M27
Filipendula ulmaria-Angelica sylvestris mire

Synonymy
Ulmaria society Pearsall 1918; *Filipendula ulmaria* consocies Tansley 1939; *Filipendula* communities Proctor 1974; Tall herb fens Adam *et al.* 1975 *p.p.*; *Filipendulo-Iridetum pseudacori* Adam 1976 *p.p.*, Adam *et al.* 1977 *p.p.*; *Epilobium hirsutum-Filipendula ulmaria* community Wheeler 1980*c p.p.*; *Valeriano-Filipenduletum* (Sissingh 1946) Birse 1980; Fen meadow Ratcliffe & Hattey 1982 *p.p.*; *Junco-Filipenduletum* Jones 1984 *p.p.*

Constant species
Filipendula ulmaria.

Physiognomy
Filipendula ulmaria is a frequent and locally abundant member of a variety of herbaceous vegetation types, notably Phragmitetalia fens, damp Arrhenatheretalia swards and the rush-pastures and fen-meadows of the Molinietalia. But it is also widely encountered as a more overwhelming component of vegetation in which the dominants of the above communities, tall helophytes, bulky sedges, rushes and rank grasses, are, if present at all, relegated to a subordinate role. Most of this kind of vegetation is included in the *Filipendula ulmaria-Angelica sylvestris* mire.

F. ulmaria is a shortly rhizomatous perennial which puts up an annual crop of leafy shoots and, under the favourable conditions characteristic here, these grow tall and luxurious, often reaching a metre or more in height and becoming densely dominant over extensive areas where clonal patches coalesce. In the deep shade cast by this herbage, the associated flora, though quite varied in composition from stand to stand, is frequently poor in species: *F. ulmaria* is the sole constant of the community, indeed the only plant to attain more than occasional frequency throughout, and even the commoner companions are often found only as scattered individuals or in dispersed clumps.

Among these, the most frequent species are other tall herbs which are able to grow up among the meadowsweet and which, by mid-summer, can present a colourful spectacle with their flowering shoots projecting above the canopy of foliage. The commonest plants among this group are *Angelica sylvestris*, *Valeriana officinalis* and *Rumex acetosa* and, in the more striking vegetation of the *Valeriana-Rumex* sub-community, these become preferentially frequent and are often accompanied by *Lychnis flos-cuculi*, *Succisa pratensis*, *Geum rivale* and sprawls of *Galium palustre*. In other stands, such species are more scarce but *Urtica dioica* is very common and, with *Cirsium arvense*, *Epilobium hirsutum*, *Eupatorium cannabinum* and *Vicia cracca*, helps to characterise an *Urtica-Vicia* sub-community. Then, at low frequency throughout the *Filipendula-Angelica* mire, there can be scattered *Lythrum salicaria*, *Rumex crispus*, *R. sanguineus*, *Epilobium palustre*, *Equisetum palustre*, *E. arvense* and *E. fluviatile*. Particularly towards the west, *Iris pseudacorus* and *Oenanthe crocata* can also figure with some local prominence, though these species are not nearly so consistent or abundant a feature here as in the *Filipendulo-Iridetum*, the closely-related tall-herb vegetation of our Atlantic seaboard.

As for the bulky monocotyledons that can be found as dominants over *Filipendula* in other fen vegetation, only *Phragmites australis* occurs with any frequency here and it is strongly associated with the more eutrophic lowland stands included in the *Urtica-Vicia* sub-community. Even there, it is always less abundant overall than the meadowsweet, though, where locally dense, it gives the vegetation a structure transitional to the *Phragmites-Urtica* fen, in close association with which this kind of *Filipendula-Angelica* mire is often found. Other swamp and fen dominants occur so sparsely as to rarely give rise to any problems of diagnosis but *Phalaris arundinacea* is found occasionally throughout and locally there can be records for big sedges like *Carex acutiformis*, *C. rostrata*, *C. vesicaria*, *C. paniculata* and *C. appropinquata*.

Rushes, too, are likewise few in number and uneven in their occurrence through the community. *Juncus effusus*

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is the most common species overall, though it is markedly preferential for more acidic soils in western Britain where it helps characterise the *Juncus-Holcus* sub-community, and even there it is rarely of high cover. *J. acutiflorus*, *J. articulatus* and *J. conglomeratus* are all found much less frequently and *J. inflexus* and *J. subnodulosus* are very scarce. Among the bulkier grasses, the occurrence of occasional tussocks of *Molinia caerulea* along with clumps of rushes can give the appearance of Junco-Molinion vegetation, but the balance of dominance still lies with *F. ulmaria*. Other rank grasses can play a subordinate role, too, although they usually show a preference for particular kinds of *Filipendula-Angelica* mire: *Holcus lanatus*, for example, is more frequent in the *Juncus-Holcus* sub-community, whilst *Arrhenatherum elatius* often helps define the *Urtica-Vicia* type. *Dactylis glomerata* and *Festuca rubra* also occur very occasionally and, where grasses as a group bulk a little larger than usual, the vegetation can approach a damp Arrhenatherion sward in its composition. Typically, however, these species are all found as scattered individuals, often attenuated beneath the tall-herb canopy, or growing more vigorously where the cover thins out a little and at the margins of stands.

Other grasses of smaller stature can occasionally contribute to a lower tier of vegetation though, with the dense shade, smaller herbs are usually few and far between, often noticeable only if they make some growth before the full emergence of the meadowsweet shoots, or where they spread on to stretches of newly deposited silt where stands are flooded. *Poa trivialis* is the most frequent member of this group, with *Agrostis stolonifera*, *A. canina* (presumably ssp. *canina*) and *Anthoxanthum odoratum* occurring less commonly. Then, among smaller dicotyledons, there can be some *Ranunculus repens*, *Mentha aquatica*, *Lotus uliginosus* and *Caltha palustris*, with more occasional *Ranunculus acris*, *Cardamine pratensis*, *C. flexuosa*, *Potentilla anserina* and *Polygonum hydropiper*.

