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 - 1947
 - 1947 Clustered Lady's-mantle Alchemilla glomerulans: S. M. Walters (Walters, 1949)
 - 1949 Rare Spring-sedge Carex ericetorum: T.C. Tutin (1949) herb. DHM (Graham, 1988)
 - Large-toothed Lady's-mantle Alchemilla subcrenata: M. E. Bradshaw; identified by 1951 S.M. Walters (Walters, 1952)
 - Alpine Foxtail Alopecurus magellanicus: D. Ratcliffe & A. Eddy (Ratcliffe & Eddy, 1960) 1959
 - 1965 Dwarf Birch Betula nana: re-found by T.C. Hutchinson (Hutchinson, 1966)
 - 1966 a dandelion Taraxacum pseudonordstedtii: new species named by A. J. Richards (Richards, 1972)
 - Water Sedge Carex aquatilis: H.C. Proctor; identified by A.C. Jermy (Graham, 1988 pers. 1968 comm.)
 - 1970 Kidney Vetch Anthyllis vulneraria ssp. lapponum: M.E. Bradshaw
 - 1979 Whorl-grass Catabrosa aquatica: F.J. Roberts (Roberts & Halliday, 1979)

The lady's-mantles were identified by Wilmot from material in the British Natural History Museum (BNHM). Large-toothed Lady's-mantle was found by the author on her first 'sampling' expedition after meeting Max Walters. Also, in the BNHM there is a sheet of four whole plants of a lady's-mantle collected by Druce in 1924 at Langdon Beck and subsequently identified by Walters as Shining Lady's-mantle. No plants of this species were found in Teesdale during the author's early searching in the 1950s, nor later.

Rare Spring-sedge was recognised by Tutin when looking for the Teesdale Violet with D.H. Valentine on Widdybank Fell.

Water Sedge was found by the Revd Hugh Proctor in 1968 in slack water by a small tributary on the north side of the Tees before the building of the Cow Green Reservoir destroyed the site (for later finds see below). The reservoir was first filled in 1972.

Dwarf Birch was re-found by Tom Hutchinson, the location fits well enough with the record of "on a moss near Birdale [Birkdale]" in Hunter's Notebook 1699 (Horsman, 2011) and "on a moss near Birdale [Birkdale]" (Camden, 1722).

Whorl-grass was found in 1979 by F. J. Roberts (pers. comm.) on the NE side of Little Fell (River Lune drainage into the Tees) and in 2005 on Mickle Fell by R. Corner, F. J. Roberts and L. Robinson.

21st century - more additions have been made:

In 2001, following the removal of sheep from the higher Teesdale fells because of the earlier serious outbreak of Foot-and-mouth Disease, the very short vegetation at the higher levels above about 615 m attained a size by which the erstwhile hidden species could be identified.

- Sheathed Sedge Carex vaginata: F.J. Roberts on Little Dun and Knock Fells (Corner, 2005 Roberts & Robinson, 2006). Other populations have been found on the Cross Fell to Mickle Fell range, as well as more Alpine Foxtail and Water Sedge found by R. W. M. Corner on the Cross Fell range, and more populations of the Alpine Foxtail, and Water Sedge Carex aquatilis, have been discovered.
- A Yellow-rattle Rhinanthus minor ssp. monticola on Widdybank Fell: M.E. Bradshaw; 2008 identified by A. Lean
- 2009 Northern Deergrass Trichophorum cespitosum: F.J. Roberts (Roberts, 2009) Northern Deergrass and the hybrid *T.* × *foersteri* with Common Deergrass [see 1905] were both found by Roberts in Widdybank Pasture at about 430 m in Forest-in-Teesdale,

means without prior written permission of the publisher. and both at 490 m, two small tufts only, by M. E. Bradshaw with L. Robinson, on Valley Bog, near Moor House, at 553 m, in 2010.

- 2011 Rush hybrid *Juncus × surrejanus* in Forest-in-Teesdale at about 430 m: M. E. Bradshaw; identified by M. Wilcox (*pers. comm.*)
- 2014 Slender Sedge Carex lasiocarpa on Black Hill opposite Birkdale at about 450 m: J. O'Reilly, BSBI Meeting
- 2022 Dwarf Birch Betula nana on Cronkley Fell: by J. O'Reilly on 29th August

The future

It is highly likely that new finds of plants in Teesdale will continue to be made, particularly of species that are known on the west side of the watershed. This is exemplified, for example, by the following finds: Alpine Saxifrage and Alpine Meadow-grass found by P.S. Lloyd in High Cup Nick in 1964; Alpine Cat's-tail in Crowdundle Beck; and Field Fleawort on Mickle Fell. Field Fleawort as *Senecio campestris* is included in Baker (1903), p.83, no date or exact location is given. Halliday (1997), p.480, has "1846 J. Backhouse on limestone outcrops 1200–1500ft. above Brough," also "Westmorland side of Mickle Fell (T.J. Foggitt) is presumably somewhere near Little Fell." In 2011, a search above Brough was unsuccessful (F.J. Roberts, pers.comm.). Field Fleawort is a plant of the chalk in SE England – could it be on Cronkley Fell along with Horseshoe Vetch, Dwarf Milkwort and Small Scabious?

A good knowledge of the mountain flora and a sharp eye are all that are needed by the plant hunter, plus determination, persistence and a fit body, as well as a notebook and/or camera. However, not only have changes in management resulted in the appearance of species hitherto not recorded in the area, climate change is sure to make its impact felt among this special relict community. Alas, many of this Teesdale Assemblage of rare and special plants have decreased in quantity and range during the 70 years the author has known the Upper Tees catchment area and the Moor House-Upper Teesdale NNR in the dale. It is management practices in the more immediate future that will determine their long-term survival, as much as climate change.

I am aware there are many omissions from the Teesdale Assemblage and noteworthy higher plants of the Tees catchment, especially of aquatics, ferns and hawkweeds.



A group recording plants at Maize Beck Scar MWH.

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NTS © Copyright, Princeton University Press. No part of this book may be distributed, posted, or reproduced in any form by digital or mechanical means without prior written permission of the publisher. Communities and habitats of the leesdale Assemblage

The members of the Teesdale Assemblage are to be found in a number of different habitats and plant communities. Some occur in several, whereas others are very specific to one habitat, *e.g.* sugar-limestone or riversides. Human beings have influenced all the habitats and communities over several millennia, so that most can only be described as semi-natural. There is no true wilderness, even though the upper reaches of Teesdale may appear wild and natural to many visitors.

The vegetation that gives special distinction to the flora of Teesdale is that associated with the metamorphosed sugar-limestone on Widdybank and Cronkley Fells. Although similar rock is to be found in small quantities on the metamorphosed Dalradian limestone in the Blair Atholl and Pitlochry areas of Scotland, where some of the 'Teesdale' plants also grow, the associated species are not identical. In the following, descriptions of each community reference the most appropriate National Vegetation Classification (NVC – *see opposite*).

Plant communities and habitats of the sugar-limestone

The most characteristic community occurring on the dry limestone areas is the close-cropped grassland in which the most commonly found plants are:

Sheep's-fescue	Festuca ovina	Eyebright	Euphrasia officinalis agg.
Blue Moor-grass	Sesleria caerulea	Fairy Flax	Linum catharticum
Quaking-grass	Briza media	Wild Thyme	Thymus drucei
Crested Hair-grass	Koeleria macrantha	Common Dog-violet	Viola riviniana
Carnation Sedge	Carex panicea		

Blue Moor-grass - Limestone Bedstraw grassland (CG9) on Widdybank Fell DM.



