A Guide to Habitats in Ireland

by Julie A. Fossitt

October 2000

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Obituary

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Ecologist and staunch defender of natural heritage

Julie Fossitt

Born: November 15th, 1964
Died: August 7th, 2022

Palaeobotanist Dr Julie Fossitt: published several key papers on the vegetation history of Britain and Ireland

Dr Julie Fossitt, who has died following a long illness, was a highly respected expert in and passionate advocate for Ireland's natural heritage. In her work as anecologist for the National Parksand Wildlife Service in the west of Ireland, she fought ardently for the protection of nature, often using European legislation to back her case against strong vested interests for proposed developments. In 2021, she was made afellow of the Chartered Institute of Ecology and Environmental Management in recognition of her contribution to ecology.

Fossitt was the author of the landmark publication, *A Guide to Habitats in Ireland* (The Heritage Council, 2000) which transformed the approach used to identify, describe and classify Irish habitats by offering clear definitions and codes which became the standard references points in public inquiries and planning decisions for infra-structural or building developments. The book continues to be widely used in education, nature conservation and environmental assessment.

Fossitt was also an acclaimed palaeo botanist whose academic focus was the ancient timbers preserved in peat bogs. This investigative work into the composition of ancient vegetation was the subject of her doctorate at St John's College, Cambridge University, and subsequent postdoctoral research with Prof Keith Bennett. She published several key papers on the vegetation history of Britain and Ireland

These include *The Late Quarternary Vegetation History of the Western Isles of Scotland* (New Phytologist, 1996) and *The Late Glacial and Holocene Vegetation History of Western Donegal* (1994, Royal Irish Academy).

The second of three children of farmer Roy and primary school teacher Lila Fossitt, Julie grew up in Walsh Island, Co Offaly where she had the freedom to explore the family farm and the adjacent Bog of Allen, Co Kildare. As an adult, she of ten returned to her family homeand loved walking the bog, describing it as her favourite habitat.

Postgraduate studies

Following her secondary school education at Drogheda Grammar School and Newtown School in Waterford City, Julie Fossitt went to Trinity College Dublin to study natural sciences, specialising in botany. She graduated in 1987. From there, she went to St John's College, Cambridge, for postgraduate studies and completed her doctorate and post-doctorate research there with Prof Keith Bennett in the Department of Geography.

Throughout both her secondary and third level education, she was a keen hockey player. Having been on the team at Newtown School to win the Kate Russell Cup (the All Ireland Schoolgirls Hockey Cham-pionships) in 1981, she went on to play hockey at TCD and was awarded a Cambridge Blue for competing at the highest level of hockey at that university. Following her return to Ireland, she worked for a time as an ecologist for Tipperary Co Council and was contracted by the Heritage Council to write A Guide to Habitats in Ireland.

Fossitt then worked for Natura Consultants for a couple of years before taking up a position as anecologist for the National Parks and Wildlife Service (NPWS) based in Galway. She was happier protecting natural heritage sites than defending developers whose work might encroach on them.

Planning applications

She often represented the NPW Satoral hearings (public inquiries) into planning applications. And she was the key expert whose advice resulted in the refusal of the Galway City Outer Bypass following a European Court of Justice case in 2013.

"She was often abrave, lone voice to protect Special Areas of Conservation and Special Protection Areas under threat to public or private develop-ments," said one long-time associate.

Popular among her colleagues, she was rigorous and tenacious in her work, yet generous in sharing her deep understanding of environmental and planning legislation with voluntary naturalist groups, students and other ecologists.

She was an inveterate field worker at home in all landscapes and weathers. She walked many miles across some of the wildest landscapes on these islands, searching for suitable lochs and tree remains.

"She was very sociable and had a wicked sense of humour. She kept us all entertained and prevented us from taking ourselves too seriously," said a colleague who accompanied her on many field trips. "She was an absolute legend a force for nature and an inspiration to all her colleagues," said another.

Outside of her work, Fossitt loved to travel, going on cycling trips around Ireland and Scotland and travelling to Zimbabwe, Canada, Alaska, South Africa and Chile, always exploring natural environments wherever she went.

Julie Fossitt is survived by her mother, Lila; her siblings, Sally and Andrew; her nieces and nephews, Sophie, Adam, Sam, Holly, Rachel, Matthew; her brother-in-law Hugh, sister-in-law Trish and her many friends and colleagues. Her father Roy predeceased her in 2021.

Julie Fossitt - An appreciation

This is the Heritage Council's third print run, and the second edition, of this massively popular and fundamental publication. Julie Fossitt was commissioned to draft the text of the 2000 guide and did so with great aptitude and focus to detail, that we are still producing copies, generally unaltered for ecologists that are beginning their careers, students learning their fieldcraft and those more experienced whose first edition is so badly dog-eared, scribbled in, or damaged from peat stains that it needs to be retired.

'A Guide to Habitats in Ireland' is by far the Heritage Council's most sought-after publication and it was such a shock, to the staff in the Heritage Council, to hear in August 2022, of Julie's passing. The Heritage Council hope that Julie's extended family will take some comfort in the immense legacy that Julie has left, and that we all hold so dear in regard to this important publication and in the knowledge that Ireland's recorded habitats, no matter how threatened, are in a safer place on foot of Julie's work, not just in regard to this publication but in all she applied herself too in her wider work.

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FOREWORD

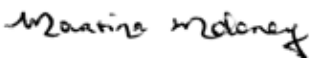
Two decades after the heritage council commissioned this publication, it is a testament to Dr Julie Fossitt's work that 'A Guide To The Habitats In Ireland' is still held in such esteem. In recent times, finding a hardcopy is as rare as tufa formations in Co. Carlow. Despite a generous first run on publications and publishing all contents on the heritage council website[1], those new to the field, especially ecological students, regularly contact the heritage council seeking a hardcopy that can accompany them as they traverse the complex array of irish habitats in the field.

The guide sets out a standard scheme for identifying, describing and classifying wildlife habitats in ireland. It covers natural, semi-natural and artificial habitats of terrestrial and freshwater environments, of inshore marine waters, and of urban and rural areas. The classification is presented within a hierarchical framework and is designed for application at a variety of different levels in terms of scale, detail and user expertise.

It has been stated previously, that this guide is intended as a working document that will evolve and be revised over time. However, it was decided not to amend or augment the original text from 2000 at this time. Rather, for some practical advice on applying the guide in the field the reader is referred to best practice guidance for habitat mapping and surveying[2]. The challenge of developing a detailed scheme at the level of plant communities has now been taken up by the irish vegetation classification[3] and users of this guide may well find the material available on the national biodiversity data centre website to be of interest.

This publication has been the foundation of so much solid ecological mapping and monitoring; it has been used to inform planners and scientists alike for two decades now, we now look forward to new developments, new methodologies and better futures for our wild places. Finally, The Heritage Council in publishing, acknowledges the co-operation of many agencies and individuals and in particular the National Parks and Wildlife Service (DHLGH), but in particular to Dr. Julie Fossitt (RIP) for her dedication in ensuring we have this resource to reference.

Virginia Teehan
Chief Executive



Martina Maloney
Chair

[1] Https://Www.heritagecouncil.ie/Content/Files/Guide_to_habitats_2007_5mb.pdf
[2] https://www.heritagecouncil.ie/content/files/best_practice_guidance_habitat_survey_mapping_onscreen_version_2011_8mb.pdf
[3] https://www.biodiversityireland.ie/ivc

ACKNOWLEDGEMENTS

The Heritage Council is extremely grateful for the assistance of the many people who gave freely of their time to facilitate the production of this guide.Without their assistance, this publication would not have been possible.

The impetus for the production of this guide came from Richard Nairn who wrote to the Heritage Council identifying the need for such a reference document. The Heritage Council agreed to produce this guide, and under the chairmanship of John O'Hallorana steering committee was established to advise on the production of the guide. This steering committee comprised individuals who have experience of working in the area of habitat description for a variety of purposes.

The steering committee members were: Mark Costello, John Cross, Jimmy Dunne, Pat Gilheaney, Roger Goodwillie, Mike Gormally, Declan Little, Mortimer Loftus, Liam Lysaght, Brian Madden, Richard Nairn, Colmán Ó Críodáin, John Rochford, Micheline Sheehy Skeffington, Chris Smal and John Wilson. Julie Fossitt was commissioned to draft the text of the guide.

In addition to the members of the steering committee, a number of other people contributed to different drafts of the guide. The Heritage Council is very appreciative of the contribution of staff members of Dúchas, The Heritage Service who channelled their detailed contributions through Colmán Ó Críodáin. These include Tom Curtis, Catriona Douglas, Neil Lockhart, Aileen O'Sullivan, Jim Ryan, Liz Sides and Mike Wyse Jackson. Others who contributed include: Clare Byrne, Louise Collier, Paul Corbett, Jennifer Dowse, Katherine Duff, Chris Emblow, Brenda Healy, Anne Hudson, Mona McCrea, Anne-Marie McKee, Austin O'Sullivan, Cilian Roden, Nick Scott, Shaun Wolfe-Murphy and the third year Environmental Science students (1998/99) at National University of Ireland, Galway.

An editing committee consisting of Colmán Ó Críodáin, Julie Fossitt, Roger Goodwillie, Liam Lysaght, Richard Nairn, Micheline Sheehy Skeffington, and chaired by John O'Halloran, oversaw the detailed editing of the final draft for publication.

Thanks are due to Gerard Doyle and Matthijs Schouten who kindly agreed to review the document prior to publication.

