# Western featherwort

*Plagiochila heterophylla*

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Introduction

Western featherwort is a species of liverwort that grows in the upland oakwoods of the western Scottish seaboard. The mild and damp climate, coupled with a varied terrain make these Atlantic woodlands ideal for bryophytes (liverworts and mosses), and this habitat is considered to be of international importance for these plants. Western featherwort is considered a nationally scarce species, and along with another rare liverwort, Deceptive featherwort (*Adelanthus decipiens*) is an indicator of woodlands of the highest conservation value[[1]](#footnote-1).

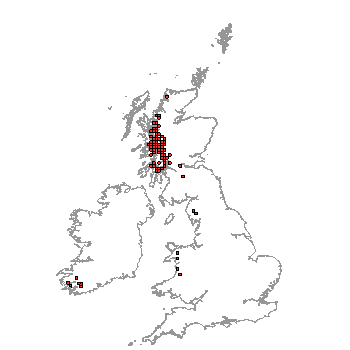
Within Europe, this kind of old oakwood is virtually confined to the UK and at its most extensive in western Scotland. Upland oakwoods are included in the Scottish Biodiversity List. They are also protected under the European Habitats Directive.

Description

Western featherwort is a large yellow-green liverwort, although older moribund parts tend to turn light reddish-brown. Its leaves are a rounded-rectangular shape, noticeably longer than wide, giving the patches a characteristic look. The spiny teeth on the leaves have a broader base and so are more triangular in shape (this is more visible with a lens).

Distribution

In Europe, Western featherwort is restricted to Atlantic woodlands, mostly in Scotland, but also at scattered sites in England, Wales, Ireland and Brittany. It tends to grow on nearly vertical surfaces of acidic rocks within these woods, but is also found on trees[[2]](#footnote-2). It can form extensive mats on south and east facing surfaces[[3]](#footnote-3). Its global distribution also includes populations in Central and South America.



Distribution of *Plagiochila heterophylla* in the UK. (From NBN Gateway: Accessed 22/11/13)

Ecology

Mosses, liverworts and hornworts are ancient plants which have been around for more than 400 million years[[4]](#footnote-4). They are conveniently lumped together as ‘Bryophytes’ because of similarities of lifestyle and ecology. However, they are not closely related. Because the leaves of most bryophytes are only one cell thick, and very few of them have any specialised conducting tissue to transport water along the stem, they are very vulnerable to drying out and can therefore only persist in humid conditions.

Liverworts can reproduce sexually, a process which requires at least a film of water, and produce a 'sporophyte', which consists of a stem with a capsule at the top containing the spores. However, sexual reproduction seems to be a rare event, and has not been recorded in Western featherwort in Europe. Vegetative reproduction involving the simple fragmentation of stems or leaves giving clones of the parent material is the more frequent mode of reproduction. This limits their potential to spread to new sites unaided[[5]](#footnote-5).

Atlantic oak woods support an unusually high biodiversity of bryophytes. This can be attributed to an almost unique combination of climate and geology in this habitat. Frequent rainfall without any long periods of drought, coupled with relatively frost-free winters and a diverse geology are crucial. The rocky terrain has also meant that tracts of woodland have been left relatively undisturbed and their position on the western fringe of Europe also means that much of this habitat has been only marginally affected by pollution.

Threats

* The invasive non-native Rhododendron (*Rhododendron**ponticum*) is the major threat to many Atlantic woodlands in Britain. Their dense standscast a very heavy shade that can be disastrous for existing lichen or bryophyte species. In some locations, beech is also becoming a problem.
* Forestry operations, including clearfelling and rotational cutting, which open the canopy will result in lower humidity levels, cause ground disturbance and removal of plant material from the site.
* Long term overgrazing prevents woodland regeneration and results in fragmentation of woodland habitats. However low levels of grazing and fencing for woodland regeneration can result in dense regrowth and thicket development which shades out bryophyte communities.
* Hydropower developments which alter watercourses in the woodlands can have an impact on humidity levels. Humidity needs to remain high to sustain a diverse bryophyte flora.

Management

Managing upland oakwoods for bryophytes centres around maintaining a diverse woodland structure. The best woodlands include areas with a closed canopy, dappled shade, glades, a patchy understorey, standing and fallen deadwood and veteran trees. These conditions provide niches with a variety of light and humidity conditions which can be colonized by different bryophyte species. A varied topography is also important. Woodlands with features such as ravines, rocky outcrops, flushed slopes and boulder screes are particularly important because these provide places for bryophytes to grow with less competition from other, more robust woodland floor species.

Specific management to promote a diverse bryophyte flora include:

* Eradicate *Rhododendron ponticum* from Atlantic woodland and adjacent habitats.
* Beech can also threaten oceanic ravines and action should be taken to mitigate this threat.
* Manage woodlands to encourage a range of tree species and habitats, including dead and dying trees.
* Protect old and veteran trees to ensure that trees with high bryophyte interest are not felled.
* Limit coppicing to ensure that the associated lichens and bryophytes remain as part of the habitat.
* Allow some grazing as a habitat management tool.
* Seek specialist advice and surveys prior to any operations or developments in high conservation value Atlantic woods. If in doubt, assume that the lichen and bryophyte interest in an Atlantic woodland with mature and old trees, particularly in ravines or rocky areas, is likely to be high. These sites should be managed sensitively.

