

**A compilation of proposed additions
and revisions to vegetation types in
the National Vegetation
Classification**



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Introduction

This document sets out and summarises information about proposed additions and revisions to the National Vegetation Classification (NVC), in terms of the communities, sub-communities and variants covered by this vegetation classification system. The exercise was limited to known information that could be accessed fairly readily, i.e. it is not completely comprehensive, but probably covers most of the key information involved.

The changes proposed are numerous and cover a wide range of vegetation types. In some cases, the changes appear relatively straight-forward and uncontroversial, but others are rather complex and could not be fully appraised without additional specialist advice.

Although the review of Rodwell *et al* (2000) provides a comprehensive framework to show what types are 'missing' from the NVC and what 'types of gap' they represent, it was not straight-forward to relate each of the proposed changes to this framework.

These data are therefore presented without any detailed appraisal or recommendation as regards their validity and acceptance into the published NVC scheme.

Summary of proposed additions and revisions

The following seven sets of proposals were included in this work:

1. Those set out by Rodwell, J.S., Dring, J.C., Averis, A.B.G., Proctor, M.C.F., Malloch, A.J.C., Schaminée, J.N.J., & Dargie T.C.D. 2000. *Review of coverage of the National Vegetation Classification*. JNCC Report No. 302. Peterborough: Joint Nature Conservation Committee.

These included a framework to identify, categorise and accommodate additional NVC types. Detailed proposals for around 113 additional types were set out, nearly half of which might qualify under Annex I of the EU Habitats Directive. Although some additions were supported by field samples and analyses, for others novel or supplementary sampling and analysis was advised before the types could be fully appraised. About half were concerned with gaps at the NVC community level; a further 40% covered extant NVC communities that perhaps needed further sub-division at the sub-community level. The additional communities were spread across a very broad spectrum of phytosociological formations and alliances.

See Annex 1.

2. Those set out by Dargie, T.C.D. 2000. *Sand Dune Vegetation Survey of Scotland: National Report*. Scottish Natural Heritage, Battleby.

These include proposals for 36 new or changed NVC types, some of which are mentioned in the review of Rodwell (2000). These cover new types of strandline, mobile dune, semi-fixed dune, fixed calcareous grassland, coarse dune grassland, dune lichen heath, fixed acidic dune grassland, dune slack, dune wet heath, mire, machair fen, wet mesotrophic grassland, swamp and scrub habitat. Each new type is described and a floristic table given as supporting evidence.

See Annex 2.

3. Those set out by Cooper, EA and MacKintosh, J (1996) *NVC review of Scottish grassland surveys*. SNH Review, No. 65.

These were based on NVC surveys of Scottish unimproved lowland grasslands. They include proposals for a limited number of new NVC types, the status of which was

considered by Rodwell et al (2000). The types are described and the underlying quadrat data is included in Scottish Natural Heritage's Lowland Grassland Database.

See Annex 3.

4. Those set out by Dr Peter Jones based on peatland NVC surveys in Wales – Unpublished document prepared by Dr Peter Jones, CCW Phase II Survey Team, Terrestrial Science Group, 8 July 2008.

These include proposals for four additional NVC communities, nine additional NVC sub-communities, and a single additional NVC variant. They focus on poor/ultra-poor fens, particularly those on the cusp of ombrotrophy. Related vegetation is very likely present in Scotland and SW and N England. In addition, it is suggested that there is significant scope for a re-analysis of some existing units aided by new quadrat records (particularly M2, M5, M9, M21, M30, S27, variants of M17 and M18, and S24).

See Annex 4.

5. Those set out by Wheeler, B.D., Shaw, S., & Tanner, K. (2009) *A wetland framework for impact assessment at statutory sites in England and Wales*. Environment Agency, Bristol.

These were developed as part of the work to create a wetland framework for impact assessment at statutory sites in England and Wales, focussing on sites across Cumbria, the East, South, South West and West Midlands of England and Wales. They include: (i) updating the accounts of 14 NVC mire and swamp communities; (ii) adding two new NVC wetland communities; and (iii) (re-)defining the M9 NVC mire community.

See Annex 5.

6. Those set out by Castle, G. and Mileto, R. (2003). Using the National Vegetation Classification (NVC) in woodland survey - 6000ha on. In: Goldberg, E. (Ed) *National Vegetation Classification – ten years' experience using the woodland section*. JNCC Report No. 335. Joint Nature Conservation Committee, Peterborough. Pages 76-86.

These were based on woodland survey in Wales and west/southwest England. The most notable additions applied to: (i) woodlands supporting a field layer dominated by *Luzula sylvatica* (particularly W10, W14, W16 and W17 NVC woodland communities); (ii) woodlands dominated by *Fagus sylvatica* but which support a field layer comprising carpets of *Allium ursinum* or a field layer rich in Atlantic bryophytes; (iii) woodlands which support abundant *Fraxinus excelsior* but with few other species characteristic of W8 or W7 NVC woodland communities or with abundant ferns but where *Polystichum setiferum* and/or *Phyllitis scolopendrium* are prevalent; (v) many of the W11 NVC woodland communities in Wales, as these generally lack key preferential species for any of the four existing W11 woodland sub-communities.

See Annex 6.

7. Those set out by Prosser M. V. and Wallace H. L. (2003) Some maritime scrub nodes from West Wales. In: Goldberg, E. (Ed) *National Vegetation Classification – ten years' experience using the woodland section*. JNCC Report No. 335. Joint Nature Conservation Committee, Peterborough.

These were based on surveys of maritime scrub in west Wales. They include six possible new NVC sub-communities and a *Ligustrum nodum* to cover coastal scrub types that are frequently found interposed between maritime grassland and heath communities. These recommendations were, however, dependent on the identification of similar stands around the British coastline.

See Annex 7.

Annex 1 – Proposed additions and revisions by Rodwell et al (2000) based on a review of coverage of the NVC

Rodwell, J.S., Dring, J.C., Averis, A.B.G., Proctor, M.C.F., Malloch, A.J.C., Schaminée, J.N.J., & Dargie T.C.D. 2000. *Review of coverage of the National Vegetation Classification*. JNCC Report No. 302. Peterborough: Joint Nature Conservation Committee.

Available via: <http://www.jncc.gov.uk/page-2312>

Background

Following completion of the original NVC project, Rodwell et al (2000) undertook a review for JNCC to assess in detail the overall coverage of the NVC. This was based on the personal experience of the reviewers, an examination of the wider European phytosociological scene, and a review of major NVC field surveys, together with comments received from a representative sample of users of the NVC.

The review identified a number of likely gaps and new variation in the classification. These were of vegetation types that had not been described because:

- they had not been sampled or were under-sampled;
- they were the result of gaps in geographical and/or habitat coverage;
- they were the product of an increased understanding of how best to design the classification.

Later, Strachan & Jackson (2001) proposed a process for incorporating gaps and new variation into the NVC. This included a code or protocol that presented rules for describing new types. This would include minimum standards for the description of new types and a process for their validation and publication. An expert committee would be given authority to validate the descriptions of new types and ensure that the standards of the code were met. The JNCC was to be responsible for establishing and chairing an expert committee who would oversee the implementation of the code. This proposal was never progressed.

Information presented for each additional type

The proposed additional types were presented within the framework of a Phytosociological Conspectus. Each was supported by a commentary that described, in indicative terms, the floristics of the type, the broad ecological requirements, and its occurrence in Britain. In addition some indication of the work required to complete a floristic table and full NVC description of the type was given, in particular, whether there was an existing data set of samples, and how much further field work may be required. Each type was assigned to one of six levels of 'gap' and those that might qualify as Annex I types under the EU Habitats Directive were identified (see table over page).

Details of NVC additions proposed by Rodwell et al (2000). Each addition is assigned to one of six levels of 'gap' and those that might qualify as Annex I types under the EU Habitats Directive are suffixed by an 'A'.

Level 1 = plant communities or sub-communities characterised in the NVC but with no supporting samples;

Level 2 = vegetation types described in the NVC at alliance or similar level where further sampling will characterise one or more plant communities;

Level 3 = plant communities described in the NVC which lose their integrity beyond a main geographic limit;

Level 4 = basal vegetation impoverished in floristics and of rank structure;

Level 5 = plant communities well characterised in the NVC but perhaps needing further sub-communities;

Level 6 = new variation and gaps at plant community level.

1. COASTAL MUDFLAT AND BRACKISH WATER – additional NVC types identified by Rodwell et al (2000)

NVC type(s)	Level	Description
SM1 type	2A	Eel-grass swards of shallower waters SM1 <i>Zostera</i> communities (2)* In British Plant Communities, there is a description of the vegetation with the various <i>Zostera</i> spp., but only a limited amount of data. It is certain that further sampling will enable the two associations distinguished elsewhere in Europe to be characterised. <i>Zostera marina</i> community <i>Zosteretum marinae</i> Harmsen 1936 Stands of <i>Z. marina</i> on firm sands, sandy muds and gravelly flats in the sub-littoral zone down to 4m. Relevés by Dargie (unpublished).
SM1 type	2A	Eel-grass swards of shallower waters <i>Zostera noltii/angustifolia</i> community <i>Zosteretum noltii</i> Harmsen 1936 Stands of <i>Z. noltii</i> , sometimes in mixtures or mosaics with <i>Z. angustifolia</i> , on very soft to firm muds and sands in the eu-littoral zone. 15 relevés by Proctor (unpublished) from Exe Estuary in UKVDB. Stewart et al. (1994) provide updated distribution maps for all three species together with information on their current status and the Unit of Vegetation Science has extensive correspondence about these kinds of vegetation. Apart from the relative scarcity of the plants themselves, eelgrass swards are of major importance as a food source for wildfowl. The localities are known but sampling is difficult and dangerous.
SM2	1A	Tassel-weed and spike-rush communities of brackish to saline waters in estuaries, salt-marsh pools and dykes of reclaimed coastal marshes SM2 <i>Ruppia maritima</i> salt-marsh community (1)* <i>Ruppium maritimae</i> Iversen 1934 There is no table in British Plant Communities but the UKVDB holds 11 relevés from various sources (Lee 1977, Proctor, unpublished) with further data from Dargie (unpublished) and less formal information on the occurrence of <i>R. maritima</i> .
SM2 type	6A	Tassel-weed and spike-rush communities of brackish to saline waters in estuaries, salt-marsh pools and dykes of reclaimed coastal marshes

NVC type(s)	Level	Description
		<p><i>Ruppia cirrhosa</i> (<i>spiralis</i>) community (6)* <i>Ruppium cirrhosae</i> Hocquette 1927</p> <p>The UKVDB has only 1 relevé with this species growing among <i>R. maritima</i> but, as in the Netherlands, it may be possible to recognise a separate assemblage with <i>R. cirrhosa</i>, <i>Potamogeton pectinatus</i> and <i>Zannichellia palustris</i> on soft sediments in the brackish and often quite deep waters of tidal inlets, lagoons, pools and ditches, mainly around the southeast coast with scattered localities elsewhere (see Stewart et al. 1994, Preston 1995). This kind of vegetation is of conservation significance because of the scarcity of <i>R. cirrhosa</i> but it also forms an integral part of an important reclaimed landscape vulnerable to sea-level rise. Sampling should be easy but data need to be assessed in relation to the A6 <i>Ceratophylletum submersi</i> and A21 <i>Ranunculetum baudotii</i> communities.</p>
SM3	1	<p>Tassel-weed and spike-rush communities of brackish to saline waters in estuaries, salt-marsh pools and dykes of reclaimed coastal marshes</p> <p>SM3 <i>Eleocharis parvula</i> salt-marsh community (1) <i>Eleocharitetum parvulae</i> (Preuss 1911/12) Gillner 1960</p> <p>There is no table in British Plant Communities and no relevés in the UKVDB or elsewhere as far as we know. The Beaulieu and Maentwrog stands are quite accessible and should be sampled.</p>

2. SALT-MARSH AND SEA-CLIFF – additional NVC types identified by Rodwell et al (2000)

NVC type(s)	Level	Description
SM4	1A	<p>Pioneer vegetation of perennial cord grasses on intertidal mud and sand</p> <p>SM4 <i>Spartina maritima</i> salt-marsh community (1)* <i>Spartinetum maritimae</i> (Emb. et Regn. 1926) Corillion 1953</p> <p>There is no table in British Plant Communities though the species occurs in 21 relevés as an occasional in other NVC vegetation types and Géhu and Delzenne (1975) have 5 relevés of the community from Wittering in Sussex. Remaining stands where it is dominant there and elsewhere around the Solent, Chichester Harbour, Essex and The Wash need sampling to characterise this vegetation.</p>
SM5	1A	<p>Pioneer vegetation of perennial cord grasses on intertidal mud and sand</p> <p>SM5 <i>Spartina alterniflora</i> salt-marsh community (1)* <i>Spartinetum alterniflorae</i> Corillion 1953</p> <p>There is no table in British Plant Communities and no relevés in the UKVDB but Géhu and Delzenne (1975) have 5 from the only apparently natural stand at Marchwood (Perring and Farrell 1977).</p>
MC type	6A	<p>Closed swards of perennials on seacliff tops, ledges and stable shingle little splashed by salt-spray</p> <p><i>Arrhenatherum elatius</i>-<i>Silene maritima</i> grassland (6)* Sneddon & Randall (1993a, b; 1994a, b) characterised a series of vegetation types from shingle structures around the British coastline in which <i>Arrhenatherum elatius</i> figured more or less prominently, with <i>Silene maritima</i>, <i>Festuca rubra</i>, <i>Hypochoeris radicata</i>, <i>Rumex crispus</i>, <i>Cerastium semidecandrum</i>, <i>Hypnum cupressiforme</i> occasional to frequent and varying representation of lichens - <i>Cladonia furcata</i>, <i>C. impexa</i>, <i>C. arbuscula</i>, <i>C. crispata</i> and others. One form of this vegetation (SH1 with dominant <i>A. elatius</i> and few associates) was more widespread, the others (SH37-41) more exclusively southern and especially well represented at Orfordness. No relevé data nor floristic tables are provided in the report, nor are there any precise details of the environmental conditions characteristic of each assemblage, bar some general remarks about conditions being more or less maritime, more or less stable or more or less mature. An earlier survey (Harding & Kay 1992) from the Suffolk coast covers what is probably the same vegetation and does include relevés. This vegetation may be best considered among the Silenion communities or the <i>Arrhenatherion</i> and is an important element of distinctive and vulnerable coastal landscapes, but the data need a careful re-examination and better contextualising.</p>
SM27	2A	<p>Ephemeral vegetation with winter annuals on bare or disturbed salt-marsh muds and sand, periodically wetted by saline waters</p> <p>SM27 Ephemeral salt-marsh vegetation with <i>Sagina maritima</i> (2)* <i>Sagina maritima</i>-<i>Cochlearia danica</i> community</p>

NVC type(s)	Level	Description
		<p>Sagino maritimae-Cochlearietum danicae R.Tx. et Gilner 1957</p> <p>There is no floristic table for Saginion vegetation in British Plant Communities but sampling will probably characterise an equivalent of this association from open colonising assemblages of <i>Sagina maritima</i>, <i>Cochlearia danica</i>, <i>Desmazeria marina</i> and <i>Plantago coronopus</i> in bare patches among upper salt-marsh turf, reclaimed coastal marshland and brackish dune slacks all around the British coast. Disturbance along pathways or through grazing or, in a few localities, the removal of salt-marsh turf for lawns and bowling greens can be important in the creation of suitable habitats. This vegetation occurs as an integral element of Atlantic salt-meadows and is an important locus for salt-tolerant ephemerals like <i>Bupleurum tenuissimum</i> (in the south), <i>Centaurium littorale</i> (in the north) and <i>Parapholis incurva</i> (on Spurn Head in East Yorkshire). It also provides additional diversity and local dynamic change in a distinctive landscape. The vegetation is easy to access on coastal marshes but scarce overall now, so sampling may need patience. Figure 18 in Appendix 1 shows a potential distribution map for this vegetation type which has been created by coincidence mapping characteristic species.</p>

3. STRANDLINE AND SAND-DUNE – additional NVC types identified by Rodwell et al (2000)

NVC type(s)	Level	Description
SD type	6A	<p>Communities of strand lines with sand-covered detritus or shingle</p> <p><i>Raphanus maritimus</i>-<i>Matricaria maritima</i> community (6)*</p> <p>Sneddon & Randall (1993a, 1994a, b) characterised a series of assemblages (SH12 & 13) of pioneer vegetation from shingle structures with <i>Raphanus maritimus</i> and <i>Matricaria maritima</i> constant, <i>Arrhenatherum elatius</i>, <i>Atriplex prostrata</i>, <i>Festuca rubra</i> and <i>Rumex crispus</i> associates. This vegetation was largely northern and particularly associated with shingle beaches in Western Scotland, though also found on The Scillies. No relevés, nor floristic tables, nor precise environmental details were provided and re-examination of data from this distinctive landscape is essential if a clearer evaluation is to be obtained. In particular, we need to know how this vegetation relates to the SD3 <i>Matricaria</i>-<i>Galium</i> community and just how it differs from the <i>Arrhenatherum</i>-<i>Silene</i> vegetation which Sneddon & Randall (1993a) described.</p>
MC/SD type(s)	6A	<p>Communities of shingle or strand lines sometimes mixed with but not covered by sand</p> <p>(6)*</p> <p>It is quite clear (eg. Harding & Kay 1992a, Sneddon & Randall 1993) that MC6 <i>Atriplici</i>-<i>Betetum</i> occurs widely as a colonising assemblage on shingle as well as on seabird cliffs. Strandline vegetation with a local abundance of various <i>Atriplex</i> spp. was also included in British Plant Communities in the SD2 <i>Honkenya</i>-<i>Cakile</i> and SD3 <i>Matricaria</i>-<i>Galium</i> communities. Re-examination of these data, plus any samples subsequent to the NVC (summarised in part in Dargie 1993, 1995, Sneddon & Randall 1993 and Radley 1994, see also Dargie 1998c), will probably characterise a range of communities best placed in the <i>Atriplicion</i> alliance. We might thus expect equivalents of the <i>Atriplicetum littoralis</i> Libbert 1940, the <i>Atriplicetum laciniatae</i> Nordhagen 1940 and perhaps the <i>Atriplicetum glabriusculae-calothecae</i> Frøde 1957/58 described from other parts of Europe. These assemblages are an important part of the dynamic vegetation of strandlines and, in the north, provide a locus for the scarce (though probably under-recorded) <i>A. praecox</i>. They are of ephemeral duration in any locality and of awkward shape to sample but are quite accessible. Other vegetation with <i>Catabrosa aquatica</i> and <i>Potentilla anserina</i> from wet or damp strandlines in Scotland also needs appraisal (Dargie 1998a).</p>
SD7	5A	<p>Vegetation of young to fixed dunes around the Atlantic coast of Europe</p> <p>SD7 <i>Ammophila arenaria</i>-<i>Festuca rubra</i> semi-fixed dune community (5)*</p> <p>Dargie (1993) describes a very widespread form of SD7 <i>Ammophila</i>-<i>Festuca</i> dune with <i>Galium verum</i>. More localised around Moray Firth (Dargie 1994a, b) is a type with a thick carpet of pleurocarpous mosses, notably <i>Hylocomium splendens</i> and <i>Rhytidiadelphus triquetrus</i>, which seems to provide a link with Boreal dunes.</p>
SD9	5A	<p>Vegetation of young to fixed dunes around the Atlantic coast of Europe</p> <p>SD9 <i>Ammophila arenaria</i>-<i>Arrhenatherum elatius</i> dune grassland (5)*</p> <p>High cover of <i>Hylocomium splendens</i> and other pleurocarpous mosses in a thick carpet, occasionally with <i>Deschampsia flexuosa</i>, are a feature of this community around the Moray Firth (Dargie 1994b).</p>

4. FRESHWATER AQUATIC – additional NVC types identified by Rodwell et al (2000)

NVC type(s)	Level	Description
A type	5	Duckweed and liverwort communities of shallow, more mesotrophic waters (5) Elsewhere in Europe, vegetation with <i>Riccia fluitans</i> and <i>Ricciocarpus natans</i> growing among duckweeds in shallow waters or on muddy margins (A2c in the NVC) is sometimes included in this alliance as distinct communities, the <i>Riccietum fluitantis</i> Slavnic 1956 emend R.Tx. 1974 and the <i>Riccicarpetum natantis</i> Segal 1963 emend R.Tx. 1974 (see, for example, Schaminée et al. 1995).
A type	6A	Submerged stonewort swards <i>Nitella translucens</i> community (6)* <i>Nitelletum translucentis</i> Corillion 1957 Stands of <i>Nitella translucens</i> with <i>N. flexilis</i> , <i>Potamogeton natans</i> , <i>Juncus bulbosus</i> , <i>Eleocharis palustris</i> , <i>Alisma plantago-aquatica</i> , <i>Spirodela polyrrhiza</i> and <i>Lemna minor</i> in clear, circumneutral standing waters in unshaded ditches, ponds, lakes and pools in fens.
A type	6A	Submerged stonewort swards of lime-rich freshwaters <i>Nitellopsis obtusa</i> community (6)* <i>Nitellopsidetum obtusae</i> Sauer ex Damska 1961 Stands of <i>Nitellopsis obtusa</i> with <i>Chara globularis</i> and occasional other stoneworts, <i>Urticularia vulgaris</i> and <i>Fontinalis antipyretica</i> in deeper lakes and sluggish streams at lower altitudes, especially around the coast where the waters can be of high pH and mildly brackish.
A type	6A	Submerged stonewort swards of lime-rich freshwaters <i>Chara hispida</i> community (6)* <i>Charetum hispidae</i> Margalef 1947 Stands of <i>Chara hispida</i> , occasionally with <i>C. vulgaris</i> and <i>C. globularis</i> , in often calcareous, peaty waters, only moderately deep, of lakes, ponds, canals, gravel pits and peat cuttings in fens.
A type	6A	Submerged stonewort swards of lime-rich freshwaters <i>Chara aspera</i> community (6)* <i>Charetum asperae</i> Corillion 1957 Stands of <i>Chara aspera</i> , occasionally with <i>C. hispida</i> , <i>Elodea nuttallii</i> , <i>Potamogeton natans</i> with emergents like <i>Phragmites australis</i> or <i>Scirpus maritimus</i> in shallower, fresh and brackish waters of lakes, ponds, ditches and peat cuttings.
A type	6A	Submerged stonewort swards of more eutrophic waters <i>Chara vulgaris</i> community (6)* <i>Charetum vulgaris</i> Corillion 1957 Stands of <i>Chara vulgaris</i> with occasional <i>Elodea nuttallii</i> , <i>E. canadensis</i> , <i>Potamogeton pusillus</i> , <i>P. lucens</i> and emergent helophytes in every kind of lake, pond, puddle or ditch, including brackish situations.
A type	6A	Submerged stonewort swards of more eutrophic waters <i>Tolypella prolifera</i> community (6)* <i>Tolypelletum proliferae</i> Guerlesquin 1961 Annual stands of <i>Tolypella prolifera</i> with occasional <i>Chara vulgaris</i> , <i>Elodea nuttallii</i> , <i>Lemna trisulca</i> , <i>L. minor</i> and <i>Ranunculus circinatus</i> in shallow, often ephemeral puddles and ditches.
A type	6A	Submerged stonewort swards of more eutrophic waters <i>Chara canescens</i> community (6)* <i>Charetum cranscentis</i> Corillion 1957 em. Van Raam et Schaminée Stands of <i>Chara canescens</i> , <i>C. aspera</i> , <i>C. connivens</i> and <i>C. baltica</i> with <i>Potamogeton pectinatus</i> and <i>Zannichellia palustris</i> in usually shallow, brackish waters of lakes,