Bryophytes, too, are often few in number and of low cover, although they can catch the eye in winter and early spring when their fresh-green patches are revealed growing over the exposed bare ground and herb stools. *Brachythecium rutabulum* (probably including some *B. rivulare*), *Calliergon cuspidatum*, *Eurhynchium praelongum* and *Lophocolea bidentata s.l.* are all found occasionally, and with somewhat greater regularity and luxuriance in the *Valeriana-Rumex* sub-community, where a variety of other low-frequency preferentials enriches this element of the vegetation.

Woody plants seem to get a hold only with difficulty in denser stands of the *Filipendula-Angelica* mire, but *Salix cinerea* seedlings can sometimes be found in the ground layer and these occasionally get away where the cover is more open. In drier stands, there can also be some patchy *Rubus fruticosus* agg.

Sub-communities

***Valeriana officinalis-Rumex acetosa* sub-community:** *Filipendula* communities Proctor 1974; Tall herb fens Adam *et al.* 1975 *p.p.*; *Valeriano-Filipenduletum* (Sissingh 1946) Birse 1980; *Junco-Filipenduletum* Jones 1984 *p.p. F. ulmaria* is still very much the most abundant plant here and it can be so overwhelmingly dominant as to make this vegetation as poor in species as any kind of *Filipendula-Angelica* mire. But overall it is characterised by the preferential occurrence of quite a variety of associates and when present in numbers, even if only as scattered individuals, these can produce a distinctive effect. Some are common throughout the sub-community, almost rivalling *F. ulmaria* in frequency and with tall flowering shoots. Foremost among these are *Angelica* and *Valeriana officinalis*, both able to make luxuriant growth here and attain a measure of local abundance, together with *Rumex acetosa* and, rather less common, *Lychnis flos-cuculi*. *Succisa* and *Geum rivale* are also preferential at lower frequencies and then there can be occasional records for taller community plants like *Cirsium palustre*, *Lythrum salicaria*, *Rumex crispus*, *Potentilla palustris* and *Equisetum fluviatile*. Towards its southern limit, this kind of *Filipendula-Angelica* mire can also have some *Sanguisorba officinalis* and, at higher altitudes, as at Malham Tarn in North Yorkshire (Proctor 1974, Adam *et al.* 1975) and in Teesdale (Jones 1984), it provides a locus for such Continental Northern herbs as *Crepis paludosa*, *Alchemilla glabra* and *Cirsium helenioides*, and for the Northern Montane *Trollius europaeus*.

Providing occasional enrichment a little below the level of the tall herbs, there can be some *Caltha palustris*, *Ranunculus flammula*, *R. repens*, *R. acris*, *Cardamine flexuosa*, *C. pratensis*, *Mentha aquatica*, *Stellaria alsine* and *Ajuga reptans*, thickening up a little where the meadowsweet is not too dense. *Galium palustre* is very common trailing among the herbage, *G. uliginosum* much less frequent, and occasionally *Lathyrus pratensis* can be found.

Apart from *Poa trivialis*, which is preferential to this sub-community, though generally of low cover, grasses and rushes are infrequent. *Phalaris* and *Phragmites* sometimes put up sparse tall shoots or, very occasionally, thicken up into small clumps, and scattered tussocks of *Juncus effusus* are sometimes to be seen. Sedges are a little more frequent, though even among these there is little consistency of occurrence and they rarely rival *F. ulmaria* in abundance. However, *Carex rostrata* is quite common and, when present with *Menyanthes* and *Potentilla palustris*, can bring the vegetation close to the *Potentillo-Caricetum* in its composition. *C. nigra* also occurs occasionally and, where there are marked fluctuations of water-level, it can grow in its strongly-tussocky form (var. *subcaespitosa*), catching the eye,

though rarely of very high total cover. *C. vesicaria* is another sedge which can attain some local prominence, particularly in Scottish localities, and, in other stands, *C. acutiformis* and the Continental Northern *C. disticha* or *C. appropinquata* have been found.

Bryophytes are somewhat better developed in this sub-community than in the others, though their cover is still rather patchy. *Brachythecium rutabulum* (with some *B. rivulare*) is the most frequent, but the other community species can also be found, together with occasional *Rhizomnium punctatum*, *Plagiomnium elatum*, *P. undulatum*, *Chiloscyphus pallescens* and *Thuidium tamariscinum*.

***Urtica dioica-Vicia cracca* sub-community:** *Epilobium hirsutum-Filipendula ulmaria* community Wheeler 1980*c p.p. F. ulmaria* and a variety of other tall herbs again compose the major structural element of the vegetation here and, if anything, the cover of these plants is denser than in the above, further reducing the contribution from smaller species. But, although *Angelica*, *Cirsium palustre* and *Lythrum salicaria* remain occasional, *Valeriana officinalis*, *Rumex acetosa* and many of the preferentials of the first sub-community are either very scarce or totally absent. *Urtica dioica*, by contrast, becomes very common and, together with occasional *Eupatorium cannabinum* and *Epilobium hirsutum*, can form small clumps among the meadowsweet, producing a characteristically patchy variegation to the canopy. Then, scattered throughout, there can be plants of *Cirsium arvense* and *Centaurea nigra* and, replacing *Galium palustre* as the typical sprawler, there is often some *Galium aparine* and *Vicia cracca*, with occasional *Calystegia sepium*.

Phragmites is also quite commonly found here and, though typically much less abundant than *F. ulmaria*, it can thicken up locally and, where it is accompanied by scattered individuals of such species as *Lysimachia vulgaris*, *Lycopus europaeus* or *Thelypteris palustris*, the floristic resemblance to Phragmitetalia fen is close. In other stands, the vegetation takes on a rank grassy look, with tussocks of *Arrhenatherum elatius* scattered beneath the tall dicotyledons, some *Holcus lanatus* and occasional *Heracleum sphondylium* and *Lotus uliginosus*. In drier stands of this kind, *Rubus fruticosus* agg. can get a substantial hold. In yet other situations, scattered clumps of rushes can be found, with *J. effusus*, *J. acutiflorus*, *J. articulatus*, *J. conglomeratus*, *J. inflexus* and *J. subnodulosus* all recorded sparsely.

