

MG1

Arrhenatherum elatius grassland *Arrhenatheretum elatioris* Br.-Bl. 1919

Synonymy

Arrhenatheretum elatioris sub-atlanticum R.Tx. (1937) 1955; *Arrhenatherum elatius* stands Pfitzenmeyer 1962 p.p.; *Pastinaco-Arrhenatheretum* (Knapp 1954) Passarge 1964; *Centaureo-Arrhenatheretum* O'Sullivan 1965; Slope grassland Packham *et al.* 1966, 1967; *Arrhenatheretum elatioris inops* Neijenhuijs & Westhoff 1968; Tall herb community Lloyd 1968; Species-rich *Arrhenatherum* grassland Lloyd 1972 p.p.; *Arrhenatherum elatius*/Festuca rubra/Helictotrichon pubescens grassland Wells *et al.* 1976.

Constant species

Arrhenatherum elatius, *Dactylis glomerata*.

Rare species

Silene nutans.

Physiognomy

The *Arrhenatheretum elatioris* is a community in which coarse-leaved tussock grasses, notably *Arrhenatherum elatius* with usually smaller amounts of *Dactylis glomerata* and *Holcus lanatus*, are always conspicuous and generally dominant. Large umbellifers are frequent throughout and sometimes abundant and the sequential flowering of first, *Anthriscus sylvestris* and later, *Heracleum sphondylium* and *Chaerophyllum temulentum*, can give stands a distinctive creamy-white haze throughout most of late spring and summer. Apart from *Cirsium arvense*, *Centaurea nigra* and *Urtica dioica*, other tall herbs are generally infrequent, though a variety of species may attain dominance locally (see variants below).

Beneath these taller species there is usually a layer of fine-leaved grasses, most frequently *Festuca rubra*, *Poa pratensis*, *P. trivialis*, *Lolium perenne* and *Elymus repens*, and small dicotyledons, notably *Trifolium pratense*, *T. repens*, *Achillea millefolium*, *Taraxacum officinale* agg., *Plantago lanceolata*, *Lotus corniculatus* and *Rumex acetosa*. At the height of the growing season the vegetation

often becomes choked by sprawling legumes such as *Lathyrus pratensis*, *Vicia sativa* ssp. *nigra* (= *V. angustifolia* L. = *V. sativa* ssp. *angustifolia* (L.) Gaud.), *V. cracca* and *V. sepium* and trailing stems of *Galium aparine* and *Rubus fruticosus* agg. Certain species, for example *Taraxacum officinale* agg. and occasional *Mercurialis perennis*, complete most of their growth and flower before this substantial bulk of vegetation has developed.

There is often a large amount of standing dead material in winter in the *Arrhenatheretum* and some ground litter generally persists throughout the year. Bryophytes are usually confined to thin wefts of pleurocarpous mosses over this decaying vegetation and on sparse patches of bare soil. *Brachythecium rutabulum* is the most frequent species throughout with some *Eurhynchium praelongum*, *Pseudoscleropodium purum* and *Rhytidadelphus squarrosus*.

Sub-communities

Five sub-communities are recognised. In the first two in particular, occasional species may attain local abundance or even dominance and a number of variants have been characterised on this basis. Further work is needed to establish the validity of these vegetation types and their hierarchical relationships to the sub-communities.

***Festuca rubra* sub-community.** Here the vegetation is generally grass-dominated with abundant *Arrhenatherum*, *D. glomerata* and *F. rubra*. Stands on recently-established sites, such as newly-created road verges, may be especially species-poor with up to 90% *F. rubra* at first and only occasional tussocks of *Arrhenatherum* and scattered dicotyledons; *Vicia sativa* ssp. *nigra*, *Cirsium arvense*, *Taraxacum officinale* agg. and *Plantago lanceolata* tend to be characteristic of such early stages. As *Arrhenatherum* and *D. glomerata* seed in, they overcome the dominance of the *F. rubra* and a wider range of dicotyledons is established: *Achillea millefolium*, *Ceras-*

MG1 *Arrhenatheretum elatioris* grassland

33

tium fontanum, *Lathyrus pratensis*, *Rumex acetosa*, *R. obtusifolius* and the large umbellifers. Species-richness increases with age (provided the vegetation is cut: see below) but, even with its full complement of species, this sub-community is one of the poorest of the British *Arrhenathereta*.

***Centaurea scabiosa* variant.** The presence of *C. scabiosa* tends to be associated with the replacement of *F. rubra* by *F. ovina* as the major grass of the understorey and an increase in records for *Hypericum perforatum*, *Galium verum* and *Agrimonia eupatoria*.

***Geranium pratense* variant.** *G. pratense*, *Vicia sepium*, *Lathyrus pratensis*, *Centaurea nigra* and *Cruciata laevipes* sometimes occur together in abundance in a particularly lush and colourful vegetation.

***Bromus sterilis* variant.** *B. sterilis* may be abundant in stands of this sub-community and it is often accompanied by *Alliaria petiolata* and a sparse ground cover of *Hedera helix* and *Glechoma hederacea*.

***Myrrhis odorata* variant.** *M. odorata* sometimes augments or replaces the large umbellifers of this sub-community to form a tall lush canopy with a somewhat sparse understorey.

***Epilobium angustifolium* variant.** A dense tall canopy of *E. angustifolium* may replace the tussock grasses as the dominant.

