

Guidance Notes: Lichens, Algae and Mosses

Algae, mosses and lichens are three distinct groups of living organisms. They frequently colonise gravestones, either in isolation or in combination. As well as possessing heritage value themselves, these organisms can affect gravestone preservation.

This information sheet provides:

- general guidance on how to distinguish between algae, lichens and moss;
- an introduction to the value of lichens in graveyards;
- suggestions for further reading

This guidance sheet has been prepared by the Carved Stones Adviser Project in conjunction with Dr Peter Gouldsborough, Archaeology Dept. University of York.

How to distinguishing between lichens, algae and mosses

The three groups of organisms commonly found on gravestones are algae, lichens and mosses. Despite the wide variations between individual species within each group, field-workers can readily learn to distinguish between them by understanding their habitat preferences, colonisation patterns, growth forms and coloration. The guidelines below do not attempt to identify individual species of lichens, algae and moss, which often can only be made using chemical tests, by examination under a microscope or under ultra-violet light. Further reading is suggested for anyone wishing to study of moss, lichen and algae in greater depth.

Lichens

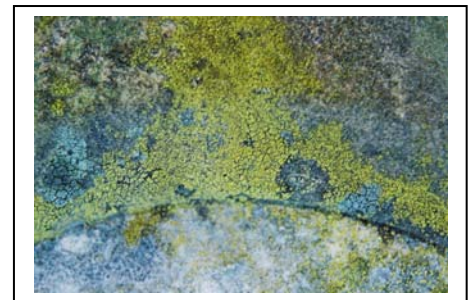
What are lichens?

A lichen is a composite organism, partly made up a fungus and partly composed of algae. Lichens are capable of colonising a variety of materials, including trees and stone surfaces. Lichens can be divided into four broad groups of species, dependent on their growth forms:

- 1) leprose lichens,
- 2) crustose lichens,
- 3) foliose lichens,
- 4) and fruticose lichens.

What do leprose lichens look like?

Leprose lichens comprise amorphous patches of white, green, grey or yellowish crusts formed by powdery granules.



How can I be sure that I am looking at leprose lichen and not algae?

Think of leprose lichens as tiny powder-like beads, which can often be mistaken for algae. The key to differentiating leprose lichens from algae is their texture, distribution and, most notably, the colour. The granularity of leprose lichens should be apparent when they are examined using a hand-lens. The distribution of leprose lichens is likely to be less extensive on a particular gravestone than algae that may also have extensive cover in the surrounding area, on walls, fences and tree trunks and branches, for example.

What do crustose lichens look like?

Crustose lichens are so called because they form a distinct crust on the surface of the stone.

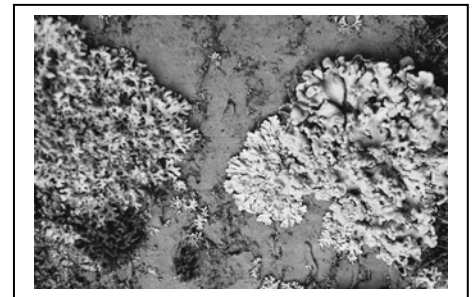


How can I recognise crustose lichens in the field?

Think of this type of species as crusty spots, which sit tightly on a memorial's surface. On sandstone gravestones these are likely to be the predominant lichen species, except perhaps in the west of Scotland, where foliose or fruticose species may occur because of the damper climate. Some species of crustose lichens colonise the surface pores of sandstones and consequently the granular structure of the stone surface is often clearly visible when viewed through a hand lens, despite the presence of the lichen. While many crustose species of lichens have no defined margin, others form distinct patches with well-defined pleated margins.

What do foliose lichens look like?

Foliose lichens are more loosely attached to the stone than crustose species, and frequently take the form of well-defined rosettes.

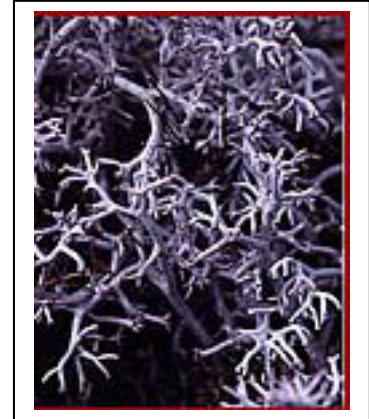


How can I recognise foliose lichens in the field?

Foliose lichens can be thought of as being leaf-like and include the most easily recognised lichen species. Foliate species often have prominent spore-bearing fruiting bodies and these provide a useful aid to their identification. Spore bodies can be readily spotted as they take on a different form and colour to the remainder of the lichen.

What do fructose lichens look like?

Fructicose lichens contrast sharply with foliose species because of their bushy form.



How can I recognise fructicose lichens in the field?

