North Pennines

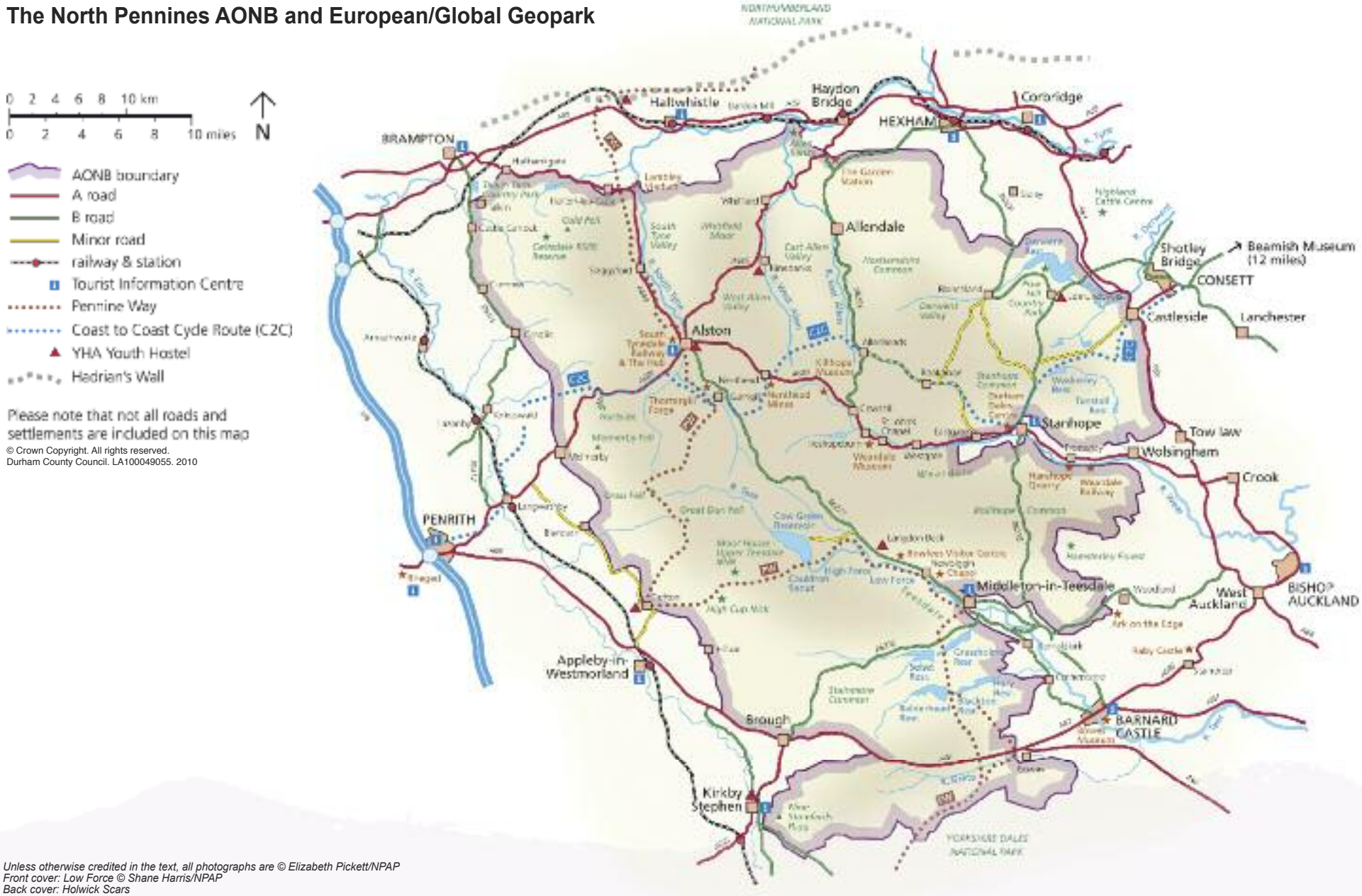
Area of Outstanding Natural Beauty and European Geopark

Geodiversity Action Plan 2010–2015

NORTH PENNINES
Area of Outstanding Natural Beauty

Geoparks

The North Pennines AONB and European/Global Geopark



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Winter guided walk © Charlie Hedley/Natural England

Children from Hexham Middle School finding out about minerals © Elfie Waren/NPAP

Killhope, the North of England Lead Mining Museum

Drumlin at Holwick

Introduction

In 2003 the AONB Partnership worked with the British Geological Survey to produce a Geodiversity Audit and Action Plan for the North Pennines AONB for the period 2004-2009. This was the first such plan for a UK Protected Landscape and has been influential in the development of other such documents elsewhere. The document contained a comprehensive audit of the area's geodiversity, which informed and underpinned a detailed action plan. **An edited and slightly updated version of the audit part of the original document is available on the AONB Partnership's website** and can be read in conjunction with the new document presented here.

This new document, **a Geodiversity Action Plan for the North Pennines AONB and European Geopark 2010-2015**, focuses on how the AONB Partnership and our many partners can make the most of the area's geodiversity for education, interpretation and geotourism.

The plan also addresses how partners can work together to find out more about our geodiversity and to conserve any features which may be under threat.

This plan was produced by the North Pennines AONB Partnership Staff Unit. The production of the document is the fulfilment of an action in the statutory North Pennines AONB Management Plan. A draft was produced and consulted upon with the AONB Partnership's 'Geopark Advisory Group' (which includes members from the statutory, voluntary and private sectors); it was also subject to a broader consultation with many other partner organisations and the wider public.

Thanks are due to all those who contributed to all stages of the production of this document and who will have a role in its implementation.

Contents

Limekiln at Wainford Bridge near Allenheads

Guided geology walk in the South Tyne Valley

Great Rundale on the North Pennine escarpment

Rookhope Arch

Areas of Outstanding Natural Beauty (AONB)

AONBs and National Parks are in a worldwide category of protected areas known as 'Protected Landscapes', which has been devised by the International Union for the Conservation of Nature. Areas of special countryside throughout the world have been given protection of various kinds so that their qualities can be enjoyed by present and future generations. Comparable landscapes in other countries include the French Parc Naturels and the National Parks of countries such as Spain and Portugal.

AONBs are unique and irreplaceable national assets and along with National Parks represent our finest countryside. AONBs and National Parks have the same level of protection in the landuse planning system.

There are 34 AONBs in England, covering 15% of the land area, and a further four in Wales. They range in size from the Isles of Scilly (16 km^2) to the Cotswolds (2038 km^2). There are nine AONBs in Northern Ireland, designated under different legislation that affords a different level of protection.

