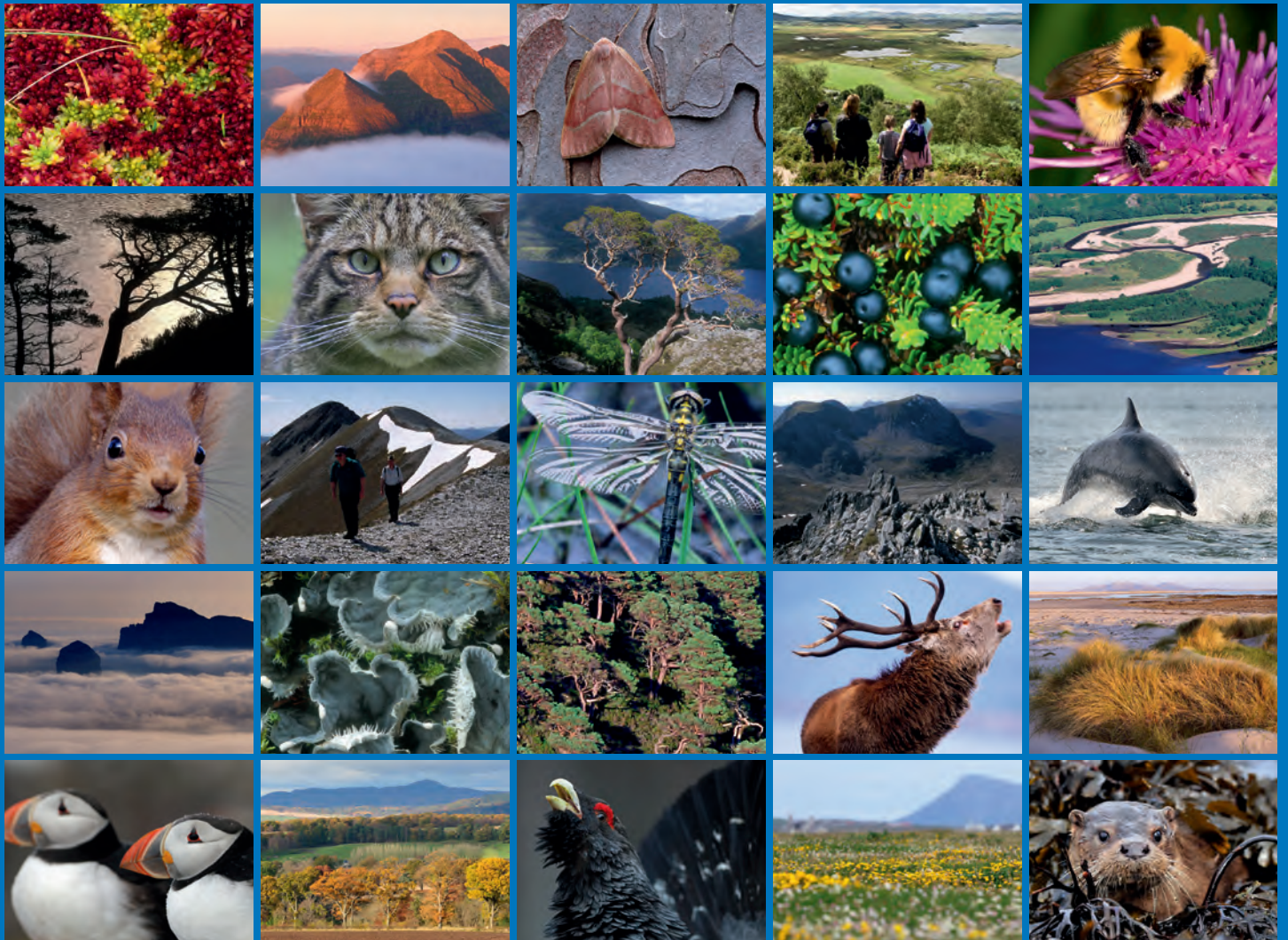


Manual of terrestrial EUNIS habitats in Scotland





Scottish Natural Heritage
Dualchas Nàdair na h-Alba

All of nature for all of Scotland
Nàdar air fad airson Alba air fad

COMMISSIONED REPORT

Commissioned Report No. 766

Manual of terrestrial EUNIS habitats in Scotland

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Version 2 revisions (2017)

Several sections have been revised as follows:

- A2 – removal of swamp types from A2.53 (already included in C3). Deletion of A2.53D and A2.53# as a consequence. Revision of notes to match.
- A5 - removal of swamp types from A5.5 by deletion of A5.541 and A5.544 (already included in C3). Revision of notes to match.
- B1 – additional NVC types for B1.52, B1.62 and B1.81.
- C1 – minor changes to names of 'x' types.
- C2 – revised level 2/4 types mainly to distinguish the Annex I rivers type. Revision of notes to match.
- C3 – minor changes to names of level 4 types to incorporate all swamp vegetation (from A2, A5 and D5). Revision of notes to match. Addition of C3.28.
- D4 – minor changes to notes for D4.15, D4.19 and D4.24, for clarity.
- D5 – deletion of D5 types, now incorporated into C3 (except D5.3 in E3.41). Revision of notes for chapter heading to match.
- E1 – addition of certain NVC types to E1.B1.
- E2 – addition of two level 5 types to E2.11 to enable separation of MG5 grasslands. Revision of notes to match.
- I1.3 – addition of NVC types.
- Consequential changes to Appendix I.
- Consequential changes to accompanying spreadsheets.
- NVC-EUNIS-Annex I table: certain wordings in qualification column amended for clarity, and comments on distribution etc moved to final column.



COMMISSIONED REPORT

Summary

Manual of terrestrial EUNIS habitats in Scotland

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Keywords

Habitat; classification; translation; EUNIS; Annex I; NVC; BAP; Phase 1; SSSI feature.

Background

Scottish Natural Heritage (SNH) intends to adopt the European Nature Information System (EUNIS) habitat classification as a consistent framework for terrestrial habitat data and mapping in Scotland. This will provide a wide range of benefits as well as meeting various legislative requirements. To do this the EUNIS habitat classification needs to be interpreted and adapted for Scotland. This includes defining correspondences with key national classifications and lists, and the identification or creation of units within the classification corresponding to Annex I habitats in Scotland.

Main findings

- Terrestrial habitats represented in Scotland have been identified in the EUNIS classification, generally to level 3/4 and in some cases to level 5.
- The EUNIS habitats have been interpreted and correlated with habitat types on Annex I of the Habitats Directive, plant communities in the National Vegetation Classification (NVC), Priority habitats in the UK Biodiversity Action Plan (BAP), Phase 1 categories, and habitat feature types on Sites of Special Scientific Interest (SSSI).
- Several additions to the EUNIS classification have been proposed for habitats in Scotland which are not adequately described by current EUNIS types. New types have also been proposed where necessary to enable Annex I habitats to be identified by a single EUNIS code. This relates to Annex I types that have components in different parts of the EUNIS classification.
- Annotated correspondence tables are presented to enable translation between EUNIS, Annex I and NVC types. Related Phase 1 types, BAP Priority habitats and SSSI habitat features are also listed.

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1. INTRODUCTION

SNH intends to adopt the EUNIS habitat classification as a consistent framework for terrestrial habitat data and mapping in Scotland. This will provide a wide range of benefits as well as meeting various legislative requirements.

Historically, terrestrial data collection and mapping in Scotland has been undertaken using various national classifications and lists, notably the National Vegetation Classification (NVC) (Rodwell 1991a, 1991b, 1992, 1995, 2000) Phase 1 (JNCC 2003) and UK BAP Broad and Priority habitats (BRIG, 2008). EUNIS is a comprehensive, pan-European, hierarchical classification of terrestrial and marine habitats which is widely used across Europe. EU member states are required by the INSPIRE Directive to use EUNIS and Annex I habitat codes, to ensure that habitat data can be used and exchanged across the EU, thereby providing governments at all levels with a better infrastructure for policy-making, implementation and monitoring.

SNH also has a statutory duty under the Habitats Regulations to undertake surveillance and assess the conservation status of Habitats Directive Annex I habitats across the whole of Scotland. This includes a requirement to map and measure habitat extent, among other Article 17 reporting requirements. Arising from the Surveillance duty and the INSPIRE Directive SNH is developing a terrestrial Habitat Map of Scotland (HabMoS) based on EUNIS for the future management of the natural heritage. It will not only underpin surveillance work but will also create an evidence-base with which informed decisions can be made on planning and policy issues.

To meet these requirements the EUNIS habitat classification needs to be interpreted and adapted for Scotland. Key elements of this are correspondences with widely used national classifications and lists and the identification or creation of units within the classification corresponding to Annex I habitats in Scotland.

2. THE EUNIS HABITAT CLASSIFICATION

2.1 Background

The EUNIS habitat classification (a component of the **European Nature Information System** EUNIS) is a pan-European system, which was developed between 1996 and 2001 by the European Environment Agency (EEA) in collaboration with experts from throughout Europe. It covers all types of natural and artificial habitats, both aquatic and terrestrial (EEA, 2014).

EUNIS builds upon the previous initiatives of the CORINE Habitat classification developed for the European Commission (DG XI) and its successor the Palaeartic Habitat classification, developed for the Council of Europe, but re-structures and re-defines this classification. Neither CORINE nor the Palaeartic Habitat classification gave clear criteria to separate classes. The EUNIS classification is based on general vegetation science with additions of a series of non-vegetated landscape elements, which are important animal habitats or form the basis for colonisation of vegetation. Marine elements are also included, whether or not colonised by plants or animals, including those composed of substrates of animal origin.

The EUNIS classification is hierarchical with a variable number of levels, of which 1 is the highest (broadest). The initial stages of the EUNIS work included a re-structuring of the Palaeartic classification to fit with criteria which were developed for the identification of habitats at levels 1, 2 and 3. Habitat units which did not fit clear criteria were moved between habitat types at any of these levels as appropriate in order to make the criteria more consistent and easily understood. So as to avoid duplication of effort, the decision was made that at hierarchical levels below level 3, the habitat units would be attached from contributing classifications, initially Palaeartic and BioMar (marine areas around UK and Ireland), later augmented with Mediterranean and Baltic marine habitats.

Davies *et al.* (2004) explained this further as follows:

*The resulting system of classification is still somewhat transitional. Down to level 3 (terrestrial and freshwater) and level 4 (marine), EUNIS habitats are now based on physiognomic and physical attributes, together with some floristic criteria. Below these levels, habitats have largely been adopted from other systems with little or no modification. Terrestrial habitats have been little altered from their previous state, mostly based on the Palaeartic Habitats Classification (Devillers & Devillers-Terschuren, 1996) which is strongly phytosociological in its basis. Other terrestrial habitats have been added to ensure that all habitats listed in Annex I of the Habitats Directive (European Commission, 2003) find a correspondence somewhere in EUNIS habitats. **Clearly to bring the lower levels into a consistent EUNIS framework, they should also be revised, preferably without the numerous minor regional variants. Such minor variants, if noted at all, are best handled by crosswalks, linking regional habitat systems to EUNIS.***

2.2 Interpretation and adaptation

To decide which types occur in Scotland, several approaches were taken. The primary focus was on the unit descriptions given on the EUNIS website and the keys in Davies *et al.* (2004). The full unit descriptions are also available in a spreadsheet which can be downloaded from the EUNIS website. Another useful source was Rodwell *et al.* (2002) which links the EUNIS classification at level 3 to European phytosociological alliances. Some level 2 types could be easily ruled out, for example types which are purely Mediterranean or Arctic; inland dunes and saltmarshes; and so on. Others were less clear and required study

of descriptions at lower levels. The category names can be misleading and reference to the descriptions is often important.

A number of difficulties were encountered. The level of detail in the descriptions varies considerably, with some types poorly described or with 'no description available' indicated. Biogeographical zones are not used consistently in the names or descriptions of habitats. Whilst Scotland is generally classed as 'Atlantic', it is apparent for some sections that it is grouped with the Boreal zone, or sometimes the Nemoral zone (e.g. saltmarshes, woodlands). There are also various inconsistencies within the classification, with some habitat types appearing in more than one location or with overlaps between types.

The NBN Habitats Dictionary <http://habitats.nbn.org.uk/index.htm> was also used as a source, although some of the translations were incorrect or not appropriate in Scotland. A wide range of textbooks and reports on vegetation were also used, many of which are listed throughout the manual.

2.3 Structure of the classification

The EUNIS classification is hierarchical, with the number of levels varying between habitats, from three to eight. As explained above, units at Level 4 and below are taken from other classifications and sometimes do not fit exactly. 'Flow diagram' keys have been developed for Levels 1 to 3 (Davies *et al.*, 2004).

Level 1

There are eleven Level 1 categories, as listed below (with clarification of scope added in square brackets). Definitions and a key for Level 1 types are given in Davies *et al.* (2004).

- A. Marine habitats [*includes saltmarshes*]
- B. Coastal habitats [*dunes, shingle, rock/cliffs*]
- C. Inland surface waters [*standing waters; running waters including springs; swamps*]
- D. Mires, bogs and fens [*bogs, fens/flushes*]
- E. Grasslands and lands dominated by forbs, mosses or lichens [*dry and wet grasslands; montane grass/sedge heaths and snowbeds; various tall-herb vegetation types; parkland*]
- F. Heathland, scrub and tundra [*dwarf-shrub and Dryas heaths; hazel, juniper and most willow (including S. herbacea) scrub/woodland; hedgerows*]
- G. Woodland, forest and other wooded land [*broad-leaved and conifer woodland and plantations; excludes parkland (E) and some scrub types (F)*]
- H. Inland unvegetated or sparsely vegetated habitats [*rock/cliffs, scree, caves*]
- I. Regularly or recently cultivated agricultural, horticultural and domestic habitats
- J. Constructed, industrial and other artificial habitats
- X. Habitat complexes [*see below*]

Categories A-J are at a broadly similar level to the first divisions of the GB Phase 1 classification and the units of the UK Biodiversity Action Plan (BAP) Broad Habitat classification, although there are some significant differences. This is not surprising considering the much wider geographical scope of EUNIS. Some notable features are:

- Category A includes all marine habitats. Consequently the marine types at each level below Level 1 tend to be broader than for terrestrial types at the same level. Thus saltmarsh is identified at Level 3 (A2.5), whereas Sand dunes or Bogs for example, are Level 2 types (B1 and D1 respectively).