NVC type(s)	Level	Description
		pools and ditches by the sea and very rare in the UK.
A5	5	<p>Rooted aquatic communities in moderate to deep standing waters, often open to wave action</p> <p>A5 <i>Ceratophyllum demersum</i> community (5) <i>Ceratophylletum demersi</i> Hild 1956 <i>Ranunculus circinatus</i> has its main occurrence in the NVC in this community but a separate <i>Ranunculetum circinati</i> Bennema et Westhoff ex Segal 1965 has been characterised in the Netherlands with <i>C. demersum</i>, <i>Elodea canadensis</i>, <i>Lemna</i> spp. and <i>Potamogeton pusillus</i>. Is this synonymous with A5a?</p>
A11	5A	<p>Rooted aquatic communities in moderate to deep standing waters, often open to wave action</p> <p>A11 <i>Potamogeton pectinatus</i>-<i>Myriophyllum spicatum</i> community (5)* A11 was originally defined in the NVC using some data collected in a somewhat different fashion (Palmer 1992: see Rodwell 1994). Further relevés will probably refine the characterisation of sub-communities within this vegetation type.</p>
A13	5A	<p>Rooted aquatic communities in moderate to deep standing waters, often open to wave action</p> <p>A13 <i>Potamogeton perfoliatus</i>-<i>Myriophyllum alterniflorum</i> community (5)* A13 was originally defined in the NVC using some data collected in a somewhat different fashion (Palmer 1992: see Rodwell 1994). Further relevés will probably refine the characterisation of sub-communities within this vegetation types.</p>
A type	6	<p>Rooted aquatic communities in moderate to deep standing waters, often open to wave action <i>Groenlandia densa</i> community (6)</p> <p><i>Groenlandietum densae</i> Segal ex Schipper, Lanjouw et Schaminée 1995 In British Plant Communities, <i>Groenlandia densa</i> occurs occasionally among aquatic and swamp vegetation but it is a widespread though local plant through southern and eastern England in shallow, usually calcareous, waters of ponds, ditches, canals, streams and rivers that have escaped eutrophication. In the Netherlands, <i>G. densa</i> occurs in a distinct association among <i>Elodea nuttallii</i>, <i>Potamogeton pusillus</i>, <i>Ceratophyllum demersum</i>, <i>Lemna minor</i> and <i>Spirodela polyrhiza</i> with emergents like <i>Alisma plantago-aquatica</i> and <i>Sparganium erectum</i> but the chalk river habitat where it is especially distinctive in the UK (Holmes 1983) may support a different assemblage. Of conservation significance as a locus for a declining species and as a landscape element, this vegetation is easy to locate and sample.</p>
A4	5	<p>Communities of free-floating macrophytes in fairly nutrient-rich waters</p> <p>A4 <i>Hydrocharis morsus-ranae</i>-<i>Stratiotes aloides</i> community (5) <i>Stratiotetum</i> Nowinski 1930 Both <i>Myriophyllum verticillatum</i> and <i>Hottonia palustris</i> have their main locus here in the NVC but in the Netherlands they are characteristic together of <i>Myriophyllo-Hottonietum</i> Segal ex Schipper, Lanjouw et Schaminée 1995, an association of the <i>Parvopotamion</i>. Further sampling of vegetation with these species is essential to clarify the existence of any additional variation.</p>
A16	2A	<p>Crosswort vegetation of shallow waters and muddy margins of streams, ditches and pools</p> <p>A16 <i>Callitriche stagnalis</i> community (2)* All vegetation in which various <i>Callitriche</i> spp. were prominent was subsumed under the <i>Callitriche stagnalis</i> community in British Plant Communities. Further sampling is necessary in shallow lowland standing waters, flooded trackways and muddy water margins to see whether we also have equivalents of associations like the <i>Callitricho-Hottonietum</i> Tüxen ex Roll 1940 and the <i>Ranunculetum hederacei</i> Schnell 1939 where <i>C. platycarpa</i> is characteristic, or the <i>Callitricho-Myriophylletum alterniflori</i> Steuslof 1939 and the <i>Callitricho-Ranunculetum fluitantis</i> Oberdorfer 1957 where <i>C. hamulata</i> is the more frequent species. As well as contributing small-scale diversity to the landscape, these kinds of vegetation provide a locus for the scarce <i>C. truncata</i> (map in Stewart et al. 1994). Widespread, common and easy to sample, but care is needed with identification of the starworts.</p>
A type	6A	<p>Crowfoot and milfoil vegetation of moving waters (6)*</p> <p>This kind of vegetation was poorly sampled in the NVC and needs further attention. The river typology developed by Holmes (1983) and Holmes et al. (1999) should provide a useful framework within which sampling could be undertaken.</p>

5. SPRINGS, SHORELINE, SWAMP AND TALL-HERB FEN – additional NVC types identified by Rodwell et al (2000)

NVC type(s)	Level	Description
M type	6	<p>Spring vegetation of base-poor waters</p> <p><i>Pohlia ludwigii</i> snow-bed (6) Where <i>Pohlia ludwigii</i> is abundant to dominant, with associates including frequent <i>Polytrichum sexangulare</i>, <i>Nardia scalaris</i> and <i>Deschampsia cespitosa</i>, on north-facing slopes irrigated by snow melt at 1050-1230 m in the Scottish Highlands, a distinct assemblage was characterised from 9 relevés by Rothero (1991).</p>
M34	-	<p>Spring vegetation of base-poor waters</p> <p>M34 <i>Carex demissa</i>-<i>Koenigia islandica</i> flush Subsequent survey makes it clear that this vegetation essentially comprises stands of <i>Koenigia islandica</i> within something like M11 <i>Carex</i>-<i>Saxifraga</i> mire. Survey by Averis (1997) and Averis & Averis (1997) indicates that on the Trotternish Ridge on Skye (the sole site for M34 in British Plant Communities), <i>Koenigia</i> is equally frequent in M11 and a new <i>Festuca</i>-<i>Oligotrichum</i> fell-field in the Nardo-Caricion alliance (see below).</p>
M36 type	6	<p>Spring vegetation of base-poor waters</p> <p>M36 Lowland springs & streambanks of shaded situations Sampling of springs, flushes and streambanks kept damp by acid or neutral ground water and overhung with trees, shrubs or tall herbs throughout the lowlands will probably characterise assemblages like the following:</p> <p><i>Chrysosplenium oppositifolium</i>-<i>Pellia epiphylla</i> community (6) <i>Pellio-Chrysosplenietum oppositifolia</i> Maas 1959 emend Siebum, Schaminée et Weeda 1995 Some stands of W7 <i>Fraxinus</i>-<i>Alnus</i>-<i>Lysimachia</i> woodland can have a rather open canopy of trees and shrubs but flush and streamside vegetation on sloppy silt or wet loamy soils that are hardly overhung or totally devoid of a woody cover are probably best referred to this association. Low, luxuriant carpets of <i>Chrysosplenium oppositifolium</i>, <i>Ranunculus repens</i>, <i>Cardamine amara</i> and <i>Stellaria alpine</i> are characteristic, with locally abundant <i>Carex laevigata</i> and various other occasional of the <i>Alno</i>-<i>Padion</i> with <i>Brachythecium rivulare</i>, <i>B. rutabulum</i>, <i>Chiloscyphus polyanthos</i>, <i>Pellia epiphylla</i> and <i>Calliergon cuspidatum</i> in a sometimes extensive ground cover. This sort of vegetation is widespread but local on or below hillslopes of grits, shales and other less base-rich rocks from The Weald westwards and north around all our upland fringes. Similar vegetation, transitional to MG10 <i>Holcus</i>-<i>Deschampsia</i> grassland, was recorded from rides in Suffolk woods by Harding et al. (1993) and Harding (1994). Of no great conservation significance by virtue of any nationally scarce or rare plants, this assemblage adds important diversity to less intensive landscapes. It is easy of access and readily sampled.</p>
M36 type	6	<p>Spring vegetation of base-poor waters</p> <p><i>Ranunculus ficaria</i>-<i>Conocephalum conicum</i> community (6) <i>Pellio-Conocephaletum conicum</i> Maas 1959 emend Weeda 1994 This vegetation is often more distinctive by virtue of its bryophyte cover than its vascular plants, so it tended to be unsampled in the NVC or subsumed as part of field and ground layers in W10 <i>Quercus</i>-<i>Pteridium</i>-<i>Rubus</i> and W8 <i>Fraxinus</i>-<i>Acer</i>-<i>Mercurialis</i> woodlands. Here, mats of <i>Conocephalum conicum</i>, <i>Pellia epiphylla</i>, <i>Marchantia polymorpha</i>, <i>Mnium hornum</i>, <i>Rhizomnium punctatum</i>, <i>Plagiomnium undulatum</i> and <i>Atrichum undulatum</i> are characteristic, sometimes with a spring show of <i>Anemone nemorosa</i>, <i>Ranunculus ficaria</i> and (in East Anglia) <i>Primula elatior</i>, and a patchy cover of <i>Glechoma hederacea</i>, <i>Adoxa moschatellina</i>, <i>Aegopodium podagraria</i> and <i>Moehringia trinervia</i>. This vegetation is typical of overhung damp clay banks and streambanks throughout lowland Britain. It may be of importance as a locus for rare bryophytes though has no great conservation value for any nationally scarce vascular plants, rather as an element of landscapes. Easy of access and readily sampled.</p>
A type	6	<p>Vegetation of fluctuating waters with loamy soils in boreal and continental parts of Europe (6)</p> <p><i>Eleocharis acicularis</i> is a perennial of shallow, eutrophic, standing or slack waters or, more commonly, of winter-wet water margins or pools throughout the lowlands, variable in its abundance from year to year, easily overlooked but probably generally declining (Stewart et al. 1994). It occurs as an occasional in various NVC communities but when growing in abundance with <i>Elatine hexandra</i>, <i>Littorella uniflora</i> and <i>Juncus bulbosus</i>, it may represent vegetation like the <i>Eleocharitetum acicularis</i> Koch 1926 or <i>Littorello-Eleocharitetum acicularis</i> Malcuit 1929 recorded from Ireland (Braun-Blanquet and Tüxen 1952, Ivimey-Cook and Proctor 1966 and Schoof van Pelt 1973) and the Netherlands (Schaminée et al. 1995). In other situations, the presence of plants such as <i>Chenopodium rubrum</i>, <i>Gnaphalium uliginosum</i>, <i>Juncus bufonius</i>, <i>Rorippa palustris</i> and <i>Polygonum</i> spp. suggests a location among the <i>Nanocyperion</i> or <i>Bidention</i> alliances rather than here. This is another vegetation</p>

NVC type(s)	Level	Description
		type whose conservation significance is to do with both its scarce plants and its contribution to the diversity of habitats in relatively unimproved landscapes. Of local and sporadic occurrence but easy to sample.
M29	3	Vegetation of soakways and shallow, strongly fluctuating, mesotrophic to oligotrophic standing waters M29 <i>Hypericum elodes</i> - <i>Potamogeton polygonifolius</i> soakway (3) <i>Hyperico</i> - <i>Potametum polygonifolii</i> (Allorge 1921) Br.-Bl. & R.Tx.1952 Beyond the geographical range of <i>Hypericum elodes</i> , essentially similar vegetation to this community is widespread and locally frequent in small, often linear, very wet soakways at low altitudes.
M30	2	Vegetation of soakways and shallow, strongly fluctuating, mesotrophic to oligotrophic standing waters M30 Related vegetation of seasonally-inundated habitats (2) In British Plant Communities, a brief account suggested that further sampling of fluctuating or ephemeral lowland pools with more nutrient-poor waters and silty, sandy or peaty margins having species such as <i>Eleocharis multicaulis</i> , <i>Baldellia ranunculoides</i> , <i>Deschampsia setacea</i> , <i>Pilularia globulifera</i> , <i>Apium inundatum</i> and <i>Scirpus fluitans</i> might characterise a range of communities whose affinities are with the <i>Hydrocotylo</i> - <i>Baldellion</i> : the <i>Eleocharitetum multicaulis</i> R.Tx. 1937, the <i>Scorpidio</i> - <i>Eleocharitetum</i> Ivimey-Cook and Proctor 1966, the <i>Baldellio</i> - <i>Littorelletum</i> Ivimey-Cook and Proctor 1966, the <i>Pilularietum globuliferae</i> Tüxen ex Müller et Gors 1960 and the <i>Scirpetum fluitantis</i> Lemée 1937 emend Hofstra 1982, recognised in Ireland (White & Doyle 1982) or in neighbouring parts of mainland Europe. These assemblages are now of very local occurrence among lowland heaths, mires and rush-pasture and, in addition to providing a key locus for various rare and scarce plants, are of significance in providing an important kind of diversity in threatened landscapes. Updated national maps of scarcer species represented here are provided in Stewart et al. (1994) and local floristic experts should help locate stands with such plants. Further sampling is of high priority and easy to accomplish.
OV type	6A	Pioneer, ephemeral, dwarf cyperaceous and therophyte communities on damp, bare, periodically flooded ground <i>Cicendia filiformis</i> - <i>Radiola linoidea</i> community (6)* <i>Cicendietum filiformis</i> Allorge 1922 British stands of this kind of vegetation sampled so far (Coombe unpublished) have frequent records for ephemerals such as <i>Juncus pygmaeus</i> , <i>J. bulbosus</i> , <i>J. bufonius</i> , <i>Cicendia filiformis</i> , <i>Radiola linoidea</i> and <i>Isolepis cernua</i> and the scarce perennial <i>Chamaemelum nobile</i> in more open places among a patchy carpet of <i>Agrostis stolonifera</i> , <i>A. canina</i> , <i>Carex demissa</i> , <i>C. panicea</i> , <i>C. flacca</i> , <i>Leontodon taraxacoides</i> , <i>L. autumnalis</i> , <i>Plantago maritima</i> and <i>Ranunculus flammula</i> , locally with <i>Salix repens</i> , <i>Molinia caerulea</i> and <i>Erica vagans</i> . Conditions suitable for this assemblage (quite variable from stand to stand) develop around the oceanic seaboard of south-west England and Wales where winter rains accumulate in shallow pools and along trackways and in areas of heath and pasture kept open by disturbance and grazing, and then evaporate leaving bare ground baked hard. Other species like <i>Illecebrum verticillatum</i> may find a locus here in the New Forest and Cornwall (Stewart et al. 1994) although in the Netherlands, this plant is characteristic of another association, the <i>Panico</i> - <i>Illecebretum</i> Diemont, Sissingh et Westhoff 1940 (Lemaire & Weeda 1994). Vegetation more or less like the <i>Cicendietum</i> is now very scarce and fragmentary but can probably still be found widely dispersed through the south-west, where local floristic experts will most likely know stations. As what is probably our most widespread <i>Nanocyperion</i> community, this is of significance for nature conservation at international level and a key element of local distinctiveness among threatened landscapes like lowland heaths and extensively-managed cliff-top pastures. 31 relevés are available from Coombe, but it is a high priority for further survey and demanding a keen eye and subtle approach to sampling. Figure 19 in Appendix 1 shows a potential distribution map for this vegetation type which has been created by coincidence mapping characteristic species.
S24	5	Swamps and fens dominated by tall graminoids in standing or gently moving waters and winterflooded fens S24 <i>Phragmites australis</i> - <i>Peucedanum palustre</i> tall-herb fen (5) <i>Peucedano</i> - <i>Phragmitetum australis</i> Wheeler 1978 em. The transfer in the NVC of what Wheeler (1978, 1980), the original author of the <i>Peucedano</i> - <i>Phragmitetum</i> , called the <i>caricetosum</i> sub-community to the M9 <i>Carex</i> - <i>Calliergon</i> fen was never entirely satisfactory and may merit reappraisal in the light of further data. This particular type of fen is renowned for its Broadland rarities: <i>Liparis loeselii</i> , <i>Anagallis tenella</i> , <i>Drosera anglica</i> , <i>Parnassia palustris</i> and <i>Hypericum elodes</i> .
S26	5	Swamps and fens dominated by tall graminoids in standing or gently moving waters and winterflooded fens S26 <i>Phragmites australis</i> - <i>Urtica dioica</i> tall-herb fen (5) Various forms of <i>Phragmites</i> fen have been reported (eg. from Suffolk in Ausden & Harding 1991, Harding 1993c, Hughes 1995, Parmenter 1996) in which either large <i>Juncus</i> spp. or <i>Arrhenatherum elatius</i> become so abundant as to make fits to any existing <i>Phragmitum</i> vegetation problematic.

NVC type(s)	Level	Description
S type	5	Swamps and fens dominated by tall graminoids in standing or gently moving waters and winterflooded fens Species-poor <i>Iris pseudacorus</i> swamp (5) Swamps which are often more or less mono-dominant stands of <i>Iris</i> occur widely around machair lochs in the Hebrides (surveys summarised in Dargie 1995, see also Dargie 1998a) and in Northern Ireland. More relevés are needed to see whether this vegetation is a new community among the <i>Phragmition</i> or a form of, for example, M28 <i>Filipendulo-Iridetum</i> .
S type	5	Vegetation dominated by bulky sedges on mineral and peaty soils <i>Menyanthes trifoliata</i> bog pools (5) British Plant Communities notes that what Continental phytosociologists would call 'societies' of Magnocaricion associates like <i>Menyanthes trifoliata</i> and <i>Potentilla palustris</i> can be locally prominent. In this case, emergent <i>Menyanthes trifoliata</i> is abundant in pools some 5-100 square metres in area, with water 30-100 cm deep, forming what could be regarded as either aquatic vegetation or a very open swamp. Other plant species are scarce, consisting mainly of small amounts of aquatic <i>Sphagnum cuspidatum</i> and <i>S. auriculatum</i> . These pools are larger and deeper than M1/M2 pools and are locally frequent in N and W Scotland. They are identified among the Drought-sensitive pools (A3) and Permanent pools (A4) in the Aquatic (A) part of the classification of bog microtopes and vegetation types by Lindsay (1995). 11 relevés from NW Sutherland (A.B.G. Averis, unpublished data).
S17	5	Vegetation with a floating raft of sedges in eutrophic waters S17 <i>Carex pseudocyperus</i> swamp (5) Dargie (1998a) describes a distinctive form of <i>Phragmites</i> swamp with occasional <i>Carex diandra</i> and carpets of <i>Calliergon cordifolium</i> and <i>C. giganteum</i> occurring in the Western Isles and in scattered localities elsewhere, surrounded by machair marsh and wet mesotrophic grassland. On Loch Hallan in South Uist, this vegetation provides a locus for the scarce <i>Cicuta virosa</i> . More relevés (from, for example, Torrs Warren candidate Special Area of Conservation) are needed to analyse with Dargie's data and define potential new variation here or as a <i>Phragmition</i> assemblage.
S23	2	Vegetation dominated by mixtures of small grasses and herbs along the banks of streams and ditches S23 Other water-margin vegetation (2) In British Plant Communities, there is a standard account but no data for a miscellany of Glyceno-Sparganion vegetation from unshaded silty margins of lowland streams and pools included together under this heading. With further sampling, it should be possible to characterise distinctive assemblages with such associates as <i>Myosotis palustris</i> , <i>Mentha aquatica</i> , <i>Veronica beccabunga</i> , <i>Agrostis stolonifera</i> , <i>Berula erecta</i> and variously dominated by <i>Rorippa nasturtium-aquaticum</i> , <i>Apium nodiflorum</i> , <i>Veronica anagallisaquatica</i> , <i>Glyceria plicata</i> and <i>Hippuris vulgaris</i> , such as the <i>Eleocharito palustris</i> - <i>Hippuridetum</i> Passarge 1955 (see, for example, Dargie 1998a, c), the <i>Polygono-Veronicetum anagallidis-aquaticae</i> (Zonneveld 1960) Schaminée & Weeda 1995, the <i>Apietum nodiflori</i> Br.-Bl. ex Boer 1942 and the <i>Glycerietum plicatae</i> Kulczynski 1928 described from elsewhere in Europe. These communities generally contain no rare or scarce plants but are significant in providing diversity, sometimes in quite improved landscapes, that is important floristically but also for associated invertebrate and bird faunas. Widespread and still quite common, this vegetation is easy to sample.
OV type	6	Weed communities of compost and dung heaps, disturbed tracksides and recreation areas (6) British Plant Communities has no assemblages of this widely distributed alliance though grassier stands of cynocrophilous vegetation figure in the OV23 <i>Lolium-Dactylis</i> community. Diligent sampling among rank stands of <i>Chenopodium album</i> , <i>Sonchus oleraceus</i> , and <i>Polygonum aviculare</i> with distinctive contributions from <i>Descurania sophia</i> , <i>Hordeum murinum</i> and such introductions as <i>Conyza canadensis</i> , <i>Sisymbrium officinale</i> , <i>S. altissimum</i> , <i>Galinsoga parviflora</i> , <i>Chenopodium vulvaria</i> and <i>Lactuca serriola</i> should help characterise various communities recognised elsewhere in Europe. This is vegetation from demolition sites, rubbish tips, railway yards, the squalid corners of bus stations and other 'filthie obscure base places' (Johnson 1636), of interest (only?) in providing loci for introduced and alien plants. Widespread in the south-east, but surveyors should watch for dangerous rubbish and nasty waste. Figure 20 in Appendix 1 shows a potential distribution map for this vegetation type which has been created by coincidence mapping characteristic species.
OV type	6	Communities of tall herbaceous nitrophiles around eutrophic lakes and ditches <i>Calystegia sepium</i> - <i>Angelica archangelica</i> community (6) <i>Convolvulo-Archangelicetum littoralis</i> Passarge 1964

NVC type(s)	Level	Description
		Mixtures of <i>Urtica dioica</i> , <i>Rumex obtusifolius</i> and <i>Calystegia sepium</i> figure in the OV25 <i>Urtica-Cirsium</i> community but, on periodically flooded river banks and shoals, often with unsorted silt, sand and pebbles, these species may be subordinate to a varied canopy of <i>Angelica archangelica</i> , <i>Symphytum officinale</i> , <i>Phalaris arundinacea</i> and <i>Carduus crispus</i> with the naturalised <i>Heracleum mantegazzianum</i> a striking companion in some places. Widespread through the lowlands and of significance as an interesting element of even quite intensive landscapes, except where the vegetation is completely dominated by more eutrophic or naturalised plants. Very few relevés in the UKVDB and further sampling is necessary to characterise this assemblage and any other river shoal vegetation. For example, are the diverse mixtures of smaller herbs found among periodically-flooded sand and shingle on river shoals all part of this community or not.
OV type	6	Communities of tall herbaceous nitrophiles around eutrophic lakes and ditches Species-poor stands of <i>Impatiens glandulifera</i> , often tall and lush, sometimes with <i>Heracleum mantegazzianum</i> , along stream, ditch and canal sides, especially in the Midlands and northern England, equivalent to societies recognised in various Continental schemes (eg. Pott 1984). 10 relevés in UKVDB.
OV type	6	Communities of tall herbaceous nitrophiles around eutrophic lakes and ditches <i>Reynoutria japonica</i> community (6) If we are to recognise such vegetation (it's real and widespread enough), then it probably belongs here. No relevés in UKVDB.
OV type	6	Communities of sunny and semi-shaded margins and clearings of woody vegetation <i>Aegopodium podagraria-Urtica dioica</i> community (6) <i>Urtico-Aegopodietum podagrariae</i> (R.Tx. 1963) Oberdorfer 1964 in Görs 1968 More eutrophic field layers occur in some drier woodlands such as the W8 <i>Fraxinus-Acer-Mercurialis</i> and unflooded W6 <i>Alnus-Urtica</i> communities but shady woodland margins, hedge-bottoms, gloomy gardens and neglected cemeteries throughout the lowlands can also have carpets of <i>Aegopodium podagraria</i> , <i>Glechoma hederacea</i> and <i>Lamium maculatum</i> with no actual tree or shrub cover but with <i>Anthriscus sylvestris</i> , <i>Alliaria petiolata</i> , <i>Galeopsis tetrahit</i> and <i>Vicia sepium</i> plus clumps of <i>Urtica dioica</i> that are probably best referred to this community. Of no great floristic interest and generally an unwanted element of landscapes, easy to access and sample. No relevés in the UKVDB and any analysis needs to define the assemblage in relation to <i>Galio-Alliarion</i> communities like OV24 <i>Urtica-Galium</i> vegetation and the <i>Alliario-Chaerophylletum</i> .
OV type	6	Communities of sunny and semi-shaded margins and clearings of woody vegetation <i>Petasites hybridus-Aegopodium podagraria</i> community (6) <i>Phalarido-Petasitetum hybridi</i> Schwickerath 1933 Eutrophic tall-herb vegetation of alluvial flats figures in the NVC among assemblages like S26 <i>Phragmites-Urtica</i> fen, OV24 <i>Urtica-Galium</i> and OV26 <i>Epilobium hirsutum</i> communities but further sampling will certainly characterise an additional assemblage that has sparse carpets of <i>Poa trivialis</i> , <i>Aegopodium podagraria</i> and <i>Lamium maculatum</i> , clumps of <i>Urtica dioica</i> and, by summer, a striking canopy of <i>Petasites hybridus</i> leaves up to 2 m tall. This vegetation occurs throughout the lowlands on seasonally-flooded river terraces and stream sides with moist silty soils, dying down to leave virtually bare ground in winter or a patchy bryophyte cover. It has no particular significance in its floristics, though it can provide a locus for bulbous garden escapes like <i>Galanthus nivalis</i> which wash downstream and provide a striking display of flowers in spring. Its main conservation value is that it represents a riverside habitat with modest uncontrolled flooding and a welcome element of diversity even among industrial landscapes. Very few relevés are available (though see Harding 1991) but the vegetation is easy to access and sample.
OV type	6	Thermophilous, semi-natural communities of nitrophilous perennials of sunny forest/meadow ecotones <i>Alliaria petiolata-Chaerophyllum temulentum</i> community (6) <i>Alliario-Chaerophylletum temulentum</i> Lohmeyer 1949 In British Plant Communities, grassier hedgebank vegetation with brambles is included in W24 <i>Rubus-Holcus</i> underscrub but sampling among tall-herb assemblages with <i>Chaerophyllum temulentum</i> , <i>Alliaria petiolata</i> , <i>Anthriscus sylvestris</i> , <i>Urtica dioica</i> , <i>Galeopsis tetrahit</i> , <i>Lapsana communis</i> and <i>Aegopodium podagraria</i> will probably characterise this community. It is widespread and very common throughout the lowlands along sunny hedge-bottoms and woodland margins, providing a narrow vertical fringe, often sharpened up by mowing of the neighbouring verge. Of little floristic significance, though elsewhere in Europe vegetation of this general type provides a locus for the, with us, nationally rare <i>Cynoglossum germanicum</i> , as in the <i>Alliario-Cynoglossetum germanici</i> Géhu, Richard et Tx. 1972. With only one exception, British stations of this plant have it in woodland edge vegetation which might be accommodated in the OV24 <i>Urtica-Galium</i> community. 15 relevés with this plant from Pigott (unpublished). Easy enough to find stands but their long narrow shape demands ingenuity in sampling.
OV type	6	Xero-mesophilous weed communities of biennials on nutrient-rich soils