The primary purpose of AONB designation is to conserve and enhance natural beauty. In pursuing the primary purpose, account should be taken of the needs of agriculture, forestry, other rural industries and of the economic and social needs of local communities. Particular regard should be paid to promoting sustainable forms of social and economic development that in themselves conserve and enhance the environment. Promoting opportunities for recreation is not an objective of designation, but the demand for recreation should be met so far as this is consistent with the conservation of natural beauty and the needs of agriculture, forestry and other uses.

The North Pennines AONB

The designation of the North Pennines AONB was confirmed in 1988 and at 1983km^2 it is the second largest of the AONBs. One of the most unspoilt places in England, it lies between the National Parks of the Lake District, the Yorkshire Dales and Northumberland, with the urban centres of County Durham to the east. The AONB crosses the boundaries of two English Regions, being in both the North East and the North West. It lies mostly within the boundaries of five local authorities: the three counties of Cumbria, Durham and Northumberland and the districts of Carlisle and Eden, with 2.6km^2 in North Yorkshire around Tan Hill.

A UNESCO European and Global Geopark

European and Global Geoparks are places where outstanding geologial heritage is used to support sustainable development, through conservation, education, interpretation and nature tourism. Each Geopark in Europe is a member of both the European and Global Geoparks Networks, where Geopark staff and partners collaborate to share ideas, raise funds, promote each others' areas and carry out projects.

The concept of 'Geoparks' is a relatively new one, arising only in 2000 out of a LEADER II project between four European partners, with the formal support and endorsement of UNESCO. In 2003 the North Pennines AONB became Britain's first European Geopark and in 2004 the area became a founding member of the UNESCO Global Geoparks Network. The European/Global Geopark status for the AONB is managed by the AONB Partnership Staff Unit.

Work in support of the Geopark status in the North Pennines includes children's geology clubs, interpretation and trails, geology festivals, evening classes, educational materials and more. Killhope, the North of England Lead Mining Museum, and the Nenthead Mines Heritage Centre are also vital parts of the North Pennines AONB European/Global Geopark.

Outside Europe, an Asia-Pacific Geoparks Network has arisen, alongside fledgling UNESCO Geoparks Networks in Africa and South America. In early 2010, there were 35 European Geoparks in 14 countries and a total of 59 members of the Global Geoparks Network, across 20 countries.

We can all be proud to not only have outstanding geological heritage, but also to be at the forefront of this global family of special places where geology is being used to support sustainable development through nature tourism, education and conservation.

Limestone pavement at Stainmore

Red sandstone buildings in Dufton © Shane Harris/NPAP

Evidence of mining in terraced hillside at Blagill, near Alston © NPAP/K Gibson

Guided geology walk at High Cup Nick © Shane Harris/NPAP

Geodiversity – what is it and why does it matter?

What is geodiversity?

In recent years many different definitions of geodiversity have been put forward, but it is succinctly captured in Mick Stanley's 2001 definition: 'The variety of geological environments, phenomena and processes that make those landscapes, rocks, minerals, fossils and soils which provide the framework for life on Earth'.* Geodiversity makes the links between people, landscape, biodiversity and culture and is one of an area's chief natural resources.

Why does geodiversity matter?

Geology is fundamental to almost every aspect of life. Geological resources, such as fuels, water supply, metal ores, industrial minerals and building materials, provide the raw materials for civilisation. A clear understanding of geology is vital for the design and siting of buildings and other developments, as well as for the safe control of waste disposal and the management of a wide range of natural and man-made hazards. Knowledge of an area's geology undoubtedly makes it much easier to understand the character of the local landscape, and also makes it easier to understand an area's biodiversity and the history and nature of settlements. In every way, geodiversity underpins all aspects of heritage.

Conserving geodiversity

It is often thought that geological and landscape features do not require active management and that they 'look after themselves'. However, inappropriate site development, the infilling of quarries, the encroachment of vegetation, natural weathering and general deterioration with time may threaten to damage or destroy important geological features that might be of interest to people for a variety of reasons. Sometimes intervention is necessary to conserve our special sites and features of geological interest.

Geodiversity in the Geopark context

Importantly in the North Pennines, which is both an AONB and a European and Global Geopark, there is commitment to make our geological heritage accessible and to share in engaging ways the many remarkable stories surrounding it. There is an expectation that there will be a significant amount of high quality interpretation of geodiversity in a variety of different forms, that there will be museums and attractions focused primarily on geodiversity and that there will be educational programmes focusing specifically on geodiversity as well as those presenting geology alongside other subjects. There is also an expectation that opportunities to discover and enjoy the area's geology should form an important aspect of destination marketing for the North Pennines and of post-arrival information provided for visitors.

This action plan brings forward projects and initiatives which help us all to grow in understanding of our geodiversity, to conserve it and to bring it to a wider audience in exciting ways.

** Stanley. M. 2001 'Welcome to the 21st century',* Geodiversity Update *Nº1, p1*

Currick above Allenheads

Nenthead Mines Heritage Centre

This chimney near Allendale provides a reminder of the lead mining history of the area © NPAP

Spar box at Killhope, the North of England Lead Mining Museum © Killhope Museum

Rock Detectives club members at Goldsborough © Harehope Quarry Project

Sleightholme Beck Gorge

The AONB Partnership and Staff Unit

Each AONB has an organisation responsible for co-ordinating efforts to conserve and enhance it. Locally this is the North Pennines AONB Partnership, made up of statutory agencies, local authorities and voluntary/community organisations which care for the North Pennines (visit www.northpennines.org.uk for a list of members). The work of the AONB Partnership is carried out through the AONB Staff Unit, employed through its accountable body, Durham County Council. The purpose of the Staff Unit is to promote partnership working to conserve and enhance the AONB and to produce, monitor and take action to implement the AONB Management Plan.
The AONB Staff Unit also acts as a champion for the area in matters relating to the conservation and enhancement of natural beauty.

Partners in geodiversity action

The North Pennines is the focus for much activity in the fields of geodiversity interpretation, education and conservation. As well as the AONB Partnership Staff Unit there are some principal 'players' in this field who will contribute to the implementation of this action plan and who play a vital role in the area's European and Global Geopark status. Nenthead Mines Heritage Centre (managed by the North Pennines Heritage Trust) and Killhope, the North of England Lead Mining Museum (managed by Durham County Council), are integral parts of the Geopark, helping to make this area a real 'geo-destination'. There are exemplary programmes of education, interpretation and outreach here, and the staff are also involved in supporting geology and mining heritage projects throughout the area.

Harehope Quarry Project at Frosterley, Weardale, is an innovative environmental education centre with a strong 'geo-theme'. Not only are many geological subjects addressed here regularly, but Harehope is also host to one of the AONB Partnership's three children's geology clubs, 'Rock Detectives.' Other Rock Detectives hosts are the North Pennines Heritage Trust and Talkin Tarn Country Park.

Durham Wildlife Trust has an important visitor centre in the North Pennines, at Bowlees in Upper Teesdale. This is an important 'gateway' for visitors to the area and Bowlees and its surrounds have been the focus of much interpretation and visitor management effort in recent years.

