

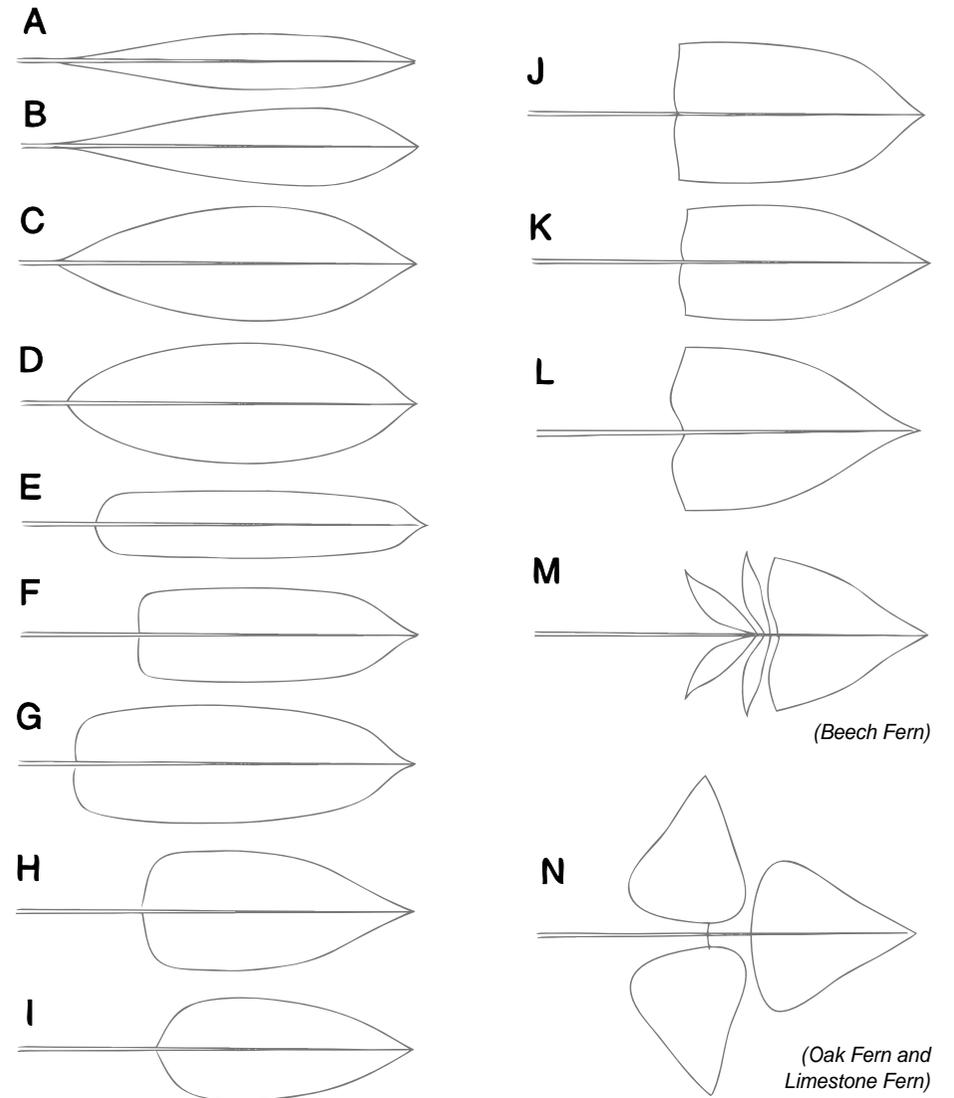
A Guide to Cumbrian Ferns and Fern-allies

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Fronnd outlines

These typical frond outlines are used in the keys. No account is taken of abnormal shapes. Remember that the growth of fronds is very much dependent upon the conditions in which they grow. Fronds growing in humid and in shady conditions are generally fuller, much larger, and more finely dissected than those grown in drier and in more exposed conditions.



Cumbrian Ferns and Fern-Allies

There are four groups of ferns and fern-allies (Pteridophytes) growing wild in Cumbria. Because of its great variety of rock-types, habitats and generally suitable climate, Cumbria has 85% of all the species of Pteridophytes growing wild in Britain! This booklet aims to help you to name all but the rarest with the help of simple keys. Most species can be named with confidence, but some tricky-to-name groups can only be touched upon here. You are recommended to refer to more substantial guides (see page 34) for more advice on these groups!

All Pteridophytes differ from flowering plants in that they reproduce by means of minute spores, produced in spore-capsules. There is no development of flowers, nor of seeds.

The growth form varies greatly across the Pteridophytes, but each of the four groups below is usually easily recognised as such.

Ferns (notes and keys start on page 4)

The largest group. All of them produce leaf-like **fronds**. The fronds grow from various types of rootstock. Spores are generated in vast numbers from spore capsules clustered on the under-surfaces, or on the tips, of the fronds.

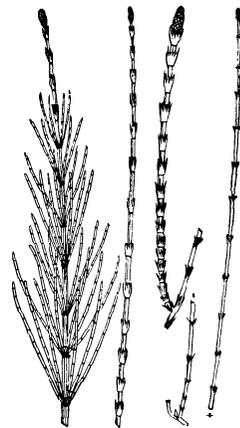


typical fern fronds

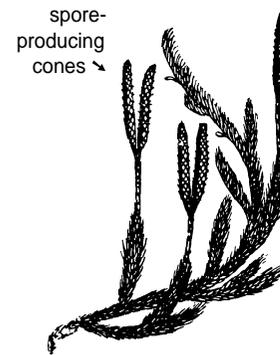
Horsetails (key on page 25)

Always readily recognised by the stem and branches being made up of sections which pull apart easily at the nodes; branches in whorls; and the frequent presence of small cones on the tips of stems or branches. The type of branching, the form of the teeth on the branch-sheaths, the form of the stem-sheaths which surround the bases of each segment, and the presence of cones on either green or brown stems, are the important features for recognition of horsetails.

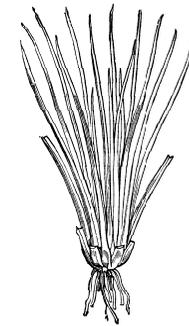
So-called 'Field' Horsetail is the pernicious garden weed, often wrongly called 'Mare's-tail', but the latter is an emergent flowering water-plant, *Hippuris vulgaris*, not a fern. It has flat leaves and tiny red flowers.



typical horsetails



a typical clubmoss



a quillwort

Clubmosses (key on page 27)

Primitive fern-relatives, looking most like large, very tough mosses, with rigid leaves clothing prostrate and ascending stems; reproduction by means of spore-capsules which are usually gathered in recognisable 'cones', the form of which is distinctive of the species. Mostly upland moor and mountain species.

Quillworts (key on page 28)

Two Cumbrian species. Rather obscure underwater plants which make strong tufts of fleshy leaves, somewhat like short rush-leaves. Often inaccessible in deep water of the Lakeland lakes, locally carpeting the beds, but a major component of the strand-line of dislodged plants along lake shores after gales.

Some fern terms

blade: the fern 'leaf' itself (see opposite)

frond: the whole fern 'leaf' including its stalk

indusium: a tiny tissuey 'hat', lid or flap covering the developing sorus in many species, the shape of which may be important for identification; it soon shrivels and may be lost entirely

pinna plural **pinnae** (say 'pin-ee'): the first divisions of a leaf-blade

rachis (say 'raa-kiss'): the part of the stalk within the leaf-blade

scales: small tissuey flakes along the stalk, usually brownish

sorus plural **sori** (say 'sore-eye'): a cluster of spore-capsules

sporangium plural **sporangia** (say 'spor-an-jy-a'): the spore-capsule(s)

stipe: the base of the stalk up to the blade

Illustrations

NB: many frond outlines (e.g. those on pages 15; 18-20) have been prepared from actual specimens. The process has not allowed the finer details to be captured in full, and hence it is the **outline** rather than the fine structure that is illustrated.

Identification of ferns

Ferns are made up of leaf-like structures called **fronds**, which grow from a **rootstock** at soil-level. If the rootstock is upright the fronds emerge to make a 'crown' of fronds, either in a basket- or 'shuttlecock'-shape with all fronds facing inwards, or else in a less organised tight clump with fronds facing all directions. If the rootstock is horizontal the fronds emerge to make a looser patch or sheet. Either form of rootstock may be branched, so that larger patches can develop.

Fronds have a set of technical terms (see also previous page) which it is important to be able to use precisely if you want to be able to name ferns successfully. They are made use of in the key which follows. Stick with us! – there are not too many to learn!

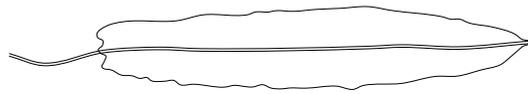
Each frond is made up of a leaf-like part, the **blade**, and a stalk; the part of the stalk within the blade, or midrib, is called the **rachis**, and the lower, protruding part is the **stipe**. Often the stipe and rachis are covered in chaffy **scales**, the distribution and colour of which are frequently important in identification.

Frond structure - the degree of 'division' of the frond

This guide uses five 'Divisions' to describe the structure of the frond: -

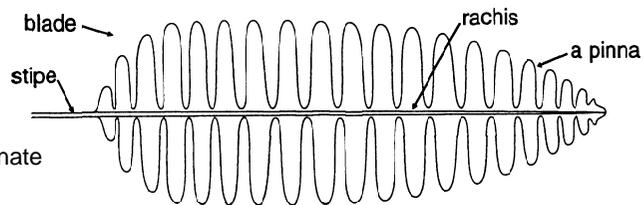
Division 0: In one fern the blade is a single undivided shape: Hart's-tongue in key Division 0, page 10.

Division 0: undivided



More usually the frond is more or less divided or 'cut' – and knowing the degree of 'division' is important for identification. There are four divisions here.

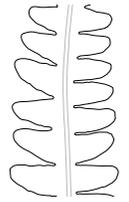
Division 1: If the **blade is divided** – or cut to the stalk – **just once**, as below, it is said to be 'once-pinnate', 1-pinnate or just **pinnate**. Each of the separate 'leaflets' is called a **pinna** (plural pinnae) – from Latin for 'feather'. Ferns like this are in key Division 1 on page 11; e.g. Polypody, Hard-fern (but read the NB below).



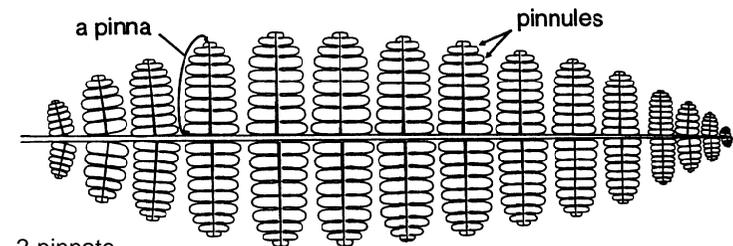
Division 1: 1-pinnate

(NB: Note that in a few awkward species, such as Lemon-scented Fern (page 12),

a first inspection suggests that the pinnae are apparently divided to the pinna-stalk (making the frond evidently 2-pinnate); on closer examination, leafy tissue is visible connecting the segments, as in the pinna shown on the right. Although therefore strictly 1-pinnate, **such ferns are dealt with in Division 2** (below), thus leaving Division 1 for the obviously 1-pinnate species such as Polypody and Hard Fern.)

