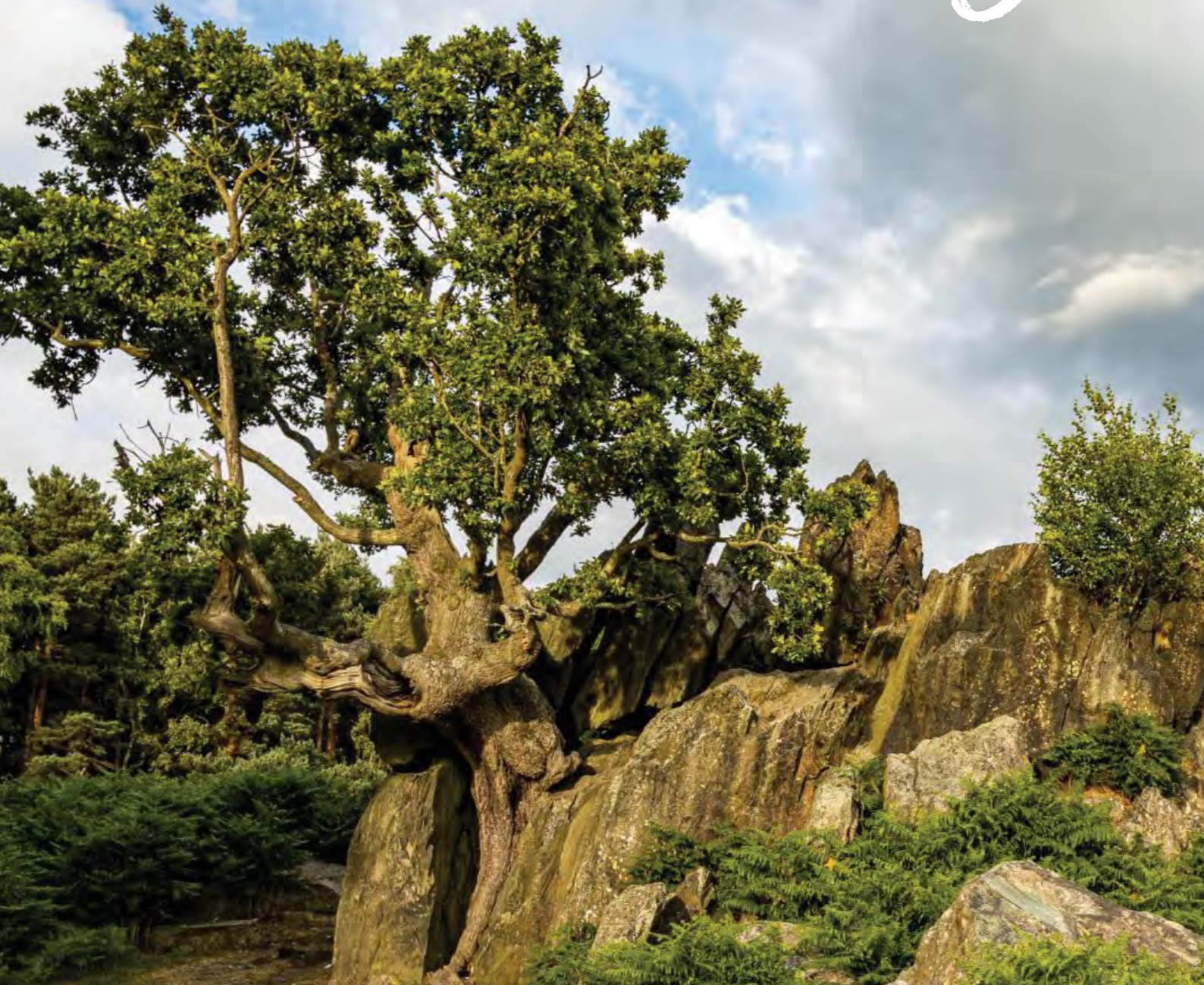


Earth Heritage

The Geological and Landscape Conservation Magazine



**Bradgate Park and
Swithland Wood - a
new geological NNR**



**Citizen Science &
the Stanmore Gravel**

ISSUE
61
Summer 2024

**Detective work
rediscovers an old
discovery**



**Birmingham's
Erratic Boulders**



Cover: An oak tree grows out of an outcrop of the Precambrian age Sliding Stone Slump Breccia in a new National Nature Reserve (NNR) - Bradgate Park and Swithland Wood in Leicestershire. Photo by Robb Doyle. Find out on p.11.



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EDITORIAL

Welcome to the summer 2024 issue! As always there's a broad and varied selection of geoconservation news and fresh approaches to publicising and celebrating our geodiversity.

There is some highly positive and exciting geoconservation news concerning two of the UK's most famous Geosites. In Leicestershire, Bradgate Park and Swithland Wood has become the 220th NNR in England. The declaration offers some of the world's rarest fossils additional protection and represents the commencement of Natural England's ambition to bring to life and tell England's geological story through its growing network of NNRs. In Glasgow's Victoria Park real progress has been made in securing funding that will restore the iconic Fossil Grove.

Making information on aspects of geodiversity more accessible continues apace with the Scottish Geology Trust's Geoguide website. This is a new approach to making published location-based information, about Britain's geology, more widely available and more easily accessible. The website has been developed as part of the Scottish Geology Trust's Geosites project and is demonstrative of the power of voluntary effort. The theme of voluntary activity continues, in the issue, with an item concerning the activities of Harrow & Hillingdon Geological Society (HHGS) that has been investigating the Stanmore Gravel. This citizen science project is helping to unravel the origins of the deposit and reveal the early Thames and its landscape context.

The aspiration of the HHGS, to attract the interest of the local community by linking geology to human activity and history, has strong resonance with the ethos of Scotland's Geodiversity Charter the subject of another article. Realising the role and value of geodiversity is at the heart of Scotland's Geodiversity Charter which is being updated for the late 2020's.

Rediscovering significant aspects of our Earth heritage is yet another theme of Issue 61. An article on Birmingham's erratic boulders presents the 'Heritage of the Ice Age' project that is reintroducing people to this glacial legacy; rediscovering lost stones and bringing together the stories of the people who preserved them. The lost Lethen Bar fish bed is a fascinating account of careful detective work that has uncovered an iconic fossil locality hidden in plain sight for many decades.

The issue brings news of this year's International Geodiversity Day on 6th October which is themed 'Conserving The Past – Sustaining The Future'. If you organise an event, and then wish to share how it went, we would like to hear from you. As always, we welcome views and articles about new projects - to contribute please contact your local editor.



Colin MacFadyen, Editor

International Geodiversity Day 2024

The theme for this year's International Geodiversity Day, on Sunday 6th October 2024, will be *'Conserving The Past – Sustaining The Future.'*

This theme is an opportunity to provide a particular focus on several aspects of geodiversity. Firstly, there are many places around the world where geodiversity of particular significance has been recognized. In the UK these sites include Local Geological Sites, Sites of Special Scientific Interest, National Nature Reserves and UNESCO Global Geoparks. These sites need to be conserved and protected, otherwise, important examples of our planet's history will be lost. Secondly, geodiversity will play an increasingly significant role as we plan for the future:

- As a record of past events, geodiversity helps us better adapt to geological hazards,
- As a resource it provides the minerals that are vital as economies transition towards a more sustainable future, and
- As the foundation for our most stunning landscapes, geodiversity underpins the growing geotourism industry that is supporting local communities.

International Geodiversity Day, and the days around it, is a special time in the year to celebrate and promote all these aspects of geodiversity.

Individuals and groups are encouraged to organise events on geodiversity and specifically on this year's theme *'Conserving The Past – Sustaining The Future'*.

Jack Matthews, Co-coordinator of International Geodiversity Day said

'This year's theme is an excellent opportunity to focus society's attention on the increasingly important role geodiversity plays in all our lives – especially as communities work towards a more sustainable future. With the support of people all around the world, we very much hope that this year's International Geodiversity Day will be bigger than ever.'

By Hannah Townley, Natural England



For more information and to see the events that have already been planned, or to add your own event see <https://www.geodiversityday.org/>

Geology of Sport

A group of geologists and cycling lovers have developed a website to describe the geology people can see whilst watching various cycling races. From their website:

The idea for blogs on the geology of sports events and especially cycling was born out of two passions: geology and cycling.

Geoscientists tend to love the outdoors. They are a talkative bunch who can't stop explaining about their rocks, fossils, landscapes, natural processes and the field expeditions they undertook. Viewers of live coverage of cycling races watch hours and hours of geological excursions! Surely, we couldn't let the opportunity pass to geo-monologue. We started in 2021 with the Tour de France, but since then we can't stop ourselves and added almost all cycling races throughout the year.

These races are covered by commentators who explain just about everything that passes

the camera. All we had to do is help the commentators to explain a few things about the landscape and underlying hidden treasures. As it turns out, there are quite a few geoscientists who love cycling and watching the race. There are also quite a few cyclists with a keen interest in the environment.

This webpage geoscience and geo-background stories on all Tour de France and Tour de France Femmes stages, the Monuments of Italy, Belgium, and France, the Dutch pride of the Amstel Gold Race, and also blogs about the grand and not so grand tours! We tell you about the mountains and the plains, the tropics and the ice ages, long-gone oceans and volcanoes, dinosaur footsteps, giant clams, obelisks and mighty salt mountains.

Find out more and see their coverage of the 2024 Tour de France:

<https://www.geo-sports.org/about/>

By Hannah Townley, Natural England



View across the Pyrenees, the route of the Tour de France.
Photo by Karl Jeller from Pixabay



SSSI monitoring progress in England

Natural England is required to report to government on condition of geological features (includes both geological and geomorphological features) every 2 years, under the G2 indicator of the Outcome Indicator Framework for the 25 Year Environment Plan. As of December 2023, there were 1,221 SSSIs in England designated wholly, or in part, for their geology or geomorphology, encompassing 1,797 features identified through the Geological Conservation Review.

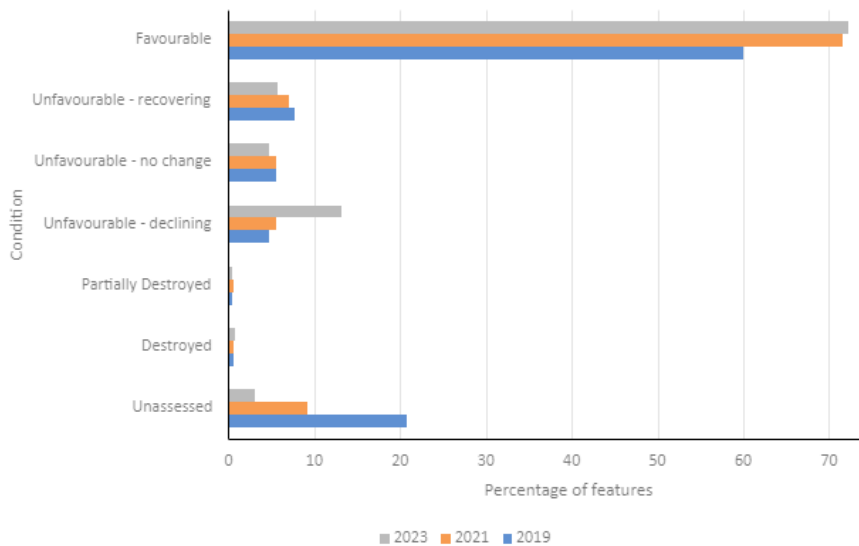
Since 2019 Natural England has run a refreshed monitoring programme, using both external contractors and in-house staff to obtain up to date condition assessments. Monitoring has generally been carried out via traditional walkover surveys, with fixed point photographs being compared to baseline historical photographs to show change in condition. Natural England has also started to utilise drone technology enabling features with large extent (such as the limestone pavements at Ingleborough SSSI) to be monitored much more effectively (see EH 59).