NVC type(s)	Level	Description
		<p>Mesophytic communities of moister soils in cooler climates</p> <p>Arctium minus agg. - Artemisia vulgaris community (6) Arctio-Artemisietum vulgaris Oberdorfer ex Seybold et Th. Müller 1972 Some rank nettle-bed vegetation with burdocks already finds a place in the NVC as part of the OV25 Urtica-Cirsium community. Where Arctium minus, A. lappa and Artemisia vulgaris become more dominant with U. dioica, C. arvense, C. vulgare and Dactylis glomerata frequent but subordinate, it will probably be sensible to recognise a community of this type. Such vegetation is a widespread and common feature of roadsides, trackways, disturbed woodland margins and rides, soil dumps and waste ground with loam or clay soils throughout the lowlands. Conium maculatum may also belong here though, in Continental schemes, this plant is sometimes seen as characteristic of a distinct Lamio albi-Conietum maculatae Oberdorfer 1957, perhaps in a separate Balloto-Conion maculatae alliance. Of no conservation significance for its floristics but part of graded transitions even in intensive landscapes. No relevés available but only too easy to find and survey.</p>
OV type	6	<p>Xero-mesophilous weed communities of biennials on nutrient-rich soils Mesophytic communities of moister soils in cooler climates</p> <p>Lamium album-Ballota nigra community (6) Lamio albi-Ballotetum nigrae Lohmeyer 1970 Less widespread than the above is vegetation in which Arctium minus agg. and Artemisia vulgaris occur with Lamium album, Ballota nigra, Malva neglecta, Elymus repens, Taraxacum officinale agg. and declining species which were once an important feature of cottage gardens such as Chrysanthemum parthenium, the local Artemisia absinthum and the rare Leonurus cardiacus. This is an assemblage of roadsides and tracks around villages and farmsteads in the drier and warmer south-eastern lowlands. Figure 21 in Appendix 1 shows a potential distribution map for this vegetation type which has been created by coincidence mapping characteristic species. Chenopodium bonus-henricus may also have a distinct locus here but it tends to be more characteristic of disturbed places like farmyards, and elsewhere in Europe, vegetation in which it is prominent has sometimes been placed in a separate Balloto-Chenopodietum boni-henrici Th. Müller in Seybold et Th. Müller 1972. This vegetation is of conservation interest because it provides a locus for weeds of declining distribution typical of less intensively-managed agricultural landscapes. No samples in the UKVDB and local in occurrence but easy to sample.</p>
OV type	6	<p>Xero-mesophilous weed communities of prickly biennials on nutrient-rich soils</p> <p>Onopordum acanthium-Cardus nutans community (6) Onopordetum acanthii Br.-Bl. ex Br.-Bl. et al. 1936 This kind of continental thistle-bed vegetation extends into only the warmer and drier southeast of the UK and is probably now found only in fragmentary form on dry calcareous soils in disturbed and waste places, particularly near the sea. Characteristic species include Onopordum acanthium, Carduus nutans, C. acanthoides, Silybum marianum, Hyoscyamus niger, Reseda lutea, R. luteola, Cynoglossum officinale, Pastinaca sativa and Cichorium intybus. The last species is also typical, with species like Picris echioides, Ononis spinosa and Trifolium ochroleucon, of clayey soils in this region which bake hard and crack in dry summer weather. These vegetation types have declining species and represent weedy assemblages of less intensive agricultural landscapes. There are no relevés in the UKVDB and further sampling within the south-east is needed to characterise one or more assemblages of this alliance. Figure 22 in Appendix 1 shows a potential distribution map for this vegetation type which has been created by coincidence mapping characteristic species.</p>
OV type	6	<p>Xero-mesophilous weed communities of biennials on nutrient-rich soils</p> <p>Artemisia vulgaris-Tanacetum vulgare community (6) Tanaceto-Artemisietum vulgaris Br.-Bl. 1931 corr. 1949 Echium vulgare-Melilotus albus community Echio-Melilotetum albae R.Tx. 1947 Tall-herb vegetation with Daucus carota, Melilotus officinalis, Artemisia vulgaris, Pastinaca sativa, Picus hieracioides, Tanacetum vulgare, Coronilla varia and Cichorium intybus is not represented in the NVC but occurs widely on waysides in the warmer and drier south-east of Britain. It adds some floristic and structural diversity to such habitats and sampling may reveal good stands of communities described from elsewhere in Europe. Figure 23 in Appendix 1 shows a potential distribution map for this vegetation type which has been created by coincidence mapping characteristic species.</p>
OV27	5	<p>Species-poor vegetation of damp fertile soils in woodland margins, clearings and burned places Communities usually associated with or replacing Quercetea woodlands</p>

NVC type(s)	Level	Description
		OV27 <i>Epilobium angustifolium</i> community (5) In Continental schemes, <i>Calamagrostis epigejos</i> is a locally prominent plant in various assemblages, most notably vegetation characterised by <i>Epilobium angustifolium</i> and other associates of clearances and rides in this alliance. Stands dominated by this plant (eg. Gibbons 1996) need further sampling to assess whether they belong here as a subcommunity of OV27 or a distinct community.
OV type	6	Species-poor vegetation of damp fertile soils in woodland margins, clearings and burned places Communities usually associated with or replacing <i>Querco-Fagetea</i> woodlands <i>Atropa belladonna</i> - <i>Hypericum hirsutum</i> community (6) <i>Atropetum belladonnae</i> (Br.-Bl. 1930) R.Tx. 1931 emend 1950 In cleared areas or sunny windthrows among W8 <i>Fraxinus-Acer-Mercurialis</i> and W12 <i>Fagus-Mercurialis</i> woodlands or where the former has been coppiced, in the warmer and drier south-eastern lowlands, tall-herb vegetation with <i>Atropa belladonna</i> , <i>Hypericum hirsutum</i> , <i>Verbascum nigrum</i> , <i>V. thapsus</i> , <i>Bromus ramosus</i> and <i>Fragaria vesca</i> can develop on rubbly lime-rich soils, with young <i>Fraxinus</i> , <i>Fagus</i> , <i>Cornus sanguinea</i> and other woody plants re-establishing. Often grading to <i>Geranium Saum</i> , this vegetation can add considerable diversity and a dynamic element to wooded landscapes and be very important as part of the sunny glade vegetation attractive to various scarcer butterflies. There are unpublished relevés available from Pigott and further sampling will be simple.

6. BOG AND FEN – additional NVC types identified by Rodwell et al (2000)

NVC type(s)	Level	Description
M type	6	Small-sedge poor-fen vegetation of acid, oligotrophic flushes and soligenous mires on peats or peaty mineral soils <i>Carex nigra</i> - <i>Ranunculus flammula</i> mire (6) In this kind of mire, a variety of small sedges are abundant to dominant with a low cover of associates such as <i>Ranunculus flammula</i> , <i>R. acris</i> , <i>Potentilla erecta</i> , <i>Viola palustris</i> , <i>Juncus articulatus</i> , <i>J. bulbosus</i> , <i>Molinia caerulea</i> , <i>Dactylorhiza maculata</i> , <i>Succisa pratensis</i> , <i>Holcus lanatus</i> , <i>Anthoxanthum odoratum</i> , <i>Calliergon cuspidatum</i> and <i>Pellia epiphylla</i> . <i>Sphagnum warnstorffii</i> , <i>S. contortum</i> and <i>S. teres</i> are locally prominent. Some stands are strongly dominated by a dense sward of <i>Carex nigra</i> 30-40 cm tall. Other stands have a more open cover of mixtures of <i>Carex nigra</i> , <i>C. panicea</i> , <i>C. demissa</i> and <i>C. echinata</i> . There is a superficial resemblance to M6 <i>Carex-Sphagnum</i> and M10 <i>Carex-Pinguicula</i> mires, and in terms of the associated species the vegetation is somewhat intermediate between these two. This mire typically occupies small, damp, soligenous depressions among grassland and heath at low altitudes in western parts of Britain becoming frequent in the western Highlands. It is usually grazed at medium to high intensity, and most stands appear to be grazed derivatives of M15 <i>Scirpus-Erica</i> wet heath or M25 <i>Molinia-Potentilla</i> mire. Relevés are available from Scotland (Averis & Averis 1995, 1996 and recent unpublished data), Cooper & Mackintosh 1996) and Wales (M.Yeo, unpublished data). Similar vegetation in Ireland has been described as a <i>Carici nigrae-Juncetum articulati</i> Br.-Bl. & Tx. 1952 sometimes placed in the <i>Caricion nigrae</i> , sometimes (O'Criodain & Doyle 1994) in the <i>Caricion davallianae</i> .
M9	5A	Small-sedge rich-fen vegetation of calcareous oligotrophic flushes, soligenous mires and dune-slacks with peats or peaty mineral soils at low to moderate altitudes M9 <i>Carex rostrata</i> - <i>Calliergon cuspidatum/giganteum</i> mire (5)* The broadening of the <i>Calliergo-Caricetum diandrae</i> as defined by Wheeler (1975, 1978, 1980) to include more generally characterised fens with <i>Carex rostrata</i> and a carpet of brown mosses and what Wheeler called the <i>Peucedano-Phragmitetum caricetosum</i> needs reappraisal in the light of further survey (Shaw & Wheeler 1991, Cooper 1993, Fojt 1994). These kinds of fens provide an important locus for various national and local rarities.
SD13	5A	Small-sedge rich-fen vegetation of calcareous oligotrophic flushes, soligenous mires and dune-slacks with peats or peaty mineral soils at low to moderate altitudes SD13 <i>Salix repens</i> - <i>Bryum pseudotriquetrum</i> dune-slack (5)* Younger stands of sub-community SD13a are clearly similar to the <i>Centaurio littoralis-Saginetum nodosae</i> Diemont, Sissingh et Westhoff 1940 which is sometimes placed in the <i>Nanocyperion</i> . Further survey may reveal that this vegetation is more widespread than the NVC suggests.
SD15	5A	Small-sedge rich-fen vegetation of calcareous oligotrophic flushes, soligenous mires and dune-slacks with peats or peaty mineral soils at low to moderate altitudes SD15 <i>Salix repens</i> - <i>Calliergon cuspidatum</i> dune slack (5)*

NVC type(s)	Level	Description
		Acidic types of SD15 with <i>Erica tetralix</i> and prostrate <i>Juniperus communis</i> ssp. <i>communis</i> occur extensively in the higher parts of slacks at Morrich More in Ross-shire and perhaps represent a new sub-community of SD15. Relevés in Dargie (1998).
M14	3A	Wet heath vegetation on drying deeper peats or winter-waterlogged peaty intergrades M14 <i>Schoenus nigricans</i> - <i>Narthecium ossifragum</i> mire (3)* Flushes of the M14 type, providing a clear link with soligenous mires of the Lusitanian zone of the Atlantic region occur more widely than suggested in British Plant Communities with stands on cliffs around the coast of south-west England and perhaps Wales. This vegetation needs to be reappraised in relation to <i>Schoenus</i> flushes from parts of the Scottish coast (Averis & Averis 1996) and the flushed swards of MC9c <i>Festuca</i> - <i>Plantago</i> grassland.
M15	5A	Wet heath vegetation on drying deeper peats or winter-waterlogged peaty intergrades M15 <i>Scirpus cespitosus</i> - <i>Erica tetralix</i> wet heath (5)* M15 is the most extensive type of vegetation over vast areas in the western Highlands and is clearly extremely variable. M15a can occur in a typical form (widespread), a <i>Schoenus nigricans</i> form (base-enriched and very western), a <i>Narthecium ossifragum</i> - <i>Campylopus atrovirens</i> form (upland, northern, acidic) and a <i>Campylopus shawii</i> form (Skye and Outer Hebrides; one of the main habitats of the nationally scarce moss <i>C. shawii</i>). M15b occurs in a typical form (widespread and extensive) and a <i>Calluna vulgaris</i> - <i>Molinia caerulea</i> form (co-dominated by tall <i>Calluna</i> and <i>Molinia</i> ; locally frequent at low altitudes). M15c occurs in a <i>Racomitrium lanuginosum</i> form (western), a <i>Cladonia</i> form (more eastern and northern), a prostrate <i>Juniperus communis</i> form (scarce and western; one of the main habitats of the very rare liverwort <i>Herbertus borealis</i>) and a <i>Schoenus nigricans</i> form (scarce and strongly western). M15d occurs in a high-altitude form (scarce, and often containing montane species), and a low-altitude form (scarce and evidently less natural; also quite frequent in Wales). Heavily-grazed examples of all four sub-communities tend to converge into wet-heath strongly dominated by <i>Scirpus</i> and with very sparse sub-shrubs. Many relevés from various surveys by A.B.G. and A.M. Averis.
M16	5A	Wet heath vegetation on drying deeper peats or winter-waterlogged peaty intergrades M16 <i>Erica tetralix</i> - <i>Sphagnum compactum</i> wet heath (5)* <i>Ericetum tetralicis</i> Schwickerath 1943 Wet heath on dunes seems almost always to be a poor fit with NVC types: <i>Erica tetralix</i> is constant, for example, but <i>Sphagnum</i> spp. are rare. Relevés from the Sand Dune Survey of Great Britain (Dargie 1993, Radley 1994) and the Sand Dune Survey of Scotland (Dargie 1998c,e, 1999) need to be brought together and reanalysed to define any new variation.

7. GRASSLAND AND HEATH – additional NVC types identified by Rodwell et al (2000)

NVC type(s)	Level	Description
M type	4	Meadows and pastures of moister soils, often peaty (4) Throughout the Molinietales, there is a tendency for swards to become dominated by dense, tussocky <i>Molinia caerulea</i> , especially where abandonment of grazing or mowing has been accompanied by eutrophication of ground waters or drying of peats. Such vegetation is hard to place because of the increasingly poor representation of smaller associates and is best regarded as what in Continental Europe would be called a 'basal community' of the Order.
M24	3A	Meadows of moist but fresh soils in western Europe, usually unmanured M24 <i>Molinia caerulea</i> - <i>Cirsium dissectum</i> fen-meadow (3)* <i>Cirsio-Molinietum caeruleae</i> Sissingh & de Vries 1942 em. Beyond the geographical limits of <i>Cirsium dissectum</i> and <i>Juncus subnodulosus</i> , vegetation essentially the same as M24 continues to occur in similar habitats, especially in the distinctive mosaics of fen-meadow and rush-pasture known as Rhos pasture. It seems sensible to regard such vegetation as part of M24.
M25	5	Meadows of moist but fresh soils in western Europe, usually unmanured M25 <i>Molinia caerulea</i> - <i>Potentilla erecta</i> mire (5) Swards of the M25 type but with (sometimes very much) less <i>Molinia</i> and a distinctive contribution from <i>Carex panicea</i> , <i>C. pulicaris</i> , <i>C. flacca</i> , <i>C. hostiana</i> , <i>Festuca ovina</i> , <i>Nardus stricta</i> , <i>Ranunculus acris</i> , <i>Prunella vulgaris</i> and <i>Trifolium repens</i> in frequently species-rich, close-cropped mixtures have been widely described from

NVC type(s)	Level	Description
		flushed slopes and periodically flooded streambanks with modest base-enrichment in Wales (Blackstock et al. 1998), Malham (Cooper 1993), from New Forest lawns and among Culm grasslands in SW England (Porley pers. comm.) and in various parts of Scotland (Cooper & MacKintosh 1996). In all these situations, it constitutes an important element of variation in landscapes of conservation significance. Analysis of large numbers of relevés now available from these sources is essential to characterise a possible new sub-community of M25 Molinia-Potentilla mire or M24 Molinia-Cirsium dissectum fen meadow (see above) and transitions to M10 Carex-Pinguicula mire and another potential new unit, the Carex nigra-Ranunculus flammula mire in the Caricion nigrae.
M25 type	5A	Meadows of moist but fresh soils in western Europe, usually unmanured (5)* Vegetation dominated by Schoenus nigricans, Festuca rubra and Molinia caerulea with a variety of tall-herbs including Eupatorium cannabinum, Angelica sylvestris and Filipendula ulmaria and basiphilous bryophytes occurs locally at low altitudes in the Western Highlands and on damp ledges on basalt and limestone seacliffs on Mull, Skye, Lismore and Kerrera. It comes closest to M25c but is a poor fit and might need a new sub-community of M25. Relevés from Resipole (McVean & Ratcliffe 1962), Rum (Heritage Environmental in preparation) and Mull (Averis & Averis 1996) need analysis and appraisal in relation to M14 Schoenus-Narthecium mire and MC9c Festuca-Plantago grassland. Of significance as a landscape element and perhaps as further variation within vegetated seacliffs of Atlantic coasts.
M22	4	Meadows and pastures of more fertile, moist mineral and peaty soils, often manured, in more Continental parts of Europe M22 Juncus subnodulosus-Cirsium palustre fen-meadow (4) An alternative trend to the dominance of Molinia in lowland fen-meadows like M22 is for other rank grasses such as Holcus lanatus and Festuca rubra to become very abundant with drying and abandonment of treatment or for Arrhenatherum elatius to invade as conditions become more eutrophic. Several reports from Suffolk Fens (eg. Harding & Kay 1992b, Harding 1993a) report this kind of vegetation which may be seen as basal Junco-Molinion or transitional to Arrhenatherion. With the abandonment of grazing Juncus subnodulosus can also become overwhelming dominant in this community (Jefferson pers. com.).
MG8	5	Meadows and pastures of more fertile, moist mineral and peaty soils, often manured, in more Continental parts of Europe MG8 Cynosurus cristatus-Caltha palustris grassland (5) The description of the Cynosurus-Caltha flood pasture is one of the least satisfactory parts of the mesotrophic grassland section of the NVC. The community is certainly real, the core of the description in Rodwell (1992) seems adequate but it is based on very few relevés from a limited area and the vegetation is both more widespread and diverse. For example, this community can be found at higher altitudes in the Northern Pennines (Jefferson pers. com.) and flushes within traditional hay meadows in the Durham and Yorkshire Dales have MG8 vegetation (Prosser 1990a, b) as an integral part of mosaics involving MG3 Anthoxanthum-Geranium and MG5 Centaureo-Cynosuretum swards (see also Cooch & Rodwell 1996). Then, on West Sedgemoor, where the community is particularly widespread, Prosser & Wallace (1992, 1993, 1995a, b) proposed a new Cirsium dissectum-Thalictrum flavum subcommunity with four variants related to different parts of a hydrological gradient across the wetland and varying levels of agricultural improvement. Preferentials of the sub-community are C. dissectum, T. flavum, Cardamine pratensis, Agrostis stolonifera, Carex riparia, Polygonum amphibium, Deschampsia cespitosa and Ranunculus flammula. These data need re-examination in relation to hay-meadow relevés and the Senecioni-Brometum described below, so as to better define these distinctive elements of landscapes important for conservation.
MG type	6	Meadows and pastures of more fertile, moist mineral and peaty soils, often manured, in more Continental parts of Europe Carex nigra-Agrostis stolonifera-Senecio aquaticus grassland (6) Senecio-Brometum racemosi Tüxen et Preising 1951 Further survey on King's Sedgemoor and other parts of the Somerset Levels (Cox 1995) and re-examination of similar sites like the Derwent Ings, has also suggested the existence of a further type of seasonally-flooded sward, managed as either pasture or meadow, which resembles this Calthion association characterised from other parts of Europe (most recently by Schaminée et al. 1996, though as a new Ranunculo-Senecionetum). In Somerset (Cox & Leach 1995), this vegetation is described as having constant Carex nigra, Agrostis stolonifera, Cardamine pratensis, Ranunculus repens, R. acris, Polygonum amphibium, Glyceria fluitans, Anthoxanthum odoratum and Calligon cuspidatum and frequent Senecio aquaticus, Trifolium repens, Carex disticha, Festuca pratensis and Taraxacum officinale agg. Marked shifts in abundance of the species can be seen from year to year and these authors consider that the timing and duration of the flood (generally December-early March and up to 1m deep) are probably critical in determining the composition of the sward. The wettest stands have the look of a species-rich MG13 Agrostis-Alopecurus grassland or S22 Glycerietum fluitantis vegetation and repeated prolonged spring flooding (mid-March onwards) could promote a succession in this direction. This kind of wet grassland is clearly of significance within the distinctive flood-plain landscape and needs re-examination, along with the new forms of MG8 Cynosurus-Caltha grassland described above. A further important relationship that needs clarifying is with the wet grasslands encountered among the machair and dune slacks of north-west Britain, noted below in the Potentillion anserinae.