Natural England, particularly through its work at Moor House - Upper Teesdale National Nature Reserve, has been an active partner in promoting the enjoyment and understanding of our geological heritage.

Finally, some local quarry operators, notably the Sherburn Group, have been helpful in supporting people to find out more about their local geology. Further relationships of this kind need to be fostered.

The British Geological Survey has been a long-time collaborator with the AONB Partnership on several projects, not least the original Geodiversity Audit and Action Plan for the area. Its continued mapping of and research in the area may yield new and important information and there is the potential to collaborate further on both land management and interpretation projects.

All of these partners, and more, will have a role to play in delivering this plan.

The Whin Sill at High Cup Nick © Steve Westwood/Natural England

View across Great Rundale to Brownber Hill

Frosterley Marble

Guided walk in Northern Rocks, North Pennines Festival of Geology and Landscape

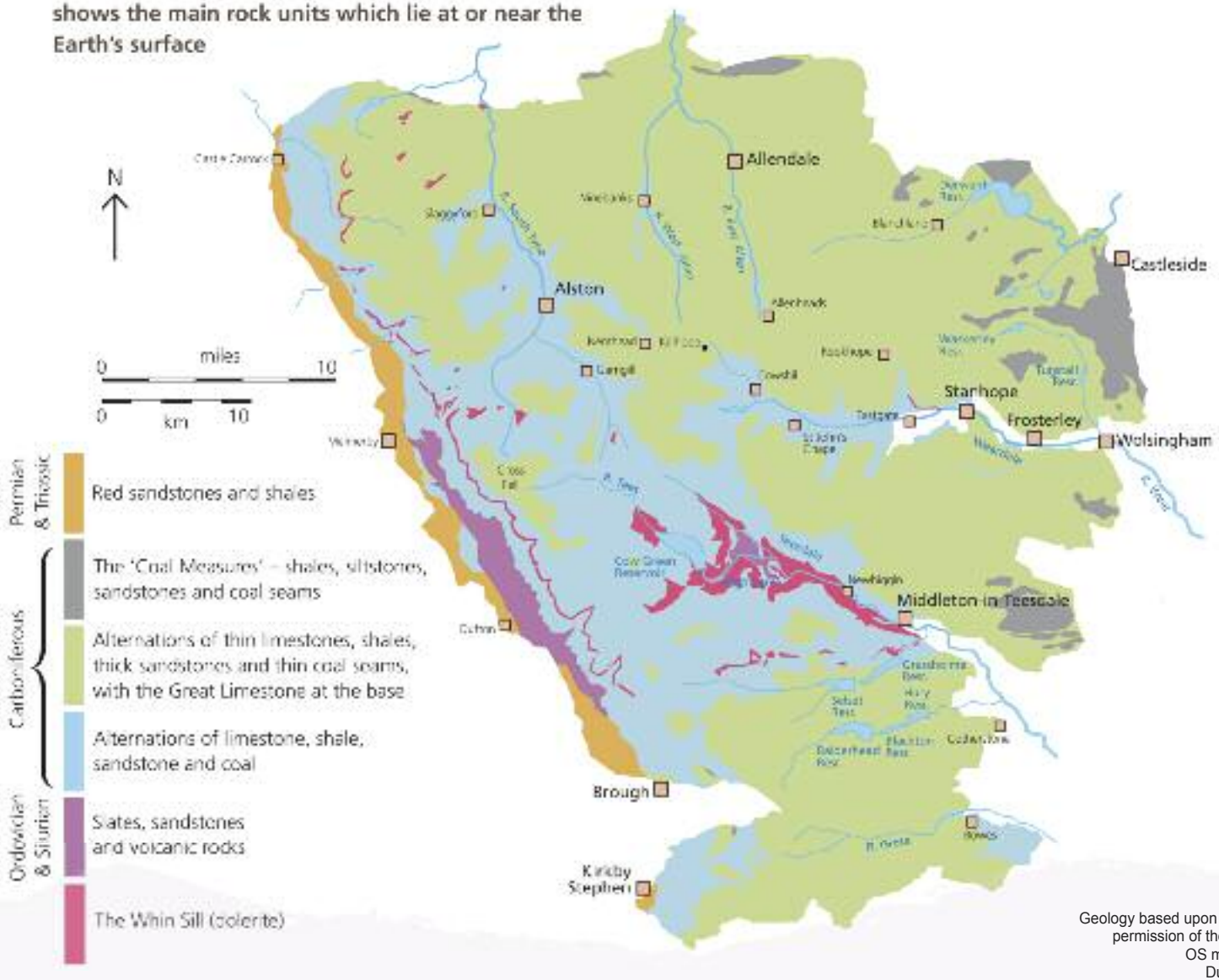
Cross Fell © Charlie Hedley/Natural England

Miner-farmer landscape near Killhope

High Force © Shane Harris/NPAP

A simplified geological map of the North Pennines

This simplified geological map of the North Pennines shows the main rock units which lie at or near the Earth's surface



High Cup Gill
© Chris Woodley-Stewart/NPAP

God's Bridge, near Bowes

Whin Sill/Sugar Limestone contact, Upper Teesdale

Scordale

Harehope Quarry, Weardale

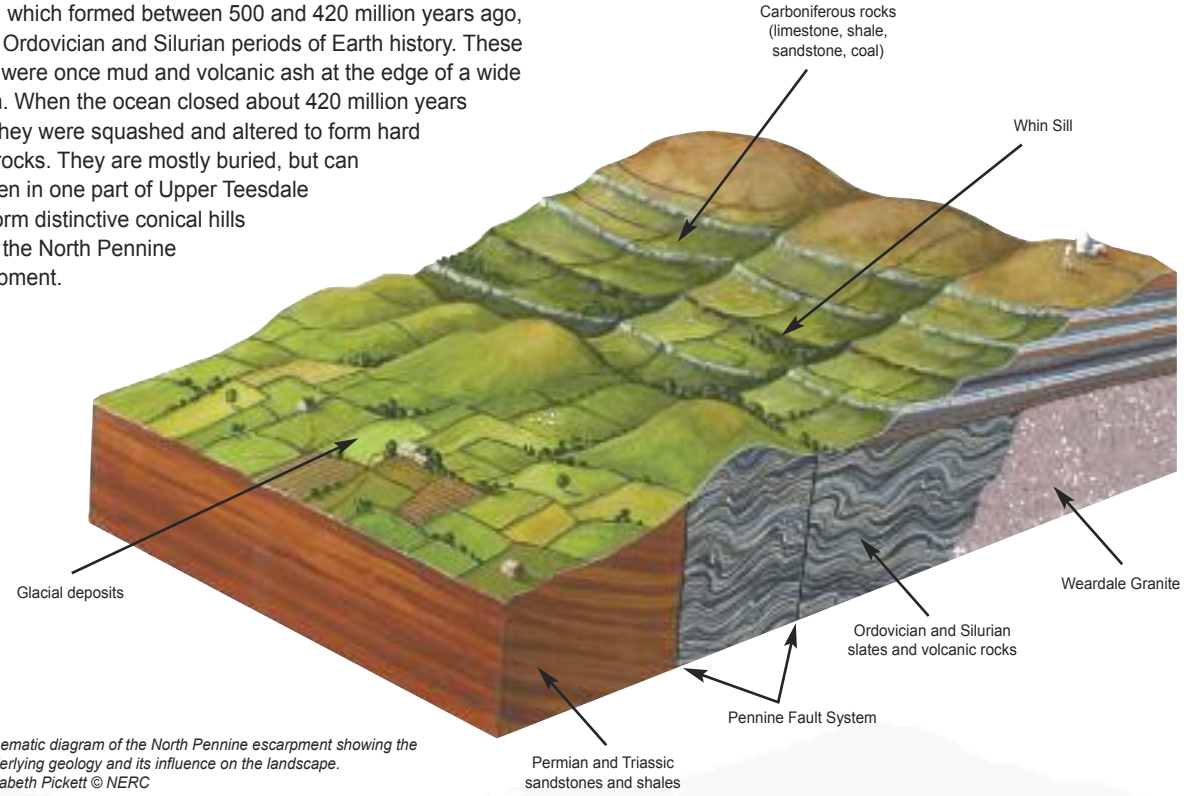
An introduction to the geology and landscape of the North Pennines