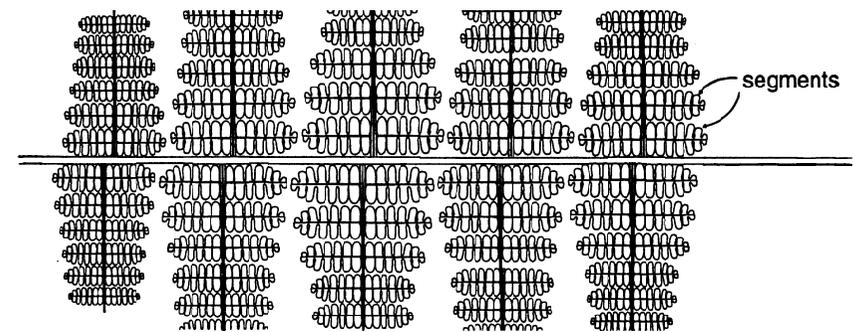


Division 2: If the pinnae are themselves divided right to the pinna-stalk, as below, the frond is said to be 'bi-pinnate', 'twice pinnate', or '2-pinnate'. Each final division is called a **pinnule** (meaning 'little pinna'). All ferns like this are in key Division 2 on page 12; e.g. Male-fern. (And remember that as just described on the previous page, a few 1-pinnate ferns which appear superficially to be 2-pinnate are included here.)



Division 2: 2-pinnate

Division 3: If the **pinnULES** are themselves divided right to the pinnule-stalk, as below, the frond is 'tri-pinnate', or '3-pinnate'. Each final division is a 'segment'. All ferns like this are in key Division 3 on page 14; e.g. Lady-fern. (So in this sense a segment is a division of a pinnule. It can also mean any final division of a frond, at whatever level.)



Division 3: 3-pinnate

Division Irregular: Finally, some species, e.g. some spleenworts, have **irregularly forked** divisions, producing a 'branched' appearance to the frond. All ferns like this are in key Division **Irregular** on page 10; e.g. Wall-rue.



irregular forking as in Forked Spleenwort

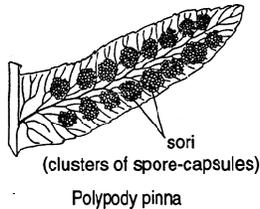
Keys to Ferns start here . . .

The ferns are keyed out in **two main keys** (⇔ below) based on where the spore-capsules (sporangia) develop. Some 'doubtful' ferns are included in both keys. (To avoid over-burdening the main keys some very rare ferns are relegated to a brief description on page 33.)

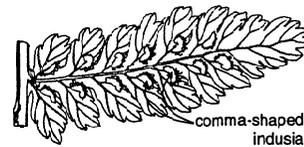
If you are not certain whether your plant is 'Standard' or 'Non-standard', then follow the Standard key on page 10, which includes the commoner 'Non-standards' such as Bracken, Hard-fern and Parsley Fern.

Spore-producing structures

On the underside of fertile fronds (or at their tips in some species) are small clusters ('sori') of spore-capsules ('sporangia'). In some groups the sori are covered when



Polydip pinna



Lady-fern pinna

young by a tissuey lid or flap ('indusium'), the shape of which is often important in the identification of the group. (The indusium is best seen just before maturity, and tends to shrivel in older fronds, in some species disappearing entirely.)

Hint: young individuals of many species of fern are notoriously difficult to name, as their shape and texture often differ widely from the mature forms. Therefore, to save yourself a lot of difficulty, it makes sense to **ignore any infertile plants** – i.e. those which **lack developing sori** – at least in those groups where the species cannot easily be named from frond shape alone.

Hints on using the Keys which follow

Where you have several choices, all the choices at that level in the key carry the same symbol, such as ➡, to help you find quickly where the other choices are.

No key is infallible. Note which plants are common and which are rare. If the key takes you to the name of a rare plant, bear in mind that it is much more likely that the key has misled you than that you have found a rarity! Sorry: go back and re-try some of the choices. As a last resort, compare your plant with the illustrations.

In the keys below, the following symbols are used:

'○' after a name means you have named your plant to species, and can stop!

'♣' after a name means you have found a **group**-name for your plant, and can go to a later key to that particular group to find the exact name.

'⌘' means there is an illustration; its page number is given, if not on that double-page.

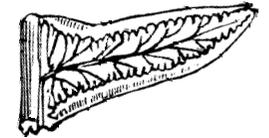
'±' means 'more or less': an unfortunate necessity in the diverse world of plants, even if it does tend to blur descriptions!

⇔ . . . Key to the 'NON-STANDARD' Ferns (starts opposite)

This is a small artificial collection of unrelated ferns, which do not carry their spore-capsules in the 'usual' sites of the 'Standard' ferns as below.

Instead, the spore-capsules are carried in one of three ways:

- on the underside of much narrower segments on special fertile fronds, so the fern **seems to be growing two types** of fronds (e.g. Hard Fern; Parsley Fern – page 9);
- underneath the outside edge of the frond segments, covered by a lip of tissue, or exposed on the fringe of the segments (e.g. Bracken – opposite);
- in exposed clusters on special fronds (or on the tips of special fronds) which look different from the sterile fronds (e.g. Royal Fern – opposite; Moonwort – page 9).

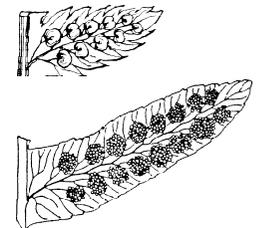


underside of Bracken pinnule showing indusium flap covering sporangia

⇔ . . . Key to the 'STANDARD' Ferns (starts on page 10)

All these carry their spore-capsules in obvious discrete lines or clusters (sori) **underneath** the segments of the fronds – see descriptions on page 6. Often the sori are circular and in rows.

Look underneath the frond to check whether it is sterile (i.e. **without** spore-capsules) or fertile (i.e. **with** spore-capsules). Looking from the top side, the sterile fronds look very similar to the fertile fronds – you can hardly tell which is which.

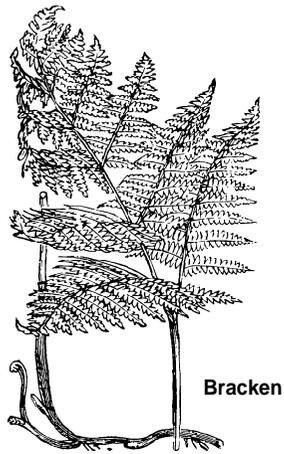


⇒ . . . Key to 'NON-STANDARD' ferns

You have two starter choices, ➔A and ➔B

➔A Plants large, or even huge [two final choices, +1 and +2]

- +1 Huge tough fronds with upright thick stalks from far-creeping buried rootstocks; triangular 3-pinnate fronds. The fern which covers whole hill-sides. *Abundant*, familiar: by far the most common fern ❄ **Bracken**○
- +2 Large tufted plant, 2-pinnate, pinnules large (1-1.5 × 2-8cm). *Rare* in wet heath, fen, wet woods, wet peaty rock-ledges, etc ❄ **Royal Fern**○



Bracken



Royal Fern

➔B: plants tiny to medium-sized, fronds no more than 30cm

[choices ❄1 and ❄2]

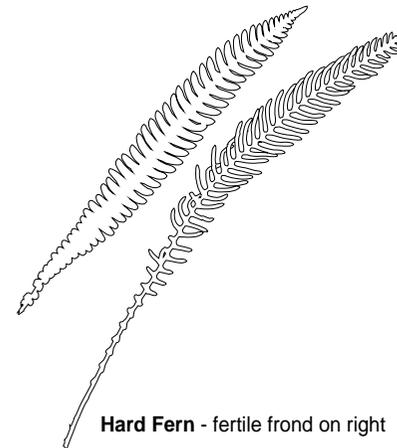
- ❄1 Obviously a fern - though Parsley Fern fronds might look like leaves of some flowering plant; a closer look reveals its fertile fronds [final choices ☆a, ☆b]
 - ☆a Fronds in untidy clumps, bright green, clearly 'like Parsley', ± 3-pinnate. Earth-backed walls, screes, cliffs on acidic rocks, especially slate. Common in Lakeland valleys and hills; rare on sedimentary rocks of Pennines except where igneous or metamorphic rock is exposed - e.g. abundant on basalt of whin sill at High Cup Nick (❄ overleaf) **Parsley Fern**○
 - ☆b Clearly a fern, tufted; fronds narrow (shape A or even narrower), pinnate. Fertile fronds with narrow pinnae, more erect than sterile fronds. Common on banks in woods or valley sides, but avoids basic soils (❄ overleaf) **Hard-fern**○
- ❄2 *Not obviously a fern* at first sight [choices ❄a below and ❄b overleaf]
 - ❄a Moss- or liverwort-like, and very delicate; small fronds, translucent, dull olive, bluey-green or blackish. Making sheets, on the shady sides of

outcrops and boulders in very humid native woodland; avoids basic rocks. Local in Lakeland; very rare in Pennines

FILMY-FERNS ➔
(key on page 21)

- ❄a Strange *fleshy* plants. Shoot forked, with spore-capsules at the tip of one fork, and the other fork being a 'leaf' ; in ± short turf [final choices ❄a, ❄b]
- ❄a Blade pinnately divided. Local; especially in dry turf ❄ **Moonwort**○
- ❄b Blade undivided. Local; especially in damper turf ❄ **Adder's-tongue**○

(Adder's-tongue very often produces fronds with no 'adder's tongue' coming from the base. The very soft and fleshy texture, complete lack of veins and bright green colour are still quite distinctive. It tends to make a patch of shoots scattered over a small area. Moonwort shoots are usually more widely scattered, and not so obviously in patches.)



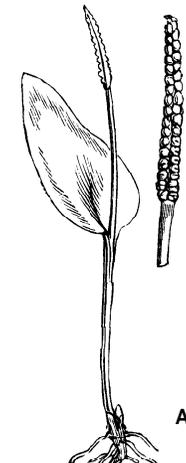
Hard Fern - fertile frond on right



Parsley Fern - fertile frond on right



Moonwort



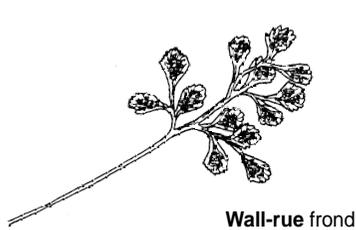
Adder's-tongue

⇨ . . . Key to 'STANDARD' Ferns

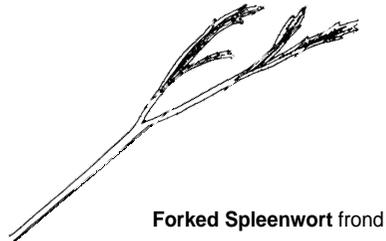
First: find the 'degree of division' of a mature frond (go back to pages 4/5 for clarification), then go to the appropriate section below: five choices: ➔ **Division IRREGULAR** (below); ➔ **Division 0** (below); then **Division 1** (starts page 11); **Division 2** (starts page 12); or **Division 3** (starts page 14).

