



Water Framework Directive Acidification risk assessment Key findings

Risk assessment details

Pressure - Acidification

Water Category – Rivers, Lakes and Canals

Risk - Risk of deterioration or not achieving good status by 2027

This risk assessment predicts where acidification due to acid deposition will still be a risk to the rivers and lakes of Wales in 2027.

Acidification remains a significant issue for Wales, particularly in the uplands. The overall picture is improving with the area of Wales deemed to be at risk reducing gradually. This is corroborated by studies of impacted lakes showing many to be recovering, and by long term studies such as the Upland Waters Monitoring Network.

Acidification is caused by the deposition of acid gases and particles such as sulphur dioxide, hydrochloric acid and nitrogen oxides. When this acidic material is deposited in areas where rocks and soils have a low buffering capacity, dramatic falls in pH can cause an increase in toxic metal concentrations and kill sensitive fish, invertebrates and plants. The main source is the burning of fossil fuels for electricity generation or oil refining, but domestic fuel, transport and emissions from intensive agriculture also play a part. Land management practice, notably forestry, can influence the degree of acid deposition and release. Careful forest design and land management can minimise these effects and promote ecological recovery. There has been a significant (greater than 80%) reduction in sulphur emissions since 1990, but a lesser reduction in nitrogen release. This risk assessment does not consider direct discharges of acidity to our waters from, for example, industrial discharges or abandoned mines.

Key Findings

- 19% of rivers and 37% of lakes were assessed as being either *at risk* or *probably at risk* of acidification. No canals were found to be at risk.
- The risk of acidification pressure is highest in the Western Wales River Basin District where 23% of rivers and 42% of lakes were assessed as *at risk* or *probably at risk*.
- The most acid sensitive areas were predominantly associated with upland areas such as Snowdonia and the Cambrian Mountains.
- The number of water bodies defined as *at risk* or *probably at risk* in peripheral areas of these regions, as well as in the uplands of South Wales has generally declined. A cluster of *at risk* water bodies identified in Pembrokeshire appears to reflect the relatively high nitrogen deposition occurring in this region.

How were the assessments developed?

This assessment uses a mixture of measured and modelled datasets to predict where acidification will still be a risk to the rivers, lakes and canals of Wales up to 2027 using the latest guidance and evidence. It combines indicators of chemical and biological impacts with sensitivity measures of confidence to formulate an overall understanding of the risk of

acidification. Each element is scored and those scores are combined, with appropriate weighting, to produce an overall score for each water body.

Key differences between cycle 1 and cycle 2 outputs

The assessment has built on similar data to the previous risk assessment published in 2007, with the following improvements:

- Updated Critical Load exceedances based on depositions predicted by FRAME¹ up to 2027, and Acid Neutralising Capacity estimates based on the MAGIC² acidification model
- Use of updated UKTAG³ guidance, to incorporate pH data, which is considered a good surrogate for labile Aluminium, indicating biologically damaging anthropogenic acidification.
- Incorporation of confidence scores in the risk matrix reflecting differing levels of evidence between water bodies
- Biological impacts have been incorporated using the acidification specific invertebrate classification tools for rivers and lakes, with an additional sensitivity metric based on palaeo-ecological records for lakes.

Review of the risk assessments

The Water Framework Directive requires the UK to achieve good ecological status and prevent deterioration for surface waters by 2027 except where certain derogations apply. As part of this process we carry out risk assessments of different pressures likely to cause failures or deterioration.

The results of this risk assessment will be used in the production of the updated River Basin Management Plans in Wales, which are due for publication in December 2015

They will be used to:

- Set water body objectives
- Determine programmes of measures at a national and local scale
- Inform regional and national Significant Water Management Issues consultation documents
- Develop monitoring strategies

We welcome feedback on this risk assessment. If you have any comments please send them to: dave.johnston@cyfoethnaturiolcymru.gov.uk

¹ FRAME: Fine Resolution Atmospheric Multi-pollutant Exchange model

² MAGIC: Model of Acidification of Groundwater In Catchments

³ UKTAG: United Kingdom Technical Advice Group