The special character of the North Pennine landscape has its foundation in the underlying rocks and the geological processes which have shaped it over hundreds of millions of years of Earth history. Tropical seas, deltas, rainforests, molten rock, deserts and ice sheets have all played a part in creating the bare bones of the landscape. People arrived in the North Pennines about 10,000 years ago, heralding a new stage in the evolution of the area – a landscape that is continually evolving through natural processes and human activity.

Looking southeast along the Pennine Fault System
© Charlie Hedley/Natural England

The oldest rocks

The deep roots of the North Pennines are slates and volcanic rocks, which formed between 500 and 420 million years ago, in the Ordovician and Silurian periods of Earth history. These rocks were once mud and volcanic ash at the edge of a wide ocean. When the ocean closed about 420 million years ago, they were squashed and altered to form hard slaty rocks. They are mostly buried, but can be seen in one part of Upper Teesdale and form distinctive conical hills along the North Pennine escarpment.



Schematic diagram of the North Pennine escarpment showing the underlying geology and its influence on the landscape.
Elizabeth Pickett © NERC

Gibson's Cave, near Bowlees

Sinkholes in Upper Teesdale

Blanchland

Schoolchildren at a 'Ready, Steady, Rock' event learn about the formation of the Whin Sill

Fluorite

Weardale Granite and the Alston Block

About 400 million years ago, a huge mass of molten rock rose up into the slates and volcanic rocks. It cooled and crystallized underground to form the Weardale Granite – a hidden but fundamental geological feature of the North Pennines. Granite is less dense than most other rocks in the Earth's crust and is relatively buoyant. Because of this, the area above the granite – much of the North Pennines – has remained higher than surrounding areas for millions of years, and is known by geologists as the 'Alston Block'. The North Pennines is an upland area today because of the effect of the Weardale Granite.

Tropical seas and swamps

About 350 to 300 million years ago – in the Carboniferous Period of Earth history – the North Pennines was near the equator and was periodically covered by shallow tropical seas. Skeletons of sea creatures accumulated as limy ooze on the sea floor. Rivers washed mud and sand into the sea, building up vast deltas on which swampy forests grew. In time, the limy ooze became limestone, the mud and sand became shale and sandstone, and the forests turned to coal. Periodically, the sea flooded in, drowning the deltas and depositing limestone again. This cycle happened many times, building up repeating layers of limestone, shale, sandstone and thin coal seams, known as 'cyclothems'.

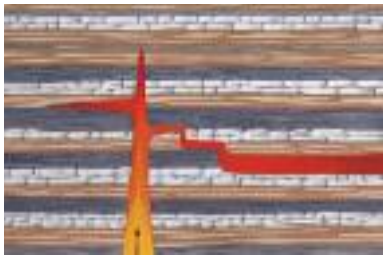
Limestone and sandstone are resistant to erosion, whereas the softer shales wear away easily. This contrast produces the distinctive terraced hillsides and flat hilltops of the North Pennines. Limestone also has its own special features. It dissolves gradually in rainwater creating 'karst' features such as sinkholes and limestone pavements.

Sandstone and limestone have been quarried in the North Pennines for centuries, and the use of local sandstone gives distinctive character to the area's settlements and dry stone walls.

Formation of 'cyclothems' as a result of changing sea levels and build-up of river deltas in the Carboniferous Period © Elizabeth Pickett

The Whin Sill

Stretching of the Earth's crust 295 million years ago caused molten rock at over 1000ºC to rise up and be injected between layers of sandstone, limestone and shale. The molten rock cooled and solidified underground to form a roughly flat-lying sheet of rock, known as a 'sill'. This is made of hard black dolerite or, as it is known locally, whinstone. While molten, its great heat baked and altered surrounding rocks, creating the unique 'Sugar Limestone' of Upper Teesdale. As the sill cooled it contracted, producing vertical cracks along which the dolerite breaks into rough columns. These columns can be seen in Whin Sill cliffs and quarry faces. After millions of years of erosion, the Whin Sill is now exposed at the surface where its cliffs form dramatic landscape features in Upper Teesdale and along the North Pennine escarpment.



Formation of the Whin Sill by the injection of molten rock into layers of limestone, shale and sandstone © Elizabeth Pickett

Mineral riches

The North Pennines is world-famous for its remarkable mineral veins and deposits, known collectively as the Northern Pennine Orefield. The veins of lead ore and other minerals formed about 290 million years ago when mineral-rich waters, warmed by heat from the buried Weardale Granite, flowed through cracks and fractures deep underground. As the fluids cooled, their dissolved minerals crystallized within the fractures, forming mineral veins. Sometimes the fluids reacted with limestone on the sides of the fractures, altering the rock and forming mineral deposits known as 'flats'.

Formation of mineral veins and flats. The arrows represent the movement of mineral-rich waters, heated by the buried Weardale Granite. Elizabeth Pickett © NERC

Mining for lead ore in the North Pennines probably goes back at least to Roman times, but it had its heyday in the 18th and 19th centuries when the area's lead mines were of world importance. Other commercially mined minerals include

Kirkland Church near Blencarn

Glacial meltwater channel near Blanchland

Peat on glacial till above Killhope

Nine Standards

sphalerite (zinc ore), iron ores, fluorite (also known as fluorspar), and barium minerals such as baryte and witherite. Mining for these minerals has had a profound effect on the landscape. Although the mines have all closed, the landscape is imprinted with the legacy of the area's mining past – from shafts, hushes, spoil heaps and chimneys to the patterns of settlement and 'miner-farmer' landscapes.