- Swamps are split between categories according to whether they are saline (B), fringing open waters (C) or in mires (D), but have been combined in C3 for this manual.
- Scrub and woodland dominated by trees not normally growing over 5 m tall (e.g. hazel, juniper, grey willow) are included in F with heaths rather than G with other woodlands.
- Parkland is also included in F rather than G (but see also X).
- Category X is unusual in that it covers various habitat complexes, within which the component habitats can be described using relevant divisions of categories A-J. Davies *et al.* (2004) describes these as ‘frequently-occurring combinations or mosaics of individual habitat types, usually occupying at least 10 ha, which may be inter-dependent.’ These complexes, which are all at Level 2, include *Machair complexes*; *Raised bog complexes*; *Blanket bog complexes*; *Treeline ecotones*; *Pasture woods* and various other open woodland/farmland landscape types; and several categories of gardens. These complexes are listed in [Section 14](#) but have not been interpreted and are excluded from the accompanying correspondence tables.

Levels 2 and below

At level 2, 38 types within categories A-J are dealt with in this manual, of which 30 are predominantly semi-natural (all in categories A-H). The manual also includes 109 existing types at level 3 and 168 at Level 4. These are nearly all semi-natural, as most artificial types at levels 3 and 4 have been omitted (see [Section 4.1](#)). Only 14 existing types at level 5 are included, but 48 new types have been added at various levels, as well as 23 composite types, all as explained in [Section 4](#).

Within the Inland surface waters category (C), most of the level 3 types are divided at level 4 into generic habitat divisions e.g. *Rooted submerged vegetation* or *Plankton communities*, rather than sub-types described as specific plant or animal assemblages. Such types occur widely across Europe including Scotland, and therefore there are significantly more level 4 types than for any other category: approximately one third of all semi-natural level 4 types in Scotland belong to category C. This also results in much duplication and difficulties in making correspondence tables.

Many of the level 3 types in the classification, notably for mires, grasslands and woodlands, are divided beyond level 4, in extreme instances to an 8th level. However there are also level 3 types which have no sub-divisions below level 3, of which 34 are included here.

3. HABITATS DIRECTIVE ANNEX I LIST

3.1 Background

The European Union Habitats Directive (Council Directive, 1992) establishes a common framework for the conservation of wild plant and animal taxa and natural habitats of importance to the European Community. The Directive provides for the establishment of Special Areas of Conservation (SACs) which, together with Special Protection Areas (SPAs) under the Birds Directive, form the Natura 2000 network. The aim of these conservation areas is to '*maintain and restore, at favourable conservation status, natural habitats and species of wild fauna and flora...*' (European Commission, 1996). Annex I of the Habitats Directive lists 233 European natural habitat types, which includes 71 labelled as priority '*habitat types in danger of disappearance whose natural range falls mainly within European Union territory*' (European Commission, 1996).

The CORINE Biotopes project, led by Professor Noirfalise, was used as the basis for the list of habitats in Annex I of the Habitats Directive published in May 1992 (EUR12). The CORINE hierarchical classification of European habitats was subsequently updated while the original Habitats Directive was being adopted. The revision introduced various changes to codes and habitat types, such that Annex I of the Habitats Directive (version EUR12) no longer matched the CORINE classification. The Task Force/European Environment Agency later produced a paper describing the differences between Annex I and the revised CORINE classification (EEA Task Force Agency, 1992). EUR12 has been repeatedly updated as new Member States have joined the EU. The latest version is EUR28 (2013).

3.2 Interpretation

The Interpretation Manual that accompanies Annex I of the Habitats Directive (European Commission, 2013) is primarily focused on the 71 'priority habitats'. The manual includes full descriptive sheets for each of these habitats, which are intended to '*establish clear, operational scientific definitions of habitat types, using pragmatic descriptive elements (e.g. characteristic plants)*'. (European Commission, 2013). Similar descriptive sheets are provided for a further 36 non-priority habitat types, which commonly cause interpretation problems. The remaining habitat types are represented by the CORINE Biotopes definitions (1991 version) (Commission of the European Communities, 1991), which are considered to be '*a minimal interpretation*' (European Commission, 2013). The simple biotope definitions omit subtypes and regional varieties.

The list of Annex I habitats, although based on a version of the CORINE classification, was developed and modified in complex ways, so that interpretation of the meaning of many types is far from straightforward. In the absence of further guidance, or sometimes against available guidance, Member States have interpreted the habitat types in different ways. This is discussed in some detail, with examples, by Evans (2010). Some types have proved particularly difficult to interpret, for example H7150 Depressions on peat substrates, H91D0 Bog woodland and H6230 Species-rich *Nardus* grasslands. As highlighted by Evans the UK has adopted a narrower interpretation than certain other countries for several types, based on strict interpretation of their names and/or descriptions in the EU Interpretation Manual, notably H2360 Water courses of plain to montane levels, H6430 Hydrophilous tall herb fringe communities and H6510 Lowland hay meadows (Rodwell *et al.*, 2007).

For this report a wide range of sources were consulted, as listed in the reference section, including the Annex I habitat descriptions on the JNCC website, the reports compiled for the 2007 and 2013 Article 17 reporting to Europe, various SNH, Natural England and JNCC reports and the EU Interpretation Manual EUR28 (2013). The agreed list of 52 terrestrial Annex I habitats in Scotland for this report is given in Appendix 1. Marine types are excluded apart from saltmarshes and coastal lagoons, the latter only being covered with respect to

swamp and aquatic NVC types. Subterranean and 'introduced' habitats (*Spartina* beds, *Hippophae* scrub) are also excluded.

4. CATALOGUE OF EUNIS HABITATS IN SCOTLAND

4.1 Introduction

The following sections present the units of the EUNIS classification (excluding fully marine habitats) that are represented in Scotland, down to level 4 (or level 3 if there are no level 4 types). In a few cases, where necessary to separate Annex I habitats or other key vegetation types, level 5 types are also given. Types that are present in Scotland but, for various reasons explained in the notes, are not recommended for use in the context of this report are listed in the accompanying Excel file. Most of these are sub-habitats or artificial habitats at levels 3 or 4, for which levels 2 or 3 will suffice.

Where necessary, **new EUNIS units** are proposed, mostly to enable Annex I habitats to be fully separated within the EUNIS classification. To avoid confusion with existing units in the classification, the codes for new types end with the following symbols:

- # - new sub-type that relates to an Annex I habitat type
- x - new sub-type that does not relate to an Annex I habitat type
- € - composite unit that includes a number of EUNIS types, all of which translate to the same Annex I habitat type

The full list includes 30 # types, 19 x types and 23 € types. In a few cases, where two types have had to be created from the same unit using the same symbol (€, x or #), the symbol is followed by 1 or 2 to distinguish them e.g. C1.1€1 and C1.1€2, F2.29#1 and F2.29#2. For new EUNIS types, names have been created to be comparable with existing EUNIS names as far as possible. In the case of € (composite) types, the equivalent Annex I name has been used, except where the Annex I name is already in use for an existing EUNIS type, here '(Annex I)' has been added to avoid duplication.

Corresponding **NVC types** are listed in round brackets after each EUNIS type at the lowest (most detailed) level only. An asterisk (*) indicates partial correspondence i.e. the NVC type may also correspond to another EUNIS type. A full list of NVC codes and names, and details of NVC to EUNIS correspondence (translation), are given in the spreadsheet accompanying this report. Various vegetation types identified or proposed since publication of the NVC volumes (e.g. Rodwell *et al.*, 2000; JNCC, 2011) have also been mentioned below where relevant, although treatment of these is not comprehensive.

The codes for **Annex I habitats** that correspond to each EUNIS type (at the lowest level only) are also given, in square brackets. Annex I types that correspond to more than one EUNIS type are also marked with an asterisk (*). The full Annex I names are listed at the end of each Level 2 category. If other component types fall within a different Level 2 category, this is indicated in the Annex I list under each section. The relationship between Annex I and EUNIS types is also summarised in Appendix 1.

Accompanying notes have been added at the end of each level 2 category, as needed, to explain the composition of specific EUNIS types where this is not clear from the name and component NVC/Annex I types. This includes all newly proposed types. Further details, including the relationship to NVC, Annex I, Phase 1, BAP Priority habitats and SSSI habitat features are given in the various Excel sheets accompanying this report. For the last three of these, relevant types have been listed against each EUNIS habitat (lowest level only) in the translation tables but the nature of the correspondence is not described in the report.

5. MARINE HABITATS (A)

Of the marine habitats, only saltmarshes and other saline/brackish vegetation are covered in this report. They are included in two level 2 types, both of which cover a wide range of other habitat types: **A2 Littoral sediment**, which includes saltmarshes, and **A5 Sublittoral sediment** which includes lagoon vegetation of low salinity situations including lagoons and estuaries. Saline/brackish swamps have been transferred to C3. Full treatment of littoral and sublittoral habitats is beyond the scope of this report. Beds of *Zostera* and *Ruppia* spp. (NVC types SM1 and SM2) are included within another level 3 type, *A2.6 Littoral sediments dominated by aquatic angiosperms*. They are not included here because they are restricted to marine habitats not dealt with in this report, although SM2 can be an important feature of pools within upper saltmarshes in Scotland (Haynes, 2016).

A2 Littoral sediment

A2.5 Coastal saltmarshes

A2.51 Saltmarsh driftlines (SM27-28)

A2.52 Upper saltmarshes (SM23)

A2.53 Mid-upper saltmarshes (SM15-20) [H1330*]

A2.54 Low-mid saltmarshes (SM10 SM13-14) [H1330*]

A2.54€ Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) (includes A2.53, A2.54, A2.556) [H1330]

A2.55 Pioneer saltmarshes

A2.551 *Salicornia*, *Suaeda* and *Salsola* pioneer saltmarshes (SM8-9) [H1310]

A2.554 Flat-leaved *Spartina* swards (SM5-6)

A2.556 Rayed *Aster tripolium* pioneer saltmarshes (SM12) [H1330*]

A2: Annex I types

H1310 *Salicornia* and other annuals colonising mud and sand

H1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

Comments on EUNIS A2 types

Treatment of A2 is restricted to saltmarsh and swamp, other (marine) components are outside the scope of this manual.

A2.5 – name and scope modified to exclude ‘saline reedbeds’ (see note below for A2.53).

A2.51 - comprises grassy, nitrophilous vegetation of saltmarsh strandlines dominated by *Elytrigia* species, and corresponds to NVC types SM28 (widespread) and SM27 (rare or probably absent in Scotland (Haynes, in 2016)).

A2.52 - the title of A2.52 is misleading, as most ‘upper’ saltmarshes fall within A2.53. A2.52 mainly comprises salt scrub and brackish saltmarsh types not found in Scotland, but NVC type SM23 (which corresponds to type A2.521 Atlantic and Baltic brackish saltmarsh communities) is included. It occurs in shallow upper marsh pans which dry out, on the mainland west coast and Orkney (Haynes, 2016).

A2.53 – the name of this type has been modified to exclude ‘saline and brackish reed, rush and sedge stands’, which are included in the types C3.21 and C3.27, the definitions of which specifically include saline as well as freshwater swamps. The amended type corresponds to NVC types SM15-20, which with SM23 (A2.52) are usually referred to as ‘upper saltmarsh’ in Scotland.

A2.54 – this comprises *Puccinellia maritima* saltmarsh of NVC types SM10 and SM14 (scarce in Scotland) and SM13 (widespread) which together make up what are usually called low- and mid-saltmarsh in Scotland.

A2.54€ - this corresponds to the Annex I type H1330 and includes A2.53 and A2.556 as well as A2.54.

A2.55 – this includes pioneer saltmarshes, mainly annual *Salicornia* and *Suaeda* types SM8 and SM9 (A2.551), which correspond to H1310. It also includes the rare *Aster tripolium* type SM12 (A2.556), which forms a small part of H1330, and *Spartina* saltmarshes SM5 and SM6 (A2.554) which are both the result of introductions in Scotland and therefore not considered to qualify as the Annex I type H1320 *Spartina* swards (*Spartinion maritimae*).

A5 Sublittoral sediment

A5.5 Sublittoral macrophyte-dominated sediment

A5.54 Angiosperm communities in reduced salinity

A5.542 Association with *Potamogeton pectinatus* (A12*) [H1150*]

A5.543 Vegetation of brackish waters dominated by *Ranunculus baudotii* (A21*) [H1150*]

A5: Annex I types

H1150 Coastal lagoons (includes other A5 types outside the scope of this report – see below)

Comments on EUNIS A5 types

Treatment of A5 is restricted to the above vegetation types, which are included since they also occur in other habitats covered by this manual. Swamp types for A5.54 (S4, S20, S21) are here included in C3.2. Other marine components are outside the scope of this report.

6. COASTAL HABITATS (B)

Coastal habitats are divided into three level 2 types, as follows:

- B1 Coastal dunes and sandy shores
- B2 Coastal shingle
- B3 Rock cliffs, ledges and shores, including the supralittoral

Treatment of the three types is very uneven, with dunes well covered whereas shingle and rock habitats have limited types and descriptions particularly below level 3.

