

LIVERWORTS generally have two rows of leaves, one up each side of the stem

*Bazzania trilobata* Greater whipwort



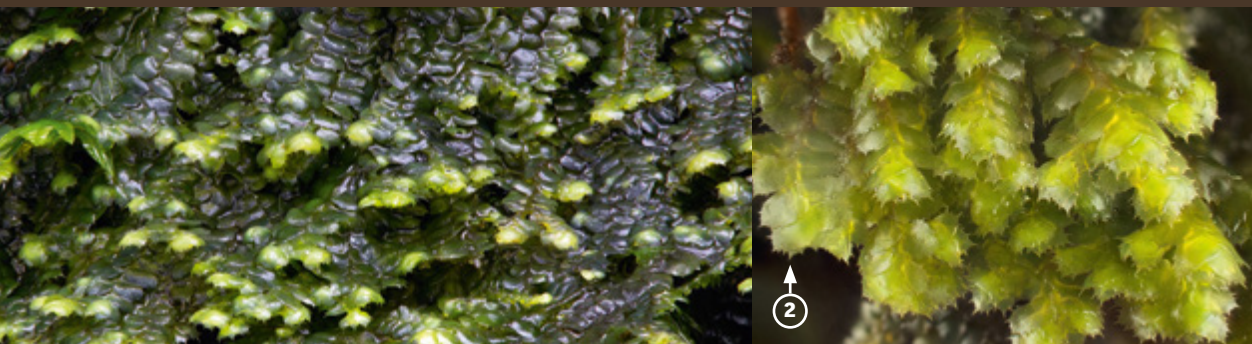
**Habitat** Often forming dense, mounded colonies on earth banks and around tree bases; also on boulders, rotten wood and occasionally on tree trunks.  
**Key characteristics** **1** Long flagella protruding from underside of stem (sometimes inconspicuous in dense colonies)  
**2** Leaf tip with 2-4 (normally 3) teeth **3** Shoot with smooth, rounded back and tip appearing hooded.  
**Confusion species** *Bazzania tricrenata* Less than half the size of *B. trilobata* and far rarer.

*Plagiochila spinulosa* Prickly featherwort



**Habitat** In loose mats or dense cushions on trees and rock faces, often close to rivers and streams.  
**Key characteristics** **1** Colour of colonies yellowish green **2** Leaves coarsely toothed around lower margin and tip, and with upper margin smooth **3** Leaf base runs down onto stem for a long distance.  
**Confusion species** *Plagiochila punctata* Generally smaller and with a leaf base that runs down onto stem for a short distance.

*Jubula hutchinsiae* Hutchins' hollywort



**Habitat** Forming dark-bluish green wefts with yellowish green shoot tips, on vertical, shaded, wet rock faces beside streams.  
**Key characteristics** **1** Colour of main colony matt bluish green **2** Leaves coarsely toothed **3** Leaves with lobe beneath.  
**Confusion species** *Frullania* species. Reddish coloured and leaves not toothed.

*Saccogyna viticulosa* Straggling pouchwort



**Habitat** Usually creeping among other bryophytes on steep mossy banks and wet rock faces.  
**Key characteristics** **1** Leaves in opposite pairs and without marginal teeth.  
**Confusion species** No other liverwort of woodland has untoothed leaves in opposite pairs.

*Plagiochila punctata* Spotty featherwort



**Habitat** Often in dense, rounded cushions on trees and rock faces, often close to rivers and streams.  
**Key characteristics** **1** Colour of colonies yellowish green **2** Leaves coarsely toothed around lower margin and tip, and with upper margin smooth **3** Leaf base runs down onto stem for a short distance.  
**Confusion species** *Plagiochila spinulosa* Generally larger and with a leaf base that runs further down onto the stem.

*Scapania gracilis* Western earwort



**Habitat** Typically in dense, rounded cushions on humid rock faces and trees.  
**Key characteristics** **1** Leaves very deeply bi-lobed, each leaf appearing to be two separate leaves **2** Upper leaf lobes semi-erect, giving a '3D' appearance **3** Leaves with fine teeth around the margins.  
**Confusion species** Other *Scapania* species in woodlands have their leaf lobes held closely together, giving shoots a flatter and less '3D' appearance.