While every effort was made to minimise errors or omissions in the text, the Heritage Council accepts responsibility for such ommissions or errors.

INTRODUCTION

Summary

This guide sets out a standard scheme for identifying, describing and classifying wildlife habitats in Ireland. It covers natural, semi-natural and artificial habitats of terrestrial and freshwater environments, of inshore marine waters, and of urban and rural areas. The classification is presented within a hierarchical framework and is designed for application at a variety ofdifferent levels interms of scale, detail and user expertise. It is intended as a first-step approach for general habitat recording rather than as a basis for detailed study and evaluation. The availability and widespread use of a standard classification scheme is important in that it will help to standardise data collection on habitats which, in turn, will assist in the management and conservation of Ireland's natural heritage. This guide is intended as a working document that will evolve and be revised over time.

The role of the Heritage Council

The Heritage Council is an independent body with a statutory responsibility to propose policy and provide advice on issues relating to the protection, preservation and enhancement of the national heritage. Since its establishment in 1995, the Heritage Council has played an important role in setting up and funding projects that deal specifically with the collection of data. This *Guide to Habitats in Ireland* was produced to fill an important gap that existed and to facilitate the standardised recording of habitat information in the future.

Future revision of the classification

Despite the considerable effort that has gone into the production of this classification, it is inevitable that it will eventually require revision, to take account of developments - both nationally and internationally - in the fields of habitat classification and ecology. As a result, the scheme will require a 'custodian' who can take on board users' comments and other appropriate information that might emerge over time.

Backgroundand rationale

Habitats are the basic building blocks of the environment that are inhabited by animals and plants, and which are important as units for site description and conservation management. Ahabitat is described as the area in which an organism or group of

organisms lives, and is defined by the living (biotic) and non-living (abiotic) components of the environment. The latter includes physical, chemical and geographical factors, in addition to human impact or management.

Habitats are recorded, described and mapped for a variety of different reasons. It is important, therefore, that a standard approach is used when recording habitat information. This guide sets out a hierarchical classification scheme that is intended to facilitate habitat identification and differentiation at a general level. While it is acknowledged that no single classification scheme can meet all the needs of all the potential users, there can be little dispute about the need for a common and comprehensible language when referring to habitats. Widespread use of this scheme would help to standardise data collection on habitats, thereby enhancing compatibility and the potential value of data collected. It should also facilitate baseline surveys of sites and habitat resources at local, regional or national scales.

A number of important considerations were taken into account in developing the classification scheme.

- It should be seen as a first-step approach, intended for widespread and general use, and not as a basis for detailed study and evaluation.
- It should be 'user-friendly' or accessible to a range of users, including non-specialists.
- It should be hierarchical to facilitate the recording of habitat details at different levels.
- It should focus attention on habitats of particular conservation importance that might require more detailed investigation.
- It should be possible to apply on single site visits, at almost any time of the year, and without the need for detailed follow-up work.
- It should be compatible, where possible, with other schemes that are already in use in this country.
- It should be seen as a working document that will evolve and be revised over time.

At the same time, however, it must be acknowledged that habitat identification and differentiation can be difficult in practice and no written guide, however comprehensive, can substitute for expertise and experience.

Habitats of particular conservation importance include those that are listed in Annex I of the Habitats Directive (see Appendix 1), and habitats that support populations of rare or notable species such as those listed in Annex I of the Birds Directive, Annex II and IV of the Habitats Directive, and in the Irish Red Data Books for vascular plants (Curtis and McGough, 1988), stoneworts (Stewart and Church, 1992) and vertebrates (Whilde, 1993).

Outline and structure of the classification

The classification scheme covers natural, semi-natural and artificial habitats of terrestrial, freshwater and marine environments, and of rural and urban areas. Habitat categories are arranged within a series of ordered groupings to produce a hierarchical framework that operates on three levels. The scheme identifies 11 broad habitat groups at level 1, 30 habitat subgroups at level 2, and 117 separate habitats at level 3. Categories are given identifying codes at each level and, where possible, these reflect the names of habitat groups or subgroups. The hierarchy, shown in full on pages 18-21, acts as a key to the classification.

The majority of terrestrial and freshwater habitats (non-marine section) are classified on the basis of vegetation characteristics, supplemented by references to aspects of the physical environment or management, where this enhances descriptions or distinctions. Vegetation is usually easy to observe and record and, in itself, reflects the underlying geological, edaphic and hydrological conditions, or climate. In situations where vegetation is not the predominant habitat feature, as in the case of some freshwater or exposed rock habitats, for example, vegetation characteristics are less significant but colonising plants may be important indicators. Habitat classification in the marine section, in contrast, is based primarily on features of the physical and chemical environment, including substratum type (rock or sediment), vertical zonation, exposure to wave action or tidal currents, and salinity. Animal communities are also important indicators of marine habitats.

Difficulties are encountered when classifying habitats in the transition zone from fully marine to fully terrestrial conditions, owing to different approaches to habitat classification in these contrasting environments, and some degree of compromise has been unavoidable. Most habitats in this transition zone have been subdivided between the coastland and the marine littoral (intertidal) sections of the classification. The former includes habitats of the coast that are primarily terrestrial while the latter includes habitats of the seashore that are primarily marine, but there are exceptions. Beyond the littoral (intertidal) zone, the marine environment can be classified in terms of seabed habitats in the marine sublittoral (subtidal) section, or as broader seascape units in the 'marine water body' section.

Efforts have been made to avoid excessive duplication and overlap of habitat categories where possible. As a result, habitats of montane and urban regions, or islands, are not categorised separately if they can be placed in other parts of the classification. Irish mountains, for example, are characterised by a range of grassland, heath, blanket bog or exposed rock habitats. In the same way, islands in rivers, lakes or marine water bodies should not be seen as habitats in themselves but as areas of land that support other habitats. A similar approach has been adopted with regard to a range of landscape features such as embankments, field boundaries, river or canal banks, and dry ditches, but there are some exceptions.

Urban areas support habitats that occur elsewhere in the wider countryside. However, the scale of habitat recording and the significance of small sites are often very different owing to the limited range and extent of habitats that exist in an urban setting. Important areas for wildlife in cities include the grounds of institutions, private gardens, municipal parks, cemeteries, railway embankments, canals, canal banks and walls. Habitats are also associated with dereliction or disturbance and may therefore be very transient in nature. Urban habitats are often characterised by a significant component of non-native plants, including those that have been cultivated and those that have escaped from gardens and become naturalised.

Instructions for users

This manual has been produced as a general guide to habitats and their classification in Ireland. Details of a standard methodology for its application are not included since the guide has not been produced with any specific survey in mind. Instead it is aimed at a range of users involved in habitat recording and mapping for a range of different reasons. The scale at which habitats should be recorded and mapped is not specified as this depends on the objectives of a particular study or the needs of the user. In urban situations, for example, important areas for wildlife tend to be small, scattered and highly fragmented, and this must be reflected in the scale of habitat recording. In contrast, broader regional or national habitat surveys may need to generalise and reduce the level of detail recorded. The scheme has an in-built hierarchy to allow for application at different spatial scales, and for grouping or subdividing habitat information at different levels.

One important point, however, is that habitats should be recorded as they are at the time of the site visit or survey. Certain categories have been included to allow for situations where the future use of a piece of land, or the type of crop or recolonising vegetation, is unknown or does not, as yet, define the habitat.

The identification and differentiation of habitats is often difficult in practice. Habitats frequently merge or grade from one to another, or form complex mosaics, with the result that a continuum of variation often exists within and between different habitat types. This may be entirely natural but, in many cases, management, damage and disturbance blur the distinctions between habitats. Drainage, fertiliser use or heavy grazing, for example, may significantly alter habitat structure, function, quality and species composition. The classification of transitional or degraded habitats is usually problematical. Another complicating factor is that many habitats are dynamic and may exist in different forms at different times of the year e.g., hay meadows, reedbeds, areas of dense bracken, or turloughs.

Framework of the classification

The list of habitats from the National Parks and Wildlife Service's *National ASI Survey* manual (Lockhart et al., 1993) was used as the framework for the new habitat classification scheme. Although unpublished, this manual has been widely used in surveying sites of conservation importance in Ireland. There were additional inputs from a range of other sources including, in particular, the British *Handbook for Phase 1 habitat survey* (Joint Nature Conservation Committee, 1993), the *Interpretation manual of European Union habitats* (European Commission, 1996) and the *Marine Nature Conservation Review: marine biotope classification for Britain and Ireland* (Connor et al., 1997a, b).

The *Handbook for Phase 1 habitat survey* was originally developed by the British Nature Conservancy Council and has evolved as the standard methodology for general habitat surveys in Britain (Joint Nature Conservation Committee, 1993). It is also used in Ireland. The level of application of Phase I, and the projected users of that scheme, are analogous in many ways to those targeted by the present guide.

The *Interpretation manual of European Union habitats* (European Commission, 1996) is a guide to habitats in Annex I of the Habitats Directive (Directive 92/43/EEC, amended by Directive 97/62/EC). It is based on the hierarchical classification of European habitats that was developed as part of the CORINE Biotopes Project (Commission of the European Communities, 1991). Ireland supports 60 Annex I habitats that require special conservation measures and, of these, 16 are priority types that are considered to be in danger of disappearance (see Appendix 1). It is important, therefore, that attention be drawn to all Annex I habitats because of their significance for nature conservation and environmental policy at national and European levels.

