1: Lead Mining in the Peak - An Introduction

'Travel with me through this howling wilderness... and I will show you all that is wonderful about it... to a valley on the side of a rising hill, where there were several grooves, so they call the mouth of the shaft or pit by which they go down into a lead mine,... we were agreeably surprised with seeing a hand, and then an arm, and quickly after a head, thrust up out of the groove we were looking at... the man was a most uncouth spectacle; he was clothed all in leather, had a cap of the same without a brim, some tools in a little basket which he drew up with him... This person was as lean as a skeleton, pale as a dead corpse, his hair and beard a deep black, his flesh lank, and, as we thought something of the colour of the lead itself... he looked like an inhabitant of the dark regions below, and who was just ascending into the world of light.'

Daniel Defoe [26]*

The 'howling wilderness' noted by Defoe in the 18th century was a very different Peak District to the one we see today. Many upland parts of the White Peak were open commons and the lead mines were extensive and in full production. Much of the countryside had been 'polluted' by centuries of lead mining. This industrial landscape was widely regarded for much of the 20th century as 'derelict land'.

Notes
* Throughout the report further reading material is indicated by numbers in square brackets within the text, which correspond with those used in Further Reading. Readers should consult the Glossary for explanations of specialist terms used.

** The term 'lead rake' was used specifically by the miners for the main mineral veins, worked from surface to great depth. This report concentrates on the surface remains and uses the term 'lead rake' here as a shorthand for all surface mining remains, including hollows and hillocks following a variety of types of mineralisation, not just those at large veins.
The Lead Rakes Project

The National Context - Lead mining was for centuries a key social and economic factor in the development of the Peak District and its landscape. Lead vied with iron for second place as Britain's major export behind wool. Britain was Europe's main producer of lead until resources elsewhere in the world were discovered in the 19th century; the Peak District orefield was one of the main sources. Thus, lead mining was vital for both the Peak District and the national economy.

Metal mining has only taken place in a small number of areas of Britain, often in upland contexts, and the surviving remains are thus a nationally-rare conservation resource. The lead mining sites in the Peak are particularly important because of their exceptionally extensive surface remains of archaeological and ecological value. This results from the unusual mineralisation here, commonly present at surface, where there is a multitude of outcropping veins. Thus, there are high numbers of surface hillocks, mostly derived from over 25,000 shafts that once dropped to underground workings. Other orefields have different but important characteristics, as for example in Cornwall which is well known for its 19th and 20th century engine houses, now viewed as icons within the county, or the Northern Pennines where there is a variety of impressive but very different 19th century mine complexes. In contrast, lead production in the Derbyshire orefield peaked at an earlier date and thus there is a wide variety of important features that are relatively uncommon elsewhere.

The lead rakes in the Peak support rare metallophyte-rich grasslands, with metal-tolerant species, that are of international importance. Sites of archaeological, biological and geological interest are designated as nationally important. The assessments of the mining resource presented in this report have great relevance to other regions, pointing the way to integrated and detailed conservation actions that could be adopted elsewhere. The methodologies applied to aerial photographic, archaeological and ecological assessments have the potential for national application at other orefields.

The conservation value of mining remains across Britain has often been undervalued in the past and it is vital that action is taken now to prevent sometimes unique and often important sites and landscapes from being lost. The surviving resource is at a critical point where if high-priority features are not assessed in detail at national and regional levels, then rare and particularly informative sites will be lost forever.

Origins and History - Lead ore occurs in veins and other deposits within the Carboniferous Limestone of the Peak District as a result of mineralising fluids migrating into the faults and fissures about 270 million years ago. Lead ores have been extensively mined in this important orefield for upwards of 2000 years and the lead produced was an important part of the national as well as the local economy. From the 20th century fluor spar, barytites and calcite, not lead, have been the main commodities to be mined from lead rakes, although lead ore has continued to be recovered as a by-product. A horse-drawn ore crusher of 19th century type in use in 1912 at Hindy Mine on Moss Rake near Bradwell. This site has now been reworked for gangue minerals and is now levelled (PDNPA collection).

The Remains Today - While much of the lead mining took place underground, for many people today what they see and value is at surface. The interest is multi-faceted:

