
Mineral extraction

The area has a very long and distinguished history as a producer of mineral products. Documentary records of mining for metals such as lead and iron exist from as far back as the 12th Century. It is possible that there was earlier mining for metals, though there is no identifiable evidence for this. It is, however, reasonable to suppose that mineral products have been raised from the area since the earliest days of human occupation.

Ores of copper, iron, lead, silver and zinc are known to have been worked here commercially.

Non-metalliferous minerals known to have been worked commercially are: barytes, barytocalcite, fluorspar, quartz and witherite

Rocks known to have been worked commercially are: coal, fireclay & brickclay, dolerite and other igneous rocks, limestone, peat, sand and gravel, sandstone (including ganister), moulding sand and slate.

Mineral extraction has had a profound effect upon almost every aspect of the modern landscape. The pattern of settlements, the road network, agricultural and land management practices can all be closely related to the former importance of mining, particularly for lead. Evidence of past or present mineral extraction can be seen in almost every part of the area. These mineral resources are clearly important elements in the area's geodiversity. Past and present workings offer a variety of opportunities for study.

The vital role played by mineral extraction in the geodiversity of the AONB is considered under the following headings: Abandoned quarries; Active quarries; Abandoned underground mines; Active underground mines; Spoil heaps

"Ancient Ironstone Workings, Cowshill, Weardale" © B. Young, BGS, NERC.

Abandoned quarries

The area's long and distinguished history of mineral extraction has left a legacy of many hundreds of abandoned quarries, though there is no comprehensive register of their location and consequently it is not possible to depict them on a map. Certain geological units or formations have attracted particular economic interest. Numerous substantial quarries mark the outcrops of the Great Limestone, the Whin Sill, and several of the Namurian sandstones. The products of such quarries were mainly employed outside the AONB. Smaller pits, often worked only for very local use within the AONB are also common. In building dry-stone walls and farm buildings, it was common practice to obtain stone from as close as possible to the construction site. Thus, small pits are common alongside many lengths of wall, or close to farms or hamlets. Some of the area's mineral veins and related flat deposits were worked by quarrying. Peat is known to have been extracted on a substantial scale in the past, though none of these workings can be reliably identified today.

Abandoned quarries may be regarded as essential and distinguishing features of the present day landscape in many parts of the AONB. As disused quarries provide some of the most important, and several unique, sites at which certain rock units may be seen, they contribute greatly to the area's geodiversity.

In some instances their biodiversity interest may be significantly greater than their geodiversity interest. Abandoned quarry floors and faces offer a variety of substrates for specialised plant communities, including sites for lichens and other lower plants. They frequently offer excellent nest and roost sites for a variety of bird species, and may provide important bat roosts. Flooded quarry workings may offer important water bodies for aquatic life and a variety of bird species.

Abandoned quarries are commonly seen as eyesores or convenient sites for waste disposal. Overgrowth of vegetation may spoil, or eventually totally obliterate, useful or important geological features. Reclamation schemes aimed at remediation of land affected by mineral extraction may destroy important or unique material.

Active quarries

These comprise quarries at which mineral products are being produced, or at which planning permissions exist to allow such extraction.

Limestone is extracted at several quarries. The bulk of this is used as crushed rock aggregate or roadstone. Large blocks are occasionally recovered for use as armour-stone. A small amount of coral-rich limestone from the Frosterley Band within the Great Limestone at Broadwood Quarry in Weardale is recovered for use as ornamental stone.

Dolerite ('whinstone') from the Whin Sill is worked as an important source of roadstone from Force Garth Quarry in Teesdale. Some large blocks are recovered for use as armour-stone.

Sandstone is worked as a building, paving and walling stone from several quarries.

Active quarries provide fresh and constantly changing sections through the deposits being worked. They therefore provide some of the finest opportunities to further understanding and appreciation of the area's geodiversity. With appropriate planning for after-use quarries may also be developed as important future assets for biodiversity and recreation.

Active quarries offer opportunities to demonstrate the working techniques and the relevance of these industries within their local and regional communities. Significant opportunities exist at many active sites to plan after-uses which may be sympathetic to the conservation of important geological features. With appropriate imagination and foresight, many abandoned quarries can become considerable assets to the area's natural heritage.

Abandoned underground mines

Accessible abandoned underground mines enable examination of numerous geological features associated with the mineral deposits formerly worked there, many of which may be rarely exposed clearly at the surface. Underground sites may provide unique opportunities to examine geological successions and structures in three dimensions and may offer the chance to study the mechanical and engineering properties of geological structures and materials. Many underground sites preserve geological features or materials in a comparatively unweathered condition, enabling comparison with surface exposures and therefore aiding understanding of a number of geological processes. Underground sites may also provide unique insights into the working practices adopted in mineral extraction. Abandoned underground mines therefore contribute greatly to the area's geodiversity.

"Old Quarry in the Great Limestone, Bollihope Common" — Charlie Hedley © Countryside Agency.

"Surface plant, Groverake Mine (now disused), Rookhope" © B. Young, BGS, NERC.

The original stone-arched entrance to Cambokeels Mine, Weardale, driven in the mid-19th Century. © B. Young, BGS, NERC

Centuries of mining, mainly for lead ore and associated minerals, have left a vast legacy of many miles of underground driveages and stopes. Whereas the majority of these have long been completely inaccessible, a substantial number remain in varying states of accessibility. Like abandoned quarries, it is quite impractical to depict all such sites on a map.

A number of the area's abandoned underground workings offer some of the clearest exposures available anywhere in Britain, or elsewhere, of several types of ore deposit. In particular, Smallcleugh, and nearby mines in the Nent Valley, provide extremely important sections through lead/zinc-rich flat deposits, including numerous features crucial to understanding their nature and origins. Parts of the underground workings of mines such as Blagill, Nentsberry Hags and Brownley Hill expose barium carbonate mineralisation unique in the world. The latter mine includes the joint type location for the mineral alstonite, and the type locality for brianyoungite.

