Risks to Rock Art

Why is rock art at risk?

Despite being carved on hard rock, rock art is very vulnerable, and is continually deteriorating. Although the carvings we see today have survived for thousands of years, many are badly eroded or damaged. We also know that many carvings have been destroyed over the last 150 years, and it is likely that countless others no longer survive. While we are not able to halt the natural processes that affect the rock art, we can mitigate our own impact on it and improve the sustainability of the carvings.The information that you record will identify panels that need immediate protective measures, and it will be crucial for future monitoring of decay or damage.

There are many agents that can impact on rock art, and we can group these into three broad categories:

1. Natural Processes
2. Animal Impact
3. Human Iimpact

These Guidance Notes detail the main risks to rock art and how to identify them so that you can include them on your recording form, and alert us to any panels that are under severe threat.

1. Natural Processes

Natural processes are typically the main causes of decay and deterioration of rock art. They include:

- **Physical and Chemical Weathering**
- **Biological Growths**

In most cases, we cannot alter these slow-acting agents without affecting – and potentially damaging – the rock surface. Sometimes, however, these natural processes pose a more immediate threat to the rock art, and we may be able to intervene to slow down or even prevent their impact.

Physical and Chemical Weathering

Rock art is carved on a variety of rock types, and these are all affected in different ways by physical and chemical weathering. For most rock types, the adverse effects of temperature, water, and atmospheric pollutants dissolve or alter the matrix which cements the geological particles of the rock together. These processes result in the loss of tiny particles from the rock surface. Over time, this erodes the carvings. Physical and chemical erosion can take different forms and act at different speeds, depending on the nature of the rock and the ways in which it is being affected.

Water is the greatest threat to long-term survival of the rock art, especially when it persistently flows over or pools on the rock surface. Sedimentary rocks, such as sandstones and limestone, are particularly affected by water action. If certain parts of a rock surface are very exposed to the weather, this can lead to **differential erosion** of the rock particles. Differential erosion can create natural features that often look like rock art, and result in water being channelled along

specific areas of the rock. Sedimentary rocks, such as sandstone, are naturally laid down in layers (bedding planes), which makes them susceptible to weathering along the bedding planes (known as **planar weathering**). In this case, layers of rock become detached from the rock surface along a bedding plane or line of weakness. Surface material is generally lost in sheets, often leaving a rough, differently coloured surface exposed. **Cratering and pitting** is caused when areas of the rock of varying hardness weather at different rates producing uneven, pitted surfaces. **Burnt areas** may be the result of wildfires (extremely destructive) or controlled burning (less damaging) of e.g. heather, as part of land management practices. Intense heat causes the rock to expand and contract leading to cracking and spalling of flakes of stone, and to the absorption of moisture which, due to freeze/thaw action, causes further damage.

Differential Weathering

Cratering and Pitting

Damage caused by wildfires

<u>Biological Growths</u>

The main types of biological growths found on carved panels are **lichens, mosses, algae, grass and turf, trees and other vegetation.** Biological growths can threaten rock art, although we do not fully understand how they cause decay – the mechanisms by which **lichens** impact the rock surface are the subject of ongoing research, for example. Some biological growths produce very fine roots called 'hyphae' which grow into the tiny pores within the rock, but it is likely that different types of biological organisms act in different ways on different types of rock.

Lichens are common on carved rocks, and there are often hundreds of different species on a single rock surface. There are two main types:

> **Crustose** (so called because they form distinct crusty spots or blotches which sit tightly on the rock surface). These are likely to be the predominant species on sandstone rocks, except perhaps in the west of the country, where damper conditions favour foliose lichens.
>
> **Foliose** (more loosely attached to the stone than crustose species. They are leaf-like frequently and frequently form roughly circular splodges or well-defined rosettes). Lichens can have different colours and may be hundreds or even thousands of years old. Lichens prefer drier conditions to moss and algae.

Several factors influence the extent of lichen colonisation on the rock surface, including aspect and orientation, texture, patterns of water run-off, levels of nitrification (e.g. due to bird or animal droppings), levels of atmospheric pollution, and mineral composition of the rock (which affects acidity). Therefore sandstone will always have a different composition of lichen species than limestone or granite, even where these occur in the same location.

Lichens may cause damage to carved rocks by a combination of factors – such as acidic secretions, or inducing stress in the rock as a result of dehydration and re-hydration of the lichen. Recent research suggests that lichens inhibit water evaporation from the surface after wetting, making the rock more vulnerable to frost and salt damage and the effects of acid rain. Despite these risks, lichens are often thought to provide a protective coating over the carved surface, preventing deterioration. However, there is no common rule, and risks vary from area to area and species to species.

Please do not remove lichens from carved stones – this may cause greater damage to the rock surface than the growth itself. Furthermore, about 150 British lichen species are currently critically endangered or vulnerable. Twenty-six species of lichens and thirty-three species of Bryophytes (which include mosses) are currently protected by British Statute, making it illegal to disturb either the lichens or their habitat. Lichen conservation is therefore a current and active issue and has equal status to monument conservation.