Deserts and floods

The Eden Valley is underlain by red sandstones which give the villages at the foot of the North Pennine escarpment their distinctive character. These rocks formed between 290 and 210 million years ago, in the Permian and Triassic periods of Earth history, when the North Pennines baked in a hot desert environment just north of the equator. Sands from desert dunes, flash floods and rivers hardened into red sandstones. These rocks lie next to the much older slates and volcanic rocks of the distinctive 'pikes' and are separated from them by faults – cracks in the Earth's crust along which there has been movement.

Ice age

From over 200 million years ago, we have little tangible evidence for what was happening in the North Pennines. We know that Britain drifted north to its present position, and that about two million years ago world climate cooled dramatically, heralding the start of a series of ice ages.

The landscape of the North Pennines owes much of its character to the action of ice and meltwater. About 20,000 years ago northern Britain lay frozen under a huge blanket of ice. A kilometre-thick ice sheet covered the North Pennines and streamed over the landscape, smoothing and scouring the hills and valleys. It dumped a mixture of clay, gravel and boulders known as 'till' and created streamlined mounds of glacial debris called drumlins. Some of the highest land in the North Pennines may have poked above the ice at times during the ice age. These hilltops would have been frozen wastes of frost-shattered rock.

After the ice

About 15,000 years ago the arctic conditions started to give way to a milder, wetter climate. The ice began to melt, leaving a landscape of bare rock, unstable slopes and piles of glacial debris. Torrential meltwaters carved drainage channels and deposited sand and gravel in the valleys. Amidst this rapidly changing landscape, arctic plants, grasses and dwarf shrubs began to colonise the bare land. These were eventually replaced by woodland – part of the great wildwood which once covered much of Britain. Sparse birch and Scots pine dominated the higher parts of the North Pennines. About 7,500 years ago, rainfall increased and blanket bog began to form on the waterlogged uplands. In these areas woodland cover decreased, leaving tree stumps buried and preserved in peat.

Ancient Scots pine tree stump emerging from peat at the edge of Smiddyshaw Reservoir

People and the landscape

Ever since people first came to the North Pennines, perhaps 10,000 years ago, human activity has profoundly influenced the landscape. The first settlers arrived in a landscape of wooded valleys, very different from today's meadows and grassland. Woodland flourished in the valleys until about 5,000 years ago when early farmers began to fell the trees.

Through the following millennia, many different peoples – Celts, Romans, Saxons, Vikings, Normans – left their mark in settlements, fortifications, field systems, graves and mines. But it is in the last few hundred years that people have had the greatest impact on the North Pennine landscape. Centuries of exploitation of the area's rich mineral resources have not only left a rich heritage of mining remains, but have influenced the pattern of settlement and agriculture and even the shape of the fells and dales themselves.

Today's landscape

Today's North Pennine landscape is the product of millions of years of geological processes and just a few thousand years of human activity. All these have lent a hand in creating both the shape of the countryside and the intricate 'quilt' of land use and settlement draped over it.

Most people live in the dales which cut through the wild moorland landscape. Villages, farms and dry stone walls built of local stone reflect the underlying geology of the area. The imprint of lead and other mining activity is still strong, with chimneys, hushes, adits, mineshops and other features providing a reminder of our industrial past.

For a full account of the area's geodiversity, visit www.northpennines.org.uk and download the revised Geodiversity Audit.

Action Plan

This action plan is intended to guide the work of the North Pennines AONB Partnership Staff Unit and its partners. It is divided into five sections:

- Our geodiversity work and our role as a European Geopark;
- Understanding more about our geodiversity;
- Conserving our geodiversity;
- Interpreting our geodiversity and supporting geotourism;
- Education and lifelong learning about our geodiversity.

These actions were derived from the work of auditing and assessing the geodiversity of the North Pennines in 2003/04 and considering the opportunities for understanding, conserving and celebrating it. They were also informed by the subsequent five years of activity in this field. It is not an exhaustive list of actions; other ideas may come forward during the life of this plan and these should be accommodated where time and funds allow.

Abbreviations used in this Action Plan

BGS	British Geological Survey
CCs	County Councils
CCC	Carlisle City Council
CDO	Community Development Organisation
CT	Cumbria Tourism
DCC	Durham County Council
DWT	Durham Wildlife Trust
EH	English Heritage
FoK	Friends of Killhope
HCT	Historic Chapels Trust
HQP	Harehope Quarry Project
Killhope	Killhope, the North of England Lead Mining Museum
LA	Local Authority
MoD	Ministry of Defence
Mus	Museums
NE	Natural England
NEGF	North East Geodiversity Forum
NPAP	North Pennines AONB Partnership
NPHT	North Pennines Heritage Trust
NT	National Trust
NTo	Northumberland Tourism
NWL	Northumbrian Water Ltd
NWT	Northumberland Wildlife Trust
PH	Pennine Horizons
RSPB	Royal Society for the Protection of Birds
UNIs	Universities
VCD	Visit County Durham
WCP	Weardale Community Partnership
WT	Wildlife Trusts
YHA	Youth Hostels Association

Using this action plan

Objective	Action	Partners	Timescale	Supports Management Plan objective
4 To achieve favourable or unfavourable recovering condition for geological SSSIs.	1 Assess the condition of geological SSSIs and produce management prescriptions where required.	**NE**, NPAP	2009–2010	LG4

Objective
Something we want to achieve by 2015.

Action
Work towards meeting the objective.

Partners
Not an exclusive list of those involved, but those which are central to implementing the action. Site/land owners are not mentioned as their involvement is implicit. **Lead in bold.**

Timescale
When it will be done.

Link to AONB Management Plan

Our geodiversity work and our role as a European Geopark

Objective	Action	Partners	Timescale	Supports Mgt Plan objective
1 To expand the geodiversity work of the AONB team and partners and to further the area's role as a European and Global Geopark.	1 Maintain the AONB Partnership's Geodiversity Officer post beyond 2012.	NPAP	2012	EU4
	2 Contribute to the life and work of the European and Global Geoparks Networks, and to regional and national geodiversity fora.	NPAP	2010–2015	EU4
	3 Act to secure continued European Geopark status at revalidations.	NPAP and partners	2010–2014	EU4
	4 Ensure that references to the Geopark are a feature of destination marketing for the North East and Cumbria.	**NPAP**, VCD, NTo, CT	2010–2015	EU4
	5 Secure further funds for geodiversity work, including through partnership projects with other European Geoparks.	NPAP	2010–2015	EU4
	6 Maintain and expand the geological resources and information on the AONB website.	NPAP	2010–2015	EU4
	7 Ensure that no members of the AONB Partnership are engaged in the sale of original geological material, or that organisations/attractions which do so are not promoted or supported by the Partnership, in accordance with the European Geoparks Charter.	NPAP	2010–2015	EU4
	8 Champion the area's geodiversity in local, regional and national strategies, plans and programmes.	**NPAP**, NE, BGS, WT	2010–2015	LG1