***Urtica dioica* sub-community:** Inner Wayside Bates 1937. In general floristics, this sub-community resembles the latter but here *U. dioica* is a constant and usually conspicuous component of the upper layer of the vegetation. The large umbellifers, too, are especially frequent and may account for up to 90% of the cover. *Galium aparine* is often present as a dense tangle.

Under the denser shade of this canopy, there is a generally more open cover of smaller grasses and dicotyledons than is usual in the *F. rubra* sub-community but a more extensive bryophyte layer. *F. rubra* itself and *Poa pratensis* and *P. trivialis* are all markedly less frequent. The leaf litter of *U. dioica* decays rapidly and, after the growing season, open patches in the vegetation expose conspicuous pads of pleurocarpous mosses, especially *Brachythecium rutabulum* on the less rapidly decaying fibrous stems.

***Papaver rhoeas* variant.** In the more open vegetation of this variant, patches of bare soil are colonised by annual ruderals such as *Papaver rhoeas*, *P. dubium*, *Capsella bursa-pastoris* and *Sonchus asper*. *Lolium perenne* attains constancy and it may be abundant.

***Artemisia vulgaris* variant.** Here, *A. vulgaris* is constant and it may form a bushy canopy. *Cirsium arvense*, *Elymus repens* and *Lolium perenne* are also more frequent.

***Epilobium hirsutum* variant.** Patches of *E. hirsutum* make a distinctive contribution to the canopy in this variant though the species does not attain dominance.

***Filipendula ulmaria* sub-community.** *Arrhenatherum*, *U. dioica* and *H. sphondylium* all remain frequent in this sub-community but here *F. ulmaria* is a constant and sometimes abundant component of the canopy. *Holcus lanatus*, *Dactylis glomerata* and *Poa trivialis* are the major grasses beneath although *Alopecurus pratensis*, *Deschampsia cespitosa* and *Festuca arundinacea* are occasionally abundant. *Ranunculus repens* is slightly preferential for this sub-community and there are occasional records for *Symphytum officinale* and *Pulicaria dysenterica*. *Rubus fruticosus* agg. is also frequent and, where stands are adjacent to hedgerows (a common occurrence), woodland species such as *Mercurialis perennis*, *Silene dioica* and *Stellaria holostea* may occur. In general, the vegetation is slightly richer than in the previous sub-communities.

***Pastinaca sativa* sub-community:** *Arrhenatheretum elatioris* Sub-Association Group B Br.-Bl. 1919; Coulter's Dean Wasteland 1920 Tansley & Adamson 1925; Coulter's Dean Wasteland 1936B Hope-Simpson 1940; *Arrhenatheretum elatioris agrimonietosum eupatoriae* LeBrun 1949; *Pastinaco-Arrhenatheretum* (Knapp 1954) Passarge 1964; *Arrhenatheretum elatioris picridetosum* Neijenhuijs & Westhoff 1968; *Arrhenatherum elatius*/Festuca rubra/Helictotrichon pubescens grassland Wells *et al.* 1976 p.p. In this more distinct sub-community, the upper layer is usually dominated by *Arrhenatherum*, *D. glomerata*, *H. lanatus* and *Pastinaca sativa* which here tends to replace *H. sphondylium* as the major umbellifer and which may lend stands a very striking appearance in the flowering season. Beneath, *F. ovina* generally replaces *F. rubra* and *Agrostis capillaris* appears as a frequent and sometimes abundant component. *Plantago lanceolata*, *Achillea millefolium*, *Galium verum* and *Senecio jacobaea* are the most frequent associates and there are occasional records for species characteristic of the coarse Mesobromion swards, e.g. *Sanguisorba minor*, *Knautia arvensis*, *Agrimonia eupatoria*, *Bromus erectus*, *Clinopodium vulgare*, *Centaurea scabiosa* and *Origanum vulgare*. Patches dominated by *U. dioica* with *Cirsium arvense* and *Galium aparine* may approach the *Urtica* sub-community in composition. Again, there is often a substantial litter accumulation below and bryophytes are sparse.

***Centaurea nigra* sub-community:** Broadbalk Wilderness 1913 Brenchley & Adam 1915; Rothamsted Plots 7 & 8 Brenchley rev. Warington 1958; *Centaureo-Arrhenatheretum* O'Sullivan 1965; Tall herb community Lloyd 1968; Species-rich *Arrhenatherum* grassland B. Lloyd 1972; *Arrhenatherum elatius*/Festuca rubra/Helictotrichon pubescens grassland Wells *et al.* 1976 p.p. This sub-community is richer and more varied than other British *Arrhenathereta*. *Arrhenatherum* itself is not so consistently dominant here although, with *D. glomerata*

and *H. lanatus*, it remains constant in the upper layer of the vegetation. *Trisetum flavescens* and *Avenula pubescens* occur less frequently but are preferential for this sub-community and are occasionally abundant. Among the taller dicotyledons, *H. sphondylium* is joined by *Centaurea nigra* and, less frequently, by *Leucanthemum vulgare* and (shared with the *Pastinaca* sub-community) *Senecio jacobaea*, *Knautia arvensis* and *Agrimonia eupatoria*. Beneath is a rich and extensive cover of grasses (the more usual *F. rubra*, *Poa trivialis* and *P. pratensis* with *Anthoxanthum odoratum* and *Agrostis capillaris*) and small dicotyledons (notably *Plantago lanceolata*, *Lotus corniculatus*, *Achillea millefolium*, *Galium verum*, *Veronica chamaedrys*, *Lathyrus pratensis* and *Luzula campestris*). *Primula veris*, *Malva moschata* and *Hypericum perforatum* are distinctive at low frequency. There is generally a bryophyte layer and *Pseudoscleropodium purum* and *Rhytidadelphus squarrosus* are preferentially frequent here.