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Patron: HRH The Prince of Wales

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## Further information

### Books

*Mosses and Liverworts of Britain and Ireland: A Field Guide* by Ian Atherton, Sam Bosanquet and Mark Lawley (British Bryological Society, 2010). The best field guide.  
*The Liverwort Flora of the British Isles* by Jean Paton (Harley Books, 1999). An in-depth guide to liverwort identification, for more advanced bryologists.

*The Moss Flora of Britain and Ireland* by A J E Smith (2nd edition, Cambridge University Press, 2004).  
An in-depth guide to liverwort identification, for more advanced bryologists.  
*Mosses and Liverworts* by Ron Porley and Nick Hodgetts (Collins New Naturalist series, Harper Collins, 2005).  
A highly readable account of moss and liverwort ecology and habitats in Britain.  
*Atlas of British & Irish Bryophytes* by Tom Blockeel, Sam Bosanquet, Mark Hill and Chris Preston (Pisces Publications Ltd, 2014). A detailed account of the distribution of bryophytes in Britain and Ireland.

### Websites

[www.britishbryologicalsociety.org.uk](http://www.britishbryologicalsociety.org.uk) The British Bryological Society (BBS) has information on bryophytes, publications, field trips and web links.



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# Mosses and liverworts of temperate rainforest in the Lake District





This guide is for anyone interested in identifying some of the more conspicuous mosses and liverworts of temperate rainforest, aiming to provide the tools needed to identify ‘good’ and potentially important bryophyte habitat. It looks at some of the more common species, as well as those that are characteristic or indicative of good temperate rainforest.

What are mosses and liverworts?

Mosses and liverworts (collectively known as bryophytes) are some of the oldest land plants evolving over millions of years and colonising almost all habitats apart from the oceans. Most have a simple structure, with a main stem and branches covered in leaves. They do not have roots like plants, but absorb water and minerals directly using various structures on the stems and leaves. Although they can be red or purple, most are varying shades of green. The difference between mosses and liverworts is in their structure – mosses mainly have leaves all around the stem, whereas liverworts generally have two rows of leaves, one up each side of the stem (although some have no leaves at all) and tend to be smaller and more delicate.

What is temperate rainforest?

Temperate rainforest is natural or semi-natural woodland found in western Britain and Ireland, where the climate is mild and wet due to the influence of the Gulf Stream. These conditions are ideal for a range of important mosses and liverworts. Temperate rainforest has been compared to tropical rainforest when there is also a luxuriant growth of lichens, ferns, mosses and liverworts.

Why are the mosses and liverworts of temperate rainforest so important?

The quantity and frequency of rainfall, cascading streams and rivers, clean air and the wild landscape with its crags, ravines and boulders beneath an extensive tree canopy make the temperate rainforest of western Britain an internationally important habitat for mosses and liverworts.

Woodland mosses and liverworts are an excellent indicator of the quality of the habitat and play an important role in the woodland ecosystem. The UK has over 1,000 species of moss and liverwort, and our temperate rainforest has as great a diversity of these as almost anywhere else on the planet. This diversity includes a number of species that are rare, both in Europe and globally, some of which are listed in Section 41 of the Natural Environment Research Council (NERC) Act.

Finding and identifying mosses and liverworts

And now for the exciting bit... Arm yourself with a hand lens (x10 and a x20 if available) and get out into the woods! While it can be tricky and a little daunting at first, you'll find that you can become familiar with many species surprisingly quickly. There are some clues that will help you – in particular, look at where they are growing, for example...

Woodland floor including earth banks, over boulders and on tree bases

**Mosses** Bank haircap (*Polytrichum formosum*), common tamarisk-moss (*Thuidium tamariscinum*), five-ranked bog-moss (*Sphagnum quinquefarium*), glittering wood-moss (*Hylocomium splendens*), greater fork-moss (*Dicranum majus*), slender mouse-tail moss (*Isoetecium myosuroides*), little shaggy-moss (*Rhytidiadelphus loreus*), red-stemmed feather-moss (*Pleurozium schreberi*).  
**Liverworts** Greater whipwort (*Bazzania trilobata*).