Crustose Lichen

Foliose Lichen

Algae

Grass

Moss

Trees and roots

Mosses are plants with a primitive root system, but complex stems and leaves. Moss species vary in appearance, but most form small, neat, round tufts or appear as patches of green, 'furry' growth. Many species can resist drought and can be found on rock surfaces in full sun, although most species like permanently damp environments where there is constant shade and moisture. Mosses can be readily identified from the presence of tiny leaves and stems less than 2mm long that can be viewed under the hand lens. Their leaves are generally narrow and elongated with a sharply pointed end, and they vary in colour from dark green or blueish-green, depending on the species. Mosses need soil and moisture to grow. The more foliage the moss has, the higher the level of moisture in the stone.

Algae are organisms that exist as single cells, in clumps or as long filaments. They like damp environments, particularly under trees or bushes, and they colonise overhangs and projections, fissures and grooves, cups and rings, and areas of water run-off. They tend to cover large areas

of the rock, giving it a uniform green colour and 'slimy' texture that is very different from the blotchy effect of lichens. Alternatively, they may colonise a part of the rock surface, giving a streaky effect. Most common algae are light green or yellow-green. There is also a less common species that is a distinctive orange colour and resembles orange velvet. Algae like damp areas and grow best on porous rocks such as sandstone. This group is typically found on the shaded sides of trees, rocks and stone surfaces. **Mosses** and **algae** tend to retain moisture at the surface of the stone, creating a micro-climate which can be detrimental.

Grass and turf (and heather) embed their roots in the rock. **Trees** can form a canopy that traps air and moisture, creating a damp environment and concentrating atmospheric pollutants. This in turn encourages growth of certain biological organisms such as algae. Tree **roots** can be very damaging causing rocks, expanding fissure and breaking apart the rock. Tree and shrub cover also produce **detritus** - leaf litter, pine needles and other decaying vegetation can alter the chemical environment of the rock surface and also trap moisture, both contributing to the dissolution of the calcite matrix.

Mixture of crustose and foliose lichens affecting a cup-and-ring motif

Algae affecting a cup-and-ring motif

Moss on a carved rock

Turf and moss on a carved rock

2. Animal Impact

Domestic stock and game animals can cause significant damage to rock art sites both over a short time scale and in the longer term. This is something we can prevent or mitigate through good management.

Stock or game animals can be a problem due to their droppings, and persistent trampling or rubbing the rock surfaces. Animal droppings alter the chemical composition of the rock surface, leading to surface erosion. Sheep droppings are liable to pool in cup marks and rot, but they are less aggressive than cow dung – this kills off all biological organisms on the underlying rock surface and prevents regrowth for a considerable time, which exposes the rock surfaces to the weather. Other problems with stock animals include location of feeding troughs on or near rock art panels, which encourages trampling on the rock surface.

Surface wear from rubbing (by stock animals) or trampling (humans or animals) may cause panels to appear worn or polished. Cattle are heavier than sheep and cause more damage through trampling carved rock surfaces. In the case of sheep, rubbing may also result in coloured patches where dye marks have transferred to the rock surface. **Chips and scratches** may be caused by the hooves of stock animals, but may be produced by human activity, either unintentionally (through trampling) or through misguided attempts to 'clean', or even to re-carve the motifs.

Gamekeeping is also potentially problematic. Scattering of quartz granules on carved rocks not only causes physical wear through abrasion, it also encourages grouse to perch on the rocks. Grouse droppings alter the chemical structure of the rock surface, particularly in the autumn when they are more alkaline after eating berries.

3. Human Impact

Humans can cause significant and irreversible damage to rock carvings. In most cases this is unintentional, usually because people are unaware of the rock art, but sadly in some instances it is deliberate. **Graffiti,** for example, may be engraved, scratched, painted or chalked onto carved panels. There are some cases where initials and dates were carved into the rock several hundred years ago, and these are historically interesting, but we need to discourage more graffiti being made in these places. More recent marks, for example in chalk, are sometimes used to enhance faint motifs or make the carvings more visible for photographs. Although these are not permanent, even temporary presence on the rock surface could affect sensitive dating techniques in the future.

In some areas, Britain's rock art has been badly damaged or destroyed by **quarrying**. This is vividly illustrated when carved motifs have been cut through by the removal of part of the rock surface. We can often see traces of historic (or possibly prehistoric) **quarrying** on carved rock surfaces. This is recognisable by the sharp, angular edges it creates on the rock, and sometimes by the remains of elongated, rectangular wedge marks. Quarrying has been ongoing for hundreds, possibly thousands, of years to extract stone for field walls, buildings, millstones, or simply to remove large blocks from agricultural land, and has severely affected the distribution and density of rock art (for example, detailed investigations by English Heritage in one part of Northumberland revealed that about 70% of the carved rock surfaces had been extracted for use as millstones). More recently, quarrying tends to be on an industrial scale for construction.

Rock art also risks being damaged by other human actions, such as **fires** or **land management** activities. **Ploughing** can cause significant damage to low-lying or part-buried panels, and we can sometimes see plough marks on the panel. Other farm machinery, such as rotating chain flail cutters used to create fire breaks and harvest heather, may also result in serious damage. Activities such as controlled burning, planting, and deforestation may also present a major risk to panels. If the panel is on or close to a route way, then farm vehicles and other human traffic, even mountain bikes, can damage the rock art.

Sheep droppings pooling in a cupmark

Graffiti

Wedge marks from quarrying