Fructicose species can be thought of as shrub-like lichens. They are generally loosely attached to the surface and tend to be fine and hair or strap-like.

Their distribution tends to be restricted to the west of Britain, particularly the west coast and the highlands of Scotland and Wales, although there are exceptions. Many of the fructicose species are relatively scarce, and are generally associated with tree bark or the tree canopy, but are less common on rocks and stone.

ALGAE

What are algae?

Algae are organisms that exist as single cells, in clumps or long filaments. They can be present in any environment where there is moisture, and they colonise ledges and projections, cracks and crevices, and areas of water run-off. Colonisation by algae also commonly takes the form of uniform coverage over large areas.

How can I recognise algae in the field?

Algal colonisation rarely exhibits any sharp boundaries – one key characteristic. A further distinguishing feature is that by far the most commonly encountered species group of algae are a distinctive yellow-green colour. There is also a less common species, which contains a pigment that gives it a distinctive orange colour. This group

of algae, often resembling orange velvet, typically colonise the shaded side of trees, rocks and stone surfaces.

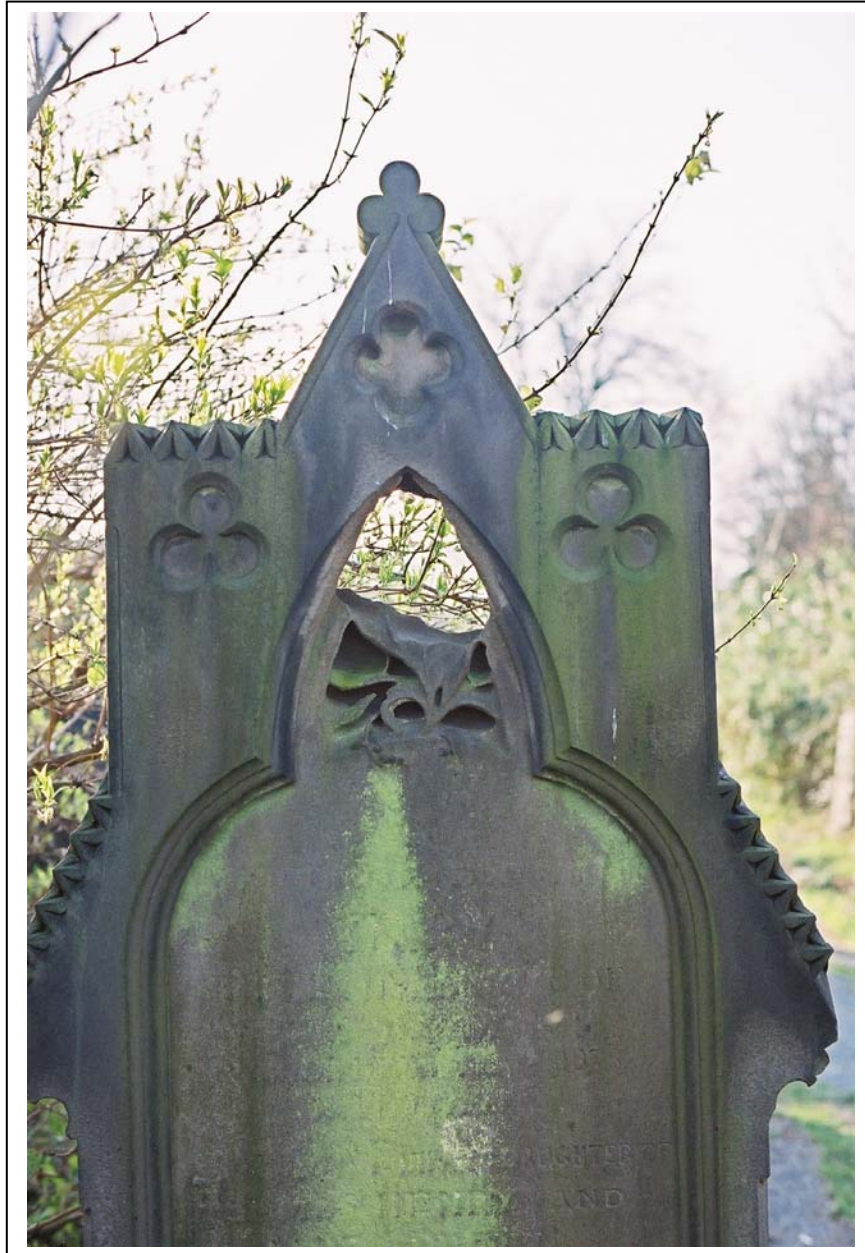
MOSSES

What are mosses?

Mosses are plants in which there is only a primitive root system, but there are the familiar leaves and stems. Moss species have a variety of appearances, varying from a creeping prostrate form, to the small neat round tufts. Many species of moss can resist drought and can be found on rock surfaces in full sun, but most species thrive in permanently damp environments. This means in areas of permanent shade, where there is a constant source of water either from the ground or from a stream, for example, or where the relative humidity is permanently high.