Since 2019, the number of geological features in favourable condition has risen by 12% to 72%. However, many of the features that have previously been unassessed/not assessed, are being assessed as unfavourable declining in condition as they have not been part of an active management programme. Currently around 13% of geological features are unfavourable declining in condition. We anticipate that many of the unfavourable features will go into management agreements to improve their condition over the next few years.

Above: Finedon 2006 and 2023. In 2006, Finedon Top Lodge Quarry SSSI was in favourable condition, showing the Middle Jurassic Rutland Formation, including the type section of the Wellingborough Member. By 2023 scree and vegetation had obscured the lower part of the section, making the feature unfavourable. We hope the feature will be made favourable again soon, through excavation.

Below: The condition of geological and geomorphological features within SSSIs in England, 2019 to 2023. Photos by Mick Murphy (2006) and Ian Price (2023)

By Dan Burgess, Natural England



i Further information

Find out about a SSSI in England: [Site Search \(naturalengland.org.uk\)](https://naturalengland.org.uk)

See the full G2 indicator data: [G2: Condition of heritage features including designated geological sites and scheduled monuments \(defra.gov.uk\)](https://defra.gov.uk)

GA Photographic Competition 2024

A great opportunity for imaginative photography! Geology is all around us impacting on our daily lives. It's in our shopping baskets, our homes and our streets as well as on mountains, volcanoes, beaches and quarries.

Send us your chosen photographs (up to 3) on any geological topic by the deadline of Friday 23rd August 2024.

The best of these will be put on display at the Festival of Geology on 2nd November 2024.

First Prize £100, Second Prize £50, Third Prize £25.

By David Bridgland, Geologists' Association



Further information about how to apply:

https://geologistsassociation.org.uk/photocomp_entry/

Two photos from the 2023 photographic competition:
Top: Honister Passage. Honister Slate Mine, Keswick, Cumbria, United Kingdom by Ben Raczkowski.
Bottom: Travertine waterfalls at Skradinski buk. Krka National Park, Croatia by Anne Bone.

QRA Conservation Grant

The Quaternary Research Association (QRA) has the [Jean and Dick Grove Conservation Grant](#) which provides up to £1000 to deliver Quaternary geoconservation projects and activities. Applications for the Jean and Dick Grove Conservation Grant can be for site-based works and off-site projects.

There are two application deadlines each year, 15th September and 15th March, although urgent applications will be considered throughout the year. For further information and application details, please contact the QRA Conservation Officer (conservation@qra.org.uk).

By Michael Dempster, QRA Conservation Officer



John Madigan submitted his photo of 'Summer Solstice. The Roaches in the Peak District' to the 2023 Geologists' Association Photographic Competition. Find out more on p.7.



North York Moors and Yorkshire Wolds - Landscape and Geology

North York Moors and Yorkshire Wolds - Landscape and Geology.
Tony Waltham. The Crowood Press. 2024. ISBN: 9780719843747. <https://www.crowood.com/products/north-york-moors-and-yorkshire-wolds-by-tony-waltham>

This beautifully illustrated book provides a comprehensive guide to the extremely diverse geology and landscape of the parts of northeast and east Yorkshire that lie between the rivers Tees and Humber, encompassing the sandstone, limestone and chalk uplands of the North York Moors and Wolds but also the lowland clay Vales that lie between them, and the coastal zone that forms their boundary to the east. The solid geology of the region is described in detail, with each area's geological evolution and its influence on the modern landscape clearly explained. All aspects of landscape history are covered, including minerals and mining, fossils and both cultural and industrial archaeology. explored in an authoritative but clearly written text that is supported by many photographs and diagrams.

This book is well organised and clearly written, and provides an engaging review of the geology and landscape of eastern Yorkshire, and the processes that have shaped it, such as glaciations that have affected the lowlands, sea-level change, fluvial history, erosion and human activity such as mining, and their landscape legacies. The level of detail and understanding is impressive, and as a narrative of the landscape history of the region it can be thoroughly recommended, and every reader will find something within it to meet their current interests and to introduce them to new ones. The author is to be congratulated on assembling such a large amount of information and in presenting it as such a comprehensive and entertaining synthesis.

James B. Innes, Durham University (Emeritus)

TONY WALTHAM

North York Moors and Yorkshire Wolds
LANDSCAPE AND GEOLOGY

THE CROWOOD PRESS **New Book**

North York Moors and Yorkshire Wolds
 by Tony Waltham

With the help of numerous maps, diagrams and photographs, most of which are taken from his personal collection, geologist Tony Waltham tells the fascinating story of eastern Yorkshire, explaining just how the landscapes of sandstone uplands, chalk hills and clay vales came to look as they do. Including suggestions for walks and places to visit to appreciate the best of the inland and coastal landforms, this accessible and readable book opens up amazing new perspectives for all who are interested in the diverse landscapes of this beautiful area.

This book is one of a popular series that seeks to tell the story of some of Britain's most beautiful landscapes. Written with the general reader - the walker, the lover of the countryside - firmly in mind, these pages open the door to a fascinating story of bygone oceans, deltas, mineralisation and glacial landscapes.

Tony Waltham is a geologist who has long studied landscapes and their evolution. He was a university lecturer for many years in Nottingham, teaching engineering geology.

ISBN: 9780719843747 £18.99 Paperback 160 pages

Available through online retailers and local bookshops
www.crowood.com

Images © Crowood Press

Doniford Bay, near Watchet on the North Somerset coast, has long been known for its stunning coastline and rich geological history. However, recent events have left local residents and geologists alike concerned about the impact of irresponsible fossil collectors on the area's paleontological and geological heritage. Find out more in the article on p.20. Photo by Andy King



Bradgate Park and Swithland Wood National Nature Reserve

Jonathan Larwood & Joshua Smith, Natural England

Some of the UK's and world's rarest fossils were protected with the declaration of a new National Nature Reserve (NNR) in Leicestershire. Announced by Natural England on 20th May, Bradgate Park and Swithland Wood became the 220th NNR in England and joined the King's Series of NNRs in celebration of the coronation of King Charles III.

Bradgate Park and Swithland Wood NNR, on the southern edge of Charnwood Forest overlooking Leicester City, is a former mediaeval deer park that was once home to Lady Jane Grey and is today managed as a Country Park by the Bradgate Park Trust. Uniquely, it contains rare examples of fossils from the Precambrian Period: trace fossils of complex multicellular organisms comparable with similar aged faunas in Newfoundland, Russia, Namibia and Australia – the Ediacaran biota.

The rocky outcrops across Bradgate Park include type sections in the Precambrian Beacon Hill and Bradgate Formations, and in Swithland Wood the Cambrian Swithland Formation is exposed in the former Swithland Slate Quarries. Originating from explosive island arc volcanism, similar to modern-day Monserrat, these marine volcanoclastic sediments engulfed the Precambrian seafloor 560 million years ago and its Ediacaran biota including the holotype of *Bradgatia linfordensis*.

Bradgate Park and Swithland Wood is the only NNR where you can find fossils of this age. They are among the first evidence of complex life on Earth and helped revolutionise our understanding of how life evolved, resolving the paradox of Darwin's 'missing link'. Darwin had suggested as part of his theory of evolution that the Precambrian seas must have hosted life, but this had never been proved until Precambrian fossils were discovered in Charnwood in the 1950s.

Declaration of Bradgate Park and Swithland Wood as an NNR is a celebration of this geological heritage and recognition of the work of the Bradgate Park Trust in managing this landscape and all that it contains.

Precambrian seafloor reconstruction by Martin Lisec featuring (from left to right) *Charnia*, *Charniodiscus*, *Bradgatia*, *Auroralumina*, *Primocandelabrum* and *Hylaecullulus*.

All images © Charnwood Forest Geopark unless otherwise stated

WELCOME TO CHARNWOOD FOREST

560 MILLION YEARS AGO



Tony Juniper, Chair of Natural England (seated), with Jack Mathews (right) from the proposed Charnwood Forest UNESCO Geopark and Josh Smith (Natural England) at the Bradgate Park and Swithland Wood NNR declaration event. The ruins of Bradgate House, one of the earliest brick-built country houses in England are in the background. Photo by Jonathan Larwood



James Dymond, Director of Bradgate Park Trust, said:

'This is a landmark moment for Bradgate Park and Swithland Wood. They are home to some of the oldest fossils and rocks in England and to have the site's conservation value recognised in this way is a fantastic achievement.'

'For Bradgate to be part of His Majesty The King's series of National Nature Reserves is a real honour and I'm extremely grateful to the teams of professionals, specialists and volunteers who have worked together to make this achievement possible.'

'As well as being a Green Flag Heritage Site, we've now got a nationally recognised nature reserve too which we hope will raise the profile of our geological history and its importance.'

Not only is the NNR of unique and global importance for its geological heritage Bradgate Park is one of the finest examples of ancient parkland in Leicestershire with many of its oaks over 300 years old whilst Swithland Wood supports among the best remaining examples of oak-lime and alder woodland in the county. Bradgate Park contains the remains of the Elizabethan mansion that was once home to Lady Jane Grey ('The Nine Days Queen'), and more recently, evidence was discovered within the Park of an Upper Palaeolithic flint knapping site. Within Swithland Wood are the flooded remains of two Swithland Slate Quarries that, up until the mid-19th Century, supplied Cambrian Slates across the region and as far south as the roof of St Pancras Station in London. More recently Sir David Attenborough, who grew up in Leicestershire, has recounted his early inspiring encounters with

Leicestershire geology and his fond memories of childhood visits to Bradgate Park. In 2016 he opened the new Bradgate Park visitor centre and exhibition.

Bradgate Park and Swithland Wood is internationally important for current scientific research and teaching, as well as geoconservation innovation. Large-scale mould and cast replication of fossil bearing bedding plane surfaces in Bradgate Park over 15 years ago was at the time groundbreaking and a technique that has subsequently been used elsewhere on the Precambrian of Charnwood Forest and further afield. As reported previously (EH 60) Bradgate Park was visited by the international ProGeo Symposium in 2023 and this newest NNR is a key site in the future plans for the Charnwood Forest UNESCO Global Geopark. Bradgate Park and Swithland Wood NNR is also the opening ‘chapter’ in Natural England’s ambition to bring to life and tell England’s geological story through our growing network of NNRs.



