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# Quaternary of Northern England

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and

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Mere Sands Wood R.C. Chiverrell

Martin Mere R. C. Chiverrell

Red Moss R.C. Chiverrell

Skipsea Bail Mere J Innes

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The Bog, Roos J. Innes

Willow Garth J. Innes

Star Carr S. Gonzalez and D. Huddart

Old Mere, Hornsea N.F. Glasser

Fen Bogs R.C. Chiverrell

Gormire J. Innes and S. Morriss

Thorpe Bulmer J. Innes

Low Hauxley J. Innes

Featherbed Moss D. Huddart

Leash Fen G. Wilson

Lindow Moss S. Gonzalez and D. Huddart

Wybunbury Moss N.F. Glasser

Malham Tarn Moss D. Huddart

Bolton Fell Moss and Walton Moss D. Huddart

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Holy Island A. Plater

Lytham D. Huddart

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## **Access to the countryside**

This volume is not intended for use as a field guide. The description or mention of any site should not be taken as an indication that access to a site is open. Most sites described are in private ownership, and their inclusion herein is solely for the purpose of justifying their conservation. Their description or appearance on a map in this work should not be construed as an invitation to visit. Prior consent for visits should always be obtained from the landowner and/or occupier.

Information on conservation matters, including site ownership, relating to Sites of Special Scientific Interest (SSSIs) or National Nature Reserves (NNRs) in particular counties or districts may be obtained from the relevant country conservation agency headquarters listed below:

Countryside Council for Wales, Plas Penrhos, Ffordd Penrhos, Bangor, Gwynedd LL57 2LQ.

English Nature, Northminster House, Peterborough PE1 1UA.

Scottish Natural Heritage, 12 Hope Terrace, Edinburgh EH9 2AS.

This rendition of a digital elevation model (DEM) illustrates an extensive suite of drumlins recording former ice flow patterns around the Kendal and Sedbergh area. Classical drumlins are clearest in the mid-west portion of the image (around Kendal) and record ice flowing towards the south-west. In the south-east corner, smaller drumlins, and of more varied morphology, record southwards flow from Cam Fell. In the north-east, drumlins and subglacially-moulded transverse ridges indicate converging flow eastwards leading into the trunk valley of Wensleydale. It is unlikely that these flows were contemporaneous, but rather that they demonstrate snapshots of flow configuration as the ice cover over the region gradually thinned, leading to greater topographic control on flow pattern. Image provided by C.D. Clark (University of Sheffield), and is a simulated solar shading of an Ordnance Survey, 50 m DEM. Illumination is from the north-west, and the east–west dimension of the image is c. 30 km. For further details of methods see Clark (1997) and for drumlin patterns see Mitchell, (1991b).

## **Preface**

There is such a diversity of rocks, minerals, fossils and landforms packed into the piece of the Earth's crust we call 'Britain' that it is difficult not to be impressed by the long, complex history of geological change to which they are testimony. But if we are to improve our understanding of the nature of the geological forces that have shaped our islands, further unravel their history and learn more of the history of life on Earth, we must ensure that the most scientifically important of Britain's geological and geomorphological localities are conserved for future generations to study, research and enjoy. Moreover, as an educational field resource and as training grounds for new generations of geologists and geomorphologists, it is essential that such sites continue to remain available for study. The first step in achieving this goal is to identify the key sites, both at national and local levels.

The GCR, launched in 1977, is a world-first in the systematic selection and documentation of a country's best Earth science sites. No other country has attempted such a comprehensive and systematic review of its Earth science sites on anything near the same scale. After over two decades of site evaluation and documentation, we now have an inventory of over 3000 GCR sites, selected for 100 categories covering the entire range of the geological and geomorphological features of Britain.

This volume, detailing the Quaternary of Northern England GCR sites, is the 25th to be published in the intended 42-volume GCR series. It contains not only descriptions of key localities that will be conserved for their contribution to our understanding of the events during this time, but also excellent summaries of their key morphological, sedimentological and palaeoecological features and the palaeoclimatic significance that can be attached to them. This volume also serves to highlight the scientific research that has been undertaken on these sites. It will be invaluable as an essential reference

book to those engaged in the study of Quaternary science and will provide a stimulus for further investigation. It will also be helpful to teachers and lecturers and for those people who, in one way or another, have a vested interest in the GCR sites: owners, occupiers, planners, those concerned with the practicalities of site conservation and indeed the local people for whom such sites are an environmental asset. The conservation value of the sites is mostly based on a specialist understanding of the stratigraphical, palaeontological and sedimentological features present and is therefore, of a technical nature. The account of each site in this book ends, however, with a brief summary of the geological interest, framed in less technical language, in order to help the non-specialist. The first chapter of the volume, used in conjunction with the glossary, is also aimed at a less specialized audience. This volume is not intended to be a field guide to the sites, nor does it cover the practical problems of their ongoing conservation. Its remit is to put on record the scientific justification for conserving the sites.

This volume deals with the state of knowledge of the sites available at the time of writing, in 1998–2002, and must be seen in this context. Quaternary Science, like any other science, is an ever-developing discipline. As new discoveries are made, existing models and paradigms are subject to continual testing and modification as new data come to light. Increased or hitherto unrecognized significance may emerge in new sites, and it is possible that further sites worthy of conservation will be identified in future years. Indeed, during the writing of this volume, a small number of sites were identified by the authors as potential GCR sites that should be considered for conservation in order to more fully represent the Quaternary history of northern England. These sites are described in this volume and are being investigated for formal addition to the GCR.

There is still much to learn about Quaternary environmental change and the sites described in this volume are as important today as they have ever been in increasing our knowledge and understanding of this, the most recent of the geological time periods. This account clearly demonstrates the value of these sites for research, and their important place in Britain's scientific and natural heritage. This, after all, is the *raison d'être* of the GCR Series of publications.

N.V. Ellis GCR Publications Manager May 2002

## [References](#)