Small herbs are few and of low cover, with just occasional *Mentha aquatica*, *Prunella vulgaris*, *Potentilla reptans* and *P. anserina*. And, though litter turnover can be brisk here, with quite extensive patches of bare ground exposed among the stools by late winter, bryophytes are typically very sparse with only *Brachythecium rutabulum* and *Lophocolea bidentata s.l.* figuring occasionally.

***Juncus effusus-Holcus lanatus* sub-community:** *Filipendulo-Iridetum pseudacori* Adam 1976 *p.p.*, Adam *et al.* 1977 *p.p.*; *Valeriano-Filipenduletum* (Sissingh 1946) Birse 1980 *p.p.*; Fen meadow Ratcliffe & Hattey 1982 *p.p. F. ulmaria* is still the most abundant species in this sub-community, though its dominance is not quite so overwhelming as in the other kinds of *Filipendula-Angelica* mire. Other tall herbs such as *Angelica*, *Valeriana officinalis*, *Cirsium palustre* and *Rumex acetosa* occur occasionally, but of greater structural importance is the presence of rushes and grasses among the meadowsweet, sometimes with moderate abundance. *Juncus effusus* and *Holcus lanatus* are both constant, *J. acutiflorus* and *Molinia* occasional and other grasses recorded less frequently include *Anthoxanthum odoratum*, *Agrostis stolonifera*, *A. canina* and *Poa trivialis*. Such plants, along with frequent *Mentha aquatica* and *Lotus uliginosus* and occasional *Achillea ptarmica*, bring the vegetation close to a rank Junco-Molinion sward. In other stands, *Iris pseudacorus* and/or *Oenanthe crocata* can be prominent and, around the upper limit of salt-marshes in western Britain, this kind of *Filipendula-Angelica* mire can grade to the *Filipendulo-Iridetum* (Adam 1976, Adam *et al.* 1977).

Habitat

The *Filipendula-Angelica* mire is typically found where moist, reasonably rich, circumneutral soils occur in situations protected from grazing. It is to be seen throughout the lowlands of Britain, in both soligenous and topogenous mires, being especially typical of the silting margins of slow-moving streams and soakways, the edges of flushes and damp hollows, but it also occurs widely in artificial habitats, as along dykes and roadside ditches, and around ponds and pools with richer waters. Natural climatic and edaphic differences across its extensive range have some influence on floristic variation in the community, but this is also affected by agricultural practices and, in many places, draining and grazing have reduced this kind of vegetation to small remnants.

The *Filipendula-Angelica* mire is, first, a community of moist ground, occurring on a variety of mineral and organic soils which are kept damp for much or all of the year. It can be found, along stream edges, right down to the water side, and it often experiences substantial seasonal and short-term fluctuations in the level of the water-table (Spence 1964, Proctor 1974) but, generally speaking, it is typical of situations between permanent standing waters and deeply winter-flooded ground on the one hand and, on the other, land which is more than superficially dry for long periods of time. Much of the overall floristic character of the vegetation is due to the ability of *F. ulmaria* to become dominant on such intermediate ground over species which have their peak of abundance at the extremes of soil moisture con-

ditions. Towards the wetter limit of the *Filipendula-Angelica* mire, for example, certain of the tall helophytes and bulky sedges which characterise the Phragmitetalia swamps and fens of open waters and their extensively-inundated surrounds can maintain moderate frequency, though they rarely occur with any vigour. This sparse cover is generally the maximum extent of the contribution here of such species as *Phragmites* (in the *Urtica-Vicia* sub-community) and *Carex rostrata* (in the *Valeriana-Rumex* type), though they often thicken up, on adjacent wetter ground, to form an overtopping canopy in floristically-similar fen vegetation (e.g. Proctor 1974, Adam *et al.* 1975). Towards the other extreme, where the *Filipendula-Angelica* mire runs on to drier ground, it is the increase in frequency of bulky grasses of the Molinio-Arrhenatheretea, such as *Arrhenatherum*, *Molinia* and *Holcus lanatus*, or of tall herbs such as *Urtica*, well seen in both the *Urtica-Vicia* and *Juncus-Holcus* sub-communities, that marks the environmental limits of the community.

Over the middle ground, a variety of other plants apart from *F. ulmaria* is able to thrive under the moist conditions but the uncompromising dominance of the meadowsweet ensures that these attain only limited frequency and abundance. Other tall hemicryptophytes fare best, being able to keep pace with the expansion of the leafy canopy, and such associates as *Angelica*, *Rumex acetosa*, *Cirsium palustre*, *Lychnis flos-cuculi*, *Succisa pratensis* and *Lythrum salicaria*, even though they are often reduced to scattered individuals among the dense cover, help confirm the general Molinietalia character of the vegetation. Some other broadly-distributed tall wetland plants, like *Valeriana officinalis* and, to the west, *Iris pseudacorus*, can also be well represented and plants like *Galium palustre* and *G. aparine* are able to reach the light by sprawling over the other herbage. Smaller herbs, though, such as *Mentha aquatica* and *Poa trivialis*, together with some of the more diminutive sedges, for which conditions here are probably otherwise very congenial, are much reduced or simply overwhelmed.