B1 Coastal dunes and sandy shores

B1.1 Sand beach driftlines

B1.12 Middle European sand beach annual communities (SD2* non-NVC)

B1.2 Sand beaches above the driftline

B1.21 Unvegetated sand beaches above the driftline

B1.23 Boreo-arctic sand beach perennial communities (SD5*)

B1.3 Shifting coastal dunes

B1.31 Embryonic shifting dunes (SD2* SD4 SD5*) [H2110]

B1.32 White dunes (SD5* SD6) [H2120]

B1.4 Coastal stable dune grassland (grey dunes)

B1.41 Northern fixed grey dunes (SD7-8 SD9* SD10-12 CG10*) [H2130*]

B1.41€ Fixed dunes with herbaceous vegetation ('grey dunes') (SD7 SD8 SD9* SD10-12 SD19 CG10*) (includes B1.41, B1.47) [H2130]

B1.47 Dune fine-grass annual communities (SD19) [H2130*]

B1.4x Species-poor *Ammophila-Arrhenatherum* dune grassland (SD9* non-NVC)

B1.5 Coastal dune heaths

B1.51 *Empetrum* brown dunes (H11b) [H2140]

B1.52 *Calluna vulgaris* brown dunes (H11a/c H10) [H2150]

B1.6 Coastal dune scrub

B1.61 Coastal dune thickets (SD18, W23*)

B1.62 *Salix arenaria* mats (SD16* SD12*) [H2170]

B1.63 Dune *Juniperus* thickets (non-NVC) [H2250]

B1.8 Moist and wet dune slacks (includes B1.81-B1.86) [H2190]

B1.81 Dune-slack pools (A10* A11* A13* A16* A22* other) [H2190*]

B1.82 Dune-slack pioneer swards (SD13) [H2190*]

B1.83 Dune-slack fens (SD14-15 non-NVC) [H2190*]

B1.84 Dune-slack grassland and heaths (SD16* SD17) [H2190*]

B1.85 Dune-slack reedbeds, sedgebeds and canebeds (S4* S19* other) [H2190*]

B1.86 Coastal dunes: wet dune slacks: dominated by shrubs or trees (W1* W2* W4* W6*) [H2190*]

B1.9 Machair (SD8* SD17* MG11* OV4* non-NVC) [H21A0]

B1: Annex I types

H2110 Embryonic shifting dunes

H2120 Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes')

H2130 Fixed dunes with herbaceous vegetation ('grey dunes')

H2140 Decalcified fixed dunes with *Empetrum nigrum*

H2150 Atlantic decalcified fixed dunes (*Calluno-Ulicetea*)
H2170 Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*)
H2190 Humid dune slacks
H21A0 Machairs
H2250 Coastal dunes with *Juniperus* spp.

Comments on EUNIS B1 types

B1.12 - This includes stands of SD2 on sandy beaches, but also *Atriplex*-dominated vegetation on sand (Rodwell *et al.*, 2000). Where these types occur on shingle beaches they are part of B2.1. Stands of SD2 associated with SD4 embryo dunes are included in B1.31.

B1.2 – refers to beaches above the driftline which are ‘more or less level’ i.e. not dunes. Mostly unvegetated, but B1.23 includes certain stands of SD5 (relates specifically to B1.231 North Sea sand beach perennial communities).

B1.31 – equivalent to the Annex I type H2110, includes SD4 and associated stands of SD2 and SD5 (mainly SD5b).

B1.32 – includes types SD5 and SD6 but excluding forms of SD5 associated with SD4 (which instead falls under B1.31).

B1.41 – includes forms of CG10 on dunes as well as listed SD types; may also include stands of *Deschampsia flexuosa* on sand assigned by Dargie (2000) to NVC type U2, but which may be better assigned to SD12. Excludes species-poor forms of SD9 (see B1.4x).

B1.41€ – this is equivalent to the Annex I type H2130 and encompasses B1.47 as well as B1.41, excluding species-poor forms of SD9 (see B1.41x).

B1.4x – comprises species-poor forms of SD9, mainly SD9a but also Dargie’s (2000) provisional new *Hylocomium splendens* sub-community, SD9x.

B1.51– equivalent to the Annex I type H2140 and corresponds to H11b (*Empetrum nigrum* ssp *nigrum* sub-community).

B1.52 – equivalent to the Annex I type H2150 and corresponds largely to H11a and H11c, but may rarely include forms of other heath types (such as H10) on dunes.

B1.61 – though it includes SD18, this type does not correspond to the Annex I type H2160 Dunes with *Hippophae rhamnoides*, as this species is considered to be introduced in Scotland. Also includes W23 on dunes and other forms of scrub on dunes such as introduced *Rosa rugosa* stands.

B1.63 – a rare but variable type restricted to Scotland in the UK, not covered by the NVC (see Rodwell *et al.*, 2000) but described in Dargie (2000) as Wx *Juniperus communis communis* dune scrub community.

B1.81-5 – the various dune slack units in EUNIS are defined in relation to other units of the classification. A wide range of vegetation types can occur. The main SD (sand dune) types are allocated as indicated, but B1.81 can include a range of aquatic NVC types as listed; B1.83 includes various non-NVC *Carex nigra* fens (certain Mx fens in Dargie, 2000) in addition to SD14-15; and B1.85 takes in a wide range of swamp NVC types, including S4, S19 and various others (Dargie, 2000).

B1.86 – includes various wet woodland/scrub types in former dune slacks (W1, W2, W4 & W6) (Dargie, 2000)

B1.9 – equivalent to Annex I type H21A0. The core of this type comprises various sub-types of SD8 (Dargie, 2000). It also includes associated areas of SD17, MG11, areas of low-intensity cultivation (non-NVC), and fallow including forms of OV4 and possibly other 'weed' communities. Definition based on Angus (2006).

B2 Coastal shingle

B2.1 Shingle beach driftlines

B2.12 Atlantic and Baltic shingle beach drift lines (SD2* SD3* MC6* non-NVC) [H1210]

B2.2 Unvegetated mobile shingle beaches above the driftline

B2.3 Upper shingle beaches with open vegetation (SD1 SD3* non-NVC) [H1220*]

B2.4 Fixed shingle beaches, with herbaceous vegetation

B2.41 Euro-Siberian gravel bank grasslands (MG1* non-NVC) [H1220*]

B2.4# Other herbaceous vegetation of fixed coastal shingle (CG10* MC5* MC8* MC9* U1* U4* U20* non-NVC) [H1220*]

B2.4€ Perennial vegetation of stony banks (see component types) (includes B2.3, B2.4, B2.5, B2.6) [H1220]

B2.5 Shingle and gravel beaches with scrub (H10* W22* W23* W24* other) [H1220*]

B2.6 Shingle and gravel beach woodland (W1* W9* W11* non-NVC) [H1220*]

B2: Annex I types

H1210 Annual vegetation of drift lines

H1220 Perennial vegetation of stony banks

Comments on EUNIS B2 types

The classification of coastal shingle vegetation is poorly developed in EUNIS (beyond level 3), as it is in the NVC. Descriptions of Scottish coastal shingle vegetation are included in Murdock *et al.* (2014) and Sneddon & Randall (1993).

B2.12 - equivalent to the Annex I type H1210. Shingle beach driftlines correspond in Scotland to stands of SD2 and SD3 on shingle beaches, but also various related assemblages of species which can be assigned to this type, such as forms of MC6, and *Atriplex glabriuscula*-dominated vegetation (Rodwell *et al.*, 2000). Where these types occur on sandy beaches they are part of B1.12.

B2.2 – Bare shingle cast up by storms above the normal strandline is a common feature of exposed shingle beaches. It often occurs as patches amongst areas of vegetated shingle, and then could be considered as part of the BAP priority habitat (Murdock *et al.*, 2014). No Level 4 types exist. Shingle with lichens is part of B2.3.

B2.3 – this type may occur very locally on Scottish coasts as SD1, but related vegetation is more widespread, partly corresponding to forms of SD3. Other vegetation corresponding to B2.3 that is not included in the NVC also occurs on shingle in Scotland (Murdock *et al.*, 2014). Open vegetation with abundant lichens and/or bryophytes is one important type. There is no clear fit in Scotland with any of the described level 4 types.

B2.41 – This includes grasslands on shingle dominated by *Arrhenatherum elatius* including forms of MG1 but also a proposed new type, *Arrhenatherum - Silene uniflora* shingle grassland (Rodwell *et al.*, 2000).

B2.4# - this new type includes a range of other grasslands on shingle, often dominated by *Festuca rubra* or *F. ovina*. These sometimes resemble MC (maritime cliff) types (MC5, MC8, MC9) but also forms of CG10, U1 and U4. Other types include *Pteridium aquilinum* stands on shingle (U20-related) (Murdock *et al.*, 2014).

B2.4€ - this is equivalent to the Annex I type H1220 and includes a wide range of vegetation types, combining B2.3, B2.4, B2.5 and B2.6.

B2.5 – this includes a range of scrub types on shingle (Murdock *et al.*, 2014), including forms of W22 with *Prunus spinosa*, W24 with *Rubus fruticosus* and, very commonly, W23 with *Ulex europaeus*. B2.5 also encompasses dwarf-shrub heaths on shingle (mostly forms of H10) which do not fit any Level 4 types.

B2.6 – This type includes forms of *Salix* scrub-woodland (W1*) and *Fraxinus-P. spinosa* woodland (W9*) which occur very rarely on shingle in Scotland (Murdock *et al.*, 2014). Other types may occur.

B3 Rock cliffs, ledges and shores, including the supralittoral

B3.1 Supralittoral rock (lichen or splash zone)

B3.2 Unvegetated rock cliffs, ledges, shores and islets

B3.3 Rock cliffs, ledges and shores, with angiosperms

B3.31 Atlantic sea-cliff communities (MC1-3 MC5 MC6* MC7-10 MC12 H7 H8* H10* CG10* MG1* U20* W21* W22* W23* W24* W25* other) [H1230*]

B3.31€ Vegetated sea cliffs of the Atlantic and Baltic coasts (various) (includes B3.31, B3.4) [H1230]

B3.4 Soft sea-cliffs, often vegetated (various) [H1230*]

B3: Annex I types

H1230 Vegetated sea cliffs of the Atlantic and Baltic coasts

Comments on EUNIS B3 types

B3.1 & B3.2 – single level 4 types are included in Appendix 4 for each of these unvegetated level 3 types, but are not listed here as they do not add anything useful to the classification.

B3.31 – may include examples of various vegetation types in addition to those listed, in certain locations e.g. CG1, CG2, MG5, U4.

B3.31€ – includes B3.4 as well as B3.31 and is equivalent to the Annex I type H1230.

B3.4 – no level 4 types exist in EUNIS. Vegetation is poorly described in Scotland, where soft cliffs occur at a small number of sites on the east coast mixed with hard cliffs.

7. INLAND SURFACE WATERS (C)

The classification of freshwater habitats in EUNIS is quite different from that for other semi-natural habitats. There are three level 2 types (of which C3 has been extended to include other swamp vegetation, see notes):

- C1 Surface standing waters
- C2 Surface running waters
- C3 Littoral zone of inland surface waterbodies and other swamp vegetation.

Standing waters are divided at level 3 by trophic type, with an additional category for temporary waterbodies. The level 4 categories relate largely to different habitats within a waterbody – benthos, plankton, floating vegetation etc. For running waters the level 3 divisions relate mainly to river zones, from spring to estuary, with level 4 types based principally on trophic status. The littoral zone category is divided at levels 3 and 4 using a mixture of vegetative and substrate characteristics.

For the six freshwater Annex I habitats represented in Scotland, new composite units have been created as listed below. However to list the individual component types for each of these (as has been done for all the terrestrial Annex I types) would require the creation of numerous new subtypes. It is doubtful how useful this would be at this stage and so it has not been done, though such units could be created at a future date if required. Nevertheless most of the Level 4 types have been listed here, although not split between the newly created types. Correspondences between NVC aquatic types and EUNIS level 4 types for types C1-C3 have been included in the spreadsheet accompanying this report as guidance, although there is limited information available for some NVC types.

Rather than using the NVC for typing standing waters in Britain, the statutory conservation agencies developed a classification based on aquatic macrophyte assemblages for whole water bodies, which has proved more useful. The most recent classification (Duigan *et al.*, 2006) divided lakes into 11 distinct groups (A-J) with group C further divided into C1 and C2. A previous classification (Palmer, 1992), based on a smaller dataset, has ten classes (1-10) and is also still in use. Broad correspondences between these classifications and other classifications/lists, including Phase 1, NVC and Annex I, is given in Appendix 1 of the Common Standards Monitoring guidance for standing waters (JNCC, 2008).