The National Vegetation Classification (NVC)

The NVC is a system of classifying natural habitat types in Great Britain according to the vegetation they contain. It comprises 286 communities, such as woodlands, grasslands, heaths, *etc.* and all their subtle variations. It was published by Cambridge University Press in the following five volumes:

Rodwell, J. S. (ed.) 1991. British Plant Communities, Volume 1: Woodlands and scrub.

Rodwell, J. S. (ed.) 1992. British Plant Communities, Volume 2: Mires and heaths.

Rodwell, J. S. (ed.) 1992. British Plant Communities, Volume 3: Grassland and montane communities.

Rodwell, J. S. (ed.) 1995. British Plant Communities, Volume 4: Aquatic communities, swamps and tallherb fens.

Rodwell, J. S. (ed.) 2000. British Plant Communities, Volume 5: Maritime communities and vegetation of open habitats.

Information concerning the NVC and details of the codes, communities and associated species can be obtained from the JNCC website at https://bit.ly/38CDNFj.

Photographs and additional information about the species is available from the Online Atlas of the British and Irish flora, which can be accessed via https://www.brc.ac.uk/plantatlas.

The various plant communities are grouped into the following major categories (those highlighted in **bold** include communities that occur in Teesdale):

Code	Description	Number of communities
W	Woodland and scrub	25 (19 classed as woodland; 4 as scrub; 2 as 'underscrub')
М	Mires	38
Н	Heaths	22 (within 6 subgroups)
MG	Mesotrophic grasslands	13
CG	Calcicolous grasslands	14
U	Calcifugous grasslands and montane communities	21
Α	Aquatic communities	24
S	Swamps and tall-herb fens	28
SM	Salt-marsh communities	28
SD	Shingle, strandline and sand- dune communities	19 (16 classed as sand-dune; 1 as shingle; 2 as strandline)
MC	Maritime cliff communities	12
OV	Vegetation of open habitats	42

NVC communities and sub-communities in Teesdale, referred to in this book

Code	Constant (and associated) species
Woodl	and and Scrub
W3	Bay Willow Salix pentandra-Bottle Sedge Carex rostrata woodland
W9	Ash Fraxinus excelsior–Rowan Sorbus aucuparia–Dog's Mercury Mercurialis perennis woodland
W9b	Ash Fraxinus excelsior–Rowan Sorbus aucuparia–Dog's Mercury Mercurialis perennis woodland, Marsh Hawk's-beard Crepis paludosa sub-community
W11	Sessile Oak <i>Quercus petraea</i> –Downy Birch <i>Betula pubescens</i> –Wood-sorrel <i>Oxalis acetosella</i> woodland
W19	Common Juniper Juniperus communis ssp. communis–Wood-sorrel Oxalis acetosella woodland

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Code	Constant (and associated) species
Mires	
M1	Cow-horn Bog-moss <i>Sphagnum denticulatum</i> bog pool community (with Common Cottongrass <i>Eriophorum angustifolium</i> , Bogbean <i>Menyanthes trifoliata</i> and Feathery Bogmoss <i>Sphagnum cuspidatum</i>)
	[5 associated rare species: Bog Orchid <i>Hammarbya paludosa</i> , Brown Beak-sedge <i>Rhynchospora fusca</i> , Rannoch-rush <i>Scheuchzeria palustris</i> , Intermediate Bladderwort <i>Utricularia intermedia</i> and Golden Bog-moss <i>Sphagnum pulchrum</i> .]
M2	Feathery Bog-moss <i>Sphagnum cuspidatum</i> /Flexuous Bog-moss <i>S. flexuosum</i> bog pool community (with Cross-leaved Heath <i>Erica tetralix</i> , Common Cottongrass <i>Eriophorum</i> <i>angustifolium</i> , Round-leaved Sundew <i>Drosera rotundifolia</i> and Flat-topped Bog-moss <i>Sphagnum fallax</i>)
	[3 associated rare species: Bog-rosemary <i>Andromeda polifolia</i> , Tall Bog-sedge <i>Carex magellanica</i> and Golden Bog-moss <i>Sphagnum pulchrum</i> .]
M4	Bottle Sedge <i>Carex rostrata</i> –Flexuous Bog-moss <i>Sphagnum flexuosum</i> mire (with Common Haircap <i>Polytrichum commune</i> , Feathery Bog-moss <i>Sphagnum cuspidatum</i> and Flat-topped Bog-moss <i>Sphagnum fallax</i>)
	[2 associated rare species: String Sedge <i>Carex chordorrhiza</i> and Tufted Loosestrife <i>Lysimachia thrysiflora</i> .]
M7b	White Sedge <i>Carex canescens</i> –Russow's Bog-moss <i>Sphagnum russowii</i> mire, Water Sedge <i>Carex aquatilis</i> –Flexuous Bog-moss <i>Sphagnum recurvum</i> sub-community
M10	Dioecious Sedge Carex dioica-Common Butterwort Pinguicula vulgaris mire
M10b	Dioecious Sedge <i>Carex dioica</i> –Common Butterwort <i>Pinguicula vulgaris</i> mire, Quaking-grass <i>Briza media</i> –Bird's-eye Primrose <i>Primula farinosa</i> sub-community
M10c	Dioecious Sedge <i>Carex dioica</i> –Common Butterwort <i>Pinguicula vulgaris</i> mire, Hook-beaked Tufa-moss <i>Hymenostylium recurvirostrum</i> sub-community
M11	Common Yellow-sedge <i>Carex demissa</i> —Yellow Saxifrage <i>Saxifraga aizoides</i> mire [can merge into M10]
M16	Cross-leaved Heath Erica tetralix-Compact Bog-moss Sphagnum compactum wet heath
M16d	Cross-leaved Heath <i>Erica tetralix</i> –Compact Bog-moss <i>Sphagnum compactum</i> wet heath, Heath Rush <i>Juncus squarrosus</i> –Broom Fork-moss <i>Dicranum scoparium</i> sub-community
M17	Northern Deergrass <i>Scirpus cespitosus</i> (now <i>Trichophorum cespitosum</i>) [but since this species has now been split, the definition should be to deergrass sp. <i>Trichophorum</i> sp.]–Hare's-tail Cottongrass <i>Eriophorum vaginatum</i> blanket mire
M21	Bog Asphodel Narthecium ossifragum–Papillose Bog-moss Sphagnum papillosum valley mire
M26	Purple Moor-grass Molinia caerulea-Marsh Hawk's-beard Crepis paludosa mire
M32	Fountain Apple-moss Philonotis fontana-Starry Saxifrage Saxifraga stellaris spring
M37	Curled Hook-moss Palustriella commutata-Red Fescue Festuca rubra spring
M38	Curled Hook-moss Palustriella commutata-Common Sedge Carex nigra spring
Heaths	
H10b	Heather <i>Calluna vulgaris</i> -Bell Heather <i>Erica cinerea</i> heath, Woolly Fringe-moss <i>Racomitrium lanuginosum</i> sub-community
Mesot	rophic grasslands
MG3	Sweet Vernal-grass Anthoxanthum odoratum–Wood Crane's-bill Geranium sylvaticum grassland (with Common Bent Agrostris capillaris and Smooth Lady's-mantle Alchemilla glabra) [associated with well-drained permanent pastures and meadows. Localized community of northern England.]

