A Beginner's Guide to the *Sphagnum* Mosses of Raised Bogs

Connecting Communities with Peatlands

Irish Rural Link
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Community Wetlands Forum

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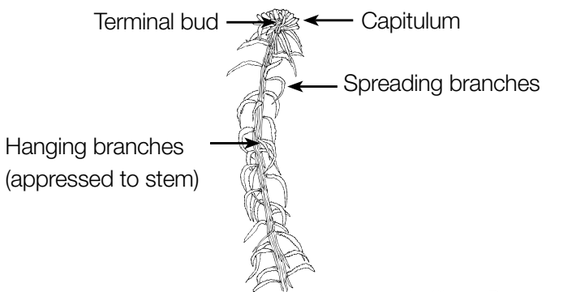
What is this guide for?

This guide is designed to help non-specialists identify the 15 species of *Sphagnum* moss commonly found in lowland raised bogs, cutover raised bogs, and bog woodland in Ireland. It is not designed for use in blanket bogs or heaths, where other species are frequently found. It includes a key and short species descriptions that use simple characters, only a few of which require the use of a hand lens. This guide is by no means fool-proof, and other references should be used to confirm identifications made using this guide if a definite identification is needed (see **Resources** below).

Sphagnum characteristics



Line drawing by Sharon Pilkington

Sphagnum mosses share a basic structure that no other moss has. A *Sphagnum* plant consists of a stem and numerous leafy branches, which arise from the stem usually in clusters of 3-6. At the top of the stem, younger, shorter branches are tightly packed together in a head, called the **capitulum**. In some species, the capitulum is shaggy and untidy looking, while in others it forms a neat, five-pointed star when viewed from above. In the centre of the capitulum is the **terminal bud,** the growing tip of the stem. In most *Sphagnum* mosses it is hidden by the young branches, but the terminal bud is larger and more visible in a few species.

Further down, the mature branches are differentiated in some species into **spreading branches** and hanging branches. Hanging branches can sometimes cling tightly to and hide the stem, and the leaves of hanging branches are often paler and shaped differently than those of the spreading branches.

Branch leaves are typically broad at the base and taper to a rounded or more-or-less sharp point. In some species, the tips of the branch leaves form a hood, like that on a cloak. **Hooded leaves** are characteristic of a particular group of large, chunky *Sphagnum* mosses. Branch leaves on some species are arranged into **neat rows** so that if a branch is cut in half, the cross-section looks like a five-pointed star.

In some *Sphagnum* mosses, the branch leaves lie flat on the branch and overlap each other, which are described as **appressed** leaves, giving the branch a smooth appearance (see *Sphagnum austinii*). In other species, they spread out at an angle of 45° or more (see *Sphagnum medium*). *Sphagnum* mosses with tightly appressed leaves often have branches that narrow to a long, fine point. The branches of species with spreading branch leaves often look rather stubby. All these differences provide ways to tell one species apart from another.

Leaves also grow directly on *Sphagnum* stems, and these are different shapes and sizes from those growing on the branches. **Stem leaves** provide very useful characters for more detailed examination of *Sphagnum* mosses, but because they can be difficult to see in the field, especially for beginners, this guide only uses stem leaves for a few species.

Sphagnum colour

Many *Sphagnum* mosses are brightly and variably coloured, which can be a great aid in identifying species. Unfortunately, colours can also be misleading. All *Sphagnum* species vary in colour according to environmental conditions and the time of year. The typical range of colour found in each species is indicated in the species descriptions below.

All *Sphagnum* growing in shade, such as under heather on the open bog or below a bog woodland canopy, tend to be more green than normal. This is especially the case for normally red *Sphagnum* species, such as *Sphagnum rubellum* and *Sphagnum medium,* which can turn almost completely green in the shade. Usually, there is at least a little of the normal colouration in the leaves of some plants to show that this is a shade form of a typically red species.

Flooding by peaty water can make *Sphagnum* colours more dingy or brown. This is often seen in the springtime in plants in hollows or pool edges that have been inundated over the winter.

In contrast, most *Sphagnum* mosses are brighter and richer in colour in the late summer and autumn. Reds and browns darken, yellows change to orange, and even green mosses become brighter. Since the autumn leaves of Irish trees are rather disappointing, the bog is the place to go in Ireland to really experience autumn colour.

Sphagnum habitats

Open, uncut bog is the primary habitat for raised bog *Sphagnum* mosses. This is the habitat they have created themselves, building up deep deposits of *Sphagnum* peat over thousands of years. Different *Sphagnum* species are found in different microhabitats depending on height above the water table. Some *Sphagnum* mosses can tolerate drier conditions and form mounds or **hummocks** that are raised above the bog surface. Some *Sphagnum* species, such as *Sphagnum austinii* and *S. beothuk*, can form very large, tall hummocks, while others, such as *Sphagnum rubellum,* tend to form lower hummocks. Others prefer to be closer to the water table and form patches or sometimes extensive **lawns** on the flat bog surface. These include some of the larger species, such as *Sphagnum papillosum* and *S. medium*.

