

Metal concentrations in reacidified lakes in the Tyresta National Park, Sweden

FRIDA EDBERG, MARCUS SUNDBOM AND HANS BORG

Department of Applied Environmental Science, Stockholm University, Sweden; frida.edberg@itm.su.se

Objective

To study the reacidification effects of terminated liming on pH and metal concentrations in lake water and sediments.

Material and methods

We present some results of a running reacidification project in Tyresta National Park, 20 km SE of Stockholm, which is part of the Swedish ISELAW programme.

Lake Trehörningen and Lake Långsjön were continually limed since 1978 until termination in 1991 and 1995, respectively. Lake Årsjön has never been limed.

Lake water was sampled 4-8 times/year during 1990-2004 and analyzed for general water chemistry and trace metals. Sediment in the deepest part of the lakes was sampled, sectioned and pH was measured.

Results

After terminated liming the surface pH and alkalinity declined in both lakes, whereas the surface pH in the non-limed reference lake has slowly increased during the last decade.

Hypolimnetic pH in the reacidified lakes also decreased and is generally lower than surface pH.

Reacidification was accompanied by increased levels of total and labile inorganic Al, Pb and Mn in both lakes. In Lake Trehörningen the levels of Cd also increased. Metal concentrations were typically higher in the hypolimnion, probably caused by the lower pH there.

In the reacidified lakes the pH in the water-sediment interface decreased. Ten years after the final liming pH also



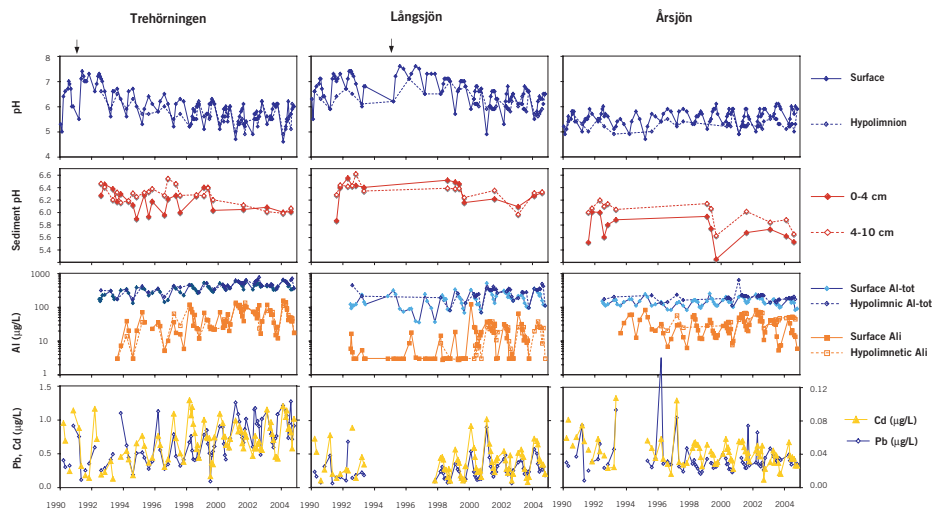
decreased deeper into the sediment, down to 10 cm in Lake Trehörningen but not in Lake Långsjön, which may be explained by the lower levels pH and the longer period of reacidification in Lake Trehörningen.

Conclusions

After terminated liming:

- pH decreases in both surface and hypolimnetic water
- Levels of Al, Pb and Mn increased in both lakes, Cd also increased in Lake Trehörningen.
- Sediment pH decreased in water sediment interface in both lakes, in Lake Trehörningen pH also decreased deeper in the sediment.

The diverse reacidification effects in two nearby lakes also shows the need of more knowledge and careful consideration before liming is terminated.



Time series of pH, total aluminium (Al-tot) and labile inorganic aluminium (AlI) of surface and hypolimnion water in two previously limed lakes and one acidic reference lake during 1990-2004. The six lower panels show corresponding pH in sediment and lead and cadmium in surface water. Arrows indicate time of last lime treatment.