NVC type(s)	Level	Description
M27	5	M27 <i>Filipendula ulmaria</i> - <i>Angelica sylvestris</i> mire (5) Ranker stands of MG3c <i>Anthoxanthum</i> - <i>Geranium</i> hay meadow, <i>Arrhenatherum</i> subcommunity occur in Scotland with <i>Filipendula ulmaria</i> frequently represented. Where this latter becomes dominant with frequent <i>Geranium sylvaticum</i> , <i>Cirsium helenioides</i> , <i>Conopodium majus</i> and local <i>Meum athamanticum</i> and <i>Trollius europaeus</i> , it seems likely that a new sub-community of M27 should be recognised. 10 relevés in Cooper & MacKintosh (1996).
MG3	5	MG3 <i>Anthoxanthum odoratum</i> - <i>Geranium sylvaticum</i> grassland (5) Stands of meadow vegetation transitional between MG3 and MG4 <i>Alopecurus</i> - <i>Sanguisorba</i> meadow occur between the Pennines and the Vale of York.
MG5	5	MG5 <i>Cynosurus cristatus</i> - <i>Centaurea nigra</i> grassland (5) <i>Centauro-Cynosuretum cristati</i> Br.-Bl. et R.Tx. 1952 MG5 is a more diverse grassland than the present account indicates. In particular, there are distinctive swards around the upland fringes which have more frequent records for rushes and other species characteristic of M23 <i>Juncus</i> - <i>Galium</i> pasture and, more locally, there is prominence of such plants as <i>Carum verticillatum</i> , <i>Sanguisorba officinalis</i> and <i>Vicia orobus</i> . CCW Lowland Grassland Survey has relevés, with further data for <i>Carum</i> in Wheeler (1986). Stands of MG3 <i>Anthoxanthum</i> - <i>Geranium</i> grassland which have only sporadic records for distinctive preferentials also often look transitional to MG5.
MG6	5	MG6 <i>Lolium perenne</i> - <i>Cynosurus cristatus</i> grassland (5) <i>Lolio-Cynosuretum cristati</i> (Br.-Bl. et de Leeuw 1936) R.Tx. 1937 Improved grasslands on some inland clay pastures and reclaimed coastal marshes around the Thames and perhaps also the Severn (Dargie, pers. comm.) with <i>Ranunculus sardous</i> , <i>Hordeum secalinum</i> and <i>Trifolium fragiferum</i> probably represent a sub-community of MG6 <i>Lolio-Cynosuretum</i> like the <i>juncetosum gerardii</i> Westhoff 1969. Further sampling is needed of this and of the grassland on the banks of large fen dykes and sea 'walls' in reclaimed saltmarshes (see Figure 25) where <i>Lactuca saligna</i> and <i>Petroselinum segetum</i> seem to be characteristic. Relevés from Hare (unpublished) and Ferry (unpublished).
MG type	6	<i>Festuca rubra</i> - <i>Holcus lanatus</i> <i>Anthoxanthum odoratum</i> grassland (6) In British Plant Communities, grassland dominated by <i>Festuca rubra</i> and <i>Holcus lanatus</i> and with a distinctive maritime element in <i>Armeria maritima</i> and <i>Plantago maritima</i> , figures among the sea-cliff communities as MC8 <i>Festuca</i> - <i>Holcus</i> grassland. Subsequent surveys in Northern Ireland (Cooper et al. 1992), Scotland (reports summarised in Cooper & MacKintosh 1996) and various parts of England and Wales (Harding 1993c and pers. comm.) have recognised that similar swards without such a maritime contingent are widely distributed. Often species-poor and rank, these swards have frequent <i>Festuca rubra</i> , <i>H. lanatus</i> , <i>Anthoxanthum odoratum</i> , <i>Poa pratensis</i> , <i>Dactylis glomerata</i> , <i>Trifolium repens</i> , <i>Plantago lanceolata</i> and mosses such as <i>Pseudoscleropodium purum</i> and <i>Rhytidiadelphus squarrosus</i> , but with little or no <i>Lolium perenne</i> and relatively few of the taller dicotyledons associated with meadows. It looks as if there may be more and less calcifugous types with on the one hand species like <i>Luzula campestris</i> and <i>Agrostis capillaris</i> and, on the other, <i>Lotus corniculatus</i> and <i>Galium verum</i> . This kind of grassland grades into younger stands of MG1 <i>Arrhenatherum elatioris</i> (often developing on sown verges) but vegetation like this seems especially associated with meadows, machair and unimproved drier pastures which have become neglected through abandonment of regular mowing and grazing and grown rank. Of little intrinsic floristic value, this grassland is an important element of marginal agricultural landscapes in western Britain and the Scottish Isles and is of potential significance for a variety of alternative uses, including perhaps reclamation for low-input agriculture. Many samples already in the UKVDB but reanalysis of these and any new data is essential.
SM28	-	Natural and anthropogenic communities of unstable habitats, periodically wetted and dried out or alternating brackish and fresh SM28 <i>Elymus repens</i> salt-marsh community <i>Elymetum repentis maritimum</i> Nordhagen 1940 <i>Elymus repens</i> grassland has been recorded inland on some flood plain systems (eg. Derwent Ings in North Yorkshire) and, on very sheltered strandlines in Orkney and the Moray Firth, where there is much organic tidal litter, <i>Elymus repens</i> forms a community with <i>Leymus arenarius</i> .
?	6	Natural and anthropogenic communities of unstable habitats, periodically wetted and dried out or alternating brackish and fresh <i>Carex nigra</i> - <i>Agrostis stolonifera</i> community (6) Wet grassland or small-sedge fen in which <i>Carex nigra</i> is often abundant with frequent <i>Agrostis stolonifera</i> , <i>Holcus lanatus</i> , <i>Ranunculus repens</i> , <i>R. acris</i> , <i>Caltha palustris</i> , <i>Lychnis flos-cuculi</i> , <i>Cardamine pratensis</i> and <i>Calliargon cuspidatum</i> and variously enriched by <i>Carex panicea</i> and poor-fen herbs or <i>Juncus articulatus</i> and Potentillion plants (though not always <i>Potentilla anserina</i>) has been widely reported from damp hollows and wet pastures at low altitudes, especially along the western seaboard of Britain (surveys summarised in Cooper & MacKintosh 1996; see also Dargie 1993, 1998a, b, e), though also from the Suffolk coast (Harding 1993c). Further survey and analysis is needed to characterise this vegetation in relation to the <i>Senecioni-Brometum</i> (described under the <i>Calthion</i>), the <i>Carex</i> - <i>Ranunculus flammula</i> mire (under the <i>Caricion fuscae</i>) and to the existing MG8.
OV type	6	Natural and anthropogenic communities of unstable habitats, periodically wetted and dried out or alternating brackish and fresh

NVC type(s)	Level	Description
		<p><i>Tussilago farfara</i>-<i>Festuca rubra</i> community (6)</p> <p>Among the sea-cliff communities in the NVC, herbaceous vegetation of softer clay cliffs is noticeably absent but it occurs widely along the eastern coast of England and locally in the south and essentially similar assemblages can be seen inland throughout the lowlands colonising slumping clay banks on open ground, roadsides and building sites, often with surface runnels where rain or ground water runs away. Tussocky grasses like <i>Festuca rubra</i>, <i>F. arundinacea</i> and <i>Dactylis glomerata</i> form an open cover with scattered <i>Tussilago farfara</i> very distinctive and, on spray-splashed sites, <i>Armeria maritima</i> and <i>Plantago coronopus</i> can figure. This vegetation provides a characteristic locus for <i>Rubus ulmifolius</i> and <i>Helmintha echioides</i> and may quickly acquire swarms of <i>Ophrys apifera</i>. There are relevés from Kent (Malloch unpublished), the Yorkshire coast (Rodwell unpublished) and from inland in Yorkshire (Lunn 1998).</p>
CG type	3	<p>Swards of lime-rich sandy soils in more Continental parts of Europe</p> <p>CG7 <i>Festuca ovina</i>-<i>Hieracium pilosella</i>-<i>Thymus praecox/pulegioides</i> grassland (3)</p> <p>On sunny south- and west-facing rocky slopes on igneous bedrocks with locally base-rich soils at low altitudes along Hadrian's Wall and in south-east Scotland, swards essentially like CG7 occur beyond the geographical range of thermophilous calcicoles like <i>Cirsium acaule</i> and <i>Thymus pulegioides</i>, providing a locus for <i>Dianthus deltooides</i>, <i>Astragalus danicus</i>, <i>Potentilla neumanniana</i> and <i>Trifolium striatum</i>. Relevés from Averis (1996 and recent unpublished data) and Lusby (1992) need analysis to characterise a possible new subcommunity.</p>
SD12	5	<p>Colonising vegetation and open grasslands of acid sands on coastal and inland dunes</p> <p>SD12 <i>Carex arenaria</i>-<i>Festuca ovina</i>-<i>Agrostis capillaris</i> dune grassland (5)*</p> <p>Much SD12 vegetation in Scotland is difficult to allocate to existing sub-communities because the differentials <i>Anthoxanthum odoratum</i> and <i>Holcus lanatus</i> are both present. Sand dune survey in Scotland (Dargie 1994a, b; 1998c,e, 1999) recorded a range of forms which might constitute further sub-communities: <i>Ammophila arenaria</i> (semi-fixed dune developing without an SD7 phase), <i>Carex arenaria</i> (usually with heavy rabbit grazing), <i>Hylocomium splendens</i> (part of the Moray Firth Boreal sequence), <i>Racomitrium canescens</i> (deflating environments, very rarely with <i>Corynephorus canescens</i> at Morar in Lochaber), <i>Deschampsia flexuosa</i> (often close to H11 dune heath) and <i>Cladonia rangiformis</i>-<i>C. portentosa</i> (perhaps the classic grey dune, though now very rare on the east coast of Scotland).</p>
MC5	6	<p>Ephemeral vegetation of bare but stable acid sands or siliceous rock outcrops</p> <p>MC5 <i>Armeria maritima</i>-<i>Cerastium diffusum</i> ssp. <i>diffusum</i> maritime therophyte community (6)</p> <p>It is clear that MC5 represents only a (distinctively maritime) part of the Thero-Airion in Britain. Inland swards rich in ephemerals like <i>Vulpia</i> spp. (relevés from Lunn 1998) are widespread on shallow acidic soils in warmer and drier parts of the country and need further sampling to characterise syntaxa like the <i>Airetum praecocis</i> (Schwickerath 1944) Krausch 1967, the <i>Filagini-Vulpietum myuros</i> Oberdorfer 1938 and the <i>Airo caryophylleae</i>-<i>Festucetum ovinae</i> R Tx. 1955.</p>
?	6	<p>Closed swards of calcareous to acidic, drought prone soils on rock outcrops</p> <p><i>Poa compressa</i>-<i>Saxifraga tridactylites</i> community (6)*</p> <p>Open and often fragmentary assemblages that are probably identical to this association have small tufts of <i>Poa compressa</i> and <i>Saxifraga tridactylites</i> with patches of <i>Sedum acre</i>, ephemerals such as <i>Arenaria serpyllifolia</i>, <i>Erophila verna</i>, <i>Aira praecox</i>, <i>A. caryophyllea</i> and <i>Cardamine hirsuta</i> and small tufts or patches of mosses like <i>Tortula muralis</i>, <i>Ceratodon purpureus</i>, <i>Bryum capillare</i>, <i>Homalothecium sericeum</i> and <i>Grimmia pulvinata</i>. Stands are widespread and common on the limestones of southern Britain on sunny wall-tops and in mortared stonework but also occur in such natural habitats as fractured limestone outcrops and clint surfaces on limestone pavement where shallow and fragmentary rendzinas dry out in summer. Figure 25 in Appendix 1 shows a potential distribution map for this vegetation type which has been created by coincidence mapping characteristic species. This kind of vegetation is clearly analogous to the assemblages reported from sunny chalk cliff tops in Limburg in the Netherlands (Schaminée et al. 1996) and is the British representative of the <i>Alyso-Sedion</i> alliance and an element of limestone pavement vegetation. There are a few relevés in the UKVDB but additional data, which are a priority, will be easy to collect.</p>
?	6	<p>Closed swards of calcareous to acidic, drought prone soils on rock outcrops</p> <p>Stonecrop vegetation of more oceanic regions of Europe.</p> <p><i>Sedum anglicum</i>-<i>Aira praecox</i> community (6)</p> <p>Stonecrop vegetation with <i>Sedum anglicum</i> and a characteristic suite of ephemerals already figures in its more maritime manifestation as part of the MC5 <i>Armeria</i>-<i>Cerastium</i> community. However, similar assemblages lacking species such as <i>Aira maritima</i> and <i>Plantago maritima</i> can be seen widely in more inland locations in the oceanic south and west of Britain. Here, <i>Sedum anglicum</i> can occur with local abundance with such other distinctive plants as <i>Jasione montana</i>, <i>Vulpia bromoides</i> and <i>Umbilicus rupestris</i> and ephemerals like <i>Aira praecox</i>, <i>A. caryophyllea</i>, <i>Bromus hordeaceus</i> ssp. <i>hordeaceus</i> and <i>Erodium cicutarium</i>. The vegetation probably</p>

NVC type(s)	Level	Description
		provides a characteristic locus for <i>Romulea columnae</i> , <i>Polycarpon tetraphyllum</i> , <i>Tuberaria guttata</i> , <i>Ornithopus pinnatus</i> , <i>Juncus capitatus</i> and certain scarce <i>Trifolium</i> spp. such as <i>T. occidentale</i> (Coombe 1961). It typically occurs on outcrops of less base-rich rocks with shallow rankers, drought-prone in the warm, sunny conditions of summer, among pastures and heaths of cliff-tops, crags and rocky knolls where grazing helps keep encroaching heath and scrub away from the crag surrounds. It is widespread but uncommon through the more oceanic parts of Britain (and locally further east: see Hughes 1995 on the Suffolk coast) and is of importance for scarce and rare plants and as part of distinctive landscapes. Relevés are available from Birse (1980) in Galloway and Mull, Hopkins (1983) on the Lizard, Proctor from south-west England (unpublished, also 1975 from Alderney) and from Averis & Averis (1995) from Mull. Further data, which would be easy to obtain, are needed to define this assemblage and clarify relationships with MC5 and U1f <i>Festuca-Agrostis-Rumex</i> grassland, <i>Hypochoeris</i> sub-community. Figure 26 in Appendix 1 shows a potential distribution map for this vegetation type which has been created by coincidence mapping characteristic species.
SD8	5	Closed swards of calcareous to acidic, drought prone soils on rock outcrops SD8 <i>Festuca rubra-Galium verum</i> dune grassland (5)* This is a remarkably complex vegetation type in Scotland where the heartland of its distribution lies on the machair. Although the present five sub-communities cover much of the variation, other forms are present and have been mapped in Dargie (1998a-e, 1999). It may thus be possible to recognise <i>Centaurea nigra-Daucus carota</i> (on at most lightly grazed calcareous sands, an analogue to MG5), <i>Thymus praecox</i> (on shallow, partly flushed sand blown over rocky hillsides) and <i>Hylocomium splendens-Rhytidadelphus triquetrus</i> subcommunities (the last part of a Boreal sequence: see SD7).
U4	5	Unfertilised mat-grass pastures at lower altitudes U4 <i>Festuca ovina-Agrostis capillaris-Galium saxatile</i> grassland (5) Locally in western Scotland, there is a distinctive form of this grassland with big mesotrophic herbs. The abundance of the grasses <i>Festuca rubra</i> , <i>F. ovina</i> , <i>F. vivipara</i> , <i>Holcus lanatus</i> and <i>Anthoxanthum odoratum</i> , together with <i>Potentilla erecta</i> and an extensive and often rather deep moss layer of <i>Rhytidadelphus squarrosus</i> and <i>Hylocomium splendens</i> and other species, places the vegetation clearly into U4. However, the vegetation differs from each of the five sub-communities of U4 in containing an abundance of tall mesophytic herbs such as <i>Filipendula ulmaria</i> , <i>Geum rivale</i> , <i>Cirsium helenioides</i> , <i>Parnassia palustris</i> , <i>Angelica sylvestris</i> , <i>Trollius europaeus</i> , <i>Alchemilla glabra</i> , <i>Geranium sylvaticum</i> and <i>Succisa pratensis</i> . Intensity of grazing varies but where it is heavier these tall herbs are mostly reduced to short, non-flowering plants. This grassland has been found on steep, moist but well-drained north-facing slopes at low altitude on basalt on Mull and Kerrera, on Cambrian fucoid beds on Beinn Eighe in Wester Ross, and on schists on Ben Lui in Perthshire. It occurs mainly on concave slopes where a moss/humus layer has provided some degree of buffering from the mineral soil and where there is some flushing from basic rock outcrops above. This vegetation probably represents a new sub-community of U4 and it typically forms small stands in sometimes extensive mosaics with CG10 <i>Festuca-Agrostis-Thymus</i> , CG11 <i>Festuca-Agrostis-Alchemilla</i> and U5 <i>Nardus-Galium</i> grasslands. 13 relevés from Mull, Beinn Eighe and Ben Lui (Averis & Averis 1996, 1998a, in prep.) with further data on U4 with MG5 meadow plants from CCW Lowland Grassland Survey. Mossy grassland with abundant <i>Racomitrium lanuginosum</i> and abundant <i>Alchemilla alpina</i> or frequent <i>Huperzia selago</i> and <i>Diphasiastrum alpinum</i> found at high altitudes in the Highlands and Snowdonia also expands the character of U4.
U5	5	Unfertilised mat-grass pastures at lower altitudes U5 <i>Nardus stricta-Galium saxatile</i> grassland (5) With abundant <i>Calluna vulgaris</i> , this vegetation resembles western forms of M15c with <i>Scirpus</i> replaced by <i>Nardus</i> and <i>Erica tetralix</i> absent or very rare (18 relevés from the western Highlands; Averis & Averis 1997b, 1997c, 1998a). Another form has little or no heather and is more of a <i>Nardus-Racomitrium</i> grassland (relevés from Skye; Averis & Averis 1997a). These two forms occur mainly on convex slopes which are at least moderately well-drained. The third form, which occurs in small, wetter, often linear shallow depressions (usually among drier U5e) has abundant <i>R. lanuginosum</i> , <i>Campylopus atrovirens</i> , <i>Sphagnum auriculatum</i> and <i>Narthecium ossifragum</i> . 6 relevés from Skye by Averis & Averis (1997a).
CG10	5A	Unfertilised mat-grass pastures at lower altitudes CG10 <i>Festuca ovina-Agrostis capillaris-Thymus praecox</i> grassland (5)* Open swards of the CG10 type with frequent records for <i>Aira praecox</i> , occasional <i>Plantago maritima</i> and a distinctive contribution in the ground layer from <i>Racomitrium ericoides</i> , <i>R. lanuginosum</i> and <i>Pogonatum aloides</i> , occurring on riverside shingle throughout the Scottish Highlands, may constitute a new sub-community. 5 relevés from Rhidorroch, Wester Ross (Averis 1998).
U6	5	Heath-rush vegetation on peaty soils U6 <i>Juncus squarrosus-Festuca ovina</i> grassland (5)

NVC type(s)	Level	Description
		Graminoid-dominated swards with a low cover of <i>Juncus squarrosus</i> and including abundant <i>Anthoxanthum odoratum</i> , <i>Nardus stricta</i> and <i>Agrostis canina</i> can differ markedly from other types of U6 in containing an abundance of mesophytic or calcicole herbs such as <i>Ranunculus acris</i> , <i>R. flammula</i> , <i>Thalictrum alpinum</i> , <i>Alchemilla glabra</i> , <i>Taraxacum officinale</i> agg., <i>Crepis paludosa</i> , <i>Geum rivale</i> , <i>Parnassia palustris</i> , <i>Persicaria vivipara</i> , <i>Trollius europaeus</i> , <i>Carex pulicaris</i> and <i>Filipendula ulmaria</i> . This distinctive, species-rich vegetation has been found very locally in the Highlands, mainly in the Breadalbanes. It occurs as small stands in wet, flushed depressions at 400-700 m, mainly in complex mosaics with U4 <i>Festuca-Agrostis-Galium</i> grassland, U5 <i>Nardus-Galium</i> grassland, H18 <i>Vaccinium-Deschampsia</i> heath and other forms of U6. In terms of floristics and habitat it can be seen as a higher-altitude replacement of M23a <i>Juncus-Galium</i> rush pasture. On Ben Lui it is an important locus for the rare <i>Carex vaginata</i> . Relevés from the Breadalbanes (McVean & Ratcliffe 1962, Averis & Averis in preparation). Short vegetation co-dominated by <i>Juncus squarrosus</i> and <i>Calluna vulgaris</i> is quite frequent in the western Highlands. Floristic details can show affinities with U6a, b or c, but some stands cannot be clearly assigned to a sub-community. Further sampling of this distinctive vegetation may suggest a new sub-community of U6. Relevés from Ben Lui (Averis & Averis in preparation).
H4	5A	Gorse-Dorset heath communities of damper soils in the Atlantic region H4 <i>Ulex gallii-Agrostis curtisii</i> heath (5)* Beyond the geographic range of <i>Agrostis curtisii</i> , Prosser & Wallace (1996) have reported a 'humid heath' with frequent <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Molinia caerulea</i> and <i>Ulex gallii</i> , essentially similar to H4 but perhaps best seen as a new sub-community.
H10	5A	Bell-heather communities on dry to fresh soils in sub-Atlantic regions H10 <i>Calluna vulgaris-Erica cinerea</i> heath (5)* Transitions between calcicolous grasslands and heaths occur widely throughout the southern lowlands of Britain, and Rodwell (1991b) explains how some of the 'limestone heath' described by various authors can be accommodated in different NVC sub-communities or mosaics between vegetation types. Detailed reinvestigation of vegetation-soil sequences first described by Gittins (1965) and Rodwell (1974) in Stevens et al. (1995) may help characterise further intermediate heathy swards.
H type	5A	Bell-heather communities on dry to fresh soils in sub-Atlantic regions (5)* Rarely in the western Highlands, prostrate <i>Juniperus communis</i> and/or <i>Arctostaphylos uvaursi</i> are co-dominant with <i>Calluna vulgaris</i> and <i>Erica cinerea</i> in heaths which appear to represent small fragments of vegetation extensive before moor-burning took place. Relevés from Skye, Beinn Eighe and Sutherland from Averis (1997) and Averis & Averis (1998a, d) and from blown sand on Mull and Colonsay in Dargie (1999). Some other H10 heath in the western Highlands and Northern Ireland has a bryophyte layer containing frequent <i>Breutelia chrysocoma</i> and some <i>Sphagnum capillifolium</i> and represents a transition from H10a to H21a, but it occurs frequently enough and extensively enough that it might warrant a new sub-community of H10. No relevés in UKVDB.
H12	5A	Bilberry heaths of moist soils in the sub-montane zone H12 <i>Calluna vulgaris-Vaccinium myrtillus</i> heath (5)* H12 containing abundant <i>Racomitrium lanuginosum</i> is rare in the Highlands. It is closest floristically to H12b, but unlike H10, H12 cannot comfortably accommodate forms of vegetation with with abundant <i>R. lanuginosum</i> . There may be a case for the creation of a <i>R. lanuginosum</i> sub-community of H12. 5 relevés from Beinn Eighe (Averis & Averis 1998a).
H21	5A	Bilberry heaths of moist soils in the sub-montane zone H21 <i>Calluna vulgaris-Vaccinium myrtillus-Sphagnum capillifolium</i> heath (5)* H21b with abundant prostrate <i>Juniperus communis</i> occurs rarely in the western Highlands. It appears to be a relatively natural type of heath which might have been more frequent before moor-burning took place. Given its extreme rarity it may not warrant recognition as a separate sub-community, but it forms part of the important series of relatively natural Scottish heaths containing abundant prostrate juniper (Averis & Averis 1998d). Most H21b south of the NW Highlands and Skye where this sub-community is extensive contains abundant <i>Herbertus aduncus</i> but lacks other montane Northern Atlantic leafy liverworts characteristic of more northern H21b. No relevés, although similar vegetation in Ireland has been sampled (Horsfield pers. comm.), and Averis (1994) sampled the full bryophyte component of Scottish heaths of this kind (Averis 1994).