Example of raised bog microhabitats

The wettest parts of an intact bog are **pools** that contain water nearly the year round. Aquatic *Sphagnum* species, such as *Sphagnum cuspidatum* and *S. auriculatum* prefer this habitat. Intermediate between the pools and the lawns are **hollows** that are flooded in winter but dry out somewhat in the summer. Discrete hollows and the margins of permanent pools can be occupied by either lawn or pool species.


Example of cutover bog

The same patterns generally occur on **cutover bog**, but microhabitats are not as well developed except on the oldest and wettest parts. The same species that are found on intact bogs can also be found on the cutover (if conditions are right), although some species, like *Sphagnum austinii* and *S. beothuk,* tend to be rather rare.

Flushes are microhabitats where there is some movement of surface water, which provide slightly more nutrients and oxygen to the plants growing there. On intact bogs, flushes occur in natural flow paths or areas of subsidence. Flushed conditions are more common on cutover bog, where the ground surface is often irregular or sloping and where there may be some groundwater seepage through shallow peat. Some *Sphagnum* mosses, such as *Sphagnum fallax* and *S. palustre*, are restricted to flushes and are never found on unflushed open bog, while others can be found in either habitat.


Example of bog woodland

Bog woodlands can be found in flushes on intact bog and can also occur on cutover bog. Most bog woodlands on cutover are dry, but some wetter ones can support an abundance of *Sphagnum* species that prefer flushed conditions, especially *Sphagnum palustre*. *Sphagnum fimbriatum* and *S. squarrosum* are found more often in wet bog woodland than in open flushes. *Sphagnum rubellum* is also frequent in bog woodlands (usually green, unfortunately), and likes to grow in nearly any raised bog habitat.

How to Use the Key

First, find a good, healthy patch of *Sphagnum* moss, as it is easier to identify a group rather than a single plant. Make sure that all the plants you are examining look more or less the same, allowing for variation in colour within a patch. It is common for a few plants of one species to occur mixed up in a patch of another species, but these are usually obviously different in shape and size.

Work through the key and answer the Yes/No questions. Pick up and look closely at a separate plant or two when you need to. (Since *Sphagnum* plants don't have roots, you can tuck them back in when you are done, and they will keep growing.) Using a hand lens (10x up to 20x) is always a good idea; where a hand lens symbol is shown in the key, then a lens really is needed. When "leaves" are referred to, this refers to the **leaves of spreading branches** unless stated otherwise.

When you have reached a conclusion, compare your plants with the species description and photo. The species descriptions summarise the typical **size & colour** of the species, its usual **habitat**, its **key ID features**, and how best to separate it from **lookalikes**. Since *Sphagnum* species names have changed a lot recently, **other names** for the species that might appear in older books and reports are also listed.

If you are happy you have made the right choice, well done! If not, look first at the **lookalikes** section for your choice, which highlights similar species and points out the main differences. If this doesn't help, then work backwards through the key and see where you think you may have gone wrong. If you are still having a hard time, some additional sources of help are listed under the **Resources** section. As with anything, identifying *Sphagnum* mosses gets much easier with practice.

Is it a brownish moss with closely appressed leaves that forms very firm hummocks?

YES

Sphagnum austinii

NO

Is it a large, chunky moss with hooded leaves?

YES

Are the leaves least partly wine red (not orange or peach)?

YES

Does it have pointed branches with appressed leaves?

YES

Sphagnum divinum

NO

Sphagnum medium

NO

Is the centre of the capitulum usually darker than the long, tapering branches?

YES

Sphagnum palustre

NO

Sphagnum papillosum

NO

Are the leaves least partly red (not orange or peach)?

YES

Is it an untidy looking moss with the centre of the capitulum usually greenish?

NO

Sphagnum rubellum

YES

Sphagnum subnitens

NO

Is it a small yellow to orange moss with branch tips like open birds' beaks?

YES

Sphagnum tenellum

NO

Is it a rich brown moss that forms soft hummocks?

YES

Sphagnum beothuk

NO

Is it a yellow-green moss in pools or wet lawns with very narrow leaves that resemble wet fur?

YES

Sphagnum cuspidatum

NO

Is it a green moss with leaves bent at right angles, making the plant look spiky?

YES

Sphagnum squarrosum

NO

Is it a green or dark yellow moss in pools with some branches swollen and curved like a cow's horn?

