning of 2016 (preferred)

Location: You will be sitting at SLU and potentially visiting NIVA in Oslo

IF YOU HAVE ANY QUESTIONS, PLEASE EMAIL:

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