Two other habitat features favour this luxuriant growth of tall herbs in general and *F. ulmaria* in particular. The first is the at least moderate nutrient-richness of the substrates, for this is a community of soils which are either naturally or, as a result of treatments, maintained in a mesotrophic or eutrophic state. To a great extent, it is this edaphic requirement, rather than any direct influence of climate, which limits the *Filipendula-Angelica* mire largely to the lowland parts of the country. It is a community that occurs throughout Britain, and it can be found almost down to sea-level in the west, but only very locally does it extend above 200 m. It is true that some of its associates show reduced growth in the cooler temperatures at greater altitudes, but certain of its most characteristic plants can be found at much higher levels in, for example, montane ledge vegetation. However, although soils which are suitably moist for the development of the *Filipendula-Angelica* mire are widespread in the upland zone of the country, this assemblage is largely excluded from them by their impoverished character, derived as they often are from siliceous rocks and rarely showing any accumulation of fine mineral detritus in the harsh eroding landscapes. Where such processes do occur at higher altitudes, as along the more sluggish stretches of streams or around the sheltered shores of lakes, the *Filipendula-Angelica* mire can form a quite striking addition to suites of poor fens and calcicolous mires on the poorer substrates. This is well seen at Malham Tarn, where the community occupies small levees alongside the input streams and where Proctor (1974) has shown that the limits of this kind of vegetation are probably set by the greater phosphate requirements of its predominant species.

In the more subdued landscapes at lower altitudes in northern and western Britain, where depositional habitats become more common, the *Filipendula-Angelica* mire consequently increases in frequency, occurring widely over mesotrophic peaty gleys and peaty alluvial soils alongside streams, around pools and in flushes. In northern England and through southern and eastern Scotland, the usual form of the community is the *Valeriana-Rumex* type, vegetation which is largely confined to the cooler parts of Britain, where mean annual maximum temperatures are generally less than 24 °C (Conolly & Dahl 1970) and February minima often below freezing (*Climatological Atlas* 1952). At the highest altitudes to which this sub-community penetrates, the appearance of such Continental Northern and Northern Montane plants as *Crepis paludosa*, *Alchemilla glabra*, *Cirsium helenioides* and *Trollius europaeus* indicates a floristic transition to Cicerbition alpini ledge vegetation.

Down the western fringe of the country, along the Atlantic seaboard of Scotland, through Wales and into the South-West Peninsula, suitably moist and mesotrophic soils continue to be widely present through the lowlands, but the climate is somewhat wetter and distinctly milder. Here, annual rainfall often exceeds 1600 mm (*Climatological Atlas* 1952), with more than 160 wet days yr^{-1} (Ratcliffe 1968), so the tendency to leaching is more pronounced, soils under the community frequently having a pH that is nearer 5 than 6, the mean of the community as a whole. Moreover, winter temperatures are high, with February minima usually above freezing, quite markedly so in the south (*Climatological Atlas* 1952). Such shifts are reflected in the *Filipendula-Angelica* mire by the occurrence of the *Juncus-Holcus* sub-community throughout this region, species such as *J. effusus*, *Holcus lanatus*, *Molinia* and *Lotus uliginosus*

representing a clear transition to the Junco-Molinion. And very close to the coast, where the community can penetrate on to the flushed upper margins of salt-marshes, well out of reach of tidal influence but under the strong influence of the oceanic climate, *Iris* and *Oenanthe crocata*, Oceanic West European plants, can make a distinctive contribution.

It is possible that the southern and eastern margins of these two kinds of *Filipendula-Angelica* mire might be drawn a little more generously were suitable edaphic conditions to extend further into central and eastern England. Moist profiles are certainly widespread there, over the alluvium deposited along mature rivers and around lakes and pools, on the fen peats of flushes and topogenous mires, which often also receive some allochthonous mineral material, and in damp hollows with stagnogleys and pelosols developed from the argillaceous bedrocks and superficials that underlie the extensive undulating landscapes of this part of Britain. Here, too, artificial habitats are particularly widespread with numerous ditches and ponds. But, with the intensive agricultural activity that has long been characteristic of the Midlands and south-east England, even the more natural of these soils are frequently disturbed and artificially enriched by fertiliser run-off or drift, by contamination with other kinds of eutrophic effluent, by dumping of dredgings or by surface oxidation of drying organic matter. In such habitats as these, it is the *Urtica-Vicia* sub-community, with its characteristically patchy cover of eutrophic tall herbs, that is the usual kind of *Filipendula-Angelica* mire.

One further environmental feature essential for the development of any of these vegetation types is freedom from any grazing more than the very light or sporadic. *F. ulmaria* is highly palatable and the predations of large herbivores can quickly reduce it to nibbled stumpy stocks with a few tufts of diminutive leaves, and then eliminate it altogether. And, although some of the other taller hemicryptophytes that give this vegetation its distinctive character can survive in grazed stands as non-flowering rosettes, the real beneficiaries of such treatments are the unpalatable bulky plants, notably rushes, which then come to dominate over those smaller dicotyledons and grasses able to persist in close-cropped swards. Such assemblages would not qualify for inclusion here and can often be found replacing the *Filipendula-Angelica* mire where moist, mesotrophic soils have been enclosed for pasture (see below). The natural wetness of the ground under this community is rarely such as to itself prevent access by stock, so stands often persist in intensive pastoral landscapes only outside such enclosures, around unreclaimed mires and flushes, for example, in wet field bottoms and edges which have been fenced off, and alongside streams and ditches between pasture and boundaries. Where the community occurs in roadside ditches, it may be subject to occasional mowing, though regular inclusion in a hay-crop probably favours a more varied pattern of dominance than is characteristic here.

Zonation and succession

The community can be found in a wide variety of zonations and mosaics with swamps, other kinds of mire, tall-herb vegetation and grasslands, among which the major lines of floristic variation are governed by interactions between soil moisture and trophic state and by differences in treatment. Scrub and woodland also often occur in close association with the *Filipendula-Angelica* mire and can undoubtedly develop from it, though, in many cases, this kind of vegetation seems somewhat resistant to the invasion of woody plants and able to persist in a fairly stable state, provided edaphic conditions and treatment remain unchanged.