How can I be sure that I am looking at mosses and not lichens?

Mosses can be readily identified from the presence of leaves and stems. Their leaves are generally narrow and elongated with a sharply pointed end, and they vary in colour from dark-green or bluely-green, to yellow-green or brownish-green, dependent upon species. The leaves are typically less than two millimetres long. The midrib of the leaves and their arrangement around the central stem is clearly visible using a hand lens, and it is this differentiation of the plant tissue into leaves and stems which make mosses unmistakably different from lichens.



This stone has **algae** on the 'shoulder' area and **leprose lichen** in the central panel. When examined under a hand lens the algae has a more powdery appearance, whereas the lichen has a more granular formation.



moss

The Value of Lichens in Graveyards

Lichens in graveyard and on gravestones are important for several reasons. Graveyard are places which have a long history as places of peace and tranquillity. Most have remained relatively undisturbed for centuries and that means that the surface which the lichens have colonised have also remained undisturbed. This results in a profusion and abundance of species which may not be evident in the surrounding countryside. Indeed, graveyards are often the last refuge of lichen species whose natural habitat has been disrupted by changes in agricultural practices, or destroyed by development. The walls of ruined monuments, churches and particularly gravestones often provide habitat for lichen species where no natural habitat exists in the surrounding area.

Invariably gravestones are inscribed with a date. Lichen growth in many species is radial, and therefore it is possible to establish the annual rates of growth of lichen species growing on dated gravestones. From these growth rates it is possible to date undated substrata colonised by the same species. This is often the only way in which the date of elements of historic buildings can be established with any certainty.

All lichens are, to a greater or lesser degree, sensitive to atmospheric pollution, although individual species are able to tolerate different levels of sulphur dioxide. By regularly recording species at sites where habitats remain undisturbed, such as graveyards, it is possible to compare species composition over time, and to determine how levels of air pollution are changing. This is a particularly useful technique in

rural areas where there is generally an absence of pollution monitoring stations.

There are several factors that influence the extent of colonisation on stone and of the species composition. These include the aspect and orientation of the surface and its texture, patterns of water run-off, levels of nitrification – from bird droppings for example, levels of illumination, levels of atmospheric pollution and, perhaps most importantly for gravestones, the mineral composition of the stone. There will invariably be a marked difference in the species composition of lichens on sandstone gravestones compared to those on limestone gravestones in the same graveyard, and this is because of the influence the minerals composition of the stone has on the surface acidity. The consequence is that sandstone gravestones will be colonised by species which can tolerate a high surface acidity, while limestone gravestones will be colonised by species which prefer a more alkaline environment, and the differences in species composition can give clues as to the mineralogy of the stone where this might not otherwise be readily apparent.

Pragmatic considerations apart, it is generally recognised that lichen colonisation of historic stone surfaces adds a special quality and enhances the appearance of those surfaces; however, on gravestones, lichens may obliterate inscriptions or cause damage to the stone by their acidic secretions, differential thermal movements between lichen and stone, or by inducing stresses into the stone as a result of dehydration and re-hydration of the lichen. Notwithstanding these known risks, there is a common belief that lichens act as a protective coating over the surface of the stone preventing

deterioration. But the preliminary results of recent research suggests that, on the contrary, lichens could be far more damaging to stone surface than had previously been believed, because of the way in which they inhibit water evaporation after wetting. The implications are that the stone will then be more vulnerable to damage by the action of frost and salts, and in areas of high levels of atmospheric pollution, more vulnerable to the effects of acid rain. These factors depend, though, on the type of stone, the lichen species and the extent of cover.

Do not be tempted to remove lichens from gravestones, because this may cause greater damage to the surface of the stone than the lichens are capable of causing; furthermore, about 150 British lichen species are currently considered to be either critically endangered, endangered, or vulnerable, as classified by the World Conservation Union and twenty six species of lichens and thirty-three species of Bryophytes, which includes mosses, are currently protected by British Statute, and it is therefore illegal to disturb either the lichens or their habitat. Lichen conservation is therefore a current and active issue, and further information on this can be obtained through the British Lichen Society bulletins.

Summary

- lichens on gravestones can be used as the basis for dating historic stone surfaces, predicting changes in levels of air pollution and are generally recognised as enhancing the appearances of historic masonry;

- lichens cause direct and indirect weathering of masonry, including gravestones, and often interfere with the legibility of inscriptions;
- nevertheless, many lichen species are in decline and protected by Statute; lichen conservation is now recognised as having equal status to monument conservation, including graveyard conservation.

Further Reading

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Useful Contacts:

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British Lichen Society website:

<http://www.thebls.org.uk/>