References

Climate change impacts: evidence from monitoring (p1)

¹www.ecn.ac.uk/sites.htm

²Sykes, J.M. and Lane, A.M.J. (eds). 1996. The United Kingdom Environmental Change Network: Protocols for standard measurements at terrestrial sites. NERC. The Stationery Office (for up to date protocols see www.ecn.ac.uk/protocols/index.asp)

³Sykes, J.M, Lane, A.M.J. and George, D.G. (eds). 1999. The United Kingdom Environmental Change Network: Protocols for standard measurements at freshwater sites. NERC (for up to date protocols see www.ecn.ac.uk/protocols/index.asp)

4www.ecn.ac.uk/aboutecn/database.htm

The climate change challenge (p2-3)

¹www.ukcip.org.uk

2www.cbd.int

3www.millenniumassessment.org

North-South divide (p6-7)

¹Warren, M. S., Hill, J. K., Thomas, J. A., Asher, J., Fox, R., Huntley, B., Roy, D. B., Telfer, M. G., Jeffcoate, S., Harding, P., Jeffcoate, G., Willis, S. G., Greatorex-Davies, J. N., Moss, D. and Thomas, C. D. 2001. Rapid responses of British butterflies to opposing forces of climate and habitat change. *Nature*, 414: 65-69

²Fox, R., Conrad, K.F., Parsons, M.S., Warren, M. S., Woiwood, I. P. (2006). The State of Britain's Larger Moths. Butterfly Conservation and Rothamsted Research, Wareham, Dorset

³Scott, W.A. and Anderson, R. 2003. Temporal and spatial variation in carabid assemblages from the United Kingdom Environmental Change Network. *Biological Conservation*, 110: 197-210

On frail wings (p8-9)

¹www.ukbms.org/default.htm

The '95 drought (p10-11)

¹Morecroft, M.D., Bealey, C.E., Howells, E., Rennie, S.C. and Woiwod, I. (2002). Effects of drought on contrasting insect and plant species in the UK in the mid-1990s. *Global Ecology and Biogeography*, 11(1), 7-22

²Carvell, C., Roy, D.B., Smart, S.M., Pywell, R.F., Preston, C.D. and Goulson, D. 2006. Declines in forage availability for bumblebees at a national scale. *Biological Conservation*, 132(4): 481-489

To everything there is a season (p12-13)

¹Beebee, T.J.C. 1995. Amphibian breeding and climate. *Nature*, 374: 219-220

Seeds of change (p14-15)

¹www.countrysidesurvey.org.uk

²Haines-Young, R.H., Barr, C.J., Black, H.I.J., Briggs, D.J., Bunce, R.G.H., Clarke, R.T., Cooper, A., Dawson, F.H., Firbank, L.G., Fuller, R.M., Furse, M.T., Gillespie, M.K., Hill, R., Hornung, M., Howard, D.C., McCann, T., Morecroft, M.D., Petit, S., Sier, A.R.J., Smart, S.M., Smith, G.M., Stott, A.P., Stuart, R.C. and Watkins, J.W. (2000). Accounting for nature: assessing habitats in the UK countryside, DETR, London ISBN 1 85112 460 8

³Bunce, R.G.H., Barr, C.J., Gillespie, M.K., Howard, D.C., Scott, W.A., Smart, S.M., van de Poll, H.M. and Watkins, J.W. (1999). ECOFACT 1: Vegetation of the British countryside - the Countryside Vegetation System. ISBN: 1 851121 55 2, pp 224. Available to download from www.ceh.ac.uk

⁴Harrison, P.A., Berry, P.M. and Dawson, T.E. (eds). 2001. Climate change and nature conservation in Britain and Ireland. Modelling Natural Responses to Climate Change (the MONARCH project). UKCIP Technical Report, Oxford

⁵Hill, M.O., Mountford, J.O., Roy, D.B. and Bunce, R.G.H. (1999). ECOFACT 2a: Technical Annex - Ellenberg's indicator values for British Plants. ISBN: 1 870393 48 1, pp 46 Available to download from www.ceh.ac.uk

Grime, J.P. (2001). Plant strategies, vegetation processes, and ecosystem properties, 2nd edn. John Wiley & Sons Ltd, Chichester. ISBN: 047085040X, pp 456

Site specifics (p16-20)

Is climate change affecting salmon survival?

