Valuing Nature's fundamental component

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Introduction

Britain has a diversity of landscapes rarely encountered in such a small geographical area anywhere else in the world. Underlying these landscapes and controlling their topography, hydrology, soils and hence habitats are rocks that record a 3 billion year history of changing environments, climate and evolving life; their study reveals the scale and speed of past environmental and climate change, informing observations of the present day.

Our geology is a critical and integral part of our natural capital, underpinning or directly providing many of the services that flow from it (Gray, 2018). For example, our rocks filter water, provide building materials, regulate carbon, control landscapes, influence our 'sense of place' and are a scientific heritage of international importance, as this poster illustrates.

Geology drives natural process and sustains our prosperity. It should be included in a holistic approach to understanding, valuing and conserving nature and hence incorporated into policy, planning and decision-making (Gordon & Barron, 2013).

From November 2019 to January 2020 a project will take place to identify how geology should be incorporated into natural capital and ecosystem services assessments and where the required data can be found. Please engage with us.


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Geological sites provide knowledge about how our world works, allowing us to access its resources and services.

It was by visiting sites in the NW Highlands such as this at Glencoul, that pioneering British geologists in the late 19th century realised that mountain belts are built as vast slabs of rock are thrust forward, one above the other. These locations are now world famous for these discoveries. (http://www.see.leeds.ac.uk/structure/mtb/index.htm)


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Locations for human settlement have always been selected where the landscape is of strategic value, providing shelter, defence or transport routes, yielding water, fertile soils, minerals, fuel and building materials. Rocks and landscapes are at the very heart of our communities.
A distinctive example is the long line of crags, capped by Hadrian's Wall and a string of castles, extending across northern England to the Farne Islands. The high ground (a natural defence in times past) is formed by the Great Whin Sill, a massive slab of hard black igneous rock that is perfect for road building. In addition, the sill creates rare soils that support an important assemblage of alpine plants, forms sea cliffs that host critical seabird colonies and underpins some extraordinary landscapes. (https://www.geolsoc.org.uk/GeositesHadrian)


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Quarries, be they for brick clay, building stone or aggregate, provide a range of services throughout their life. They provide construction materials, landfill and burial space; they support a range of habitats; some yield knowledge about past life and environments as new rock is exposed; and many give cultural services such as green space, education and fossil collecting.

SERVICES

- Regulating
- Provisioning
- Supporting
- Cultural
- Knowledge


© John Hunter

Karst areas provide many services. Limestone dissolves easily in rain water, forming distinctive landscapes and caves, each popular for recreation. The rock is a store of carbon, the fissured rock channels water, caves may be mined for industrial or ornamental minerals, caves provide rare habitats and cave deposits (speleothems) are 'important palaeoenvironmental archives': they provide highly detailed (seasonal to decadal resolution), continuous data that can be used to reconstruct a history of rainfall, temperature, soil conditions and past climate (Fairchild & Treble. 2009).


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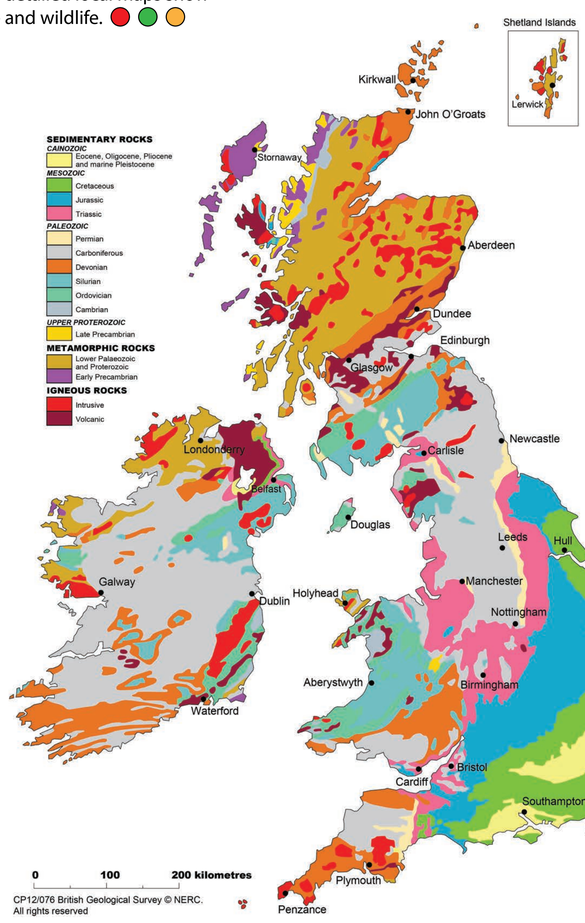
The character of our treasured landscapes is directly dependent upon the nature and structure of the rock. Think of contrasting places you know and look at the geological map to see how the rocks vary, even on this simplified map – detailed local maps show much more complexity. These are places of inspiration and recreation for everyone and home to people and wildlife.