Left: An oak tree grows out of an outcrop of the Precambrian age Sliding Stone Slump Breccia. Photo by Robb Doyle

Below: Cast of *Bradgatia*



i

King’s Series NNRs

<https://www.gov.uk/government/news/kings-nature-reserves-to-leave-lasting-legacy-for-people-and-nature>

Bradgate Park Trust

<https://www.bradgatepark.org/>

Charnwood Forest Geopark

<https://www.charnwoodforest.org/>

Updating Scotland's Geodiversity Charter

Colin MacFadyen, NatureScot

First published in 2012 and refreshed in 2017, Scotland's Geodiversity Charter is being updated for the late 2020s. Now embedded in the Scottish Biodiversity Strategy Delivery Plan, the Charter will highlight the need to promote the role and value of geodiversity in helping to address the nature and climate crises.

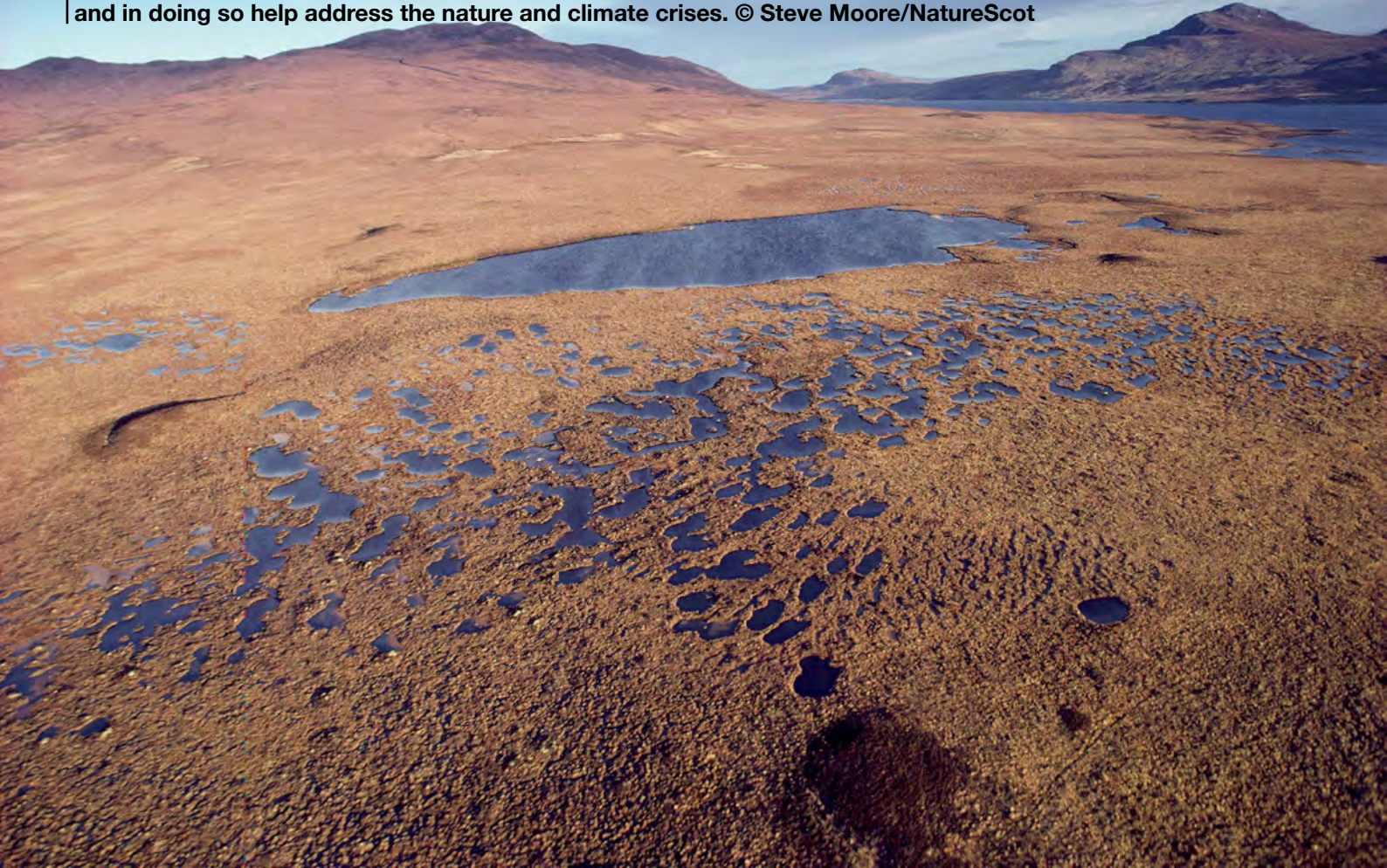
Scotland's Geodiversity Charter is a world first that was prepared and published by the Scottish Geodiversity Forum in 2012. The Charter is an acknowledgment that Scotland's geodiversity not only has intrinsic value but is fundamental to all our lives providing essential 'geosystem services' that benefit our economy, biodiversity and cultural development. Over the last 12 years the Charter has encouraged activity that promotes, celebrates and helps conserve Scotland's world-class geodiversity. News of activities were published by the Forum by means of various updates that helped maintain and raise the profile of geodiversity and that of the Charter itself. The ethos of the Charter has attracted 96 signatories representing a community of interest which spans a broad range of organisations, as well as individuals, ranging from communities, land managers, Local Authorities, public bodies, Scotland's UNESCO Global Geoparks, non-governmental organisations and businesses. Signatories share a common vision that our geodiversity is maintained, actively promoted and managed appropriately to the benefit of all.

It was intended, at the outset, that the Charter would be a time-limited document. This approach was adopted to accommodate refocussing and redevelopment to address additional needs and fresh challenges. Consequently, at the end of each iteration the Charter is updated; the second, and latest version, being published in 2017. From the beginning the Scottish Government has supported the Charter acknowledging geodiversity's continuing provision of essential benefits for Scotland and the Charter is now embedded in the Scottish Biodiversity Strategy Delivery Plan. Inclusion in the Delivery Plan is a loud statement that integrated management of geodiversity and biodiversity, where linkages are demonstrable, helps serve the needs of biodiversity conservation and restoration. As Scotland faces the nature-climate crisis promotion of the Charter and raising awareness of the role of geodiversity, in the delivery of valuable geosystem services, clearly has value.



The landscape at Loch Glencoul within the North West Highlands UNESCO Global Geopark. Interpretation of the landscape here at Unapool, by means of an interpretative panel, and elsewhere along the Rock Route, demonstrates the economic and educational value of geodiverse landscapes.
© Lorne Gill/SNH

An aerial view of the largest expanse of blanket bog in Europe in the Flow Country of Caithness. Covering about 4000 km² this peatland bog, and others like it, represent a lesser-known aspect of Scotland's geodiversity. Peatland bogs provide valuable regulating, supporting and cultural geosystem services. Maintenance and restoration of this and other peatlands will help to reduce greenhouse gas emissions, aid carbon sequestration and in doing so help address the nature and climate crises. © Steve Moore/NatureScot



Scotland's Geodiversity Charter for 2024-2030 will recommit to the championing of geodiversity's role in the delivery of valuable geosystem services. The refreshed Charter will continue to foster the need to raise awareness and consider conservation of its best and most representative aspects regionally and nationally. However, the third iteration is likely to more closely reflect the need to encourage an understanding and appreciation of geodiversity as an integral part of nature having significance in tackling the nature-climate crises. To access and find out more about the Charter, and get involved in updating it, visit the Charter page on NatureScot's website – <https://www.nature.scot/landforms-and-geology/protecting-our-geodiversity/scotlands-geodiversity-charter>. NatureScot is currently hosting the Charter.

Further information

Earth Heritage has documented various landmarks in the development of the Charter:

- [Earth Heritage 38.pdf](#) page 5
- [Earth Heritage 46.pdf](#) page 6
- [Earth Heritage 49.pdf](#) page 6

NatureScot webpage and access to the Charter:

<https://www.nature.scot/landforms-and-geology/protecting-our-geodiversity/scotlands-geodiversity-charter>

Investigating the Stanmore Gravel – a Citizen Science project

Liz Chiu, Harrow and Hillingdon Geological Society

Members of the Harrow & Hillingdon Geological Society (HHGS) are interested in gravel. On the edge of northwest London, former gravel pits are now lakes and pebbles cap the hills; this is our geological heritage. The Thames bypassed our area when it was diverted from further north into its current course by the Anglian glaciation, nearly half a million years ago. So what is the explanation for the enigmatic Stanmore Gravel?



The rounded pebbles on top of our hills are not so easy to explain. They belong to the Stanmore Gravel Formation, considered to be Early Pleistocene in age and thus pre-dating glaciation. According to the British Geological Survey (BGS), the type area for the Stanmore Gravel Formation is Harrow Weald Common; the formation is said to extend across a wide area as far as Essex and Kent and is categorised as part of the marine Crag Group. However, the gravel to be found at Harrow Weald Common may tell a different story from some of the other gravels that have been included in this group.

At HHGS we knew of published data linking the gravels to an ancient tributary of the River Thames, and we invited Dr Peter Allen to give us a lecture about this in July 2022. Peter set us a challenge - to carry out some research into the origins of the Stanmore Gravel at Harrow Weald SSSI in order

Exposed section of Stanmore Gravel on Harrow Weald Common, April 2024, with close-ups of each step. All photos by Liz Chiu





Members of the Stanmore Gravel Project who excavated the gravel bank, including Prof David Bridgland (with dog), Dr Peter Allen and Dr Phil Collins

to add to what is currently known about it. This was the start of the Stanmore Gravel Project. With Peter guiding us, Prof David Bridgland (Durham University) agreed to lead the research and Dr Phil Collins (Brunel University) offered to help with analysis, and we set up a project which anyone with an interest in the topic could join.

In fact, HHGS members had been looking into this gravel for decades and had contributed their knowledge to the Mayor of London's Green Infrastructure and Open Environments planning guidance framework in 2008 and 2012 (London's Foundations). Unfortunately, during all that time we were unable to gain access to the SSSI, which is the site of a former gravel quarry and now privately owned. We are continuing to send requests for permission to conduct our research there but so far we have not been able to make contact with the owners.

Instead, we started to look for good exposures of gravel on the public land of Harrow Weald Common. Harrow Council and the Conservators of the Common support our project and have given permission for us to dig a vertical section into the perimeter bank adjoining the SSSI. So, on Friday 19th April 2024 our team of academics and citizen scientists finally managed to expose an in-situ deposit of Stanmore Gravel. It is a striking shade of orange / yellow with clasts of all shapes and sizes in a sandy, clayey matrix. There is little structure, but there is some variation from top to bottom of the section. Pebbles of 11.2-16mm and 16-32mm have been taken to Durham University for analysis by Prof David Bridgland and a full description will appear on the Project webpage later this year: <https://www.hhgs.org.uk/StanmoreGravelProject.html>

What is the role of Citizen Science?

There are many gaps in current knowledge about the gravels of the London Basin, but academic research is already overstretched and this type of project cannot be funded. Local geology groups like HHGS have members who are mostly retired and have a broad range of knowledge and experience which they are willing to share. Our Project members are keen to be involved with a genuine piece of research and happily invest a lot of time and energy into it.