In the more natural vegetation sequences in which the *Filipendula-Angelica* mire is to be seen, it typically occupies a zone between standing or sluggish open waters on the one hand, and tall-herb communities on the other. Alongside small streams, as seen at Black Beck in the Esthwaite fens (Pearsall 1918, Tansley 1939) and at Malham (Proctor 1974), it can actually run right down to the water's edge, forming a strip over the intermittently flooded ground and often helping to accumulate small levees. In other cases, it can give way below to emergent vegetation on the permanently submerged ground or that subject to extensive winter flooding. To the north of Britain, where the *Valeriana-Rumex* sub-community is a common component of open-water transitions around lakes and along streams, it is the *Caricetum rostratae* which often replaces it on wetter ground or, more locally, the *Caricetum vesicariae*, and, with these vegetation types, there can be a measure of floristic continuity, some of the associates of the *Filipendula-Angelica* mire extending out under the dominant sedge (Spence 1964, Proctor 1974, Adam *et al.* 1975). Such swamps also extend into western Britain and can be found abutting on to the *Juncus-Holcus* sub-community where this occurs around open waters. To the south and east, by contrast, where the *Urtica-Vicia* sub-community is typical, it is the *Phragmitetum australis* that most often replaces it on wetter ground or, more occasionally, the *Caricetum paniculatae* or communities like the *Sparganietum erecti* or *Typhetum latifoliae*; and, again, there can be some gradations between the vegetation types.

Along stream sides and drainage ditches and around small pools and ponds which are maintained in an open condition, particularly common habitats for the *Filipendula-Angelica* mire to the south of Britain, zonations such as these can be very compressed, with little more than fragments of the various communities occurring in

a belt of very small overall width. In more extensive open-water transitions, on the other hand, such as those found around some lakes in northern Britain and in Broadland, the ground between the swamps and the *Filipendula-Angelica* mire can be occupied by a wide zone of what is essentially Phragmitetalia fen, in which the tall helophytes and bulky sedges of the swamps retain their dominance but are accompanied by a richer suite of associates which shows considerable continuity with the meadowsweet vegetation. To the north of the country, such fen is typically of the *Potentillo-Caricetum rostratae* type; to the south and east, it can generally be grouped in the *Phragmites-Eupatorium* fen or, in Broadland the *Peucedano-Phragmitetum*, or very often now, around disturbed and eutrophicated water-margins, the *Phragmites-Urtica* fen.

However, only where the substrates of the fen hinterland are maintained in a reasonably rich state, either by fresh deposition of silt in floods, or by input of nutrients from the landward edge, will they be able to sustain the *Filipendula-Angelica* mire in such extended zonations as these and, at some sites with large tracts of fen, the community is very much restricted to the edges of streams, soakways or dykes, running through, or cut through, the flood-plain deposits. Both kinds of pattern can be seen at Malham, where complex variations in water-depth and nutrient- and base-status across the fens result in particularly varied mosaics of rich and poor fens disposed over the peats between the channels and grading, with varying degrees of abruptness, to the *Filipendula-Angelica* mire on the richer, circumneutral deposits (Proctor 1974).

Even in more extensive and natural zonations such as these, the sequence of vegetation types rarely continues on to drier ground without some suspicion of modification as a result of man's activities. Very locally in northern Britain, it is possible to see transitions from the *Valeriana-Rumex* sub-community to the *Molinia-Crepis* mire on ground that is subject to less marked fluctuations in water level, as at Malham (Proctor 1974), and, around flushes on the lower valley sides of some Pennine dales, such zonations can continue into stretches of *Anthoxanthum-Geranium* grassland, a community which is often cut for hay, but which is otherwise little improved (Jones 1984). Very commonly through northern and western Britain, however, even where the surrounds of mires and flushes with the *Filipendula-Angelica* mire have escaped marked improvement, they are heavily grazed, so many stands of the *Valeriana-Rumex* and *Juncus-Holcus* sub-communities survive sharply marked off from surrounding Nardo-Galion swards by artificial boundaries, remaining largely within fenced-off damp hollows or field corners, and persisting otherwise only in very fragmentary fashion along stream sides running through pasture.

The situation within southern and eastern England is very similar, except that there the agricultural landscape is more intensive and largely given over in certain areas to arable cropping with its attendant eutrophication of the drainage waters by fertiliser run-off. More natural zonations probably run from the *Urtica-Vicia* sub-community to some kind of *Arrhenatheretum*, and there can be considerable overlap between the two vegetation types. Paradoxically, such transitions are now most easily seen within the artificial roadside verge habitat, where damp ditches and drier banks often carry these two closely juxtaposed. In many places, however, the *Urtica-Vicia* sub-community gives way, not to such grasslands, but to eutrophic tall-herb vegetation dominated by such plants as *Urtica* and *Epilobium hirsutum*, which forms a fringe on the disturbed and enriched edges of mires and drainage ditches, set within intensive pastoral or arable landscapes.

Where more traditional regimes of mowing and grazing have been extended down, around mires and flushes, on to the moister soils normally occupied by the *Filipendula-Angelica* mire, further variations on these patterns can be seen. Detailed studies of the effects of such treatments on the community have never been undertaken, but it seems likely that grazing, and perhaps also regular summer-mowing, convert it to the kinds of vegetation, generally dominated by rushes, included in the Calthion to the east of Britain, and in the Juncion acutiflori to the west and north. Where the *Urtica-Vicia* sub-community occurs in spring-fens, for example, it can often be seen alongside the *Juncus-Cirsium* rush-pasture in those areas where stock have access or which, in the past, were mown for litter. Similarly, to the west, a very common context for the *Juncus-Holcus* sub-community is stretches of the *Juncus-Galium* rush-pasture, which form a transitional zone between the *Filipendula-Angelica* mire and the surrounding Nardo-Galion sward where stock have had access to the damper flush surrounds. With further cropping and selective nutrient depletion, such developments could proceed further with the expansion of *Molinia* in Junco-Molinion swards.

Even where such treatments have been withheld for long periods of time, progression of the *Filipendula-Angelica* mire to woodland seems slow, perhaps because of the overwhelming dominance of the meadowsweet, and, quite commonly, stands of the community can be found closely hemmed in by a cover of trees or shrubs. However, observation suggests that invasion of woody plants can take place and it seems likely to result in the development of either drier forms of the *Salix-Betula-Phragmites* woodland, particularly in the south and east, or, to the west and north, the *Salix-Galium* or *Alnus-Fraxinus-Lysimachia* woodlands. Drying and disturbance of the substrate probably favours progression to the *Alnus-Urtica* woodland.