C1 Surface standing waters

C1.1 Permanent oligotrophic lakes, ponds and pools

C1.1#1 Soft oligotrophic standing waters not on sandy plains with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* (A7* A9* A13* A14* A24*) [H3130*]

C1.1#2 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) (A7* A9* A14* A24*) [H3110*]

C1.1#2€ Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)(Annex I) (includes C1.1#2 and relevant parts of C3) [H3110]

C1.1#3 Hard oligotrophic waters with benthic vegetation of *Chara* spp (see comments below) [H3140*]

C1.1x Soft oligotrophic standing waters lacking *Littorelletea* vegetation (see comments below)

C1.11 Benthic communities of oligotrophic waterbodies

C1.12 Rooted submerged vegetation of oligotrophic waterbodies

C1.13 Rooted floating vegetation of oligotrophic waterbodies

C1.14 Charophyte submerged carpets in oligotrophic waterbodies

C1.15 Peatmoss and *Utricularia* communities of oligotrophic waterbodies
C1.16 Plankton communities of oligotrophic waters

C1.2 Permanent mesotrophic lakes, ponds and pools

C1.2#1 Hard mesotrophic standing waters with benthic vegetation of *Chara* spp (see note) [H3140*]

C1.2#1€ Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp (includes C1.1#3, C1.2#1 and relevant parts of C3) [H3140]

C1.2#2 Soft mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the Isoëto-Nanojuncetea (A2* A7* A8* A9* A10* A13* A15* A16* A19* A20*) [H3130*]

C1.2#2€ Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the Isoëto-Nanojuncetea (includes C1.1#1, C1.2#2 and relevant parts of C3) [H3130]

C1.2x Soft mesotrophic standing waters lacking *Littorelletea* vegetation (see comments below)

C1.21 Benthic communities of mesotrophic waterbodies

C1.22 Free-floating vegetation of mesotrophic waterbodies

C1.23 Rooted submerged vegetation of mesotrophic waterbodies

C1.24 Rooted floating vegetation of mesotrophic waterbodies

C1.25 Charophyte submerged carpets in mesotrophic waterbodies

C1.26 Peatmoss and *Utricularia* communities of mesotrophic waterbodies

C1.27 Plankton communities of mesotrophic standing waters

C1.3 Permanent eutrophic lakes, ponds and pools

C1.3# Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation (A2* A5* A8* A9* A10* A11* A15* A16* A19* A21*) [H3150*]

C1.3#€ Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation (Annex I) (includes C1.3# and relevant parts of C3) [H3150*]

C1.3x Eutrophic standing waters lacking *Magnopotamion* or *Hydrocharition*-type vegetation (see comments below)

C1.31 Benthic communities of eutrophic waterbodies

C1.32 Free-floating vegetation of eutrophic waterbodies

C1.33 Rooted submerged vegetation of eutrophic waterbodies

C1.34 Rooted floating vegetation of eutrophic waterbodies

C1.35 Plankton communities of eutrophic standing waters

C1.4 Permanent dystrophic lakes, ponds and pools

C1.4# Natural dystrophic lakes and ponds (A24*) [H3160*]

C1.4#€ Natural dystrophic lakes and ponds (Annex I) (includes C1.4# and relevant parts of C3) [H3160]

C1.4x Artificial dystrophic water bodies (A24*)

C1.41 Benthic communities of dystrophic waterbodies

C1.42 Rooted submerged vegetation of dystrophic waterbodies

C1.43 Rooted floating vegetation of dystrophic waterbodies

C1.44 Charophyte submerged carpets in dystrophic waterbodies

C1.45 Peatmoss and *Utricularia* communities of dystrophic waterbodies

C1.6 Temporary lakes, ponds and pools (see comments below)

C1: Annex I types (see also C3)

H3110 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)

H3130 Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*

H3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.

H3150 Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation

H3160 Natural dystrophic lakes and ponds

Comments on EUNIS C1 types

For each of the five Annex I standing water types a new composite type (€) has been created. As explained above the existing level 4 types under each Level 3 type are listed but have not been divided and linked to relevant composite types. Note that the Annex I types also each include the associated littoral zone as well as the main water body, so encompass elements of C3 as well as C1 (see notes for C3). NVC types for the composite types are not listed, but can be determined from the relevant component types.

C1.1#1 – corresponds to oligotrophic examples of Annex I type H3130, excluding the littoral zone (see C3).

C1.1#2 – includes standing waters corresponding to Annex I type H3110 but excluding the littoral zone (see C3).

C1.1#2€ – this type is equivalent to Annex I type H3110 and includes C1.1#2 together with relevant elements of C3.

C1.1#3 - corresponds to oligotrophic examples of Annex I type H3140, but excluding the littoral zone (see C3). NVC types uncertain but likely to be a sub-set of those for C1.1#1, together with non-NVC charophyte vegetation (Rodwell *et al.*, 2000). Also included in C1.2#1€.

C1.1x – this type includes any oligotrophic standing waters that are not Annex I types. NVC types uncertain but likely to be a sub-set of those for C1.1#1.

C1.2#1 - corresponds to mesotrophic examples of Annex I type H3140, but excluding the littoral zone (see C3). NVC types uncertain but likely to be a sub-set of those for C1.1#1, together with non-NVC charophyte vegetation (Rodwell *et al.*, 2000). Also included in C1.2#1€.

C1.2#1€ - this is equivalent to Annex I type H3140 and encompasses examples of both oligotrophic (C1.1#3) and mesotrophic (C1.2#1) standing waters (as well as relevant C3 elements).

C1.2#2 – corresponds to mesotrophic examples of Annex I type H3130, excluding the littoral zone (see C3). Also included in C1.2#2€.

C1.2#2€ - this type is equivalent to Annex I type H3130 and encompasses examples of both oligotrophic (C1.1#1) and mesotrophic (C1.2#2) standing waters (as well as relevant C3 elements). It includes all the NVC types listed for both C1.1 and C1.2.

C1.2x – this includes any mesotrophic standing waters which are not Annex I types. NVC types uncertain but likely to be a sub-set of those for C1.2#2.

C1.3# - this type is equivalent to Annex I type H3150 but excluding the littoral zone (see C3).

C1.3#€ - this type is equivalent to Annex I type H3150, and includes C1.3# and relevant elements of C3.

C1.3x – this includes eutrophic standing waters which are not included in the Annex I type. NVC types uncertain but likely to be a sub-set of those for C1.3#.

C1.4# - this type is equivalent to Annex I type H3160 but excluding the littoral zone (see C3).

C1.4#€ - this type is equivalent to Annex I type H3160, and includes C1.4# and relevant elements of C3.

C1.4x - this includes highly modified dystrophic standing waters which are not included in the Annex I type.

C1.6 – temporary water bodies are of relatively restricted occurrence in Scotland, with rather little known about them and their associated vegetation. It is suggested that the level 4 types are of limited use at present.

C2 Surface running waters

C2.1 Springs, spring brooks and geysers

C2.2 Permanent non-tidal, fast, turbulent watercourses

C2.2# Well-vegetated fast-flowing water courses (A9* A14* A16* A18- A20* other) [H3260*]

C2.2x Sparsely or non-vegetated fast-flowing water courses

C2.24 Waterfalls (non-NVC bryophyte communities)

C2.3 Permanent non-tidal, smooth-flowing watercourses

C2.3# Well-vegetated slow-flowing water courses (A5* A8-11* A13-16* A17 A18 A19* A20* other) [H3260*]

C2.3#€ Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (Annex I) (includes C2.2#, C2.3# and relevant parts of C3) [H3260]

C2.3x Sparsely or non-vegetated slow-flowing water courses

C2.4 Tidal rivers, upstream from the estuary

C2.41 Brackish water tidal rivers

C2.5 Temporary running waters

C2: Annex I types

H3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (see also C3).

Comments on EUNIS C2 types

C2.1 - excludes mire vegetation of springs, which is included in section D (mainly D2.2C and D4.1N). Vegetated 'spring brooks' should be included in C2.2.

C2.2# - includes only well-vegetated watercourses/sections corresponding to H3260. Includes non-NVC bryophyte communities.

C2.3# - includes only well-vegetated watercourses/sections corresponding to H3260. Includes non-NVC bryophyte communities.

C2.3#€ - this is equivalent to the Annex I type H3260 and encompasses C2.2#, C2.3# and relevant elements of C3. NVC types can be determined from the relevant component types.

C2.4 – tidal freshwater river sections should be included in C2.3.

C3 Littoral zone of inland surface waterbodies and other swamp vegetation

C3.1 Species-rich helophyte beds

C3.11 Beds of small helophytes (S22* S23*) [H3130* H3140* H3150* H3260*]

C3.2 Reedbeds and tall helophytes

C3.21 *Phragmites australis* beds (S4* S25* S26) [H3110* H3130* H3140* H3150*]

C3.22 *Schoenoplectus lacustris* beds (S8) [H3130* H3160*]

C3.23 *Typha* beds (S12 S13) [H3130* H3150*]

C3.24 Medium-tall non-graminoid swamp communities (S10 S14 S19*) [H3130* H3150* H3160* H3260*]

C3.25 *Glyceria maxima* beds (S5) [H3150*]

C3.26 *Phalaris arundinacea* beds (S28) [H3150*]

C3.27 Halophile *Scirpus*, *Bolboschoenus* and *Schoenoplectus* beds (S20 S21)

C3.28 *Cladium mariscus* beds (S2)

C3.29 Large sedge swamp communities (S3 S6 S7 S9 S11 S18) [H3130* H3140* H3150* H3160* H3260*]

C3.4 Species-poor beds of low-growing water-fringing or amphibious vegetation

C3.41 Euro-Siberian perennial amphibious communities (A22 A23 A24* M29* M30) [H3110* H3130* H3160*]

C3.5 Periodically inundated shores with pioneer and ephemeral vegetation (OV29-33 OV35)

C3.6 Unvegetated or sparsely vegetated shores with soft or mobile sediments [H3110* H3130* H3140* H3150* H3160* H3260*]

C3.7 Unvegetated or sparsely vegetated shores with non-mobile substrates [H3130* H3140* H3150* H3260*]

C3: Annex I types

H3110 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) (see C1.1#2€)

H3130 Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletalia uniflorae* and/or of the *Isoëto-Nanojuncetea* (see C1.2#2€)

H3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. (see C1.2#1€)

H3150 Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation (see C1.3#€)

H3160 Natural dystrophic lakes and ponds (see C1.4#€)

H3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (see C2.3#€)

Comments on EUNIS C3 types

See general comments for freshwater Annex I types at the start of section C, and notes for C1 and C2. The relevant Annex I types are indicated for level 3 or 4 types, but new sub-

types have not been created for each Annex I/C3 combination. For mapping purposes swamps fringing Annex I water bodies should be 'double badged' with EUNIS and Annex I codes.

C3 – the title has been expanded to encompass swamps not associated with open waters.

C3.1 – beds in standing waters as well as running waters should be included.

C3.2 – all swamp vegetation (except in dune slacks) is included here for simplicity. This includes stands of swamp types not fringing open water (transferred from D5) and saline stands in tidal areas and lagoons (transferred from A2.53 and A5.54). The names of C3.2 and certain level 4 types have been amended to reflect this. The word 'canes' has been removed from the habitat name as they do not occur in the UK. For correspondence of C3 NVC types with Annex I types see the NVC-EUNIS spreadsheet.

C3.5 & C3.6 – level 4 types are probably of limited use so are not listed here.

8. MIRES, BOGS AND FENS (D)

Mires, bogs and fens are divided into three level 4 types relevant to Scotland:

- D1 Raised and blanket bogs
- D2 Valley mires, poor fens and transition mires
- D4 Base-rich fens and calcareous spring mires

The classification of mires in EUNIS is very detailed, with numerous types at level 5 and below, some of which seem to overlap. This creates some difficulties in deciding which types are represented in Scotland, and a pragmatic approach has been adopted here.

Category D5 (Sedge and reedbeds, normally without free-standing water) is not included here; instead, all swamp vegetation is included in section C3 to simplify coding/mapping.

D1 Raised and blanket bogs

D1.1 Raised bogs

D1.11 Active, relatively undamaged raised bogs (M18* M19* M1* M2*) [H7110]

D1.12 Damaged, inactive bogs

D1.12# Degraded raised bogs still capable of natural regeneration (M3* M15* M16* M17* M18* M19* M20* M25* other) [H7120]

D1.12x Damaged, inactive bogs not capable of restoration within 30 years (various)

D1.2 Blanket bogs (includes D1.21, D1.22, D1.24) [H7130]

D1.21 Hyperoceanic low-altitude blanket bogs, typically with dominant *Trichophorum* (M1* M2* M3* M15* M17* M18* M25*) [H7130*]

D1.22 Montane blanket bogs, *Calluna* and *Eriophorum vaginatum* often dominant (M1* M2* M3* M15* M19* M20*) [H7130*]

D1.24 Wet bare peat and peat hags on blanket bogs [H7130*]

D1: Annex I types

H7110 Active raised bogs

H7120 Degraded raised bogs still capable of natural regeneration

H7130 Blanket bogs

Comments on EUNIS D1 types

Wet heath vegetation (M15-16) and *Molinia* mire (M25a) on deep peat are included in sub-types of D1.1 and D1.2 as listed above. On shallow peat they are classified as wet heath types (see F4.1).

D1.11 – corresponds to Annex I type H7110.

D1.11 & D1.21 - vegetation in bog pools and hollows corresponding to H7150 *Depressions on peat substrates of the Rhynchosporion* occurs widely in these habitats, but should be assigned to D2.37 (q.v.). Areas of active raised or blanket bog with scattered trees (*Pinus sylvestris* and/or *Betula pubescens*) corresponding to H91D0 Bog woodland should be assigned to relevant woodland types (G3.D1 or G1.51# respectively) rather than D1.11 or D1.21, unless tree growth is a consequence of anthropogenic factors such as hydrological changes through drainage.

D1.12# and D1.12x – D1.12# is equivalent to Annex I type H7120, comprising stands of degraded raised bogs that are capable of natural regeneration within 30 years if appropriate measures are taken. Areas degraded to such a degree that recovery is not considered

feasible, at least within 30 years, are included in D1.12x. Areas of bare peat and hags may be included in either type as appropriate. Both may also include a variety of vegetation types in addition to those listed, such as dry heath, conifer plantation, scrub/woodland, improved pasture and other grasslands.

D1.2 – comprises the three level 4 types D1.21. D1.22 and D1.24 and is equivalent to the Annex I type H7130.