Pimpinella saxifraga variant: *Centaureo-Arrhenatheretum* O'Sullivan 1965 sensu Shimwell 1968a; Habitat Study 42 Elington 1969. This highly distinctive vegetation is best considered as a variant of the *Centaurea* sub-community. The taller species *Arrhenatherum*, *D. glomerata*, *H. lanatus*, *C. nigra* and *H. sphondylium* remain constant and *Avenula pubescens*, *Knautia arvensis* and *Agrimonia eupatoria* increase in frequency. *Pimpinella saxifraga*, generally infrequent in the sub-community as a whole, is a particularly distinctive preferential. Many of the smaller grasses and dicotyledons are, however, reduced in frequency, notably *Anthoxanthum odoratum*, *Agrostis capillaris*, *Trifolium repens* and *Luzula campestris* while *Briza media*, *Pimpinella major* and *Brachypodium sylvaticum* show an increased occurrence. *Silene nutans* is a national rarity which occurs in this variant. Bryophytes are more varied here with records for *Calliergon cuspidatum*, *Hylocomium splendens* and *Lophocolea bidentata* s.l. In general, the vegetation of this variant is more open and heterogeneous and is often disposed irregularly over steep and rocky slopes.

Habitat

The *Arrhenatheretum* is, above all, an ungrazed grassland. It is characteristic of circumneutral soils throughout the British lowlands and occurs on road verges, railway embankments and churchyards and in neglected agricultural and industrial habitats such as badly-managed pastures and meadows, building sites, disused quarries and rubbish dumps.

The key factor in the development of the *Arrhenatheretum* on otherwise suitable sites is the absence or irregularity of grazing. However, without mowing, ungrazed stands of the community are rapidly invaded by shrubs and, in such cases, the *Arrhenatheretum* is a temporary

stage in the succession to scrub and woodland. The community is maintained, in the absence of grazing, by regular but infrequent cutting. Road verges, which represent one of the main reserves of permanent stands, are generally cut annually in early summer by mechanical mowers or, still occasionally, by the traditional scythe and sickle. On bends of roads and along major routes there may be two (or even more) cuts each year. Provided cut material is removed, the species-richness and diversity of the vegetation is maintained under such a regime. Early cutting or the use of herbicides or growth retardants may, however, drastically reduce the dicotyledonous component of the community and very frequent cutting or the resumption of grazing can convert the vegetation into something resembling a *Cynosurion* sward.

The *Arrhenatheretum* can become established and be maintained on a variety of circumneutral soils although it thrives best on well-structured and freely-draining loams. The most important edaphic variables influencing the floristic variation within the community are probably pH, the amount of the nutrients N, P and K and drainage. The *Festuca rubra*, *Urtica* and *Filipendula* sub-communities are generally associated with brown earths of neutral pH and, in artificial habitats, these may be shallow and somewhat stony or compacted and clayey. The *Centaurea scabiosa* and *Geranium* variants of the *Festuca rubra* sub-community and, more especially, the *Pastinaca* sub-community are more characteristic of brown calcareous earths of higher pH developed over calcareous bedrocks or superfcials. The *Centaurea nigra* sub-community seems to be associated with more mesotrophic soils. These may be calcareous and of high pH but the sub-community as a whole occurs over a wide range of bedrock types. There may be some developmental relationship between the typical variant of this sub-community and the long-unploughed pastures and meadows of the *Centaureo-Cynosuretum*. In the Park Grass Plot experiments at Rothamsted, application of mixed mineral (P, K, Na, Mg) manure to what is essentially a *Centaureo-Cynosuretum* sward (Plot 3) has produced an *Arrhenatheretum* very similar to the *Centaurea* sub-community (Plot 7: see Brechley rev. Warington 1958; also Pigott 1982). Fertilising of unimproved meadows with subsequent lack of grazing may thus account for some natural stands of this sub-community. Interestingly, the typical variant of the *Centaurea* sub-community is also frequent in churchyards where there is a distinctive release of nutrients into often deep profiles. The most striking of all the British *Arrhenathereta*, the *Pimpinella* variant of the *Centaurea* sub-community, is very closely related to moist calcareous soils on steep rocky slopes of Carboniferous and Magnesian limestones.

Verges and banks are frequently enriched with

mineral N, P and K in a somewhat raw fashion by runoff of ground water from fields treated with artificial fertilisers and the *Urtica* sub-community is especially frequent in areas of intensive arable agriculture. It also occurs as a narrow belt beneath hedges, fences and walls where perching or roosting birds provide a more natural input of these minerals in their droppings (Figure 8).

