Long-term ecological effects of liming – the ISELAW programme

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1 Objective

The Swedish liming programme was initiated in 1977 to counteract the effects of anthropogenic acidification on aquatic ecosystems. Ecosystem development in limed waters has been followed since 1989 in a programme for Integrated Studies of the Effects of Liming Acidified Waters (ISELAW). The main objectives are to assess:

- Long-term ecological effects of liming.
- To what extent ecosystems recover to a pre-acidification state.
- Possible detrimental effects of lime treatment.

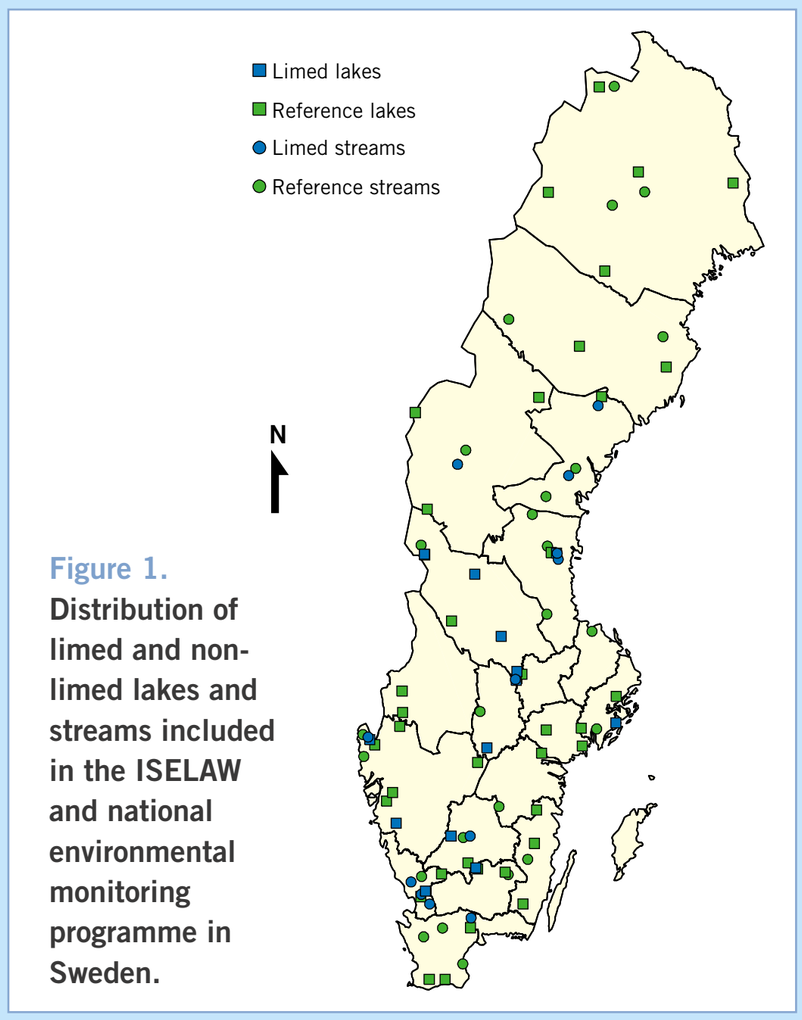

Figure 1. Distribution of limed and non-limed lakes and streams included in the ISELAW and national environmental monitoring programme in Sweden.

2 Material and methods

The programme comprises monitoring of water chemistry, phyto- and zooplankton, vegetation, benthic invertebrates and fish in 13 limed and 5 non-limed lakes. In addition, water chemistry, benthic invertebrates and fish is monitored in 12 limed and 10 non-limed streams (Fig. 1). Paleolimnological studies are performed to reveal pre-acidification lake history.

3 Results and discussion

- LONG TERM EFFECTS OF LIMING

Lake water chemistry show decreased annual mean SO_4-concentrations (Fig. 2), reduced minimum O_2-concentrations, and increased total nitrogen concentrations (Fig. 2). Biological development varies among lakes and streams.