D2 Valley mires, poor fens and transition mires

D2.1 Valley mires

D2.11 Acid valley mires (M21)

D2.2 Poor fens and soft-water spring mires

D2.22 *Carex nigra*, *Carex canescens*, *Carex echinata* fens (M6-7)

D2.2C Soft water spring mires (M31-33 M35-36)

D2.3 Transition mires and quaking bogs

D2.31 *Carex lasiocarpa* swards (M4* M5* M9*) [H7140*]

D2.32 *Carex diandra* quaking mires (M9*) [H7140*]

D2.33 *Carex rostrata* quaking mires (M4* M5* M8 M9*) [H7140*]

D2.33€ Transition mires and quaking bogs (Annex I) (includes D2.31-33, D2.39, D2.3#) [H7140]

D2.37 *Rhynchospora alba* quaking bogs (M1* M2*) [H7150]

D2.39 *Menyanthes trifoliata* and *Potentilla palustris* rafts (S27 non-NVC) [H7140*]

D2.3# *Hypericum elodes*-*Potamogeton polygonifolius* soakway (M29*) [H7140*]

D2: Annex I types

H7140 Transition mires and quaking bogs

H7150 Depressions on peat substrates of the *Rhynchosporion*

Comments on EUNIS D2 types

D2.1 – other valley mire types are habitat complexes and should be categorised by their component types.

D2.22 – encompasses all forms of M6 vegetation as well as M7.

D2.3 – various other level 4 types probably occur in Scotland, but can be encompassed by the types listed.

D2.31 – this corresponds to transition mires with abundant *Carex lasiocarpa*, including forms of M4, M5 and M9. Also see Wheeler's proposals in JNCC (2011).

D2.32 – this corresponds to transition mires with abundant *Carex diandra*, particularly M9b as well as certain non-NVC forms of mire (MxCd and MxMt*) described from machair by Dargie (2000).

D2.33 – this corresponds to transition mire types with *Carex rostrata* including forms of M4, M5, M8 and M9, but not S27 which corresponds to D2.39. Forms of M4, M5 or M9 with abundant *Carex lasiocarpa* are assigned to D2.31 and forms of M9 with abundant *C. diandra* to D2.32. Certain forms of M9 correspond to D4.1C.

D2.33€ – this is equivalent to Annex I type H7140, and corresponds to type D2.3 but excluding type D2.37. It includes all the relevant NVC types.

D2.37 – equivalent to Annex I type H7150 *Depressions on peat substrates of the Rhynchosporion*, comprising M1/M2 bog hollows, characterised by abundant *Rhynchospora alba*, also *Drosera* spp. and sometimes rarities including *R. fusca* and *Scheuchzeria palustris*. Typically transitional to M17/M18 bog vegetation (see D1.11 and D1.21).

D2.39 – S27 could arguably correspond to several different level 4 types but for simplicity it is proposed that all S27 mires are assigned to this type, along with certain non-NVC forms of *Carex nigra*-rich mires (MxPp, MxTm and MxMt*) and *Phragmites australis* fen (SxTHF) described from machair areas by Dargie (2000).

D2.3# - corresponds to stands of M29 (with or without *Hypericum elodes*) within transition mires. Other stands of M29 fringing streams etc. are included in C3.41.

D4 Base-rich fens and calcareous spring mires

D4.1 Rich fens, including eutrophic tall-herb fens and calcareous flushes and soaks

D4.12 *Schoenus ferrugineus* fens (M10*) [H7230*]

D4.15 *Carex dioica*, *Carex pulicaris* and *Carex flava* fens (M10*) [H7230*]

D4.15€ Alkaline fens (includes D4.12, D4.15, D4.19, D4.1C) [H7230]

D4.17 *Carex saxatilis* fens (M12) [H7240*]

D4.19 British *Carex demissa* - *Saxifraga aizoides* flushes (M11*) [H7230*]

D4.1C *Carex rostrata* alkaline fens (M9*) [H7230*]

D4.1I Tall herb fens (S25*)

D4.1N Hard water spring mires (M37 M38) [H7220]

D4.2 Basic mountain flushes and streamsides, with a rich arctic-montane flora

D4.24 British mica flushes (M10* M11* M34) [H7240*]

D4.24€ Alpine pioneer formations of the *Caricion bicoloris-atrofuscae* (M10* M11* M12 M34) (includes D4.17, D4.24) [H7240]

D4: Annex I types

H7220 Petrifying springs with tufa formation (*Cratoneurion*)

H7230 Alkaline fens

H7240 Alpine pioneer formations of the *Caricion bicoloris-atrofuscae*

Comments on EUNIS D4 types

D4.12 – a rare type in Scotland which corresponds to stands of M10 dominated by *Schoenus ferrugineus*.

D4.15 – corresponds to M10 mires except for rare stands with *Schoenus ferrugineus* (D4.12) or with arctic-alpine species (D4.24).

D4.15€ – equivalent to Annex I type H7230, including D4.12, D4.19 and D4.1C as well as D4.15 (main type).

D4.19 – includes stands of M11 lacking arctic-alpine species; stands with arctic-alpine species represented should be assigned to D4.24.

D4.1C – corresponds to alkaline stands of M9 (mostly M9a). Less alkaline stands of M9 with much *Carex diandra* correspond to D2.32 or with *C. rostrata* dominant to D2.33.

D4.1N – equivalent to Annex I type H7220.

D4.24 – corresponds to M34, and forms of M10 and M11 with arctic-alpines represented.

D4.24€ - equivalent to Annex I type H7240, including D4.24 and D4.17.

9. GRASSLANDS & LANDS DOMINATED BY FORBS, MOSSES OR LICHENS (E)

This habitat has five main divisions at level 2 represented in Scotland:

- E1 Dry grasslands
- E2 Mesic grasslands
- E3 Seasonally wet and wet grasslands
- E4 Alpine and subalpine grasslands
- E5 Woodland fringes and clearings and tall forb stands.

Type E7 *Sparsely wooded grasslands* also occurs in Scotland (as 'parkland') but this is not a very satisfactory category to use. The relevant level 3 type is E7.1 Atlantic parklands, defined as 'extensive surfaces of Atlantic regions of nemoral Europe occupied by grassland dotted with widely planted trees, characteristic of the British Isles, where they are usually enclosed, used for cattle or deer grazing.' 'Sparsely wooded' is further defined as <10% tree cover. Since neither grassland type nor tree species are specified, the value of this type on its own is doubtful. In any case parkland and wood pasture are covered in section X by several habitat complexes, which seems more appropriate for this habitat, which is of considerable nature conservation interest.

Rock and scree habitats dominated by mosses or lichens are generally included in category H rather than E.

E1 Dry grasslands

E1.2 Perennial calcareous grassland and basic steppes

E1.26 Sub-Atlantic semi-dry calcareous grassland (CG2 CG7 CG10*) [H6210]

E1.7 Closed non-Mediterranean dry acid and neutral grassland

E1.71 *Nardus stricta* swards (U5*)

E1.72 *Agrostis - Festuca* grassland

E1.72# Species-rich *Nardus* grassland, on siliceous substrates in mountain areas (CG10* CG11 U4c U5c) [H6230]

E1.72x Other *Agrostis - Festuca* grassland (U4* CG10*)

E1.73 *Deschampsia flexuosa* grassland (U2)

E1.9 Open non-Mediterranean dry acid and neutral grassland, including inland dune grassland

E1.92 Perennial open siliceous grassland (U1*)

E1.B Heavy-metal grassland

E1.B1 Atlantic heavy-metal grassland (CG10* CG13* OV37 non-NVC) [H6130]

E1: Annex I types

H6210 Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*)

H6230 Species-rich *Nardus* grassland, on siliceous substrates in mountain areas (and submountain areas in continental Europe)

H6130 Calaminarian grasslands of the *Violetalia calaminariae*

Comments on EUNIS E1 types

E1.26 – equivalent to Annex I type H6210. This corresponds in Scotland to stands of CG2 and CG7, as well as CG10 on limestone, but excluding CG10 on limestone pavement, which is assigned to H3.511. Also includes possible CG1 grassland recorded at Burnmouth (Dadds & Averis, 2014).

E1.71 – includes species-poor, drier forms of *Nardus* grasslands (U5a, d and e). Excludes herb-rich forms (U5c), which are included in E1.72#, and wet forms (U5b) which are included in E3.52.

E1.72# - this is equivalent to Annex I type H6230. It corresponds in Scotland to CG11 and most stands of CG10 (see below), as well as species-rich forms of U4 (mostly U4c) and of U5, notably U5c. The Annex I name is misleading - these are all species-rich ***Nardetalia*** grasslands rather than species-rich *Nardus* grasslands and *Nardus* is not usually prominent. Excludes CG10 on limestone (see E1.26) and non-limestone stands of CG10 in the lowlands (E1.72x) although it does include enclosed ('lowland') CG10 stands in upland landscapes (i.e. 'in mountain areas'). This interpretation of H6230 was adopted in Scotland for the 2013 Article 17 Report.

E1.72x – includes less herb-rich forms of *Agrostis-Festuca* grasslands (U4) as well as stands of CG10 on non-limestone rocks in the lowlands. Herb-rich forms of U4 (mainly U4c) are included in E1.72#

E1.92 – This type is rare in Scotland, corresponding to U1 (except that U1 on coastal shingle is part of B2.4#).

E1.B1 – equivalent to Annex I type H6130. This encompasses vegetation on metalliferous substrates, including OV37, certain forms of CG10 and CG13 on Shetland as well as other non-NVC types on serpentine and mine waste (Averis *et al.*, 2004).

E2 Mesic grasslands

E2.1 Permanent mesotrophic pastures and aftermath-grazed meadows

E2.11 Unbroken pastures (MG5 MG6*)

E2.111 Ryegrass pastures (MG6*)

E2.112 Atlantic *Cynosurus-Centaurea* pastures (MG5)

E2.12 Ditch-broken pastures (MG6*)

E2.13 Abandoned pastures (non-NVC)

E2.2 Low and medium altitude hay meadows

E2.21 Atlantic hay meadows (MG1 MG2)

E2.24 Boreal and sub-boreal meadows (MG3) [H6520]

E2.6 Agriculturally-improved, re-seeded and heavily fertilised grassland, including sports fields and grass lawns (MG7)

E2.8 Trampled mesophilous grasslands with annuals (OV12, OV19-23)

E2: Annex I types

H6520 Mountain hay meadows

Comments on EUNIS E2 types

E2.1 – the level 4 types are poorly defined in EUNIS, but here have been interpreted as follows.

E2.111 – corresponds to relatively species-poor, semi-improved grasslands dominated by *Lolium perenne*, often with *Cynosurus cristatus* (MG6). It does not include the short-lived rye-grass leys.

E2.112 – corresponds to more species-rich, unimproved grasslands dominated by *Cynosurus cristatus* and with many flowering herbs, notably *Centaurea nigra* (MG5).

E2.12 - this covers 'dry' grasslands crossed by ditches and drains, here restricted to forms of MG6. Wet grasslands in such situations are included in E3.41 (MG8) and E3.44 (MG11-13).

E2.13 – abandoned mesotrophic pastures and meadows often revert to MG1 types but here these are all included in E2.21. However the widespread vegetation provisionally named as *Festuca rubra-Holcus lanatus-Anthoxanthum odoratum* grassland by Rodwell *et al.* (2000) is included in E2.13 as it also appears to be the result of neglect or abandonment of MG5 grasslands (Cooper & MacKintosh, 1996) and does not seem to fit elsewhere.

E2.21 – includes all MG1 grasslands except on coastal shingle (B2.4) – the name is misleading as they are not typically managed as 'hay meadows' in Scotland. Also includes MG2 (if it occurs in Scotland).

E2.24 – equivalent to Annex I type H6520.

E2.6 – These grasslands are of little conservation interest and there seems to be no benefit in using the level 4 categories.

E3 Seasonally wet and wet grasslands

E3.4 Moist or wet eutrophic and mesotrophic grassland

E3.41 Atlantic and sub-Atlantic humid meadows (M22 M23b MG8 MG9)

E3.42 *Juncus acutiflorus* meadows (M23a)

E3.44 Flood swards and related communities (MG10-13 OV28)

E3.5 Moist or wet oligotrophic grassland

E3.51 *Molinia caerulea* meadows and related communities

E3.511 Calicline purple moorgrass meadows (M26) [H6410]

E3.512 Acidocline purple moorgrass meadows (M25*)

E3.52 Heath *Juncus* meadows and humid *Nardus stricta* swards (U5b U6)

E3: Annex I types

H6410 *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)

Comments on EUNIS E3 types

Certain forms of the 'Mx' machair fens proposed by Dargie (2000) may correspond with EUNIS E3 types but further analysis is required.

E3.41 – includes M23b *Juncus effusus* sub-community in addition to M22, MG8 and MG9. M23a is included in E3.42.

E3.42 – includes M23a *Juncus acutiflorus* sub-community. M23b is included in E3.41.

E3.44 – drier grasslands with ditches e.g. MG6 are included in E2.12.

E3.511 – equivalent to Annex I type H6410.

E3.512 – this excludes *Molinia*-dominated forms of degraded wet heath (M25a) on shallow peats or mineral soils, which correspond to F4.13; and M25a on deep peat, which forms part of D1.1 or D1.2.

E3.52 – includes U5b *Agrostis-Polytrichum* sub-community as well as U6.