The marine biotope classification was developed by the Marine Nature Conservation Review as a contribution to the BioMar project to aid the conservation and management of marine habitats (Connor et al., 1997a, b). It is the first and only hierarchical classification of all inshore littoral (intertidal or seashore) and sublittoral (subtidal or seabed) biotopes that is applicable to Ireland. A biotope is defined as a combination of the physical habitat and the characteristic community of animals and/or plants. The upper two levels of the marine biotope classification, namely broad habitats and habitat complexes, are followed closely in the marine section of the classification.

Numerous other ecological and botanical studies were consulted in developing the classification. The most widely used were the British National Vegetation Classification, published in five volumes of *British Plant Communities* (Rodwell, 1991-2000), and

phytosociological classifications of plant communities including *'The vegetation of Ireland: a catalogue raisonné'* (White and Doyle, 1982) and *'Phytosociological conspectus of British plant communities'* (Rodwell, 2000). Phytosociology is a long-established botanical discipline that classifies plant communities on the basis of floristic composition. Many of the existing habitat classification schemes are loosely based on phytosociological classifications. For terrestrial vegetation types in Ireland, the principal sources are as follows: grasslands - O'Sullivan (1982); raised bogs - Cross (1990), Schouten (1984); blanket bogs - Doyle (1990), Schouten (1984); fens - Ó Críodáin and Doyle (1994); woodlands - Kelly and Moore (1975), Kelly (1981), Kelly and Kirby (1982), Cross (1992), Kelly and Iremonger (1997); salt marshes - Sheehy Skeffington and Wymer (1991), Sheehy Skeffington and Curtis (2000); sand dunes - Bassett and Curtis (1985), Curtis (1991).

Links with other schemes

Links with Annex I habitats are indicated throughout the text and in an equivalence table in Appendix 1. Priority habitats are highlighted with an asterisk '*'. Codes are given as Natura 2000 habitat codes. In this way, attention is drawn to the possible occurrence of Annex I habitats. However, correspondence is not exact in many cases and the *Interpretation manual of European Union habitats* (European Commission, 1996) should always be consulted. Annex I habitats are often subtypes of habitat categories in the present classification and, in many cases, identification will require the collection and appropriate analysis of additional data. Habitat quality and diversity are important factors that must also be taken into account when identifying Annex I habitats.

The equivalence table in Appendix 1 also shows links between habitat categories in the present classification and habitat complexes from level 2 of the BioMar marine biotope classification. Correspondence between the two schemes is close but is not always exact.

Links with established phytosociological units, known as syntaxa, are outlined in Appendix 2. Syntaxonomic nomenclature is derived from *'Phytosociological conspectus of British plant communities'* (Rodwell, 2000) and takes account of current consensus among European phytosociologists regarding a standard nomenclature at class (level 1) and order (level 2) level. Correspondence is made at order level in the phytosociological hierarchy as a general rule. In a few instances, alliances (level 3) are listed where it is considered that they serve to clearly distinguish two separate habitat categories. Correspondence between phytosociological syntaxa and habitat categories in this classification is only approximate in most cases; the syntaxon given relates to the vegetation that is found most frequently in the habitat concerned and/or occurs over the greater part of it.

Nature conservation issues

It is envisaged that this guide to habitats will have a range of uses and applications. Many of these will have a bearing on nature conservation, even when this is not the primary concern. The following points are raised to draw attention to situations where more detailed investigation might be required.

- Different examples of the same type of habitat will vary in terms of their overall interest and importance for conservation. Some may be of higher diversity or may support rare species, while others may be degraded as a result of inappropriate human activity. This guide does not undertake to provide a basis for the evaluation of individual habitats or sites.

- Likewise, there are a range of human activities that can lead to the alteration, degradation or destruction of various habitat types. For example, any landuse or development that increases the level of plant nutrients in watercourses is likely to impact negatively on aquatic or wetland habitats. Some landuses are beneficial at a certain level but destructive when they become more intensive; some landuses are beneficial to some habitats and destructive to others. It is beyond the scope of this guide to address these issues. It will assist in the identification of habitats but assessment of the impacts of proposed developments is a separate exercise.

- The value of a habitat for invertebrate fauna is not directly related to its importance for either plants or vertebrates. Many invertebrates use different habitats at different stages of their life cycles, yet their low mobility in some cases means that these habitats must be located close together. The structural components of the habitat (vegetation height, the extent of canopy cover) are often more important than floristic composition. Some species are specialists in microhabitats, such as decaying logs. Consequently a mosaic of suitable habitats or microhabitats is often required.

- While semi-natural habitats are generally more valuable than artificial or heavily managed ones, the latter can contain features of particular conservation interest. Gravel pits, quarries and other areas of disturbed ground can host a suite of specialist rare plants. Fields of heavily fertilised grassland are used as feeding areas by a number of wildfowl species. A range of rare plants may colonise buildings, particularly older ones in a rural setting, or old stone bridges. These buildings can also serve as refuges for rare or noteworthy animals such as bats.

Species nomenclature

Species nomenclature follows Webb et al. (1996) for Latin names of vascular plants; Scannell and Synnott (1987) for common names of vascular plants; Purvis et al. (1992) for lichens; Smith (1978) for mosses; and Howson and Picton (1997) for marine flora and fauna.

SUMMARY OF THE CLASSSIFICATION

NON-MARINE					
F	**Freshwater**	**FL** Lakes and pond	**FL1**	Dystrophic lakes	23
			FL2	Acid oligotrophic lakes	24
			FL3	Limestone/marl lakes	24
			FL4	Mesotrophic lakes	25
			FL5	Eutrophic lakes	25
			FL6	Turloughs	25
			FL7	Reservoirs	26
			FL8	Other artificial lakes and ponds	26
		FW Watercourses	**FW1**	Eroding/upland rivers	27
			FW2	Depositing/lowland rivers	28
			FW3	Canals	29
			FW4	Drainage ditches	29
		FP Springs	**FP1**	Calcareous springs	30
			FP2	Non-calcareous springs	30
		FS Swamps	**FS1**	Reed and large sedge swamps	31
			FS2	Tall-herb swamps	31
G	**Grassland and marsh**	**GA** Improved grassland	**GA1**	Improved agricultural grassland	33
			GA2	Amenity grassland (improved)	34
		GS Semi-natural grassland	**GS1**	Dry calcareous and neutral grassland	34
			GS2	Dry meadows and grassy verges	36
			GS3	Dry-humid acid grassland	36
			GS4	Wet grassland	37
		GM Freshwater marsh	**GM1**	Marsh	38
H	**Heath and dense bracken**	**HHS** Heath	**HH1**	Dry siliceous heath	41
			HH2	Dry calcareous heath	42
			HH3	Wet heath	42
			HH4	Montane heath	43
		HD Dense Bracken	**HD1**	Dense bracken	44

NON-MARINE					
P	**Peatlands**	**PB** Bogs	**PB1**	Raised bog	47
			PB2	Upland blanket bog	48
			PB3	Lowland blanket bog	49
			PB4	Cutover bog	50
			PB5	Eroding blanket bog	50
		PF Fens and flushes	**PF1**	Rich fen and flush	51
			PF2	Poor fen and flush	52
			PF3	Transition mire and quaking bog	53
W	**Woodland and scrub**	**WN** Semi-natural woodland	**WN1**	Oak-birch-holly woodland	56
			WN2	Oak-ash-hazel woodland	56
			WN3	Yew woodland	57
			WN4	Wet pedunculate oak-ash woodland	57
			WN5	Riparian woodland	58
			WN6	Wet willow-alder-ash woodland	58
			WN7	Bog woodland	59
		WD Highly modified/ non-native woodland	**WD1**	(Mixed) broadleaved woodland	59
			WD2	Mixed broadleaved/conifer woodland	60
			WD3	(Mixed) conifer woodland	60
			WD4	Conifer plantation	60
			WD5	Scattered trees and parkland	60
		WS Scrub/transitional woodland	**WS1**	Scrub	61
			WS2	Immature woodland	62
			WS3	Ornamental/non-native shrub	62
			WS4	Short rotation coppice	62
			WS5	recently-felled woodland	62
		WL Linear woodland/ scrub	**WL1**	Hedgerows	63
			WL2	Treelines	63

NON-MARINE					
E	**Exposed rock and disturbed ground**	**ER** Exposed rock	**ER1**	Exposed siliceous rock	65
			ER2	Exposed calcareous rock	65
			ER3	Siliceous scree and loose rock	66
			ER4	Calcareous scree and loose	67
		EU Underground rock	**EU1**	Non-marine caves	67
			EU2	Artificial underground habitats	67
		ED Disturbed ground	**ED1**	Exposed sand, gravel or till	68
			ED2	Spoil and bare ground	68
			ED3	Recolonising bare ground	69
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FRESHWATER

River Nore, Co. Kilkenny *(L.Lysaght)*

Habitat categories and codes	**FL** LAKES AND PONDS	**FL1** Dystrophic lakes **FL2** Acid oligotrophic lakes **FL3** Limestone/marl lakes **FL4** Mesotrophic lakes **FL5** Eutrophic lakes **FL6** Turloughs **FL7** Reservoirs **FL8** Other artificial lakes and ponds
	FW WATERCOURSES	**FW1** Eroding/upland rivers **FW2** Depositing/lowland rivers **FW3** Canals **FW4** Drainage ditches
	FP SPRINGS	**FP1** Calcareous springs **FP2** Non-calcareous springs
	FS SWAMPS	**FS1** Reed and large sedge swamps **FS2** Tall-herb swamps

This section includes all bodies of freshwater that may be either natural, modified or entirely artificial, and that are either permanent or seasonal. Areas of land that flood temporarily in winter or during very wet periods are excluded if there is no differentiation or evidence of a shoreline or draw-down zone, and if there are no aquatic plants. Springs that are maintained by a more or less continual supply of moving water are included in this section, as are swamps. Swamps are an integral part of many freshwater bodies but may also occur in brackish waters and tidal situations. Note, however, that apart from swamps, all other brackish water and tidal habitats are excluded.

