

Home

Online Library HESS

- Recent Final Revised Papers
- Volumes and Issues**
- Special Issues
- Library Search
- Title and Author Search

Online Library HESSD

Alerts & RSS Feeds

General Information

Submission

Review

Production

Subscription

Comment on a Paper



[Volumes and Issues](#) [Contents of Issue 3](#) [Special Issue](#)

Hydrol. Earth Syst. Sci., 5, 421-432, 2001
www.hydrol-earth-syst-sci.net/5/421/2001/

© Author(s) 2001. This work is licensed under a Creative Commons License.

Recovery from acidification of lochs in Galloway, south-west Scotland, UK: 1979-1998

R. C. Ferrier¹, R. C. Helliwell¹, B. J. Cosby², A. Jenkins³, and R. F. Wright⁴

¹Macaulay Institute, Aberdeen, Scotland, AB15 8QH, UK

²Department of Environmental Science, University of Virginia, Charlottesville, VA 22901, USA

³Centre for Ecology and Hydrology, Wallingford, Oxon OX10 8BB, UK

⁴Norwegian Institute for Water Research, PO Box 173, Kjelsås, N-0411 Oslo, Norway

Email for corresponding author: r.ferrier@macaulay.ac.uk

Abstract. The Galloway region of south-west Scotland has historically been subject to long-term deposition of acidic precipitation which has resulted in acidification of soils and surface waters and subsequent damage to aquatic ecology. Since the end of the 1970s, however, acidic deposition has decreased substantially. The general pattern is for a rapid decline in non-marine sulphate in rainwater over the period 1978-1988 followed by stable concentrations to the mid-1990s. Concentrations of nitrate and ammonium in deposition have remained constant between 1980 and 1998. Seven water quality surveys of 48 lochs in the Galloway region have been conducted between 1979 and 1998. During the first 10 years, from 1979, there was a major decline in regional sulphate concentrations in the lochs, which was expected to have produced a decline in base cations and an increase in the acid neutralising capacity. But sea-salt levels (as indicated by chloride concentrations) were approximately 25% higher in 1988 than in 1979 and thus short-term acidification due to sea-salts offset much of the long-term recovery trend expected in the lochs. During the next 10 years, however, the chloride concentrations returned to 1979 levels and the lochs showed large increases in acid neutralising capacity despite little change in sulphate concentrations. From the observed decline in sulphate deposition and concentrations of sulphate in the lochs, it appears that approximately 75% of the possible improvement in acid neutralising capacity has already occurred over the 20-year period (1979-1998). The role of acid deposition as a driving factor for change in water chemistry in the Galloway lochs is confounded by concurrent changes in other driving variables, most notably, factors related to episodic and year-to-year variations in climate. In addition to inputs of sea-salts, climate probably also influences other chemical signals such as peaks in regional nitrate concentrations and the sharp increase in dissolved organic carbon during the 1990s.

Keywords: acidification, recovery, Galloway, sulphur, nitrogen

[Final Revised Paper](#) (PDF, 552 KB)

Citation: Ferrier, R. C., Helliwell, R. C., Cosby, B. J., Jenkins, A., and

Search HESS

Library Search

Author Search

News

- New Service Charges
- Financial Support for Authors
- ISI Impact Factor: 2.270

Recent Papers

01 | HESSD, 24 Mar 2009:
The significance and lag-time of deep throughflow: an example from a small, ephemeral catchment with contrasting soil types in the Adelaide Hills, South Australia

02 | HESSD, 24 Mar 2009:
On the benefit of high-resolution climate simulations in impact studies of hydrological extremes

03 | HESSD, 23 Mar 2009:
Reducing the hydrological connectivity of gully systems through vegetation

Wright, R. F.: Recovery from acidification of lochs in Galloway, south-west
Scotland, UK: 1979-1998, Hydrol. Earth Syst. Sci., 5, 421-432,
2001. [Bibtex](#) [EndNote](#) [Reference Manager](#)