- RECOVERY TO PRE-ACIDIFICATION STATUS?

pH and alkalinity in limed lakes resemble that of circum-neutral reference lakes with low and stable metal-concentrations. Biodiversity at different trophic levels has increased in the limed lakes but is still lower compared to circum-neutral reference lakes.

- DETRIMENTAL EFFECTS IN THE LIMED LAKES?

No severe detrimental effects have been observed in the studied limed lakes and streams. However, both abiotic and biotic variables indicate reduced productivity in lime treated lakes.

4 Conclusions

- The long-term trends in studied limed lakes indicate that sulphur-concentrations decrease, possibly due to reduced deposition. A reduction in productivity in limed lakes is expressed both in abiotic and biotic variables.
- The water chemical goals of the Swedish liming programme are accomplished in most lakes, but to a lesser degree in streams.
- No severe detrimental effects of long-term lime treatment have so far been observed in the studied lakes and streams. However, in a long-term perspective reduced productivity may affect community composition and result in low biodiversity.

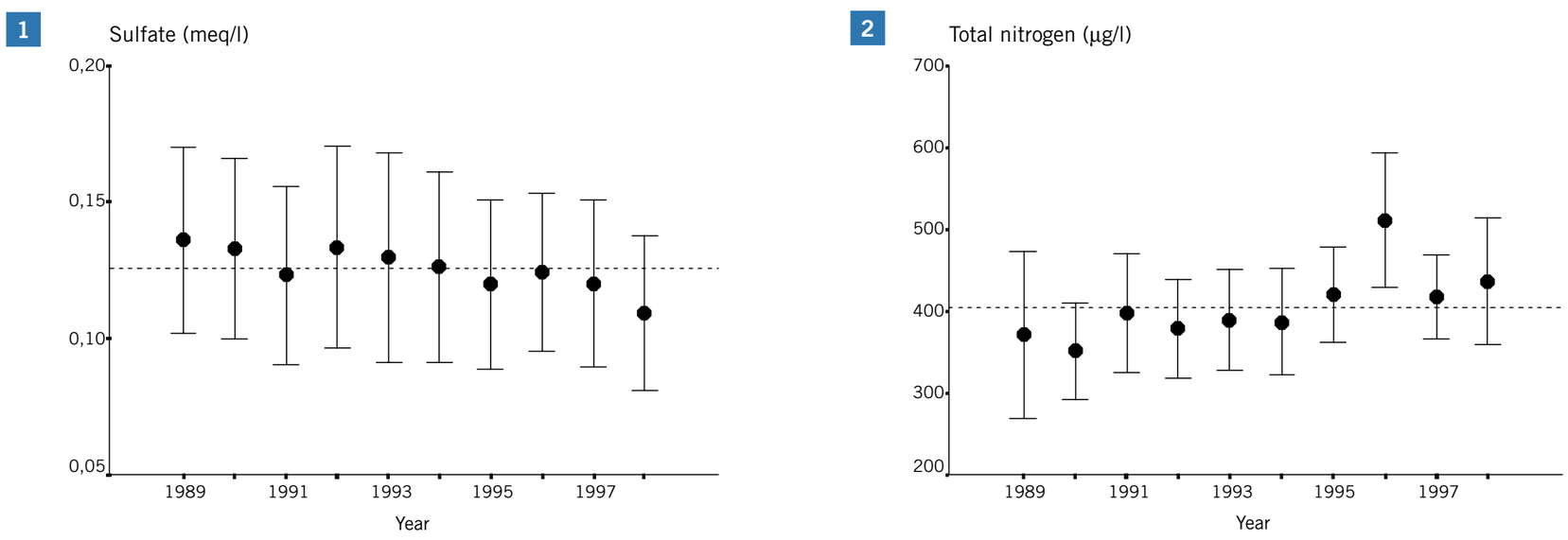

Figure 2. Mean and 95% C.L. for sulfate concentration (left) and total nitrogen concentration (right) in the 13 limed lakes 1989-1998. Dotted lines represents mean value for the study period.

ISELAW

Integrated Studies of the Effects of Liming Acidified Waters

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