LAKES AND PONDS

Lakes and ponds include all bodies of open or standing freshwater that lack a strong unidirectional flow of water. These can be either natural, modified or entirely artificial, as in the case of some reservoirs, ornamental lakes, or flooded quarries and gravel pits, and may be either temporary or seasonal as in the case of turloughs and some ponds. Artificial linear water bodies with no obvious connection to a wider drainage network are also included here. To distinguish a lake from a wide stretch of river, most of the water in the former should be either standing, moving imperceptibly or circulating within the basin, as opposed to moving with a strong unidirectional flow. Note that no distinction is made between lakes and ponds.

Only the area of open water, with or without floating or submerged aquatic vegetation, is included here. This is taken as the area normally occupied by a water body in situations where water levels fluctuate, or as the normal limit of flooding in the case of seasonal or temporary lakes and ponds. Swamps **(FS1-2)**, which may include floating mats or surface scraws of vegetation, and any other peripheral wetland habitats, are excluded. Note that some tall reeds die back in winter and have a late but vigorous growing season; their full extent may not be evident before about mid-May. Any fish farming operations should be categorised separately under **fish cages and rafts - CC2**.

The classification of most open water bodies is largely based on the trophic, or nutrient status of the water. The concentrations of phosphorus and phytoplankton, which require measurements in the laboratory, have well defined categories to recognise oligotrophic, mesotrophic and eutrophic water bodies. Because the present classification is based on vegetation and not actual values of water quality parameters, this approach is only loosely applied here. **Turloughs - FL6, reservoirs - FL7 and other artificial lakes** and **ponds - FL8** are considered separately but may also differ in terms of their trophic status.

Dystrophic lakes FL1

This category includes lakes and ponds that are highly acidic (pH 3.5-5.5), base-poor and low in nutrients, and where the water is brown in colour owing to inputs of humic and other acids from peat. They are usually associated with blanket bogs, mainly the lowland type, and are characterised by peaty rather than rocky margins and substrata. The transition from bog to open water is often abrupt. Among the aquatic plants that colonise these lakes are bladderworts *(Utricularia spp.)*, pondweeds *(Potamogeton natans, P. polygonifolius)* and Bogbean *(Menyanthes trifoliata)*. Aquatic *Sphagnum* mosses such as *S. auriculatum* and *S. cuspidatum* may also be present.

Links with Annex I: Corresponds to the annexed habitat, 'natural dystrophic lakes and ponds (3160)'.

Acid oligotrophic lakes FL2

This category includes lakes and ponds that are low in nutrients, base-poor and acidic; those that are oligotrophic and base-rich should be considered under **limestone/marl** lakes - FL3. Most acid oligotrophic lakes are associated with areas of acidic bedrock and many have rocky margins. The substratum in shallow water is either rock, organic lake sediment, or coarse mineral material (sand and gravel). Water is often brownish in colour as a result of inputs from peaty soils or bogs in the catchments. These lakes support communities of submerged and floating aquatic plants. Small submerged aquatics such as Shoreweed (Littorella uniflora), Water Lobelia (Lobelia dortmanna) and Bulbous Rush (Juncus bulbosus) occur in shallow water. Quillworts (*Isoetes* spp.) may be abundant but are rarely visible as they colonise lake sediments in deep water. Floating aquatics include Bog Pondweed (Potamogeton polygonifolius), Alternate Water-milfoil *(Myriophyllum alterniflorum)* and Floating Club-rush *(Eleogiton fluitans*). Fringing emergent vegetation may include open stands of Common Reed *(Phragmites australis)*; if extensive, reedbeds should be considered under **reed and large sedge swamps - FS1.**

Links with Annex I: Acid oligotrophic lakes correspond to two annexed habitats, 'oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) (3110)' and 'oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea (3130)'.

Limestone/marl lakes FL3

This category includes lakes and ponds of limestone areas (other than **turloughs - FL6**) that are base-rich and poor to moderately rich in nutrients (oligotrophic to mesotrophic). The water is typically clear and the lake sediment usually has a high proportion of marl, a white clayey precipitate of calcium carbonate. Marl-forming stoneworts (*Chara* spp.) are often abundant and may form dense carpets in unpolluted waters. Various-leaved Pondweed *(Potamogeton gramineus)* is also characteristic. These lakes are frequently fringed by **rich fen and flush - PF1** vegetation.

Links with Annex I: Corresponds to the annexed habitat, 'hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. (3140)'.

Mesotrophic lakes FL4

This category includes lakes and ponds that are moderately rich in nutrients, and where the water is sometimes discoloured by algae. Characteristic aquatic plants include White Water-lily *(Nymphaea alba)*, Yellow Water-lily *(Nuphar lutea)*, and a large number of pondweeds *(Potamogeton gramineus, P. obtusifolius, P. perfoliatus)*. Stoneworts (*Chara* spp.) may also be present. The fringing and aquatic plant communities are typically more lush than those associated with oligotrophic lakes.

Eutrophic lakes FL5

This category includes lakes and ponds that are high in nutrients and base-rich and where the water is usually discoloured or turbid, often grey to green in colour, from the abundant algae and suspended matter. Some water bodies are naturally eutrophic but most Irish lakes are eutrophic as a result of enrichment and high levels of nutrients entering the water. This category can also include hypertrophic or highly-enriched (polluted) waters. Characteristic aquatic plants of eutrophic lakes and ponds include duckweeds (*Lemna* spp.), pondweeds *(Potamogeton pectinatus, P. crispus)* and Spiked Water-milfoil *(Myriophyllum spicatum)*. Submerged aquatics are usually rare or are restricted to shallow waters owing to poor light penetration. Reedbeds on sheltered shores and dense stands of fringing vegetation are characteristic of eutrophic lakes and ponds; if reedbeds are extensive they should be considered under **reed and large sedge swamps - FS1**.

Links with Annex I: Only those lakes that are naturally eutrophic are recognised as the annexed habitat, 'natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation (3150)'.

Turloughs FL6

Turloughs are ephemeral lakes that occupy basins or depressions in limestone areas, and where water levels fluctuate markedly during the year. They are virtually unique to Ireland and their greatest concentration is in counties Clare, Galway and Roscommon. The general pattern is to flood in winter and dry out in summer, but there may be other sporadic rises in response to high rainfall. Turloughs normally fill through underground passages and sinkholes but some also have inflowing rivers or streams. Some turlough basins retain standing water in channels, pools or small lakes when flooding subsides. All areas within the normal limit of flooding are considered as part of the turlough habitat. The presence of the distinctive dark moss, *Cinclidotus fontinaloides*, on stone walls or rocks can help to establish this level. Soils of turlough basins can include marls, peat, clays or loams. Large boulders or exposures of bedrock may also be present.

Turloughs support a range of different plant communities that comprise a mixture of aquatic, amphibious and terrestrial species. Plant communities typically form a concentric pattern around the basin; the different zones reflect differences in the extent

and duration of flooding. Wet grassland usually dominates and characteristic species include Creeping Bent *(Agrostis stolonifera)*, small sedges (particularly *Carex nigra* and *C. panicea*), Silverweed *(Potentilla anserina)*, Meadowsweet *(Filipendula ulmaria)*, Creeping Buttercup *(Ranunculus repens)*, Marsh Pennywort *(Hydrocotyle vulgaris)* and Amphibious Bistort *(Polygonum amphibium)*. Permanent pools, channels and lakes may also be present and may support Common Spike-rush *(Eleocharis palustris)*, Water-plantain *(Alisma plantago-aquatica)*, pondweeds (*Potamogeton* spp.), and tall reeds such as Common Club-rush *(Schoenoplectus lacustris)*.

Meadowsweet *Filipendula ulmaria (L.Lysaght)*

Links with Annex I: Corresponds to the priority habitat, '*turloughs (3180)'.

Reservoirs FL7

This category incorporates all open water bodies that are used for the storage and supply of water. It includes natural lakes where water levels fluctuate significantly and unnaturally as a result of abstraction, in addition to modified lakes with dams or retaining walls or banks. Entirely artificial water bodies, some lined with concrete, that are used as reservoirs are also included here (see also other artificial lakes and ponds -FL8). Other lakes where there is evidence of water abstraction (pumps, pumphouses or outflowing pipes) but where there are no indications of significant water level changes are not included here. Redshank *(Polygonum persicaria)* is often common along the draw-down zone of reservoirs in lowland areas

Other artificial lakes and ponds FL8

This category should be used for artificial or ornamental bodies of standing water that may be found in parks, demesnes, gardens or golf courses. Flooded quarries, tailings ponds and water treatment plants (with open water) should also be included. The nutrient status of these artificial water bodies is variable and may be high as in the case of hypertrophic lakes in urban parks. Moats can also be included here if there is no obvious connection to a wider drainage network.