Display at the Uxbridge Rock Show in February 2024 with a representative sample of Stanmore Gravel, washed and sieved, and information for people wanting to join the Project

We regularly meet online to discuss the Project and study the geology together. Since January 2023 we have increased our collective understanding of the Stanmore Gravel deposits by sharing academic articles, learning about uplift and isostatic rebound, looking at topographic maps, and visiting Harrow's historical archives to look for clues about the quarry and kilns at the site. We make a summary video of each Zoom meeting for YouTube, which stands as a public record of our progress (eg [October 2023 summary of discussion \(Stanmore Gravel Project\) \(youtube.com\)](https://www.youtube.com/watch?v=...)). We hope this might encourage other local geology groups to set up their own unfunded research projects into sites that currently are not well documented.

Training and upskilling

Some Project members have not previously conducted field research but are keen to learn. One of the first things we did was to go out and locate promising test sites on Harrow Weald Common, saving time for the academics. In order to do this, we had to consider the topography, previous human activity, borehole data and current land use. Peter Allen and Phil Collins then selected the sites for excavation.

There have been three training opportunities so far for volunteers to learn about sample collection and sieving, culminating in the great 'dig' event of 19th April, the day the vertical section was created.

1) In May 2023 we collected pebbles from a spoil heap after ponds had been dug for reasons of water management on the Common. The gravel was sieved and the pebbles labelled and stored for later analysis if needed. 2) In August 2023 we used hand augurs to check below the surface at a promising site, but found silty, sandy clay there, no gravel. Eight samples were collected at different depths and kept for possible comparison with samples of gravel matrix. 3) In April 2024, while excavating the gravel bank adjoining the SSSI, a variety of different samples were collected, labelled and taken for analysis: medium pebbles to Durham University, the rest to our local university in Uxbridge, Brunel.

The next stage will be to investigate the bulk samples taken to Brunel University. Once the samples have been dried, small samples of the fine material will be sent to the University's Experimental Techniques Centre where heavy mineral analysis and other specialist tests will be carried out. Project

members will then be invited to sieve, sort and examine the remainder, under supervision. We will be looking in particular at the smaller pebbles, less than 8mm, which can be fiddly and time-consuming for manual processing. Our challenge will be to pick out any small clasts that are not flint – not as easy as it sounds! Preliminary checks of the spoil-heap pebbles showed that there are quartz clasts to be found in the smaller fractions of the gravel. We will also be keeping an eye out for any pieces of Lower Greensand Chert, as this could be indicative of the gravel having travelled from the south. With many keen eyes on the job, you never know what we might find – and that is the joy of Citizen Science.

Public Engagement

Harrow & Hillingdon Geological Society's mission is advancing public appreciation of geology. We run the Uxbridge Rock Show for 3 weeks each February and participate in many local events where we display fossils, rocks, minerals and posters while talking to the public. We hold Earth Discovery Sessions at Brunel University which are free of charge, open and accessible. At these events we have displayed a washed sample of Stanmore Gravel along with a poster explaining the Project. There is also a dedicated webpage and YouTube playlist.

All of the findings from the Stanmore Gravel research will be made available to the public and we further hope to attract the interest of the local community by linking the geology to human activity and history. By chance, an ancestor of one of our members was a gravel-digger on Harrow Weald Common, and that story will be written up as part of the project.

We are very keen to share our experience with local geology groups who would like to set up a similar project in their area. We are grateful for the help and participation of the London Geodiversity Partnership and acknowledge that without the support and encouragement of our academic leaders, the time they have given and patience they have shown, our Project would not have been possible.

Lilstock to Blue Anchor – Irresponsible Fossil Collecting on the North Somerset Coast

Joshua Smith, Natural England

Doniford Bay, near Watchet on the North Somerset coast, has long been known for its stunning coastline and rich geological history. However, recent events have left local residents and geologists alike concerned about the impact of irresponsible fossil collectors on the area's paleontological and geological heritage.

Last November, local people reported fossil collectors using power tools on Doniford Bay's foreshore. They undertook extensive excavations of the bedrock. The foreshore of Doniford Bay is designated as a Site of Special Scientific Interest (SSSI) on account of its exceptional succession of Triassic to early Jurassic strata, overlying Pleistocene sediments and both the coastal geomorphological processes and the associated landforms present.

Local Geologist and Watchet resident surveying the damage caused by the irresponsible collection of fossils. All photos by Andy King





The SSSI designation comes with legal protection which requires consultation with Natural England before specific actions are undertaken. Following an outcry from local residents about the extent of the collecting activity in the SSSI, Somerset Council contacted Avon and Somerset Police, who were able to intervene and halt the damaging activities, advising the collectors that they were committing a wildlife crime.

As a result of this incident, public interest in conserving the unique geological heritage of the North Somerset Coast has been galvanised, with people recognising the importance of protecting geodiversity through sustainable fossil collecting practice and local interest groups, police, and regulatory authorities have come together to take prompt action and to promote responsible fossil collecting. As part of this effort, new signage is being installed, which aims to increase awareness of the area's unique natural heritage whilst encouraging responsible collecting. The need for a renewed fossil-collecting code of practice for the region surrounding Watchet has also been recognised as a way of providing clear guidelines to collectors.

Natural England promotes responsible and sustainable fossil collecting through advocating collection of only a few representative specimens from fallen or loose material. Scientific study may require collection of *in situ* specimens; this should be carefully planned and wherever possible avoid sampling the most visible exposures or those critical to interpreting the site. Hand tools, where allowed, should only be used when essential and power tools only used in exceptional circumstances. Any form of excavation is likely to require permission before it is undertaken. Landowner permission should always be sought to collect fossils.

Detective work rediscovers an old discovery

Bob Davidson MBE, Honorary Research Fellow, University of Aberdeen.

The Moray and Nairn areas, in Northeastern Scotland, host internationally renowned fossil fish beds from the Middle Devonian period, dating from around 380 million years ago. The Lethen Bar locality, near Nairn, is particularly celebrated for the great beauty and scientific importance of its fossil fishes, which are coveted by researchers and collectors alike. However, its broader provenance is fraught with published misinformation dating back over two hundred years. Rediscovering the iconic Lethen Bar highlights the potential pitfalls of accepting historic information, especially from the formative years of a discipline, without due diligence.

The story can be traced back to 1807; Aaron Arrowsmith, head of the London cartography dynasty that bore his name, produced a topographic map of Scotland. At the time this was regarded as state of the map maker's art and was adopted by the government as a template for the first geological map commissioned in 1826 from the celebrated geologist, Dr John MacCulloch. MacCulloch surveyed Scotland adding geological data to the map. However, MacCulloch noted errors on the map which he complained about to his client, but the government was adamant that Arrowsmith's map was the benchmark, and he was obliged to use it. MacCulloch's map was published posthumously in 1836 but few realised that some areas exhibited displaced geology.

The Middle Devonian Lethen Fishbed as exposed at Lethen House Quarry near Nairn. This is the sole naturally exposed representative of the Lethen area fishbed rediscovered by considerable detective work. The image shows Top and Bottom Units comprising fine-grained sandstones which contain fossil remains of plants. The Middle Unit contains numerous limestone nodules enclosing well-preserved fossil fish



A spectacular fossil of the early ray fin fish, *Cheirolepis trailli* from the recently 'rediscovered' Lethen Bar locality. The specimen occurs within a limestone nodule which has ensured a high level of feature preservation. NMS G. 1973.12.163. British Geological Survey. © NERC

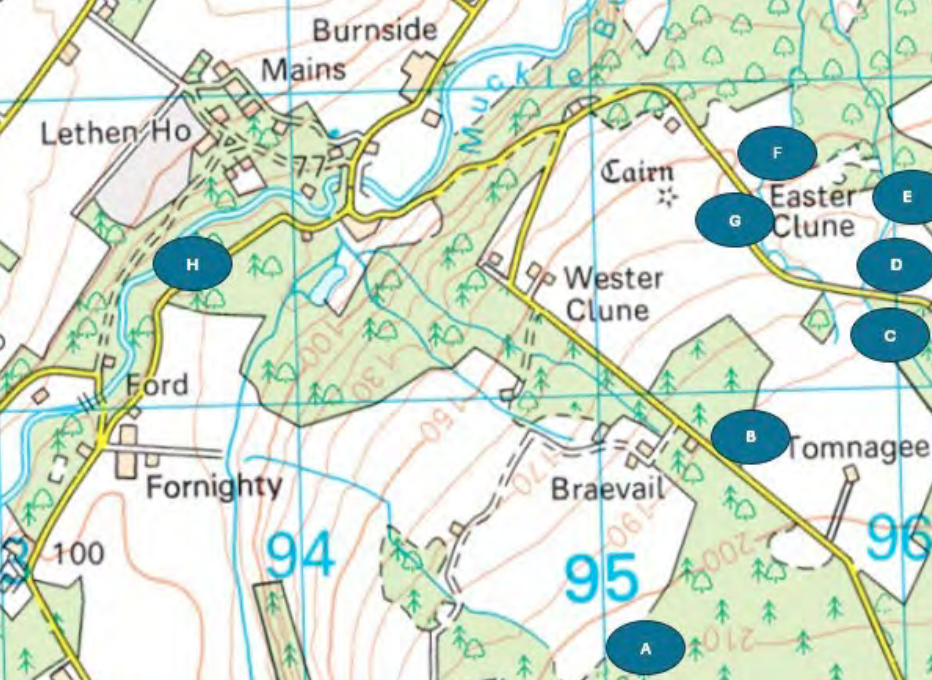


The error central to this story is that in the Lethen area, SE of Nairn the hill named Lethen Bar, was illustrated 1 km north of its true position but despite this MacCulloch was forced to insert the hill's true, but displaced, bedrock geology.

In 1839, Dr John Grant Malcolmson, renowned geologist and palaeontologist set out to produce a detailed account of the Old Red Sandstone and its fish fossils of his home county of Nairn and Moray. It appears Malcolmson used MacCulloch's map as a geological baseline in producing a set of (inaccurate) geological cross sections which centred on the erroneous hill with its displaced geology and misrepresented the position and stratigraphy of the fossil bed. In addition, Malcolmson bewilderingly compounded the situation by renaming Lethen Bar, 'Cairn Bar', a neighbouring hill centred on different bedrock geology. Malcolmson hurriedly submitted his (unfinished, it has to be said) manuscript to the Geological Society of London (GSL) in 1839/40 and left for India soon after, where he died in 1844. In the meantime, his manuscript was forgotten for twenty years before being decimated and published in a considerably depleted form in 1859 by the GSL, following the publication of a heavily paraphrased version by Rev. George Gordon in a disparate journal. earlier that year.

Enter the British Geological Survey (BGS) and Dr John Horne, their Lead Surveyor, in 1878; Horne praised Malcolmson's work overall but nevertheless re-interpreted and corrected Malcolmson's, MacCulloch's and Arrowsmith's errors in his accurate 1923 geological map and accompanying memoir of the Nairn area. Horne also pinpointed six isolated fossil localities, traceable to his original field slips in BGS archives, which should have brought the matter to a close.