Code	Constant (and associated) species
MG3b	Sweet Vernal-grass Anthoxanthum odoratum–Wood Crane's-bill Geranium sylvaticum grassland, Quaking-grass Briza media sub-community [associated with well-drained permanent pastures and meadows. Localized community of northern England.]
MG6a	Perennial Rye-grass <i>Lolium perenne</i> -Crested Dog's-tail <i>Cynosurus cristatus</i> grassland, typical sub-community
MG6b	Perennial Rye-grass <i>Lolium perenne</i> -Crested Dog's-tail <i>Cynosurus cristatus</i> grassland, Sweet Vernal-grass <i>Anthoxanthum odoratum</i> sub-community
MG8	Crested Dog's-tail Cynosurus cristatus-Marsh-marigold Caltha palustris grassland
Calcico	lous grasslands
CG8	Blue Moor-grass Sesleria caerulea-Small Scabious Scabiosa columbaria grassland
CG9	Blue Moor-grass Sesleria caerulea-Limestone Bedstraw Galium sterneri grassland
CG9a	Blue Moor-grass Sesleria caerulea–Limestone Bedstraw Galium sterneri grassland, Hoary Rock-rose Helianthemum oelandicum–Squinancywort Asperula cynanchica sub-community
CG9b	Blue Moor-grass <i>Sesleria caerulea</i> -Limestone Bedstraw <i>Galium sterneri</i> grassland, typical sub-community
CG9c	Blue Moor-grass Sesleria caerulea–Limestone Bedstraw Galium sterneri grassland, Flea Sedge Carex pulicaris–Carnation Sedge C. panicea sub-community
CG9d	Blue Moor-grass <i>Sesleria caerulea</i> –Limestone Bedstraw <i>Galium sterneri</i> grassland, Hair Sedge <i>Carex capillaris</i> –False Sedge <i>Carex simpliciuscula</i> sub-community (includes Heather <i>Calluna vulgaris</i> and Cranberry <i>Vaccinium oxycoccos</i>)
CG9e	Blue Moor-grass Sesleria caerulea–Limestone Bedstraw Galium sterneri grassland, Mossy Saxifrage Saxifraga hypnoides–Pyrenean Scurvygrass Cochlearia pyrenaica sub-community [ssp. pyrenaica is usually found on more basic soils than is ssp. alpina]
CG10	Sheep's-fescue Festuca ovina–Common Bent Agrostis capillaris–Wild Thyme Thymus drucei grassland
CG10c	Sheep's-fescue <i>Festuca ovina</i> -Common Bent <i>Agrostis capillaris</i> -Wild Thyme <i>Thymus drucei</i> grassland, Yellow Saxifrage <i>Saxifraga aizoides</i> -Bendy Ditrichum <i>Ditrichum flexicaule</i> sub-community
Calcifu	gous grassland and montane communities
U4	Sheep's-fescue <i>Festuca ovina</i> –Common Bent <i>Agrostris capillaris</i> –Heath Bedstraw <i>Galium saxatile</i> grassland
U4a	Sheep's-fescue <i>Festuca ovina</i> -Common Bent <i>Agrostris capillaris</i> -Heath Bedstraw <i>Galium saxatile</i> grassland, typical sub-community
U4b	Sheep's-fescue Festuca ovina–Common Bent Agrostris capillaris–Heath Bedstraw Galium saxatile grassland, Yorkshire-fog Holcus lanatus–White Clover Trifolium repens sub- community (species-rich variant, including Lady's Bedstraw Galium verum, Harebell Campanula rotundifolia and Bitter-vetch Lathyrus linifolius)
U6	Heath Rush Juncus squarrosus-Sheep's-fescue Festuca ovina grassland
U10	Stiff Sedge Carex bigelowii-Woolly Fringe-moss Racomitrium lanuginosum moss-heath
U17	Great Wood-rush Luzula sylvatica-Water Avens Geum rivale tall-herb community
U21	Parsley Fern Cryptogramma crispa-Wavy Hair-grass Deschampsia flexuosa community
Swamp	os and tall-herb fens
S27	Bottle Sedge Carex rostrata-Marsh Cinquefoil Commarum palustre tall-herb fen
Vegeta	tion of open habitats
OV37	Sheep's-fescue Festuca ovina-Spring Sandwort Sabulina verna community
OV40	Green Spleenwort Asplenium viride–Brittle Bladder-fern Cystopteris fragilis community

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means without prior written permission of the publisher. If Blue Moor-grass is omitted, this grassland community is widespread on calcareous soils in many northern districts. In Teesdale, some of the plant communities on the sugar-limestone (CG9) are difficult to classify, therefore some of the assigned sub-communities should be regarded as approximations.

Other familiar species are:

Ribwort Plantain	Limestone Bedstraw
Mouse-eared Hawkweed	Glaucous Sedge
Devil's-bit Scabious	Spring-sedge
Common Rock-rose	Heath-grass
Autumn Gentian	

The most constant mosses are Cypress-leaved Plait-moss, Comb-moss, Woolly Fringe-moss and Bendy Ditrichum.

On the sugar-limestone there are additional species of more or less local distribution. Some are widespread northern plants: Alpine Bistort, Mountain Everlasting, Alpine Cinquefoil, Hoary Whitlowgrass and Lesser Clubmoss. Of the true mountain plants, Hair Sedge occurs also in the Highlands where False Sedge has a few localities. Bird's-eye Primrose, Spring Sandwort and an endemic dandelion *Taraxacum pseudonordstedtii* are found in northern England; Teesdale Violet and Dwarf Milkwort are extreme rarities in the north of England and Spring Gentian is virtually confined to Upper Teesdale (CG9d). Two distinctive species at their extreme northern locations are the Rare Spring-sedge and the very rare Horseshoe Vetch; Small Scabious is also present (CG9a).

A few other species are Dark-red Helleborine, a subspecies of Kidney Vetch (ssp. *lapponica*) and Sea Plantain. Among the notable mosses Frizzled Crisp-moss var. *curta* is constant, but Wrinkle-leaved Feather-moss is very local. A number of 'meadow' species occur: Globeflower,



Calcareous grassland MR.

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Many of these plants are inconspicuous and no one patch of grassland contains them all. On the summit, outcrops of sugarlimestone on Cronkley Fell, the turf contains two dwarf shrubs – prostrate patches of Mountain Avens and Hoary Rock-rose – as well as Common Rock-rose, Wild Thyme, Small Scabious, Dark-red Helleborine and Crowberry, ordinarily a plant of acidic soils.

Local damper patches within the Blue Moor-grass-Sheep's-fescue turf can be recognized by the increase of False Sedge and Bird's-eye Primrose and patches of Tawny Sedge now more obvious as a result of overgrazing by Rabbits. This dry sward is in some respects intermediate between the southern lowland and northern montane calcareous grasslands, but with a distinct northern bias. Some species are absent or rare in Scotland - Spring Gentian, Spring Sandwort, False Sedge, Rare Spring-sedge, Bird's-eye Primrose, Teesdale Violet and Dwarf Milkwort (CG9d). Although Spring Gentian, Mountain Avens and Blue Moorgrass grow together in western Ireland, the composition of that sward is not the same. No calcareous grassland elsewhere has quite the same combination of plants as found on Cronkley and Widdybank Fells.

Grassland on the unaltered limestone may contain several of these rare species, but with increasing distance from the sugar-limestone more of the distinctive species are absent. At higher altitudes (700–750 m) several 'Teesdale' species reappear: Alpine Forget-menot, Spring Gentian, Spring Sandwort, Hoary Whitlowgrass, Alpine Bistort, Northern Bedstraw, Pyrenean Scurvygrass, Mountain Everlasting, Mossy Saxifrage, Mountain Pansy and Moonwort (CG9e).



тор: Calcareous grassland (CG10); воттом: Calcareous grassland species *both MR*.

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Limestone heath

Where the sugar-limestone soil is mixed with a proportion of glacial drift and forms a brown calcareous soil, the Blue Moor-grass-Sheep's-fescue community has a sparse cover of short Heather and Crowberry. Amongst this many of the sugar-limestone plants, including Spring Gentian, Northern Bedstraw, Alpine Bistort, Mountain Everlasting, Alpine Meadow-rue, Harebell and the woodland relic Wood Anemone are frequent. A few flowers of Creeping Willow have been found, but no Wood Crane's-bill. This is a very rare type of vegetation that is only known from a few other places in northern England and Scotland.