➔ **Division IRREGULAR**, so fronds variously forked or branched
[final choices ➔1, ➔2, ➔3]

- ➔1 Fronds in untidy clumps, bright green, clearly 'like Parsley', ± 3-pinnate. Earth-backed walls, screens, cliffs on acidic rocks, especially slate. Common in Lakeland valleys and hills; rare in Pennines except where metamorphic rock is exposed – e.g. abundant at High Cup Nick (* opposite) **Parsley Fern**○
- ➔2 Fronds irregularly branched, short, pinnae alternate with a few (3 to 5) small, ± rounded segments. Limestone cliffs and outcrops; mortared walls in other areas. Common * **Wall-rue**○
- ➔3 Fronds very narrow, forked, segments all narrow. In dense grass-like tufts on dry acidic cliffs, and on a very few screens. Rare * **Forked Spleenwort**○



Wall-rue frond



Forked Spleenwort frond

➔ **Division 0**

Fronds a single undivided blade [a single species, ♣]

- ♣ Fronds large, strap-shaped (shape E, etc). Common on shady banks, walls, cliffs, especially in limestone areas; not on acidic soils * **Hart's-tongue**○

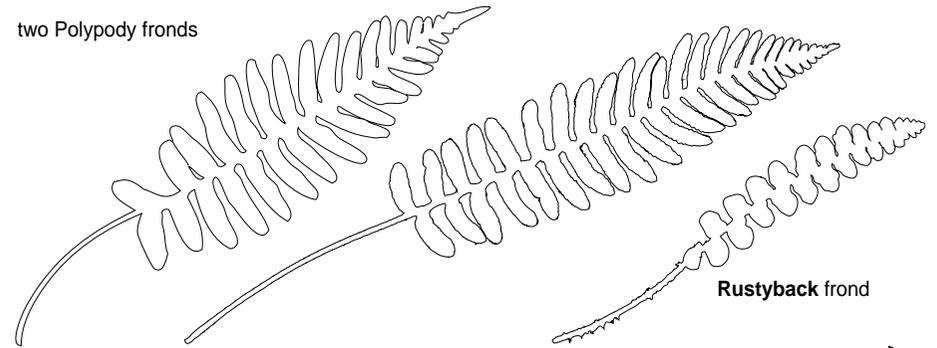


Hart's-tongue frond

➔ **Division 1:** Fronds 1-pinnate [choices, ➤A below and ➤B opposite]

- A Pinnae **widen** at their attachment with the rachis, not, or only lightly, toothed [choices ➤1, ➤2, ➤3]
 - 1 Tufted. Blades narrow, gradually narrowing to base (shape A or narrower), fertile fronds different in form, erect, with narrow pinnae. Common on ± acidic soils in ± shady places (* page 9) **Hard-fern**○
 - 2 Making patches with a conspicuous creeping rootstock. Blades wider, basal pinnae hardly shorter than those above (shape E to I). Sori large, round/oval, in lines; no indusium. Frequent in many habitats. **POLYPODIES** ♣ (key on page 22)
 - 3 Making dense tufts. Back of fronds covered in rusty scales. Small plant of mortared walls, or limestone rocks. Only locally frequent * **Rustyback**○

two Polypody fronds



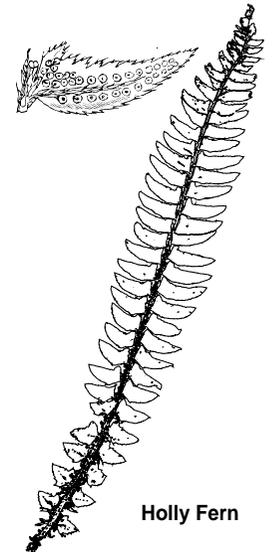
Rustyback frond



Maidenhair Spleenwort



Sea Spleenwort



Holly Fern

► **B** Pinnae **narrowed** at attachment with rachis, making separate ± stalked 'leaflets' [choices, ⇨1 and ⇨2]

⇨1 Plant small; pinnae ± ovoid, rounded or rectangular; frond very narrow compared with length [final choices ⇒a and ⇒b]

⇒a Rachis *black or deep reddish*, wiry. Rocks, cliffs, and especially walls. Abundant ☼ **Maidenhair Spleenwort**○

⇒b Rachis *green throughout*, not wiry. Basic rocks in hills. Locally frequent. **Green Spleenwort**○

⇨2 Plant larger; frond wider; pinnae longer, broader at base [final choices ⇒a and ⇒b]

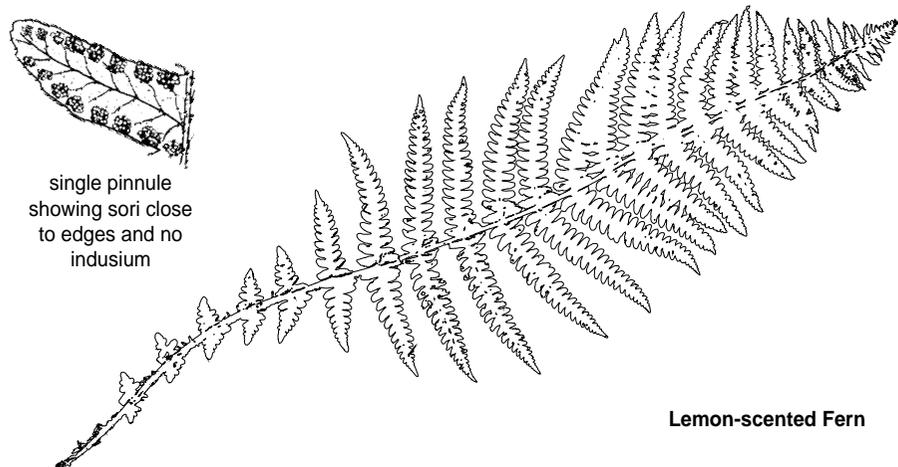
⇒a Pinnae edges not spiky. Coastal rocks, local ☼ **Sea Spleenwort**○

⇒b Pinnae edges spiky. Mountains, very rare ☼ **Holly Fern**○

► **Division 2:** Fronds **2-pinnate**; check pinnae are divided once only, so pinnules are no more than lightly toothed [choices ⇨A (below), ⇨B (page 13), ⇨C (page 14)]

⇨ **A** Fronds making neat 'shuttlecocks' or 'baskets', or at least tight tufts with fronds arising steeply or almost vertically; not in loose patches or tufts. All are medium or large plants when mature. [choices >1 below, >2 overleaf]

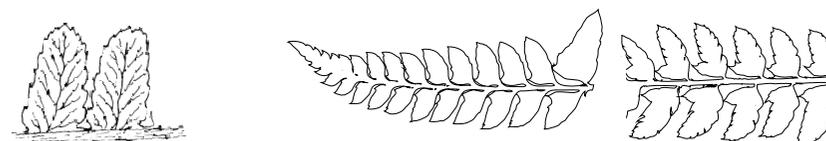
>1 Medium to large plant, fronds strongly erect; [pinnules joined at the base, so strictly 1-pinnate]; blades gradually narrowing downwards (shape B, C), often bright yellow-green; sometimes a lemon smell on first bruising; sori small, and around very edge of pinnules; indusium minute or absent. Frequent in the hills, especially on damp banks by streams ☼ **Lemon-scented Fern**○



>2 Fronds erect or more spreading, tougher than >1 and leathery; shape A, C, D, G; sori large, in two rows down pinnules, covered (at least when young) by conspicuous convex rounded or kidney-shaped indusia. [group choices, > a and > b]

> a Pinnules attached by full width of base; *teeth* on pinnules *blunt* **MALE-FERNS**♣ (key on page 17)

> b Pinnules ± obviously stalked; *teeth* on pinnules *sharp* and ± distinctly spiny. **SHIELD-FERNS**♣ (key on page 24)



two Male-fern pinnules

Hard Shield-fern

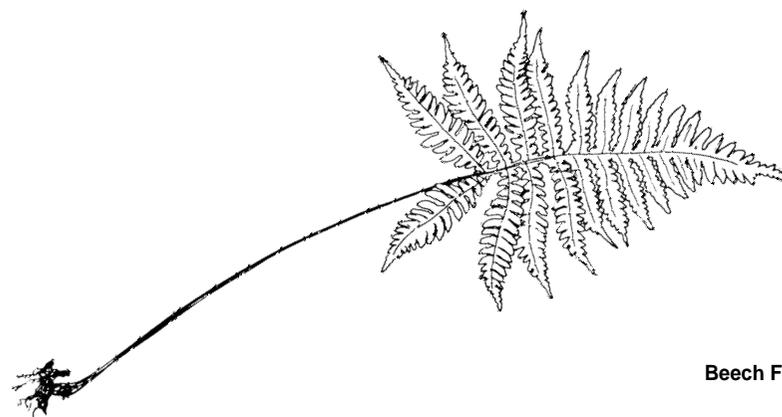
Soft Shield-fern

Shield-fern pinnae showing pinnules

⇨ **B** Fronds making *loose ± spreading patches, not in tufts*. Medium-sized plants. [final choices, ⇨1 and ⇨2]

⇨1 Fronds a *highly distinctive shape* (= shape M), with lowest pinnae large, gracefully swept back. Especially on shady rocks or damp banks in woods; also on ledges and cracks in cliffs in hills. Avoids the most acidic rocks. Locally frequent ☼ **Beech Fern**○

⇨2 Fronds very fragile, erect; stalk as long as blade, shape D, I. Very *rare* in swamps and fens. **Marsh Fern**○



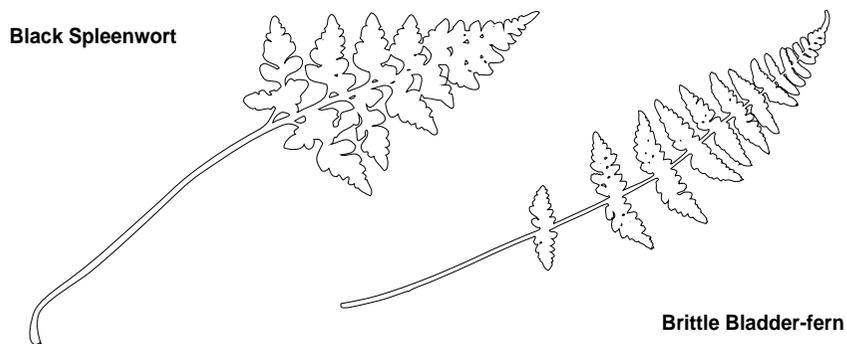
☞ Always in crevices in rocks or walls. Small ferns; fronds in clumps or tufts, but not making a shuttlecock. (Less-divided forms of these two ferns may key out here – see also page 15 for these). Always on rocks. [final choices ➡1 & ➡2]

➡1 Fronds very tough and leathery; narrow *triangular* (shape L or more narrowly triangular); sori in thick lines or in wider patches, even covering undersides of pinnules; stipe black. Rocks and walls, scattered. ❄

Black Spleenwort ○

➡2 Fronds delicate, shape E, F, H, I. Stipe green (to black at base); sori tiny, circular, in two lines on each side of the midrib of pinnules or pinnae. Making tufts or patches on ± shady, ± *basic* rocks/walls; frequent in limestone areas, more local elsewhere and dependent on mortar in walls or mineral flushing in acidic areas ❄

Brittle Bladder-fern ○



➡ **Division 3:** Fronds **3-pinnate**; check pinnules are divided ± to their midrib, making separate segments

Bracken will key out here (see also p. 8): huge tough fronds with upright thick stalks from far-creeping buried rootstocks; triangular 3-pinnate fronds. The fern which covers whole hill-sides. **Abundant**, familiar; by far the most common fern. ❄ (page 8)

Besides Bracken, you have choices, ➡A below and ➡B overleaf.