YES

Sphagnum auriculatum

NO

Is it a golden-orange moss with leaves in neat rows along the branches and dark stems?

YES

Sphagnum pulchrum

NO

Is it a yellow-green moss with leaves often in neat rows along the branches and pale stems?

YES

Sphagnum fallax

NO

Is it a green moss in bog woodland that has broad stem leaves with frilly margins visible when you remove the capitulum?

YES

Sphagnum fimbriatum

NO

Uh oh. Have another go or look for help from a source in the **Resources** section.

Sphagnum species notes

Sphagnum auriculatum

Size & colour: Medium. Dark green to mustard yellow to coppery brown

Habitat: Bog pools and drains, especially in western bogs

Key ID features: Outer capitulum branches are swollen with more-or-less appressed leaves. Some branches are curved, resembling a cow's horn. Stem leaves are large and concave.

Lookalikes: *Sphagnum inundatum* is a moss of flushes in uplands and the west. This species is usually yellower with branch leaves that stick out more, but it is sometimes indistinguishable in the field or even under the microscope.

Other names: *Sphagnum denticulatum*

Sphagnum austinii

Size & colour: Medium. Pale brown often with greenish capitulum centres and red tinges towards the branch tips

Habitat: Hummocks on open, intact bog, rarely on cutover

Key ID features: Closely appressed leaves and smooth, pointed branches. Hummocks are very tight and firm and usually hard to the touch.

Lookalikes: Usually easy to identify, but dense patches of brightly coloured *Sphagnum papillosum* can resemble it.

Other names: *Sphagnum imbricatum*

Sphagnum beothuk

Size & colour: Small. Ginger to chocolate brown

Habitat: Hummocks on open, intact bog, rarely on cutover

Key ID features: Dense but not firm hummocks. All brown. Stem leaves point upwards.

Lookalikes: Recently split from *Sphagnum fuscum*, which seems to be rare in Ireland and may be more of an upland species. *S. fuscum* tends to be paler, but can only be separated from *S. beothuk* under the microscope.

Other names: *Sphagnum fuscum*

Sphagnum cuspidatum

Size & colour: Medium. Light yellow-green to green, sometimes with orange tints in the capitulum. Sometimes with pink at the base of the branches.

Habitat: Bog pools, drains and hollows

Key ID features: Long, very narrow, needle-like leaves. Feathery appearance in pools, but resembles wet fur when taken out of the water.

Lookalikes: *Sphagnum fallax* usually has a star-shaped capitulum, often has leaves in neat rows, and has young branches emerging from the capitulum in pairs.

Other names: None

Sphagnum divinum

Size & colour: Large. Wine-red to pink, often mottled green

Habitat: Lawns and hollows in slightly flushed bogs

Key ID features: Hooded leaves overlapping and appressed with pointed branches.

Lookalikes: Recently split from *Sphagnum medium*, which has stubby branches with more widely spreading leaves and tends to be darker.

Other names: *Sphagnum magellanicum*

Sphagnum fallax

Size & colour: Medium. Green to yellow-orange to mustard brown. Sometimes with pink at the base of the branches.

Habitat: Lawns in flushes and bog woodland

Key ID features: Capitulum looks like a 5-pointed star, branch leaves usually in neat rows. Young branches emerge from capitulum in pairs.

Lookalikes: Similar to two closely related species *Sphagnum angustifolium* and *S. flexuosum*, which are found in more base-rich habitats. *Sphagnum pulchrum* has leaves in very sharp rows, but has dark stems. See also *Sphagnum cuspidatum*.

Other names: *Sphagnum recurvum* var. *mucronatum*

Sphagnum fimbriatum

Size & colour: Medium. Always green.

Habitat: Lawns in bog woodland

Key ID features: Broad stem leaves with frilly margins standing erect and visible when the capitulum is removed. Prominent terminal bud in centre of capitulum.

Lookalikes: Green forms of other *Sphagnum* mosses, especially *Sphagnum rubellum*.

Other names: None

Sphagnum medium

Size & colour: Large. Wine-red, sometimes mottled green

Habitat: Lawns and hollows on open bog

Key ID features: Large size, hooded leaves, colour.

Lookalikes: Recently split from *Sphagnum divinum*, which has more pointed branches with appressed leaves. Green plants could be confused with *Sphagnum papillosum*, which is usually a duller colour, and there is almost always some red in *S. medium*.

Other names: *Sphagnum magellanicum*

Sphagnum palustre

Size & colour: Large. Green to yellow-brown, often with peach-coloured tints. The centre of the capitulum can be dark green or brown and is usually darker than the surrounding branches

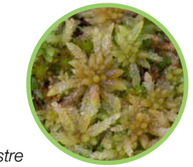
Habitat: Lawns and soft hummocks in bog woodland and flushes

Key ID features: Large size, hooded leaves, long capitulum branches

Lookalikes: Some forms with short branches and dull colours can only be distinguished from *Sphagnum papillosum* under the microscope.