Understanding more about our geodiversity

Objective	Action	Partners	Timescale	Supports Mgt Plan objective
2 To acquire improved data and support new research about the geodiversity of the North Pennines.	1 Establish a set of geodiversity research priorities for the North Pennines.	**NPAP**, UNIs, BGS, Mus	2011	IK1, IK3
	2 Establish links with academic institutions and support studies linked to the research priorities through staff time, data and project funding.	**NPAP**, UNIs, BGS, Mus	2010–2015	IK1, IK3
	3 Establish and maintain a GIS record of sites/features and their management and interpretation.	NPAP	2011	EU4, IK1
	4 Acquire, maintain and update a set of maps, books, reports and studies on the geodiversity of the North Pennines.	NPAP	2010–2015	IK1
	5 Create a modern archive to record the mine workings at Nenthead.	**NPHT**, EH	2012	IK1

Old limestone quarry at Bollihope © Charlie Hedley/Natural England

Conserving our geodiversity

Objective	Action	Partners	Timescale	Supports Mgt Plan objective
3 To ensure that sites and features of Earth heritage importance are protected from adverse impacts of development.	1 Support the production of new and more robust criteria for Local Geodiversity Sites in line with DEFRA's guidance on Local Sites.	NEGF	2010–2011	LG1, LG2, LG4, LG5
	2 Assess Local Geodiversity Sites against the new criteria, ensuring input from qualified geologists.	**WT**, NE, NPAP	2010–2011	LG1, LG2, LG4, LG5
	3 Assess other sites identified in the geodiversity audit against the criteria and seek the designation of any that qualify, ensuring input from qualified geologists.	**NPAP**, WT, NE	2010–2011	LG1, LG2, LG4, LG5
	4 Adopt the revised list of Local Geodiversity Sites which arises from the new criteria and assessment and protect them from loss and damage.	CCs	2011–2015	LG1, LG2, LG4
	5 Incorporate policies in the Local Development Frameworks which protect Local Geodiversity Sites from adverse impacts of development.	CCs	2010	LG1, LG2, LG4
	6 Before undertaking reclamation or groundworks on mineral spoil heaps, seek advice on their geodiversity importance and take account of any recommendations which may arise.	**CCs**, BGS, NPAP	2010–2015	LG4
	7 Guard against the loss of/loss of access to sites and features of geological/geomorphological interest through land management schemes, eg. through tree planting.	**NE**, NPAP, CCs	2010–2015	LG4, LG7

Local Geodiversity Sites – those sites and features, including RIGS, County Wildlife Sites and other equivalent sites across the three North Pennine counties, which have been afforded a basic level of protection through the land use planning process.

Objective	Action	Partners	Timescale	Supports Mgt Plan objective
4 To achieve favourable or unfavourable recovering condition for geological SSSIs.	1 Assess the condition of geological SSSIs and produce management prescriptions where required.	**NE**, NPAP	2010	LG4
	2 Secure and implement revised management agreements for SSSIs shown by condition monitoring to require them.	NE	2010–2011	LG4, LB3
5 To conserve the geological/ geomorphological interest of individual sites and features.	1 Produce a pragmatic Collecting Code which accords with the area's status as a European Geopark and reflects national guidance.	**NPAP**, NE, Mus, WT, local groups/individuals	2011	LG5, EU4
	2 Establish NPHT policies on underground access, archaeology, codes of conduct, mineral collection and interpretation on its sites, which is in line with that established for the wider Geopark area and accords with the EGN Charter.	**NPHT**, NPAP	2012	LG5, EU4
	3 Record and conserve important geological features in operational quarries and encourage enhancement of those features where possible.	**Operators**, NPAP	2010–2015	LG6
	4 Encourage the establishment of new sites and features of geodiversity value. This should be a part of any review of restoration plans for quarries.	**NPAP**, quarry operators, LA	2010–2015	LG6
	5 Establish and deliver a Calaminarian Grasslands project which interprets and conserves the habitat and makes clear links with geodiversity.	**NWT**, NPAP, NE	2011–2014	LB6
	6 Conserve and interpret Shildon Engine House and Whitesyke and Bentyfield Mine, and at least two other features of the area's built mining heritage.	**NPAP**, EH, Mus, local groups/individuals	2010–2011	HE3, EU4
	7 Seek to retain the headgear at Groverake Mine.	**Owner**, NPAP, EH	2010–2015	LG4, HE2
	8 Consolidate and interpret the mining and smelting site at Augill.	**NPHT**, NPAP	2014	LG4, HE2, HE3, EU4

Interpreting our geodiversity and supporting geotourism

Objective	Action	Partners	Timescale	Supports Mgt Plan objective
6 To increase awareness of the geodiversity of the AONB as a whole.	1 Produce a popular geology book for the AONB.	NPAP	2010	EU4
	2 Produce a book on the minerals of the North Pennines.	**Killhope**, NPAP, local groups/individuals	2011	EU4
	3 Include a geological element in talks and presentations about the area's natural heritage.	**NPAP**, NE, WT	2010–2015	EU4
	4 Hold an annual 'Northern Rocks – the North Pennines Festival of Geology and Landscape' as part of European Geoparks celebrations.	**NPAP**, Killhope, NPHT, operators, HQP, local groups/individuals	2010–2015	EU1, EU4
	5 Ensure that the area's Geopark status and its features and attractions of geodiversity/mining heritage interest are promoted in pre- and post-arrival tourism material for the North East and Cumbria.	**NPAP**, VCD, NTo, CT	2010–2015	EU1, EU4, EB2, EB4
	6 Maintain a photographic record of sites/features of geological/geomorphological importance.	NPAP	2010 onwards	LG4, EU4, IK1
	7 Establish an oral history project with former workers in the quarry industry.	NPAP	2010	EU4, CC7
	8 Establish an oral history project with former workers in the fluorspar industry.	**WCP**, Killhope, NPAP, local groups/individuals	2011	EU4, CC7
	9 Produce a rock and mineral ID guide.	**NPAP**, Killhope, local groups/individuals	2012	EU4
	10 Re-launch the Wheels to the Wild geology and landscape-themed cycle guide.	NPAP	2010	EU4, EB3, EB4
	11 Produce a short guide to the mining heritage of the North Pennines using the model of existing NPAP guides, which will promote visits to Killhope and to Nenthead Mines Heritage Centre.	**NPHT/FoK**, NPAP, EH	2013	EU4
	12 Continue to provide guided walks on geological themes throughout the North Pennines.	**NPAP**, NE, Killhope, NPHT, local groups/ individuals	2010–2015, at least 10 per year	EU1, EU4, CC2, CC3
	13 Produce 'generic' interpretation leaflets about waterfalls, minerals, cyclothems, karst features and glacial features.	NPAP	One per year from 2010	EU4
	14 Make links with museums outside the North Pennines, notably the local gallery at the Great North Museum, to promote increased awareness of the area's geodiversity.	**NPAP**, Mus	2011	EU4