Distribution

The *Filipendula-Angelica* mire occurs throughout lowland Britain with the sub-communities showing clear regional associations: the *Valeriana-Rumex* type is the usual form of the community in northern England and southern and eastern Scotland, the *Juncus-Holcus* type down the western seaboard of the country and the *Urtica-Vicia* type in central, southern and eastern Britain.

Affinities

Except in the study of particular sites (e.g. Pearsall 1918, Tansley 1939, Proctor 1974, Adam *et al.* 1975), the kinds of vegetation included here have figured very little in accounts of British plant communities and have usually been defined in terms of the dominance of meadowsweet. This scheme brings together data from a variety of existing sources, as well as including new samples, and it confirms the floristic integrity of the richer kind of *F. ulmaria* vegetation characterised here as the *Valeriana-Rumex* sub-community, first described in detail from this country by Proctor (1974), and considered by him and by Birse (1980) to be essentially similar to the *Valeriano-Filipenduletum*, an association described by Sissingh (1946) from Holland and north-west Germany with closely-related assemblages in Eire (Braun-Blanquet & Tüxen 1952), Belgium (Duvigneaud 1958) and northern France (Géhu 1961). But it also seems sensible to retain, within the same general unit, the transitional kinds of vegetation placed here in the *Urtica-Vicia* and *Juncus-Holcus* sub-communities. The community as a whole cannot then be uniquely defined in terms of anything other than the overwhelming abundance of *F. ulmaria*, but in qualitative terms there is nothing peculiar even about the richer assemblage of the *Valeriana-Rumex* type: what is special about these vegetation types is the persistence of the associates, albeit often in an attenuated form, among a dense canopy of meadowsweet, the luxuriance of which is a real reflection throughout of a particular combination of ecological conditions.

The general affinities of the community, indicated by such species as *F. ulmaria* itself, *Angelica*, *Cirsium palustre*, *Equisetum palustre*, *Lotus uliginosus* and *Juncus effusus*, are with the damp herbaceous communities of the Molinietalia and, in a broad context, the vegetation shows links with both the Phragmitetalia swamps and fens and the grassy swards of the Arrhenatheretalia, transitions to which are mediated essentially by edaphic differences. Species such as *Carex rostrata* and *Phragmites* (in wetter stands of the *Valeriana-Rumex* and *Urtica-Vicia* sub-communities) thus provide a connection with the former, plants like *Arrhenatherum elatius* and *Holcus lanatus* (in drier tracts of the *Urtica-Vicia* and *Juncus-Holcus* types) with the latter, and many of the associated herbs of the *Filipendula-Angelica* mire extend far in both these directions, as an understorey in both fens and wet grasslands.

More narrowly, the community is particularly close to the vegetation included in the Calthion and the Juncion acutiflori, other Molinietalia alliances in which the dominance of coarse monocotyledons, notably rushes, is under the strong control of treatments characteristically absent in sites with the *Filipendula-Angelica* mire. Phytogeographical trends in the community to some extent reflect those among these other kinds of Molinietalia vegetation, with the *Juncus-Holcus* sub-community representing a clear transition to the oceanic *Juncus-Galium* rush-pasture towards western Britain, the other types coming closer to the more continental *Juncus-Cirsium* rush-pasture in the eastern part of the country.

Two further features confuse these relationships. First, where the *Valeriana-Rumex* sub-community attains higher altitudes in northern Britain, it begins to show a floristic affinity to the tall-herb vegetation of the Cicerbition alpini in which Northern Montane and Continental Northern plants become important. More widely, in the intensive agricultural landscape of southern and eastern Britain, the effect of disturbance and enrichment of the habitats of the *Filipendula-Angelica* mire is to bring it very close, in the *Urtica-Vicia* sub-community, to the weedy eutrophic tall-herb vegetation of the Artemisietea.

The striking influence of the dominance of *F. ulmaria* has led phytosociologists to group the kind of vegetation included here in a separate Molinietalia alliance, the Filipendulion. No British plants apart from meadowsweet show a qualitative or quantitative preference for this group and only one other vegetation type, the *Filipendulo-Iridetum*, could properly be regarded as belonging to it.

Floristic table M27

	a	b	c	27
Filipendula ulmaria	V (4–10)	V (5–10)	V (4–8)	V (4–10)
Angelica sylvestris	IV (1–4)	II (1–5)	II (1–7)	III (1–7)
Valeriana officinalis	IV (2–7)	I (1–5)	II (2–6)	II (1–7)
Rumex acetosa	IV (1–4)	I (1–3)	II (1–4)	II (1–4)
Galium palustre	IV (1–4)	I (2–4)	II (2–4)	II (1–4)
Brachythecium rutabulum	IV (3–6)	I (3–4)	I (3–7)	II (3–7)
Ranunculus repens	III (1–7)	I (3–4)	II (2–4)	II (1–7)
Poa trivialis	III (1–4)	I (1–5)	II (3–5)	II (1–5)
Lychnis flos-cuculi	III (1–5)	I (3–4)	I (1–3)	II (1–5)
Caltha palustris	III (1–6)	I (3–4)	I (3–4)	II (1–6)
Lophocolea bidentata s.l.	III (1–5)		I (3)	I (1–5)
Carex rostrata	III (1–5)		I (1)	I (1–5)
Calliergon cuspidatum	II (1–8)		II (1–4)	I (1–8)
Eurhynchium praelongum	II (1–6)		II (3–5)	I (1–6)
Equisetum palustre	II (1–2)	I (1–5)	I (4)	I (1–5)
Lathyrus pratensis	II (1–3)	I (2–3)	I (1–4)	I (1–4)
Ranunculus acris	II (1–5)	I (1–3)	I (1–4)	I (1–5)
Cardamine flexuosa	II (1–3)		I (2–3)	I (1–3)
Cardamine pratensis	II (1–3)		I (3)	I (1–3)
Carex nigra	II (1–5)		I (1)	I (1–5)
Geum rivale	II (1–7)			I (1–7)
Stellaria alsine	II (1–4)		I (2)	I (1–4)
Rhizomnium punctatum	II (2–4)			I (2–4)
Sanguisorba officinalis	II (1–3)			I (1–3)
Succisa pratensis	II (1–4)			I (1–4)
Crepis paludosa	II (1–6)			I (1–6)
Plagiomnium elatum	I (1–4)			I (1–4)
Carex disticha	I (1–3)			I (1–3)
Alchemilla glabra	I (2–5)			I (2–5)
Myosotis scorpiodes	I (1–2)			I (1–2)
Cirsium helenioides	I (3–4)			I (3–4)
Trollius europaeus	I (2–6)			I (2–6)
Ranunculus flammula	I (2–3)			I (2–3)
Carex panicea	I (1–3)			I (1–3)
Carex vesicaria	I (5–6)			I (5–6)
Calliergon cordifolium	I (1–5)			I (1–5)
Plagiomnium undulatum	I (3–4)			I (3–4)
Rhytidiadelphus squarrosus	I (1–4)			I (1–4)
Cochlearia pyrenaica	I (1–4)			I (1–4)
Ajuga reptans	I (1–3)			I (1–3)
Chiloscyphus pallescens	I (1–3)			I (1–3)
Thuidium tamariscinum	I (1–5)			I (1–5)
Carex appropinquata	I (1–3)			I (1–3)
Urtica dioica	I (1–6)	III (2–5)	I (3)	II (1–6)
Vicia cracca	I (1–3)	III (1–6)	I (2)	II (1–6)