The soil moisture regime in the habitats of the *Arrhenatheretum* is most obviously influenced by the slope of adjacent land and the provision of banks and ditches as on verges and field margins. Soils are generally freely draining but moister soils typically carry the *Filipendula* sub-community (especially in roadside ditches or

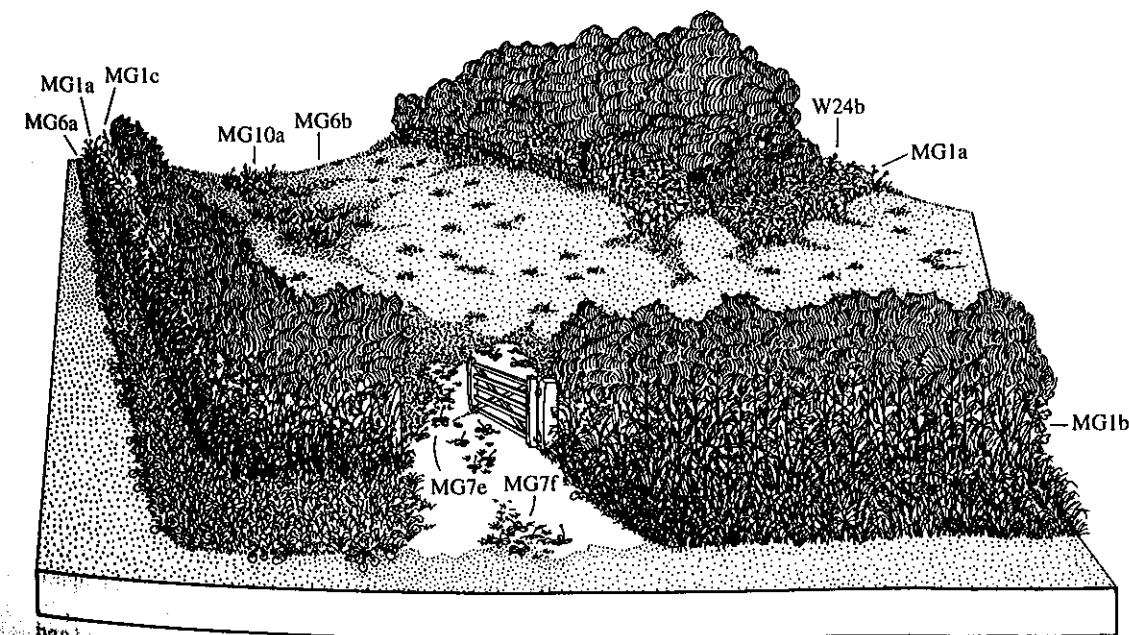
choked streams) or the *Epilobium hirsutum* variant of the *Urtica* sub-community (particularly on fen margins and on the banks of droves or rhynes across flood-meadows).

Sporadic interference or informal treatment is generally responsible for the local prominence of the variants of the *Festuca* and *Urtica* sub-communities. Physical disturbance, sometimes with mineral or organic enrichment, is common in the habitats of the *Arrhenatheretum* and may lead to the development of a ruderal element as in the *Papaver* and *Artemisia* variants of the *Urtica* sub-community. The former is frequent around road works and the gateways of arable fields and the latter occurs commonly on building sites and on the central reservations of motorways. The *Myrrhis* variant of the *Festuca rubra* sub-community is frequently associated with old habitations and this may reflect the once popular use of *Myrrhis* as a pot-herb (Tutin 1980).

The often substantial amounts of litter and, in winter, of standing dead material render the *Arrhenatheretum* highly susceptible to fire. If burning occurs outside or early in the growing season, when the bulk of the resources of the vegetation are under ground, even the short-term effects may be slight and repeated burning of this kind would probably not drastically alter the community (Lloyd 1968). Frequent burning, especially during the growing season, may permit colonisation by *Epilobium angustifolium* and stands of the variant of this species may be temporarily prominent on fire sites. Railway embankments (though less so now than in the days of steam locomotion) and amenity verges often carry this vegetation.

Figure 8. Typical pattern of grasslands in and around a run-down lowland pasture.

- MG1a *Arrhenatheretum*, *Festuca* sub-community on verge bank
- MG1b *Arrhenatheretum*, *Urtica* sub-community on disturbed verge
- MG1c *Arrhenatheretum*, *Filipendula* sub-community in verge ditch
- MG6a *Lolio-Cynosuretum*, Typical sub-community on frequently mown verge edge
- MG6b *Lolio-Cynosuretum*, *Anthoxanthum* sub-community with avoidance mosaic
- MG7e *Lolio-Plantagineum* towards gateway
- MG7f *Poo-Lolietum* in gateway
- MG10a *Holco-Juncetum*, Typical sub-community in ill-drained field hollow
- W24b *Rubus-Holcus* underscrub, *Arrhenatherum-Heracleum* sub-community invading around field margin



The occurrence of and variation within the *Arrhenatheretum* often reflect patterns of past treatment which have continuing effects. The sites of many permanent stands are artificial to some degree and the particular conjunction of verge, bank, ditch and boundary hedge, fence or wall can exert an influence through the modification of soil drainage or by the close juxtaposition of grassland, swamp and hedgerow vegetation. The *Bromus* variant of the *Festuca rubra* sub-community, for example, is very characteristic of the inner fringe of verges which directly front hedgerows and many stands of the *Arrhenatheretum* have a minor component of woodland field-layer species which reflect long association with adjacent hedges or wood margins.

Zonation and succession

Some of the most frequent zonations involving *Arrhenatheretum* stands are the often sharp juxtapositions of the various sub-communities and variants with one another or with other vegetation types along road margins. Such patterns are very varied and sometimes reflect long, local traditions of boundary construction and maintenance.