Objective	Action	Partners	Timescale	Supports Mgt Plan objective
7 To interpret a series of priority sites and features of geological interest, integrated with interpretation of other aspects of the area's heritage.	**TEESDALE AND WEARDALE**			
	1 Renew the interpretation panels at Holwick Scars, Holwick drumlins, High Force and Hanging Shaw, in a style in keeping with that for the Bowlees area interpretation being produced in early 2010.	**NPAP**, NE, DCC	2011	EU4
	2 Re-draft and re-design the geological trail for Holwick Scars.	NPAP	2011	EU4
	3 Produce new onsite interpretation at Low Force, incorporating Wynch Bridge and the falls. Remove old bridge interpretation panel.	**NPAP**, NE, DCC	2010	EU4
	4 Create a new easy-access path at Wynch Bridge/Low Force.	**NPAP**, DCC	2010	EU4, EU6
	5 Produce an audio-geotrail for Holwick Scars.	NPAP	2012	EU4
	6 Produce new interpretation for Gibson's Cave and Bowlees Quarry.	**NPAP**, DCC, DWT	2010	EU4
	7 Produce new interpretation for Cow Green Reservoir car park including static interpretation and a new trail publication.	**NPAP**, NE, NWL	2010	EU4
	8 Produce a new Slitt Wood trail booklet and ensure maintenance of the site.	**NPAP**, local groups/ individuals, Killhope, NE, EH	2010	HE2, EU4
	9 Produce new interpretation on geology, mining heritage and Geoparks at Killhope as part of redevelopments in the visitor centre.	**Killhope**, NPAP	2010–2011	EU4
	10 Update the display in Bowlees Visitor Centre.	**DWT**, NPAP, NE	2011	EU4
	11 Provide touchscreen interpretation in the geology room at the Langdon Beck Hotel.	NPAP	2012	EU4
	12 Ensure the links with the area's mining heritage are successfully made in any interpretation of Westgate Chapel.	**NPAP**, HCT, local groups/ individuals, Killhope	2011	EU4, HE5
	13 Explore the potential for a collaboration between Killhope and the Natural History Museum for use of mineral exhibits.	Killhope	2011	EU4
	14 Produce a geology and mining heritage trail for the Rookhope area.	NPAP	2013	EU4

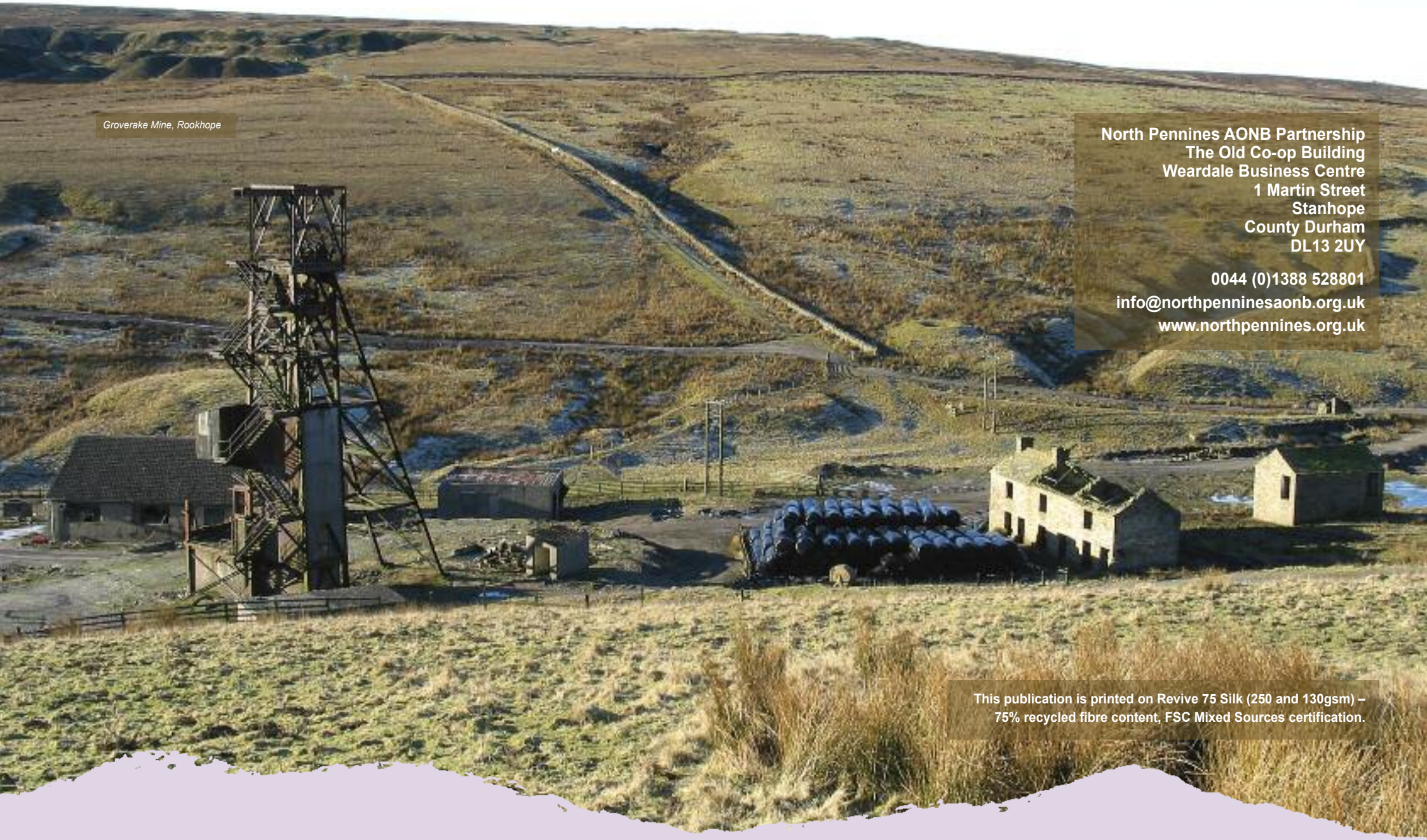
Objective	Action	Partners	Timescale	Supports Mgt Plan objective
	15 Produce a new geological trail from Bowes which covers God's Bridge and Sleightholme Beck SSSIs.	NPAP	2012	EU4
	16 Provide roadside interpretation of Groverake Mine.	NPAP	2013	EU4
	17 Ensure there is a geological element to any interpretation associated with the Eastgate site, including an opportunity to promote the AONB's Geopark status.	**NPAP,** DCC	2011–2015	EU4
	18 Support the development of further geological interpretation at Weardale Museum.	**Weardale Museum**, NPAP, FoK	2010–2015	EU4
	19 Support the continued development of geological interpretation and education facilities at Harehope Quarry.	**HQP**, NPAP	2010–2015	EU4
	THE DERWENT AND ALLEN VALLEYS			
	20 Produce a geological trail for Blanchland and surrounding countryside and ensure that geodiversity features in other interpretation of the area.	**NPAP**, Blanchland CDO	2010	EU4
	21 Establish the upstairs of Allenheads Blacksmith's Shop as a mini interpretation centre.	**NPAP**, Allenheads Trust	2010	EU4, EB4
	22 Produce a geological trail for Allenheads and surrounding countryside and ensure that geodiversity features in other interpretation of the area.	**NPAP**, Allenheads Trust	2011	EU4
	23 Interpret Shildon Engine House, ensuring that the geodiversity story comes across strongly.	**NPAP**, EH, Blanchland CDO, NPHT	2010	HE3, HE5, EU4, CC2, CC3
	24 Produce a new Local Information Point in Blanchland Abbey.	**NPAP**, Blanchland CDO	2011	EU4, EB4
	25 Establish a Local Information Point in Allenheads which features Geopark and geological information.	**NPAP**, Allenheads Trust	2011	EU4, EB4
	26 Produce geological interpretation for the interior of Ninebanks Youth Hostel.	**NPAP**, YHA	2011	EU4
	27 On renewal of interpretation of Derwent Reservoir, ensure that interpretation of geodiversity is included.	**NWL**, NPAP	2014	EU4
	28 Host geologically themed breaks at Ninebanks Youth Hostel.	**YHA**, local groups/ individuals	2010–2015	EU1, EU4, EB7

