

Catchment nutrient sources and impacts in an Irish mesotrophic lake

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Lough Melvin is a polymictic, humic and alkaline lake in north-west Ireland which, by virtue of its low nutrient status, is an increasingly rare example of a lake with a natural post-glacial flora and salmonid community. However since monitoring began in 1990, phosphorus (P) in the lake has risen 50% from 19 to 28 $\mu\text{g P L}^{-1}$. Three annual programmes of lake and inflow nutrient monitoring have shown increases in P export intensity from diffuse sources across the catchment but the spatial pattern of this increase has not been uniform. CORINE land cover P export coefficients gave catchment and sub-catchment P exports within 10% of those estimated from monitoring in all but one area, where a large increase in P loss over time indicates catchment specific impacts on P losses compared to those predicted from changing land use. In 2001, lake P was higher than predicted from inflow concentrations, which was attributed to a pulse of P associated with clear-felling of coniferous forestry in the catchment but this source of P declined from 2000 to 2007. Post 2012, conifers planted in the 1970s and 1980s will reach harvestable size and predictions of P loads from planned clearfelling suggest a potential increase of lake P concentration to 34 $\mu\text{g P L}^{-1}$ by 2015. There is evidence that the impact of increasing P is being modified by other limnological factors as, despite considerable P enrichment, phytoplankton abundance has remained indicative of oligo-mesotrophic status, apparently being capped by the combination of the deep mixing depth and a humic matter restricted photic zone. With respect to the latter the lake is becoming browner reflecting higher inputs of dissolved organic carbon. A more subtle and less studied littoral response by filamentous benthic algae may be a more likely impact of P-induced degradation in Lough Melvin.