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## Critical loads of sulphur and nitrogen for freshwaters in Great Britain and assessment of deposition reduction requirements with the First-order Acidity Balance (FAB) model

C. Curtis<sup>1</sup>, T. Allott<sup>1</sup>, J. Hall<sup>2</sup>, R. Harriman<sup>3</sup>, R. Helliwell<sup>4</sup>, M. Hughes<sup>1</sup>, M. Kernan<sup>1</sup>, B. Reynolds<sup>5</sup>, and J. Ulliyett<sup>2</sup>

<sup>1</sup>ECRC, University College London, 26 Bedford Way, London, WC1H 0AP, UK

<sup>2</sup>Institute of Terrestrial Ecology, Monks Wood, Abbots Ripton, Huntingdon, PE17 2LS, UK

<sup>3</sup>SOAFD Freshwater Fisheries Laboratory, Faskally, Pitlochry, PH16 5LB, UK

<sup>4</sup>MLURI, Craigiebuckler, Aberdeen, AB15 8QH, UK

<sup>5</sup>Institute of Terrestrial Ecology, Bangor Research Unit, Bangor, LL57 2UP, UK  
e-mail for corresponding author: (ccurtis@geog.ucl.ac.uk)

**Abstract.** The critical loads approach is widely used within Europe to assess the impacts of acid deposition on terrestrial and freshwater ecosystems. Recent work in Great Britain has focused on the national application of the First-order Acidity Balance (FAB) model to a freshwaters dataset of 1470 lake and stream water chemistry samples from sites across Britain which were selected to represent the most sensitive water bodies in their corresponding 10 km grid square. A "Critical Load Function" generated for each site is compared with the deposition load of S and N at the time of water chemistry sampling. The model predicts that when catchment processes reach steady-state with these deposition levels, increases in nitrate leaching will depress acid neutralizing capacity (ANC) below the critical threshold of  $0 \mu\text{eq l}^{-1}$  at more than a quarter of the sites sampled, i.e. the critical load of acid deposition is exceeded at these sites. The critical load exceedances are generally found in upland regions of high deposition where acidification has been previously recognised, but critical loads in large areas of western Scotland are also exceeded where little biological evidence of acidification has yet been found. There is a regional variation in the deposition reduction requirements for protection of the sampled sites. The FAB model indicates that in Scotland, most of the sampled sites could be protected by sufficiently large reductions in S deposition alone. In the English and Welsh uplands, both S and N deposition must be reduced to protect the sites. Current international commitments to reduce S deposition throughout Europe will therefore be insufficient to protect the most sensitive freshwaters in England and Wales.

**Keywords:** critical loads; acidification; nitrate; FAB model; acid deposition

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