Where stands are not maintained by cutting, zonations are generally a reflection of stages in succession to mixed deciduous woodland. This succession is most often mediated by grazing. *Arrhenatheretum* is a ready invader of soils and calcareous talus exposed by landslide, construction work or the abandonment of ploughed land. It can also spread into and increase in certain other grassland types where grazing is absent or withdrawn or where there is injudicious pastoral treatment. Resumption of grazing can once more reduce its cover. Hope-Simpson (1940b) noted that, within four years of the removal of rabbits from a primitive *Festuca ovina*-*Avenula pratensis* sward at War Down, Hampshire, *Arrhenatheretum* previously no more than occasional, had become very abundant. Within seven years of the resumption of grazing by sheep and rabbits on an *Arrhenatheretum* at nearby Coulter's Dean Wasteland, the vegetation had been converted to a *Festuca ovina*-*Avenula pratensis* grassland with no *Arrhenatheretum* (Hope-Simpson 1940b). Thomas (1960, 1963) showed that, after the virtual elimination of rabbits by myxomatosis, the coarser grasses characteristic of the *Arrhenatheretum* were among those species which spread in grasslands and heaths on chalk. These had previously been present in small amounts and had provided a valuable winter-green bite for the rabbits. They were reduced in cover when rabbit numbers rose again. *Arrhenatheretum* can also spread into seeded verges and some of the floristic variation within the *Festuca rubra* sub-community (see above) is attributable to this advance. Increase of *Arrhenatheretum* in *Centaureo-Cynosuretum* grasslands seems to follow careless grazing, perhaps by the use of such grasslands as horse-pad-

docks, and the *Centaurea nigra* sub-community of the *Arrhenatheretum* may originate partly in this way.

Ploughing and subsequent abandonment of land after unsuccessful arable cultivation seems to have been a fairly widespread factor in the development of some of the more extensive stands of the community, especially on deeper soils over chalk. The *Arrhenatheretum* at Coulter's Dean Wasteland had developed on land ploughed and abandoned some 30 years before (Tansley & Adamson 1925). Brenchley & Adam (1915) had reported a similar occurrence of the community on the abandoned and ungrazed Broadbalk Wilderness at Rothamsted. Several subsequent studies (Lloyd & Pigott 1967 in the Chilterns, Grubb *et al.* 1969 at Lullington Heath, Sussex and Wells *et al.* 1976 at Porton Down on the Hampshire/Wiltshire border) have confirmed the view that the *Arrhenatheretum* is one of the communities dominated by coarse grasses which can, in the absence of grazing, develop naturally on the chalk without the prior development of a *Festuca ovina*-*Avenula pratensis* sward.

The *Arrhenatheretum* described in these studies are of the kind classified here as the *Pastinaca* and *Centaurea nigra* sub-communities but the lists provided are generally insufficiently precise to allocate stands unequivocally to one or the other. The available data suggest that the *Pastinaca* sub-community develops on the more calcareous and oligotrophic soils where there has been relaxation of grazing or where there has been a relaxation of grazing of calcicolous grassland. This sub-community is most common on the chalk of the south and east where *P. sativa* has its centre of distribution in Britain and where there has been a history of unsuccessful arable cultivation of marginal chalkland and pastoral neglect (see, for example, Smith 1980). The *Centaurea* sub-community is more widespread and seems to develop on more mesotrophic soils which are generally less calcareous. It is perhaps the more natural sub-community on deeper soils over chalk, such as those derived from superficial deposits, but it may also develop by the relaxation of grazing of mesotrophic grasslands throughout the lowlands, especially where this has been combined with application of fertilisers.

Similar differences in the trophic state of soils may be an important factor in controlling whether it is *Arrhenatheretum* (of any kind) or grassland dominated by other coarse species such as *Avenula pubescens*, *Festuca rubra*, *Bromus erectus* and *Brachypodium pinnatum* which develops in any given situation. Wells *et al.* (1976) showed that, at Porton, the *Arrhenatheretum* occurred on land ploughed relatively recently where, they suggested, there was still a comparatively small accumulation of organic matter and mineral nutrients. Other coarse grassland types had developed on soils ploughed less recently which were consequently richer.

If any kind of *Arrhenatheretum* remains ungrazed and

uncut it eventually develops a pronounced tussock physiognomy and litter accumulation depresses species-richness. Shrubs invade and the frequently close hedgerows and field boundaries provide a seed source. Foremost among the invaders is *Crataegus monogyna* with *Prunus spinosa*, *Sambucus nigra* (especially where there has been disturbance and soil eutrophication), *Rubus fruticosus* agg., *Rosa* spp. and, on the more calcareous soils, *Cornus sanguinea*, *Viburnum lantana* and *Ligustrum vulgare*. *Clematis vitalba* may form a tangle among the developing scrub. Eventually, succession progresses to some form of mixed deciduous woodland but even very coarse and scrubby *Arrhenatheretum* can be converted to a low sward by grazing. At Aston Rowant NNR, Oxfordshire, four years of sheep-grazing in winter and spring drastically reduced the height of a scrubby *Arrhenatheretum* and converted *A. elatius* itself from large tussocks to small scattered shoots in a ground of *Festuca ovina* (Wells 1969: compare especially Figures 1 and 2).