In addition to their vital contribution to the area's geodiversity, underground workings commonly support an important biodiversity. Many mine entrances and shafts are well-known and well-used bat roosts and some such workings provide specialised habitats for a variety of invertebrates, especially in their near surface parts. Timber, used within the mines may today host a range of fungal species.

All of the area's accessible abandoned underground workings exhibit significant features of industrial archaeological or historical interest, both above and below ground. Most of these workings are frequented by mine explorers, as well as mineral collectors. Clearly, access to such potentially unstable workings raises important considerations of safety and a range of conservation issues across several disciplines.

By their very nature, underground workings are especially vulnerable to deterioration. It is many years since most of the currently accessible workings were actively worked. Their stability and security is therefore almost entirely dependent upon the physical properties of the rocks through which the workings are excavated and the condition of any supporting structures placed by the original miners. In parts of many mines within the AONB, substantial parts of the workings lie within areas of competent rock which have stood with no support, or minimal support, in some cases for over two centuries. In other areas stone-arch supports, the traditional method employed in the North Pennines, continue to provide adequate support for many miles of workings. However, deterioration is inevitable and long-term stability and accessibility cannot be guaranteed.

Some rudimentary maintenance of wall-rock and roof support is undertaken by some groups of mine explorers anxious to maintain access to popular sections of workings. It is also common for mine explorers and mineral collectors to attempt to regain access to long-inaccessible areas of workings by excavating through blockages etc. Such work is generally of an ad hoc type and may not be based on expert civil engineering practices and may threaten the long-term stability of the workings. There is anecdotal evidence that illegal use of explosives has been used in collecting minerals from several mines. Mine exploration groups may offer opportunities to monitor the condition of workings and to recommend necessary remedial work.

Collecting of mineral specimens constitutes one of the most serious threats to both the accessibility and scientific value of many underground geological sites.

Two underground sites, Park Level Mine, Killhope, and Carr's Level Mine, Nenthead, are currently operated for public access and interpretation of mining and geological features.

Active underground mines

Only one small underground mine is still active at the time of editing (January 2010). Rogerley Mine, within Rogerley Quarry in Weardale, is worked intermittently as a source of high quality fluorite specimens for the world mineral specimen trade.

Like active quarries, active underground mines provide constantly changing sections through the deposits being worked and thus have much to contribute to the understanding of the area's geodiversity. The fine exposures of mineralised ground, exposed in Rogerley Mine, have in recent years, figured in research into the origins of 'flat' mineralisation in the North Pennines. The mine workings offer very considerable opportunities for significant further research.

Spoil heaps

Centuries of mineral extraction have left a varied legacy of mineral wastes in the form of spoil heaps from quarries, mines or mineral processing plants, including former metal smelting operations.

Because the great majority of the area's underground mines are no longer accessible for study, their associated spoil heaps may provide the only source of samples of the materials worked, or penetrated, in the mine workings. The technical literature includes many examples of descriptions and interpretations of important geological and mineralogical features based largely, or solely, on the evidence of materials contained in spoil heaps.

Exposure to weathering in spoil heaps may enhance the value of the materials present. For example, many fossils which may be extremely difficult to see in an unweathered exposure or quarry face, may be clearly exposed in weathered blocks in a spoil heap. A number of supergene mineral species may be forming within spoil heaps, particularly in waste materials from former smelting operations.

Spoil heaps are locally prominent in the area's landscape. Indeed, many of the spoil heaps associated with metalliferous mines may be viewed as essential features which help to characterise and define those landscapes. In some places spoil heaps may give the only clues to the presence of former workings.

Many spoil heaps offer a ready source of rubble suitable for earthworks or track-making. Reclamation and landscaping of areas of spoil deemed to be unsightly, may involve their concealment beneath spreads of top-soil, obliteration by tree planting or their complete removal. Natural erosion threatens a small number of scientifically significant spoil heaps. Uncontrolled collection of mineral specimens may seriously deplete their value. Spoil heaps may therefore be regarded as vulnerable elements in the landscape, susceptible to a variety of threats to their scientific value as important components of the area's geodiversity

Some spoil heaps provide an important habitat for a number of plant communities. These include limestone flora on the heaps adjoining some limestone quarries and metallophyte flora, including a variety of lower plant species, on numerous spoil heaps from metal mines and processing plants.

Several spoil heaps, particularly some associated with former metalliferous mines are included in the archaeological features scheduled at those sites. Scheduled Ancient Monument (SAM) designation normally precludes any form of disturbance, however minor.

Spoil heaps may offer important potential for sustainable educational and recreational collecting. Potential exists for mineral operators to make portions of spoil heaps accessible for educational or recreational use by groups or individuals. Such activities may include setting aside concentrations of waste material of particular geological interest. Excavation of a spoil heap offers important opportunities for recovery of significant material and associated recording of finds.

“Spoil Heaps, Coalcleugh Mine” © B. Young, BGS, NERC.

Figures

(Figure 61) “Ancient Ironstone Workings, Cowshill, Weardale” © B. Young, BGS, NERC.

(Figure 62) Old Quarry in the Great Limestone, Bollihope Common — Charlie Hedley © Countryside Agency.

(Figure 63) Surface plant, Groverake Mine (now disused), Rookhope © B. Young, BGS, NERC.

(Figure 64) The original stone-arched entrance to Cambokeels Mine, Weardale, driven in the mid-19th Century. © B. Young, BGS, NERC.

(Figure 65) Spoil Heaps, Coalcleugh Mine © B. Young, BGS, NERC.

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