Wet calcareous communities

A short sedge-marsh has developed where the sugar-limestone meets the blanket bog over the impervious Whin Sill rock and the mixture of granular sugar-limestone and redistributed peat is frequently flooded with calcareous water. In a ground layer of mosses and liverworts are False, Tawny, Carnation, Flea and Common Sedges and Long-stalked Yellow-sedge. Sheep's-fescue is also present, but generally grasses are scarce. Here Alpine



Blue Moor-grass – Heather heath in foreground MEB.

Meadow-rue is sometimes abundant and Bird's-eye Primrose and Scottish Asphodel occur (M10a).

Mossy spring-heads and gravelly flushes

These occur where lime-rich water drains out of the sugar-limestone above impervious layers of baked mudstone or the Whin Sill and below limestone strata on other parts of the Fells. The spring-heads may have a domed head of Curled Hook-moss, Fountain Apple-moss and Thick-nerved Apple-moss with Pyrenean Scurvygrass, Cuckooflower, Opposite-leaved Golden-saxifrage and Starry Saxifrage (M38). The more open gravelly areas are characterized by tight, dark green, cushions of two rare mosses, Hook-beaked Tufa-moss and the darker Golf-club Moss amongst a sparse cover of the other marsh mosses. In both habitats the mosses become encrusted with lime, precipitated out of the calcareous water and form the porous, fragile tufa rock that is easily broken by trampling (M10c).

These mini-hummocks are eventually colonized by many of the rare species: False Sedge, Bird's-eye Primrose, Hair Sedge, Alpine Meadow-rue, Scottish Asphodel and Spring and Teesdale Sandworts. Other species, usually in the open wet areas are: Yellow Saxifrage, Alpine Rush, Three-flowered Rush and Variegated Horsetail. Other more widespread flush and marsh plants include: Dioecious Sedge, Long-stalked Yellow-sedge, Carnation Sedge, Few-flowered Spikerush, Common Butterwort, Knotted Pearlwort, Alpine Rush, Jointed Rush, Sea Plantain and very



Short sedge-marsh (M10a) DM.



Turfy calcareous, gravelly flush GH.

Hook-beaked Tufa-moss cushions (M10c) JO'R.



Spring head mound (potential tufa mound) MEB.



Centre of tufa mound with Alpine Bartsia MR.



Former tufa mound completely destroyed by trampling 2013 *MEB*.

occasionally Thrift (M10c and M37). These communities/sub-communities are found mainly on the upper parts of Widdybank and Cronkley Fells, and occasionally at higher levels. Less species-rich forms are also found in Cronkley Pasture below springs and in flushes.

Turfy marshes

On the dip slope of Widdybank Pasture, and to a lesser extent across the Tees in Cronkley Pasture, where the lime-rich glacial drift is deeper and has been formed into a series of drumlins and lateral moraines, combinations of very similar dwarf sedge communities are found on the wetter ground. These are subject to the grazing and trampling of cattle, as well as sheep. Poaching by the cattle has broken up the even 'swards', disturbing the drainage and, in places, creating vegetated mini-hummocks in a matrix of mud and gravel – the turfy marshes of Pigott (1956). The relatively dry tops support Blue Moor-grass, Spring Gentian, Hair and Glaucous Sedges, and are the particular habitat of the rare Alpine Bartsia. The wet ground carries an abundance of marsh

means without prior written permission of the publisher. sedges and rushes together with locally abundant Bird's-eye Primrose, Marsh Valerian, Grass-of-Parnassus, Frog Orchid, Marsh Fragrant-orchid, Early and Northern Marsh-orchids, Common Twayblade, Broad-leaved Cottongrass, Flat-sedge, Marsh Arrow-grass, Yellow Saxifrage, False Sedge, Scottish Asphodel, Alpine Rush, Marsh Horsetail and dispersed plants of Purple Moorgrass. Locally, where the grazing and poaching are absent, there is a damp Purple Moor-grass community with Globeflower and Wood Crane's-bill and Sneezewort. Communities of similar species occur on the moist, unstable, clayey sides below the spring-line of some moraines, and there is a fine example by the Tees where the river constantly erodes the base. More grassdominated and slightly less species-rich communities are found in the upper part of the valley, on drift banks with solifluction terraces enhanced by trampling. Here may be Spring Gentian, Bird's-eye Primrose, Blue Moor-grass and Lesser Clubmoss (M10).

Also, at these lower levels are/were a few fine hook-moss spp.–apple-moss spp.-dominated tufa mounds over spring-heads. Too often, trampling has caused leaking from the sides and the lessening of the central artesian effect that enabled the deposition of tufa, with the consequential drying and invasion by herbaceous species such as Creeping Bent, Common Cottongrass, Selfheal and tall rushes *e.g.* Soft-rush, *etc.*

Meadows

In the first half of the 20th century the meadows in the valley bottom and up the south face of Teesdale and Harwood Dale, on the better brown earth and brown podsolic soils, consisted of a large number of higher plants. At the time, at almost 600 m, Grass Hill was the highest farm in England. In summer, this richness and colour, and their nutrient level was being maintained by light dressings of farmyard manure (FYM) and occasional applications of lime or basic slag. Unfortunately, only a few of these traditional upland hay meadows, with their spectacular botanical display, have survived the advent of selective weed-killers and the widespread applications of artificial Nitrogen–Phosphorus–Potassium (NPK) manures, the unavailability of basic slag, and reduced applications

of lime. This century, following an awareness of the great decline of these species-rich meadows, much research, time and effort has been put into attempting to recreate the original flora, but it is essential to also restore the original quality of the soil. Does a diet of mixed herbs produce healthier livestock? If so, and there is evidence that it does, there would be an incentive to the farmers to value such pretty, but lower-yielding, meadows.

The flora of the original meadows showed a close similarity to that of the remaining upland deciduous woodlands, from which it is believed they were derived. Seasonal grazing favoured an increase in the grasses, and over time an equilibrium of broad-leaved species, grasses and sedges was reached, with none particularly dominant.

The usual grasses include: Sweet Vernal-grass, Red Fescue, Yorkshire-fog, Cock's-foot, Quakinggrass, Smooth and Rough Meadow-grasses, Crested Dog's-tail and some Perennial Rye-grass and Tufted



Wet Marsh-marigold meadow (MG8), Forest-in-Teesdale *DM*.

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means without prior written permission of the publisher. Hair-grass. The most conspicuous herbs are, or were, Globeflower, Wood Crane's-bill, and the occasional Melancholy Thistle, Meadowsweet, Great Burnet, dandelions, Pignut, Rough Hawkbit, Cat's-ear, Meadow and Bulbous Buttercups, Yellow-rattle, Oxeye Daisy, Heath Spotted-orchid, Heath Fragrant-orchid and Common Twayblade, the two common Lady's-mantles (Pale and Smooth) and Common Sorrel, producing a yellow-white-red/brown visual effect, instead of the yellow-white-mauve of earlier times. Other species include: Red and Zigzag Clover, Selfheal, Mountain Pansy, Lady's Bedstraw, Harebell and occasionally Field Gentian. Where the soil becomes leached the variety is much reduced and Wavy Hair-grass and even Mat-grass are found (MG3b). In damper areas Meadowsweet is more abundant, with Marsh Hawk's-beard, Ragged-Robin, Heath Spotted-orchid and Northern Marsh-orchid, Sneezewort, Marsh Valerian, Marsh Lousewort, Wild Angelica and more sedges and rushes: Carnation and Common Sedge, Common Cottongrass, Soft-rush, Sharp-flowered and Jointed Rushes. These meadows may only be mown in the drier years. The only rare species in the meadows include some eyebrights, occasional Northern Hawk's-beard and five species of lady's-mantle: Large-toothed, Velvet (Teesdale only), Starry (also in Weardale), Clustered and Rock – both rare in northern England (MG8).