8. ROCK-CREVICE AND SCREE – additional NVC types identified by Rodwell et al (2000)

NVC type(s)	Level	Description
OV type	6	<p>Communities of shaded calcareous rocks</p> <p>Polypodium vulgare-Umbilicus rupestris community (6) Both Polypodium interjectum and P. australe occur among the wall crevice assemblages of the Cymbalario-Asplenion but the former fern, along with P. vulgare sensu stricto, is also a distinctive feature of the vegetation of hedgebanks and lanesides in western Britain with other ferns such as Dryopteris filix-mas, D. borrieri, D. dilatata, Polystichum setiferum, P. aculeatum, Phyllitis scolopendrium, Asplenium adiantum-nigrum, A. billotii and various hybrid ferns, Hedera helix, Umbilicus rupestris, Silene dioica, Teucrium scorodonia, Brachypodium sylvaticum and overhanging shrubs such as Crataegus monogyna and Ulex europaeus. This sort of vegetation is at its most luxuriant in the deep lanes running down to the sea in south Devon but it is widespread and common all around the south-western seaboard, extending up on to moorland where there is local shelter. On more accessible hedgebanks, periodic cutting helps prevent closure of a scrubby cover. The vegetation has many features suggestive of shady Saum and is perhaps better placed among the Melampyrium assemblages but, apart from its contribution to distinctive landscapes, it provides an important locus for various rare and scarce ferns (Page 1982, 1988). There are no relevés available but the vegetation is easy to locate and sample.</p>
OV type	6A	<p>Communities of shaded calcareous rocks</p> <p>Asplenium marinum community (6)* Asplenium marinum figures occasionally among the maritime crevice vegetation of MC1 Crithmo-Spergularietum but this fern also occurs, sometimes with great local abundance and luxuriance, in shaded crevices, beneath overhangs and in caves cut in hard rock coasts, particularly of our Atlantic seaboard, where constant drenching with spray from Gulf Stream waters in an oceanic climate creates a humid, frost-free atmosphere. The moss Schistidium maritimum is often the only companion. According to Page (1982), stands are much less common and luxuriant now compared with last century, perhaps partly because of sea water pollution. The nationally scarce Asplenium billotii tends to occur more frequently in crevices a little higher up cliffs but the A. marinum community is itself important as part of the sequence of sea-cliff vegetation. 8 relevés from Malloch (unpublished) are in the UKVDB and additional samples would be relatively easy to collect from more accessible cliffs.</p>

9. MONTANE HEATH, TALL-HERB AND SNOW-BED – additional NVC types identified by Rodwell et al (2000)

NVC type(s)	Level	Description
U7	5A	<p>Moderately chionophilous sedge-, rush- and moss-dominated communities kept moist by snow-lie and melt waters</p> <p>U7 Nardus stricta-Carex bigelowii grass-heath (5)* Some U7 Nardus snowbed vegetation on N-facing slopes at 600-950 m on Beinn Eighe contains a distinctive abundance of the nationally scarce Northern Atlantic leafy liverworts Anastrophyllum donnianum, A. joergensenii, Scapania ornithopodioides, S. nimbosea, Bazzania pearsonii and Plagiochila carringtonii. This vegetation may warrant separation as a new sub-community if it proves to be widespread. Relevés from Averis & Averis (1998a).</p>
U8	5A	<p>Moderately chionophilous sedge-, rush- and moss-dominated communities kept moist by snow-lie and melt waters</p> <p>U8 Carex bigelowii-Polytrichum alpinum sedge-heath (5)* U8 vegetation containing a distinctive abundance of Barbilophozia floerkei occurs locally on moist N-facing slopes at 1030-1230 m in the Highlands. 19 relevés from Rothero (1991), who considered it worthy of separation as a B. floerkei sub-community.</p>
U10	5A	<p>Moderately chionophilous sedge-, rush- and moss-dominated communities kept moist by snow-lie and melt waters</p> <p>U10 Carex bigelowii-Racomitrium lanuginosum moss-heath (5)* U10c includes two distinctly different types of vegetation which may warrant separation into separate sub-communities. One type is much like U10b but with frequent scattered Silene acaulis and Armeria maritima (13 relevés from Beinn Eighe; Averis & Averis 1998a). The other type, which is species-rich and very distinctive, contains several montane herbs such as Saussurea alpina, Thalictrum alpinum, Luzula spicata, Sedum rosea, Minuartia sedoides, Cerastium arcticum and Cochlearia</p>

NVC type(s)	Level	Description
		pyrenaica ssp. alpina (relevés from Beinn Eighe; Averis & Averis 1998a).
U type	6	Moderately chionophilous sedge-, rush- and moss-dominated communities kept moist by snow-lie and melt waters Festuca vivipara-Oligotrichum hercynicum fell-field community (6) This very short and sparse vegetation occurs on moist, bare, gravelly, flat to moderately sloping ground in very exposed places over 300 m in northern and western Scotland. The total vegetation cover is typically less than 10%. Scattered plants of Festuca vivipara, Agrostis canina and the mosses Oligotrichum hercynicum and Racomitrium lanuginosum are generally abundant. Fell-fields are particularly well-developed on basalt in Skye, Mull and Morvern and provide a strong link with the basalt environment in the Faroe Islands especially where, in some basalt fell-fields of this type in the western Highlands, the flora is distinctive in containing base-demanding species such as Thymus praecox, Sedum villosum, Juncus triglumis, Luzula spicata, Koenigia islandica and the oceanic moss Racomitrium ellipticum. Basalt fell-fields in Skye and Mull represent one of the main habitats of the rare Koenigia islandica in the British Isles. Other fell-fields on basalt, granite, schist and other rock types in the western Highlands and Shetland are evidently more acidic. They support a flora including frequent Vaccinium myrtillus, V. vitis-idaea, Campanula rotundifolia, Deschampsia flexuosa, Solidago virgaurea, Polytrichum alpinum and Jasione montana. The vegetation of some of the more acidic fell-fields on Mull contains a distinctive abundance of Sedum anglicum and Saxifraga stellaris. Appraisal of relevés from Averis (1997) and Averis & Averis (1997a) and any new data could characterise two subcommunities reflecting the variation from basic to acidic rock types.
U type	6	Tall herb and scrub on more fertile and lime-rich soils Tall-herb communities Pteridium aquilinum-Cirsium helenioides fern-community (6) Bracken-dominated vegetation with rather low-grown, moderately grazed associates including Filipendula ulmaria, Ranunculus repens, Cirsium palustre, C.helenioides, Lysimachia nemorum, Prunella vulgaris, Primula vulgaris and Ajuga reptans occurs locally on moist, deep soils on gently sloping ground at low altitudes in the western Highlands. This does not fit comfortably into U20 or W25 and may represent a new community in this alliance. No relevés are available.
U type	6	Tall-herb and fern communities of acidic and more impoverished soils Dryopteris borreeri community (6) Local dominance of ferns can be a striking feature of U16 Luzula-Vaccinium tall-herb vegetation but, more widely, Dryopteris borreeri (=D. affinis) occurs abundantly in sometimes quite extensive stands with Nardo-Galium associates over the lower slopes of hills in western Scotland and sheltered valleys in the drier east. This may warrant a new community in this alliance. No relevés in UKVDB.
U11	5	Dwarf-willow and moss-dominated communities of snow-beds on lime-poor rocks and soils U11 Polytrichum sexangulare-Kiaeria starkei snow-bed (5) The three sub-communities recognised by Rothero (1991) are a Typical form, a hepatic-rich type with abundant Barbilophozia floerkei, Nardia scalaris, Cephalozia bicuspidata and Pleurocladula albescens and a Racomitrium variant with abundant Racomitrium heterostichum. 58 relevés from Rothero (1991).

10. FRINGE, SCRUB AND BROADLEAF WOODLAND – additional NVC types identified by Rodwell et al (2000)

NVC type(s)	Level	Description
W? type	6A	Drought-tolerant communities of sunny woodland edges on calcareous soils Agrimonia eupatorium-Origanum vulgare community (6)* Rubo-Origanetum Van Gils et Huits 1978 Something approaching thermophilous Saum appears in the NVC among the dune communities as part of the SD9 Ammophila-Arrhenatherum grassland and Willems (1978) described swards from the English chalk that had some Geranium species. There is no place at present, however, for the patchily rank assemblage of Agrimonia eupatoria, Origanum vulgare, Hypericum perforatum, Brachypodium pinnatum and Rubus caesius, developed in open, sunny places in and around W8 Fraxinus-Acer-Mercurialis and W12 Fagus- Mercurialis woodlands. Young Crataegus monogyna, Cornus sanguinea and Viburnum lantana are commonly present, often with Fraxinus saplings, and there can be untidy sprawls of Clematis vitalba and Tamus communis over the young woody growth of W21d Crataegus-Hedera scrub that may encroach where invasion is not set back by browsing or scrub clearance. This vegetation is a local and dynamic feature of the limestone soils of the warm and dry

NVC type(s)	Level	Description
		south-east and of significance for butterflies, providing shelter and food plants. There are no relevés in the UKVDB and further survey is a priority.
W? type	6A	Drought-tolerant communities of sunny woodland edges on calcareous soils Corylus avellana-Geranium sanguineum community (6)* Geranio-Coryletum Shimwell 1968 Shimwell's (1968a) survey of the Derbyshire Dales (data also incorporated into Shimwell 1968b) characterised a form of open scrub which he considered equivalent to the 'retrogressive scrub' of Moss (1913) and part of the Geranium. In British Plant Communities, this was subsumed into W21 Crataegus-Hedera scrub but what has been lost is the more open Saum aspect of this assemblage in which sunny areas among colonising Corylus avellana (and in other locations Juniperus communis and Taxus baccata) have plants like Origanum vulgare, Viola hirta, Hypericum perforatum, Verbascum thapsus, Polypodium australe (Page 1982, 1988) and, most notably, Geranium sanguineum. Epipactis atrorubens, Convallaria majalis and Thalictrum minus probably all have some stations here. Rosa pimpinellifolia can also figure and, locally, species of Berberis or Cotoneaster can invade from nearby gardens. This kind of Saum is limited to rubbly rendzinas on rocky slopes over limestones of the north and west of Britain, particularly North Wales, Derbyshire, the Morecambe Bay area and parts of the Yorkshire Dales, where southern and western aspects give sun and warmth, and to some calcareous dune systems in the region. Except where extreme rockiness inhibits closure of a canopy, this vegetation type requires action to control woody invaders. Even here, ornamental shrubs can be a menace. Relevés exist from Shimwell (1968a, b) but more data are needed. Figure 27 in Appendix 1 shows a potential distribution map for this vegetation type which has been created by coincidence mapping characteristic species.
W? type	6	Marginal and ride vegetation in drier situations Holcus mollis-Melampyrum pratensis community (6) Hyperico pulchri-Melampyretum pratensis De Foucault et Frileux 1983 In British Plant Communities, some vegetation like this association described, for example, from the Netherlands (Schaminée et al. 1996), was included as open stands of W16 Quercus-Betula-Deschampsia woodland. With further sampling, it may be possible to characterise a distinct community in which the cover of Quercus (usually robur) and Betula (usually pendula) are low and field layer plants like Holcus mollis, Deschampsia flexuosa and Melampyrum pratense are accompanied by Teucrium scorodonia, Solidago virgaurea, Hypericum pulchrum, Carex pilulifera and large Hieracia at greater frequencies than under closed Quercion canopies. Such assemblages are typical of shady clearings, rides and woodland margins on free-draining, acidic soils over siliceous bedrocks throughout the lowlands and upland fringes. Periodic mowing or clearance of shrubs and trees may be necessary to maintain open conditions. This vegetation is rarely floristically exciting but it comprises graded transitions from woodland to heath or pasture which are valuable for invertebrates and passerines, as well as a landscape element. More relevés are needed from relatively unwooded situations and would be easy to collect.
W type	6	Seral elder and willow scrub of nutrient-rich mull soils Sambucus nigra-Urtica dioica scrub (6) Sambucus nigra figures occasionally as a locally prominent shrub in various types of eutrophic (often disturbed) woodland. It can also dominate (with or without Salix caprea, Acer pseudoplatanus and naturalised Buddleia davidii) in scrub with associates like Rubus idaeus, R. fruticosus agg., Urtica dioica, Holcus lanatus and Epilobium angustifolium on damp, nutrient-rich soils on disturbed waysides, in woodland clearings, railway embankments, industrial wasteland, canal banks and derelict back yards, gardens and outside lavatories. Green shrubbery in otherwise devastated landscapes and all too easy to find and sample.
W9, W10, W11, W16, W17	4	Broadleaved temperate woodland of the West European lowlands (4) Luzula sylvatica can be so dominant in ungrazed or very lightly grazed stands of W9, W10, W11, W16 and W17 woodlands and Pteridium aquilinum so abundant in W11 that associates are reduced sufficiently to make it difficult to characterise existing subcommunities. It may be sensible to recognise new species-poor subcommunities distinguished by these plants.
W11	4	Oak and mixed oak-birch woodland communities of acid soils in central and western Europe W11 Quercus petraea-Betula pubescens-Oxalis acetosella woodland (4) The grasses Holcus mollis, Agrostis capillaris and Anthoxanthum odoratum are often overwhelmingly dominant in a species-poor field layer in grazed or young stands of W11 woodland in various parts of the British uplands. The scarcity or lack of sub-community preferentials is such that the vegetation cannot be clearly assigned to any existing subcommunity of W11, and may warrant a new type. Relevés from Wales (Averis & Averis 1998b, c) and Somerset (Averis unpublished).
W type	6	Oak and mixed oak-birch woodland communities of acid soils in central and western Europe

NVC type(s)	Level	Description
		<p>Rhododendron ponticum community (6)</p> <p>Rhododendron ponticum is a vigorous invader of W17 Quercus-Betula-Dicranum woodland and some W10 Quercus-Pteridium-Rubus, W11 Quercus-Betula-Oxalis and W16 Quercus- Betula-Deschampsia woodland at low altitudes in western Britain and locally further east. It can also invade open habitats such as heathland and bog. The cover can thicken up over a few years to form a virtually impenetrable thicket some 3-6 m tall. The heavy shade cast by the dense evergreen foliage, combined with the thick acidic leaf litter which smothers the ground, causes marked impoverishment in the field and ground layer vegetation and the epiphytic vegetation on native trees and shrubs. The effect is similar to that within conifer plantations, namely a reduction in species-richness, loss of light-demanding species and survival of little other than a sparse, species-poor assemblage of mainly common calcifuge, shade-tolerant bryophytes such as Isopterygium elegans and Mnium hornum. Rhododendron poses a serious threat to the rich oceanic bryophyte and lichen floras in many W17 woods in north Wales, the Lake District, the western Highlands and western Ireland. Clearance of Rhododendron has taken place in many western woods; methods vary from manual cutting and subsequent treatment of stumps to clearance using a mechanical flail. Observations suggest that following clearance, recovery of the woodland vegetation is a very slow process, and that some of the rarer bryophytes and lichens might never return.</p>
W7	5	<p>Ash and alder woodland communities of flushed and impeded lime-rich soils</p> <p>W7 Alnus glutinosa-Fraxinus excelsior-Lysimachia nemorum woodland (5)</p> <p>Scrub dominated by Salix aurita (with or without S. cinerea) has been widely reported from Scotland, especially the Western Highlands. However, where the composition of the field layer has been examined, the vegetation looks essentially the same as W7 Alnus-Fraxinus- Lysimachia or W4 Betula-Molinia woodland so a new community may not be necessary, just distinctive types of two existing communities with striking canopies.</p>
W18	5	<p>Pine and juniper woodland communities of acid soils</p> <p>W18 Pinus sylvestris-Hylocomium splendens woodland (5)*</p> <p>Pinewood with abundant Molinia is occasional in the Highlands. It may warrant a new subcommunity of W18. Relevés from Glen Affric (Averis 1994) and Loch Torridon (Tidswell 1995).</p>
W18 type	6A	<p>Pine and juniper woodland communities of acid soils</p> <p>Pinus sylvestris-Cladonia woodland (6)*</p> <p>Cladonio-Pinetum sylvestris Watson & Birse 1990</p> <p>Lichens figure only occasionally and with little prominence in W18 Pinus-Hylocomium woodland but locally, in open, sunny and windy stands of Pinus sylvestris, Watson & Birse (1990) recorded a very distinct kind of vegetation with Erica cinerea and an extensive ground carpet of Cladonia impexa, C. furcata, C. gracilis, C. ciliata, C. arbuscula and C. uncialis. It is impossible to accommodate this within W18 and it bears some resemblance to lichen-rich pine woodland described from Scandinavia and Eastern Europe (Rodwell & Cooper 1995), so recognition at community level is probably more appropriate. There are relevés from Watson & Birse (1990) and Dargie (1994b) but further searches may reveal other stands.</p>
W19	5A	<p>Pine and juniper woodland communities of acid soils</p> <p>W19 Juniperus communis-Oxalis acetosella woodland (5)*</p> <p>Wetter juniper scrub from Morrish More (Dargie 1993) can probably be accommodated with SD15 but the drier forms, more extensive geographically with records from Dalchalm on Brora to Nigg and Culbin are more enigmatic. More relevés are required to examine the relationship of this vegetation to W19.</p>
W type	6	<p>Pine and juniper woodland communities of acid soils</p> <p>Conifer plantations (6)</p> <p>The NVC approach to classifying stands of woodland dominated by non-native conifers was to regard them as coniferised versions of native broadleaved woodlands or replacements for native Scot's pine woodland. This is quite informative for understanding the impact of afforestation on the woodland flora but, when plantations are very extensive, seems a little odd. It may therefore be sensible to recognise distinct communities of Picea sitchensis, Pinus sylvestris, P. nigra var. maritima and Pseudotsuga menziesii (plus any other extensive coniferous dominants) where there is usually just a very sparse field layer of puny Deschampsia flexuosa, Oxalis acetosella and Dryopteris dilatata and only scattered patches of Isopterygium elegans, Mnium hornum and Plagiothecium undulatum with a deep layer of conifer needles. These plantations are widespread and extensive, especially in upland Britain and are usually replacements for Quercion or Dicrano-Pinion woodland, more locally for Betulion woodland. They are an important landscape element and sometimes help sustain a distinctive fauna. Sampling should also help understand the</p>

NVC type(s)	Level	Description
		impact of deciduous conifers like <i>Larix</i> spp. which can have a richer field and ground flora and, the distinctiveness of old-growth stands.
W type	5	<p>Spruce and birch related woodland communities</p> <p>W4 <i>Betula pubescens</i>-<i>Molinia caerulea</i> woodland (5) Scrub dominated by <i>Salix aurita</i> (with or without <i>S. cinerea</i>) has been widely reported from Scotland, especially the Western Highlands. However, where the composition of the field layer has been examined, the vegetation looks essentially the same as W4 <i>Betula</i>-<i>Molinia</i> woodland or W7 <i>Alnus</i>-<i>Fraxinus</i>-<i>Lysimachia</i> so a new community may not be necessary, just distinctive types of two existing communities with striking canopies.</p>

Overview of additional NVC types proposed by Rodwell et al (2000)

Around 113 additions were identified by the review of Rodwell et al (see preceding tables for details and table below for summary). These are spread across a broad spectrum of vegetation types, from open grassland and heath, to high altitude and vegetation of rocky sites, and from woodland and scrub to communities of wetland, freshwater and coastal environments. Many were of conservation significance: nearly half might qualify under Annex I of the EU Habitats Directive.

Summary table of the 113 additional NVC types identified by the Rodwell et al (2000). See text for details. Gaps suffixed by 'A' might qualify under Annex I of the EU Habitats Directive.

Broad vegetation types (number additional types)	Level of gap										
	6	6A	5	5A	2	2A	3	3A	1	1A	4
Grassland and heath (29)	7		11	7			1	1			2
Springs, shoreline, swamp and tall-herb fen (26)	16	1	6		2		1				
Freshwater aquatic (16)	1	9	3	2		1					
Fringe, scrub and broadleaf woodland (11)	4	3	3	1							2
Bog and fen (7)	1			5				1			
Montane heath, tall-herb and snow-bed (7)	3		1	3							
Coastal mudflat and brackish water (5)		1				2			1	1	
Salt-marsh and sea-cliff (4)		1				1				2	
Strandline and sand-dune (4)		2		2							
Rock-crevice and scree (2)	1	1									
Sub-totals	33	18	24	20	2	4	2	2	1	3	4
Totals		51		44		6		4		4	4

The additions ranged from new communities to sub-communities and variants. Although some had supporting samples available and, in some cases, supporting analysis had been undertaken, in other cases no samples were known and supplementary sampling and analysis was advised before the types could be fully appraised.

In terms of level of gaps, most of the additions fell under levels 6 (45%) and 5 (39%). The latter includes communities that are already well characterised in the NVC, but perhaps need further sub-division at the sub-community level. Level 6 gaps are more significant in that they include new variation and gaps at the plant community level. These combine with level 2 gaps, i.e. types described in the NVC at alliance or similar level where further sampling should characterise one or more new plant communities. Combining levels 2 and 6 (50% of total) suggests that the overall number of additional communities in the NVC could be increased by around 20%, although this might be too generous an estimate and most of the newcomers are relatively modest in scale and may have no sub-communities.

In terms of their phytosociological formations and alliances, the biggest weaknesses was among the freshwater aquatic vegetation of moving and standing waters (perhaps 11 new communities), shallow or fluctuating pools (perhaps 8 new communities), and water-margins and springs (perhaps 7 new communities). A further substantial group covers weedy vegetation (5 communities) or rank vegetation of clearings, woodland fringes, riverbanks and

shoals (9 possible communities). Shingle and strandline vegetation (perhaps 5 communities) and mud-flat and lagoon assemblages (3 communities) are the major omissions among maritime vegetation. Among lowland grasslands, the most substantial deficiency appears to be among wetter swards in floodplains and from periodically inundated hollows among pastures and more base-poor dune slacks (2 or 3 new communities). Other additions include ranker swards of damp clay banks (1 community) and of neglected meadows and pastures (1 community). Ephemeral-rich vegetation of sandy soils (perhaps 3 communities), stonecrop swards of outcrops and rock-hollows or crevices (2 communities), and fern assemblages of shaded talus, rock clefts and banks (3 communities) comprise a further distinctive and under sampled group. From the montane zone, the major deficiencies appear to be among snow-bed assemblages (2 communities), tall-herb vegetation (1 community) and fell-field (1 community). Finally, among woodlands and scrub, lowland elder-willow scrub and lichen-rich pine woodland from Scotland appear to be the major omissions among semi-natural vegetation. Saum vegetation could also sensibly be included here (2 communities).

Annex 2 – Proposed additions and revisions by Dargie (2000) based on NVC sand dune surveys in Scotland

Dargie, T.C.D. 2000. *Sand Dune Vegetation Survey of Scotland: National Report*. Scottish Natural Heritage, Battleby.

Regional reports available via: <http://www.snh.org.uk/pubs/>

The Sand Dune Vegetation Survey of Scotland (Dargie 2000 and associated regional reports) found that much of the dune and machair vegetation in Scotland agrees closely with types described in the NVC. Even so, a number of changes and proposed new types were described. The latter was based on an analysis of quadrat data collected in the Sand Dune Vegetation Surveys of Great Britain and Scotland. Overall some 36 new NVC types were proposed. Each new type was described and a floristic table given as supporting evidence. The status of some of these provisional new NVC types has already been partly reviewed and this is discussed in Rodwell *et al.* (1998) and Rodwell (2000).

This is a notable quantity of new NVC variation and it covers many habitats: strandline, mobile dune, semi-fixed dune, fixed calcareous grassland, coarse dune grassland, dune lichen heath, fixed acidic dune grassland, dune slack, dune wet heath, mire, machair fen, wet mesotrophic grassland, swamp and scrub. New types of fixed calcareous and acidic dune grassland contribute substantially to understanding these habitats as complexes responding to moisture, acidity and grazing-controlled successions. Machair fens are emphasised as a major new type of British vegetation, though these were recorded and noted in Sand Dune Vegetation Survey of Great Britain studies. They have strong links to Irish small sedge vegetation.

List and summary descriptions of provisional new NVC types present on Scottish dunes

STRANDLINE

SDx *Potentilla anserina* strandline community

This is a species-poor community found on dry strands with wet ground close to the surface. It occurs widely in western Scotland and with small occurrences in Orkney and Shetland. It prefers sheltered strands and seems restricted to damp upper beach sectors with a water table at or close to the surface. *Potentilla anserina* is constant, whilst *Agrostis stolonifera*, *Ammophila arenaria*, *Elymus farctus* and *Tripleurospermum maritimum* are the most frequent additional species.

SDy *Atriplex prostrata* – *Atriplex glabriuscula* strandline community

This species-poor community occurs mainly on the eastern and south-western coasts of Scotland and is locally extensive in Orkney where it prefers slab shingle beaches and can contain the nationally scarce *Mertensia maritima*. It is widespread in small quantities, especially on shingle, including beaches with thin sand over a shingle substrate, and develops best over seaweed buried by sand. In sheltered situations it can be luxuriant due to high levels of nutrition from rotting material in the root zone. *Atriplex prostrata* is constant and often occurs with *Atriplex glabriuscula*.