Distribution

The *Arrhenatheretum* is virtually ubiquitous throughout the lowlands of Britain, although the bulk of Scotland has been under-sampled. Many of the stands are fragmentary and the distributions of the sub-communities generally reflect differences in verge and grassland management or neglect which may vary greatly from one locality to the next. The *Festuca rubra* sub-community is the most widely distributed; the *Urtica* sub-community is especially prominent in areas of intensive arable agriculture and the *Filipendula* sub-community occurs wherever local drainage requirements have necessitated the provision of roadside and field ditches. The *Pastinaca* and *Centaurea nigra* sub-communities are more restricted by soil conditions, the former to more calcareous soils in the south and east, the typical variant of the latter to more mesotrophic soils throughout the country. The *Pimpinella* variant of the *Centaurea* sub-community has been recorded only from the Carboniferous and Magnesian limestones of the Mendips, Derbyshire, Yorkshire and Durham. The occurrence of some of the other variants is also influenced by geology and soil: the *Centaurea scabiosa* and *Geranium pratense* variants are particularly well developed over limestones with good examples of the former on Salisbury Plain

verges and of the latter in the Yorkshire Dales.

With an increased intensity of land management, the *Arrhenatheretum* has become restricted in some areas: the richest stands of the *Centaurea* sub-community, for example, are now confined to churchyards. However, road verges continue to provide a valuable resource and the gradual maturation of motorway verges is increasing the potential extent of the community.

Affinities

There is no existing comprehensive description of the *Arrhenatheretum elatioris* in the British literature, although the community is obviously very similar to the *Arrhenatheretum* of western Europe, where this vegetation is also widespread (e.g. Tüxen 1955). In general, however, the core of the Continental *Arrhenatheretum* corresponds to the vegetation described here as the *Centaurea nigra* sub-community. It is for this reason that we have not separated off this vegetation as a distinct community (cf. O'Sullivan 1965, Shimwell 1968a). We have also retained the floristically less distinctive *Pastinaca sativa* type of *Arrhenatheretum* within the ambit of a single community, although its counterpart in Europe has sometimes been distinguished as a separate association (e.g. Knapp 1954, Passarge 1964; cf. LeBrun *et al.* 1949). In a Continental perspective, the bulk of the British *Arrhenatheretum* would be regarded as impoverished forms of a rich grassland type which is frequently managed in parts of western Europe as hay-meadow. In Britain, the continuing management of the widely-distributed roadside verge habitat maintains these poorer forms in abundance.

The *Arrhenatheretum* has clear floristic affinities with other major vegetation types. It grades, through an increase in ruderal elements, to the communities of the Secalinetea and Artemisietea and, through species such as *Filipendula ulmaria* and *Epilobium hirsutum*, to Filipendulion mires. The presence of Mesobromion or Cynosurion species within the *Pastinaca* and *Centaurea* sub-communities represents floristic transitions to calcicolous grasslands and mesotrophic pastures. An herbaceous woodland element is frequently present in *Arrhenatheretum* and there is a clear affinity with the damp mixed deciduous woodlands of the Alno-Ulmion through the *Filipendula* sub-community and the closely-related *Filipendulo-Arrhenatheretum*.

Floristic table MG1

	a	b	c	d	e	f
<i>Arrhenatherum elatius</i>	V (2-9)	V (1-9)	V (1-8)	V (2-9)	V (2-8)	V (1-9)
<i>Dactylis glomerata</i>	IV (2-8)	IV (1-8)	IV (1-7)	V (3-5)	V (1-7)	IV (1-8)
<i>Holcus lanatus</i>	II (2-8)	II (2-6)	IV (2-7)	IV (3-7)	IV (1-8)	III (1-8)
<i>Heracleum sphondylium</i>	III (1-6)	IV (2-7)	III (1-5)	II (3-4)	V (1-5)	III (1-7)
<i>Anthriscus sylvestris</i>	II (1-7)	II (2-7)	I (2-8)	I (3)	I (1-5)	II (1-8)
<i>Agrostis stolonifera</i>	II (2-6)	I (1-9)	I (2-5)	I (3-4)	I (3-8)	I (1-9)
<i>Lamium album</i>	I (3-4)	I (2-4)	I (1-2)	I (4)		I (1-4)
<i>Papaver rhoeas</i>	I (2)	I (3-4)				I (2-4)
<i>Papaver dubium</i>	I (1)	I (2)				I (2-4)
<i>Capsella bursa-pastoris</i>	I (3-4)	I (2-3)				I (2-4)
<i>Sonchus asper</i>	I (3)	I (2-4)				I (4-5)
<i>Agropodium podagraria</i>	I (5)	I (4)				III (1-7)
<i>Urtica dioica</i>	I (1-3)	V (1-7)	III (1-6)	II (2-5)	I (2)	II (1-5)
<i>Galium aparine</i>	I (1-5)	II (1-5)	III (2-5)	I (4)		I (1-6)
<i>Epilobium hirsutum</i>		I (2-6)	I (1-3)			I (3-7)
<i>Artemisia vulgaris</i>		I (3-7)			I (6)	I (1-6)
<i>Filipendula ulmaria</i>		I (1-2)	V (1-6)			II (2-5)
<i>Pastinaca sativa</i>	I (2)			V (2-5)	III (1-5)	III (1-6)
<i>Achillea millefolium</i>	II (1-5)	II (2-6)	I (3)	V (2-5)	IV (1-4)	III (1-5)
<i>Plantago lanceolata</i>	III (1-5)	II (2-4)	II (2-4)	IV (2-4)	III (1-5)	II (1-7)
<i>Galium verum</i>	I (2-7)	I (3-4)	I (3)	III (2-4)	II (1-7)	I (1-8)
<i>Agrostis capillaris</i>	I (2-8)	I (2-4)	I (3)	III (3-7)	I (1-5)	I (1-6)
<i>Festuca ovina</i>	I (2-5)	I (3-5)		III (3-6)	II (1-4)	II (1-4)
<i>Senecio jacobaea</i>	I (2-3)			III (1-4)	II (1-4)	I (1-5)
<i>Knautia arvensis</i>	I (3-4)	I (3-5)		II (2-3)	I (5)	I (1-5)
<i>Sanguisorba minor</i>	I (1-4)	I (3)		II (1-4)	I (2-4)	I (1-5)
<i>Prunella vulgaris</i>	I (5)		I (1)	II (1-2)	II (2-4)	I (1-5)
<i>Agrimonia eupatoria</i>	I (1-3)			II (4)	I (1)	I (1-3)
<i>Clinopodium vulgare</i>	I (2-3)			II (3)		I (1-7)
<i>Centaurea scabiosa</i>	I (1-7)			II (1-4)	II (1-3)	I (1-3)
<i>Pimpinella saxifraga</i>				II (1-3)		I (1-3)