Other work

**British Bryological Society** aims to promote a wider interest in all aspects of bryology. It provides tuition, organizes meetings, facilitates research and aids measures for conservation.

**Plantlife, Forest Research, Highland Birchwoods, Caledonian Partnership** are all involved in conserving Atlantic oak woodlands in Scotland. Plantlife have published a number of reports concerning the management and conservation of Atlantic oak woodlands and bryophytes[[6]](#footnote-6).

Wider context

The Atlantic oakwoods on the west coast of Scotland are sometimes referred to as Celtic rainforest and are renowned for their rich lichen, moss and liverwort communities. The oceanic bryophyte element of the vegetation is not only the richest in Europe but is also one of the richest bryophyte floras in the world. According to the most recent European checklists there are 1769 bryophyte species of which Britain has approximately 1150; this is about 65% of the European flora, a far higher proportion than for any other plant group[[7]](#footnote-7).

Bryophytes play vital ecological roles in these woodlands[[8]](#footnote-8). On bare and disturbed ground they are primary pioneers helping other plants such as ferns and orchids to gain a foothold. They absorb huge quantities of water, thereby acting as a sponge and maintaining humidity over dry periods and preventing rapid run-off and flooding. They act as a home to many plants and animals, particularly invertebrates. Over 500 species of plants and animals are associated with Atlantic oakwoods. This includes 35 species regarded as priorities for conservation in the UK Biodiversity Plan[[9]](#footnote-9).

Quick Facts

* The name 'liverwort' comes from the supposed resemblance of thalloid liverworts to liver and has its origin in the 'Doctrine of Signatures' of the old apothecaries, who believed similarity of shape conferred healing powers to that part of the body.
* Many of the liverworts have interesting smells and give the woodlands in which they grow a distinct sweet and peppery perfume.
* Although *Plagiochila heterophylla* was collected once two centuries ago, it was confused with *P. spinulosa* and remained unrecognized for most of the 20th century.
* Upland oakwoods have historically been important for people, and not just for their timber. In the 18th and 19th century, many of them were coppiced; their wood was used to make charcoal for iron smelting and gunpowder, and their bark was used for tanning leather. These industries finally ceased over 100 years ago, since when the woods have grown up and developed into mature stands
* Most good Scottish Atlantic woodlands will have over 200 different species of moss and liverwort, many of which are very specific as regards micro-habitat[[10]](#footnote-10).

Selected References

**Mitchell, R., Truscott, A., Cape, N., Fowler, D., Leith, I., Sutton, M. and Tang, S. (2005). How atmospheric nitrogen deposition affects mosses, liverworts and lichens in Atlantic oakwoods**

[www.nerc.ac.uk/publications/other/documents/gane\_deposition.pdf](http://www.nerc.ac.uk/publications/other/documents/gane_deposition.pdf) Accessed 22/11/13

Nitrogen pollution affected which species of mosses, liverworts and lichens grew on trees in Atlantic oakwoods. Certain species were more tolerant to nitrogen deposition than others, allowing indicator species to be identified. As the nitrogen concentration increased in the atmosphere, the growth of mosses and liverworts declined and nitrogen in their tissue increased. The reverse occurred when nitrogen levels dropped, and a slow recovery occurred. This is the first time that recovery has been shown to occur.

Nitrogen deposition affects the growth of mosses and liverworts and the species composition of mosses, liverworts and lichens. They conclude that, even in remote, relatively unpolluted areas, nitrogen deposition is affecting this internationally important habitat.

**Thompson, R. (2005). Thinning in Atlantic oakwoods: assessing options at the stand scale.Highland Birchwoods, Munlochy.**

This report provides guidance to managers of mature oak coppice in Atlantic oakwoods where there is significant lower plant interest.

Results indicate that:

• Timber is unlikely to be extracted on a commercial basis. However, it has the potential to support rural development through innovative application of locally grown wood.

• A uniform stand structure does not necessarily indicate low biodiversity values

• In the majority of stands, some compromises are needed to remove sufficient trees to realise objectives. Trees shading bryophytes of moderate importance may be suitable candidates as their removal should only reduce the suitability of conditions for these lower plants, rather than removing interest directly.

• Atlantic oakwood lower plants indicating ancient woodland need high humidity and varying degrees of shade. For rarer species, the balance between humidity and shade can be critical.

• Wheeled vehicles should only be used to extract timber after extensive periods of dry weather.

• Thinning can be used to increase prospects for natural regeneration, increase tree species diversity, develop veterans (i.e. characterful trees with a range of niches for biodiversity / aesthetic value) and epiphytes, as well as produce timber and increase timber quality.

• Stands suitable for thinning will have been coppiced or planted after the mid to late 19th century. Stands with high biodiversity values and frequent rock outcrops or steep sided ravines are unlikely to be suitable for thinning.

