

UKTAG – Biological Status Methods

Lakes – Macrophytes

What do we use as an Indicator?

Macrophytes (water plants that are visible to the naked eye).

Why do we use macrophytes?

Macrophytes provide habitats for fish and smaller animals; they bind sediments, protect banks, absorb nutrients and provide oxygenation. Macrophytes can indicate the impact of increased nutrients in lakes and are also influenced by other pressures such as water level change or acidification. The types and amount of macrophytes present in a lake can tell us how the lake ecosystem is working. This method uses the principle that different macrophytes are associated with different amounts of nutrients (especially phosphorus). Different combinations, quantity and numbers of macrophytes are expected to be present, depending on the lakes catchment characteristics and its fertility.

Sampling



Surveys are conducted during the summer months. For the purposes of sampling at least four sites per lake are surveyed. At each site 100 m transects are deployed by boat perpendicular to the shoreline so that a range of different habitats can be surveyed. Each 100 m transect is divided into 5 m² quadrants and in each quadrant all macrophytes encountered are identified to species level and an assessment of the relative frequency of each of the macrophyte taxa¹ present is made.

What do we measure?

We measure 6 things:

Maximum depth of colonisation (Zc);

This is the deepest point observed along the transect at which submerged or floating-leaved macrophytes (but not free-floating taxa) were observed to be growing.

Mean depth of presence

This is the average of the depth at which each quadrant ends in which submerged or floating-leaved macrophyte taxa (but not free-floating taxa) were recorded.

Percent relative frequency of *Chara* (Stoneworts)

This is the percent relative frequency of *Chara* species. This metric is only included for lakes with an alkalinity of more than 100 mg L⁻¹ CaCO₃.

Percent relative frequency of Elodeids²

This is the percent relative frequency of Elodeids.

Plant trophic score

This is a measure of how sensitive or tolerant macrophyte species are to nutrient levels. Scores of over 25 indicate that a plant is tolerant of nutrient rich conditions. For example, rigid hornwort has a very high trophic score of 62 and is therefore expected to dominate in highly enriched conditions. Other plants such as Lobelia have a score of 10 and will decline in number if nutrient levels increase. The overall plant trophic score is the average of the individual trophic scores for the different species found in the lake.

Percent relative frequency of tolerant taxa

Indicates how much of the aquatic vegetation is represented by nutrient tolerant taxa e.g. filamentous algae.

How do we decide the Biological Status?

Each of the six characteristics are scaled from 0 to 1 and averaged to give an overall average index value. This observed value is then compared with what would be found in a similar lake with no or very low human disturbance to give an Ecological Quality Ratio (EQR), that ranges from 1 (unimpacted or natural state) to 0 (highly degraded by pollution or other disturbance). This is subdivided equally into the five bands (High, Good, Moderate, Poor, Bad) as required by the Water Framework Directive.

Biological Status Boundary Values

Status	EQR Values
High	0.90
Good	0.68
Moderate	0.42
Poor	0.33
Bad	<0.33

For more details see UKTAG Lake Assessment Method UKTAG LAKES ASSESSMENT METHODS MACROPHYTES (FREE INDEX) ISBN 978-1-906934-02-6

¹ Taxon (pl.taxa) taxonomic unit e.g. family, genus, species

² Elodeids are plants whose functional form resembles Elodea species as opposed to the rosettes or isoteids forms