Today, the finest meadow-type community lies between the south bank of the River Tees and the fenced-off meadows and pastures down the river below High Force. The Whin Sill and limestone rocks are exposed as small cliffs or flat slabs, or covered with alluvial soils to various depths, so a mosaic of basic and acidic substrates exists. When the river is high, the lower areas, even as far as the public footpath, are awash and flooded with debris. Scattered trees and bushes occur: the northern form of Downy Birch (ssp. tortuosa), Bird Cherry, Goat, Grey, Tea-leaved, Creeping and Eared Willows, Alder, Hazel, occasional Rock Whitebeam trees, Common Juniper and Stone Bramble. Under these, and in the wider open areas, are all the meadow species listed above, except for Velvet and Large-toothed Lady's-mantles, augmented with more frequent Globeflowers, Betony, Saw-wort, Common Knapweed, Field Scabious, Goldenrod, Northern Bedstraw, Wood and Field Horsetails, Burnet-saxifrage, Devil's-bit Scabious, Meadow and Downy Oat-grasses, Tall Fescue, Blue Moorgrass, Viviparous Sheep's-fescue, and several sedges: Glaucous and Flea Sedges, and Long-stalked Yellow-sedge. Rooted in the Whin Sill crevices are Common Rock-rose, Shrubby Cinquefoil, Mountain Everlasting, Goldenrod, Limestone Bedstraw, Lesser Clubmoss, Bird's-eye Primrose, Grass-of-Parnassus, Variegated Horsetail, Flat-sedge and Jointed Rush. The presence of Heather, Bell Heather, Mat-grass, Bilberry and Wood Sage indicate local, more acidic conditions (MG3b).

Woodland and scrub

Upper Teesdale, between Middleton and High Force, gives the impression of being wooded – apart from the conifer plantations and small deciduous woods, the roads, river and streams are lined with trees and shrubs and isolated trees dot the field boundaries. Above 300 m, just west of High Force, the wide valley floor is virtually bare of trees accentuating the 'wild' and barren appearance of this upland area.

Mixed deciduous woodland dominated by Ash and Wych Elm, with some Sessile Oak, once widespread in the area, is restricted to remnants as in Baldersdale and Brockers Gill. Most of the remaining woodland is of the northern form of the Downy Birch found above and below High Force and along some tributaries – Ettersgill and Mill Beck. Birch woodland on base-rich soils, which are often wet, may have Ash, Bird Cherry, Hazel, Alder and willows; the ground flora is varied and contains many tall herbs including: Meadowsweet, Common Valerian, Marsh Thistle, Ragged-Robin, Water Avens, Marsh-marigold, Wild Angelica and Globeflower, Wood



Tees bank species-rich meadow (MG4) DM.

Species-rich meadow (MG3b), Widdybank Farm MR.





Common Juniper with Wood-sorrel (W19) DM.

Crane's-bill and Melancholy Thistle; ferns and mosses are not prominent. More localised and rare species include Giant Bellflower, Northern Hawk's-beard, Herb-Paris, Mountain and Wood Melick grasses and Shady Horsetail (W9).

On acid soils over the Whin Sill the flora is poorer, composed of Bluebell, Wood-sorrel, Common Dog-violet, Creeping Bent, Creeping Soft-grass and the ferns: Broad Buckler-fern, Lemon-scented, Beech and Oak Ferns, Hard-fern and Bracken under Bird Cherry, Goat Willow and Hazel.

The most extensive wooded area is often of impenetrable stands of quite large junipers on the north-facing slopes west of Holwick and on and below Dine Holm Scar, on Whin Sill near Cronkley Farm (where the effects of one-time grazing by goats can be seen outside an existing exclosure fence) and scattered on other Scars and higher slopes, as on Cronkley Fell. Spreading and columnar junipers, with occasional Yews, shelter a sparse woodland flora with several ferns

(including: Oak and Beech Ferns, Hard-fern and Bracken) and Wood-sorrel, but do not form a distinctive flora (W19). It is expected that formerly Common Juniper would have been the shrub layer in taller deciduous woodland. Evidence from 376 charcoal pits linked to iron-smelting hearths found between Holwick and Cronkley Scar suggest there must have been extensive medieval woodland in a large area that is now predominantly moorland or Common Juniper scrub. Threequarters of the wood was birch, with smaller



Ash-Rowan-Dog's Mercury Woodland (W9) DM.

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Tees margins

The vegetation close to the river margins does not form a unique community, but in Teesdale it is characterized by shrubs of the Shrubby Cinquefoil from Falcon Clints to below Middleton. This deep-rooted plant can withstand submergence and the destructive force of the Tees in spate.



Shrubby Cinquefoil, which is submerged when the Tees is in flood (as below) *MR*.



Tees in spate submerging the Shrubby Cinquefoil shown in the image above MR.

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Cliffs, screes, benches and the fell-top plateaux

The major cliffs in Teesdale are the impressive Whin Sill scars of Holwick Scar, Dine Holm Scar, Cronkley Scar, Raven Scar and Falcon Clints. At their bases are block and talus screes. The soils are mostly acidic and very free-draining (although the rocks are baserich, but lacking calcium) and locally have lime-rich waters percolating from above. On these are, locally, impressive stands of Bell Heather, Bearberry and Parsley Fern with Heather, Bilberry and Crowberry. Where inaccessible ledges and block screes give protection from grazing are Great Woodrush, native Rosebay Willowherb, Goldenrod, Holly-fern and others. Many ferns grow in the block and finer scree, the locally frequent Parsley Fern, and the widespread species: Broad Buckler-fern, Hard-fern, Male-fern, Golden-scaled and Mountain Male-ferns, and Fir Clubmoss. This community (U21) with Parsley Fern is a pioneer community, dependant on the accretion of fractured rock from above and a degree of grazing to maintain the unstable habitat. It is nationally rare, particularly so on the east side of the Pennines. A few trees survive on the cliffs, most notably Common Whitebeam, Yew, Aspen, Bird Cherry, Hawthorn and Common Juniper. Plants, grown from spores of Hollyfern and the long-extinct Oblong Woodsia, have been successfully reintroduced into the area of their original sites by the former English Nature (EN) and the Royal Botanic Garden, Edinburgh (RBGE).



Whin Sill block scree, Falcon Clints GY.



Talus and block scree below Holwick Scar MR.

In Teesdale there are no thick strata of limestone and sandstone as in the central and south Pennines. On the north side of Upper Teesdale the edge of the Great Limestone is prominent at High Hurth Edge, but other cliffs are small. Here are the calcicoles: Common Rock-rose, Wild Thyme, Blue Moor-grass, Hoary Whitlowgrass, Burnet-saxifrage, Rock Lady's-mantle, Meadow Saxifrage, Salad Burnet, Small Scabious and annuals such as Rue-leaved Saxifrage, Wall Speedwell and, on the talus, Spring Gentian. Benches of unaltered limestone, as at Cow Green and on the higher slopes south of Cronkley Fell, that have long been grazed by sheep and latterly by Rabbits, support a short bent–fescue turf of various degrees of species-richness, dominated by Sheep'sfescue and Common Bent. Other frequent species include: Sweet Vernal-grass, Crested Dog's-

means without prior written permission of the publisher. tail, Quaking-grass, Heath Bedstraw, Tormentil, White Clover, Yarrow, Smooth, Pale and Hairy Lady's-mantles, Spring-sedge, Ribwort Plantain, Field Wood-rush, Meadow Buttercup, Common Sorrel, Mountain Pansy, and Common Dog-violet and some of the following 'Teesdale' specials: Blue Moor-grass, Spring Gentian, Alpine Bistort, Northern and Limestone Bedstraws, Mountain Everlasting, Lesser Clubmoss and Hair Sedge (CG10/CG9b).