Rock faces, especially those near rivers and streams




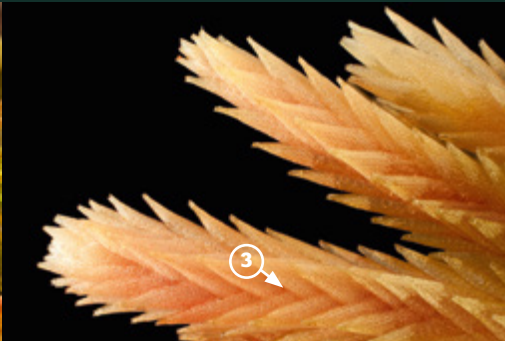

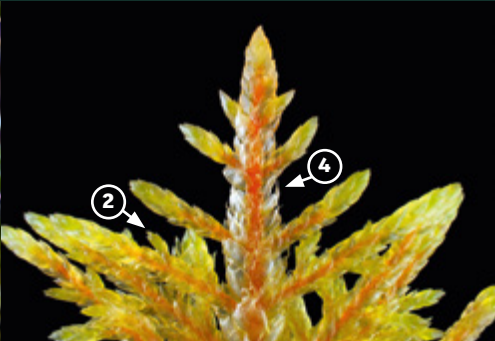






**Mosses** Prostrate signal-moss (*Sematophyllum demissum*).  
**Liverworts** Prickly featherwort (*Plagiochila spinulosa*), spotty featherwort (*Plagiochila punctata*), straggling pouchwort (*Saccogyna viticulosa*), western earwort (*Scapania gracilis*).

Tree trunks

**Mosses** Slender mouse-tail moss (*Isoetecium myosuroides*).  
**Liverworts** Prickly featherwort (*Plagiochila spinulosa*), spotty featherwort (*Plagiochila punctata*), western earwort (*Scapania gracilis*).

The other key things to look at when identifying mosses and liverworts are the colour (paying attention to the particular shade of green), the shape of the leaves – eg, are they broad or narrow, pointed or blunt tipped? – the nerve (in the mid-rib of the leaf) and the way the leaf attaches to the stem.

Finally, please submit any records you have to the British Bryological Society (website, [www.britishbryologicalsociety.org.uk](http://www.britishbryologicalsociety.org.uk)). Although common names have been used in this guide, scientific names should always be used when recording bryophytes to avoid ambiguity.

MOSSES mainly have leaves all around the stem							
Dicranum majus Greater fork-moss		Pleurozium schreberi Red-stemmed feather-moss		Sphagnum quinquefarium Five-ranked bog moss			
							
<b>Habitat</b> In loose patches on steep earth banks, around the base of trees and on thin soil over boulders. <b>Key characteristics</b> <b>1</b> Shoots unbranched, standing upright and in loosely aggregated colonies <b>2</b> Leaves curved, tapering to a very long, fine tip and all pointing in one direction <b>3</b> Leaves with clear nerve <b>4</b> Stem tomentose. <b>Confusion species</b> <i>Dicranum scoparium</i> Leaves more erect and much shorter (half the length of <i>D. majus</i> ) and generally forming denser colonies (this species is more common than <i>D. majus</i> ).		<b>Habitat</b> Generally in loose, sometimes dense, patches on earth banks, around tree bases, over low boulders and across open ground. <b>Key characteristics</b> <b>1</b> Stem red <b>2</b> Branches off main stem without their own smaller branches (1-pinnate) <b>3</b> Leaves without clear nerve <b>4</b> Leaves on main stem bluntly pointed. <b>Confusion species</b> <i>Hylocomium splendens</i> Branches off main stem with their own smaller branches (2- and 3-pinnate) and leaves on main stem with sharp and wavy points.		<b>Habitat</b> Typically forming blankets and hummocks on earth banks. <b>Key characteristics</b> <b>1</b> Sometimes pure green but often with some pinkish brown colour and red flecks <b>2</b> Branches along main stem in bunches of usually five, with three spreading away from stem and two pressed closely to the stem <b>3</b> Leaves on branches arranged in clear rows. <b>Confusion species</b> Other woodland Sphagnum species with pinkish colours have two spreading branches per fascicle or do not have leaves arranged in clear rows.			
Hylocomium splendens Glittering wood-moss		Polytrichum formosum Bank haircap		Thuidium tamariscinum Common tamarisk-moss			
							