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Understanding geology has been fundamental to securing our fuel and energy needs, from the safe mining of coal to finding oil and gas fields.
As we reduce our dependency on hydrocarbons, the same technologies and skills will enable us to make safe foundations for wind turbines, develop geothermal energy and sequester greenhouse gases underground.


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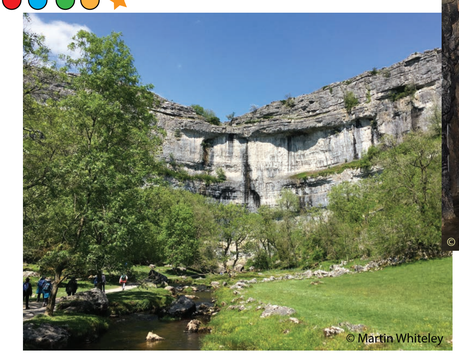
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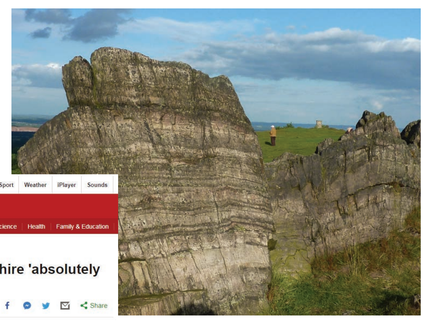


Fossil finds in Leicestershire 'absolutely world class'
4 May 2013
This cast shows two of the newly-found fossils
Geologists say thousands more fossils exist at a Leicestershire site than previously realised.

The rocky outcrops of Charnwood Forest are the site of the first ever discovery (in 1957 by a local school boy) of the earliest known complex life on our planet. Similar fossils have since been found in just a few other places on Earth. The Charnwood fossils are part of our global natural heritage and are of great, ongoing, international, scientific importance for their evolutionary significance, helping us to understand the development of life on Earth (Wilby *et al*., 2011).


© Eleanor Brown

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Chalk limestone was extracted here, on the Chilterns, to make cement, and exposed evidence of three major phases of climate change over the last 240,000 years (Murton *et al*., 2015). The site is now a nature reserve with chalk grassland, woodland and wetland habitats. Chalk and Quaternary geology is being conserved and interpretation information is being developed for the 1 million people who visit the site each year (Gordon, in press). Hence, in terms of ecosystem services, this site provides building materials, carbon regulation, water filtration, important scientific heritage, mixed habitats, greenspace and recreation.


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Rocks filter, channel and store our essential groundwater resource. The Triassic sandstone exposed in the tunnelled crag upon which Nottingham Castle is built is part of one of the most important aquifers in the UK (UK Groundwater Forum).
In addition, these famous man-made caves have been used as homes, cellars and workshops in their long history, and are a popular tourist attraction today.

Surface reservoirs are best on impermeable rock.


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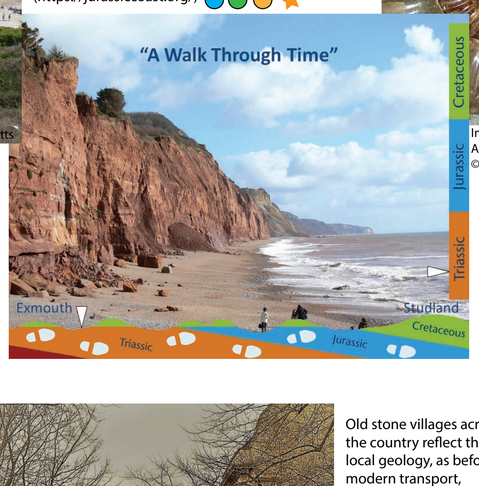
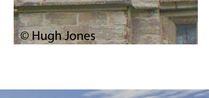
The Jurassic Coast displays a near complete and continuous record of the Mesozoic Era of Earth history, from the Triassic, through the Jurassic to the Cretaceous Period of time. It is geology of global importance that led to the Coast's designation as a World Heritage Site in 2001. This is one of the most popular destinations in Britain, drawing visitors from all over the world to hunt for fossils and enjoy its wonderful scenery. (https://jurassiccoast.org/)



Images - Ammonite and A Walk Through Time © Jurassic Coast Team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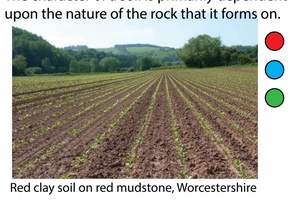
Civil engineers involved in major infrastructure projects such as Crossrail and the Thames Tideway have received cost-saving insight from field training on exposures of the rock strata that they would encounter during tunnelling under London (ChalkRock Ltd.).