WATERCOURSES

This section includes linear channels of freshwater that are primarily associated with drainage and the movement or transport of water on the land surface. Sections of watercourses that flow underground are not considered in this classification unless they feature as part of non-marine caves - EU1. Linear water bodies with no obvious links to a wider drainage network (some moats and ornamental water bodies) are excluded (see other artificial lakes and ponds - FL8). The main subdivision in this section is between

watercourses that are primarily natural (rivers) and those that are primarily artificial (canals and drainage ditches). Rivers are divided into watercourses that are mainly eroding, as in the case of upland streams, and those that are mainly depositing, as in the case of lowland rivers. No distinction is made between streams and rivers.

Rivers differ from most artificial watercourses in that they have a strong unidirectional flow of water. They are dynamic systems where water levels and flow rates can fluctuate markedly. The entire channel is included as part of the river habitat, irrespective of water levels at the time of the survey. Natural watercourses may flood beyond the limits of their banks but note that floodplains are excluded. Tidal sections of rivers that are influenced by brackish waters should be considered under **tidal rivers - CW2**, while the freshwater tidal sections should be included under **depositing/lowland rivers - FW2**. Note that large fringing swamps or reedbeds should be recorded separately (see **reed and large sedge swamps - FS1**). Any mid-channel islands should be noted and classified on the basis of the habitats present.

Links with Annex I: Clear unpolluted rivers can contain the annexed habitat, 'watercourses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation (3260)'. The annexed habitat, 'rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation (3270)' can occur in association with rivers but stands are typically small and fragmented in Ireland.

Eroding/upland rivers FW1

This category includes natural watercourses, or sections of these, that are actively eroding, unstable and where there is little or no deposition of fine sediment. Eroding conditions are typically associated with the upland parts of river systems where gradients are often steep, and water flow is fast and turbulent. Rivers in spate are included. For some rivers on the seaward side of coastal mountains, particularly in the west of Ireland, eroding conditions persist to sea level because of comparatively steep gradients over short distances, and high rainfall. Small sections of other lowland rivers may also be eroding where there are waterfalls, rapids or weirs. The beds of eroding/upland rivers are characterised by exposed bedrock and loose rock. Pebbles, gravel and coarse sand may accumulate in places, but finer sediments are rarely deposited. These rivers vary in size but are usually smaller and shallower than **depositing/lowland rivers - FW2**. Small mountain streams that dry out periodically can be included if an obvious channel persists or wetland plants are present.

The unstable rocky channels of eroding/upland rivers usually support little vegetation cover. Submerged rocks and boulders may be colonised by aquatic mosses such as *Fontinalis* spp. and *Racomitrium aciculare*. Exposed rocks and wet shaded banks may also support extensive cover of lichens and liverworts. Higher plants are generally rare or absent except in places where fine sediments are trapped. Typical species include water-

crowfoots *(Ranunculus penicillatus, R. aquatilis)*, Alternate Water-milfoil *(Myriophyllum alterniflorum)* and the aquatic form of Bulbous Rush *(Juncus bulbosus)*. Plant and animal communities of eroding/upland rivers are influenced by a range of factors including bedrock and substratum type, nutrient status, water force, water quality, shade and human impact. Habitat conditions also vary along different stretches of a river where there are riffles, runs, pools, waterfalls and backwaters.

Water-crowfoot Ranunculus sp. *(R. T. Mills)*

Depositing/lowland rivers FW2

This category includes watercourses, or sections of these, where fine sediments are deposited on the river bed.

Depositing conditions are typical of lowland areas where gradients are low and water flow is slow and sluggish. These rivers vary in size but are usually larger and deeper than those above. In a natural state these rivers erode their banks and meander across floodplains. Because of this, most have been modified to some extent to control water flow, facilitate navigation or prevent flooding and erosion. Canalised or walled sections of rivers are included here, as are natural watercourses that have been dredged or deepened, and those with artificial earth banks. If channels have been excavated to divert water away from the main watercourse, these should be considered under **canals - FW3**. Tidal sections of rivers with brackish water influence are excluded (see **tidal rivers - CW2**). Rejuvenated sections of lowland rivers associated with rapids, waterfalls and weirs should be considered under **eroding/upland rivers - FW1** if eroding conditions predominate.

Plant and animal communities are influenced by numerous factors including substratum type, water force, nutrient status, water quality, channel size, water depth, human impact, disturbance and shade. Within a river channel there may be deep pools, backwaters, banks or mid-channel bars of gravel, sand or mud, in addition to vegetated islands and fringing reedbeds. The substratum of depositing/lowland rivers comprises mainly fine alluvial or peaty sediments. Vegetation may include floating and submerged aquatics, with fringing emergents in shallow water or overgrowing the banks. Floating aquatics can include water-lilies *(Nuphar lutea, Nymphaea alba)*, pondweeds (*Potamogeton* spp.), water-starworts (*Callitriche* spp.) and Unbranched Bur-reed *(Sparganium emersum)*. Tall emergents such as Common Club-rush *(Schoenoplectus lacustris)*, Common Reed *(Phragmites australis)* and Yellow Iris *(Iris pseudacorus)* may also be present. Large areas of fringing reedbed should be considered under **reed and large sedge swamps - FS1**.

Canals FW3

Canals are artificial linear bodies of water that were originally constructed for the purpose of navigation. They typically lack strong currents and any significant channel or bank erosion. This means that canals tend to have closer affinities with ponds than rivers. Canals can normally be distinguished from **drainage ditches - FW4** by a combination of width and function. Channels that have been excavated to divert water away from the main watercourse are included in this category but canalised sections of rivers are excluded (see **depositing/lowland rivers - FW2**). Locks that are used to control water levels are considered as part of the canal habitat, but note that any built stone structures, including bridges and banks that are faced with stone, are excluded (see **stone walls and other stonework - BL1**). All canals require management and maintenance to keep them open and operational. They are readily colonised by aquatic plants and frequently support floating, submerged or emergent vegetation. Typical aquatics include water-milfoils (*Myriophyllum* spp.), water-lilies *(Nuphar lutea, Nymphaea alba)*, Amphibious Bistort *(Polygonum amphibium)*, bur-reeds (*Sparganium* spp.) and duckweeds (*Lemna* spp.). Canals with standing water are included here even if they are overgrown with swamp-like vegetation. Disused dry canals are excluded and should be classified on the basis of habitats they now support.

Drainage ditches FW4

This category includes linear water bodies or wet channels that are entirely artificial in origin, and some sections of natural watercourses that have been excavated or modified to enhance drainage and control the flow of water. Drainage ditches are generally not used for navigation and are typically narrower than **canals - FW3**, but there may be exceptions. To be included here, drainage ditches should either contain water (flowing or stagnant) or be wet enough to support wetland vegetation. Dry ditches that lack wetland plants are not included. As with **canals - FW3**, drainage ditches must be maintained and cleared in order to keep them open. Those that are overgrown with vegetation are likely to be cleared intermittently. Note that water levels are also likely to undergo seasonal fluctuations. Drainage ditches may be intimately associated with hedgerows and should be recorded as a separate habitat if they meet the criteria outlined above.

SPRINGS

Springs are usually very small local features that are maintained by a more or less continual supply of water from upwelling groundwater sources, or along seepage zones. They occur in upland and lowland areas and may be associated with a variety of different habitat groups such as woodland, heath, grassland or exposed rock. Springs are characterised by abundant mosses and may or may not be peat-forming.

Calcareous springs FP1

This category is used for springs that are irrigated and kept permanently moist by water that is calcareous and oligotrophic. These springs may be associated with shallow peaty or skeletal mineral soils. There may be some precipitation of marl, or tufa formation.

Calcareous springs are typically dominated by mosses, and by *Cratoneuron* spp. in particular; *Bryum pseudotriquetrum* is also characteristic. Other common components of the vegetation include grasses *(Festuca rubra, Briza media)*, sedges *(Carex dioica, C. pulicaris, C. flacca, C. nigra)*, Common Butterwort *(Pinguicula vulgaris)* and Marsh Horsetail *(Equisetum palustre)*. The relatively rare Yellow Saxifrage *(Saxifraga aizoides)* can occur in calcareous springs and is diagnostic of this habitat.

Common Darter *Sympetrum striolatum (L. Lysaght)*

Links with Annex I: Calcareous springs with tufa formation are recognised as the priority habitat, '*petrifying springs with tufa formation (Cratoneurion) (7220)'.

Non-calcareous springs FP2

This category is used for springs that are irrigated and kept permanently moist by acidic to neutral water that is base-poor and typically oligotrophic. They may be associated with skeletal mineral or peaty soils. Vegetation is typically dominated by mosses (particularly *Sphagnum auriculatum, Calliergon sarmentosum* and *Polytrichum commune*), grasses (*Agrostis* spp., *Deschampsia caespitosa, Nardus stricta*), Bulbous Rush *(Juncus bulbosus)*, and wetland species such as Marsh Violet *(Viola palustris)*, Lesser Spearwort *(Ranunculus flammula)* and Marsh Pennywort *(Hydrocotyle vulgaris)*.

SWAMPS

Swamps are stands of emergent herbaceous vegetation that generally occupy a zone at the transition from open water to terrestrial habitats. Water levels may fluctuate but swamps typically remain wet with the water table above ground level for most of the year. They can be associated with freshwater or brackish systems, and the water may be stagnant, slow-moving or tidal. Swamps occur along the margins of rivers, lakes, canals, lagoons and estuaries, but may also occupy more extensive flooded areas or infilling basins. Some swamps occur as floating mats of vegetation.