- **Landscape Character** - The surface remains of the lead mining industry are a key element in the landscape character of the Peak District. This has been recognised as a key character element of the White Peak by the Countryside Agency [32], English Heritage [4] and English Nature [30].
- **Geology** - There are many important sites, at surface and underground, where the mineralisation and its formation can be studied. Some are protected by statutory designation as Sites of Special Scientific Interest (SSSIs) for their mineralogical value, or are listed as Regionally Important Geological and Geomorphological Sites (RIGS).
- **Archeology** - The surface and underground remains of lead mining are very varied and include hillocks and such features as shafts, coes, gin circles, stopes, engine houses, crushing circles, ponds and buddles, which tell us much about the history of the mining and the processes used. Some sites are protected by statutory designation as Scheduled Monuments (SMs) and Listed Buildings.
- **Ecology** - Important mosaics of metaliferous, calcareous, neutral and acidic grasslands are highly characteristic of lead mining remains in the Peak District. Part of their ecological interest is the rare ‘metallophyte’ plant communities which tolerate metal-polluted ground. These metalophyte-rich grasslands are of international importance and some sites have been designated as candidate Special Areas of Conservation (sSACs) and Sites of Special Scientific Interest (SSSIs). They are also recognised as an important component of the Peak District Biodiversity Action Plan (BAP).
- **Cultural, Social and Industrial History** - The surface remains are a visible manifestation of this once-important industry and are far more than just archaeological or ecological features. They provide important tangible evidence of the social, economic and industrial past of the region and its communities. Derbysire lead miners, photographed at a reckoning day in 1867 at Rake Head Mine near Bradwell. Many of their names are known and some have descendants who still live in the region (PDNPA collection).
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A horse-drawn ore crusher of 19th century type in use in 1912 at Windy Mine on Moss Rake near Bradwell. This site has now been reworked for gangue minerals and is now levelled (PDNPA collection).

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Many lead rake hillocks have exceptionally rich plant communities. For example, at Bonsall Moor the plants include harebell and bird's-foot-trellis (left), fragrant orchid, autumn gentian, thyme, fairy flax and hawkweed (right). The example near Elton has the metallophyte spring sandwort (left) and kidney vetch (centre). (photographer Rebecca Penny, PDNPA).
The lead rakes of the Peak District are a conservation resource of national importance, with a multitude of types of interest, including landscape character, geology, archaeology, ecology and cultural, social and industrial history.

A Resource at Risk

Many of the lead mining remains of the Peak District are currently at serious risk of damage or removal. There are two main causes:

- The re-working of the mineral resource.
- Removal or degradation by agricultural activity.

In the 20th century the Peak District became Britain’s main source of fluorspar, contained within the waste minerals left behind by the lead miners. Other minerals such as calcite and barytes are also worked. While previous mining activity has left a diverse and valued resource, modern working methods and their often extensive nature have the capacity to obliterate the historic lead legacy and the unique ecological habitats which have developed here.

At many important sites niblocks have been removed for their minerals, as here at Cap Rake near Peak Forest (photographer Ray Manley, PDNPA).

The mines started life because of people’s desire to acquire mineral wealth, following what would be termed today the development prerogative. They then went through a time of ‘abandonment’ and were commonly seen as industrial wasteland. In recent years lead mining sites have been recognised as an integral part of the environmental, historical and cultural assets of the Peak District. Thus, historic mining remains have changed in value as our perceptions of them have altered. This is not to say that every example should be conserved, there may be overriding reasons for developing some of them. However, as a minimum, for those sites and landscapes of high-priority conservation value the desirable starting point for the future is a presumption in favour of conservation rather than allowing them to be damaged or removed.

Lead rakes may lack the obvious romance of moorland and hay meadows. However, one goal of the Lead Rakes Project is to enhance people’s understanding and appreciation of the fascinating complexities of lead rakes and the many elements of interest they contain, from insects and flowers to geological and historic features. The Project aims to inspire the conservation of these national treasures for the benefit of current and future generations.

There is a need to raise the conservation profile of lead rakes, now recognised as an integral and valued part of the environmental, historical and cultural assets of the Peak District.

The Lead Rakes Project

In 1996 officers of the Peak District National Park Authority formed the Lead Rakes Project to co-ordinate opportunities for lead rake conservation within the National Park, and identify and implement ways to achieve this. Subsequently, both English Heritage and English Nature have become partners in the Project.

The Project’s aim is to ensure that current and future generations can continue to experience and enjoy the Peak District’s important lead mining heritage.

Our primary objective has been to survey in detail the remaining lead rakes in the Peak District orefield to enable conservation priorities to be identified.

Using this information, we have worked together to:

- Raise awareness amongst local communities and the general public of the important contribution lead mining remains make to the historic landscape and its biodiversity.
- Forge partnerships with national and local conservation organisations, and others, to promote conservation of lead rakes.
- Safeguard important sites by negotiating conservation agreements with farmers and landowners.
- Carry out appropriate assessments of sites in relation to planning and development proposals.
- Raise awareness of the current conservation opportunities and challenges.

Much day-to-day conservation of the lead mining resource has traditionally taken place through the normal casework of the Authority’s officers, both in the context of Minerals Planning and as a key broker of agri-environment schemes. However, since the formation of the Lead Rakes Project a more focused and integrated approach to the problems of the conservation of lead rakes has been possible.

In summary, the main achievements to date have been:

General

- Completion of an aerial photographic assessment of the extent of the orefield’s surviving surface remains (Chapter 4) [5].

Archaeology

- Commissioning of reports to quantify the loss of significant lead mining features (Chapter 4) [54] and to give the historical background to specific mining areas [55, 57, 59-63].
- Extensive fieldwork and desk-based assessment to produce Inventories of ‘Lead Mining Sites’ and ‘Landscapes’ of special importance (Chapter 6) [7].