<b>Habitat</b> Generally in loose, sometimes dense, patches on earth banks, around tree bases and over low boulders. <b>Key characteristics</b> <b>1</b> Stem red <b>2</b> Branches off main stem with their own smaller branches (known as 2-pinnate), some of which have further branches (3-pinnate) <b>3</b> Leaves without clear nerve <b>4</b> Leaves on main stem with sharply pointed and wavy tips. <b>5</b> Stem leaves far bigger than branch leaves. <b>Confusion species</b> <i>Pleurozium schreberi</i> Leaves on main stem bluntly pointed and branches off main stem without their own branches (1-pinnate).		<b>Habitat</b> Typically on earth banks, on the woodland floor and around the bases of trees, often forming large and dense cushions. <b>Key characteristics</b> <b>1</b> Shoots erect, unbranched and usually in densely aggregated colonies <b>2</b> Leaves long, narrow and sharply pointed <b>3</b> Shoots with a ‘bottle brush’ appearance <b>4</b> Basal sheath of leaf slightly longer than wide (viewed with a hand lens after pulling a leaf away from the stem). <b>Confusion species</b> <i>Polytrichum commune</i> Basal sheath of leaf much longer than wide (less common than <i>P. formosum</i> in woodland, although often frequent).		<b>Habitat</b> Forming scruffy patches on earth banks, on the woodland floor and around the bases of trees. <b>Key characteristics</b> <b>1</b> Stem brownish or greenish (not red) <b>2</b> Branches off main stem with their own smaller branches (2-pinnate), some of which have further branches (3-pinnate) <b>3</b> Leaves on main stem much bigger than leaves on adjacent branches <b>4</b> Leaves on main stem pleated, tapering to a sharp point and with a clear nerve <b>5</b> Stem covered in a tomentum. <b>Confusion species</b> <i>Thuidium delicatulum</i> Tending to form shorter and denser turfs, but has to be confirmed with a microscope (much less frequent than <i>T. tamariscinum</i> ).			
Isoetecium myosuroides Slender mouse-tail moss		Rhytidiadelphus loreus Little shaggy-moss				GLOSSARY	
						<p><b>Basal sheath</b> The lower part of the leaf where it clasps the stem <b>Bi-lobed</b> Divided into two leaves or segments <b>Falcate</b> Strongly curved and turned to one side <b>Fascicle</b> Group of branches <b>Flagella</b> A whip-like structure dangling from beneath a leaf or stem <b>Lobe</b> The larger segment of a divided leaf <b>Nerve</b> The central vein-like structure in the mid-rib of the leaf <b>Pinnate</b> With numerous, spreading branches on opposite sides of the stem, like a feather.     <b>1-pinnate</b> refers to the branching pattern – 1 tier of branching from the main stem     <b>2-pinnate</b> 2 tiers of branching     <b>3-pinnate</b> – 3 tiers of branching <b>Pleated</b> Creased or folded <b>Shoots</b> The main stem plus leaves <b>Tomentose</b> Closely covered in fine hairs <b>Tomentum</b> A covering of fine hairs <b>Toothed</b> With points, or ‘teeth’ around the margin of the leaf</p>	
<b>Habitat</b> Typically forming dense, often mounded colonies that cloak trees and boulders, usually very abundant. <b>Key characteristics</b> <b>1</b> Leaves with a clear central nerve and tips that are long and sharply pointed <b>2</b> Main stem without branches below and densely branched above <b>3</b> Colonies plain green or yellowish green. <b>Confusion species</b> <i>Isoetecium holtii</i> Colonies usually with a bronzy-brown colour. <i>Isoetecium alopecuroides</i> Short pointed leaf tips.		<b>Habitat</b> Often abundant, forming springy carpets over woodland floor, bases of trees, earth banks and over low boulders. <b>Key characteristics</b> <b>1</b> Stem red <b>2</b> Leaves pleated and without a clear nerve <b>3</b> Leaves broad at base, tapering to a long fine point <b>4</b> Leaves at main shoot tip curved in same direction. <b>5</b> Branches off main stem without their own smaller branches (1-pinnate). <b>Confusion species</b> <i>Rhytidiadelphus squarrosus</i> Leaves at main shoot tip not all curved in same general direction (usually much less common than <i>R. loreus</i> in temperate rainforest).				