Subsequently the respected palaeontologist, Dr Mahala Andrews of the National Museum of Scotland, while curating the Altyre collection of Lethen fish fossils, reinvestigated the fossil localities of the area in 1974-1983 and published her findings in 1983. For reasons unknown, Andrews largely circumvented Horne's authoritative work and map and focussed instead on Malcolmson's account; in particular, she cited a loosely provenanced, handwritten but anonymous copy of Malcolmson's



Positions of 19th century fish bed localities based on updated evidence. A: NH949 503 'Lethen Bar Quarry'/ Andrews quarry 1. B: NH954 508 'Clune pits' (new locality). C: NH958 512 'Clune Quarry'/Andrews' quarry 2. D: Trial pit by BGS (Horne, 1878). E: Andrews quarry 4 (Horne 1878). F: Andrews quarry 3 (Horne 1878). G: NH956 515 Broad meander scar of stream (previously unreferenced). H: NH935515 Lethen House Quarry and adjacent natural exposure. Contains British Geological Survey materials © UKRI [2023]. © Crown copyright and database rights (2023) Ordnance Survey 100021290

1839 manuscript (it is not in Malcolmson's hand) and decimated 1859 memoir along with Gordon's well meaning, but selective, version published earlier in the same year. Andrews appears to have relied little on fieldwork and believed Malcolmson's work despite its inconsistencies and incongruous statements and crucially, embraced his displaced hill. Despite Horne's affirmative report of 6 fixed localities, Andrews developed the hypotheses that only 1 fossil bearing exposure existed at any time and that, with quarrying, it moved continuously around the area as the fossil fish bed was stripped out.

Andrews' hypotheses persisted for the next 40 years and threw subsequent investigators off the scent of the true nature and location of the old fossil localities, by inferring that the fishbed is now 'lost'.

In 2005, our team of research palaeontologists, led by the late Professor Nigel Trewin, reopened a remote and largely bypassed locality in the grounds of Lethen House, where the fish fossils were known to occur and found the fish bed intact (above). In 2020-2023 we completed detailed surveys of the area, confirming the positions of the old quarries, and adding a further two fishbed penetrations, along with an overhaul of the historical literature, and in January 2024, published a new and definitive account of the fish bed of the area, which addresses past misinformation and misunderstandings. This account has re-affirmed the significance of the surviving Lethen House Quarry as the sole exposed representative of the Lethen area fishbed and its stratigraphy, see further reading below.

Lethen House Quarry is not unique scientifically; the Geological Conservation Review (GCR) already lists other well documented Devonian fossil fish sites, therefore no justification exists for its inclusion on that basis. However, its importance lies in the history of geology, which does not have a separate category, or block, in the GCR.

The site's uniqueness is that it represents an outcrop previously poorly appreciated as typical of the 'lost' Lethen fishbed. We now know that up to eight, perhaps nine, old quarried openings into the fishbed existed and although they can still be traced, most are now backfilled and lost to science. Lethen House Quarry, the last best and most representative of the Lethen fishbed, therefore would merit recognition as a Local Geodiversity Site. Inclusion of this last, rediscovered, locality in the Local Authority's collection of Local Nature Conservation Sites could be appropriate introducing a level of protection to the site.

Further information

Davidson *et al.* 2024. Dr John Grant Malcolmson and a reconciliation of the Middle Devonian Lethen Bar and Lethen House fish bearing nodule localities. With notes on the Middle Devonian nodule beds of the Moray Firth area. *Scottish Journal of Geology*. **60**, <https://doi.org/10.1144/sjg2023-011>

The canals came first – HS2 and mapping the ground

Gareth Jenkins, Engineering Geologist at Mott Macdonald

Construction of the canal network in the United Kingdom provided insights that led to the development of the first national geological map by engineer and pioneering geologist, William Smith. Later, the canals were superseded by the newly developing railway network. This network, along with the subsequent road network, led to an even greater understanding of the UK ground and how to engineer it. Today, another national infrastructure project, HS2, is employing geologists to guide its construction and is providing a legacy of new data about the ground along its route.

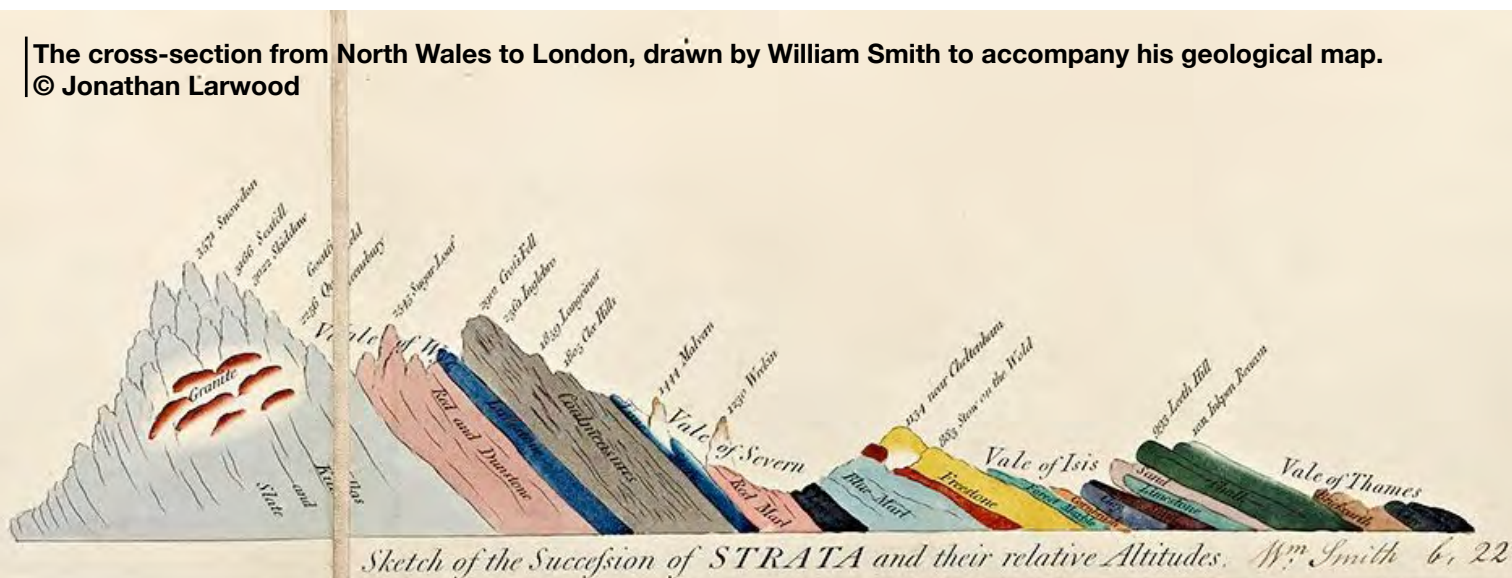
In the United Kingdom the history of canals dates to the Roman times. However, our familiar network of canals - with the distinctive pound locks we see today - were constructed during a prolific period from the late 17th to 18th Centuries. These canals were commissioned by wealthy merchants and venture capitalists to move the commodities of the Industrial Revolution to where they were in demand. In doing so, they brought wealth to people and places and improved the communication network in the country.

To allow such an engineering endeavour to be possible, accurate surveying of the topography and geology of the country was required. The snappily entitled '*A Delineation of the Strata of England and Wales, with Part of Scotland; Exhibiting the Collieries and Mines, the Marshes and Fen Lands Originally Overflowed by the Sea, and the Varieties of Soil According to the Variations in the Substrata, Illustrated by the Most Descriptive Names*' was the first geological map of an entire country and was published in 1815 by William Smith (1769-1839).

Smith learned his trade after being commissioned to survey the Somersetshire Coal Canal. Subsequent to his work there, it took him 14 years to complete his 175,000m², UK-wide survey. Impressively, Smith undertook this task himself. He was able to do so by understanding that different fossils succeeded each other in successive strata and he termed this '*The Principal of Faunal Succession*'. In addition to this insight, Smith visualised his discoveries in a long section from Snowdon to London.

This improved understanding of the ground conditions became crucial in allowing engineers to plan routes for an efficient and robust canal network.

The cross-section from North Wales to London, drawn by William Smith to accompany his geological map.
© Jonathan Larwood





The planned route of HS2 from London to Birmingham. Source: https://en.wikipedia.org/wiki/High_Speed_2, based on OpenStreetMap data. Contains Ordnance Survey data © Crown copyright and database right 2010-2024

Ultimately the canals were superseded by the newly developing railway network. This network, along with the subsequent road network, led to an even greater understanding of the UK ground and how to engineer it.

HS2 is another immense transport infrastructure project currently being constructed from London to the Midlands. Benefitting from the work of Smith and so many subsequent geologist engineers, HS2 embarked on an epic ground investigation programme from 2015. Just like Smith's commission, this ground investigation was conducted to understand the ground conditions along the HS2 route. The investigation has continued since 2015 to today, and over that time has included 10,000s of boreholes, trial pits, probes and tests using other ground investigative techniques.

As the ground is being opened as part of the preparatory earthworks - cuttings, excavations, tunnels and shafts reveal the ground for teams of geologists to inspect, observe and record.

This has created huge amounts of ground condition and groundwater data, including - and not limited to - photographs, laboratory tests, field tests, field monitoring results and reports. The data is not a simple snapshot in time, but in some instances, a continuous record of years of dynamic data - for example, of fluctuating groundwater levels both seasonal and across many years.

HS2 store data in the AGS data format (Association of Geotechnical and Geo-environmental Specialists) – see www.learninglegacy.hs2.org.uk . This data format requires consistency for all inputs, ensuring the data can be shared across a large range of geological software and applications. Similar to the way in which Smith presented his data in his original map, this dynamic data is presented in large Geographical Information Systems. From this, multiple maps can be produced - dynamic maps which are constantly changing through time as more data is collected.

Just as Smith's original 1815 map allowed engineers to make predictions about the ground, one of HS2's legacies will be this huge understanding of the ground between Birmingham and London. It is simply coincidence that this long section coincides with that of Smith's Snowdon to London section.

Further information

Natural History Museum - <https://www.nhm.ac.uk/discover/first-geological-map-of-britain.html>

Britannica - <https://www.britannica.com/biography/William-Smith-British-geologist>

Natural England launches new website for England's National Character Areas

Sally Marshall & Dawn Griffiths, Natural England

Natural England has launched a new interactive website for England's National Character Areas (NCAs). This development makes environmental evidence far more accessible to a wide range of stakeholders, partners and local communities.

What are NCAs?