Reed and large sedge swamps FS1

This category includes species-poor stands of herbaceous vegetation that are dominated by reeds and other large grasses or large, tussock-forming sedges. Most reed and large sedge swamps are overwhelmingly dominated by one or a small number of species, as in the case of reedbeds. Stands of vegetation can range from very dense to open. Typical components include Common Reed *(Phragmites australis)*, Common Club-rush *(Schoenoplectus lacustris)*, Reed Sweet-grass *(Glyceria maxima)*, Branched Bur-reed *(Sparganium erectum)*, Reed Canary-grass *(Phalaris arundinacea)*, Great Fen-sedge *(Cladium mariscus)*, Greater Tussock-sedge *(Carex paniculata)*, Bulrush *(Typha latifolia)* and Water Horsetail *(Equisetum fluviatile)*. Stands of Sea Club-rush *(Bolboschoenus maritimus)* may also occur in brackish waters. Note that a number of the possible dominants have a late growing season and their full extent may be difficult to determine before mid-May. Unlike **tall-herb swamps - FS2** below, the broadleaved herb component is minor. Vegetation typically lacks stratification as there is little or no development of an understorey element. In some situations there may be a mixture of other species such as Common Marsh-bedstraw *(Galium palustre)*, Water Mint *(Mentha aquatica)*, forget-me-nots (*Myosotis* spp.), Bogbean *(Menyanthes trifoliata)*, Marsh Cinquefoil *(Potentilla palustris)*, Wild Angelica *(Angelica sylvestris)*, Meadowsweet *(Filipendula ulmaria)* or Fool's Water-cress *(Apium nodiflorum)*.

Tall-herb swamps FS2

Tall-herb swamps are comparatively species-rich stands of herbaceous vegetation that occur in wet areas where the water table is above the ground surface for most of the year, or where water levels fluctuate regularly as in the case of tidal sections of rivers. Tall or robust broadleaved herbs dominate and common components include Lesser Water-parsnip *(Berula erecta)*, Fool's Water-cress *(Apium nodiflorum)*, Gipsywort *(Lycopus europaeus)*, Brooklime *(Veronica beccabunga)*, Hemlock Water-dropwort *(Oenanthe crocata)*, Hemp-agrimony *(Eupatorium cannabinum)* and Water Forget-me-not *(Myosotis scorpioides)*. These swamps may also support Yellow Iris *(Iris pseudacorus)*, Water-plantain *(Alisma plantago-aquatica)* and Water Horsetail *(Equisetum fluviatile)*, in addition to occasional reeds, large grasses *(Glyceria maxima, Festuca arundinacea)* and sedges. Cover of the latter should, at most, be patchy or dispersed; swamps that are dominated by reeds, and other large grasses or sedges should be considered under **reed and large sedge swamps - FS1** above. Tall-herb swamps may have an understorey element with a range of smaller wetland plants.

Links with Annex I: Tall-herb swamps can include pockets of the annexed habitat 'hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430)'. In Ireland, however, stands of the latter are usually fragmented and poorly developed.

GRASSLAND AND MARSH

Barrigone, Co. Limerick *(L.Lysaght)*

Habitat categories and codes	**GA** IMPROVED GRASSLAND	**GA1** Improved agricultural grassland
		GA2 Amenity grassland (improved)
	GS SEMI-NATURAL GRASSLAND	**GS1** Dry calcareous and neutral grassland
		GS2 Dry meadows and grassy verges
		GS3 Dry-humid acid grassland
		GS4 Wet grassland
	GM FRESHWATER MARSH	**GM1** Marsh

This section includes habitats where the vegetation is either dominated by grasses, or is 'grassy' in appearance with abundant small sedges or rushes. Freshwater marshes are also considered here since they are difficult to distinguish, on floristic grounds, from some types of grassland.

There are few, if any, natural grasslands in Ireland, particularly in the lowlands, as most have been modified or managed to some degree by grazing, mowing, fertiliser application or drainage. In the absence of such management, most grasslands would revert to scrub, woodland or heath. The key distinction being made in this classification is between grasslands that are improved, defined here as species-poor and intensively managed grasslands, and those that are unimproved or semi-improved. Improved grassland is by far the most widespread type and makes up a large proportion of Ireland's productive farmland. Much of it is reseeded, fertilised or heavily grazed with the result that species diversity is low. It is of comparatively little conservation interest. Grass leys that are planted as part of an arable rotation are included in this section, as are areas of amenity grassland that are improved and managed specifically for recreation, amenity or sport, as opposed to agriculture. 'Semi-natural' grasslands may receive some inputs of fertiliser (organic or artificial), but they are not intensively managed and have not recently been reseeded. Low levels of improvement and high levels of grazing can influence sward composition, reduce species diversity and lead to increased representation of 'agricultural' herbs. These are listed below in the **improved agricultural grassland - GA1** category.

Coastal grasslands, other than those of salt marshes (**CM1-2**) and sand dune systems (**CD1-6**), are included in this section. Grassland vegetation should be primarily herbaceous. If cover of dwarf shrubs exceeds 25%, the habitat should be considered under heath. If scattered trees are prominent in areas of grassland but canopy cover is less than 30%, the habitat should be recorded as **scattered trees and parkland - WD5**.

IMPROVED GRASSLAND

Improved agricultural grassland GA1

This category is used for intensively managed or highly modified agricultural grassland that has been reseeded and/or regularly fertilised, and is now heavily grazed and/or used for silage making. It includes regularly-reseeded monoculture grasslands and rye-grass leys that are planted as part of an arable rotation. These differ significantly from areas of permanent grassland. Improved agricultural grassland is typically species-poor. Sward quality varies depending on soil type, fertility, drainage and management. Rye-grasses (*Lolium* spp.) are usually abundant and may entirely dominate the sward, often in association with White Clover *(Trifolium repens)*. Many improved varieties or cultivars of

these plants are now widely sown. Other grasses that may be prominent include meadow-grasses (*Poa* spp.), Timothy *(Phleum pratense)*, Crested Dog's-tail *(Cynosurus cristatus)* and Yorkshire-fog *(Holcus lanatus)*. Among the more frequently occurring 'agricultural' herbs are Dandelion *(Taraxacum spp.)*, Creeping Buttercup *(Ranunculus repens)*, plantains *(Plantago spp.)*, Nettle *(Urtica dioica*), thistles *(Cirsium arvense, C. vulgare)* and docks (*Rumex* spp.). Some reseeded but poorly-drained fields may support abundant rushes.

Amenity grassland (improved) GA2

This type of grassland is improved, or species-poor, and is managed for purposes other than grass production. It includes amenity, recreational or landscaped grasslands, but excludes farmland. Most areas of amenity grassland have been reseeded and are regularly mown to maintain very short swards. Fertilisers and herbicides are often applied but there is rarely any grazing by livestock. The sward may comprise a variety of grasses, including some that also occur in **improved agricultural grassland - GA1**, but rye-grasses (*Lolium* spp.) are rarely abundant. Broadleaved herbs such as Daisy *(Bellis perennis)*, Dandelion (*Taraxacum* spp.), clovers (*Trifolium* spp.) and plantains (*Plantago* spp.) are common. Amenity grassland is typically associated with lawns and other managed grassland areas in gardens, parks, grounds of various buildings or institutions, golf course fairways, grassy sports fields and race courses. Ornamental **flower beds and borders - BC4** should be excluded and, if trees are a prominent feature, the category **scattered trees and parkland - WD5** should be considered.

Note that amenity areas that support unimproved or semi-natural grassland should be considered elsewhere in the grassland section. If a playing field occurs on machair -CD6, for example, it should be considered as amenity grassland only if it has been heavily modified or reseeded.

SEMI-NATURAL GRASSLAND

Dry calcareous and neutral grassland GS1

This category is used for unimproved or semi-improved dry grassland that may be either calcareous or neutral, but not acid. It is associated with low intensity agriculture and typically occurs on free-draining mineral soils of various depths. Calcareous grassland is restricted in its distribution and is now largely confined to the steep slopes of esker ridges and moraines in the midlands, and to other areas with shallow and rocky limestone soils. Management and fertiliser use makes calcareous grasslands more like neutral grasslands in character and these have a wider distribution. Most old permanent pastures and less intensively managed lowland grasslands fit into this category. Grazing is a characteristic feature; unimproved dry meadows which are rarely grazed should be excluded (see **dry meadows and grassy verges - GS2**).

Dry calcareous and neutral grassland may comprise a wide range of grasses and broadleaved herbs. Species richness varies and can be high (up to 45 species per m2). Common grasses include bents (*Agrostis* spp.), meadow-grasses (*Poa* spp.), Meadow Foxtail *(Alopecurus pratensis)*, Timothy *(Phleum pratense),* fescues (*Festuca* spp.), Sweet Vernal-grass *(Anthoxanthum odoratum)*, Crested Dog's-tail *(Cynosurus cristatus)*, Cock's-foot *(Dactylis glomerata)* and Yorkshire-fog *(Holcus lanatus)*. Grasses that are indicative of strongly calcareous soils include Downy Oat-grass *(Avenula pubescens)*, Yellow Oat-grass *(Trisetum flavescens)*, Blue Moor-grass *(Sesleria caerulea)* and Quaking-grass *(Briza media)*. Perennial Rye-grass *(Lolium perenne)* may also be present but should not dominate the sward. Common broadleaved herbs include clovers (*Trifolium* spp.), Yarrow *(Achillea millefolium)*, Common Knapweed *(Centaurea nigra)*, Selfheal *(Prunella vulgaris)*, Common Bird's-foot Trefoil *(Lotus corniculatus)*, Cat's-ear *(Hypochoeris radicata)*, Lady's Bedstraw *(Galium verum)* and Oxeye Daisy *(Leucanthemum vulgare)*. The more calcareous grasslands are characterised by broadleaved herbs such as Field Scabious *(Knautia arvensis)*, Kidney Vetch *(Anthyllis vulneraria)*, Mountain Everlasting *(Antennaria dioica)*, Yellow-wort *(Blackstonia perfoliata)*, Salad Burnet *(Sanguisorba minor)* and Carline Thistle *(Carlina vulgaris),* and may also be important for orchids, including Ophrys and Orchis spp.