➡A Plant **large**, fronds mostly over 20 cm long, often much larger [further choices, +1 and +2]

+1 Fronds erect, in untidy shuttlecock; blade shape C, D, feathery and lace-like; indusium comma- or half-moon-shaped. Abundant in woods and other shady places (❄ *overleaf*) **Lady-fern** ○

+2 Lowest pinnae the longest, or equal longest with next pair up, so shape F, H, J, K, L; teeth on segments minutely spiny (❄ *overleaf*) **BUCKLER-FERNS** ♣ (key on page 19)

B Plant **small**, fronds mostly under 20 cm long [three further choices ➔1, ➔2, ➔3]

➔1 Fronds tough and leathery, blade deep glossy green, stipe black; sori in lines, when mature forming purplish or deep brown-black patches covering undersides of pinnules. Fronds in tight clumps, not in shuttlecock; narrow triangular, shape L or narrower. Rocks and walls, scattered (☼ page 14)

Black Spleenwort○

➔2 Delicate plant, shape E, F, H, 1; stipe green (to black at base), slender, brittle. Making tufts or patches on ± shady, ± basic rocks/walls; frequent in limestone areas, more local elsewhere and dependent on mortar in walls or mineral flushing in acidic areas (☼ page 14)

Brittle Bladder-fern○

➔3 Fronds very distinctive shape (= shape N); forming patches:
[final choices †a & †b]

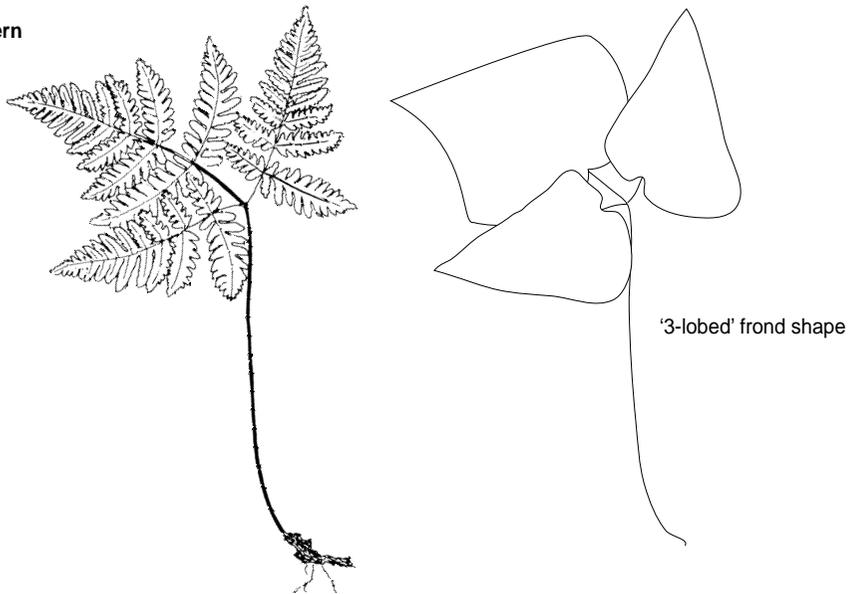
†a Fronds very delicate, yellow- or emerald-green, *strongly* '3-lobed' – the basal lobes are each nearly as large as the rest of the blade. Mainly steep rocky woods on acidic soils, also open screes, locally common in Lakeland, scarce elsewhere ☼

Oak Fern○

†b Fronds larger, tougher, dull green and mealy-looking, less strongly 3-lobed. Almost always in *limestone pavement* or *scree*.

Limestone Fern○

Oak Fern

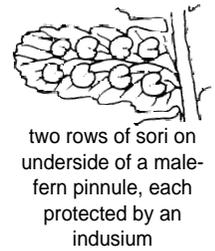


Group Keys

Key to MALE-FERNS (from p. 13) and BUCKLER-FERNS (from p. 14)

Tough leathery ferns, all in the one genus *Dryopteris*, a few of them abundant and sometimes dominant. Sori in rows along each side of the midrib of the pinnule or segment, each one round, covered in a rounded or kidney-shaped indusium.

The treatment below is somewhat simplified, but it should enable you to put a name to most well-developed plants; expect some plants to have a confusing mixture of characters. Always look for mature plants to begin with, and ignore young ones until you have some experience!



two rows of sori on underside of a male-fern pinnule, each protected by an indusium

Two groups, keyed out below, and a single intermediate (Rigid Buckler-fern) which might key out in either camp, so is dealt with separately below *

⇨ MALE-FERNS (below) are **2-pinnate**; the lower pinnae are **narrower** than those in middle of blade, so blade typically narrows to base (shape B, C, D, G); stipe much less than ½ as long as blade.

⇨ BUCKLER-FERNS (page 19) are (2- to) **3-pinnate**; the lowest pairs of pinnae are **as long as** the longest pinnae, so shape of blade is 'triangular-lanceolate' (i.e. shape F, H, J, K, L); stipe from ½ as long as blade to longer than blade.

* **Rigid Buckler-fern**○ – stipe shortish and stout; blade narrow triangular-lanceolate (with lowest pair of pinnae equal to or longer than others), more 2- than 3-pinnate; blade yellow-green to dull- or even bluish-green, covered in tiny glands, giving a 'dusty' appearance in close view. Totally restricted to cracks in *limestone* rocks, especially in grykes (the vertical fissures in limestone pavement); locally frequent where this habitat occurs. (☼ page 20)

⇨ MALE-FERNS

Typical specimens of the three species are often easy to name. However, each is very variable, and hybrids may be frequent, blurring specific distinctions. Do not expect to name every plant to species! [choices, ➔1 and ➔2]

➔1 Fronds stiff and ± erect; *rachis very scaly* right to tip; a dark spot is usually visible where pinna-stalk joins rachis, especially on lower side of frond; blade in some forms glossy, golden-green. Pinnules ± square-ended, very regular, wide, parallel-sided, leaving little space between. Toothing/lobing on margin of pinnules very variable. Common, sometimes dominant on sheltered screes in Lakeland; also on banks in damper woods, e.g. on clay. Much scarcer higher in the hills, where Male-fern is frequent. ☼

Scaly Male-fern○

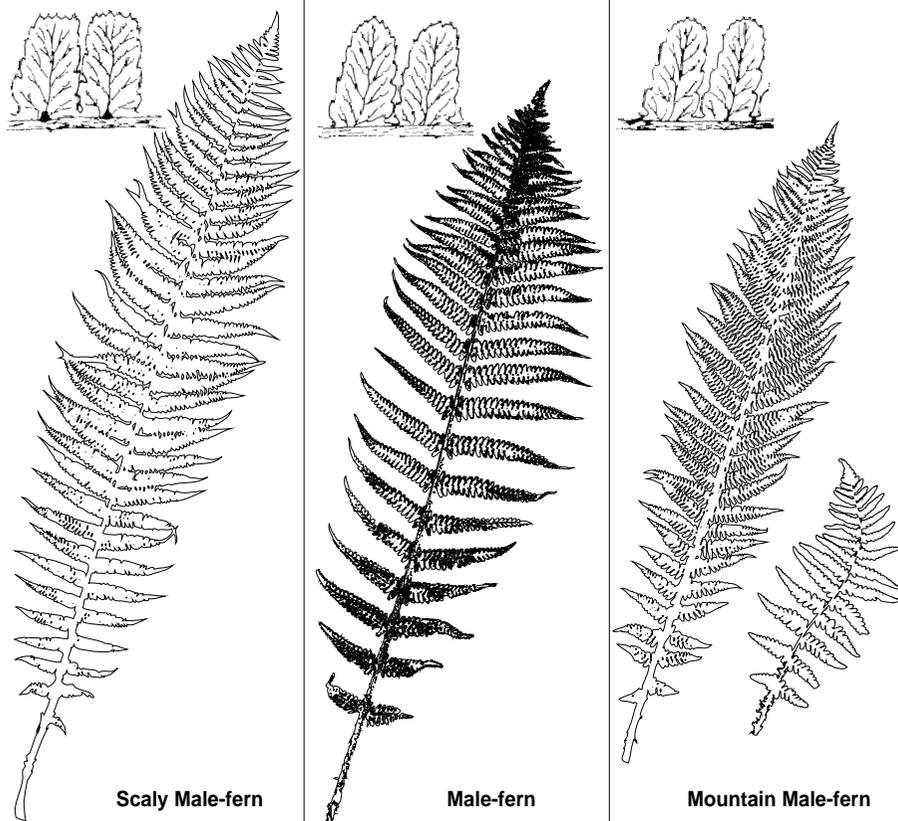
➤2 Rachis not very scaly; *no dark spot* where pinna-stalk joins rachis; blade never golden-green. Pinnules narrower, round-tipped, more lobed, so greater gap visible between them [final choices, ➤a and ➤b]

➤a Blade rather wide, lanceolate (shape C, D); mid- or bright green. Pinnules ± flat; teeth at tips of pinnules pointed and curved towards the tip; indusium with only a few or no glands on margin (× 20 lens). Abundant: woodland of all sorts; banks by rivers and on roadsides; rock-ledges and cliffs in hills ❄ **Male-fern**○

➤b Blade narrower, often more parallel-sided (shape E, G); often dull green; pinnules ± concave, margins curled upwards, producing a ± ‘crinkly’ effect. Teeth at tips of pinnules blunt and not curved; indusium with a fringe of tiny glands (× 20 lens or microscope). Branched rootstock produces many tight crowns together. Montane; screes and rocks, avoids shade; scarce and elusive ❄

Mountain Male-fern○

(Beware: stunted ordinary Male-ferns are much more common on mountains than is Mountain Male-fern, and are often named in error for it! The old name of ‘Small Male-fern’ gave the ⇨



Scaly Male-fern

Male-fern

Mountain Male-fern

impression that it was little more than a dwarf Male-fern – check the characters carefully. Mountain Male-fern also grows in Lakeland valleys, where it can be almost as tall as the other male-ferns. Difficult to identify without prior experience; get to know the other two male-ferns first.)

