APPLICABILITY OF A TARGETED DIATOM TRANSFER FUNCTION TO PHOSPHORUS RECONSTRUCTION IN AN ENVIRONMENTALLY ANOMALOUS AREA

by

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To achieve the “good surface water status” required by the EU Water Framework Directive, we first need to identify reference states for our lakes. Bennion (2011) suggests the time before intensifying human activity due to the onset of rapid industrialization as a reference point. In determining the past reference conditions for a lake, the lack of undisturbed reference lakes can often be overcome by using palaeoecological predictive models, i.e. transfer functions (see e.g. Andersson 1995). However, the models may suffer from poor performance in environmentally atypical areas. We propose that these challenges could be alleviated by developing a targeted model with a training set that consists of modern microfossil calibration samples and corresponding water quality data from the area of interest.

We tested this targeted approach in the Iisalmi region, central-eastern Finland, by developing a diatom-total phosphorus transfer function for the shallow, humic and conspicuously eutrophic lakes in the area. The fossil samples for determining the reference conditions were selected from below a depth where magnetic susceptibility notably increased towards the sediment surface. We interpreted this increase to represent intensified erosion caused by human activity. The resulting phosphorus reconstructions suggest that human activity has only induced significant eutrophication in a minority of the modelled lakes. However, the reconstructions for the reference conditions are mostly very high.

Our results indicate that a successful local diatom-total phosphorus model can be developed for an environmentally anomalous area. An important implication for lake restoration is that the reference conditions for the shallow, humic and eutrophic lakes in the Iisalmi region seem to be notably higher (up to 70 µgl⁻¹) than the previously reported background total phosphorus concentrations for naturally eutrophic lakes in Finland (20–30 µgl⁻¹; Vuori et al. 2006). Further research is under way to examine how well our local model reflects observations of total phosphorus in lake water, and whether it consistently shows larger variation than the previous regional model of Kauppila et al. (2002) for this lake type.
REFERENCES