E4 Alpine and subalpine grasslands

E4.1 Vegetated snow-patch

E4.11 Boreo-alpine acidocline snow-patch grassland and herb habitats

E4.115 Boreal moss snowbed communities

E4.115# *Polytrichastrum -Kiaeria* snowbed (U11) [H6150*]

E4.115x *Rhytidiadelphus-Deschampsia* snowbed (U13b)

E4.116 Boreo-alpine *Deschampsia-Anthoxanthum* communities (U13a)

E4.117 Boreo-alpine herb-rich acid snowbed communities (U14) [H6150*]

E4.12 Boreo-alpine calcicline snow-patch grassland and herb habitats (CG12) [H6170*]

E4.12€ Alpine and subalpine calcareous grasslands (CG12 CG13* CG14) (includes E4.12, F2.29#1) [H6170]

E4.14 Boreo-alpine fern snowbed grassland (U18*) [H8110*]

E4.2 Moss and lichen dominated mountain summits, ridges and exposed slopes

E4.21 Oroboreal *Carex bigelowii-Racomitrium* moss-heaths (U9-10) [H6150*]

E4.22 Rock pavement lichen communities (non-NVC)

E4.23 Rock pavement, plateau and summital moss heaths (non-NVC)

E4.3 Acid alpine and subalpine grassland

E4.32 Oroboreal acidocline grassland (U7-8) [H6150*]

E4.32€ Siliceous alpine and boreal grasslands (U7-12 U14) (includes E4.115#, E4.117, E4.21, E4.32, F2.11) [H6150]

E4: Annex I types

H6150 Siliceous alpine and boreal grasslands (*see also F2*)

H6170 Alpine and subalpine calcareous grasslands (*see also F2*)

H8110 Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*) (*see H2.31€*)

Comments on EUNIS E4 types

E4.12€ - corresponds to Annex I type H6150 and includes E4.12 along with stands of *Dryas* heath (F2.29#1), but excludes stands of CG13 on limestone pavement (part of H3.511€).

E4.14 – included in composite type H2.31€. Stands of U18 on cliffs and crags rather than scree are included in H3.1#.

E4.22 & E4.23 – includes various lichen and bryophyte communities not described in the NVC (*see Averis et al.*, 2004).

E4.32€ - equivalent to Annex I type H6150, and includes E4.115#, E4.117, E4.21, E4.32 and F2.11.

E5 Woodland fringes and clearings and tall forb stands

E5.1 Anthropogenic herb stands (OV24-27)

E5.2 Thermophile woodland fringes

E5.22 Mesophile fringes (non-NVC)

E5.3 *Pteridium aquilinum* fields

E5.31 Sub-Atlantic *Pteridium aquilinum* fields (U20 W25*)

E5.4 Moist or wet tall-herb and fern fringes and meadows

E5.41 Screens or veils of perennial tall herbs lining watercourses (non-NVC)

E5.42 Tall-herb communities of humid meadows (M27 M28)

E5.5 Subalpine moist or wet tall-herb and fern stands

E5.59 Oro-boreal tall-herb communities (U17) [H6430]

E5.5B Alpine and subalpine fern stands (U19 non-NVC)

E5.5x *Luzula sylvatica-Vaccinium myrtillus* tall-herb community (U16)

E5: Annex I types

H6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels

Comments on EUNIS E5 types

E5.1 - comprises 'Stands of herbs developing on abandoned urban or agricultural land, on land that has been reclaimed, on transport networks, or on land used for waste disposal.' (Hill *et al.*, 2004). The distinction between the different Level 4 types is based on context rather than floristics and is unlikely to be useful.

E5.22 – includes proposed *Holcus mollis-Melampyrum pratensis* community (Rodwell *et al.*, 2000; Averis & Rodwell, 2006).

E5.31 - defined as '*Pteridium aquilinum* fields appearing as a recolonisation stage of the *Quercion...*', this type includes U20 vegetation but the position of W25 is less clear. Stands dominated by *Pteridium* belong here but *Rubus*-dominated stands should be assigned to F3.13.

E5.41 – includes non-NVC *Petasites hybridus-Aegopodium podagraria* community, also *Impatiens glandulifera* and *Heracleum mantegazzianum* stands (Rodwell *et al.*, 2000).

E5.42 – includes *Filipendula ulmaria*-dominated vegetation (M27, part of M28) as well as types with *Iris pseudacorus* and *Oenanthe crocata* abundant (other M28 stands). In some stands of M28, rushes and/or grasses can be prominent but all types are included here for simplicity.

E5.59 – equivalent to Annex I type H6430.

E5.5B – as well as U19, dense stands of *Dryopteris affinis* (see Averis *et al.* 2004) should be included here.

E5.5x – this has been created to encompass the more acidic forms of tall-herb vegetation dominated by or with abundant *Luzula sylvatica* (NVC type U16) for which there is no relevant level 4 type.

10. HEATHLAND, SCRUB AND TUNDRA (F)

Semi-natural heathland and scrub has four level 2 types represented in Scotland:

- F2 Arctic, alpine and subalpine scrub
- F3 Temperate and mediterranean-montane scrub
- F4 Temperate shrub heathland
- F9 Riverine and fen scrubs.

F9 includes wet woodland and scrub dominated by broad-leaved willow species (most Scottish types of lowland willow scrub), whereas the same woodland dominated by alder or birch is included in G1 types, leading to some 'sharing' of NVC types.

F also includes two more or less artificial habitats, which are listed but not analysed in this report:

- FA Hedgerows
- FB Shrub plantations

F2 Arctic, alpine and subalpine scrub

F2.1 Subarctic and alpine dwarf willow scrub

F2.11 Boreo-alpine acidocline snow-patch *Salix herbacea* scrub (U12) [H6150*]

F2.1# Sub-Arctic *Salix* spp. scrub (W20) [H4080]

F2.2 Evergreen alpine and subalpine heath and scrub

F2.25 Boreo-alpine and arctic heaths (H10* H12* H13-15 H16* H17 H18* H19-20 H21* H22*) [H4060]

F2.29 *Dryas octopetala* mats

F2.29#1 *Dryas* mats not on limestone pavement (CG13* CG14) [H6170*]

F2.29#2 *Dryas* mats on limestone pavement (CG13*) [H8240*]

F2.3 Subalpine deciduous scrub

F2.32 Subalpine and oroboreal *Salix* brush

F2.323 Northern British willow brush (non-NVC)

F2: Annex I types

H4060 Alpine and Boreal heaths

H4080 Sub-Arctic *Salix* spp. scrub

H6150 Siliceous alpine and boreal grasslands (see E4.32€)

H6170 Alpine and subalpine calcareous grasslands (see E4.12€)

H8240 Limestone pavements (see H3.511€)

Comments on EUNIS F2 types

F2.11 – is included in type E4.32€ with other siliceous mountain 'grasslands'.

F2.1# – equivalent to Annex I type H4080, corresponding to W20 and other stands of montane willows in Scotland. These scrub types clearly belong to F2.1, based on climate and the dwarf nature of the willows (defined as species that rarely exceed 1.5 m in height). The corresponding level 5 type appears to be F2.322 (Oroboreal *Salix* scrub) but this is inconsistently included in F2.3 (which specifically excludes dwarf *Salix* scrub) instead of F2.1. Therefore this new type has been created.

F2.25 – equivalent to Annex I type H4060. As well as the fully montane types, this includes montane forms of various heath types which are essentially submontane (H10, H12, H16, H18, H21). Sub-montane stands of H22 are included in F4.21.

F2.29#1 – all stands except those on limestone pavements (F2.29#2). Also included with CG12 in E4.12€.

F2.29#2 – includes stands on limestone pavements (CG13*), which are also included in H3.511€.

F2.323 – described as ‘Mixed *Salix aurita*, *Salix atrocineria*, *Salix repens* and *Salix caprea* scrub, with *Rumex acetosa*, *Filipendula ulmaria*, *Dryopteris* spp., *Oxalis acetosella*, developed on ungrazed ledges, islands and gullies of Shetland, Orkney, Hebrides and the Northern Highlands’. Not specifically described in NVC, but see Averis *et al.* (2004).

F3 Temperate and mediterranean-montane scrub

F3.1 Temperate thickets and scrub

F3.11 Medio-European rich-soil thickets (W21* W22*)

F3.13 Atlantic poor soil thickets (W24* W25*)

F3.14 Temperate *Cytisus scoparius* fields (W23*)

F3.15 *Ulex europaeus* thickets (W23*)

F3.16 *Juniperus communis* scrub

F3.16#1 *Juniperus communis* formations on heaths or calcareous grasslands (W19*) [H5130]

F3.16#2 *Juniperus communis* scrub in native pinewoods (W19*) [H91C0*]

F3.17 *Corylus* thickets

F3.17#1 *Corylus* thickets on calcareous rocky slopes (W9*) [H9180*]

F3.17#2 *Corylus* thickets on limestone pavement (W9*) [H8240*]

F3.17x *Corylus* thickets not on calcareous rocks (W11*)

F3: Annex I types

H5130 *Juniperus communis* formations on heaths or calcareous grasslands

H8240 Limestone pavements (see H3.511€)

H9180 *Tilio-Acerion* forests of slopes, screes and ravines (see G1.A2#1€)

H91C0 Caledonian forest (see G3.41€)

Comments on EUNIS F3 types

F3.1 – excludes scrub on coastal dunes (B1.6), scrub on coastal shingle (B2.5) and scrub on maritime cliffs (B3.3).

F3.13 – in Scotland comprises scrub mostly of *Rubus* species, including W24 and *Rubus*-dominated stands of W25 (see notes for E5.31).

F3.14 – includes stands of W23 dominated by *Cytisus scoparius*.

F3.15 – includes stands of W23 dominated by *Ulex europaeus*.

F3.16#1 – equivalent to Annex I type H5130. Includes juniper-dominated woodland and scrub, corresponding to W19, and other ‘upright’ juniper stands on heathland and grassland. Excludes stands within native pinewoods (F3.16#2). Heaths with much *Juniperus communis* ssp *nana* are included in F2.25.

F3.16#2 – stands of upright juniper scrub (W19*) within native pinewoods. Also forms part of G3.41€.

F3.17#1 - includes calcareous *Corylus avellana* scrub, typically on rocky slopes, corresponding to W9* but without *Fraxinus* or other canopy trees present. Also forms part of H9180 and so is included in G1.A2#1€.

F3.17#2 – includes *Corylus* scrub on limestone pavements, which also form part of H3.511€.

F3.17x - includes less-calcareous *Corylus avellana* scrub, corresponding to W11*.

F4 Temperate shrub heathland

F4.1 Wet heaths

F4.11 Northern wet heaths (M15* M16*) [H4010]

F4.13 *Molinia caerulea* wet heaths (M25*)

F4.2 Dry heaths (includes F4.21-F4.25) [H4030]

F4.21 Submontane *Vaccinium - Calluna* heaths (H12* H18* H21* H22*) [H4030*]

F4.22 Sub-Atlantic *Calluna - Genista* heaths (H9 H16*) [H4030*]

F4.23 Atlantic *Erica - Ulex* heaths (H8*) [H4030*]

F4.25 Boreo-Atlantic *Erica cinerea* heaths (H7* H10*) [H4030*]

F4: Annex I types

H4010 Northern Atlantic wet heaths with *Erica tetralix*

H4030 European dry heaths

Comments on EUNIS F4 types

F4.11 – equivalent to Annex I type H4010. It excludes M15 and M16 wet heath vegetation on deep peat, which is included in relevant D1.1 bog types.

F4.13 – this contains *Molinia*-dominated degraded wet heaths (M25a) on shallow peats or mineral soils. M25a on deep peat is assigned to D1.1 types.

F4.2 – equivalent to Annex I type H4030. It excludes dry heaths on coastal shingle (B2.5), coastal dunes (B1.5) and maritime cliffs (B3.3). Montane forms of several 'dry heath' NVC types (H10, H12, H16, H18 and H21) are included in F2.25 rather than F4.2.

F9 Riverine and fen scrubs

F9.2 *Salix* carr and fen scrub

F9.21 Grey willow carrs (W1 W2* W3* W5*)

F9.22 Sphagnum willow carrs (W4*)

F9.23 Bay willow carrs (W3*)

F9.3 Southern riparian galleries and thickets

F9.35 Riparian stands of invasive shrubs (non-NVC)

F9: Annex I types

None

Comments on EUNIS F9 types

F9.21 – excludes stands of W2, W3 and W5 dominated by alder (G1.41) or birch (G1.51). Small stands associated with W6 or W7 on alluvial rivers could be included in G1.21€.

F9.22 - excludes stands of W4 dominated by alder (G1.52) or birch (G1.51).

F9.23 – only includes stands of W3 with abundant *S. pentandra*. Stands with *S. cinerea* dominant are included in F9.21 and with alder dominant in G1.41.

F9.35 - includes stands of invasive knotweed species (*Fallopia japonica*, *F. sachalinensis*, *Persicaria wallichii*) even though not strictly 'shrubs'. Not described in the NVC but see Rodwell *et al.* (2000).

FA Hedgerows

- FA.1 Hedgerows of non-native species
- FA.2 Highly-managed hedgerows of native species
- FA.3 Species-rich hedgerows of native species
- FA.4 Species-poor hedgerows of native species

FB Shrub plantations

- FB.1 Shrub plantations for whole-plant harvesting
- FB.2 Shrub plantations for leaf or branch harvest
- FB.3 Shrub plantations for ornamental purposes or for fruit, other than vineyards
- FB.4 Vineyards

FA & FB: Annex I types

None

Comments on EUNIS FA & FB types

FA – the level 3 types are relevant to biodiversity in Scotland but are not defined further.

FB – these are artificial habitats including plantations of ornamental shrubs and fruit bushes (*Ribes/Rubus* spp.), also osier beds (FB.2) and vineyards. Orchards of fruit-bearing trees (such as apples and pears) are included in G1.D4 irrespective of stature.

11. WOODLAND, FOREST AND OTHER WOODED LAND (G)

This level 1 type includes four level 2 types in Scotland:

- G1 Broadleaved deciduous woodland
- G3 Coniferous woodland
- G4 Mixed deciduous and coniferous woodland
- G5 Lines of trees, small anthropogenic woodlands, recently felled woodland, early-stage woodland and coppice.