⇨ **BUCKLER-FERNS** (see page 17 for Rigid Buckler-fern)

Two choices, ➤1 and ➤2

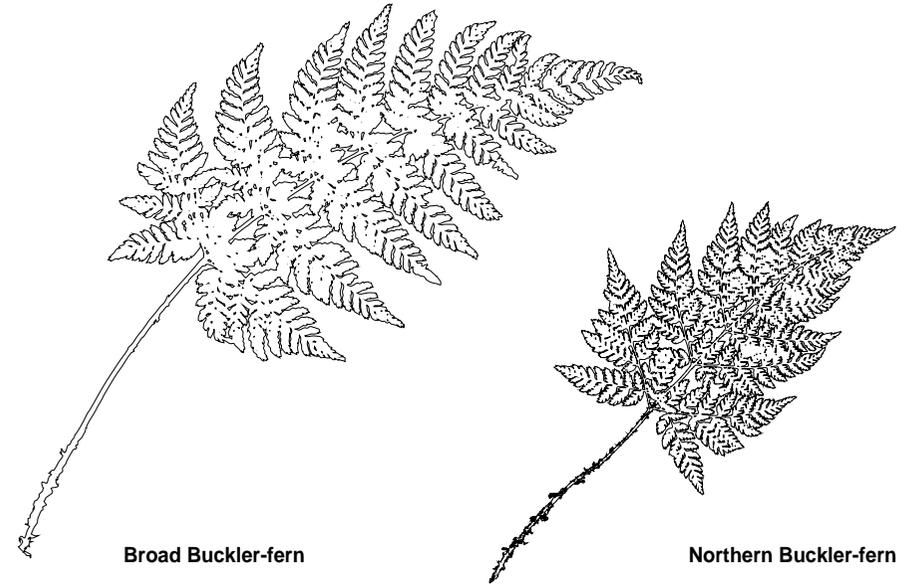
➤1 Scales typically with a *dark central stripe*; fronds make a basket or shuttlecock shape at least in well developed plants. Lowland or *mountain*.

[final choices ⇨a (abundant) and ⇨b (rare)]

⇨a Scales brown (only rarely gingery), dark stripe distinct; blade tends to mid- or dark green, segments very often ± drooping at edges (but not always). (Spores dirty brown with dense tall bristles just about visible under highest magnification*) *Abundant everywhere*, even high on mountains. Huge and dominant in many lowland plantations on clay ❄ **Broad Buckler-fern**○

(In mountains, this can approach the next species in appearance, with scales tending to gingery and lacking a stripe. Much experience, and a microscope, needed for a confident identification of ⇨b!)

⇨b (Very rare so can usually be discounted.) Very similar to Broad Buckler-fern. Scales gingery, dark stripe diffuse (or absent); blade tends to mid- or yellow-green, more delicately divided than ⇨a, so looking ‘lacy’ (almost reminiscent of Lady-fern); pinnules ± flat. (Spores light brown with sparse



Broad Buckler-fern

Northern Buckler-fern

lower spines just about visible under highest magnification*) Very local, elusive, montane; rare in a very few western rocky woods; otherwise a high mountain plant of cliff-ledges, ravines and screens ☼ **Northern Buckler-fern**○

(*Spore characters require at least ×450 magnification, preferably ×900-1000 with an oil-immersion lens.)

➡2 Scales uniform in colour, with no dark central stripe. Growth form various. Lowland only. (If up a mountain, go back to ➡1: both Broad and Northern Buckler-ferns may have all-pale scales.) [final choices ➡a (frequent) and ➡b (rare)]

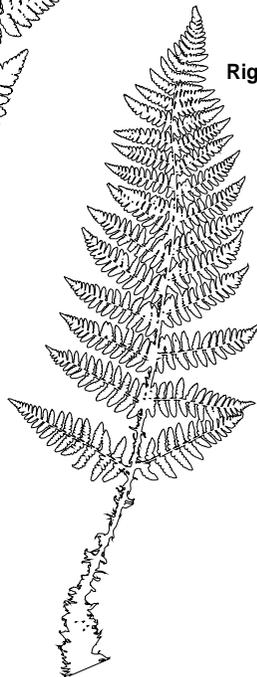
➡a Forming a clump, with erect fronds angled in all directions, not a shuttlecock. Fronds often yellowish-green; blade narrow (shape F or K). On level ground, in damp peaty woods, wet heath, lowland wet moorland. Widespread ☼ **Narrow Buckler-fern**○

Narrow Buckler-fern



➡b Fronds making a 'basket', not erect; blade broadly triangular (shape L); margins of segments strongly upturned so blade looks 'crisped'. Stipe purplish at base. (Scales may have a narrow dark patch across the base.) In steep places on peaty slopes or ledges on outcrops in lowland woods; one site on sea-cliffs. Rare ☼ **Hay-scented Buckler-fern**○

Rigid Buckler-fern (p. 17)



Hay-scented Buckler-fern

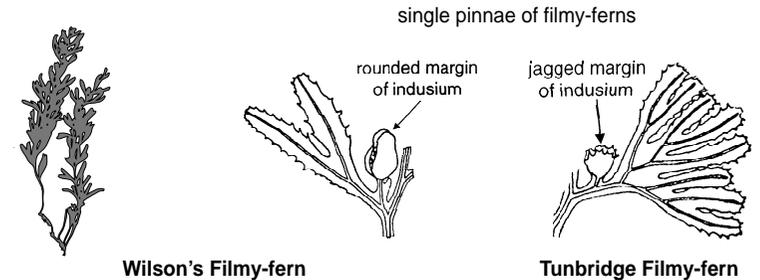


Key to FILMY-FERNS (*Hymenophyllum*) (from page 9)

[You have just two choices, ➡A and ➡B]

➡A Indusium with rounded margin (10× lens); pinnae angled downwards, ± olive-green. Locally frequent in some Lakeland woods; very rare in Pennines ☼ **Wilson's Filmy-fern**○

➡B Indusium with jagged margin (10× lens); pinnae flatter, bluer. Much rarer; a few very damp S.W. Lakeland woods. **Tunbridge Filmy-fern**○



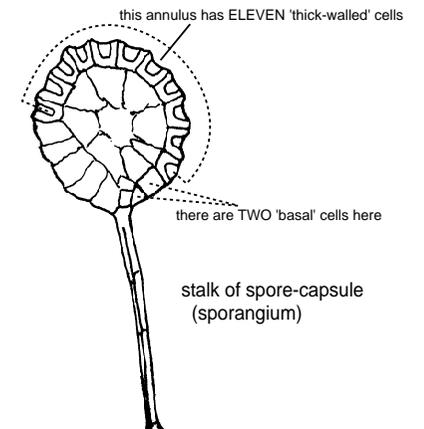
Key to POLYPODIES (*Polypodium*) (from page 11)

Three species only. Well-developed plants of ('Common') Polypody can often be named with confidence when the frond shape is narrow and parallel-sided (shape E), but when broader or shorter (shape F, G, H) it approaches the other two species. Plants on acidic sites are almost certain to be this species. Stunted forms, in habitats which may harbour the other species (limy or ± neutral rocks, banks, or mortared walls, trees in sheltered ± calcareous sites, etc.), are tricky, and need microscopic examination to confirm.

The other species can be told on sight when well-developed, with care and experience, but need checking microscopically, especially when stunted. A 'student's microscope' is adequate!

Hint: if plants are out of reach on cliffs or up trees, look for dropped brown fronds which can still be used microscopically.

[For the microscope, wet a pen-knife tip or forceps with soapy water and scrape off a fully ripe sorus or two, transfer to a drop of water on a slide, and separate the spore-capsules



very thoroughly. Cover with coverslip. View at 40x - 100x. Look for old spore-capsules which have released their spores. Unripe spore-capsules are much less easy to determine.

Each sporangium has an **annulus** of obviously thick-walled cells, the range of numbers of which is significant. (These cells make a kind of 'spring' to eject the ripe spores.) The annulus is connected to the stalk of the spore-capsule by a few thin-walled '**basal cells**'; again, the number of these is important. (Sometimes there are cells side-by-side: you must count the number of **rows** of cells between the stalk and the annulus.)

For Southern Polypody, look also for diagnostic '**branched paraphyses**'. These are very tiny, branched hairs which are scattered amongst the spore-capsules. They are thinner than the spore-capsule stalks, but otherwise can be overlooked as broken-off stalks. They are diagnostic, but very easily overlooked, especially when infrequent. The other two species have **unbranched** short paraphyses.

See also comments on page 32 on hybrids; *Polypodium interjectum* × *P. vulgare* may occur where the two species occur together.]

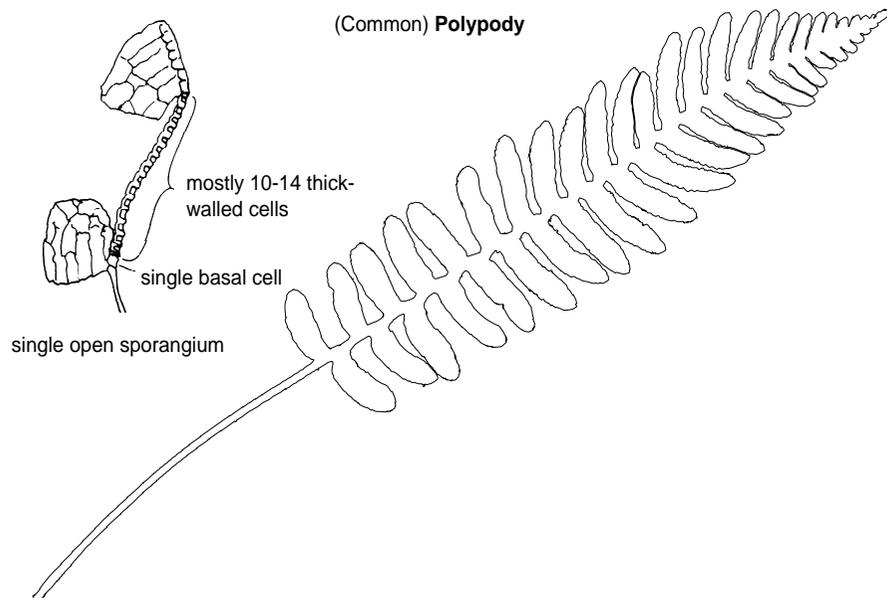
You have two starter choices, ➡A and ➡B

➡A Blade in well-developed plants *narrow* in proportion to length (shape E or even narrower), often parallel-sided for much of length, but can be very stunted in dry sites (shape H etc). (Thick-walled cells *red-* or orange-brown, often *more than 10* per annulus; only *one* basal cell.) Widespread in many different habitats ☼

(Common) Polypody ○

➡B Blade *wider* in proportion to length (shape F to I). (Thick-walled cells paler golden-brown, usually *fewer than 10* per annulus, and *2 or more* basal cells.)