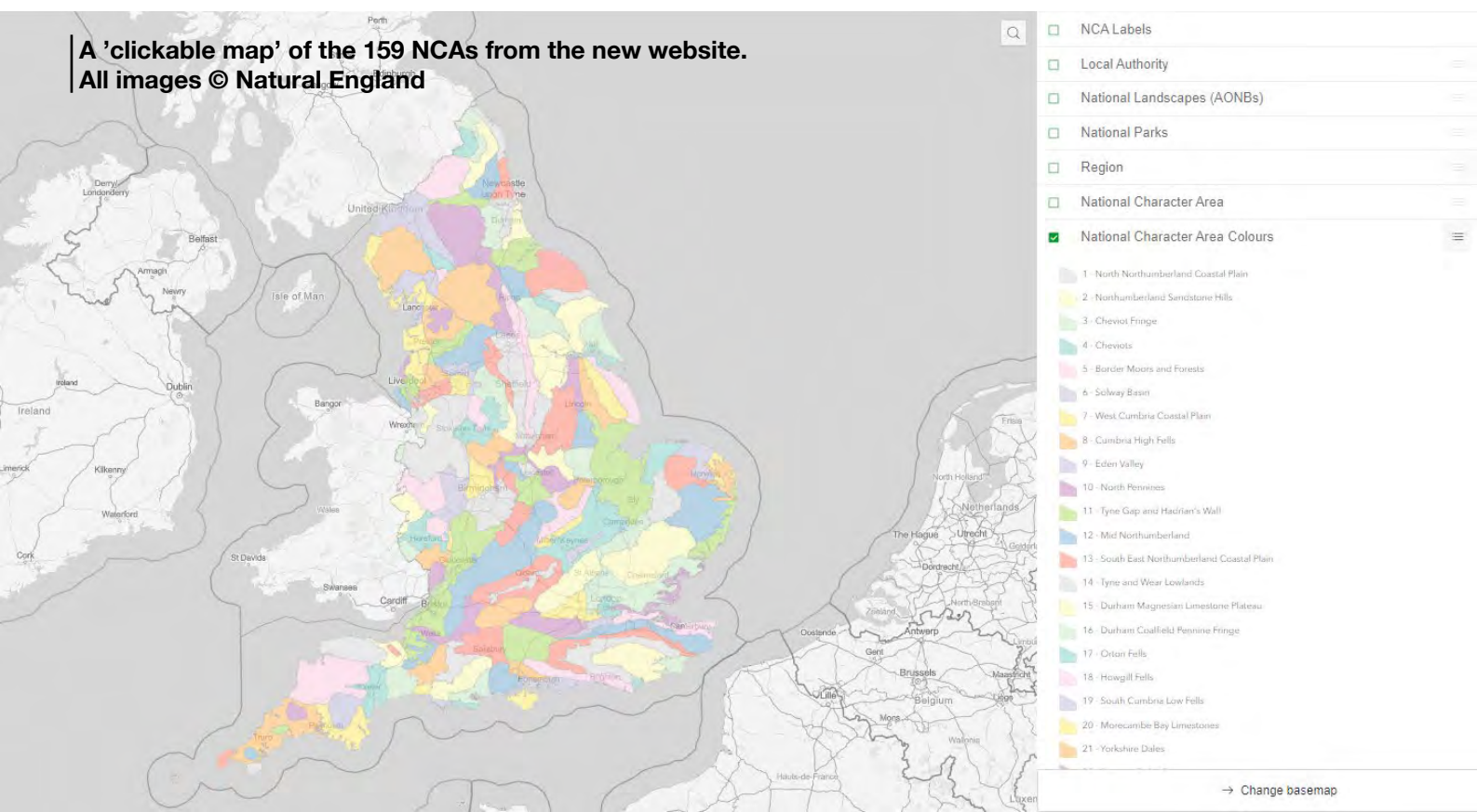
There are 159 National Character Areas covering all of England. They are broad areas of land with a cohesive and distinctive landscape and ecological character, shaped by natural, cultural and historical influences. NCA boundaries follow natural lines in the landscape, not administrative boundaries, which makes them a good decision-making framework for the natural environment.

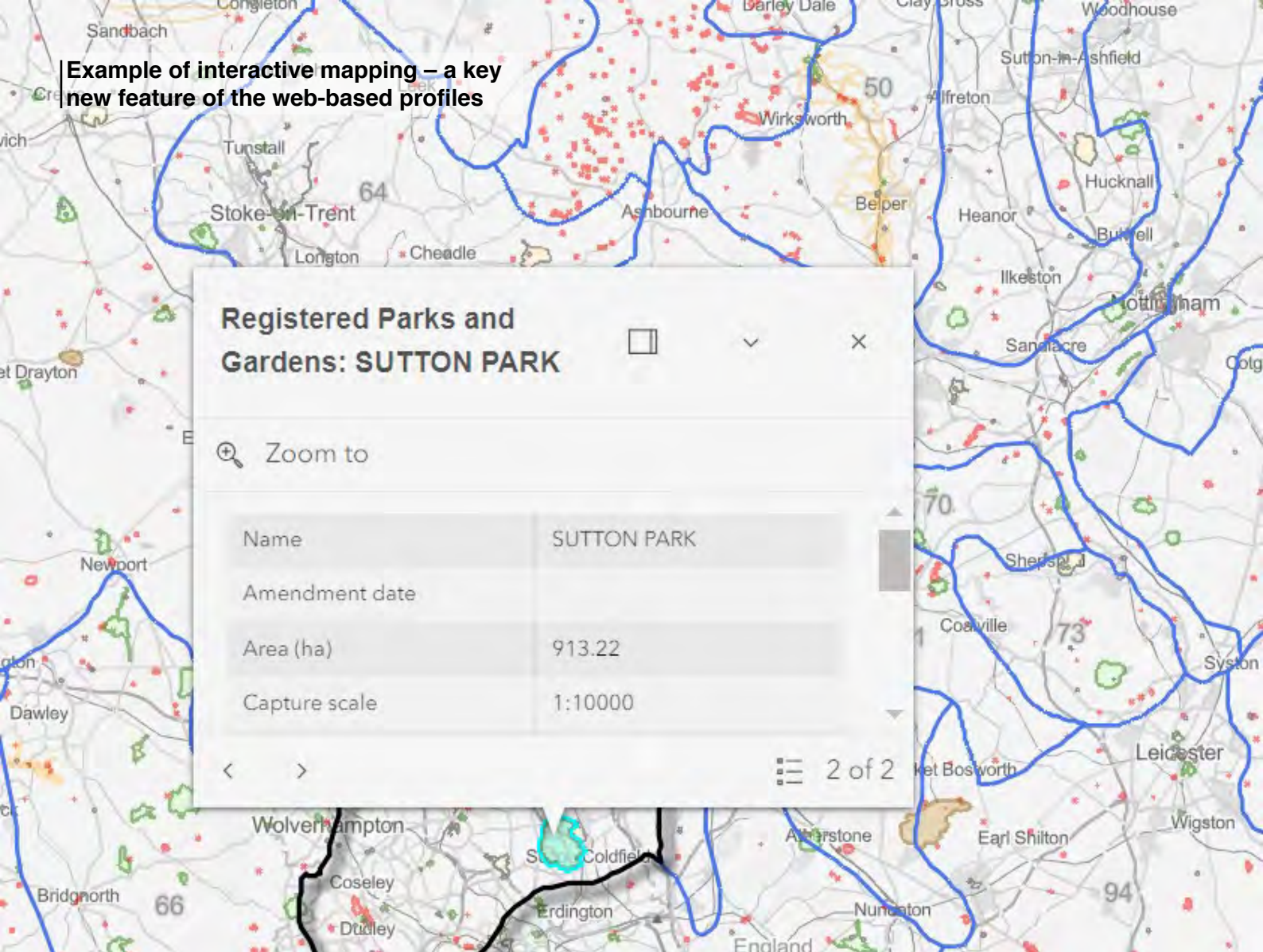
History

The NCAs began to take shape in 1993 when the Countryside Commission launched the original 'New Map of England' pilot project. This aimed to identify, describe, and analyse landscape character at a broad regional scale. The map identified 159 distinct 'Countryside Character Areas' (still reflected in today's NCAs) and was accompanied by written 'profile' descriptions published in regional volumes.

The Countryside Character Areas became 'National Character Areas' in 2008 and a major project was undertaken between 2010 and 2014 to update the information. Online PDFs were all published by 2014, and it is these documents that have been refreshed and incorporated into the new interactive website.

A 'clickable map' of the 159 NCAs from the new website.
All images © Natural England





Example of interactive mapping – a key new feature of the web-based profiles

What are the NCA profiles used for?

The integrated evidence presented in the NCA profiles can be used to inform many aspects of land use planning and land management. They can shape strategies that seek to strengthen character and sense of place, as well as improve a landscape’s resilience to climate change and other pressures. The information and evidence in the profiles can:

- help people to make decisions about the places that they live in and care for
- guide actions to achieve nature recovery, including through Local Nature Recovery Strategies
- support the planning of large-scale conservation projects and the design of land management schemes
- inform choices about landscape change
- encourage partnership working towards a common vision.

What is the new website and how does it improve the user experience?

Stakeholders have said how valuable they found the NCA profiles. The new website builds on the previous static PDF documents. It makes the information much more accessible and interactive – a key recommendation from an independent 2017 review of their effectiveness.

New features include interactive mapping on a range of topic themes, updated statistics and signposting to other sources of information. The design of the website also allows for an easier process of updating the information, including as new evidence becomes available.

Much of the information in the original NCA profiles is still relevant and has been transferred over. Content includes:

- a description of the landscape, including its key characteristics
- information describing and showing how the area has changed over time
- facts, data and interactive maps
- an overview of the NCA's Natural Capital (the benefits of the area to society)
- statements of environmental opportunity – setting out how the landscape could be managed for the future.

The new NCA Profiles website is available to access via: <https://www.gov.uk/guidance/national-character-area-profiles-information-for-local-decision-making>

The previous PDF publications from 2012-2014 will still be available on NE's [Access to Evidence](#) site as a past record of information.



© Dawn Griffiths/Natural England

The Black Mountains and Golden Valley National Character Area (NCA) lies within the south-west corner of Herefordshire. It is one of the most tranquil areas of England, with few settlements and relatively little new development or transport infrastructure. Key challenges for the area include the fragmentation of semi-natural habitats, in particular the fragile upland habitats, and maintaining a sense of remoteness while providing a range of recreational opportunities. A border landscape, it is bounded by the Welsh half of the Black Mountains and the Brecon Beacons to the west, the Wye Valley and Herefordshire lowlands to the north and east and the River Monnow to the south. There is a strong sense of transition from the wild and remote beauty of the upland plateau to the cultivated intimacy of lowland England.



© Dawn Griffiths/Natural England

Summary and Headline Statements of Environmental Opportunity

Summary of the National Character Area, including a general description of the landscape, and headline Statements of Environmental Opportunity (SEOs).



© A.Ratcliffe (Clay Colliery Co Ltd)

Context Map

Interactive map that provides context to the National Character Area and its surrounds.



© Dawn Griffiths/Natural England

Key Characteristics

A list of the key characteristics of the National Character Area, which includes both natural and human influences on the landscape.



© Dawn Griffiths/Natural England

Description

Overview of how this NCA links to others, a description of the landscape today, and a summary of how the landscape has changed over time.



© Nick Turner/Courtyard Agency

Key Facts & Data

Detail on the spatial distribution, type and quantity of components and features of the National Character Area.