<i>Origanum vulgare</i>	II (2-3)				I (1-4)	I (2-3)
<i>Campanula rotundifolia</i>	I (1-3)					I (1-4)
<i>Scabiosa columbaria</i>	I (1-3)					I (1-3)
	I (1-4)					I (1-4)
<i>Bromus erectus</i>	I (1-3)					I (1-3)
<i>Helianthemum nummularium</i>	I (1-2)					I (1-2)
<i>Linum catharticum</i>	I (1-3)					I (1-3)
<i>Teucrium scorodonia</i>	I (1-2)					I (1-2)
<i>Thymus praecox</i>						
<i>Festuca rubra</i>	I (4-7)	I (3-5)	I (4-6)	III (1-9)	IV (1-7)	II (1-9)
<i>Lotus corniculatus</i>	II (3-4)	I (3)	I (3)	I (2-5)	IV (1-7)	II (1-7)
<i>Centaurea nigra</i>	II (3-5)	II (1-5)	I (1-7)	II (1-6)	V (1-7)	III (1-7)
<i>Trisetum flavescens</i>	I (2-5)	I (2-3)	I (2-3)	I (3-4)	III (1-5)	I (1-5)
<i>Veronica chamaedrys</i>	II (2-3)	I (1-2)	I (2-3)	I (1-4)	III (1-4)	I (1-4)
<i>Leucanthemum vulgare</i>		I (2)	I (4)	I (3-6)	II (1-7)	I (1-7)
<i>Trifolium pratense</i>	II (2-4)	I (2-4)	I (6)	I (3-7)	II (1-4)	II (1-7)
<i>Anthoxanthum odoratum</i>	II (1-4)				III (1-7)	I (1-7)
<i>Avenula pubescens</i>			I (4)		II (1-5)	I (1-5)
<i>Hypericum perforatum</i>				I (2-8)	II (1-4)	I (1-8)
<i>Primula veris</i>			I (2)		I (1-3)	I (1-3)
<i>Silene nutans</i>					I (1-4)	I (1-4)
<i>Cirsium arvense</i>	III (3-4)	III (1-5)	III (1-6)	III (1-5)	I (1-5)	III (1-6)
<i>Poa pratensis</i>	II (3-8)	I (2-5)	I (2-7)	II (1-6)	II (1-4)	II (1-8)
<i>Poa trivialis</i>		III (3-6)	I (2-7)	II (2-8)	II (1-4)	II (1-8)
<i>Rumex acetosa</i>	I (3)	III (1-4)	I (1-4)	I (1-3)	I (1-3)	II (1-4)
<i>Trifolium repens</i>	II (2-3)	II (2-6)	I (2-3)	I (2-4)	II (1-5)	II (1-6)
<i>Lathyrus pratensis</i>	I (1-2)	III (2-4)	I (1-5)	II (1-7)	III (1-5)	II (1-7)
<i>Elymus repens</i>		II (2-5)	II (1-8)	II (2-8)	I (2-6)	II (1-8)
<i>Lolium perenne</i>	II (1-8)	II (1-7)	II (1-6)	II (1-8)	I (2-6)	II (1-8)
<i>Rubus fruticosus</i> agg.	II (1-8)	III (1-4)	II (1-6)	II (2-6)	II (2-4)	II (1-8)
<i>Taraxacum officinale</i> agg.	II (1-5)	II (1-3)	I (1-4)	II (1-5)	II (1-3)	II (1-5)
<i>Vicia sativa nigra</i>	II (1-5)	II (4-5)	I (1-3)	II (2-4)	I (1-3)	II (1-5)
<i>Brachythecium rutabulum</i>	II (1-7)	I (1-2)	I (2-4)	II (1-7)	II (1-5)	II (1-7)
<i>Eurhynchium praelongum</i>	I (1-9)	II (1-9)	I (2-6)	I (2-7)	I (1-2)	I (1-9)
<i>Pseudoscleropodium purum</i>	I (1-4)	I (3)	I (1)	I (3)	II (1-4)	I (1-4)
<i>Rhytidiadelphus squarrosus</i>	I (1-3)	I (3)	I (3)	I (2-3)	I (1)	I (1-3)
<i>Alopecurus pratensis</i>	I (1-8)	I (3)	I (1-8)	I (4-8)	I (2-3)	I (1-8)