[two final choices, ⇒1 and ⇒2 overleaf]

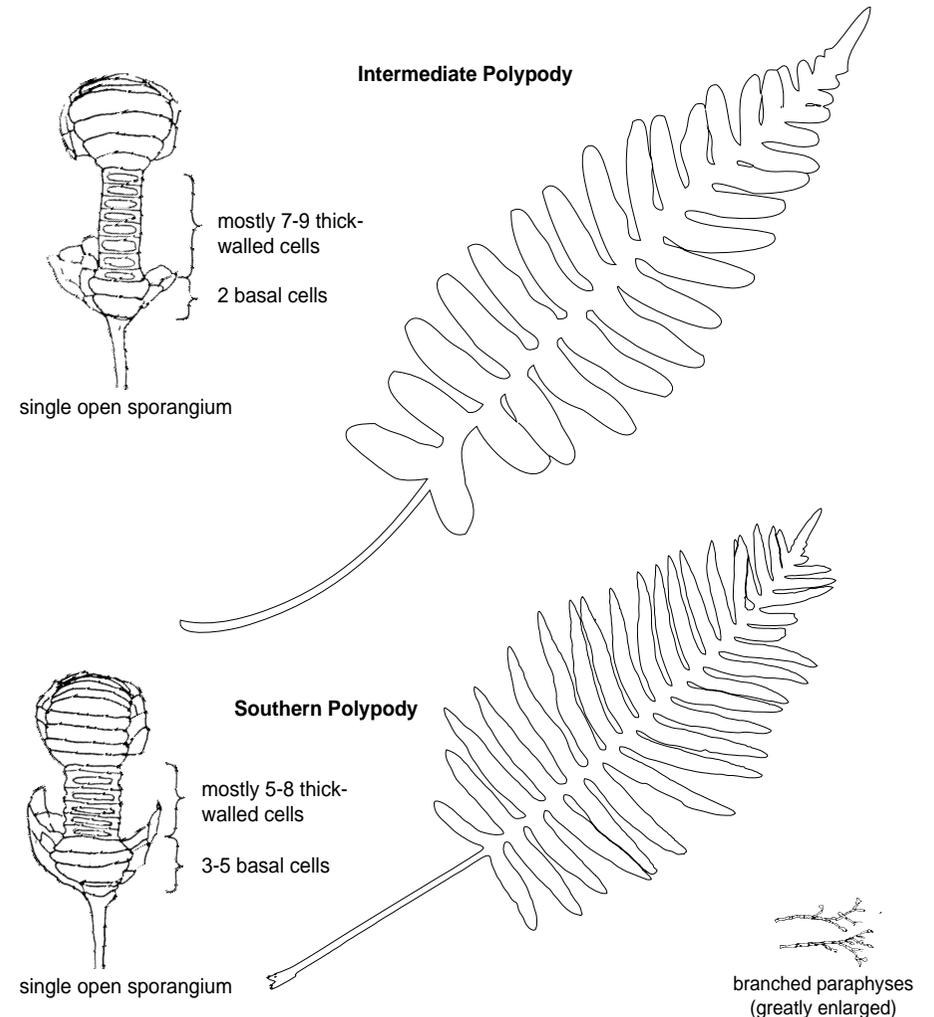


⇒1 Blade ovate-lanceolate (shape F, G or even more bulging), *pinnae often wide and blunt*. Sori often *oval*. (Thick-walled cells mainly 7-9 per annulus; 2(-3) *basal cells*. Any paraphyses present not branched.) Widespread on more basic rocks, mortared walls, even trees ☼

Intermediate Polypody ○

⇒2 Blade short, ovate to triangular (shape H etc), *pinnae often narrow, pointed, ± toothed* (but can be much wider than example below); basal few pairs of pinnae often strongly upturned, ± crossing. Sori rounded rather than oval. (Thick-walled cells mainly 5-8 per annulus (rarely more); 3-5 *basal cells*. *Branched paraphyses present* (but often very difficult to find).) Largely restricted to Morecambe Bay limestones (one site on siliceous rock in central Lakeland) ☼

Southern Polypody ○



Key to SHIELD-FERNS (*Polystichum*) (from page 13)

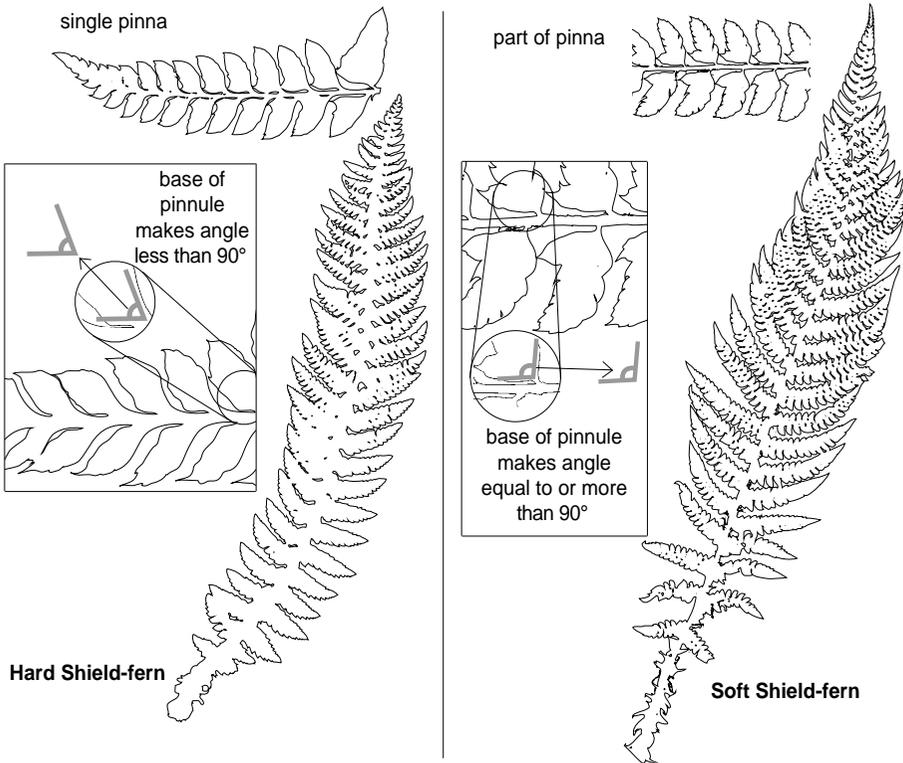
Three species only. You have two starter choices, ➔A and ➔B (Holly Fern should have already keyed out on page 12, being 1-pinnate; included here for completeness).

➔A Fronds 2-pinnate [final choices, >1, >2] Also see **NB overleaf.

>1 Frond shape A etc, with very short stipe; blade leathery and coarse; basal pinnae very short; pinnules in middle of a middle pinna are ± diamond-shaped, their lower margins making an *acute* angle where attached to the pinna midrib and their *stalks* ± 'flanged', see figure below. Fairly common in shade, on basic or neutral soils, crags, etc * **Hard Shield-fern**○

>2 Frond shape E or G; blade finer, less leathery, rather floppy; often a longer stipe; basal pinnae little shorter than those above; pinnules in middle of a middle pinna are ± oblong, their lower margins making an *obtuse* angle where attached to the pinna midrib and their *stalks* not 'flanged', see figure below. Local, more frequent in S. of county, hedgebanks etc., on various soils * **Soft Shield-fern**○

➔B Fronds 1-pinnate, pinnae distinctly spiny. Very rare and elusive, montane; rock ledges in Lakeland; rather more frequent in limestone scree, sinkholes and pavement in Pennines. (See comments overleaf.) (* p. 11) **Holly Fern**○



(*NB Beware: young plants of Hard Shield-fern may produce ± 1-pinnate fronds, which very often tempt wishful-thinkers into identifying them as Holly Fern. Their fronds are wider than Holly Fern, and the pinnae are always more deeply cut. Holly Fern is rare in the county, and your chances of stumbling upon it unexpectedly are low, since it was long ago dug up from any more accessible sites!)

Key to HORSETAILS (*Equisetum*) (from page 2)

Horsetails reproduce by means of spores produced in a terminal cone. (In two species (key ➔B, opposite) the cone-carrying stems are brownish, unbranched, emerging in early spring before the sterile green stems, and soon withering.)

In all other species, the cones – when present, which they often are not – are on the tips of the green summer stems, or their branches.

You have two starter choices, ➔A and ➔B.

➔A Green stems present, with or without cones [choices ♦1 below, ♦2 opposite]

♦1 stems with *whorls of branches* up stem [further choices, ➔a & ➔b]

➔a Stems robust, about 1 cm diameter, and *often over 1m tall, whitish*, smooth. Local on flushed clayey soil on roadsides, banks, glades. **Great Horsetail**○

➔b Stems much less than 1 cm diameter, shorter, not whitish, never so tall [further choices, ♦i, ♦ii]

♦i Branches *themselves branched*, gracefully arching. Locally frequent, in woods and on damp banks in hills * **Wood Horsetail**○

♦ii Branches *simple* (i.e. not branched again), seldom drooping, often ascending [further choices ⇒1, ⇒2]

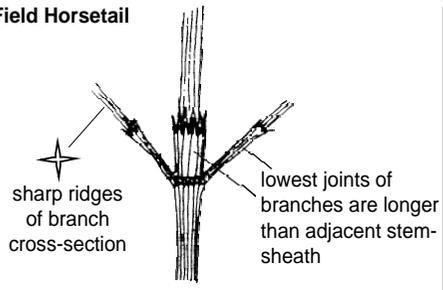
⇒1 Stem ridges indistinct; *central hollow at least 4/5ths of stem diameter, so stem readily squashed*. Branches sparse in some forms. In standing water or wet marsh. Frequent * **Water Horsetail**○

⇒2 Stems tougher; ridges distinct; much narrower central hollow [final choices ⇨1, ⇨2]

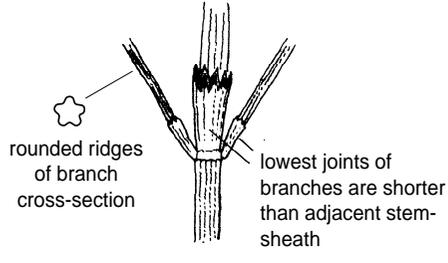
⇨a Branches *sharply 4-angled*; teeth of branch-sheaths *sharply pointed*, green, ± curving out. Lowest segments of branches *longer* than adjacent stem sheath (diagram opposite). Abundant in all sorts of habitats, with prostrate forms even high on mountains in flushes * **Field Horsetail**○

⇨b Branches *only shallowly furrowed*; teeth of branch-sheaths short, blunt, black-tipped, ± incurved. Lowest segments of branches *shorter* than adjacent stem sheath (diagram opposite). Common; wet soils (and colonising nearby dry soils) * **Marsh Horsetail**○

Field Horsetail



Marsh Horsetail



❖2 Stems apparently *without branches*, or with a few steeply upcurved branches from the very base of the stem [further choices, ⇔a, ⇔b]

⇔a Stems *hardly rough* to touch; cones oval, blunt-tipped. *Common* ❖

Marsh Horsetail○

⇔b Stems clearly *rough*; cones pointed or conical. *Very local*. [final choices, >i & >ii]

>i Stems *thick*, pencil-thickness (*ca.* 6-7 mm). Makes very dense patches.