© Courtyard Agency John Morrison

Natural Capital and Key Ecosystem Services

Overview of Natural Capital, and the benefits to society this NCA provides, linking to the Natural England Natural Capital Atlas.

A new approach to sharing geological information online

Angus Miller, Scottish Geology Trust & Lothian and Borders GeoConservation

Do you have a bookshelf groaning with excursion guides, leaflets, and other publications including perhaps Geological Conservation Review (GCR) volumes? Do you spend hours searching through different sources and cross-referring to maps to find the best places to visit? Have you found yourself on holiday, looking at interesting rocks and not knowing where to find out more?



The *Geoguide* website (<https://geoguide.scottishgeologytrust.org/>) is a new approach to tackling these challenges and making published location-based information, about Britain's geology, more widely available and more easily accessible. The website has been developed as part of the Scottish Geology Trust's Geosites project, which is building a map and database of all designated geosites across Scotland (see *Earth Heritage* issue 60, p7). We were frustrated by the inaccessibility of GCR volumes online: these were often in large pdf files that were not searchable and didn't work well on phone screens. So, our team got to work. With the full support of the Joint Nature Conservation Committee (JNCC) and NatureScot, we have made thousands of pages of text and images available in a new format; and added another 30 publications from other sources, including excursion guides published by the Edinburgh, Glasgow, Aberdeen and Yorkshire geological societies and the British Geological Survey. Almost all of this work has been achieved by just two volunteers, Bob McIntosh and Daniel Burgess, in just a few months.

The interactive map on the Geoguide website. Zooming into the map gives access to hundreds of individual data points that link to the Geoguide text content. Excursion guides produced by geological societies and Geological Conservation Review volumes have been included. All images © Geoguide

Case study: Lothian and Borders GeoConservation leaflets

The Lothian and Borders group has produced more than 30 printed leaflets on local geology in the last 20 years. Usually folded A3 size, these full-colour illustrated leaflets are highly regarded and over 300,000 copies been printed for distribution at visitor centres and events, and by mail order. All the leaflets are also available as free pdf downloads from the Edinburgh Geological Society website (<https://www.edinburghgeolsoc.org/publications/geoconservation-leaflets/>).

However, there is a cost to the production and distribution of leaflets, both in volunteer time and financially (10p per leaflet, plus storage costs). And the pdf versions are difficult to read on a small screen, and expensive to print at home due to the extensive use of colour.

Recently, the group has been debating a new approach. People love having a printed publication in their hand, and we are committed to continue to print and distribute our most popular leaflets. However, we also want to make the content available online, and the Geoguide website provides the ideal platform for this. The clean, modern interface works well on different screen sizes, and makes text and images available in an easy-to-use format. It is an added bonus having an accompanying map that shows the locations mentioned in the text. This facility gives people a different way of discovering and accessing the information. We hope to eventually add the content of all our leaflets to Geoguide.



Lothian and Borders geoconservation leaflets



Prototype Geoguide launch page for the geointerpretative leaflets produced by Lothian and Borders GeoConservation. There is potential to add the text and image content of more than 30 leaflets here prepared over the years that will be saved for perpetuity. The accompanying map, which has a zooming-in function, pinpoints the locations highlighted in the leaflets shown as pink dots

A major innovation of the new website is the addition of an interactive map that shows the locations of all the grid references mentioned in text of the paper publications. This allows one to quickly see where these localities are in map view, and switch between different publications covering the same area. All the figures and photographs have also been scanned at high resolution. These are displayed next to the text, and linked from where they are described. Making all this accessible on different screen sizes is technically difficult, but it already works well on most screens and we are continually making improvements to the design and usability of the website.

At the time of writing, the Geoguide website includes over 3,500 pages covering over 15,000 locations in Scotland, England and Wales. And more publications are being added all the time! Together, our linked Geosites and Geoguide websites are a step change in the availability of information, and a foundation for further work enabling local communities to benefit from their geology; the Scottish Geology Trust is committed to making this information available in the long-term. If you appreciated what we are doing, please join and support us (<https://www.scottishgeologytrust.org/support-us/>), for we are a small membership charity with big ambitions! We are also open to collaboration with organisations in England and Wales with similar aims.

**We'd love to get more volunteers involved in our work – please get in touch at:
geosites@scottishgeologytrust.org.**

GeoFest - the annual summer programme delivered by the Abberley and Malvern Hills Geopark

Peter Oliver, Herefordshire and Worcestershire Earth Heritage Trust

Each year the Abberley and Malvern Hills Geopark delivers a summer programme for the public - GeoFest. It runs over three months, arranged by the 22 member organisations of the Geopark Forum and consists of events mainly located at the 14 visitor centres operated by the Forum members. It is an annual celebration of the geology, landscape and associated heritage of the Geopark. Events throughout June, July and August include walks, talks, exhibitions, demonstrations and children's and family activities along with 'Ask the Expert' sessions and demonstrations - all exploring rocks, fossils, wildlife, heritage, history, archaeology, landscape, science and art. These events and activities are drawn from the summer programmes of member organisations, enabling a very comprehensive GeoFest to be delivered.

Rock and fossil hunt at Severn Valley Country Park in Shropshire. Here children can search through three acres of old colliery spoil to find specimens of Carboniferous sandstone, ironstone, coal, plant fossils as well as imported dolerite, Silurian limestone fossils and river worn quartz pebbles. All photos © GeoFest



Although GeoFest covers a broad range of interests it has as its core the promotion of geology and landscape. In the programme there are always the very popular events such as geo-craft days, guided walks, exhibitions, specimen identification days, rock and fossil hunts, and dinosaur detective trails. The promotion of the many self-led geology and landscape trails including the Geopark Way, forms a major part of the summer programme. A full list of these trails is on the website under 'Explore Landscape'. This year a new activity developed by Forum member Geologists in the Geopark, is 'make your own geology collection. This is a set of 12 common and easily collected rocks, fossils and minerals - all from sustainable sources. This year the group is also working with fellow Forum members National Trust at Croome and Forestry England at Wyre to deliver geo-craft events and rock and fossil detective trails during GeoFest.

The programme is put together by Severn Valley Country Park with financial support from Oracle Environmental Experts. Publicity is managed via the website by Bewdley School Discovery Society with financial support from Merlin Energy. The Tomlinson Brown Trust (now managed by the GA Curry Fund) helps to fund the Geopark and GeoFest information that is on display permanently at Bewdley Museum. Similar displays and publicity can be found at the Malvern Hills GeoCentre.

Further information: <http://geopark.org.uk/pub/wp-content/uploads/2024/05/Geofest-2024-Programme.pdf>

A geo-craft day at Worcester Cathedral. The event took place in the Chapter House which is built of Carboniferous Highley Sandstone and Jurassic Cotswold Stone





Above: Guided walk round Bewdley looking at building stones. The bridge built mainly of Carboniferous sandstone with later repairs using Triassic Hollington Stone is grade 1 listed and was built to the design of Thomas Telford in 1798

Below: Preparing specimens for a busy day at Severn Valley Railway's Kidderminster Station





A partial view of Fossil Grove in Victoria Park, Glasgow. This tiny jewel in the crown of Scottish geology and one of the first examples of geoconservation has featured in Earth Heritage several times over the years. With major investment forthcoming from Glasgow City Council the building, housing these iconic Carboniferous tree stumps, will be renovated to improve the environment for the fossils. The investment also includes: drainage repairs to reduce the water ingress; repairs to the roof structure perhaps involving replacing roof support structures; improvement of ventilation; and introduction of new electrical circuits to allow better display lighting. © Lorne Gill/NatureScot

The long-awaited renovation of Fossil Grove

David Webster, Fossil Grove Trust

Earth Heritage has over the years documented the challenges faced by those concerned with the conservation of Fossil Grove and aspirations for promoting this iconic and internationally significant site. In 2024 a corner will be turned with substantial investment from Glasgow City Council that will improve the condition of both the building and the fossils. David Webster, of the Fossil Grove Trust, reports on what will be a landmark year in the history of the site.

Colin MacFadyen, NatureScot

Glasgow City Council has recently allocated the sum of £450,000 towards renovating the building that houses Fossil Grove in Glasgow's Victoria Park. This will provide environmental conditions, inside the structure, conducive to the maintenance of the fossil tree stumps. The integrity of the fossils, which have shown signs of degradation in recent years, will also be stabilised. Fossil Grove Trust, a voluntary body that exists to raise funds and provide advice and support to the Council (<https://fossilgroveglasgow.org/>), have attended a number of site meetings with Glasgow City Council architects. The aim is to develop a prioritised plan of activity and it has been passed to nominated lead contractor City Building for costing. The plan is likely to include details of measures to be deployed to protect the fossils during the works.

There is an expectation that the Fossil Grove Trust may, through a leasing arrangement operate the repaired building. Leveraging-in of further funding will be required to continue enhancement of interpretative provision including displays and external information boards. Going forward, funding will need to be earmarked for income generation to cover running costs under a lease arrangement as there is limited scope for public donation given that charging for entry is a not an option.

Open Afternoons at Fossil Grove have been held each year on the third Sundays of the month. The events have proved very popular and so they will be developed further. However, outreach efforts may have to be curtailed somewhat later this year should work commence onsite. A school's programme (1/2 day for older primary students) is being organised and hopefully will be piloted once public access is restored after the current phase of renovation works is completed.

A view over one of the spectacular Fossil Grove tree stumps, located at the margin of the 'grove', highlighting some of the issues affecting the fossils and associated rock. The ingress of groundwater has led to the formation of shallow pools between roots of some stumps. Worryingly white salt deposition, mostly gypsum but some epsomite, is breaking-up the rock fabric. The source of the epsomite remains unknown but condensation on magnesium-aluminium alloy metal structures in the roof space is suspected. The dark parallel lines running across the floor of the grove, as seen on either side of the fossil, are the result of condensation dripping from the roof supports. © Colin MacFadyen /NatureScot



Birmingham's Erratic Boulders: Heritage of the Ice Age

Beth Andrews & Ian Fairchild, Herefordshire and Worcestershire Earth Heritage Trust

Like many cities, Birmingham's Earth heritage is mostly hidden from the public under urban development. Formerly there were numerous clay- and sand-pits, containing deposits of the ice age, but they are now all filled in. Thankfully there is one indicator of deep time that is still visible: the erratic boulders, brought to Birmingham by ice. Whilst some were celebrated centuries ago, many more were discovered during the expansion of Birmingham around the turn of the 20th century. These erratic stones tell the story of scientific discovery, the enthusiasm of amateur geologists and a desire to protect them for the future.

An intriguing feature of the Quaternary geology of the Midlands is the contrast between the erratics found in Birmingham and Worcestershire from those in Wolverhampton and further north-west. The Wolverhampton erratics are granites mostly from Eskdale in the Lake District and Criffel in Scotland. We now know that these represent the last (Devensian) ice advance about 20,000 years ago which never reached Birmingham. In contrast, the Birmingham erratics are overwhelmingly volcanic rocks, discovered by the Victorians to have originated in the Arenig area of north Wales and likely to have been first brought to the area in the Anglian ice age about 450,000 years ago.