No deep limestone pavement, similar to that found in Yorkshire, exists today, although the irregular 'water-worn' slabs that cap some stone walls, as at Langdon Beck and in Middleton, suggest that it once did. The existing 'pavement' is shallow, with wide 'grykes' that allow grazing by Rabbits, if not sheep. The closest to the 'gryke' woodland-type community is to be found in some of the larger and deeper shake-holes/swallow-holes/mini-pot-holes. In these shaded, dank holes are woodland plants: Wood-sorrel, Wall Lettuce, Wild Angelica, Herb-Robert, Mossy Saxifrage, Opposite-leaved Golden-saxifrage and ferns, including Hart's-tongue and occasionally the rare Holly-fern. It was in such a hole with Common Nettle that Jacob's-ladder was first recorded.

At high levels (700–750 m) the close-grazed, species-rich limestone grassland on the talus may include: Alpine Forget-me-not, Spring Gentian, Spring Sandwort, Mossy Saxifrage, Pyrenean Scurvygrass, Mountain Everlasting, Hoary Whitlowgrass, Alpine Bistort, Northern Bedstraw, Mountain Pansy and, frequently, Moonwort. On ledges just over the watershed are Roseroot, Alpine Cinquefoil and the very scarce Alpine Cat's-tail (CG9e).





Fescue-bent-Heath Bedstraw (U4a) DM.





On the broad summit plateau of Cross Fell at 850–900 m, the soil hummocks amongst the stone polygons and stripes support Woolly Fringe-moss and lichens of the reindeer-moss type, including *Cladonia rangiferina*, whilst between these are fescues and bents, with Wavy Hair-grass and Stiff Sedge (U10).

Vegetation below the summit plateaux and above the blanket bog



Alpine Foxtail flush, Great Dun Fell FJR.

Above the blanket bog is a mosaic of plant communities on the leached and acidified soils where the influence of limestone has been lost or overridden, or over sandstone or shale. Fescue – bent – Heath Bedstraw (U4) grassland with Wavy Hair-grass occupies the steeper slopes, Mat-grass (U5) the moister, slightly gleyed podsols and Heath Rush swards (U6) the deeper, wetter gleys. Bracken is scarce and Alpine Lady's-mantle is absent (except where introduced in the NNR). So far, no rarities have been found in these communities. However, since the grazing pressure of sheep was reduced following the outbreak of Foot-and-mouth Disease in 2001, many species have grown to identifiable size. In the more base-rich fescue – bent grassland some herb-rich meadow plants have been found: Clustered Lady's-mantle, Globeflower, Water Avens, Pignut, Heath Spotted-orchid and, in short turf, Mountain Pansy, Wild Thyme, Spring Sandwort and Moonwort. The flushes, usually culminating in streams, often somewhat base-rich or mildly acidic, have added new northern species (Marsh Saxifrage, Water and Sheathed Sedges) to the known Alpine Foxtail, Three-flowered Rush, Dioecious Sedge, Marsh-marigold, Lesser Spearwort, Cuckooflower, Smooth Lady's-mantle, Common Cottongrass and Tufted Hair-grass.

Blanket bog

Extensive blanket bogs cover the gentle slopes of the Tees catchment, between approximately 460 m and 615 m, mostly co-dominated by Heather and Hare's-tail Cottongrass with varying amounts of bog mosses. Common Cottongrass is abundant, especially on bare and redistributed peat, and other typical species are Cross-leaved Heath, deergrass sp., Cowberry, Crowberry, Bog Asphodel and Round-leaved Sundew. Living Dwarf Birch was rediscovered in this community in 1965, previously also known in the Pennines as a sub-fossil in peat.

Very few areas of actively growing wet bog remain in the area due to burning and gripping (draining), but those that do remain have a high cover of bog-mosses – Papillose, Magellanic, Red and Feathery Bog-mosses, occasional hummocks of Austin's and Rusty Bog-mosses, and the locally rare Bog-sedge.



Heather-Hare's tail Cottongrass blanket bog (M19) JO'R.



Papillose Bog-moss and Magellanic Bog-moss, as found on Muckle Moss JO'R.



M2 Bog grading to M18a, Muckle Moss JO'R.



Eroding blanket bog, cages over original and transplanted Dwarf Birch *JO'R*.



Spring Sandwort, Cronkley Fell GH.

Heavy metal mine spoil

Upper Teesdale, situated in the North Pennine Orefield, was an important industrial area in the 18th and 19th centuries; relics of the lead-mining era are scattered over much of the uplands as 'hushes', open veins and spoil-heaps. These are sparsely colonized by several species of the unaltered limestone grassland that have evolved to tolerate the toxicity of the heavy metals that include lead, barium and zinc: Sheep's-fescue, Crested Hair-grass, Blue Moor-grass, Wild Thyme, Harebell, Common Dog-violet, Common Bird's-foot-trefoil, White Clover, Fairy Flax, Autumn Gentian, Mountain Pansy, Moonwort and, locally, Hair Sedge. Three northern species, characteristic of such habitats are: Alpine Penny-cress, Spring Sandwort, Pyrenean Scurvygrass and very occasionally Thrift (OV37).

Sheep's-fescue-Spring Sandwort Calaminarian vegetation (OV37), Widdybank Fell MR.

Geographical elements in the lessdale Assemblage

Within Europe there are three main climatic factors that determine plant distribution – namely summer warmth, winter cold and summer drought. Preston and Hill built on work done by both H.C. Watson and J.R. Matthews to draw up a new classification of the distribution of British plants which was published in 1997. The paper's Appendix lists the species in each Floristic Element, as well as including an alphabetical list of UK plants. Species are classified by two criteria: occurrence in one or more of the four major terrestrial biomes, *i.e.* the Major Biome Category captured in the first number for Arctic-montane, Boreal-montane, Temperate or Southern; and then a criterion for the Eastern Limit Category represented by the second numeral, as included in the Key:

|--|

*					
Oceanic	Suboceanic	European	Eurosiberian	Eurasian	Circumpolar
Confined to Western Europe (Norway, W Denmark, Low Countries, Britain, Ireland, W France and the Atlantic fringe of Spain and Portugal).	Confined to Western and Central Europe (occurring west of a line from the Baltic to the Adriatic).	Widespread in Europe but with an eastern limit west of 60°E.	Widespread in Europe and western Asia, with an eastern limit between 60° E and 120° E.	Widespread in Europe and Asia, with an eastern limit east of 120°E.	Present in Europe, widespread in Asia and also present in North America.
1 ARCTIC-MONTANE			2 BOREO-ARCTIC MONTANE		
North of the tree li	ne or (on mountain	s) above the	In both the Arctic	and Boreal-montar	ie zones.
tree-line, or both.			23 European		
13 European Alpine Bartsia Bartsia alpina (p. 166) Dwarf Birch Betula nana (p. 123)			Clustered Lady's- Hoary Whitlowg Hairy Stonecrop	mantle Alchemillag rass Draba incana (Sedum villosum (p.	plomerulans (p. 118) p. 138) 98)
Chickweed Willowherb Epilobium alsinifolium (p. 133)		24 Eurosiberia	n		
Yellow Saxifrage Saxifraga aizoides (p. 94)		Alpine Cinquefoi	l Potentilla crantzii (p. 108)	
16 Circumpolar			26 Circumpola	r	
Alpine Foxtail Alopecurus magellanicus (p.211) False Sedge Carex simpliciuscula (p. 206) Alpine Clubmoss Diphasiastrum alpinum (p. 70) Mountain Avens Dryas octopetala (p. 104) Alpine Willowherb Epilobium anagallidifolium (p. 132) Three-flowered Rush Juncus triglumis (p. 185) Stag's-horn Clubmoss Lycopodium clavatum (p. 72) Alpine Forget-me-not Myosotis alpestris (p. 159) Alpine Meadow-grass Poa alpina (p. 213) Teesdale Sandwort Sabulina stricta (p. 145) Alpine Saxifrage Micranthes nivalis (p. 96) Roseroot Rhodiola rosea (p. 97) Alpine Meadow-rue Thalictrum alpinum (p. 90) Scottish Asphodel Tofieldia pusilla (p. 177)		us (p. 211) D6) hum (p. 70) 104) lidifolium (p. 132) s (p. 185) avatum (p. 72) tris (p. 159) 213) p. 145) ac	Alpine Foxtail A Dwarf Birch Bett Alpine Bistort B Water Sedge Car Hair Sedge Care Sheathed Sedge Variegated Hors Fir Clubmoss Hu Marsh Saxifrage Oblong Woodsia	lopecurus magellani ula nana (p. 123) istorta vivipara (p. 14 rex aquatilis (p. 204) x capillaris (p. 196) Carex vaginata (p. etail Equisetum var uperzia selago (p. 68) Saxifraga hirculus (p Woodsia ilvensis (p	cus (p. 211) 13) 198) iegatum (p. 74) p. 93) 180)
		. 96)	3 WIDE-BOREAL		
		um (p. 90) 177)	In Arctic-montane, Boreal-montane and Temperate zones.		
- CIRCUMPOLA	R ARCTIC-ALPINE		34 Eurosiberia	n	
Not in Preston and	Hill (1997)		Sea Plantain Pla	ntago maritima (p. 1	60)
Northern Deergra	SS		36 Circumpolar		
Trichophorum cespitosum (p. 188)		Thrift Armeria maritima (p. 80)			

'Hybrid' Deergrass Trichophorum × foersteri (p. 190)

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distributed, posted, or reproduced in	any form by digital or mechanical times and that		
4 BOREAL-MONTANE	54 Eurosiberian		
In the coniferous forest zone, either in the Boreal zonobiome or on mountains farther south, or both. 41 Oceanic	Rare Spring-sedge Carex ericetorum (p. 200) Dark-red Helleborine Epipactis atrorubens (p. 178) Jacob's-ladder Polemonium caeruleum (p. 147) Alpine Meadow-rue Thalictrum alpinum (p. 90)		
Pale Forget-me-not Myosotis stolonifera (p. 158)	55 Eurasian		
42 Suboceanic	Mountain Everlasting Antennaria dioica (p. 173)		
Mountain Male-fern Dryopteris oreades (p. 82) Rock Whitebeam Sorbus rupicola (p. 106)	56 Circumpolar		
43 European	Chamaenerion angustifolium (p. 130)		
Rock Lady's-mantle Alchemilla wichurae (p. 120) Parsley Fern Cryptogramma crispa (p. 76) Small Cow-wheat Melampyrum sylvaticum (p. 129)	Northern Bedstraw Galium boreale (p. 152) Common Juniper Juniperus communis (p. 85)		
Alpine Penny-cress Noccaea caerulescens (p. 136) Small-white Orchid Pseudorchis albida (p. 181) Aspen Populus tremula (p. 128) Globeflower Trollius europaeus (p. 88)	6 WIDE-TEMPERATE In Boreal-montane, Temperate and Southern- temperate zones.		
44 Eurosiberian	7 TEMPERATE		
Wood Crane's-bill Geranium sylvaticum (p. 129)	In the cool-temperate, broad-leaved deciduous forest		
45 Eurasian	zone.		
Bird's-eye Primrose Primula farinosa (p. 149) Teesdale Sandwort Sabulina stricta (p. 145) Spring Sandwort Sabulina verna (p. 146)	Flat-sedge Blysmus compressus (p. 193) Northern Hawk's-beard Crepis mollis (p. 171)		
46 Circumpolar	Downy Currant Ribes spicatum (p. 92)		
Bearberry Arctostaphylos uva-ursi (p. 151) Bustyback Asplenium ceterach (p. 79)	Small Scabious Scabiosa columbaria (p. 175)		
Slender Sedge Carex lasiocarpa (p. 194) Tall Bog-sedge Carex magellanica (p. 203) Shrubby Cinquefoil Dasiphora fruticosa (p. 110) Northern Buckler-fern Dryopteris expansa (p. 83) Shady Horsetail Equisetum pratense (p. 73) Bog Orchid Hammarbya paludosa (p. 180) Alpine Rush Juncus alpinoarticulatus (p. 183)	 Orpine Hylotelephium telephium (p. 100) Small Scabious Scabiosa columbaria (p. 175) Saw-wort Serratula tinctoria (p. 169) Teesdale Violet Viola rupestris (p. 124) 'Hybrid' Violet (Teesdale Violet × Common Dog-violet) Viola × burnatii (p. 126) 		
-	8 SOUTHERN		
5 BOREO-TEMPERATE In both Boreal-montane and Temperate zones.	In the warm-temperate zone south of the broad-leaved deciduous forest zone, which in Europe is represented by the Mediterranean zone.		
Starry Lady's-mantle Alchemilla acutiloba (p. 113)	9 MEDITERRANEAN		
Shining Lady's-mantle Alchemilla micans (p. 121)	92 Submediterranean- <u>Subatlantic</u>		
Velvet Lady's-mantle Alchemilla monticola (p. 116) Large-toothed L'-mantle Alchemilla subcrenata (p. 117) Mountain Everlasting Antennaria dioica (p. 173) Lily-of-the-valley Convallaria majalis (p. 182) Few-flowered Spike-rush Eleocharis quinqueflora (p. 192)	Species with a broader distribution than those fairly strictly confined to the Mediterranean and Atlantic fringe of Europe; often extending into the south- western parts of Central Europe.		
Broad-leaved Cottongrass Eriophorum latifolium (p. 186) Montane Evebright	Rustyback Asplenium ceterach (p. 79)		
Euphrasia officinalis ssp. monticola (p. 163)	93 Mediterranean-montane		
Field Gentian Gentianella campestris (p. 154) Dwarf Milkwort Polygala amarella (p. 103) Yellow-rattle Rhinanthus minor ssp. minor (p. 167) Blue Moor-arass Sesleria caerulea (p. 210)	Montane in the Southern biome but found in considerably warmer conditions than typical Boreal- montane fauna.		
J			

Hoary Rock-rose Helianthemum oelandicum ssp. levigatum (p. 79)

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means without prior written permission of the publisher. International Union of Nature Conservation (IUCN) Red List (see p. 218)

Under the IUCN Red List criteria, each species is assigned to one of the following categories based on an assessment of threats, reflecting the likely degree of extinction risk:

CR Critically Endangered EN Endangered

VU Vulnerable NT Near Threatened LC

Least Concern

Plants that are extant in other parts of Great Britain and Ireland but are extinct in England are categorized as **RE** Regionally Extinct; plants for which there is inadequate information to make an assessment of its risk of extinction based on its distribution and/or population status are categorized as **DD** Data Deficient; the species coded **WL** Waiting List is under consideration.

The categories **CR**, **EN** and **VU** indicate an appreciable risk of extinction in the near future, and are collectively described as '**Threatened**': **CR** indicates the highest level of extinction risk in the wild, and **EN** and **VU** indicate progressively lower levels of risk. **Near Threatened** (**NT**) indicates that the species is close to qualifying as **Threatened**, or is likely to qualify as such in the near future.