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Phragmites australis	I (3–5)	III (3–8)	I (3–4)	II (3–8)
Arrhenatherum elatius	I (3–4)	III (1–5)	I (3)	II (1–5)
Cirsium arvense	I (1–3)	II (1–5)	I (3)	II (1–5)
Galium aparine	I (1–3)	II (3–5)		I (1–5)
Centaurea nigra	I (1–4)	II (1–4)		I (1–4)
Eupatorium cannabinum		II (1–7)	I (2)	I (1–7)
Epilobium hirsutum		II (1–7)	I (3)	I (1–7)
Calystegia sepium		I (4–5)		I (4–5)
Elymus repens		I (3)		I (3)
Thalictrum flavum		I (3–7)		I (3–7)
Prunella vulgaris		I (3–5)		I (3–5)
Juncus inflexus		I (2–5)		I (2–5)
Potentilla reptans		I (2–4)		I (2–4)
Polygonum amphibium		I (2–4)		I (2–4)
Juncus subnodulosus		I (2–7)		I (2–7)
Juncus effusus	II (1–5)	I (5)	V (2–6)	III (1–6)
Holcus lanatus	I (1–4)	I (1–6)	IV (1–6)	II (1–6)
Mentha aquatica	II (1–4)	II (1–5)	III (2–6)	II (1–6)
Lotus uliginosus		II (1–5)	III (2–5)	II (1–5)
Iris pseudacorus	I (4–5)	I (2–4)	II (5–7)	I (2–7)
Achillea ptarmica	I (1–2)		II (1–4)	I (1–4)
Anthoxanthum odoratum	I (1–4)		II (3–4)	I (1–4)
Agrostis stolonifera			II (3–4)	I (3–4)
Molinia caerulea			II (3–6)	I (3–6)
Stellaria graminea			I (1–3)	I (1–3)
Carex paniculata			I (4–5)	I (4–5)
Pteridium aquilinum			I (4–5)	I (4–5)
Agrostis canina			I (2–4)	I (2–4)
Senecio aquaticus			I (2–3)	I (2–3)
Epilobium obscurum			I (1)	I (1)
Hydrocotyle vulgaris			I (3–5)	I (3–5)
Sparganium erectum			I (2–3)	I (2–3)
Cirsium palustre	II (1–3)	II (1–5)	II (1–3)	II (1–5)
Galium uliginosum	I (1–3)	I (3–5)	I (1–4)	I (1–5)
Phalaris arundinacea	I (4–7)	I (3–5)	I (4)	I (3–7)
Lythrum salicaria	I (1–5)	I (1–5)	I (1–3)	I (1–5)
Rumex crispus	I (1)	I (1–4)	I (1–4)	I (1–4)
Juncus acutiflorus	I (1–3)	I (1–4)	I (2–7)	I (1–7)
Dactylis glomerata	I (1–6)	I (2–4)		I (1–6)
Equisetum arvense	I (1–5)	I (2–4)		I (1–5)
Carex acutiformis	I (3–6)	I (3–4)		I (3–6)
Epilobium palustre	I (1–2)		I (2)	I (1–2)
Potentilla palustris	I (1–3)		I (4)	I (1–4)
Festuca rubra	I (2–4)		I (1–4)	I (1–4)
Poa pratensis	I (1–5)		I (1)	I (1–5)
Viola palustris	I (1–2)		I (1)	I (1–2)
Equisetum fluviatile	I (1–2)		I (1)	I (1–2)
Rubus fruticosus agg.		I (2–5)	I (3)	I (2–5)
Heracleum sphondylium		I (1–4)	I (1)	I (1–4)