In the latter part of the 20th century a large number of lead mining surface remains were removed or damaged by agricultural activity, often as part of general farming trends linked to increased productivity: this continues today. Sometimes removal by landowners and farmers has also been as a result of real or perceived potential problems of lead poisoning in their livestock.

If positive conservation action is not taken now then a wide range of important ecological and archaeological sites will be lost forever.

Changing Attitudes

Chapter 1.5
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Many mining sites are potentially at risk and conservation initiatives are needed. Here, high above Castleton, Hazard Mine in the foreground was largely removed by open-casting for mineral a few years ago and the opencuts were being backfilled when this photograph was taken in 1998. The walled out parts of Daisy Rake and Dolow Rake beyond survive and are now parts of a Scheduled Monument and SSSI. However, the unvealled parts of the vein here were recently levelled when paper pulp was spread (National Monuments Record/English Heritage).

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### In Summary

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This Report

An early result of the increased focus on lead mining remains has been confirmation that statutory designation, the planning system and agri-environment schemes, all of which are key elements of increased protection and improved conservation, are not enough in their current form to ensure a sustainable future for the remaining resource.

The work of the Lead Rakes Project highlights the need to:

- Promote greater awareness and interest in lead rakes locally and nationally.
- Forge new, and consolidate existing, partnerships to further lead rake conservation.
- Work with the minerals industry and landowners to promote the retention of sites of conservation interest.
- Secure additional resources for conservation and research.
- Promote changes in legislation, agri-environment schemes and the planning system at national, regional and local levels.

This report, prepared in partnership with English Heritage and English Nature, and funded by the Aggregates Levy Sustainability Fund through Defra and English Heritage, addresses these issues (Chapters 7 and 8).

As a preliminary to this, the report introduces the conservation interests and what survives today (Chapters 2 and 4), presents Inventories of Lead Mining Sites and Landscapes of known high conservation priority (Chapter 5 and The Inventories), and gives examples of recent conservation initiatives (Chapter 6).

2: The Origins and History of Lead Rakes

Natural processes initially formed the lead veins about 270 million years ago. Over the last 2000 years they have been mined by people who depended on them as a source of income and sometimes wealth.

Geology and Minerals

The Bedrock - The formation of the rocks of the central Peak District is described succinctly by Ford and Rieuwerds (1935):

"The limestones of the White Peak were formed as sediment on the floor of a tropical sea in the Carboniferous period of geological time, some 310-330 million years ago, when Britain lay close to the equator. The shallow sea was warm and clear and inhabited by a multitude of shrimps, crabs, sea lilies (crinoids) and various microscopic forms of life. When these died their remains accumulated as layer upon layer of shell debris which hardened with time to form limestone."

Lead Ore - The common lead ore of the Peak District is galena (lead sulphide). It occurs most commonly in veins in the Carboniferous Limestone, present as a result of mineralising fluids migrating into the faults and fissures several million years after the limestone was formed (1, 21, 24, 34, 36, 46, 71). The lead miners' term 'rake' applies to a major vertical or near-vertical mineralised vein. 'Scrins' are smaller veins. Other mineral deposits include 'flats' which are near horizontal deposits in the bedding planes between layers of limestone. 'Pipes' are irregular cavities that have been mineralised, with this often extending beyond the cavity to replace the surrounding limestone.

Mining History

Lead mining has been an extremely important industry in the Peak District since the Roman period. Mining was extensive in the medieval period and later reached a peak in the 17th and 18th centuries, before the industry all but collapsed in the late 19th century. In post-medieval times production was often on an industrial scale, the ore removed from deep underground with the aid of engines, and using pumps and drainage levels to de-water the mines. Mining was also commonly undertaken by miner/farmers across the orefield, who continued using simple methods to produce small quantities of ore to supplement their incomes (3, 7, 8, 11, 42, 44, 56, 74-76). The lead produced from the mines was a vital part of the economy of the Peak District and was important nationally, lead being one of Britain's major exports.

Early Mining - Lead has been used in very small quantities for ornaments and ritual objects since Bronze Age times. Copper, one of the main constituents of bronze, was certainly mined at Eaton near Warslow, Staffordshire in the Bronze Age, sometime between 2000 and 1500 BC, as indicated by the recent discovery of a mining tool there which has been radio-carbon dated (12).

The main direct evidence for Roman mining in the Peak is the discovery of several inscribed lead ingots, known as pigs, found locally and as far away as Normandy. One of the main interests in lead ore for the Romans (and in later times) was that it is the main source of silver, often a small but significant component of the ore. In the Peak orefield they may have been disappointed, for the ores produced in post-medieval times were usually particularly poor in silver.

Documentary evidence for mining in Anglo-Saxon and medieval times is sparse, but enough is known to indicate lead mining was widespread and well established in the Peak. From at least the early 8th century through to the late 9th century mines at Whirlow were controlled by the important Mercian abbey at Repton in the Trent Valley. After the collapse of the Daneslaw in the early 10th century, many of the mines in the Peak were controlled by the English kings who owned large estates here. Downesday