IUCN Red List categorization and flowering periods of Teesdale's special flora

The table below lists all the species of the Teesdale Assemblage (in alphabetical order of scientific name). For each species, the IUCN Red List category is shown (following *A Vascular Plant Red List for England* (Stroh, 2014)) and a summary is provided of their flowering period (dark green cells indicate the main flowering period (or in the case of ferns and their relatives the 'spore-producing' period, and in the case of Viviparous Sheep's-fescue when plantlets are produced); pale green cells indicate months during which flowers may persist). Species of Principal Importance in England under the Natural Environment and Rural Communities (NERC) Act (2006) (see *page 216*) are highlighted in pink.

				Flowering/spore-producing period											
			Page	J	F	М	A	М	J	J	Α	S	0	Ν	D
vu	Starry Lady's-mantle	Alchemilla acutiloba	113												
LC	Clustered Lady's-mantle	Alchemilla glomerulans	118												
νu	Shining Lady's-mantle	Alchemilla micans	121												
EN	Velvet Lady's-mantle	Alchemilla monticola	116												
EN	Large-toothed Lady's-mantle	Alchemilla subcrenata	117												
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Conservation status (see *below*) Names follow Stace, C. 2019. New Flora of the British Isles (Fourth Edition) Legal protection (see *below*)

Schedule 8

NB English names are used throughout the text and a list of the English and *scientific* names of all species mentioned in the book is on *page 278*.

Notes on the first reference to include the species.

ALTITUDE The altitudinal range (metres

above sea level) within which

the plant can be found in

Teesdale.

Growth type; flowering and

fruiting periods; seed and reproduction/germination details (where relevant).

LC English name

Scientific name Naming authority

General introduction and broad description of the plant.

Distribution: Summary of distribution of the plant in Great Britain and Ireland, with supplementary information covering the areas of Teesdale in which recorded.

Habitat: Information on the plant's favoured habitat within the Teesdale area, including NVC community codes. See *page 43* for an explanation of these codes.

Status and conservation: Overview of the recent and present status of the plant in Teesdale and of the conservation measures in

place, plus, where appropriate, suggestions for future measures that may be beneficial.

Further information: Link(s) to relevant resources (some hyperlinks use former scientific names).

The plates

Photographs show the plant in its context with close-ups where appropriate. All are credited with the photographer's initials – see *page 283* for full details of contributors.



Order of species The plant profiles are presented in the same order as in Stace (2019), although in a few cases species within a genus have been reordered to allow for better comparison of species.

C Fir Clubmoss

Huperzia selago L.

Shoots usually in erect, light green clusters. Unlike most other clubmosses, the fertile sporangia of Fir Clubmoss are not clustered into cones but borne in leaf axils within the fertile zones that alternate with sterile zones up the stem. It also reproduces vegetatively from bud-like gemmae that are shed from the axils of the leaves. In some years after reproducing, whole clumps of shoots die off, before being replaced by new plants growing from the gemmae.

۰.	
	FIRST RECORD IN TEESDALE
	1794, Robson
	ALTITUDE
	450– 675 m
	LIFE-CYCLE
	Perennial; SPORES are produced June–August; also reproduces vegetatively by gemmae.

Distribution: Widespread, mainly upland and western, but from sea-level to 1,310 m; lost from many lowland sites. In Teesdale it is quite frequent in block scree at Falcon Clints, Cronkley, Dine Holm and Holwick Scars, Long Crag and Dodgen Pot; rare and sparse on wet rock, for example at Red Sike, Widdybank Fell and in old quarries; also rare in the drier blanket bogs. In the 19th century it was additionally recorded as frequent in the hills around Mickle Fell.



Fir Clubmoss: 1 growing at Walltown Crags DM; 2 with gemmae MEB.

means without prior written permission of the publisher. **Habitat:** In block scree Fir Clubmoss is associated with several ferns (Parsley Fern – very local on the east side of the Pennines, Hard-fern and several species of male-fern, Herb-Robert, Woodsorrel, Rosebay Willowherb and Woolly Fringe-moss. Also on drier blanket bogs/heaths of H10b Heather–Bell Heather sub-community with Crowberry, Bell Heather, Mat-grass and Hare'stail Cottongrass. Very occasionally found as small, possibly relatively young plants, developed from gemmae, in gravelly flushes within moist/wet base-rich habitats such as the short sedgemarsh of the M10b Dioecious Sedge–Common Butterwort sub-community and on more or less bare rock flushed with drainage from the metamorphosed limestone over the Whin Sill rocks on Widdybank Fell, including the M10c Hook-beaked Tufa-moss sub-community with Spring Sandwort, Knotted Pearlwort and Sea Plantain.

Status and conservation: Although largely stable, it has been lost from former sites in the drier blanket bogs; the recent blocking of drains and rewetting may result in increases. Needs to be monitored for conservation purposes.

Further information: https://www.brc.ac.uk/plantatlas/plant/huperzia-selago Merryweather, J. 2020. *Britain's Ferns*. Princeton WILD*Guides*



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Le Alpine Clubmoss Diphasiastrum alpinum L.

Clubmosses are spore-bearing plants that separated from ferns and seed-bearing plants more than 360 million years ago. Alpine Clubmoss usually has a prostrate growth form, its shoots branched regularly into two, sometimes forming a fan shape. The stems are four-sided, with leaves folded longitudinally. Small yellow-green cones are formed on upright stems, but only immature cones have been seen in Teesdale.

Distribution: Alpine Clubmoss is found in the mountains and uplands from Wales, Derbyshire and the Lake District to central and north-west Scotland, although rather infrequent, and decreasing, in the northern Pennines and Southern Uplands. In Teesdale it is rare and sparse, found on Widdybank Fell, in the vicinity of Moor House (Nether Hearth and Dodgen Pot), Harthope Ganister quarry (with Stag's-horn and Fir Clubmosses), and a railway cutting near Barnard Castle. In the 19th century it was reported as frequent on the hills rising to the peak of Mickle Fell and abundant on Cronkley Fell: it has not been seen recently in these locations.

Habitat: Found mostly on shallow soil on lead-mining waste (and sometimes sandstone quarry waste) in the OV37 Sheep's-fescue–Spring Sandwort community. On Widdybank Fell small groups of shoots occur in the species-rich CG9d Blue Moor-grass–Limestone Bedstraw grassland community over sugar-limestone, with slightly larger groups in the CG10 Sheep's-fescue–Common Bent–Wild Thyme community on unaltered limestone. Associated plants include Mountain Pansy, Harebell, Glaucous Sedge, Wild Thyme, Spring Sandwort, Lesser Clubmoss and several lichens.

Status and conservation: On Widdybank Fell it is very scarce and thinly scattered in apparently ungrazed grassland; individual plants have been recorded as surviving here for more than 50 years. Plants from Helvellyn were introduced into exclosures in high-altitude grassland on Knock and Little Dun Fells and Hard Hill in the Moor House NNR in the mid-1950s, but did not survive, probably in part due to the dense growth of other species in the absence of grazing.

The small colonies must continue to be monitored, especially in view of the dangers of undergrazing now that Rabbit numbers have been reduced. Searches for the known 1970s sites in the Blue Moor-grass community on Widdybank Fell should be undertaken, along with searches of its former sites around Cronkley Fell and Mickle Fell.

Further information: https://www.brc.ac.uk/plantatlas/plant/diphasiastrum-alpinum Merryweather, J. 2020. *Britain's Ferns*. Princeton WILD*Guides*





This index includes all the people referred to in the text (excluding references and contributors to this book mentioned in the Acknowledgements and photographic credits on *p. 283* and *opposite*).

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