Seepage areas on banks and stream sides etc ❖

Rough Horsetail○

>ii Stems *thinner*, rarely as thick as 4 mm. Makes more open patches. Seepage

areas, flushes, stream- and river-sides, dune-slacks ❖

Variiegated Horsetail○

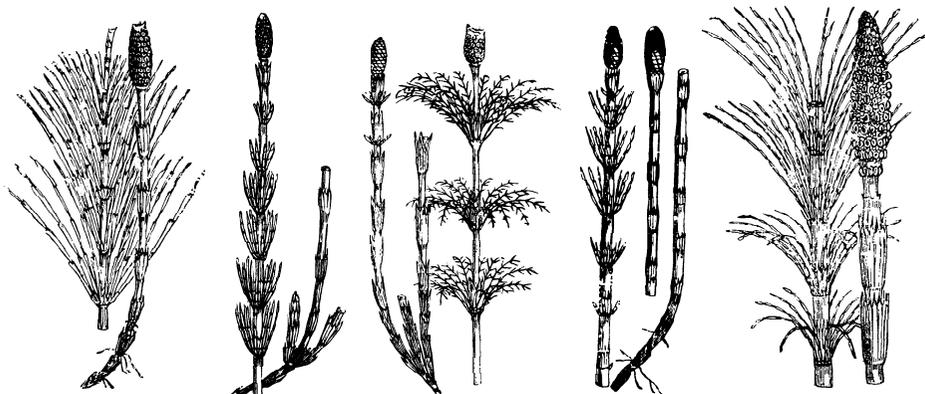
➤B Early spring only: brownish, fertile stems present, with 'cones' at the top, but no green stems, or these just emerging [final choices, →1, →2]

→1 Stem short, with only 4-6 sections; cone shorter than 4 cm. Abundant ❖

Field Horsetail○

→2 Stem longer, 6-12 sections; cone longer than 4 cm. Local ❖

Great Horsetail○



Field

Marsh

Wood

Water

Great

Horsetails

Key to CLUBMOSES (*Lycopodium*; *Selaginella*) (from page 3)

Two starter choices, ➤A and ➤B

➤A All stems erect or ascending, ± equal lengths, usually less than 15 cm, making a bushy plant 'like a tiny fir-tree'; no *distinct* cone – spore-capsules at bases of leaves, in discrete zones up the stems. Common on mountains in screes, turf, and on peaty ledges on outcrops and cliffs ❖

Fir Clubmoss○

➤B Size very varied. Main stems prostrate, or even long-creeping, then ascending at the tip; cone-bearing branches erect, with distinct cones [further choices, ➤1 and ➤2]

➤1 Stems long-creeping, and trailing loosely over ground, to 1m or more; cones on long thin stalks, often in pairs. Local, usually with heather, on peaty or stony moors, heathery screes, etc ❖

Stag's-horn Clubmoss○

➤2 Stems not long-creeping, seldom to 50 cm, and usually much shorter. [further choices, ⇔a and ⇔b]

⇔a Stems blue-green, flattened and 4-angled, making low, dense tufts; cones on long stalks, often in pairs. Stony exposed ridges, gravel fans, screes. Frequency increases with altitude. Common in Lakeland (but rare in Pennines) ❖

Alpine Clubmoss○

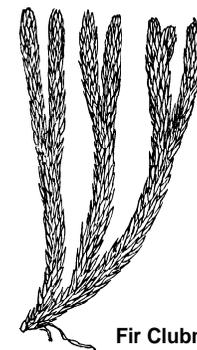
⇔b Stems green or yellow-green, not flattened [final choices, ➤1 and ➤2]

➤1 Plant inconspicuous, yellowish; stems very short, moss-like; leaves coarsely toothed; cones single, stalk-less. *Frequent* in ± *basic* or at least mineral-flushed short turf in hills ❖

Lesser Clubmoss○

➤2 Like a robust version of ➤1 above, but leaves longer (4-6 mm), curving upwards on prostrate stems which seldom branch, except to send out a short erect stem with a terminal cone. *Very rare* in bare areas in peaty / silty wet heath in valley bottoms ❖

Marsh Clubmoss○



Fir Clubmoss



Stag's-horn Clubmoss

List of Ferns and Fern-allies of Cumbria

The number of species within each family or family group, known from Cumbria at the present time is given in brackets. (Two species once known are now probably extinct.)

The figure after each species or hybrid name below is the **percentage of the total number of tetrads** within which the species was recorded for *A Flora of Cumbria* – see ‘Further Reading’ on page 34. (A tetrad is a National Grid square of 2 km × 2 km, a standard recording unit for natural history surveys.) Cumbria has 1781 tetrads, and so the percentages give a very good indication of how widespread the plant is, although not necessarily its abundance: e.g. Bracken is only sixth in percentage occurrence, but by far the most abundant, since it creates extensive sheets, unlike any other fern. (Percentages above 1 are rounded to the nearest integer; those below 1, to the nearest 0.1.)

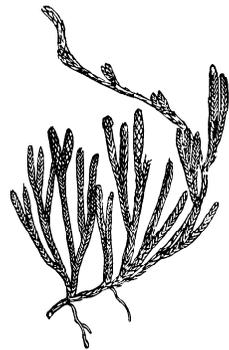
The twenty most widespread species have their English names given in **bold** (greater than 20% occurrence). They are the ‘main’ species in the county.

Others, with English names not highlighted, are scarcer, but many are common locally, in the right habitat.

Some of the rarer species are dealt with in the keys. Twelve of the rest, with English names given *in italic*, are mentioned in a separate section on page 33. (You would be very lucky to chance upon any of these: seeing them in the county will usually mean a special trip, in some cases to a very remote or inaccessible locality, and knowing details to the site in advance.) Two are not currently known in the county.

A name prefixed by an asterisk * means an introduced species. These three species are not in the keys, but are mentioned briefly on page 34. All three are rare.

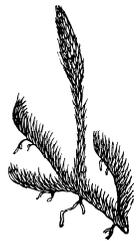
Ferns have been plagued by changes in the scientific names. The most frequently used synonyms, which you will find in books, or used by botanists, are given at the end of the list. Names follow those in Stace’s *New Flora of the British Isles*, ed. 1.



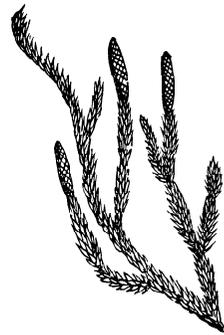
Alpine Clubmoss



Lesser Clubmoss



Marsh Clubmoss



Interrupted Clubmoss (p. 33)

Key to QUILLWORTS (*Isoetes*) (from page 3)

You have two choices, ➡A and ➡B

➡A Leaves deep or dull green, parallel-sided and not tapering, rather inflexible, so do not stick together when plant lifted from the water. Common in lakes within Lake District; often in strand-line jetsam (⊗ p. 3) **Quillwort**○

➡B Leaves bright green, tapering, flexible, so that many stick together when plant lifted from water. Much rarer. **Spring Quillwort**○

(Quillwort leaves are confusingly like those of three other unrelated strand-line water-plants; snap a leaf in two and check the leaf cross-section: Quillworts have round cross-section leaves with 4 hollow tubes; Water Lobelia *Lobelia dortmanna* has oval cross-section with 2 hollow tubes; Shoreweed *Littorella uniflora* has round cross-section, spongy inside; Awlwort *Subularia aquatica* (much rarer) is variably round to triangular in cross-section, and solid-textured.)

Fern-allies

Lycopodiaceae/Selaginellaceae – Clubmoss families (6 species in Cumbria)

<i>Huperzia selago</i>	Fir Clubmoss	17 %
<i>Lycopodiella inundata</i>	Marsh Clubmoss	0.2
<i>Lycopodium clavatum</i>	Stag’s-horn Clubmoss	5
<i>L. annotinum</i>	<i>Interrupted Clubmoss</i>	0.1
<i>Diphasiastrum alpinum</i>	Alpine Clubmoss	5
<i>Selaginella selaginoides</i>	Lesser Clubmoss	24

Isoetaceae – Quillwort family (2 species in Cumbria)

<i>Isoetes lacustris</i>	Quillwort	6 %
<i>I. echinospora</i>	Spring Quillwort	0.2

Equisetaceae – Horsetail family (7 species in Cumbria)

<i>Equisetum hyemale</i>	Rough Horsetail	1 %
<i>E. variegatum</i>	Variiegated Horsetail	1
<i>E. fluviatile</i>	Water Horsetail	38
<i>E. arvense</i>	Field Horsetail	85
<i>E. sylvaticum</i>	Wood Horsetail	21
<i>E. palustre</i>	Marsh Horsetail	37
<i>E. pratense</i>	<i>Shady Horsetail</i>	?extinct
<i>E. telmateia</i>	Great Horsetail	4

Azollaceae – Water Fern family (1 species in Cumbria)

* <i>Azolla filiculoides</i>	Water Fern	0.2 %
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Marsileaceae – Pillwort family (1 species in Cumbria)

<i>Pilularia globulifera</i>	<i>Pillwort</i>	0.6 %
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'True' Ferns

Ophioglossaceae – Adder's-tongue/Moonwort family (3 species in Cumbria)

<i>Ophioglossum vulgatum</i>	Adder's-tongue	6 %
<i>O. azoricum</i>	<i>Small Adder's-tongue</i>	0.1
<i>Botrychium lunaria</i>	Moonwort	8

Osmundaceae – Royal Fern family (1 species in Cumbria)

<i>Osmunda regalis</i>	Royal Fern	5 %
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Adiantaceae – Maidenhair Fern family (2 species in Cumbria)

<i>Cryptogramma crispa</i>	Parsley Fern	30 %
<i>Adiantum capillus-veneris</i>	<i>Maidenhair Fern</i>	0.2

Hymenophyllaceae – Filmy-fern family (3 species in Cumbria)

<i>Hymenophyllum tunbrigense</i>	Tunbridge Filmy-fern	0.4 %
<i>H. wilsonii</i>	Wilson's Filmy-fern	9
<i>Trichomanes speciosum</i>	<i>Killarney Fern</i>	0.1

Polypodiaceae – Polypody family (3 species in Cumbria)

<i>Polypodium vulgare</i>	(Common) Polypody	86 %
<i>P. interjectum</i>	Intermediate Polypody	11
<i>P. cambricum</i>	Southern Polypody	0.5

Dennstaedtiaceae – Bracken family (1 species in Cumbria)

<i>Pteridium aquilinum</i>	Bracken	83 %
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Thelypteridaceae – Marsh Fern family (3 species in Cumbria)

<i>Thelypteris palustris</i>	Marsh Fern	0.2 %
<i>Phegopteris connectilis</i>	Beech Fern	25
<i>Oreopteris limbosperma</i>	Lemon-scented Fern	41

