

# Evidence

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## Diatom Assessment of River and Lake Ecological Quality

Project summary SC070034

The EU Water Framework Directive (WFD) requires us to assess the ecological status of water bodies so that we can take action to protect and improve them. The DARLEQ (*Diatom Assessment of River and Lake Ecological Quality*) tool is one of a number of methods used by Environment Agency staff to assess and classify lakes and rivers and this report is one of a series describing the development of this method.

The full report provides details of the scientific work underpinning the tool which may be of interest to academics and practitioners implementing the classification requirements of the WFD in the UK and other EU member states.

### Lakes

The tool was derived from a database of over a thousand benthic diatom samples collected from 228 lakes since 2003. The dataset was divided into low, medium and high alkalinity lake types, and sites relatively unaffected by human activity were identified as the basis for a reference typology.

A Lake Trophic Diatom Index (LTDI) related to lake nutrient status was developed and ecological quality ratios (EQR) were generated for each lake type. An EQR greater than one indicates an unaffected diatom community, whereas a ratio close to zero indicates major nutrient impacts from human activities.

The reference data were used to predict the expected (unimpacted) class at each lake site which was then compared with the observed classification. The model performed well in predicting lake quality status, although it appeared to overestimate the quality of a number of low alkalinity Cumbrian lakes.

### Rivers

In rivers, a similar approach based on EQR is used, although defining the 'expected' state has proven difficult, particularly for acidity (pH).

This report describes a new Diatom Acidification Metric (DAM) that offers a simple but effective way of assessing the ecological status of soft-waters vulnerable to acidification. The model was validated using data from a number of well-studied catchments and in most cases the predicted ecological status agreed well with chemical and invertebrate analyses. Where there was disagreement, this could be attributed to the variability of the site. Diatoms can respond to changes in water chemistry in a matter of days, so it is important that associated water samples reflect short-term variations in acidity related to changes in flow.

### Taxonomy

The report investigated different approaches for streamlining the taxon lists used in the Trophic Diatom Index (TDI) to make assessment more efficient. We were able to make the following recommendations:

- Reduce the list to only those taxa with a maximum relative abundance of over two per cent in samples.
- Use this streamlined TDI for routine monitoring, but retain an option to use the current TDI for investigative monitoring where fine-level taxonomy is of benefit.
- Apply a trigger for special protocols developed for use in acid-sensitive waters.

### Further work

An additional short report will follow detailing the approach taken to relate the DARLEQ tool to the macrophyte assessment tool *LEAFPACS*, and to determine a rule to combine the outputs of these two tools for WFD classification.

**Internal Status:** Released to all regions

**External Status:** Publicly available

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