SDz *Catabrosa aquatica* strandline community

This uncommon strandline community occurs on saturated sands in south-western Scotland. It mainly occurs on the sides of streams discharging fresh water into the intertidal zone, but can be locally extensive on saturated strands influenced by groundwater. In some locations it covers accumulations of saturated, rotting and stinking seaweed. *Catabrosa aquatica* is the sole species contributing to this type.

SDxx *Leymus arenarius* – *Elymus repens* strandline community

This strandline community is eastern in distribution, with large but highly localised areas on sheltered strandlines, principally in Orkney and the Moray Firth. It is associated with sheltered strandlines receiving regular inputs of organic material (particularly seaweed) where good nutrient supply from rotting debris is responsible for strong plant growth. *Leymus arenarius* and *Elymus repens* are constant species in this community, whilst *Tripleurospermum maritimum*, *Atriplex glabriuscula* and *Sonchus arvensis* are the most frequent associates.

MOBILE DUNE

SD5x *Leymus arenarius* mobile dune, *Bryum algovicum* sub-community

This rare sub-community has been recorded in a few areas in the Moray Firth on steep-sided mobile dunes inland from the foredune edge. It is dominated by *Leymus arenarius* and also has a prominent moss crust in which *Bryum algovicum* is dominant. Few other associates are recorded. This is a relatively stable open type of vegetation that contains little or no *Festuca rubra*. It is very localised and may not warrant recognition as a provisional new NVC type and might represent the equivalent of SD7d vegetation in association with *Leymus arenarius*, in which *Bryum algovicum* replaces *Tortula ruralis* as the main moss in a very open sward.

SD6x *Ammophila arenaria* mobile dune, *Brachythecium albicans* sub-community

This scarce type is largely restricted to the East Coast of Scotland, with small areas of similar vegetation possibly also occurring at Culbin and Lossiemouth in the Moray Firth. It is distinctive in structure, with much bare sand, scattered tufts of *Ammophila arenaria* and *Holcus lanatus*, plus *Senecio jacobaea* and patches of *Brachythecium albicans*. The most frequent additional species are *Cerastium diffusum*, *Epilobium angustifolium*, *Carex arenaria*, *Dicranum scoparium* and *Festuca ovina*. It seems confined to sands which have a low initial acidity, forming close to the shore and with little or no SD7 vegetation inland. *Festuca rubra* is absent and it changes inland to SD12z (a mix of *Ammophila arenaria* and *Festuca ovina*). The nationally scarce *Festuca juncifolia* has been recorded in this sub-community. It is also significant in that it demonstrates that it is possible for an acidic mobile dune type to form and pass into a semi-fixed state without involving the normal foredune succession of SD6e and SD6f, followed by some form of SD7. Its rarity in Britain suggests that sands with a low initial carbonate level are very rare.

SEMI-FIXED DUNE

SD7x *Ammophila arenaria*-*Festuca rubra* semi-fixed dune, *Galium verum* sub-community (including *Heracleum sphondylium* variant)

Some of the variation in the SD7 community in Scotland does not fit the NVC well, and SD7x forms one of two proposed new sub-communities. This type occurs on strongly calcareous dune systems throughout western and northern Scotland, where there is a dominant succession from mobile sand dune to SD7x, sometimes passing through SD7a close to the shore. Lack of sand deposition and grazing then converts SD7x to SD8 *Festuca rubra* – *Galium verum* fixed calcareous dune.

SD7x is abundant and obviously restricted to Scotland. Quadrat evidence suggests that most of the SD7a Typical sub-community, which is distributed widely within south-western and eastern Scotland, is in fact SD7x, which means that this sub-community covers very large areas (a total of 2732ha were recorded) and is one of the most abundant semi-fixed dune vegetation types in Britain. The bulk of its distribution is in the Western Isles, Tiree and Coll, with modest extents present in the Inner Hebrides and north-east Scotland between Fraserburgh Bay and Sands of Forvie. It replaces the SD7c type in western and northern Scotland and is particularly important because it is the source of all machair grasslands in the SD8 community. Indeed, this vegetation type defines well the geographical range of machair and quasi-machair vegetation in Scotland. In some sites this sub-community is very

extensive indeed: in several sites on the western seaboard of Coll it extends as a continuous vegetation type with abundant *Ammophila arenaria* for a kilometre inland.

Floristically, SD7x is species-rich and includes three virtually constant species (*Ammophila arenaria*, *Festuca rubra*, *Galium verum*). Notable amongst the many other associated species are *Lotus corniculatus*, *Plantago lanceolata*, *Poa pratensis*, *Ranunculus acris*, *Trifolium repens*, *Cerastium fontanum*, *Rhytidiadelphus squarrosus*, *Senecio jacobaea* and, on the Northwest Coast, *Avenula pratensis* and *Poa subcaerulea*. There is some floristic variation evident from the Western Isles to Orkney, Shetland, and the Northwest Coast. A distinctive variant with much hogweed *Heracleum sphondylium* occurs mainly in the Western Isles, usually in partly nutrient-rich dune hollows where seaweed is blown over low foredune ridges. A continuum is clearly present in the floristic character of this sub-community, from stages close to mobile dunes with abundant marram grass and bare sand, through to stands which have low *Ammophila arenaria* and a rich herb and forb content in a continuous turf closely resembling SD8 vegetation. It can be rank and species-poor in areas with the *Heracleum sphondylium* variant.

SD7y *Ammophila arenaria*-*Festuca rubra* semi-fixed dune, *Hylocomium splendens* sub-community

The other proposed new SD7 sub-community, which is also restricted to Scotland, is SD7y *Hylocomium splendens* – *Rhytidiadelphus triquetrus* semi-fixed dune. Although present elsewhere in small outliers on the eastern seaboard, this type is best developed in the Moray Firth where it forms part of a dominant succession to SD8 fixed dune.

Quadrat data from the Moray Firth reveal that this sub-community is species-rich and has *Ammophila arenaria*, *Festuca rubra*, *Galium verum*, *Hylocomium splendens*, *Peltigera canina*, *Poa pratensis* and *Rhytidiadelphus triquetrus* as constant or near-constant species. The type also has a very distinct structure, with a very high cover and deep mat of feather mosses. In ungrazed sites, the best examples have almost 100% moss cover dominated by *Hylocomium splendens* or *Rhytidiadelphus squarrosus*, forming a carpet up to 20 cm thick. If left ungrazed the sward is invaded by *Arrhenatherum elatius*, forming another provisional new Moray Firth type (SD9x *Hylocomium splendens* sub-community – see below – which also has a very high feather moss biomass). Grazing converts SD7y to SD8b calcareous fixed dune or to a further feather moss type (SD8y *Hylocomium splendens* – *Rhytidiadelphus triquetrus* provisional sub-community – see below).

FIXED CALCAREOUS DUNE GRASSLAND

SD8x *Festuca rubra*-*Galium verum* grassland, *Centaurea nigra* - *Daucus carota* sub-community

This calcareous dune grassland sub-community is usually ungrazed or very lightly grazed and represents early succession to a rank grassland with close affinities to MG5 *Cynosurus cristatus* – *Centaurea nigra* meadow. It occurs throughout most of the range of SD8 vegetation (but is absent from Shetland), occupying small areas of unused former pasture or ground fenced off as part of development. The largest extent is in the Western Isles (607 ha), with a further large area in the Inner Hebrides (236 ha, mainly on Tiree). Along with *Festuca rubra* and *Galium verum*, *Centaurea nigra* is virtually constant throughout the range of this tall sward. Other prominent herbs and forbs in this distinctive and generally rich vegetation include *Achillea millefolium*, *Anthoxanthum odoratum*, *Carex flacca*, *Centaurea scabiosa*, *Cerastium fontanum*, *Cynosurus cristatus*, *Daucus carota*, *Euphrasia officinalis* agg., *Holcus lanatus*, *H. mollis*, *Plantago lanceolata*, *Poa pratensis*, *P. subcaerulea*, *Ranunculus acris*, *R. repens*, *Rhinanthus minor*, *Rhytidiadelphus squarrosus*, *Trifolium pratense*, *T. repens* and *Vicia cracca*.

SD8y *Festuca rubra* - *Galium verum* grassland, *Hylocomium splendens* - *Rhytidiadelphus triquetrus* sub-community

This relatively scarce sub-community is confined to sites around the Dornoch Firth in the Inner Moray Firth and has a distinctive thick mat of feather mosses (usually with a moss cover >90%) which have a very high biomass. It occurs with SD7, SD9 and SD12 provisional new types with a similar bryophyte structure and, together, these indicate vegetation of a different biogeographical character to other parts of Scotland. It is best developed on land ungrazed by stock but can occur with moderate grazing. In addition to *Hylocomium splendens* and *Rhytidiadelphus triquetrus*, additional Moray Firth constants are *Agrostis capillaris*, *Anthoxanthum odoratum*, *Avenula pratensis*, *A. pubescens*, *Carex flacca*, *Koeleria macrantha* and *Poa subcaerulea*.

SD8z *Festuca rubra*-*Galium verum* grassland, *Thymus praecox* sub-community

This sub-community is found on climbing dunes and shows a preference for shallow soils of variable thickness which often have outcrops of bedrock. It is mainly found in the Western Isles (656 ha) and Inner Hebrides (184 ha) where it occupies much of the interior of its sites on lower ground. It is moderately species-rich and, in addition to *Thymus praecox*, frequently occurring species are *Campanula rotundifolia*, *Ditrichum flexicaule*, *Koeleria macrantha*, *Plantago maritima*, *Polygala vulgaris*, *Primula vulgaris*, *Prunella vulgaris*, *Selaginella selaginoides* and *Succisa pratensis*. It often forms part of a gradation to CG10b vegetation, which occurs on higher ground with steeper slopes, thinner soil and more bedrock outcrop. It also grades into CG13 heath at Durness. Species composition resembles SD8e vegetation but the topographic location is very different and several frequent species in SD8z are rare or absent from the SD8e type.

COARSE DUNE GRASSLAND

SD9x *Ammophila arenaria* - *Arrhenatherum elatius* grassland, *Hylocomium splendens* sub-community

This scarce and restricted sub-community comprises a distinctive type of SD9 dune grassland. It is best-developed and most extensive in the Moray Firth, with small outliers at Dunnet Bay and Barry Links. It has a thick ground layer dominated by feather mosses. Constant species are *Ammophila arenaria*, *Arrhenatherum elatius*, *Festuca rubra* and *Poa pratensis*, with *Carex arenaria*, *Cerastium fontanum triviale*, *Eurhynchium praelongum*, *Galium verum*, *Holcus lanatus*, *Hylocomium splendens*, *Rhytidiadelphus squarrosus*, *Rosa pimpinellifolia*, *Rumex acetosa* and *Veronica chamaedrys* the most frequent associates. The most acidic examples in the Moray Firth have *Pleurozium schreberi* as the dominant bryophyte and *Deschampsia flexuosa*.

DUNE LICHEN HEATH

SD11x *Carex arenaria* - *Cornicularia aculeata* community, *Polytrichum piliferum* - *Cladonia zopfii* sub-community

This sub-community occurs at Cuthill on the Dornoch strandplain, in dry hollows with thin sand lying over shingle and sand/shingle mixes. Well-developed examples have sizeable 'lichen lawns' of the rare montane species *Cladonia zopfii* and *Stereocaulon condensatum*, as well as types largely restricted to dune heath in Britain (*Cladonia uncialis* ssp. *uncialis*, *C. mitis*). Deflation hollows are common at Cuthill varying from small to large features, within which there is a succession mosaic from bare sand and shingle to SD11x and then to H11a dune heath. The type is reliant on large areas of ground that are kept open by winds funnelling east down the Dornoch Firth: stabilisation results in it being replaced by H11a and in turn W23 *Ulex europaeus* scrub. Allied vegetation also occurs in Culbin Forest.

FIXED ACIDIC DUNE GRASSLAND

SD12x *Carex arenaria*-*Festuca ovina*-*Agrostis capillaris* dune grassland, *Hylocomium splendens* sub-community

This acidic dune sub-community is part of the Moray Firth suite of SD7/8/9/12 vegetation with a very prominent feather moss layer, forming a distinctive biogeographical set. Although most of the recorded 495 ha is in the Moray Firth, scattered examples occur along the east coast, particularly at Barry Links, albeit these are generally much less species-rich. *Festuca ovina* and *Agrostis capillaris* form the only constantly occurring species, though *Carex arenaria* is present in most samples and *Galium saxatile* in many. In the Moray Firth, there are many additional constant or near-constant species (*Hylocomium splendens*, *Anthoxanthum odoratum*, *Dicranum scoparium*, *Luzula campestris*, *Plantago lanceolata*, *Poa pratensis*, *Trifolium repens*), and many others occur frequently (notably *Avenula pratensis*, *Danthonia decumbens*, *Holcus lanatus*, *Koeleria macrantha*, *Lotus corniculatus*, *Plantago maritime*, *Rhynchospora squarrosus*, *R. triquetrus*).

SD12y *Carex arenaria* - *Festuca ovina* - *Agrostis capillaris* dune grassland, *Carex arenaria* sub-community

This proposed acidic dune sub-community is easily recognised as species-poor vegetation dominated by tall, dense *Carex arenaria* with much lower cover of *Festuca ovina* (which is occasionally absent) and *Agrostis capillaris*. The most frequent associates are *Cerastium fontanum* *triviale*, *Galium saxatile*, *Holcus lanatus*, *Luzula campestris*, *Poa pratensis* and *Rhynchospora squarrosus*. It occurs in locally large quantities on the east coast seaboard south of Cairnbulg Point, with small additional quantities in the Moray Firth and Dunnet Bay. Unlike SD10 vegetation, it is never associated with mobile dune conditions, but appears to be strongly associated with former areas of intensive rabbit burrowing and scraping, which it appears to invade following a crash in local rabbit numbers.

SD12z *Carex arenaria* - *Festuca ovina* - *Agrostis capillaris* dune grassland, *Ammophila arenaria* sub-community

This sub-community is a form of acidic semi-fixed dune. It is locally abundant in the Moray Firth and occurs elsewhere on the eastern seaboard and south-western Scotland. Marram grass *Ammophila arenaria* is constant, often with high cover, along with *Carex arenaria* and *Festuca ovina*. All quadrat samples from the Moray Firth include *Agrostis capillaris*, *Anthoxanthum odoratum*, *Campanula rotundifolia*, *Danthonia decumbens*, *Galium saxatile*, *Hylocomium splendens*, *Luzula campestris* and *Pleurozium schreberi*, and most contain *Deschampsia flexuosa*. In contrast, there are no constants in other East Coast samples and most contain *Dicranum scoparium*, *Festuca rubra* and *Holcus lanatus*. This vegetation marks ground which has been re-worked in the past by wind and there is usually irregularly hummocky relief present. Most occurrences in the Moray Firth are not currently associated with mobile sand and are quite stable, but sand-blow close to SD12z is a feature of several other east coast locations.

SD12xx *Carex arenaria* - *Festuca ovina* - *Agrostis capillaris* dune grassland, *Racomitrium canescens* sub-community

This is a rare sub-community that occupies small areas of deflating sand scattered down both the west and east coasts of Scotland. Bare sand is common, with a high cover of the moss *Racomitrium canescens*. This vegetation is a direct acidic analogue of SD7d and SD8c vegetation with *Tortula ruralis* ssp. *ruraliformis*, with *Aira praecox* usually present and occasional *Ammophila arenaria* and *Polytrichum piliferum*. It is closely related to the SD12xz *Corynephorus canescens* sub-community, which only occurs in a single site in Scotland (see below), and can occur in mosaics with SD11 dune lichen heath, particularly the provisional SD11x sub-community in the Moray Firth.

SD12xy *Carex arenaria*-*Festuca ovina*-*Agrostis capillaris* dune grassland, *Deschampsia flexuosa* sub-community

This sub-community is rather localised on the east coast, occurring in the inner Moray Firth and a few sites on the eastern seaboard. It is characteristic of the most acidic soils in the SD12 series. *Galium saxatile* is constant in samples throughout the range, whilst *Carex*

arenaria is present in most. In the Moray Firth, there are many additional constant species (*Achillea millefolium*, *Agrostis capillaris*, *Anthoxanthum odoratum*, *Cerastium fontanum* *triviale*, *Deschampsia flexuosa*, *Festuca ovina*, *Hylocomium splendens*, *Poa pratensis*, *Rhynchospora squarrosus*), whereas on the East Coast only *Ammophila arenaria* and *Pleurozium schreberi* occur constantly. The abundance of *Deschampsia flexuosa* shows resembles to U2 grassland, whilst Moray Firth quadrats also contain much *Hylocomium splendens* and *Ammophila arenaria* (linking it with SD12x and SD12z) and occasional *Calluna vulgaris* (showing hints of H11 dune heath). Without grazing, variants of this type in the Moray Firth with *Ammophila arenaria* can be invaded by *Arrhenatherum elatius* to form very acidic variants of SD9x vegetation.

SD12xz *Carex arenaria* - *Festuca ovina* - *Agrostis capillaris* dune grassland, *Corynephorus canescens* sub-community

This sub-community is confined to one small sector of deflating semi-fixed dune and dune heath at Camusdarach on the Arisaig coast of the western seaboard. It is defined by the presence of *Corynephorus canescens*, a nationally rare grass in Britain that is not considered native to Scotland. Given it includes high constancy and some high cover values for *Racomitrium canescens*, it is recommended that it would be best to amalgamate this type with SD12xx vegetation.

SD12yy *Carex arenaria* - *Festuca ovina* - *Agrostis capillaris* dune grassland, *Cladonia rangiformis* - *C. portentosa* sub-community

This acidic dune sub-community is present in modest quantities in the Moray Firth and a few parts of the eastern seaboard. All samples contain *Cladonia rangiformis*, *Festuca ovina* and *Pleurozium schreberi*, usually along with *Cladonia portentosa*, *Deschampsia flexuosa* and *Teucrium scorodonia*, and frequently *Agrostis capillaris*, *Anthoxanthum odoratum*, *Carex arenaria*, *Dicranum scoparium* and *Rhynchospora triquetrus*. This vegetation has a high cover of lichens, but lacks *Cornicularia aculeata* the diagnostic lichen species for SD11 dune lichen heath. It seems to represent a very grassy sward, perhaps less acidic than SD11 conditions, which develops in areas with high rabbit grazing. The turf has a very grey appearance and may also resemble the 'grey' dunes which were once widespread on many rabbit-grazed British dunes prior to myxomatosis in the 1950s.

DUNE SLACK

SD15x *Salix repens* - *Calliergon cuspidatum* dune slack, provisional *Erica tetralix* sub-community

This provisional new dune slack sub-community is restricted to 26 ha at Morrich More in the Moray Firth. It marks ground where the slack is gradually changing into acid wet heath. Like M16x vegetation, this type has high cover and constancy for *Hylocomium splendens*, suggesting links to other Boreal dune vegetation types in the inner Moray Firth. *Erica tetralix* is constant with high cover and *Carex nigra* is present in moderate quantity in most stands, showing links to SD15a vegetation. *Juniperus communis communis* is also constant, occurring always in a prostrate form, and is usually accompanied by *Juncus balticus*, *Pinguicula vulgaris*, *Prunella vulgaris*, *Schoenus nigricans*, *Succisa pratensis* and *Trifolium repens*. This latter suite of species suggests links between this vegetation type and the provisional Mxbd rich fen.

SD17x *Potentilla anserina*-*Carex nigra* dune slack, *Agrostis stolonifera* sub-community

This second provisional dune slack sub-community represents an early stage of slack development (protoslack conditions). It is recorded in a few locations in the Western Isles and on the East Coast of Scotland, where it marks the early stages of SD17 slack development in wet deflation hollows. These areas are often small and irregular in form, with patchy vegetation development. The flora typically consists of dominant *Agrostis stolonifera*, characteristically in near-circular colonies, with variable amounts of *Potentilla anserina* and *Calliergon cuspidatum*. In the Western Isles, *Carex arenaria*, *Hydrocotyle vulgaris*, *Juncus*

articulates, *Ophioglossum vulgatum*, *Ranunculus repens* and *Trifolium repens* are common associates, whereas in on the East Coast the most frequent associated species are *Holcus lanatus*, *Parnassia palustris*, *Phragmites australis* and *Rumex crispus*. There are similarities to MG11 vegetation, but it is never associated with areas of former tillage and often occurs close to larger extents of other SD17 vegetation.

DUNE WET HEATH

M16x *Erica tetralix* - *Sphagnum compactum* wet heath, Species-poor sub-community
This species-poor dune wet heath sub-community occurs across 377 ha at sites in the Moray Firth and on East Coast and Orkney. Wet heath on blown sands is scattered in Scotland, with concentrations in the Moray Firth, Orkney, north-east Scotland and the southern Inner Hebrides. The necessary acidic soils for this habitat occur mainly on the edges of acidic SD15 and SD16 slacks or on damp ground within areas dominated by H11 dune heath. Precise placement of wet heath quadrat data within the NVC is difficult, as stands are often species-poor and some species typical of wet heath elsewhere are much reduced in frequency in a dune environment: very often only *Erica tetralix* is prominent in otherwise dry heath or a slack. This problem is particularly acute for the M16 community, which accounts for most Scottish dune wet heath, as *Sphagnum compactum* is very rare on dunes and other *Sphagnum* species are uncommon. Most dune wet heath M16 vegetation is in fact assigned to the M16x Species-poor sub-community, which evidently reflects the character of such vegetation under dune conditions.

The M16x sub-community shows significant regional variation with only *Erica tetralix* and *Calluna vulgaris* recorded as constant or near-constant across its range. Additional species usually present in Orkney are *Empetrum nigrum nigrum*, *Eriophorum angustifolium*, *Hypnum jutlandicum*, *Juncus squarrosus* and *Potentilla erecta*, whereas in the Moray Firth these change to *Carex nigra*, *Hylocomium splendens*, *Pleurozium schreberi* and *Potentilla erecta*, and on the East Coast to *Carex arenaria*, *Nardus stricta*, *Pleurozium schreberi* and *Salix repens*. An interesting early successional variant recorded at Sands of Doomy, Orkney, on an acidic deflation plain with relief patterns very similar to machair, mostly comprises *Agrostis stolonifera*, *Aneura pinguis*, *Bryum* sp. (including *Bryum pseudotriquetrum*), *Calluna vulgaris*, *Empetrum nigrum nigrum*, *Erica tetralix*, *Holcus lanatus* and *Juncus squarrosus*.

MIRE

M28x *Iris pseudacorus* - *Filipendula ulmaria* mire, *Poa trivialis* sub-community

This proposed mire sub-community is widespread in western and northern Scotland and accounts for most M28 occurrences on dunes in the Inner Hebrides and Western Isles and on Orkney and Shetland. It is characterised by monodominant *Iris pseudacorus*, with *Poa trivialis* virtually a constant associate, and usually no *Filipendula ulmaria*, which is removed either by grazing or prevented from developing in new stands on freshly excavated ditch material. In the Western Isles *Agrostis stolonifera* is constantly present and *Ranunculus repens* very frequent, whilst on Orkney *Phalaris arundinacea* forms a constant associate. Despite being species-poor, this vegetation is it is a striking structural contrast to short-grazed grassland and attractive when *Iris* is in flower.

MACHAIR FEN

Mx *Carex nigra* provisional new rich fen types

Areas of *Carex nigra* rich machair marsh occurring on the inner edge of Scottish dune systems are both extensive (total extent 1233 ha) and poorly-covered in the existing NVC accounts. This kind of vegetation is particularly extensive in the Western Isles, especially on South Uist, and the Inner Hebrides, especially on Tiree. It is mostly restricted to larger sites with wet machair deflation plains as most small sites lack the very wet and poorly drained conditions necessary for this type. The sward is often tall, with bright, colourful herbs such as *Lychnis flos-cuculi* making it a distinctive element of the wetter machair environment. The habitat is characterised by the constant presence of *Carex nigra* and only sporadic

occurrences of *Potentilla anserina*, showing links with the SD17 *Potentilla anserina* - *Carex nigra* dune slack community but also a character which probably deserves recognition as one or more new NVC types at community or sub-community level. It forms mosaic complexes on machair deflation plains and has a very large number of intermediates showing continuous variation with MG11, SD8, and swamp vegetation types. It occupies wetter and lower ground than SD17 vegetation when the two are present in the same area and there are many fine gradations between SD8e, MG11, SD17, Mx and swamp types.