Other names: None

Sphagnum papillosum



Size & colour: Large. Ochre brown to dull green

Habitat: Lawns and hollows on open bog

Key ID features: Large size, hooded leaves

Lookalikes: Brighter coloured plants could be confused with *Sphagnum austinii*, *Sphagnum palustre* or even green *Sphagnum medium.*

Other names: None

Sphagnum pulchrum

Size & colour: Medium. Golden orange

Habitat: Lawns and hollows on open bog, especially in the west

Key ID features: Leaves in very sharp, neat rows, colour

Lookalikes: Can be confused with orange *Sphagnum fallax*, which has longer, more tapering branches and paler green to pinkish brown stems.

Other names: None

Sphagnum rubellum

Size & colour: Small. Red to candy pink but often green in shade

Habitat: Low hummocks and lawns on open bog and in bog woodland and flushes

Key ID features: Size and colour. Capitulum often shaped like a 5-pointed star. Leaves often in neat rows. Stem leaves point upwards.

Lookalikes: *Sphagnum subnitens* is larger and scruffier, usually paler pink, and often has a green centre to the capitulum. *Sphagnum capillifolium* is a closely related species with a pom-pom shaped capitulum that forms dense, bumpy hummocks. It never has leaves in neat rows. *S. capillifolium* is rare on raised bogs.

Other names: *Sphagnum capillifolium* subsp. *rubellum*

Sphagnum squarrosum

Size & colour: Medium to large. Green

Habitat: Lawns in bog woodland and flushes

Key ID features: Leaves are sharply bent away from the branches, giving plants a spiky appearance. Prominent terminal bud in centre of capitulum.

Lookalikes: *Sphagnum palustre* sometimes has leaves bent away from the branches, but it is a larger moss with hooded leaves.

Other names: None

Sphagnum subnitens

Size & colour: Small to medium. Salmon pink, often with a green centre to the capitulum and often green in shade. Sometimes pale brown.

Habitat: Low hummocks and lawns in flushes and open bog. Less frequent on intact bog.

Key ID features: Colour, stem leaves point upwards. Appearance is characteristically untidy. Plants that have been collected and dried have a metallic sheen.

Lookalikes: *Sphagnum rubellum* is quite similar, though usually smaller and neater with leaves often in rows. The pink colour of *Sphagnum rubellum* is richer than that of *S. subnitens.*

Other names: None

Sphagnum tenellum

Size & colour: Very small. Pale yellow to yellow-orange

Habitat: Small patches on open bog

Key ID features: Small size. Leaves at the end of some branches spreading apart so that they resemble an open bird's beak or crab's claw.

Lookalikes: None

Other names: None

Resources

The **British Bryological Society** is the voluntary organisation that promotes the study and conservation of mosses, liverworts and hornworts, collectively known as bryophytes, in Ireland and Britain. The BBS website is a fantastic mine of information about *Sphagnum* and other bryophytes. You can easily find information on a particular species using the Species Finder page at https://www.britishbryologicalsociety.org.uk/learning/species-finder/.

Mosses and Liverworts of Britain and Ireland: a Field Guide (I. Atherton, S. Bosanquet and M. Lawley, eds. 2010. British Bryological Society) is the essential guide for beginning and advanced field bryologists. It is user-friendly and available on the BBS website. Digital excerpts from the Field Guide are available on line under the BBS Species Finder page.

More technical identification guides that use microscopic as well as field characters include **British Mosses and Liverworts** (E.V. Watson. 1981. Cambridge University Press), which is approachable and still quite useful despite its age. **The Moss Flora of Britain and Ireland** (A.J.E. Smith. 2004. Cambridge University Press) is the standard identification guide for mosses in Ireland.

***Sphagnum* Mosses: the Stars of European Mires (**J. Laine, K.I. Flatberg, P. Harju et al. 2018. University of Helsinki) is a comprehensive guide to all the European *Sphagnum* species and includes many beautiful photographs.

Hand lenses can be bought from many online sources and some local camera shops. Two online sellers are Summerfield Books (https://www.summerfieldbooks.com/) and NHBS (https://www.nhbs.com/). A minimum of 10x magnification is recommended, and 20x lenses are very useful for viewing stem leaves and smaller features.

For more information about Connecting Communities with Peatlands visit
www.communitywetlandsforum.ie or email info@communitywetlandsforum.ie

Submit your recorded sightings to the Citizen Science Portal of the National Biodiversity Data Centre
www.biodiversityireland.ie

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