Aspleniaceae – Spleenwort family (9 species in Cumbria)

<i>Phyllitis scolopendrium</i>	Hart's-tongue	37 %
<i>Asplenium adiantum-nigrum</i>	Black Spleenwort	19
<i>A. obovatum</i>	<i>Lanceolate Spleenwort</i>	0.1
<i>A. marinum</i>	Sea Spleenwort	0.4
<i>A. trichomanes</i>	Maidenhair Spleenwort	64
(in two subspecies, <i>trichomanes</i> [0.5% only] & <i>quadrivalens</i>)		
<i>A. viride</i>	Green Spleenwort	12
<i>A. ruta-muralis</i>	Wall-rue	56
<i>A. septentrionale</i>	Forked Spleenwort	0.4
<i>Ceterach officinarum</i>	Rustyback	10

Woodsiaceae – Lady-fern family (7 species in Cumbria)

* <i>Matteucia struthiopteris</i>	Ostrich Fern	0.2 %
* <i>Onoclea sensibilis</i>	Sensitive Fern	0.3
<i>Athyrium filix-femina</i>	Lady-fern	85
<i>Gymnocarpium dryopteris</i>	Oak Fern	13
<i>G. robertianum</i>	Limestone Fern	2
<i>Cystopteris fragilis</i>	Brittle Bladder-fern	35
<i>C. montana</i>	<i>Mountain Bladder-fern</i>	extinct
<i>Woodsia ilvensis</i>	<i>Oblong Woodsia</i>	0.1

Dryopteridaceae – Buckler-fern family (11 species in Cumbria)

<i>Polystichum setiferum</i>	Soft Shield-fern	5 %
<i>P. aculeatum</i>	Hard Shield-fern	24
<i>P. lonchitis</i>	Holly Fern	0.3
<i>Dryopteris oreades</i>	Mountain Male-fern	4
<i>D. filix-mas</i>	Male-fern	91
<i>D. affinis</i>	Scaly Male-fern	49
(in three subspecies, <i>affinis</i> , <i>cambrensis</i> & <i>borreri</i> – beyond the scope of this booklet, and indeed this author)		
<i>D. aemula</i>	Hay-scented Buckler-fern	0.3
<i>D. submontana</i>	Rigid Buckler-fern	2
<i>D. carthusiana</i>	Narrow Buckler-fern	15
<i>D. dilatata</i>	Broad Buckler-fern	92
<i>D. expansa</i>	Northern Buckler-fern	0.7

Blechnaceae – Hard-fern family (1 species in Cumbria)

<i>Blechnum spicant</i>	Hard-fern	66 %
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Total number of species of ferns and fern-allies in Cumbria = 62

Number of 'true' ferns = 44

Synonyms & alternative vernacular names

<i>Asplenium billotii</i>	= <i>A. obovatum</i> (Lanceolate Spleenwort)
<i>A. trichomanes-ramosum</i>	= <i>A. viride</i> (Green spleenwort)
<i>A. ceterach</i>	= <i>Ceterach officinarum</i> (Rustyback)
<i>Dryopteris abbreviata</i>	= <i>D. oreades</i> (Mountain Male-fern)
<i>D. assimilis</i>	= <i>D. expansa</i> (Northern Buckler-fern)

<i>D. borrieri</i>	= <i>D. affinis</i> (Scaly Male-fern)
<i>D. villarii</i>	= <i>D. submontana</i> (Rigid Buckler-fern)
<i>Polypodium australe</i>	= <i>P. cambricum</i> (Southern Polypody)
<i>Thelypteris dryopteris</i>	= <i>Gymnocarpium dryopteris</i> (Oak Fern)
<i>Thelypteris robertiana</i>	= <i>G. robertianum</i> (Limestone Fern)
<i>Thelypteris phegopteris</i>	= <i>Phegopteris connectilis</i> (Beech Fern)
<i>Thelypteris limbosperma</i> ; <i>T. oreopteris</i>	= <i>Oreopteris limbosperma</i> (Lemon-scented Fern)

Alpine Buckler-fern	= Northern Buckler-fern
Common Horsetail	= Field Horsetail
Common Spleenwort	= Maidenhair Spleenwort
Dutch Rush	= Rough Horsetail
Golden-scaled Male-fern	= Scaly Male-fern
Limestone Polypody	= Limestone Fern
(Sweet) Mountain Fern	= Lemon-scented Fern
Small/Dwarf Male-Fern	= Mountain Male-fern

Hybrids

The hybrids listed below have been recorded in Cumbria. All are rare, except perhaps in the male-fern group, and they can safely be ignored for most practical purposes. They are given here for completeness.

All are more or less intermediate between the parents, but the most useful feature is their usual sterility, a condition which shows itself in the abortion of spores, and often whole spore-capsules, so that under the microscope, very few or no 'good' spores can be seen, and spore-capsules break open to reveal just a mass of colourless spores with shrivelled coats and no apparent contents. Spores with coloured contents can be grossly enlarged in some hybrids.

(Be aware that spore sterility can sometimes occur even in fertile plants due to adverse conditions during spore ripening, although some ripe spore-capsules (with good spores) can usually still be found, and enlargement of spores is not then observed.)

Plants which do not fit into your idea of a species, or seem to combine features of two species, are much more likely to be odd forms of one 'good' species rather than hybrids between two. If, at the season when spore-capsules should be ripe, such plants also show spore abortion, then seek expert advice!

<i>Isoetes echinospora</i> × <i>I. lacustris</i>	0.1 %
<i>Equisetum hyemale</i> × <i>E. variegatum</i>	0.1
<i>E. arvense</i> × <i>E. fluviatile</i>	1
<i>Polypodium interjectum</i> × <i>P. vulgare</i>	1
<i>Asplenium ruta-muraria</i> × <i>A. septentrionale</i>	(? extinct)
<i>A. septentrionale</i> × <i>A. trichomanes</i> ssp <i>trichomanes</i>	(perhaps extinct)
<i>Polystichum aculeatum</i> × <i>P. setiferum</i>	0.2
<i>Dryopteris filix-mas</i> × <i>D. affinis</i>	0.3
<i>D. filix-mas</i> × <i>D. oreades</i>	0.1
<i>D. carthusiana</i> × <i>D. filix-mas</i>	(? extinct)
<i>D. carthusiana</i> × <i>D. dilatata</i>	
<i>D. dilatata</i> × <i>D. expansa</i>	0.1

Rare Cumbrian Pteridophytes not covered in the main key

Interrupted Clubmoss – quite like Stag's-horn Clubmoss, but creeping stems shorter and less conspicuous; there are more ascending/erect stems, which show constrictions at intervals - hence the name. Stems more prickly, with tough jutting toothed leaves, and solitary stalk-less cones. Some strong colonies on the east slopes of Bow Fell. (Locally common in Scotland.)

Shady Horsetail – delicate and feathery like Wood Horsetail, but branches not themselves branched; branches very slender, triangular in cross-section, so branch-sheaths with three teeth only. Perhaps now extinct in the county; once collected in Swindale, Brough. (Frequent in parts of Teesdale and Weardale; to be looked for in Cumbria.)

Pillwort – makes a 'turf' of shortish bright green upright grass-like shoots, about 2-8 cm long, on margins of pools. Shoots unroll from the tip, unlike grasses, sedges, and rushes, but like ferns. Rare, mainly in the south-west of the county.

Small Adder's-tongue – blades less than 3 cm × 2 cm, often in pairs. Only known in dune-slacks in one site (and very rare elsewhere in UK as a whole).

Maidenhair Fern – obviously like the house plant; very delicate with wiry stipe, pinnae stalked, large, ± triangular, bright green. A very rare fern of shaded seepage sites on limestone cliffs by the sea, Morecambe Bay only.

Killarney Fern – a filmy-fern, large by filmy-fern standards, of very shaded and humid sites. Only one site left for the sporophyte – the 'fern proper' – in the county. However, its alternate generation ('gametophyte') – forming a dense mat of green filaments very like a filamentous alga – has been found recently in several places, all in very dark and humid caves and crevices. These mats are capable of generating new sporophyte plants. (A very few other sites for the sporophyte, mainly in wet western parts of S.W. England, Wales, Scotland, Ireland; the gametophyte generation quite widespread.)

Lanceolate Spleenwort – like Black Spleenwort, but more divided, narrowing to base (shape G to I). Three sites, on shaly rocks and walls in S.W. Cumbria. (Frequent in Wales, Cornwall, etc.)

Mountain Bladder-fern – like Brittle Bladder-fern, but with triangular fronds, patch-forming. Once collected on Helvellyn; now presumed extinct. (Still a few sites in Scotland.)

Oblong Woodsia – a tiny tufted fern, like a stunted Bladder-fern, but scaly below. Apparently only one Cumbrian site left, on dry rocks in Lakeland. (Perhaps half-a-dozen localities remaining in UK. Reintroduction attempts are taking place in Teesdale and Southern Uplands.)

Introduced Ferns

Water Fern – nothing like a fern: individually a tiny scaly-looking floating pond-plant, but making large patches on still water, turning a shade of pink or red.

Ostrich Fern – makes ‘shuttlecocks’ of tall sterile fronds strongly reminiscent of Lemon-scented Fern, but the fertile fronds are in the centre of the crown, short, and very stiff and woody. In marshy fields, wet woodland, waste places.

Sensitive Fern - makes widely spreading patches of upright sterile fronds, looking like gross, broad Polypody fronds (1-pinnate, with wide pinnae, their edges being wavy). Fertile fronds are separate, shorter, and brown. Wet woodlands, etc.

Further Reading

The following cover Pteridophytes only; the group also appears (usually too scantily treated) in many general flora guides.

The fern ‘bible’ is still *Ferns of Britain and Ireland* by C.N. Page (C.U.P.)

The Illustrated Field Guide to Ferns and Allied Plants of the British Isles by A.C. Jermy. & J. Camus. Natural History Museum publications, London.

The Fern Guide by J. Merryweather and M. Hill, in the AIDGAP series by the Field Studies Council (Preston Montford, Shrewsbury SY4 1HW) has excellent illustrations, and keys which seem to work, but make sure you obtain the revised, corrected edition, not the first edition.

Welsh Ferns, Clubmosses, Quillworts and Horsetails by G. Hutchinson and B.A. Thomas (National Museum of Wales). This covers all British Ferns, in spite of its name.

An absolutely essential purchase for anyone interested, at any level, in the county’s flora is *A Flora of Cumbria* by G. Halliday (University of Lancaster 1997). It has tetrad distribution maps, and much useful information on habitat, etc., for all vascular plants in the county.

Acknowledgements

Grateful thanks to David Clarke, Geoff Naylor and Mike Porter for checking and for many useful comments.

Frond outlines are from specimens, with bitmaps prepared by scanning or digital photography, and these outlined using computer software. Some artwork is by the author. Other line-drawings are from W.H. Fitch’s illustrations for Bentham’s *Handbook of the British Flora* (1865).

The fern life-cycle