Areas that are contaminated with heavy metals, mainly from old lead and zinc mines, and which support a type of calcareous grassland with abundant Bladder Campion *(Silene vulgaris)*, Thrift *(Armeria maritima)* and the eyebright, *Euphrasia micrantha*, should be included in this category.

Dry calcareous and neutral grassland may grade into, or contain elements of dry calcareous heath - HH2 or scrub vegetation, characterised by heathers *(Calluna vulgaris, Erica cinerea*), Juniper *(Juniperus communis)*, gorse (Ulex spp.), Blackthorn *(Prunus spinosa)*, Hawthorn *(Crataegus monogyna)* or Hazel *(Corylus avellana)*. To be considered as grassland, total cover of dwarf shrubs should not exceed 25% and, while trees and shrubs may be present, they should not be abundant.

Four-spotted Chaser Libellula quadrimaculata *(L.Lysaght)*

Links with Annex I: Calcareous grasslands with either high numbers or diversity of orchids correspond to the priority habitat, 'semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometea) (*important orchid sites) (6210)'. Grassland with scattered Juniper *(Juniperus communis)* could also be included in the Annex I category, 'Juniperus communis formations on heaths or calcareous grasslands (5130)'. Grasslands of old mine workings can correspond to the annexed habitat, 'Calaminarian grasslands of the Violetalia calaminariae (6130)' if they are judged to be of interest. There are no naturally-occurring grasslands of this latter type in Ireland.

Dry meadows and grassy verges GS2

Dry meadows that are rarely fertilised or grazed, and are mown only once or twice a year for hay are now rare in Ireland. Most have been improved for agriculture and this type of grassland is now best represented on grassy roadside verges, on the margins of tilled fields, on railway embankments, in churchyards and cemeteries, and in some neglected fields or gardens. These areas are occasionally mown (or treated with herbicides in the case of some railway embankments), and there is little or no grazing or fertiliser application. This pattern of management produces grasslands with a high proportion of tall, coarse and tussocky grasses such as False Oat-grass *(Arrhenatherum elatius)* and Cock's-foot *(Dactylis glomerata)*. Other grasses may include Yorkshire-fog *(Holcus lanatus)*, Smooth Meadow-grass *(Poa pratensis)*, Barren Brome (*Anisantha sterilis)* and Meadow Foxtail *(Alopecurus pratensis)*. The broadleaved herb component is characterised by a range of species that either grow tall, such as Cow Parsley *(Anthriscus sylvestris)*, Hogweed *(Heracleum sphondylium)*, Goat's-beard *(Tragopogon pratensis)*, Nettle *(Urtica dioica)* and Common Knapweed *(Centaurea nigra)*, or climb the stems of others, as in the case of Bush Vetch *(Vicia sepium)* and Meadow Vetchling *(Lathyrus pratensis)*. Grassy verges may support other smaller broadleaved herbs such as Pignut *(Conopodium majus)*, Creeping Cinquefoil *(Potentilla reptans)* and clovers (*Trifolium* spp.).

Links with Annex I: Corresponds to the annexed habitat, 'lowland hay meadows *(Alopecurus pratensis, Sanguisorba officinalis)* (6510)'.

Dry-humid acid grassland GS3

Unimproved or semi-improved grassland that occurs on free-draining acid soils that may be dry or humid, but not waterlogged. This type of grassland mainly occurs on mineral-rich or peaty podzols in upland areas but can also be found on siliceous sandy soils in the lowlands, as in the case of the Curragh in Kildare. It is usually most extensive near the upper limit of enclosed farmland on hills and mountains, particularly those in the centre and east of the country, but also occurs widely on steep slopes in upland and lowland regions, and near the coast. Dry-humid acid grassland frequently grades into, or forms mosaics with **dry siliceous heath** - HH1 or blanket bog (**PB2-3**).

This type of grassland is characterised by dense low swards of narrow-leaved grasses such as bents *(Agrostis capillaris, A. tenuis)*, fescues (*Festuca* spp.), Sweet Vernal-grass *(Anthoxanthum odoratum)*, Wavy Hair-grass *(Deschampsia flexuosa)* and Mat-grass *(Nardus stricta)*. Purple Moor-grass *(Molinia caerulea)* may be present but should not dominate. Wood-rushes (*Luzula* spp.), Heath Rush *(Juncus squarrosus)* and small sedges such as Green-ribbed Sedge *(Carex binervis)* and Pill Sedge *(Carex pilulifera)* may also be prominent. Common broadleaved herbs include Heath Bedstraw *(Galium saxatile)*, Tormentil *(Potentilla erecta)*, White Clover *(Trifolium repens)*, Devil's-bit Scabious *(Succisa pratensis*), Sheep's Sorrel *(Rumex acetosella)*, Heath Speedwell *(Veronica officinalis)*, Common Dog-violet *(Viola riviniana)*, Lousewort *(Pedicularis sylvatica)* and Yarrow *(Achillea millefolium)*.

Ribwort Plantain
Plantago lanceolata (R. T. Mills)

Herbs of **improved agricultural grassland - GA1** may be well represented in areas that are semi-improved. Moss cover is often extensive. Dwarf shrubs may also be present (particularly *Calluna vulgaris, Erica cinerea and Vaccinium myrtillus*) but cover of these should not exceed 25%. Scattered shrubs of Hawthorn *(Crataegus monogyna)* or patches of gorse (*Ulex* spp.) or Bracken *(Pteridium aquilinum)* are common.

Acid soils that are contaminated with heavy metals, mostly from old copper mines, and which support a type of grassland with abundant Spring Sandwort *(Minuartia verna)*, Ribwort Plantain *(Plantago lanceolata)*, Red Fescue *(Festuca rubra)* and Common Mouse-ear *(Cerastium fontanum)* should be included in this category.

Links with Annex I: This category includes the priority habitat, '*species-rich *Nardus* grasslands on siliceous substrates in mountain areas (6230)'. High species diversity is not characteristic but species-poor stands that appear to be the product of overgrazing are excluded. As with **dry calcareous and neutral grassland - GS1**, acid grasslands of old mine workings may also correspond to the annexed habitat 'Calaminarian grasslands of the Violetalia calaminariae (6130)'.

Wet grassland GS4

This type of grassland can be found on flat or sloping ground in upland and lowland areas. It occurs on wet or waterlogged mineral or organic soils that are poorly-drained or, in some cases, subjected to seasonal or periodic flooding. On sloping ground, wet grassland is mainly confined to clay-rich gleys and loams, or organic soils that are wet but not waterlogged. This category includes areas of poorly-drained farmland that have not recently been improved, seasonally-flooded alluvial grasslands such as the River Shannon callows, and wet grasslands of turlough basins (see also **turloughs - FL6**).

Species composition varies considerably. Wet grassland often contains abundant rushes *(Juncus effusus, J. acutiflorus, J. articulatus, J. inflexus)* and/or small sedges *(Carex flacca, C. hirta, C. ovalis)*, in addition to grasses such as Yorkshire-fog *(Holcus lanatus),* Creeping Bent *(Agrostis stolonifera)*, Marsh Foxtail *(Alopecurus geniculatus)*, Rough Meadow-grass *(Poa trivialis)* and Tufted Hair-grass *(Deschampsia caespitosa)*. Purple Moor-grass *(Molinia caerulea)* may also be present but should not dominate. The proportion of broadleaved herbs is often high; those that commonly occur in wet grassland include Creeping Buttercup *(Ranunculus repens)*, Marsh Thistle *(Cirsium palustre)*, Silverweed *(Potentilla anserina)*, Meadowsweet *(Filipendula ulmaria)*, Water Mint *(Mentha aquatica),* Common Marsh-bedstraw *(Galium palustre)*, Devil's-bit Scabious *(Succisa pratensis)*, Lesser Spearwort *(Ranunculus flammula)* and Cuckooflower *(Cardamine pratensis)*. Other common broadleaved herbs that occur on

drier grasslands may also be present, depending on the degree of wetness. Wet grassland may be important for orchids such as Spotted-orchid *(Dactylorhiza maculata)*. Horsetails (*Equisetum* spp.), Yellow Iris *(Iris pseudacorus)*, Floating Sweet-grass *(Glyceria fluitans)* and clumps of tall reeds may be locally abundant.

Wet grassland frequently grades into **marsh - GM1** and there are many similarities in the range of species present in both habitats. To be included in the wet grassland category, the cover of grasses should exceed 50%, except in areas where rushes or small sedges predominate, and the total cover of reeds, large sedges and broadleaved herbs should be less than 50%. Among the suite of broadleaved herbs that are present, there should be a significant proportion of drier grassland species in addition to those that are more commonly associated with wetlands.

Links with Annex I: Wet grassland may contain examples of the annexed habitat, 'Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) (6410)'.