Did you know that there are nine UNESCO Global Geoparks in the British Isles? Fforest Fawr in south west Wales, with its beautiful waterfalls, is one of them.

A Geopark is an area with outstanding geological heritage that uses this as a catalyst for generating social and economic benefits for the local area, often through geo-tourism – using the geological story as a golden thread for creating visitor experiences connected to the Earth.

(http://www.unesco.org/new/en/natural-sciences/environment/earth-sciences/unesco-global-geoparks/)

The character of a soil is primarily dependent upon the nature of the rock that it forms on.


Red clay soil on red mudstone, Worcestershire


Pale grey soil on slate bedrock, Cornwall


Stoney brown soil on limestone, Cotswolds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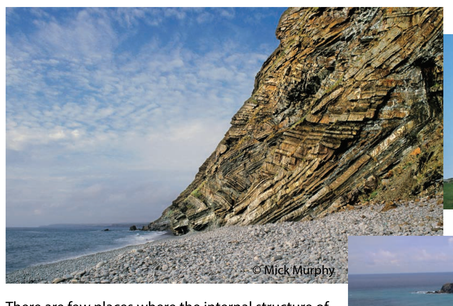
Old stone villages across the country reflect the local geology, as before modern transport, construction material for most buildings was usually sourced nearby. The stone creates our 'sense of place'.
The market town of Corsham in Wiltshire is built with Great Oolite, more often known as Bath Stone. This is still quarried (underground) there today.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There are few places where the internal structure of our rocks is exposed as well as on the coast.
The dramatic folding of the rocks from Cornwall through Pembrokeshire to south west Ireland occurred 290 million years ago when southern Britain was the frontier of a continental collision. The same event was responsible for the intrusion of the granite which creates the high moorland and tors of Dartmoor. These geological features make these favourite places for sightseeing, hiking and photography amongst many other recreational activities, including geo-tourism. (https://www.geolsoc.org.uk/Plate-Tectonics/)


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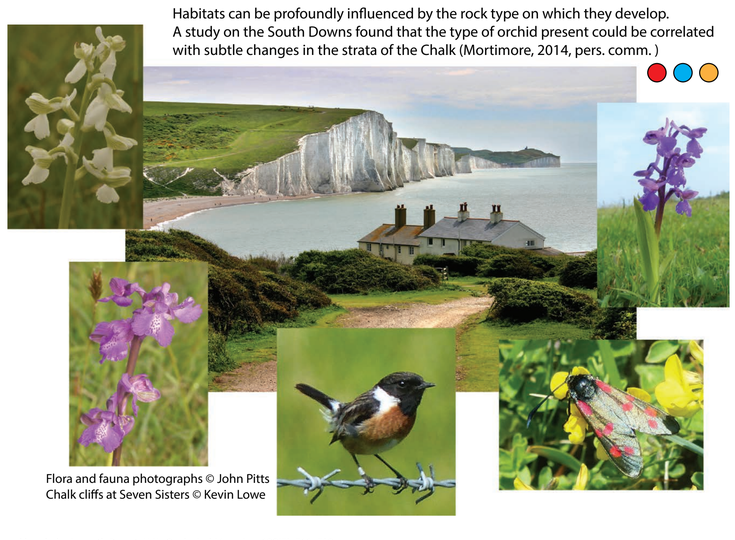
A high-resolution study of the sedimentary rocks exposed in the cliffs near Kimmeridge demonstrated that the rocks record cyclic variations in climate and sea-level change during part of the Late Jurassic (157 – 149 million years ago). (Morgans-Bell, et al., 2001; Weedon, et al., 2004)

Habitats can be profoundly influenced by the rock type on which they develop.
A study on the South Downs found that the type of orchid present could be correlated with subtle changes in the strata of the Chalk (Mortimore, 2014, pers. comm.)


Flora and fauna photographs © John Pitts
Chalk cliffs at Seven Sisters © Kevin Lowe

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