Mxbd *Carex nigra* - *Prunella vulgaris* - *Molinia caerulea* machair fen

This proposed new mire type is remarkably diverse and accounts for about half of the recorded Mx fen vegetation. It is mostly recorded in the Western Isles, with small areas on Orkney, the Inner Hebrides and Moray Firth. Mxbd accounts for the most acidic occurrences of machair rich fen, in which *Carex nigra*, *Prunella vulgaris*, *Molinia caerulea* and *Holcus lanatus* are the major constant species. Stands with *Prunella vulgaris* relate closely to SD8e fixed damp dune grassland, others with *Carex flacca* are similar to SD17b dune slack vegetation. Two closely related forms were mapped: an Mxbd type; and an Mxd type in which *Prunella vulgaris* was generally absent and *Molinia caerulea* was the major constant species in addition to *Carex nigra*. These are the driest forms of Mx rich fen and have the best drainage, allowing some surface leaching to occur, explaining the localised occurrence of calcifuge species, e.g. *Danthonia decumbens*, *Succisa pratensis* and *Nardus stricta*. Bare sand is characteristic in small quantities and the very open nature of this vegetation allows species typical of flushes to occur, e.g. *Selaginella selaginoides*, *Anagallis tenella* and *Pinguicula vulgaris*. There is some regional floristic variation, with the most frequent additional associates being *Danthonia decumbens*, *Juncus balticus*, *Plantago maritime*, *Selaginella selaginoides* and *Succisa pratensis* in the Western Isles; *Calliargon cuspidatum*, *Hydrocotyle vulgaris*, *Juncus articulatus*, *Lychnis flos cuculi* and *Ranunculus acris* in the Inner Hebrides; and *Calliargon cuspidatum*, *Festuca rubra*, *Lychnis flos cuculi* and *Ranunculus flammula* on Orkney.

MxCd *Carex nigra* - *Carex diandra* machair fen

This is the rarest of the proposed Mx fen types. It is confined to South Uist, Balranald and Callernish, where it occupies very wet ground that can be treacherous. In most locations it is fenced to deter stock. *Caltha palustris* and *Menyanthes trifoliata* are constant. *Carex nigra* is common, but not constant, and usually has low cover. Bryophytes characteristic of very wet ground which rarely dries are present (*Calliargon cordifolium*, *C. giganteum* and *Scorpidium scorpioides*) and tall *Angelica sylvestris* is a very striking feature of some stands. Areas that have been poached by stock grazing often have scattered *Utricularia minor* in wet depressions between low sedge tussocks. It is closely related to MxMt vegetation, and several intermediate small patches of an MxCd/SxTHF *Phragmites australis* tall-herb fen have been mapped, with much *Phragmites australis*: it is possible that this type represents the upper edge of extensive *Phragmites australis* reedswamp and tall-herb fen which have now largely been lost from dune and machair loch environments due to drainage, stock grazing and occasional tillage.

MxMt *Carex nigra* - *Menyanthes trifoliata* machair fen

This proposed Mx *Carex nigra* fen type is virtually restricted to Tiree. It represents the wettest Mx fen conditions, often occurring on treacherous ground which is sometimes fenced to exclude livestock. In addition to *Menyanthes trifoliata*, several other species have their highest Mx constancy in this type: *Agrostis stolonifera*, *Carex lepidocarpa*, *Epilobium obscurum*, *Equisetum fluviatile* and *Eriophorum angustifolium*.

MxPp *Carex nigra* - *Potentilla palustris* machair fen

This is another scarce Mx fen type, although it is probably more widespread beyond the blown sand limit of the Scottish Sand Dune Survey. Small-scale occurrences are recorded in the Inner Hebrides, Shetland, Orkney and the Moray Firth, but the majority occurs in the

Western Isles. It is the most acidic in preference of the proposed Mx types, often being found along the inner edge of dunes in transitions to acidic peats. Quadrat data from the Inner Hebrides and Orkney show it to be characterised by constant and often high cover of *Potentilla palustris* and *Carex nigra*, along with various other typical associates, including *Calliargon cuspidatum*, *Caltha palustris*, *Eriophorum angustifolium*, *Hydrocotyle vulgaris*, *Ranunculus flammula* and, in Orkney samples, *Agrostis stolonifera*, *Galium palustre*, *Holcus lanatus*, *Lychnis flos-cuculi* and *Ranunculus repens*.

MxTm *Carex nigra* - *Triglochin maritima* machair fen

This provisional species-rich fen type is widespread and extensive in the Western Isles and is also present in Shetland, Orkney, Caithness and the Inner Hebrides. It occupies lower and wetter ground than the Mxbd fen type and is often strongly poached by grazing livestock. The resultant microtopography, together with dunging, creates great variation in soil wetness and thermal microclimate. Across the geographic range of this type, *Carex nigra* is recorded as a constant species and generally widespread frequent associates are *Agrostis stolonifera*, *Calliargon cuspidatum*, *Hydrocotyle vulgaris*, *Lychnis flos-cuculi*, *Ranunculus flammula* and *Triglochin maritima*. Other regionally important associates are *Caltha palustris*, *Cardamine pratensis*, *Carex flacca*, *Epilobium palustre*, *Eriophorum angustifolium*, *Festuca rubra*, *Holcus lanatus*, *Juncus articulatus*, *Mentha aquatica*, *Prunella vulgaris*, *Ranunculus acris*, *Succisa pratensis* and *Trifolium repens*. *Triglochin maritima* appears to be the best differential species for this type and is common, though usually only with low cover. Apart from *Plantago maritima* it is the only species more typical of saltmarsh environments, but its presence here is probably due to the wet ground and frequent trampling which create suitable bare patches. Overall this type shows floristic links with SD8e, SD17b, SD17c and Mxbd vegetation, but only the published SD17 NVC community comes close and this occurs at higher levels in the dune landscape.

WET MESOTROPHIC GRASSLAND

MG13x *Agrostis stolonifera* - *Alopecurus geniculatus* inundation grassland, *Rorippa islandica* sub-community

This is a very scarce proposed sub-community, which accounts for small areas on Orkney with MG13 vegetation that contain the Red Data Book species *Rorippa islandica*. These areas are subject to lengthy winter flooding but dry summer conditions. *Alopecurus geniculatus* only has low constancy and *Juncus bufonius* and *Potentilla anserina* are also characteristic with *Agrostis stolonifera* and *Rorippa islandica*.

SWAMP

S19x *Eleocharis palustris* swamp, *Berula erecta* sub-community

This provisional sub-community forms a distinctive and locally abundant type of S19 *Eleocharis palustris* swamp in The Reef of West Tiree. In addition to constant *Eleocharis palustris* and *Mentha aquatica*, *Berula erecta* is both constant and abundant.

S19y *Eleocharis palustris* swamp, *Triglochin maritima* sub-community

This provisional new sub-community is found only on the Morrigh More where it occurs in a large number of shallow, wetter depressions within young dune slack recently developed from saltmarsh. Conditions are more waterlogged than those characteristic of the SM16/SD15a intermediate, which occurs elsewhere in transitions from saltmarsh to slack. This species-poor form of S19 has only *Eleocharis palustris* and *Triglochin maritima*, plus an algal mat covering the ground surface. Over time and with flooding to produce larger areas of standing water, this type is likely to develop into S19b vegetation.

SHv *Hippuris vulgaris* swamp

This proposed rare swamp type occurs in small patches in shallow open water close to machair fens. Most stands are in South Uist, with a few additional cases in Paible and Balranald, and on Tiree. Together with *Eleocharis palustris*, *Hippuris vulgaris* is constant,

whilst *Agrostis stolonifera*, *Galium palustre* and *Myosotis secunda* are common associates. Quadrat records suggest similarities with the S19c sub-community, except for the distinctive presence of *Hippuris vulgaris*.

SxTHF *Phragmites australis* - *Calliergon cordifolium* tall-herb fen

This new tall-herb fen community is locally abundant in machair areas, mainly in the Western Isles in South Uist, but with fragmentary stands elsewhere, including on Orkney. *Phragmites australis* is constant, together with *Mentha aquatica*, *Caltha palustris*, *Galium palustre* and *Hydrocotyle vulgaris*. The best stands have a continuous floor cover of wetland bryophytes, usually dominated by *Calliergon cordifolium*. Stands which have been grazed or cultivated in the past lack this cover and restrict the constancy of *C. cordifolium*. Many tall herbs are present, including in some locations abundant *Angelica sylvestris*, *Iris pseudacorus* and tall *Equisetum fluviatile*. It is likely that drainage, cultivation and grazing have greatly reduced the extent of this type, which might have been very widespread on the drier margins of machair lochs prior to human settlement. It is probably replaced by Mx machair fen if livestock are removed. Although structurally similar to the rare S24 *Phragmites australis* - *Peucedanum palustre* tall-herb fen of southern England, floristically it probably represents new variation of NVC community status.

SCRUB

W23x *Ulex europaeus* - *Rubus fruticosus* agg. scrub, *Cytisus scoparius* sub-community

This provisional new scrub type occurs consistently along the southern coast of the Moray Firth and is also present in small quantity on the western shoreline. It generally comprises stands with *Ulex europaeus*, *Cytisus scoparius*, *Rubus fruticosus* and *Teucrium scorodonia*. In a few locations, *C. scoparius* can be the first scrub invader of dune grasslands.

Wx *Juniperus communis communis* dune scrub

One of the most important Scottish dune scrub types is the provisional Wx *Juniperus communis communis* type. This is restricted to the Moray Firth, where juniper grows in a great range in height and growth forms, ranging from 3m tall individuals on dry grassland to prostrate bushes within slack, mire and wet heath habitats. This proposed new community is focused on tall juniper stands, since these provide a striking structural contrast to other vegetation types within which juniper is found (e.g. SD15x, M16x and M25 vegetation).

Wx vegetation is species rich. In addition to *Juniperus communis communis*, constant species are *Agrostis capillaries*, *Anthoxanthum odoratum*, *Festuca ovina*, *Hylocomium splendens*, *Luzula campestris*, *Rhynchospora squarrosus*, *R. triquetrus* and *Trifolium repens*. Additional frequently occurring plants are *Festuca rubra*, *Galium saxatile*, *G. verum*, *Hieracium pilosella*, *Koeleria macrantha*, *Lotus corniculatus*, *Peltigera canina*, *Plantago lanceolata* and *Thymus praecox*. Four possible variants of the type are set out.

Good examples are widespread at Morrich More, where tall juniper occurs in scattered to dense clumps within SD12x acidic dune grassland, making a striking contribution to the dune landscape. The strong association with SD12x and other types with a high cover of the moss *Hylocomium splendens*, suggest this scrub is part of the Boreal suite of vegetation types that characterise much of the vegetation in the inner Moray Firth. Such scrub probably represents relict populations from a former larger expanse, which has been reduced by grazing, burning and wood collection over a considerable time.

Annex 3 – Proposed additions and revisions by Cooper and MacKintosh (1996) based on unimproved lowland grassland NVC surveys in Scotland

Cooper, EA and MacKintosh, J (1996) *NVC review of Scottish grassland surveys*. SNH Review, No. 65.

Available via: <http://www.snh.org.uk/pdfs/publications/review/065.pdf>

Cooper and MacKintosh (1996) reviewed NVC data from surveys of Scottish unimproved lowland grasslands undertaken from 1980 to 2000. The data was used to create Scottish Natural Heritage's Lowland Grassland Database, which contains details of all lowland grassland sites recorded by the grassland surveys. Several new types of variation amongst Scottish grassland were described, as given below. The view of Rodwell et al (2000) on these is given afterwards.

Provisional *Festuca rubra*-*Holcus lanatus* grassland type

Among the Scottish grassland surveys, vegetation of this kind is most frequent in Lochaber, the Uists and Skye, but also occurs around the coastal parts of Fife and on a few sites in Central Region. Species-poor rank grassland of this kind is most extensive along the western coastal parts of Scotland on neglected agricultural land, sheltered from the most extreme maritime influences but still influenced by the oceanic climate. Similar vegetation has been recorded from neglected agricultural land along the coast of Northern Ireland (Cooper *et al*, 1992), from the inland portions of stable dune and machair systems in western Britain (Crawford 1987–91) and from Orkney (*pers comm*). Previous workers have described vegetation of this kind rather unsatisfactorily under a range of NVC sub-communities, most commonly as species-poor forms of either *Centaurea-Cynosurus* grassland, MG5 or *Lolium-Cynosurus* grassland, MG6.

Provisional *Carex nigra*-*Agrostis stolonifera* type and subtypes

Among the Scottish grassland surveys this vegetation is most frequently and extensively encountered in the western parts of Scotland and is especially widespread in the Western Isles, with, less commonly, stands scattered in Ayrshire, Dumfries & Galloway and Central Region. The wet grasslands included here are usually characterised by mixtures of *Carex nigra* and grasses with frequent *Caltha palustris*, variously joined by *Juncus articulatus* or *Carex panicea*. Vegetation of this kind has been described from elsewhere in Britain and Ireland. From the survey descriptions, it is possible to recognise the following sub-types:

Carex panicea-*Filipendula ulmaria* sub-type

In these stands, *Carex panicea* is a strongly preferential constant with a wide range of tall herbs as frequent preferential associates including *Angelica sylvestris*, *Cirsium palustre*, *Lotus uliginosus*, *Filipendula ulmaria* and more occasionally *Juncus conglomeratus*, *Juncus acutiflorus*, *Valeriana officinalis*, *Galium uliginosum* and *Lathyrus pratensis*.

Juncus articulatus-*Trifolium repens* sub-type

In these stands, the constant *Caltha palustris* is more abundant. *Juncus articulatus* and *Trifolium repens* are preferential constants, with *Ranunculus repens* also constant and more abundant than in the other types.

Carex nigra-*Juncus articulatus* sub-type

These stands are co-dominated by *Carex nigra* and *Juncus articulatus* with an undercarpet of *Calliargon cuspidatum* and frequently associated *Agrostis stolonifera* and *Ranunculus repens* but little else.

Provisional AK *Aira praecox*-*Koeleria macrantha* therophyte type

Largely recorded from the Borders (report No.16), this kind of vegetation is rare and local, found on shallow skeletal soils where there is underlying basic igneous rocks or Silurian sediments, with a base-rich influence, usually on a south-facing slopes of rocky knolls and escarpments. Vegetation of this kind is an inland equivalent of the *Armeria-Cerastium* maritime therophyte community, MC5, and is likely to be locally widespread throughout Britain.

M25b *Molinia caerulea*-*Potentilla erecta* mire, *Anthoxanthum odoratum* sub-community, Provisional *Nardus stricta*-*Carex panicea* type (VARIANTS?)

M25b' Provisional *Nardus stricta*-*Carex panicea* type

Several surveys, in particular Central, Borders, Fife and Ayrshire, commonly describe this *Nardus-Carex* type of the *Anthoxanthum odoratum* sub-community of the *Molinia-Potentilla* mire, M25b'. This kind of vegetation seems to occur most commonly on shallow slopes, often close by to stands of the *Carex panicea*-*Viola riviniana* sub-community of the *Nardus-Galium* grassland, U5c. Vegetation of this kind is likely to be more widespread but unrecognised.

M25b'' Provisional *Carex hostiana*-*Briza media* type

There are a few surveys notably in Central, Ayrshire, Fife and Borders which very rarely refer to this new provisional *Carex-Briza* type of the *Anthoxanthum odoratum* sub-community of the *Molinia-Potentilla* mire, M25b''. Vegetation of this kind tends to occur on the lower portions of flushed slopes, where there is some base-influence among the flushing waters. This kind of vegetation has come to be known by some surveyors as part of the complex of vegetation types known as Rhos pasture, particularly following an internal report to SNH of a field visit by CCW. There is accumulating data for vegetation of this kind, from Wales (CCW, Blackstock, T. & Stephens, D., *pers comm*), from Malham (Cooper, 1993), from the New Forest Lawns (Porley, R., English Nature, *pers comm*) and Devon/Cornwall Culm grasslands (Porley, R., *pers comm*). In fact, Burnett (1964) describes very similar vegetation to this as a *Molinia-Festuca-Agrostis* type of McVean and Ratcliffe's species-rich Nardetum sub-alpinum (see pp192, 219).

M27a *Filipendula ulmaria*-*Angelica sylvestris* mire, *Valeriana officinalis*-*Rumex acetosa* sub-community, Provisional *Geranium sylvaticum* type (VARIANT?)

M27a' Provisional *Geranium sylvaticum* type

Several of the surveys describe river margin tall-herb vegetation co-dominated by *Geranium sylvaticum* and *Filipendula ulmaria* with a scattering of other distinctly northern tall herbs such as *Cirsium helenoides* and *Trollius europaeus*, along with *Conopodium majus*, *Lathyrus pratensis*, *Juncus acutiflorus* and a few other sparsely scattered dicotyledons. Stands of this kind lack virtually all grasses, except perhaps the odd bit of *Holcus* species and therefore cannot be considered as *Anthoxanthum-Geranium* grassland, MG3. It is quite simply not a grassland at all, but instead a tall-herb community best described as a new northern *Geranium sylvaticum* type of the *Filipendula-Angelica* mire, M27a'. Where *Luzula sylvatica* rises to prominence and *Filipendula ulmaria* is of low frequency or absent such vegetation approaches the *Luzula sylvatica*-*Geum rivale* tall-herb community, U17.

U17c *Luzula sylvatica*-*Geum rivale* tall-herb community, *Agrostis capillaris*-*Rhynchospora alba* sub-community, Provisional *Geranium sylvaticum* type (VARIANT?)

U17c' Provisional *Geranium sylvaticum* type

Vegetation of this kind is rare among the Scottish grassland surveys, and confined to the shingle river margins of Tayside and Deeside. It is a distinctive mixture of Northern Montane dicotyledonous associates with *Luzula sylvatica* in the absence of grasses. Although the descriptions from the Deeside and Tayside surveys include many of the species prominent

among the *Geranium sylvaticum* sub-community, U17b, stands always lack the community constant *Rhodiola rosea* and the frequent U17b sub-community preferentials *Polystichum lonchitis*, *Thalictrum alpinum*, *Saussurea alpina*, *Oxyria digyna*, *Silene acaulis* and *Saxifraga oppositifolia*. It is felt, therefore, most appropriate to describe this kind of vegetation as a tall-herb-rich form of the more lowland and grassy *Agrostis capillaris*-*Rhytidadelphus loreus* sub-community, provisionally named a *Geranium sylvaticum* type, U17c'. The absence of grasses in the survey data is due to the lack of grazing. This leaves the distribution of the highly rated *Geranium sylvaticum* sub-community, U17b, confined to inaccessible mountain ledges. Only with reasonable data can a fuller interpretation of the relationship between these two sub-communities be made.

View on above types taken by Rodwell et al (2000)

The review of the NVC undertaken by Rodwell et al (2000) considered the provisional *Festuca rubra*-*Holcus lanatus* grassland to be new variation at plant community level (within the mesotrophic grasslands) and renamed it *Festuca rubra*-*Holcus lanatus*-*Anthoxanthum odoratum* grassland. The provisional *Carex nigra*-*Agrostis stolonifera* community was also considered to be new variation at plant community level within mesotrophic grasslands and renamed it *Carex nigra*-*Agrostis stolonifera*-*Senecio aquaticus* grassland. The provisional *Aira praecox*-*Koeleria macrantha* community was considered to be a likely sub-community of CG7, *Festuca ovina*-*Hieracium pilosella*-*Thymus praecox/pulegioides* grassland.

Annex 4 – Proposed additions and revisions by Jones (2008) based on peatland NVC surveys in Wales

Unpublished document prepared by Dr Peter Jones, CCW Phase II Survey Team, Terrestrial Science Group, 8 July 2008

Provisional table of additional NVC types recognised and mapped on Welsh peatlands that are not currently covered in the NVC scheme. All units have been recognised from multiple sites. This has not had the benefit of discussion with our survey team who would probably have changes to suggest or additions to make.

* = additional communities (n = 4), i.e. syntaxa of sufficient rank to be recognised as new ('first order') communities

** = additional sub-communities (n = 9), i.e. syntaxa that could usefully be recognised as sub-communities of existing but expanded units

*** = additional variants recognised (n = 1)

Community, sub-community or variant name / code	Name	NVC affinity/synoptic notes	Geographic range in Wales	Availability of quadrat records	Derivation/source; ownership
Nodum 19* 3 sub-comm's, labelled a-c**	Vaccinium oxycoccus – Sphagnum recurvum nodum	Closest to Erico-Sphagnion vegetation. Covers vegetation similar to M17/18 and thus including ericoids and <i>Eriophorum vaginatum</i> , but with oligotrophic Sphagna (e.g. <i>S. papillosum</i> , <i>S. capillifolium</i>) absent or uncommon. 3 sub-com's identified: N19a is close or even referable to transition mire and quaking bog and includes various poor-fen markers. N19c has affinities with M17c.	Northern and western. Has been found at many sites.	Numerous Q records	Nodum recognised by Ratcliffe (1983) and subsequently re-assessed and found to be valid (aided by multivariate analysis) by Turner (2006); CCW – Peatland Survey
M25 Ev var***	M25 <i>Eriophorum vaginatum</i> variant	Very species-poor vegetation – ericoids and oligotrophic Sphagna largely absent. Basically just <i>Molinia</i> with frequent <i>Eriophorum vaginatum</i> .	North and west	>10	Turner (2006) and Peatland Survey Team; CCW Peatland Survey
M15 s.v.*	M15 'swampy variant'	Close to M15, but generally lacks <i>Scirpus</i> and instead contains poor fen markers such as <i>Sphagnum palustre</i> , <i>Menyanthes</i> , <i>Potentilla palustris</i> , <i>Carex</i> and sometimes <i>Equisetum fluviatile</i> . Lacks <i>Eriophorum vaginatum</i> . Ericoid abundance (chiefly <i>Erica tetralix</i>) rules out M4, M5 – i.e. core poor-fen communities. We regard this as partly or possibly wholly a community of the Annex I type transition mire and quaking bog. Often occurs in topogenous situations, and may mark the transition to ombrotrophy.	North-west	Numerous	Peatland Survey Team and Turner (2006); CCW Peatland Survey
Species-rich <i>Carex rostrata</i> mire**	Species-rich <i>Carex rostrata</i> mire	Effectively a species-rich form of M4, with <i>Carex rostrata</i> but too many forbs for M4 (>15 spp per 2x2 m quadrat compared with a mean of 10 for the published NVC	Widespread	Numerous	Peatland Survey Team and Bosanquet (2007); CCW Peatland Survey

Community, sub-community or variant name / code	Name	NVC affinity/synoptic notes	Geographic range in Wales	Availability of quadrat records	Derivation/source; ownership
		population). When checked, the <i>Sphagnum</i> has almost always proved to be the base-tolerant <i>S. flexuosum</i> . At a few sites, <i>S. fimbriatum</i> is the principal <i>Sphagnum</i> in this vegetation type: this species should not be used as an M5 marker. Could be regarded as a species-rich sub-community of M4. We regard this as a community of the Annex I type transition mire and quaking bog.			
M6c E.v**	M6c 'Eriophorum vaginatum variant'	Very widespread and sometimes occupying large areas. <i>Juncus effusus</i> is the dominant species in this variant, as in typical forms of the sub-community, but <i>E. vaginatum</i> and <i>Deschampsia flexuosa</i> are frequent throughout. <i>Sphagnum fallax</i> and <i>Polytrichum commune</i> generally dominate the bryophyte layer, although there are sometimes mounds of <i>Aulacomnium palustre</i> and <i>Pleurozium schreberi</i> , indicating affinities to 'Nodum 19'.	Widespread	>10	Turner (2006), Bosanquet (2007); CCW Peatland Survey
C.M* Possibly two sub-communities based partly on species-richness.	Cladio-Molinietum	Vegetation with abundant <i>Cladium</i> , but with a range of taxa not associated with the existing S2 community, including <i>Molinia caerulea</i> , <i>Juncus subnodulosus</i> and <i>Myrica gale</i> and sometimes a blend of other ericoids and Caricion davallianae elements. Confined to drier and possibly somewhat base de-saturated peats than classic S2 swamp, with sub-surface water tables in the summer. In some contexts, this community appears to be a product of partial drainage and burning. We consider this unit an important part of the Calcareous fens Annex I type.	Confined to Anglesey and Lleyn – possibly also in Pembrokeshire.	Numerous	Wheeler (1980a) [the omission of this community from the NVC was most unfortunate – we regard it as a legitimate and very useful syntaxon]; CCW Peatland Survey
M22 sv**	M22 swampy variant	Vegetation quite distinct from existing M22 sub-communities, with dominant <i>Juncus subnodulosus</i> together with <i>Menyanthes trifoliata</i> and sometimes <i>Carex rostrata</i> and <i>C. lasiocarpa</i> . Distinct from M9, this appears to be a sub-community of very wet topogenous situations.	Anglesey	>10	Yeo (1989) and Peatland Survey Team; CCW Peatland Survey
NF*	Neutral flush	Flush vegetation with elements of both base-poor (M6) and base-rich (M10) and with a characteristic bryophyte assemblage which includes <i>Sphagnum inundatum</i> , <i>S. subnitens</i> and <i>S. teres</i> .	Present at 58 sites in the west of Wales, from Carmar to Gwynedd.	Numerous	Stevens et al (2008 in prep); CCW Grassland Survey of Wales and CCW Peatland Survey

Further comments

Recognition of the syntaxa identified in the above table has added greatly to our knowledge of the Welsh peatland resource, and we would now find it impossible to adequately describe and evaluate the resource without them. Their recognition has wider and already proven applicability in terms of condition assessment and management planning. The NVC has found to be particularly deficient in the poor/ultra-poor fens (Nodum 19 pp, M15 s.v and species-rich *Carex rostrata* mire), particularly those on the cusp of ombrotrophy, but there are significant omissions across the other community suites identified above. It seems very likely that related vegetation would be present in Scotland and SW and N England.