The approach adopted in this report is that all semi-natural woodlands should be included in G1 and G3. G4 should be restricted to mixed plantations, with mixed native pinewoods assigned to G3. Regarding G5, 'early stage woodland' resulting from natural regeneration should be included with the relevant G1 or G3 woodland type, as should other woodlands of relatively semi-natural character. G5 should be used only for 'forest' habitats resulting from relatively intensive management.

G1 Broadleaved deciduous woodland

G1.1 Riparian and gallery woodland, with dominant *Alnus*, *Betula*, *Populus* or *Salix*
G1.11 Riverine *Salix* woodland (W6*) [H91E0*]

G1.2 Mixed riparian floodplain and gallery woodland
G1.21 Riverine *Fraxinus* - *Alnus* woodland, wet at high but not at low water (W2* W5* W6* W7*) [H91E0*]
G1.21€ Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) (W2* W5* W6* W7*) (includes G1.11, G1.21) [H91E0]

G1.4 Broadleaved swamp woodland not on acid peat
G1.41 *Alnus* swamp woods not on acid peat (W2* W3* W5* W6* W7*)

G1.5 Broadleaved swamp woodland on acid peat
G1.51 Sphagnum *Betula* woods
G1.51# Birch bog woodland (W4* M17* M18*) [H91D0*]
G1.51x Other sphagnum *Betula* woods (W2* W4*)
G1.52 *Alnus* swamp woods on acid peat (W4*)

G1.6 *Fagus* woodland
G1.62 Atlantic acidophilous *Fagus* forests (W15)

G1.8 Acidophilous *Quercus*-dominated woodland
G1.81 Atlantic *Quercus robur* - *Betula* woods (W16*)
G1.83 Atlantic *Quercus petraea* woods (W11* W17*) [H91A0*]
G1.83€ Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles (W11* W17*) (includes G1.83, G1.91#) [H91A0]

G1.9 Non-riverine woodland with *Betula*, *Populus tremula* or *Sorbus aucuparia*
G1.91 *Betula* woodland not on marshy terrain
G1.91#1 Atlantic *Betula* - *Quercus petraea* woodlands (W11* W17*) [H91A0*]
G1.91#2 *Betula* woodland in native pinewoods (W11* W17*) [H91C0*]
G1.91x Other dry *Betula* woodlands (W10* W11* W16* W17*)
G1.92 *Populus tremula* woodland (W11*)

G1.A Meso- and eutrophic *Quercus*, *Carpinus*, *Fraxinus*, *Acer*, *Tilia*, *Ulmus* and related woodland

- G1.A1 *Quercus-Fraxinus-Carpinus betulus* woodland on eutrophic and mesotrophic soils (W10*)
- G1.A2 Non-riverine *Fraxinus* woodland
 - G1.A2#1 *Fraxinus* woodland of slopes, screes and ravines (W7* W8* W9*) [H9180*]
 - G1.A2#1€ *Tilio-Acerion* forests of slopes, screes and ravines (W7* W8* W9*) (includes F3.17#1, G1.A2#1) [H9180]
 - G1.A2#2 *Fraxinus* woodland on limestone pavement (W9*) [H8240*]
 - G1.A2x Other non-riverine *Fraxinus* woodland (W8*)

G1.C Highly artificial broadleaved deciduous forestry plantations

G1.D Fruit and nut tree orchards

G1.D4 Fruit orchards

G1.D4x1 Traditionally managed orchards

G1.D4x2 Intensively managed orchards

G1: Annex I types

H9180 *Tilio-Acerion* forests of slopes, screes and ravines (see also F3)

H91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

H91D0 Bog woodland (see G3.D1€)

H91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)

H8240 Limestone pavements (see H3.511€)

Comments on EUNIS G1 types

G1.11 – includes stands of W6 dominated by narrow-leaved willows, typically *Salix fragilis* (W6b). These form part of H91E0 and so are also included in G1.21€. Osier beds are excluded (see FB).

G1.21 - includes alderwoods associated with rivers, streams and flushes (W2* W5* W6* W7*). Excludes W2, W5 and W6 in basin mires and open-water transitions (G1.41).

G1.21€ - equivalent to Annex I type H91E0, comprising G1.11 and G1.21. Includes woods associated with rivers, streams and flushes (W2* W5* W6* W7*) dominated by *Alnus glutinosa*, or *Salix fragilis* (W6b). The word ‘alluvial’ is misleading since the Annex I habitat clearly also includes flushed alderwoods (*Alno-Padion*), which are specifically identified in the description in the EU Interpretation Manual (see also Rodwell & Dring, 2001).

G1.41 – includes non-acidic alderwoods in basin and open-water transition fens (W2* W3* W5* W6*) and W7 stands not included in G1.21 or G1.A2#1. Stands in alluvial/riverine situations form part of G1.21.

G1.51# - includes birch forms of bog woodland (H91D0*) consisting of naturally colonised and slow-growing open stands of *Betula pubescens* on relatively undisturbed bog or poor fen, typically intermediate in character between W4 and M17, M18 or other bog/poor fen types. Excludes stands resulting from artificial drainage/damage. Also forms part of G3.D1€.

G1.51x – consists of birch-dominated stands of W2 and W4, excluding birch bog woodland (G1.51#).

G1.52 – includes alder-dominated stands of W4 (uncommon).

G1.62 – *Fagus sylvatica* woodlands in Scotland are all of planted origin; although beech regenerates freely here, the accepted native range is limited to southern England (Rodwell & Dring, 2001). However NVC type W15 is widespread in the south and east of Scotland (Averis & Rodwell, 2006) and is included in this EUNIS type. W12 and W14 are of uncertain occurrence (single records in SW Scotland in Rodwell, 1991a, beyond main range) but if present would be included in G1.63 Medio-European neutrophile *Fagus* forests.

G1.81 – includes oak-dominated stands of W16.

G1.83 – includes oak-dominated stands of W11 and W17.

G1.83€ - equivalent to Annex I type H91A0. Includes G1.83 together with G1.91#.

G1.91#1 - birch-dominated stands of W11 and W17 which contain at least some oak, and which either (a) occur as part of an intimate mosaic with oak-dominated stands, or (b) are clearly successional stages reverting to oak woodland (JNCC, 2014).

G1.91#2 - birch-dominated stands of W11 and W17 which are intimately associated with native pinewoods (G3.41) and form part of G3.41€.

G1.91x – W10 and W16 birch-dominated woodlands, also W11/W17 birchwoods which are not intimately associated with native pinewoods (i.e. G1.91#2), and that do not meet the criteria for G1.9#1, in particular those which lie beyond the present-day natural distribution of oak, and also those within this range for which there is no historical evidence for the presence of oak (JNCC, 2014).

G1.92 – woodland stands (mostly W11) dominated by *Populus tremula*.

G1.A1 – oak-dominated forms of W10.

G1.A2#1 - comprises stands of *Fraxinus* woodland of types W8e-f and W9, typically on rocky slopes, screes and in ravines, together with associated stands of W7c. Excludes stands on limestone pavement (G1.A2#2).

G1.A2#1€ - equivalent to Annex I type H9180. It comprises type G1.A2#1 and calcareous 'Atlantic hazelwoods' of type F3.17#1.

G1.A2#2 - stands of G1.A2 on limestone pavement (W9*).

G1.A2x – includes stands of G1.A2 not corresponding to Annex I type H9180 or on limestone pavement (W8b).

G1.C – includes commercial plantations of poplar, beech and other broadleaves. Orchards are included in G1.D4.

G1.D4 – includes orchards of fruit-bearing trees (apples, pears etc) irrespective of stature. Plantations of fruiting shrubs (*Ribes/Rubus* spp.) are included in FB.

G1.D4x1 – this comprises orchards which meet the definition for the UK BAP priority habitat *Traditional orchards* (BRIG, 2008). Other orchards are included in G1.D4x2.

G3 Coniferous woodland

G3.4 *Pinus sylvestris* woodland south of the taiga
G3.41 Caledonian forest (W18*) [H91C0*]

G3.41€ Caledonian forest (Annex I) (W18* W19* W11* W17*) (includes F3.16#2, G1.91#2, G3.41) [H91C0]
G3.4F European *Pinus sylvestris* reforestation (W18*)

G3.D Boreal bog conifer woodland

G3.D1 Boreal *Pinus sylvestris* bog woods (W18* M18* M19*) [H91D0*]

G3.D1€ Bog woodland (W4* W18* M17* M18* M19* other) (includes G1.51#, G3.D1) [H91D0]

G3.F Highly artificial coniferous plantations

G3.F1 Native conifer plantations (W18*)

G3.F2 Exotic conifer plantations (non-NVC types)

G3: Annex I types

H91C0 Caledonian forest (see also F3 and G1)

H91D0 Bog woodland (see also G1)

Comments on EUNIS G3 types

G3.41 – corresponds to semi-natural pinewoods (W18*) within the native range of *Pinus sylvestris*. Excludes Scots pine forms of Bog woodland (G3.D1), Scots pine plantations within the native range (G3.4F) and other planted Scots pine stands (G3.F1).

G3.41€ - corresponds to the Annex I type H91C0, and includes G3.41 together with small associated stands of G1.91#2 and F3.16#2.

G3.4F – includes semi-natural W18 plantations within the native range of *P. sylvestris*.

G3.D1 – includes forms of Bog woodland (H91D0) consisting of naturally colonised stands of *P. sylvestris* on relatively undisturbed bog, typically intermediate in character between W18 and blanket bog (M18 or M19). Excludes stands resulting from artificial drainage/damage.

G3.D1€ – equivalent to Annex I type H91D0, comprising pine bog woodlands (G3.D1) and birch bog woodlands (G1.51#).

G3.F1 – corresponds to *Pinus sylvestris* plantations outside its native range.

G4 Mixed deciduous and coniferous woodland

G4.F Mixed forestry plantations

G5 Lines of trees, small anthropogenic woodlands, recently felled woodland, early-stage woodland and coppice

G5.1 Lines of trees

G5.7 Coppice and early-stage plantations

G5.8 Recently felled areas

G4 & G5: Annex I types

None

Comments on EUNIS G4 & G5 types

As indicated above, the approach taken here is that all semi-natural woodlands should be included in G1 and G3. G4 should be restricted to mixed plantations, with mixed native

pinewoods assigned to G3. G5.2 – G5.6 should be assigned to the most appropriate type in G1, G2 or G3.

G5.6 - 'early stage woodland' resulting from natural regeneration should be included with the relevant G1 or G3 woodland type.

12. INLAND UNVEGETATED OR SPARSELY VEGETATED HABITATS (H)

This category includes four level 2 types in Scotland:

- H1 Terrestrial underground caves, cave systems, passages and waterbodies
- H2 Screes
- H3 Inland cliffs, rock pavements and outcrops
- H5 Miscellaneous inland habitats with very sparse or no vegetation.

Although cave and other subterranean habitats (H1) do occur in Scotland, survey to date has been limited. It is recommended that the level 3 types listed below should be adequate for categorising relevant habitats.

Rock and scree habitats in Scotland (H2 and H3) are poorly covered in EUNIS, and it is difficult to equate existing level 4 types to Scottish habitats, so a relatively simple approach has been taken here.

H1 Terrestrial underground caves, cave systems, passages and waterbodies

- H1.1 Cave entrances
- H1.2 Cave interiors
- H1.3 Dark underground passages
- H1.5 Underground standing waterbodies
- H1.6 Underground running waterbodies
- H1.7 Disused underground mines and tunnels

H1: Annex I types

None

Comments on EUNIS H1 types

The Annex I habitat H8310 *Caves not open to the public*, which needs to host specialist or endemic cave species or support important populations of Annex II species to qualify, is not considered to occur in Scotland.

H2 Screes

- H2.3 Temperate-montane acid siliceous screes
 - H2.31 Alpine siliceous screes (U21* non-NVC) [H8110*]
 - H2.31€ Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*) (U18* U21* non-NVC) (includes E4.14, H2.31 and H5.11#1) [H8110]
- H2.4 Temperate-montane calcareous and ultra-basic screes (OV38* OV40* non-NVC) [H8120*]
- H2.4€ Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*) (OV38* OV40* non-NVC) (includes H2.41 and H5.11#2) [H8120]

H2: Annex I types

H8110 Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*) (see also E4 and H3)

H8120 Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*) (see also H3)

Comments on EUNIS H2 types

H2 - the types listed above include screes on open slopes and in gullies, but exclude screes in the lowlands, which are scarce in Scotland and generally support other vegetation types (e.g. heath, scrub, grassland) and so can be assigned to other habitat types as relevant.

H2.31 – comprises stands of U21 on scree and other non-NVC types of vegetation, including bryophyte and lichen communities (Averis *et al.* 2004). Excludes stands of U18 on scree, which are included in E4.14.

H2.31€ – equivalent to Annex I type H8110 and includes E4.14 (U18*) and H5.11#1 as well as H2.31.

H2.4 – Includes stands of OV40 and OV38 on scree, as well as non-NVC vegetation types. No existing level 4 types seem to be relevant to Scotland.

H2.4€ - corresponds to Annex I type H8120, and includes H2.4 and basic fell-field habitats (H5.11#2).