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Floristic table M27 *(cont.)*

	a	b	c	27
Potentilla anserina		I (1–3)	I (2–4)	I (1–4)
Oenanthe crocata		I (2–3)	I (5–6)	I (2–6)
Juncus articulatus		I (2–5)	I (5)	I (2–5)
Lysimachia vulgaris		I (2–6)	I (1)	I (1–6)
Glyceria maxima		I (3–5)	I (2)	I (2–5)
Rumex sanguineus		I (3–4)	I (2)	I (2–4)
Polygonum hydropiper		I (3–5)	I (3)	I (3–5)
Phleum pratense		I (2–4)	I (3)	I (2–4)
Juncus conglomeratus		I (3–6)	I (4)	I (3–6)
Pulicaria dysenterica		I (3)	I (2)	I (2–3)
Number of samples	29	41	18	88
Number of species/sample	17 (8–28)	14 (6–33)	15 (9–22)	15 (6–33)
Vegetation height (cm)	85 (48–130)	109 (20–200)	92 (20–150)	102 (20–200)
Herb cover (%)	96 (80–100)	100	99 (85–100)	99 (80–100)
Ground cover (%)	25 (0–70)	1 (0–10)	7 (0–50)	8 (0–70)
Altitude (m)	259 (2–378)	45 (4–246)	119 (4–320)	145 (2–378)
Soil pH	5.8 (5.7–6.0)	6.5 (5.4–7.5)	5.3 (4.4–6.1)	6.0 (4.4–7.5)

a *Valeriana officinalis-Rumex acetosa* sub-community
b *Urtica dioica-Vicia cracca* sub-community
c *Juncus effusus-Holcus lanatus* sub-community
27 *Filipendula ulmaria-Angelica sylvestris* mire (total)

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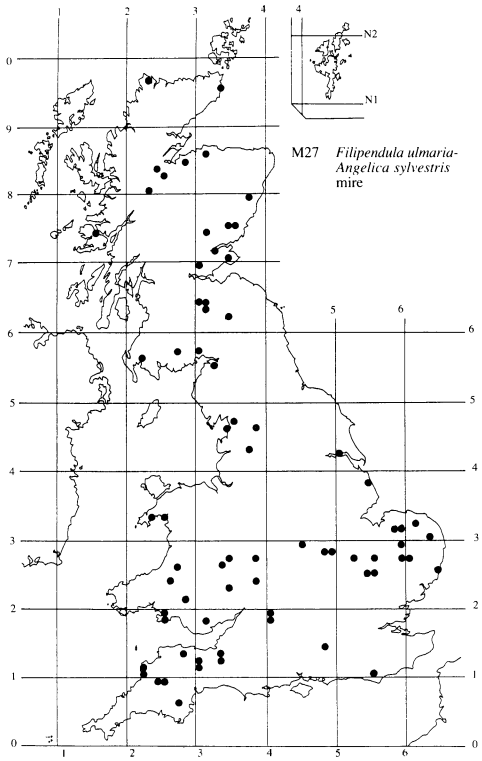

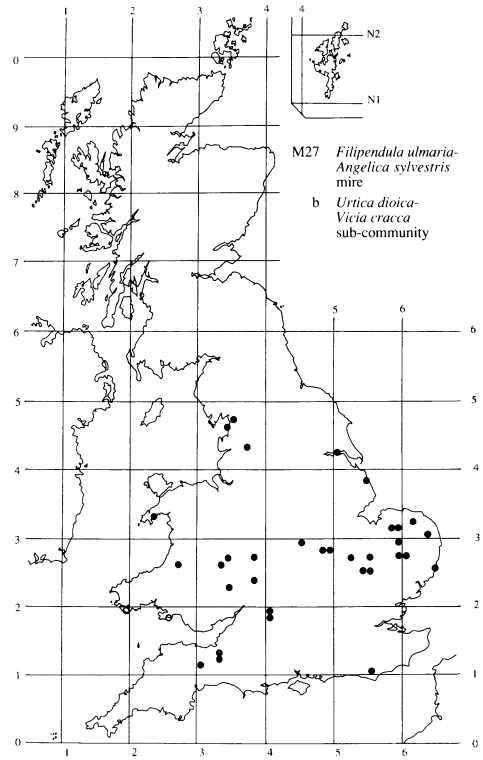

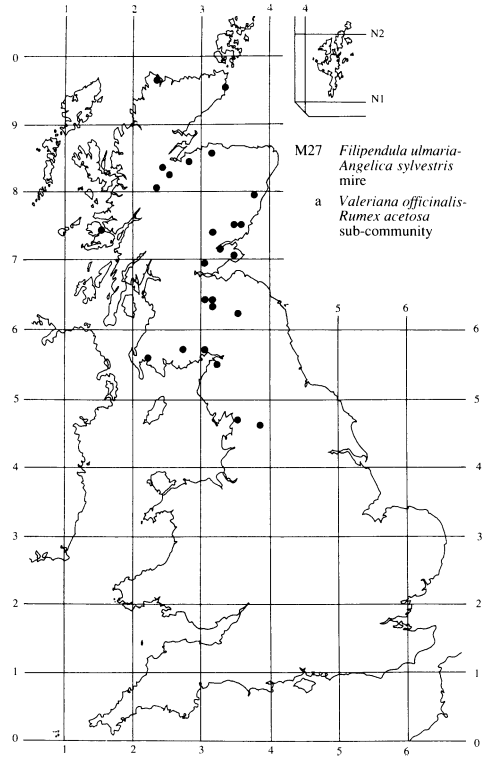

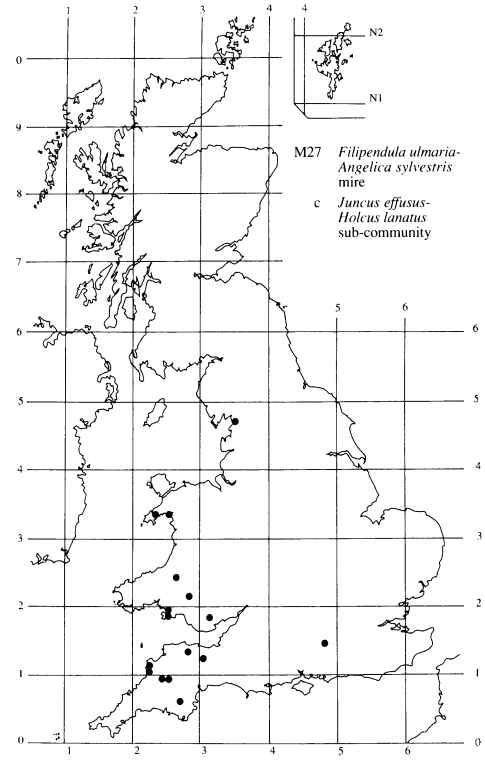

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