As well as the **addition** of clearly needed new communities/sub-communities, we feel there is significant scope for the re-analysis of some existing units, aided by new quadrat records. We feel this applies particularly to M2, M5, M9, M21, M30, S27, variants of M17 and M18 with abundant *Sphagnum fallax*, and S24. Placement of Welsh examples into these existing published NVC units can be tricky.

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Annex 5 – Proposed additions and revisions by Wheeler, Shaw and Tanner (2009) based on an assessment of wetland plant communities of England and Wales

Wheeler, B.D., Shaw, S., & Tanner, K. (2009) *A wetland framework for impact assessment at statutory sites in England and Wales*. Environment Agency, Bristol.

Available via: <http://publications.environment-agency.gov.uk/epages/eapublications.storefront/>

Background

The Wetland Framework project (see Wheeler, Shaw and Tanner 2009) was set up as a partnership between the Wetland Research Group at the University of Sheffield, the Environment Agency, English Nature (now Natural England) and Countryside Council for Wales. It was initiated in response to the Environment Agency's need to interpret international conservation objectives whilst carrying out a review of consents for the EC Habitats Directive.

The project largely built on the wetland NVC types included in the mires and heaths and swamps and tall-herb fens volumes of Rodwell (1991b, 1995). It originally focussed on the Anglian Region, but was expanded to include other sites, mainly in the South, South West, West Midlands, Cumbria and Wales. The project combined and reviewed ecological and hydrogeological data sources from about 200 wetland sites, including over 1,500 stand samples. The main distinctive wetland habitats were identified based on an analysis of field data. This detected the recurrence of sets of conditions and species as the foundation for a classification. The main procedures used for data analysis were multivariate classification and cluster analysis, in particular canonical correspondence analysis (CCA) and Ward's method.

Recommendations about the NVC

The table below summarises the main wetland plant communities considered by Wheeler, Shaw and Tanner (2009). The following comments/recommendations were made regarding the NVC:

- (i) 14 NVC mire and swamp communities (M4, M5, M10, M13, M14, M18, M21, M22, M24, M29, S1, S2, S24, S27) have updated accounts available;
- (ii) two additional communities should be added to the NVC, i.e. *Cladio-Molinietum ericetosum* and *Betulo-Dryopteridetum cristatae*;
- (iii) changes to M9 including (re-)defining this community on floristic grounds to:
 - M9-1 *Carex lasiocarpa*–*Scorpidium* mire (a smaller and more cohesive unit than M9a and which is largely restricted to soakways and allied situations);
 - M9-2 *Carex diandra*–*Calliergon* mire, including all stands of M9b and some stands apparently allocated to M9a by Rodwell (1995), but which have closest floristic affinities with M9b;
 - M9-3 *Carex diandra*–*Peucedanum palustre* mire (although this could be considered as a sub-community of M9-2), equivalent to the *Peucedano-Phragmitetum caricetosum* community, which is floristically transitional between M9 and S24 but, as Rodwell (1995) suggested, is probably better considered as a relative of M9 than S24.

Main wetland plant communities considered by Wheeler, Shaw and Tanner (2009). Those light grey highlight have with new or updated accounts; those in dark grey highlight involve proposed changes to the NVC.

NVC code	Scientific name	Common name	Comments
M3	<i>Eriophorum angustifolium</i> bog pool community	Common cotton-grass community	Mainly associated with blanket mire; also widespread, but local in some lowland mires and heaths. Typically found as small stands on acid peat in depressions, erosion channels or shallow peat cuttings.
M4 n	<i>Carex rostrata-Sphagnum recurvum</i> mire	Bottle sedge-Bog moss community	A species-poor, poor-fen community, primarily comprising a carpet of <i>Sphagna</i> with a cover of sedges and impoverished herb flora. Supports a few uncommon species. Mainly a western and northern distribution in Britain. Typically found in conditions which are base-poor and generally of low to moderate fertility, with summer water levels at or near the surface. Examples are included in the SAC category "transition mire and quaking bog".
M5 n	<i>Carex rostrata-Sphagnum squarrosum</i> mire	Bottle sedge-Bog moss community	Characterised by the dominance of sedges with scattered poor-fen herbs over a patchy carpet of moderately base-tolerant <i>Sphagna</i> (particularly <i>S. squarrosum</i> and <i>S. palustre</i>). Mainly a western and northern distribution in Britain. Typically found as a floating raft, with water level generally close to the surface year round, and in moderately base-poor and moderately fertile conditions. Examples are included in the SAC category "transition mire and quaking bog".
Non-NVC unit w	<i>Betulo-Dryopteridetum cristatae</i>	None given	<i>Betulo-Dryopteridetum cristatae</i> (BDc) is a distinctive community that does not clearly fit any NVC type, although it appears to be closest to M5 <i>Carex rostrata-Sphagnum squarrosum</i> mire. BDc contains a number of uncommon species that appear to be relict from an earlier, more base-rich, seral phase, in addition to acidophilous taxa.
M9 eu (M9-1 and M9-2)	<i>Carex rostrata-Calliergon cuspidatum</i> mire or <i>Acrocladio-Caricetum</i> (<i>Carex lasiocarpa-Scorpidium</i> mire and <i>Carex diandra-Calliergon</i> mire)	Bottle sedge-Brown moss community (Slender sedge-Hooked scorpion-moss community and Lesser tussock sedge-Brown moss community)	Widespread in Britain, but rare in the South and West and can be particularly important in supporting rare fen species. Examples here are included in the SAC category "calcium-rich spring water-fed fens". Some examples have been included in the "transition mire" and "chalk-rich fen dominated by saw sedge" SAC categories. A community of low fertility, wet, topogenous situations, usually of low base status. Particularly vulnerable to lowered water tables and eutrophication, although floating raft may provide some accommodation. Note that in the accounts of the ecohydrology of wetland plant communities provided in Wheeler, Shaw and Tanner (2009), evidence is presented that 'M9' is not a very good community and it has been subdivided into M9-1 (<i>Carex lasiocarpa-Scorpidium</i> mire) and M9-2 (<i>Carex diandra-Calliergon</i> mire), which correspond broadly but by no means exactly with M9a and M9b.
M9-3 u	<i>Carex diandra-Peucedanum palustre</i> mire (ex. <i>Peucedano-Phragmitetum caricetosum</i> (PPc))	Milk parsley-Slender sedge community [NB: given as Lesser tussock sedge-Milk parsley community in Appendix 1.3]	A fine-leaved sedge-brown moss community, of restricted distribution in the UK (recorded only from Broadland), and supporting some internationally rare species (such as <i>Liparis loeselii</i>). Typically associated with conditions of low fertility and moderate though relatively constant water tables in topogenous fens. Stands require management (usually mowing or burning), and possibly periodic excavation of peat to maintain hydrosereal conditions. Particularly vulnerable to lowered water tables and eutrophication, although floating raft may provide some accommodation. Included in the SAC category "chalk-rich fen dominated by saw sedge". Note the change in name from <i>Peucedano-Phragmitetum caricetosum</i> (PPc) to <i>Carex diandra-Peucedanum palustre</i> mire (see community accounts in Part 3 of Wheeler, Shaw and Tanner (2009)).
M10 n	<i>Pinguicula vulgaris-Carex dioica</i> mire	Butterwort-Dioecious sedge community	Generally an open sward, dominated by low-growing monocots (mainly sedges). <i>Molinia</i> and/or rushes are sometimes prominent; there is often an extensive bryophyte component and a wide range of associated short herbs. Typically found in soligenous conditions of relatively high base status but low fertility, where summer water levels are close to the surface between tussocks. Stands require

NVC code	Scientific name	Common name	Comments
			management (light grazing).
M13 eu	<i>Schoenus nigricans</i> - <i>Juncus subnodulosus</i> mire or <i>Schoeno-Juncetum</i>	Black bog rush-Blunt-flowered rush community	Examples are included in the SAC category “calcium-rich spring water-fed fens”. Widespread in southern Britain, but of rare occurrence and can be particularly important in supporting rare fen species. Typically associated with low fertility, very base-rich spring-fed sites, where summer water tables are usually close to the surface. Management is required (mowing or grazing). Examples are included in the SAC categories “calcium-rich spring water-fed fens” and “chalk-rich fen dominated by saw sedge”.
M14 n	<i>Schoenus nigricans</i> - <i>Narthecium ossifragum</i> mire	Black bog rush-Bog asphodel community	Uncommon community, largely confined to Southern England (although a similar vegetation type occurs in Scotland). Typically found in sites where there is a strong soligenous input of water, which is of moderate base status and low fertility. Water can have a quite high pH (> 6) but is weakly buffered. Particularly vulnerable to lowered water tables and eutrophication. Requires moderate grazing pressure to maintain diversity. Examples are included in the SAC categories “chalk-rich fen dominated by saw sedge” and “transition mire and quaking bogs”.
M18 n	<i>Erica tetralix</i> - <i>Sphagnum papillosum</i> raised and blanket mire	Cross-leaved heath-Bog moss community	Considered to be the natural core community type of lowland raised bogs. Vegetation generally dominated by <i>Sphagna</i> with a few ericaceous sub-shrubs (such as <i>Calluna vulgaris</i>), monocotyledons (such as <i>Eriophorum</i> spp) and herbs. Supports several uncommon or rare species. Solely dependent on rainfall for water supply, and thus has a mainly western and northern distribution in Britain. Particularly vulnerable to lowered water tables, eutrophication and increase in base status. Some examples are included in the SAC category “active raised bogs”.
M21 n	<i>Narthecium ossifragum</i> - <i>Sphagnum papillosum</i> valley mire	Bog asphodel-Bog moss community	A local community of the southern lowlands. Characteristic of base-poor soligenous situations of low fertility. Particularly vulnerable to lowered water tables and eutrophication. Some examples are included in the SAC category “depressions on peat substrates (<i>Rhynchosporion</i>)” (though this community rarely occurs in such situations, nor is it referable to the <i>Rhynchosporion</i>).
M22 e	<i>Juncus subnodulosus</i> - <i>Cirsium palustre</i> fen meadow	Blunt-flowered rush-Marsh thistle community	The most widespread form of rich-fen vegetation in England and Wales, associated with a wide range of habitat conditions. The most species-rich examples are managed, usually by grazing. Low water levels tend to be associated with the loss of fen species. A few examples are included in the SAC category “chalk-rich fen dominated by saw sedge”, but this is exceptional.
M24 e	<i>Molinia caerulea</i> - <i>Cirsium dissectum</i> fen meadow or <i>Cirsio-Molinietum</i>	Purple moor grass-Meadow thistle community	Widespread through the lowland south of Britain, but becoming more localised. On the borderline between fen and wet grassland-typically associated with low fertility substrata and relatively low water levels. Lack of management can lead to loss of species. Examples are included in the SAC category “chalk-rich fen dominated by saw sedge” and (probably) “ <i>Molinia</i> meadows on chalk and clay”.
Non-NVC unit w	<i>Cladio-Molinietum</i>	Saw sedge–Purple moor grass fens	<i>Cladio-Molinietum ericetosum</i> (CM) is a non-NVC unit that does not fit neatly into the NVC scheme. Along with M16 and M25, <i>Molinia</i> is typically an important constituent of this type. CM has greatest floristic affinities variably with M24 and M25. Rodwell appears to have encompassed the unit within M24. It is not difficult to see a rationale for this, because the <i>Cladio-Molinietum</i> undoubtedly intergrades fairly seamlessly into M24. Nonetheless, if it had been retained as an independent segregate it would have reduced the floristic affinities of a (truncated) M24 to <i>Phragmitetalia</i> fen and would have improved its environmental definition, by removing from the compass of M24 examples which have quite high summer water tables.
M25	<i>Molinia caerulea</i> - <i>Potentilla erecta</i> mire	Purple moor grass-Tormentil community	Occurs throughout Western Britain, and is especially frequent in South-West England, Wales and southern Scotland. Uncommon in East Anglia. Very poorly defined. A community of moist but well-aerated acid to neutral peats and peaty mineral soils in the lowlands and upland fringes. The most species-rich examples are managed, usually by grazing. Not included within an SAC category.

NVC code	Scientific name	Common name	Comments
M26	<i>Molinia caerulea</i> - <i>Crepis paludosa</i> mire	Purple moor grass-Marsh hawksbeard community	A fairly scarce community of parts of northern Britain, occurring on relatively base-rich, but relatively low fertility soils; possibly a geographical variant of M24. Examples included within " <i>Molinia</i> meadows on chalk and clay (Eu-MOLINION)" SAC category.
M29 n	<i>Hypericum elodes</i> - <i>Potamogeton polygonifolius</i> soakway	Marsh St John's Wort-Bog pondweed community	Typically consists of mats of <i>Hypericum elodes</i> and <i>Potamogeton polygonifolius</i> within a submerged carpet of <i>Sphagnum auriculatum</i> , but with a limited range of vascular associates. Has an exclusively western distribution in Britain. Characteristic of base-poor oligotrophic pools and soakways, often shallowly flooded, but may occasionally dry out. Some examples are included within "transition mire and quaking bogs" SAC category.
S1 e	<i>Carex elata</i> sedge swamp	Tufted sedge community	An uncommon community, restricted to a few localities in West Norfolk, Anglesey and Cumbria. Usually occurs as emergent vegetation in shallow pools (including pingos and peat cuttings). May form an unstable, semi-floating mat.
S2 e	<i>Cladium mariscus</i> sedge swamp	Saw sedge community	Generally uncommon in Britain, and many examples are fragmentary. Species-poor and of limited floristic interest. Typically found in fairly nutrient-poor, base-rich situations in wet hollows in fens and flooded peat pits. Examples are included in the SAC category "chalk-rich fen dominated by saw sedge".
S4	<i>Phragmites australis</i> swamp and reed-beds	Common reed community	A widespread community, but frequently only as fragmentary stands, making the extensive and managed stands in Broadland of particular importance. Associated with a wide range of habitat conditions, but typically relatively fertile substrata. Not of great botanical interest (except for some of the wettest examples), but especially prized as supporting various rare birds and invertebrates.
S5	<i>Glyceria maxima</i> swamp	Reed sweet-grass community	A lowland community, commonest in the Midlands and East of England. Very species-poor and of limited floristic interest. Especially characteristic of nutrient-rich, circumneutral to basic mineral substrata (alluvia), or on fen peats irrigated by nutrient-rich waters.
S24 e	<i>Phragmites australis</i> - <i>Peucedanum palustre</i> fen	Common reed-Milk parsley community	A very localised community in Britain, for which Broadland is particularly important. Associated with a range of habitat conditions, but typically of only moderate fertility. Low water levels tend to lead to an increase in grassland species. Vegetation management is essential to maintain species richness. The community has added importance as the main vegetation type supporting milk parsley, the food plant of the rare swallow-tail butterfly. Examples here are included in the SAC category "chalk-rich fen dominated by saw sedge" (although note that not all stands of S24 necessarily support <i>Cladium mariscus</i>).
S25	<i>Phragmites australis</i> - <i>Eupatorium cannabinum</i> tall-herb fen	Common reed-Hemp agrimony community	A widespread, but rather variable, mixed tall fen vegetation, often of only moderate species richness. Most characteristic of base-rich and fairly fertile conditions. Stands are normally unmanaged (or occasionally grazed or burnt), although may have been grazed or mown in the past. Some examples are included in the SAC category "chalk-rich fen dominated by saw sedge".
S27 n	<i>Carex rostrata</i> - <i>Potentilla palustris</i> fen or <i>Potentilla Caricetum</i>	Bottle sedge-Marsh cinquefoil community	A widespread community in Britain, but mainly in the North and West. Typically associated with wet, topogenous situations, usually as a floating raft, and thus with some accommodation of variations in water level. Examples are included in the SAC category "transition mire and quaking bog".

w: see Wheeler (1980) for community account.

e: see Wheeler and Shaw (2000a) for community account.

n: new account of the community in Wheeler, Shaw and Tanner (2009).

u: community account in Wheeler and Shaw (2000a) has been updated in Wheeler, Shaw and Tanner (2009).

Annex 6 – Proposed additions and revisions by Castle and Mileto (2003) based on woodland NVC surveys in Wales and west and southwest England

Castle, G. and Mileto, R. (2003). Using the National Vegetation Classification (NVC) in woodland survey - 6000ha on. In: Goldberg, E. (Ed) *National Vegetation Classification – ten years' experience using the woodland section*. JNCC Report No. 335. Joint Nature Conservation Committee, Peterborough. Pages 76-86.

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Castle and Mileto (2003) report on several woodland stands encountered during extensive field survey in Wales and west and southwest England that appear not to conform to any communities/sub-communities described by the NVC or are difficult to assign. In some instances, these appear to be particularly unusual stands and may represent a unique scenario – no classification system could be expected to describe every situation. However, in several instances, similar stands have been encountered which vary significantly from any communities or sub-communities described by the NVC. These may represent gaps in the current classification. Examples of such stands include:

- Stands supporting a field layer dominated by *Luzula sylvatica* - this species can be abundant/dominant in a variety of stand types (often in steep valley woodland) which would otherwise appear closest to a number of different NVC communities, in particular W10, W14, W16 and W17 (occasionally W8). Such stands appear relatively frequent in Wales and western England although they may be uncommon in a national context.
- Stands dominated by *Fagus sylvatica* but which support a field layer comprising carpets of *Allium ursinum* appear to have been poorly sampled in the published data but are presumably closest to W12a.
- Stands dominated by *Fagus sylvatica* but which support a field layer rich in Atlantic bryophytes (ie: stands close to W17 but where the canopy is dominated by *Fagus*). These do not appear to have been sampled in the published data but are presumably a form of W15 (W15c?). Although beech can be dominant in “upland” stands there are no beech dominated analogues for W9, W11 and W17 (W12, W14 and W15 representing beech-dominated analogues of the lowland communities W8, W10 and W16 respectively).
- Stands relatively frequent in and around the Brecon Beacons, north Gwent and south Brecknock which support abundant *Fraxinus excelsior*, often with some *Alnus glutinosa* and abundant *Deschampsia cespitosa* but with few other species characteristic of either W8 or W7, though calcicoles are sometimes present at low covers. Such stands are close to both W7c and W8c, perhaps closer to the former in wetter situations but more commonly appearing closer to W8c. However, these Welsh stands appear to occupy distinctly different situations to the sampled stands of W8c which were typically (coppiced) stands on the heavy clay soils of southern and eastern England. These stands may therefore represent a W8 sub-community distinct to this area.
- *Fraxinus* dominated stands, often in ravines on a calcicolous substrate, with abundant ferns but where *Polystichum setiferum* and/or *Phyllitis scolopendrium* account for a significant proportion of the fern cover. Such stands have the general appearance of W9 due to the high cover of ferns but *Polystichum*, although mentioned as occurring at low frequency in W9, does not appear on the W9 summary table presumably since it occurred in less than 5% of the samples (ie: 4 samples or fewer) and *Phyllitis* is not a dryopterid fern typical of W9. These stands therefore appear closer to W8e since *Phyllitis* is a W8e preferential species and *Polystichum setiferum* is cited in the description of W8e as often contributing to the lush appearance of this sub-community and is recorded up to cover 8

(up to 75%). However, it is possible that these stands represent under-sampled variations of W9.

- Many, if not most, of the stands of W11 in Wales clearly fit the community but generally lack key preferential species for any of the four W11 sub-communities. It is possible that the majority of Welsh W11 stands are somewhat transitional between W11a and W17 and/or represent a distinct W11 sub-community.
- *Quercus* hybrids were apparently not recorded in the canopies of samples used to prepare the W16 data table (though hybrids were recorded in the shrub layer). However the majority of W16b stands encountered in Wales appear to be dominated by hybrids rather than *Quercus petraea*.

Annex 7 – Proposed additions and revisions by Prosser and Wallace (2003) based on maritime scrub NVC surveys of west Wales

Prosser M. V. and Wallace H. L. (2003) Some maritime scrub noda from West Wales. In: Goldberg, E. (Ed) *National Vegetation Classification – ten years' experience using the woodland section*. JNCC Report No. 335. Joint Nature Conservation Committee, Peterborough.

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Maritime cliff top scrub and underscrub relevés from south west England, and especially from Cornwall (Malloch 1970 and 1971), were included within recognized communities of the NVC. However, Prosser and Wallace (2003) described some maritime scrub noda from West Wales based on data collected from coastal situations in Pembrokeshire and on the Llyn Peninsula which, whilst fitting broadly within the envelopes defining NVC scrub and underscrub communities, contain groups of differential species which reflect the situation whereby coastal scrubs are frequently found interposed between maritime grassland and heath communities. Should noda similar to those presented be found more widely around the British coastline, then a case might be made for the erection of maritime sub-communities within the existing scrub and underscrub units.

Commentary on maritime scrub noda from West Wales

Maritime W22a	Close to type but generally on damper profiles and characterized by the scarcity of the W10 ground flora elements of typical stands.
Maritime W22c	More distinctive and characterized by having as differentials the southern Atlantic species <i>Rubus peregrina</i> and <i>Tamus communis</i> together with other species which suggest its affinities with the <i>Brachypodium sylvaticum</i> sub-community of <i>Crataegus-Hedera</i> scrub (W21c).
Maritime W23c	The presence of 'W25 species' demonstrate the transitional nature of these coastal stands which commonly occur between MC9 maritime swards and W25 scrub on more acidic profiles. <i>Ulex gallii</i> , <i>Serratula</i> , <i>Calluna</i> , <i>Erica cinerea</i> and <i>Silene maritima</i> reflect the often close proximity to maritime and coastal heaths.
Maritime W25a	Often found as a transition between MC12 and W22a on the less exposed coastal slopes over moderately deep brown earth profiles. Distinguished from the typical sub-community by the high frequency of species associated, in a coastal context, with MC8-12 maritime swards.
Maritime W25b	The stands also display the high representation of MC9 and MC12 species similar to that seen in the W25a examples but tend to occur on more base-poor and/or more exposed coastal situation.
Maritime W25b (<i>Calluna</i>)	A more extreme form found on acidic profiles and having a suite of <i>Calluno-Ulicetalia</i> species; often forms a transition to coastal <i>Calluna-Ulex gallii</i> heath.
Ligustrum nodum	Essentially a maritime form of W21 in which hawthorn canopy is replaced by privet, the stands are also distinguished by the high frequency of <i>Rumex acetosa</i> .