H3 Inland cliffs, rock pavements and outcrops

H3.1 Acid siliceous inland cliffs

H3.1# Siliceous rocky slopes with chasmophytic vegetation (U18* U21* non-NVC) [H8220]

H3.1C Disused siliceous quarries

H3.2 Basic and ultra-basic inland cliffs

H3.25 Alpine and sub-mediterranean chasmophyte communities (OV39* OV40* non-NVC) [H8210]

H3.4 Wet inland cliffs

H3.42 Northern wet inland cliffs (U15 non-NVC)

H3.5 Almost bare rock pavements, including limestone pavements

H3.51 Pavements, rock slabs, rock domes

H3.511 Limestone pavements (OV38* OV39* OV40* CG10* non-NVC) [H8240*]

H3.511€ Limestone pavements (Annex I) (CG10* CG13* OV38* OV39* OV40* W9* non-NVC) (includes F2.29#2, F3.17#2, G1.A2#, H3.511) [H8240]

H3.51x Non-limestone rock slabs

H3: Annex I types

H8210 Calcareous rocky slopes with chasmophytic vegetation

H8220 Siliceous rocky slopes with chasmophytic vegetation

H8240 Limestone pavements (*see also F2, F3 and G1*)

Comments on EUNIS H3 types

H3.1# - equivalent to Annex I type H8220 in Scotland. Includes U21, also stands of U18 and other non-NVC types on siliceous cliffs and crags, and associated rocky gullies (see Averis *et al.*, 2004). Excludes disused quarries (H3.1C) and siliceous rock slabs/pavements (H3.51x).

H3.25 – equivalent to Annex I type H8210. Includes stands of OV39, OV40 and non-NVC plant assemblages on calcareous rocks and associated rocky gullies, but not on limestone pavement

H3.42 – as well as U15, other vegetation types may occur including non-NVC bryophyte assemblages (Averis *et al.*, 2004).

H3.511 – corresponds to limestone pavements with crevice vegetation corresponding to OV38, OV39 and OV40, CG10 grassland and assemblages of woodland species in grikes not specifically described in the NVC. Excludes stands on limestone pavements of W9 (G1.A2#2) and CG13 (F2.29#2), but is included with these in H3.511€.

H3.511€ - equivalent to Annex I type H8240, and includes associated *Fraxinus* woodland (G1.A2#2), *Corylus* scrub (F3.17#2) and *Dryas* stands (F2.29#2) as well as H3.511.

H3.51x – includes unvegetated siliceous slabs or pavements only. Excludes rock pavements with lichen communities (E4.22) or moss heaths (E4.23).

H5 Miscellaneous inland habitats with very sparse or no vegetation

H5.1 Fjell fields and other freeze-thaw features with very sparse or no vegetation

H5.11 Fjell fields with very sparse or no vegetation

H5.11#1 Acidic fell-fields (non-NVC) [H8110*]

H5.11#2 Basic fell-fields (non-NVC) [H8120*]

H5.3 Sparsely- or un-vegetated habitats on mineral substrates not resulting from recent ice activity

H5.31 Clay and silt with very sparse or no vegetation

H5.35 Gravel with very sparse or no vegetation

H5.36 Shallow rocky soils with very sparse or no vegetation

H5.37 Boulder fields

H5.6 Trampled areas

H5: Annex I types

H8110 Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*) (see H2.31€)

H8120 Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*) (see H2.4€)

Comments on EUNIS H5 types

It is recommended that most of these types should be included with associated vegetated habitats. Burnt areas (H5.5) should be assigned to the habitat from which they are derived e.g. areas of burnt heath should be assigned to the relevant heathland type.

H5.11 – includes a range of non-NVC fell-field habitats (Averis *et al.*, 2004). Rodwell *et al.* (2000) have proposed a *Festuca ovina-Oligotrichum hercynium* community to include some Scottish fell-field vegetation.

H5.11#1 – includes fell-field habitats on granite and other acidic substrates. Forms part of H8110 (see H2.31€).

H5.11#2 – includes fell-field habitats on basalt and other basic substrates. Forms part of H8120 (see H2.4€).

13. CULTIVATED AND ARTIFICIAL HABITATS (I & J)

I: REGULARLY OR RECENTLY CULTIVATED AGRICULTURAL, HORTICULTURAL AND DOMESTIC HABITATS

I1 Arable land and market gardens

- I1.1 Intensive unmixed crops
- I1.2 Mixed crops of market gardens and horticulture
- I1.3 Arable land with unmixed crops grown by low-intensity agricultural methods (OV1* OV3-4* OV7* OV9-10* OV13*)
- I1.5 Bare tilled, fallow or recently abandoned arable land (OV1* OV3-4* OV7* OV9-10* OV13*)

I2 Cultivated areas of gardens and parks

J: CONSTRUCTED, INDUSTRIAL AND OTHER ARTIFICIAL HABITATS

J1 Buildings of cities, towns and villages

J2 Low density buildings

J3 Extractive industrial sites

J4 Transport networks and other constructed hard-surfaced areas

J5 Highly artificial man-made waters and associated structures

J6 Waste deposits

I & J: Annex I types

None

Comments on I & J EUNIS types

I1.2 & I1.3 – may also include NVC types listed for I1.5

I1.3 & I1.5 – low-intensity cultivated and fallow areas on machair are included in B1.9 (Machair) rather than here.

For category J, types below level 2 are not listed here as these types are not considered in this report, except that category J1.31 (Old town walls) supports NVC types OV39*, OV41 and OV42.

14. HABITAT COMPLEXES (X)

As indicated above, this category is unusual in that it includes a series of habitat complexes, within which the component habitats can be described using relevant divisions of categories A-J. These complexes are all at Level 2.

Davies *et al.* (2004) describe them as 'frequently-occurring combinations or mosaics of individual habitat types, usually occupying at least 10 ha, which may be inter-dependent.' It was also noted that 'The listed habitat complexes represent preliminary draft proposals. They have not been subjected to rigorous scrutiny to ensure consistency. Some complex habitats have been listed above (e.g. valley mires D2.1).'

The types which may be relevant to Scotland are listed below, with perhaps the most useful semi-natural types underlined. However they have not been developed further in terms of correspondence with other classifications, and are not included in the spreadsheets.

X04 Raised bog complexes

X05 Snow patches

X06 Crops shaded by trees

X07 Intensively-farmed crops interspersed with strips of natural and/or semi-natural vegetation

X09 Pasture woods (with a tree layer overlying pasture)

X10 Mosaic landscapes with a woodland element (bocages)

X11 Large parks

X13 Land sparsely wooded with broadleaved deciduous trees

X15 Land sparsely wooded with coniferous trees

X16 Land sparsely wooded with mixed broadleaved and coniferous trees

X20 Treeline ecotones

X22 Small city centre non-domestic gardens

X23 Large non-domestic gardens

X24 Domestic gardens of city and town centres

X25 Domestic gardens of villages and urban peripheries

X27 Machair complexes

X28 Blanket bog complexes

15. ANNEX I HABITATS IN SCOTLAND

The relationship between the 52 Annex I habitats covered in this report and EUNIS categories is summarised in Annex 3 and explained in more detail in the relevant EUNIS chapters. The relationship between NVC communities and Annex I is included in the NVC-EUNIS spreadsheet (available separately). Corresponding BAP Priority habitats are also listed. Fuller descriptions of the Annex I habitats can be found on the JNCC website¹ and in the relevant Article 17 reports on the same website.

For each Annex I type (excluding saline lagoons) there is a single EUNIS code that can be used. Of these, 23 (45%) are existing EUNIS types that correspond directly to Annex I types. In 5 cases (10%) a new composite type has been proposed to combine existing EUNIS types. In 5 cases (10%) a single new type has been proposed. The remainder (35%) are a mixture of existing and proposed types. The most complex relationships occur amongst the woodland and freshwater habitats.

16. CONCLUSIONS

The habitat units set out in the catalogue above (sections 5-13) should enable all known terrestrial habitats in Scotland to be accommodated. The existing EUNIS classification provides almost comprehensive coverage of terrestrial habitats in Scotland. Nearly all habitat types can be accommodated within existing units, at varying levels, with very few 'gaps' to be filled by additions. A number of existing types have had to be divided into new sub-types to enable Annex I habitat to be separated out from non-Annex I habitat; and several additional 'composite' types have been created to ensure that Annex I habitats can be assigned to a single type where required.

As with any habitat classification, EUNIS has advantages and disadvantages compared to other classifications, according to the purpose for which it is used. The EUNIS classification as set out here does not currently replace the need for existing national classifications. Classification to NVC communities or sub-communities for example will continue to be useful for particular purposes e.g. for detailed site survey, selection of SSSIs and application of certain sections of the Common Standards Monitoring guidance. Unlike the NVC, EUNIS descriptions are not presently supported by floristic or other data. Nevertheless EUNIS would seem to have a valuable role to play in Scotland, not least as being a common language with the rest of Europe.

The author would welcome feedback on the contents of this manual.

¹ http://jncc.defra.gov.uk/ProtectedSites/SACselection/SAC_habitats.asp

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APPENDIX 1: TRANSLATION BETWEEN HABITATS DIRECTIVE ANNEX I AND EUNIS TYPES IN SCOTLAND

Only includes types that occur naturally in Scotland. Excludes fully marine types.

code	Annex I habitat name	EUNIS code	component codes for composite types
H1150	Coastal lagoons	n/a	A5.552-553, relevant parts of C3.2 and other marine types not dealt with in this manual
H1210	Annual vegetation of drift lines	B2.12	
H1220	Perennial vegetation of stony banks	B2.4€	B2.3 + B2.41 + B2.4# + B2.5 + B2.6
H1230	Vegetated sea cliffs of the Atlantic and Baltic coasts	B3.31€	B3.31 + B3.4
H1310	<i>Salicornia</i> and other annuals colonising mud and sand	A2.551	
H1330	Atlantic salt meadows (<i>Glaucopuccinellietalia maritimae</i>)	A2.54€	A2.53 + A2.54 + A2.556
H2110	Embryonic shifting dunes	B1.31	
H2120	Shifting dunes along the shoreline with <i>Ammophila arenaria</i> ('white dunes')	B1.32	
H2130	Fixed dunes with herbaceous vegetation ('grey dunes')	B1.41€	B1.41 + B1.47
H2140	Decalcified fixed dunes with <i>Empetrum nigrum</i>	B1.51	
H2150	Atlantic decalcified fixed dunes (<i>Calluno-Ulicetea</i>)	B1.52	
H2170	Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenariae</i>)	B1.62	
H2190	Humid dune slacks	B1.8	B1.81-B1.86
H21A0	Machairs	B1.9	
H2250	Coastal dunes with <i>Juniperus</i> spp	B1.63	
H3110	Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>)	C1.1#2€	C1.1#2 and relevant parts of C3
H3130	Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or of the <i>Isoëto-Nanojuncetea</i>	C1.2#2€	C1.1#1, C1.2#2 and relevant parts of C3
H3140	Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara</i> spp.	C1.2#1€	C1.1#3, C1.2#1 and relevant parts of C3
H3150	Natural eutrophic lakes with <i>Magnopotamion</i> or <i>Hydrocharition</i> -type vegetation	C1.3#€	C1.3# and relevant parts of C3
H3160	Natural dystrophic lakes and ponds	C1.4#€	C1.4# and relevant parts of C3
H3260	Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation	C2.3#€	C2.2#, C2.3# and relevant parts of C3
H4010	Northern Atlantic wet heaths with <i>Erica tetralix</i>	F4.11	

code	Annex I habitat name	EUNIS code	component codes for composite types
H4030	European dry heaths	F4.2	F4.21-F4.23 + F4.25
H4060	Alpine and Boreal heaths	F2.25	
H4080	Sub-Arctic <i>Salix</i> spp. scrub	F2.1#	
H5130	<i>Juniperus communis</i> formations on heaths or calcareous grasslands	F3.16#1	
H6130	Calaminarian grasslands of the <i>Violetalia calaminariae</i>	E1.B1	
H6150	Siliceous alpine and boreal grasslands	E4.32€	E4.115# + E4.117 + E4.21 + E4.32 + F2.11
H6170	Alpine and subalpine calcareous grasslands	E4.12€	E4.12 + F2.29#1
H6210	Semi-natural dry grasslands and scrubland facies: on calcareous substrates (<i>Festuco-Brometalia</i>)	E1.26	
H6230	Species-rich <i>Nardus</i> grassland, on siliceous substrates in mountain areas (and submountain areas in continental Europe)	E1.72#	
H6410	<i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>)	E3.511	
H6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	E5.59	
H6520	Mountain hay meadows	E2.24	
H7110	Active raised bogs	D1.11	
H7120	Degraded raised bogs still capable of natural regeneration	D1.12#	
H7130	Blanket bogs	D1.2	D1.21 + D1.22 + D1.24
H7140	Transition mires and quaking bogs	D2.33€	D2.31 + D2.32 + D2.33 + D2.39 + D2.3#
H7150	Depressions on peat substrates of the <i>Rhynchosporion</i>	D2.37	
H7220	Petrifying springs with tufa formation (<i>Cratoneurion</i>)	D4.1N	
H7230	Alkaline fens	D4.15€	D4.12 + D4.15 + D4.19 + D4.1C
H7240	Alpine pioneer formations of the <i>Caricion bicoloris-atrofuscae</i>	D4.24€	D4.17 + D4.24
H8110	Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i>)	H2.31€	H2.31 + E4.14 + H5.11#1
H8120	Calcareous and calcshist screes of the montane to alpine levels (<i>Thlaspietea rotundifolii</i>)	H2.4€	H2.4 + H5.11#2
H8210	Calcareous rocky slopes with chasmophytic vegetation	H3.25	
H8220	Siliceous rocky slopes with chasmophytic vegetation	H3.1#	
H8240	Limestone pavements	H3.511€	H3.511 + G1.A2#2 + F2.29#2 + F3.17#2

code	Annex I habitat name	EUNIS code	component codes for composite types
H9180	<i>Tilio-Acerion</i> forests of slopes, screes and ravines	G1.A2#1€	G1.A2#1 + F3.17#1
H91A0	Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	G1.83€	G1.83 + G1.91#1
H91C0	Caledonian forest	G3.41€	G3.41 + G1.91#2 + F3.16#2
H91D0	Bog woodland	G3.D1€	G3.D1 + G1.51#
H91E0	Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i>)	G1.21€	G1.21 + G1.11

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