Cannon Hill Park had one of the first boulders to be put on display thanks to the work of local boulder hero Rev. Henry Crosskey, and it historically included interpretation. Thanks to the recent project and funding from the Quaternary Research Association it once again has an interpretation panel sharing the origins of the boulder with visitors to the park. Photo by W. J. Harrison. British Geological Survey. P236744





Using the original maps produced by the Erratic Blocks Committee an enthusiastic team of volunteers were able to rediscover many boulders. Photo by Herefordshire and Worcestershire Earth Heritage Trust

Birmingham's Erratic Boulders: Heritage of the Ice Age project reintroduced people to this legacy, which had been largely forgotten over the previous century, rediscovering lost stones and bringing together the stories of the people who preserved them. This partnership project between Herefordshire and Worcestershire Earth Heritage Trust, Lapworth Museum of Geology, Black Country Geological Society and Birmingham Open Spaces Forum was made possible through funding from the National Lottery Heritage Fund.

The science of glaciology, gaining pace through the second half of the 19th Century, was still a relatively new concept with timings and details being debated. A combination of the right people, in the right place at the right time, led to a strong local interest in the findings and action to preserve and promote these boulders as an important part of the geological history of the area.

There were two main theories under discussion as to how 'drift' deposits formed: 1) a cold period of marine submergence with floating icebergs eroding the land surface – collecting and dropping sediments and boulders as temperatures rose and the icebergs melted and 2) large ice-sheets flowed overland, eroding and transporting sediment as they travelled forward and deposited. The former theory was supported by many British geologists and the latter by Swiss Geologist Louis Agassiz, who visited Britain in 1840. Support for the marine hypothesis by established names created confusion in the 1850s and set British glaciology behind the state of the science in mainland Europe.

Glacial erratics provided the key evidence determining the direction of ice flow, but were also rapidly being destroyed as obstacles in the development of towns and cities. The British Association's Erratic Blocks Committee was set up to record the evidence and halt the destruction of these erratic boulders. Birmingham-based Unitarian minister Henry Crosskey was appointed as its first secretary, and this local link encouraged several geologists to visit the area for their insights. One such visitor was American geologist, Henry Carvill Lewis, who, after visiting the boulders at the top of Frankley Hill at 823ft and Romsley Hill at 927ft, realised that they were too high to support the idea of marine submergence with floating icebergs, as it would have required a depth of water of 1350ft or more. He also realised that they along with other sites in the area, provided evidence for there being several distinct ice ages in the past.



A series of 8 walking and cycling guides linking together the stones with towns, villages and parks where they can still be seen today, were created to encourage people to discover this exciting part of the geological story of Birmingham. Photo by Herefordshire and Worcestershire Earth Heritage Trust

Many of the original specimens of boulders from the initial research into erratic blocks in the UK are found in Lapworth Museum of Geology. A temporary exhibition was held there in Spring 2022 with accompanying family events, to inspire a new generation to protect these features. Photo by Lapworth Museum of Geology



Maps produced using data supplied to the Erratic Blocks Committee allowed erratic boulders to be matched to their source rocks, often from the distant mountains of Scotland, the Lake District and Wales. Possible routes from source to current location were proposed and showed the direction of movement of the boulders from their source crossed each other. Those found around southern Birmingham and north Worcestershire were predominantly from North Wales, whilst those further north were found to be from the Lake District and Scotland. When tracing the routes taken, it was clear that the paths of the glaciers would have crossed each other. As this is not what happens when two glaciers meet a new theory was proposed with several distinct Ice Ages, one that brought rocks from Wales and another that carried rocks from Scotland.

In the recent project, through the dedication of volunteers (who were often hunting through many years of bramble growth), it was discovered that many boulders originally described, have survived the changes to the development of the area over the last 100 years. An example is a cluster of

MISSING

Glacial Erratic Boulder

Last seen in 1923 during its
excavation in Rowheath Grounds

History:

Brought by ice
450,000 years ago
and dropped here
when the ice melted

Photo:

Bournville Works
Magazine,
April 1923.

Courtesy of the Cadbury Archive,
Mondelēz International.



Dimensions:

8ft 6in x 5ft x 3ft,
(2.6m x 1.5m x 0.9m)

Project:

For more information
about the project
go to:
erraticsproject.org



Do you know what happened to this boulder?

Can you help us find it?

If you have any information or photos please contact
the project team, email: erraticsproject@worc.ac.uk



boulders in Masefield Square, which is a well-preserved cluster from what appears to be an end moraine in the Northfield area of Birmingham. Many more boulders are to be found even now on footpaths, in fields and along old railway lines.

The project volunteers also unearthed stories about the roles of specific geologists and boulders. Alongside the valuable work of Reverend Henry Crosskey was that of Louis Barrow, chief engineer at the Cadbury Factory and an enthusiastic geologist. Many of the boulders that now survive, remain thanks to his hard work. Boulders discovered during factory expansion were recorded and reported in detail in the Bournville Works Magazine and frequently relocated to public parks and spaces to protect them for the future. The largest collection of these boulders is in Cotteridge Park, where a "bouldery" was created which included information on the source and movement of the boulders. Louis Barrow recognized that without this information they made little sense to the public. Following the example of these boulder heroes, the project relocated some boulders within Woodgate Valley Country Park with an interpretation board for visitors. Their new position on well surfaced paths was chosen for accessibility and to help protect them from future development.

For more details on the work of the project visit www.erraticsproject.org.



Top left: An article in the Bournville Works Magazine inspired a hunt for a missing boulder in the grounds of Rowheath Pavilion. Sadly it has still not been located, providing a tantalising glimpse into the boulders yet to be discovered. Image created by Julie Schroder

Bottom left: A Fire To Ice brass rubbing trail through Balaam's Wood in New Frankley, was created using artwork provided by local art groups. It highlights key features in the history of Earth between the original formation of the boulders in the Ordovician 450 million years ago and their movement from North Wales and deposition in the West Midlands 450,000 years ago. Photo by Herefordshire and Worcestershire Earth Heritage Trust

Barbara Castle's Boulders in Blackburn: an incredible ignored urban geo-education resource

Phillip J Murphy & G McLeod, University of Leeds

Anyone navigating around the centre of Blackburn in North-west England will find themselves on the dual carriage way of the A6078 Barbara Castle Way named after the highly influential politician who was a member of parliament for 35 years. She is now best remembered for pioneering the Equal Pay Act (1970) targeting gender discrimination in work place remuneration. The original construction phase was undertaken 1990/91 though planning and clearance started in the mid-1980s. The final phase was in the late 1990s/early 2000s and the official opening on the 6th June 2003 was by Jack Straw, the local MP and the then Foreign Secretary, and the leader of the local council Sir Bill Taylor.

Any geologist will immediately notice the trail of boulders along the route on both sides of the road as well as along the embankment separating the carriageways. There are a total of 224 boulder spread along the dual carriage way, 81 on the north side and 94 on the south with a further 47 along the central reservation. On joining the Barbara Castle Way from the A678 roundabout at its eastern end a group of 15 large boulders are prominent on left hand verge overlooking what was once the site of Thwaites brewery. This consists of four coarse grained sandstone boulders, probably sourced from Millstone Grit group strata, two very granitic looking blocks which on closer analysis seem to be flow banded rhyolites and the rest are meta-sedimentary and meta-volcanic rocks. This is a fairly typical of the type and proportion of rock types with the exception of a block of conglomerate towards the western end of the road and two blocks of 'Shap' type granite in a sub group of 12 boulders on bridge where the A678 crosses the Leeds and Liverpool canal. They all have the look of naturally weathered boulders rather than blasted blocks. The most likely source is from the Pleistocene glacial deposits of the Lancashire plains, deposited by ice sourced from Cumbria and southern Scotland. A description of such deposits is reproduced below from page 140 of the classic British Geological Survey memoir *The Geology of the Burnley Coalfield* published in 1875:

Lower Boulder Clay.—This deposit is well seen in a cutting near the Preston Waggon Works at Marsh End, where it underlies the Middle Sand and Upper Boulder Clay. It is of reddish brown colour, and contains numerous stones and boulders, chiefly derived from the lake district of Cumberland and Westmoreland; one boulder of greyish white granite, with large crystals of black mica, is 5 × 4 × 3 feet in size; it, as well as most of the smaller erratics, are scratched in more than one direction. The lower and upper clays precisely resemble each other in this section, the lower perhaps having the greater number of stones per cubic yard, and occasionally containing large boulders of altered volcanic breccias from the Lake District, more than a yard in length.

Local knowledge says the boulders were sourced from a quarry north of Carnforth in northern Lancashire, presumably as overburden clearance, at considerable expense.

The boulders can be of considerable size with the largest being over 6 m³ which gives a mass of the order of 16 tons. On the south side they are distributed along the verge until the junction with Richmond Hill. Up until this point the two carriage ways are separated by raised embankments. The embankment sides are lined by setts which were recovered from the London Road area of town where streets of terraced houses were being demolished.

The furthest west boulders are around the junction with Montague Street. On the north side of the road between Montague Street and west of the junction with Preston New Road boulders are incorporated in small areas of roadside garden. In several such sites the boulders are set on areas of gravel tarmac surface which have wavy margins. These were apparently intended to make the boulders appear as if they were in a river setting. Clearly a considerable effort went in to sourcing and placing the boulders, recognition of the project is shown by a small plaque attached to a boulder close to the junction with Victoria Street which records the receipt of a civic award in 1995 from the now defunct Blackburn Civic Society.



Top: Road Sign welcoming you to the Barbara Castle Way

Left: An array of boulders at eastern end of Barbara Castle Way. The wavy margined tarmac surface seen around some groups of boulders.

All photos by Phil Murphy

The boulders provide the opportunity to see lithologies from the iconic landscapes of northern England without leaving the city as well as illustrating the power and effects of glaciation. At times in the past planners and developers went to considerable efforts to try and improve the streetscapes of our towns and cities. We all need to keep our eyes open for forgotten geological education opportunities such actions provide as we traverse what often appear to be the least likely parts of our urban built environment. The people who went to considerable efforts to try and improve the urban environment during major infrastructure projects, such as this example in Blackburn, deserve to be recognised and one way we can do this is to make use the educational opportunities they provided

Many thanks to the Old Blackburn Town – Our History Facebook group and especially Tony Holt for providing information and answering my many questions.

Available at: <https://pubs.bgs.ac.uk/publications.html?pubID=B01800>

Further information

Hull, E., Dakyns, J.R., Tiddeman, R.H., Ward, J.C., De Rance, C.E. and Gunn, W. 1875. The Geology of the Burnley Coalfield and the country around Clitheroe Blackburn, Preston, Chorley, Haslingden and Todmorden. *Memoirs of the Geological Survey*.

A plaque recording receipt of a civic award in 1995





Earth Heritage in print

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Each year the Abberley and Malvern Hills Geopark delivers a summer programme for the public - GeoFest. Here at the Severn Valley Country Park in Shropshire, children can search through three acres of old colliery spoil to find specimens of Carboniferous sandstone, ironstone, coal, plant fossils as well as imported dolerite, Silurian limestone fossils and river worn quartz pebbles.

Find out more in the article on p33.