Floristic table MG1 (cont.)

	a	b	c	d	e	f
<i>Cerastium fontanum</i>	I (1-4)	I (2)	I (1-3)	II (1-3)	II (1-3)	I (1-4)
<i>Ranunculus acris</i>	I (1-4)	I (3-5)	II (1-3)	I (3)	II (1-4)	I (1-5)
<i>Vicia cracca</i>	I (2-4)	I (3)	I (3-4)	I (2)	I (2)	I (2-4)
<i>Galium mollugo</i>	I (3-4)		I (4-5)	I (3)	I (3)	I (3-5)
<i>Bromus sterilis</i>	I (1-8)	I (2-7)	I (1)	I (3)	I (1-7)	I (1-8)
<i>Brachypodium sylvaticum</i>	I (2-5)	I (5)	I (1-4)	I (1-2)	I (3)	I (1-7)
<i>Convolvulus arvensis</i>	I (2-6)	I (2-6)	I (1-3)	II (3-5)	I (3)	I (1-6)
<i>Cynosurus cristatus</i>	I (2-8)	I (3)	I (2-3)	I (2)	I (4-5)	I (2-8)
<i>Glechoma hederacea</i>	I (1-4)	I (1-6)	I (4)	II (1-5)	I (3-4)	I (1-6)
<i>Pteridium aquilinum</i>	I (3-6)	I (2-5)	II (1-5)	I (3)	I (1-3)	I (2-6)
<i>Ranunculus repens</i>	I (1-6)	I (1-3)	I (3)	II (2-5)	I (1-3)	I (1-6)
<i>Lotus uliginosus</i>	I (2)	I (1-3)	I (1)	I (3)	I (1-5)	I (1-3)
<i>Leontodon hispidus</i>	I (3)	I (2)	I (1)	I (1)	I (1-7)	I (1-5)
<i>Potentilla reptans</i>	I (1-7)	I (2)	I (2-4)	I (3-6)	I (1-5)	I (2-4)
<i>Festuca pratensis</i>	I (1-3)	I (1-3)	I (3)	I (1-5)	I (2-4)	I (1-4)
<i>Stellaria graminea</i>	I (2-3)	I (1)	I (2-3)	I (1)	I (1-4)	I (1-4)
<i>Ranunculus ficaria</i>	I (1-4)	I (1-3)	I (4)	I (1)	I (1)	I (1-4)
<i>Vicia sepium</i>	I (3-4)	I (1-2)	I (1-3)	I (1-3)		I (1-6)
<i>Epilobium angustifolium</i>	I (2-6)	I (4)	I (1)	I (1-2)		I (1-4)
<i>Pheum pratense pratense</i>	I (3-4)	I (1-4)	I (1)	I (1-2)		I (1-5)
<i>Cirsium vulgare</i>	I (3-5)	I (1-2)	I (4)	I (2)		I (1-4)
<i>Rumex crispus</i>	I (4)	I (1-4)	I (2-3)	I (1-2)	I (1-4)	I (1-4)
<i>Hypochaeris radicata</i>	I (2)		I (4)	I (3)		I (2-4)
<i>Rhinanthus minor</i>	I (2-3)			I (6)	I (3)	I (2-6)
<i>Pheum pratense bertolonii</i>	I (1)			I (1)	I (1-4)	I (1-4)
<i>Carduus nutans</i>	I (4)		I (4)		II (1-4)	I (1-4)
<i>Luzula campestris</i>	I (1)				I (1-6)	I (1-7)
<i>Holcus mollis</i>	I (3-4)		I (2-7)	I (1)	I (1-3)	I (1-3)
<i>Ranunculus bulbosus</i>	I (3)			I (1-3)		I (1-4)
<i>Daucus carota carota</i>	I (3-4)			I (1)		I (1-4)
<i>Bromus hordeaceus hordeaceus</i>	I (1-4)		I (2-3)	I (1)		I (1-4)
<i>Geranium dissectum</i>	I (2-5)		I (3)	I (1)		I (1-5)
	I (3-5)	I (2-4)	I (3)			I (2-5)

<i>Rumex obtusifolius</i>	I (1-4)	I (1-4)	I (1-4)	I (1-4)	I (1-4)
<i>Symphitum officinale</i>	I (1-4)	I (3-5)	I (3-5)	I (3-5)	I (3-5)
<i>Briza media</i>	I (1)	I (1)	I (1)	I (1-3)	I (1-4)
<i>Conopodium majus</i>	I (3)			I (1-4)	I (1-4)
<i>Pimpinella major</i>	I (4)			I (1-7)	I (1-7)
Number of samples	85	118	27	46	316
Number of species/sample	12 (4-19)	12 (3-18)	15 (4-21)	16 (5-20)	14 (3-30)

- a *Festuca rubra* sub-community
b *Urtica dioica* sub-community
c *Filipendula ulmaria* sub-community
d *Pastinaca sativa* sub-community
e *Centaurea nigra* sub-community
f *Arrhenatheretum elatioris* (total)