¹www.afbini.gov.uk/index/about-us/location/bushmills.htm

Lakes in a changing climate

¹George D.G., Maberly S.C. & Hewitt D.P. (2004). The influence of the North Atlantic Oscillation on the physics, chemistry and biology of four lakes in the English Lake District. *Freshwater Biology*, 49, 760-774

Unravelling carbon losses from upland peatlands

¹Clark J.M., Chapman P.J., Adamson J.K. and Lane S.N.
(2005). Influence of drought induced acidification on the mobility of dissolved organic carbon in a peat soil. *Global Change Biology*, 11: 791-809

²Monteith, D.T., Stoddard, J.L., Evans, C.D., de Wit, H.A., Forsius, M., Hogasen, T., Wilander, A., Skjelkvale, B.L., Jeffries, D.S., Vuorenmaa, J., Keller, B., Kopacek, J. and Vesely, J. (2007). Dissolved organic carbon trends resulting from changes in atmospheric deposition chemistry. *Nature*, 450, 537-540

Globe watching (p21)

¹www.ilternet.edu

²Climate Change 2007. The IPCC Fourth Assessment Report consists of the Synthesis Report, and reports from three Working Groups. See www.ipcc.ch/index.htm

3www.lter-europe.net

4www.alter-net.info

Extending the network (p23)

¹Morecroft, M.D., Sier, A.R.J., Elston, D.A., Nevison, I.M., Hall, J.R., Rennie, S.C., Parr, T.W. and Crick, H.Q.P. (2006). Targeted Monitoring of Air Pollution and Climate Change Impacts on Biodiversity. Report to the Department for Environment Food and Rural Affairs, Countryside Council for Wales and English Nature (CR0322)

²Parker, J., Temple, M., Morecroft, M.D., Holmes, M. and Critchley, N. (2008). The Environmental Change Biodiversity Network Business Case: Final Report. Report to the ECBN Steering Group. ADAS, UK

³Parker, J., Critchley, N. and Morecroft, M.D. (2008). The Environmental Change Biodiversity Network Business Development Plan: Final Report. Report to the ECBN Steering Group. ADAS, UK



Printed by Prontaprint Lancaster & Morecambe Tel. 01524 36367

Acknowledgements

The editors wish to thank the following people for their assistance in producing this publication: John Adamson, Joanna Clarke, Walter Crozier, Gersham Kennedy, Richard Kennedy, Stephen Maberly, Don Monteith, Mike Morecroft, Terry Parr and Helen Pontier. We thank ECN's sponsoring organisations for their continued support for the network. We also owe a debt of gratitude to the current and previous ECN site managers and their assistants, to the many other people involved in ECN monitoring and to past and present ECN Data Centre staff. Without their tireless efforts to collect and collate the data this publication would not have been possible.

Image credits

Cover: Design - Andrew Sier; photos - © CEH

Page 1: Photo - Andrew Sier © CEH; map - Simon Wright © CEH

Pages 2-3: Background photos - © Andrew Sier; graph redrawn by Andrew Sier from data provided by Rothamsted Research Ltd.

Pages 4-5: Photo - Andrew Sier © CEH

Pages 6-7: Photo - © Roy Anderson; map - © CEH

Pages 8-9: Photos and map - © CEH

Pages 10-11: Moth - © Ian Kimber, http:://ukmoths.org.uk; butterfly - Andrew Sier © CEH; beetle - © Roy Anderson

Pages 12-13: Photo - Andrew Sier © CEH; graphs - © CEH

Pages 14-15: Background photo - © Andrew Sier; photo of vegetation recording plot - Bev Dodd © CEH

Pages 16-17: Photo - © Andrew Sier; graph - redrawn by Andrew Sier from data provided by AFBI

Pages 18-19: Graph - © CEH; photo - © CEH

Pages 20-21: Background photo - © Joanna Clarke; globe - © NASA; map - Andrew Sier © CEH

Pages 22-23: Photo - Andrew Sier © CEH; map - Jane Hall © CEH



The UK Environmental Change Network (ECN) is the UK's long-term, integrated environmental monitoring and research programme. ECN gathers information about the pressures on and responses to environmental change in physical, chemical and biological systems. ECN is a multi-agency programme. ECN's objectives are:

- To establish and maintain a selected network of sites within the UK from which to obtain comparable long-term datasets through the monitoring of a range of variables identified as being of major environmental importance
- To provide for the integration and analysis of these data, so as to identify natural and man-induced environmental changes and improve understanding of the causes of change
- To distinguish short-term fluctuations from long-term trends, and predict future changes
- To provide, for research purposes, a range of representative sites with good instrumentation and reliable environmental information