Objective	Action	Partners	Timescale	Supports Mgt Plan objective
	ALSTON MOOR AND THE SOUTH TYNE			
	29 Produce a town geology trail for Alston.	**NPAP**, local groups/individuals	2012	EU4, CC7
	30 Ensure geology is included in any interpretation of Whitley Castle.	**NPAP**, EH	2012	EU4, HE2
	31 Interpret the geological heritage of Whitesyke and Bentyfield Mine.	**NPAP**, NPHT, EH	2012	EU4, HE3
	32 Produce a geological trail for Allen Banks and Staward Gorge.	**NPAP**, NT, WT	2012	EU4
	33 Arrange a series of special events that make innovative use of Carrs Level show mine, with a focus on art and photography events.	NPHT	2010–2015	EU1, EU4, EU6
	34 Deliver a programme of 'wild' or experiential mine tours into areas at Nenthead Mines not normally visited by the public.	NPHT	2011–2015	EU1, EU4, EU6
	35 Improve the interpretation of the underground workings at Nenthead that are only occasionally accessible to the public on special tours.	NPHT	2013	EU4
	36 Develop improved interpretation at Nenthead Mines Heritage Centre on the minerals and fossils of the North Pennines.	**NPHT**, NPAP, Killhope, BGS, local groups/ individuals	2012–2013	EU4
	37 Subject to confirmation of their aquisition, display and interpret at Nenthead Mines Heritage Centre a mineral and fossil collection bequeathed to NPHT.	**NPHT**, NPAP	2012–2013	EU4
	ESCARPMENT VILLAGES AND THE WESTERN NORTH PENNINES			
	38 Produce a new interpretation panel in the car park at Murton.	**NPAP**, MoD, Parish Council	2010	EU4, CC7
	39 Ensure a geological element to new interpretation at Hartside.	NPAP	2010	EU4
	40 Provide interpretation of local geology at High Cup Wines.	NPAP	2011	EU4
	41 Produce a new geological trail starting at Dufton, interpreting the geodiversity of surrounding fells.	NPAP	2012	EU4
	42 Produce a new geological trail for Scordale.	**NPAP**, MoD	2012	EU4
	43 Produce a geological trail for Geltsdale RSPB reserve.	**NPAP**, RSPB	2013	EU4
	44 Produce a short publication on the red sandstones of the western North Pennines and their use as a local building stone.	NPAP	2013	EU4

Education and lifelong learning about our geodiversity

Objective	Action	Partners	Timescale	Supports Mgt Plan objective
8 To increase opportunities for schools to increase their use of the North Pennines for the study of geodiversity.	1 Hold a twilight session for teachers to promote available resources and to showcase opportunities to deliver the curriculum which are provided by the area's geodiversity.	**NPAP**, HQP	2010	EU4, EU5
	2 Provide an annual bespoke event/series for school groups, including making more of ideas and materials from Rock Detectives.	**NPAP**, HQP, Killhope, NPHT	2011	EU1, EU4, EU5
	3 Update geologically themed education resource material in partnership with teachers, either as a stand-alone project or as part of other resources.	NPAP	2013	EU4, EU5
	4 Support school travel grants for education visits to the area.	NPAP	2010–2011	EU5
	5 Encourage the use of local buildings, structures, graveyards, quarries, etc. as local educational resources to introduce children to the varied range and uses of geological materials.	**NPAP**, EH, NPHT	2010–2015	HE5, EU4, EU5
	6 Work with media artists and local schools to produce short films about the geology and landscape of the North Pennines.	NPAP	2010–2015	EU4, CC2, CC3, CC7
	7 Create a 'fossil pit' at Nenthead Mines Heritage Centre modelled on the 'Georium' in use at Harehope Quarry and in other European Geoparks.	NPHT	2012	EU4, EU5
	8 Create a 'mini-mine-maze' at Nenthead Mines Heritage Centre, for under six year-olds to crawl through and discover fossils set into the walls.	NPHT	2012	EU4, EU5

Objective	Action	Partners	Timescale	Supports Mgt Plan objective
9 To support lifelong learning about the North Pennines' geodiversity.	1 Run an annual series of evening classes on the geodiversity of the AONB/Geopark.	**NPAP**, local groups/ individuals	2010–2015	EU4, CC5
	2 Ensure the continuation of a geodiversity aspect to the Know Your North Pennines training programme for tourism providers.	**PH**, Killhope, NPAP	2010–2015	EB6
	3 Secure funding to continue the Rock Detectives clubs at Talkin Tarn, Nenthead/Allendale and at Harehope. Consider expansion to Teesdale.	**NPAP**, CCC, HQP, NPHT	2010–2015	EU4
	4 Develop further opportunities for young people to explore, celebrate and make decisions about their heritage, including geodiversity.	**NPHT**, Killhope, NPAP	2011–2015	EU4, CC3, CC7
	5 Initiate a programme of training workshops for all people accessing the underground workings at Nenthead Mines.	NPHT	2012	EU4



Groverake Mine, Rookhope

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