• Where there are signs of historic management such as wood pasture, judicious thinning around previously open grown trees may be appropriate to maintain the health of the tree and its epiphytes.

• Thinning intensities which remove around 25% of basal area will be necessary to have any appreciable effect on tree growth. The frequency of thinning will depend on objectives of management and response of retained trees.

• Criteria are included to select individual trees. The relative importance of lower plant species is specific to each woodland. Training locally employed native woodland advisors / project officers in lower plant identification is recommended together with employment of lower plant specialists where appropriate.

• Use of locally available low impact equipment is recommended to extract round logs or converted timber. Where material is extracted by a crofter or craftsman, the time required may not be as big a consideration as it would be to a timber contractor.

**Moseley, D.G., Ray, D. and Bryce, J. (2006). A Forest Habitat Network for the Atlantic Oakwoods in Highland Region, Scotland. Botanical Journal of Scotland, 57(1&2), 197-209.**

The Scottish Forestry Strategy contains a major aspiration to develop forest habitat networks through the restoration and improvement of existing woodland and the expansion of new woodland.

The Forest Research landscape ecology model BEETLE (Biological and Environmental Evaluation Tools for Landscape Ecology) uses a focal species approach to assess the functional connectivity of habitat within the wider landscape matrix. This paper describes how this model has been used to predict the current habitat network for Atlantic oakwood specialists in the Highland region of Scotland.

**Plantlife (2010). Lichens and bryophytes of Atlantic woodland in Scotland: an introduction to their ecology and management. Back from the Brink Management Series.**

Describes woodlands with bryophyte and lichen interest, and gives recommendations for management.

**Averis ABG, (2000). Bryophytes and run-of-river hydro-electric power schemes in the British Isles. Unpublished paper for Scottish Natural Heritage.**

**Averis, A B G, (1991). A survey of the bryophytes of 448 woods in the Scottish Highlands. Scottish Field Unit Report, NCC, Edinburgh.**

**Averis, A.B.G. (1996, revised 2001) *The effects of woodland management on bryophytes and***

***lichens in the Western Highlands*. SNH contract no: RASD/133/96AWEB.**

**Rothero, G.P. (2005). Mosses and Liverworts. Part of the ‘Naturally Scottish’ series published by Scottish Natural Heritage, Battleby.**

General information about bryophytes in Scotland.

**Hill, M.O. and Preston, C.D. (1998). The geographical relationships of British and Irish bryophytes. *Journal of Bryology,* 20, 127-226.**

**Ratcliffe, D.A., (1968). An ecological account of Atlantic bryophytes in the British Isles. *New Phytologist* 67, 365-439.**

Long, comprehensive account of distribution of different species of Bryophyte. But over 50 years old now.

**Worrel, R., and Long, D. (2009). Management of woodland plants in Atlantic broadleaved woodland: a conservation framework. Plantlife.**

Considers lichens, bryophytes, ferns and woodlands herbs and shrubs and provides:

1. Guidance on how to assess the conservation value of woodland flora.

2. Outline management guidance for woodland flora at both local (site) and catchment

(habitat network) scales.

3. Means of assisting conservation planning by prioritising the locations where management is required based on habitat network principles.

1. Plantlife (2010) Lichens and bryophytes of Atlantic woodland in Scotland: an introduction to their ecology and management. Back from the Brink Management Series. [↑](#footnote-ref-1)
2. <http://www.bbsfieldguide.org.uk/sites/default/files/pdfs/liverworts/Plagiochila_atlantica.pdf> Accessed 22/11/13 [↑](#footnote-ref-2)
3. http://www.plantlife.org.uk/uploads/documents/PLINKS\_Woodland\_Guide1LRes.pdf Accessed 22/11/13 [↑](#footnote-ref-3)
4. <http://www.rbge.org.uk/science/cryptogamic-plants-and-fungi/bryology> Accessed 22/11/13 [↑](#footnote-ref-4)
5. Long, D. and Williams, J. (2007) *Rhododendron ponticum*: impact on lower plants and fungi communities on the west coast of Scotland. Working towards protecting internationally important bryophyte and lichen communities from *Rhododendron ponticum* invasion. Scottish Natural Heritage project no. 19412 [↑](#footnote-ref-5)
6. Available from: www.plantlife.org.uk/publications [↑](#footnote-ref-6)
7. www.plantlife.org.uk/uploads/documents/PLINKS\_Woodland\_Guide1LRes.pdf Accessed 22/11/13 [↑](#footnote-ref-7)
8. [www.rbge.org.uk/science/cryptogamic-plants-and-fungi/bryology](http://www.rbge.org.uk/science/cryptogamic-plants-and-fungi/bryology) Accessed 3/12/13 [↑](#footnote-ref-8)
9. www.forestry.gov.uk/forestry/Uplandoakwood Accessed 22/11/13 [↑](#footnote-ref-9)
10. Rothero, G.P. (2005). Oceanic bryophytes in Atlantic Woodlands. *Botanical Journal of Scotland,* **57**: 135-140. [↑](#footnote-ref-10)