FRESHWATER MARSH

Marsh GM1

Marsh is found on level ground near river banks, lakeshores, and in other places where mineral or shallow peaty soils are waterlogged, and where the water table is close to ground level for most of the year. Unlike swamps, standing water is not a characteristic feature except, perhaps, during very wet periods or in winter months. Marsh is comparatively species-rich and supports a high proportion of wetland species in addition to the typical dominants: rushes (*Juncus* spp.), sedges (*Carex* spp.) and Meadowsweet *(Filipendula ulmaria)*. Grasses such as Creeping Bent *(Agrostis stolonifera)*, Tall Fescue *(Festuca arundinacea)* and Purple Moor-grass *(Molinia caerulea)* may be present but not abundant. To be considered as marsh, the proportion of sedges and grasses should not exceed 50%. The broadleaved herb component may include Water Mint *(Mentha aquatica)*, Marsh Thistle *(Cirsium palustre),* Wild Angelica *(Angelica sylvestris)*, Marsh Pennywort *(Hydrocotyle vulgaris)*, Marsh-marigold *(Caltha palustris)*, Common Valerian *(Valeriana officinalis)*, Ragged-robin *(Lychnis flos-cuculi)*, Purple-loosestrife *(Lythrum salicaria),* Marsh Woundwort *(Stachys palustris)* and Marsh Cinquefoil *(Potentilla palustris)*. Marsh may also support horsetails (*Equisetum* spp.), Yellow Iris *(Iris pseudacorus)*, reeds and other large grasses and sedges but these should not dominate. Herbs that are characteristic of drier ground are rare or absent in marshes. Mosses, particularly *Calliergon* and *Climacium* spp., may be plentiful.

Yellow Iris *(Iris pseudacorus) (L.Lysaght)*

Marsh differs from swamps in that the vegetation is usually more species-rich, standing water is absent for much of the year, and reeds and other tall or bulky grasses and sedges, and tall herbs are not overwhelmingly dominant in the former. The distinction between marsh and **wet grassland - GS4** is less clear but, in marsh, wetland herbs should be prominent, and species of drier ground should generally be absent. If there is greater than 50% cover of grasses and sedges, the habitat should be considered under grassland or, if it is a peat-forming system, under fens and flushes. Marsh is not a peat-forming habitat.

Links with Annex I: Marsh may contain pockets of the annexed habitat, 'hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430)'.

Species Rich Wet Grassland (L. Scott)

HEATH AND DENSE BRACKEN

Glendoo, Co. Dublin *(L.Lysaght)*

Habitat categories and codes	**HH** HEATH	**HH1** Dry siliceous heath
		HH2 Dry calcareous heath
		HH3 Wet heath
		HH4 Montane heath
	HD DENSE BRACKEN	**HD1** Dense bracken

HEATH

Heath includes areas where the vegetation is open and there is at least 25% cover of dwarf shrubs, or where mosses dominate in the case of some montane areas. If the underlying soil is peat, peat depths of less than 0.5 m are usually, but not always, indicative of heath. Trees and larger shrubs may be present but should not be abundant; low-growing Western Gorse *(Ulex gallii)* and Juniper *(Juniperus communis)* are exceptions as they may be components of heath. Note that any areas of heath on sand dunes should be considered under fixed dunes - CD3 in the coastland section; all other types of heath in coastal areas are included here.

Dry siliceous heath HH1

Dry siliceous heath can be found on flat to steeply sloping ground in upland and lowland areas. The underlying soils are relatively dry or free-draining but are acid and poor in nutrients (mainly mineral-rich or peaty podzols). Typical components of the vegetation include Ling *(Calluna vulgaris)*, Bell Heather *(Erica cinerea)*, Bilberry *(Vaccinium myrtillus)* and low-growing Western Gorse *(Ulex gallii);* in parts of Galway and Mayo, St Dabeoc's Heath *(Daboecia cantabrica)* is also common. Other dwarf shrubs such as Crowberry *(Empetrum nigrum)*, Bearberry *(Arctostaphylos uva-ursi)* and Cowberry *(Vaccinium vitis-idaea)* may be locally abundant. Gorse (*Ulex* spp.) should only be considered as a component of heath if it is very low-growing; in situations where it becomes the main structural element of the vegetation, and overtops other dwarf shrubs, it should be classified as scrub. The same applies in the case of prostrate Juniper *(Juniperus communis)*. Dry siliceous heath commonly contains elements of **dry-humid acid grassland - GS3**, and may grade into or form mosaics with this habitat. Among the commonly occurring grasses and sedges are bents (*Agrostis* spp.), Wavy Hair-grass *(Deschampsia flexuosa)*, Mat-grass *(Nardus stricta)*, fescues *(Festuca rubra, F. ovina)* and Green-ribbed Sedge *(Carex binervis)*. Broadleaved herbs of dry siliceous heath include Heath Bedstraw *(Galium saxatile)*, Tormentil *(Potentilla erecta)* and Sheep's Sorrel *(Rumex acetosella)*. In coastal areas, Spring Squill *(Scilla verna)* and Sheep's-bit *(Jasione montana)* may also be present along with salt-tolerant plants such as Thrift *(Armeria maritima)* and Sea Plantain *(Plantago maritima)*.

St Dabeoc's Heath *Daboecia cantabrica (L.Lysaght)*

Dry siliceous heath can be distinguished from **dry calcareous heath - HH2** by the absence of any calcicolous, or lime-loving plants in the former. It differs from **wet heath - HH3** in that Purple Moor-grass *(Molinia caerulea)*, Deergrass *(Trichophorum caespitosum)* and Cross-leaved Heath *(Erica tetralix)* are rare or absent in dry siliceous heath, and peaty soils, if present, are shallow (<15 cm deep).

Links with Annex I: Corresponds to the broader annexed habitat, 'European dry heaths (4030)'. Any areas with scattered Juniper (Juniperus communis) may be included in the annexed category, '*Juniperus communis* formations on heaths or calcareous grasslands (5130)'.

Dry calcareous heath HH2

Dry calcareous heath occurs mainly in limestone areas on rocky ground or on shallow soils that are well-drained and base-rich. Leaching of surface layers of the soil is common and this results in the proliferation of plants that would normally be associated with acid soils. Dry calcareous heath usually comprises some Ling *(Calluna vulgaris)*, Purple Moor-grass *(Molinia caerulea)* and Tormentil *(Potentilla erecta)*, in addition to a range of grasses and broadleaved herbs that are characteristic of the more calcareous element of **dry calcareous and neutral grassland - GS1**. Other dwarf shrubs can include Crowberry *(Empetrum nigrum)*, Bell Heather *(Erica cinerea)* and Bearberry *(Arctostaphylos uva-ursi)*. Dry calcareous heath frequently grades into, or forms mosaics with scrub or grassland vegetation. To be considered as heath there should be at least 25% cover of dwarf shrubs. Trees and shrubs, including low-growing or stunted Hazel *(Corylus avellana)*, Juniper *(Juniperus communis)*, Blackthorn *(Prunus spinosa)*, Burnet Rose *(Rosa pimpinellifolia)* or Bramble (*Rubus fruticosus* agg.), may be present but should not be abundant. This type of heath differs from **dry siliceous heath - HH1** in that it is usually more species-rich and contains a number of calcicolous, or lime-loving, broadleaved herbs, grasses and mosses.

Links with Annex I: Corresponds to the broader annexed habitat, 'European dry heaths (4030)'. Areas with scattered Juniper *(Juniperus communis)* may be included in the annexed category, '*Juniperus communis* formations on heaths or calcareous grasslands (5130)'.

Wet heath HH3

Vegetation with at least 25% cover of dwarf shrubs on peaty soils and shallow wet peats that typically have an average depth of 15-50 cm. Wet heath can occur in upland and lowland areas and is widespread on the lower slopes of hills and mountains that are either too dry or too steep for deep peat accumulation. It can grade into, or form intimate mosaics with **upland blanket bog - PB2, lowland blanket bog - PB3** or **dry siliceous heath - HH1** with minor changes in slope and topography. Wet heath is typically dominated by Ling *(Calluna vulgaris)* and Cross-leaved Heath *(Erica tetralix)*, but can also be dominated by Purple Moor-grass *(Molinia caerulea)* and/or sedges. Other common species include Bell

Heather *(Erica cinerea)*, Crowberry *(Empetrum nigrum)*, Deergrass *(Trichophorum caespitosum)*, Heath Rush *(Juncus squarrosus)* and Green-ribbed Sedge *(Carex binervis)*. Moss and lichen cover may be high in areas of undamaged wet heath. Typical mosses include *Hylocomium splendens, Dicranum scoparium, Rhytidiadelphus loreus* and *Polytrichum commune*. Sphagnum mosses (particularly *S. papillosum, S. subnitens and S. capillifolium*) may also be present.

Wet heath differs from **dry siliceous heath - HH1** in that Cross-leaved Heath *(Erica tetralix)*, Purple Moor-grass *(Molinia caerulea)* and Deergrass *(Trichophorum caespitosum)* are usually abundant in the former. Wet heath differs from **upland blanket bog - PB2** in that Heath Rush *(Juncus squarrosus)*, Green-ribbed Sedge *(Carex binervis)* and mosses other than *Sphagnum* are usually present in the former. The absence of Black Bog-rush *(Schoenus nigricans)* distinguishes wet heath from **lowland blanket bog - PB3**. The depth of peat can also be used to differentiate these habitats, particularly when they occur in a degraded condition. Peat, or peaty soils, are either absent or very shallow (<15 cm) in the case of dry heath (siliceous or calcareous types), while peat depths in excess of 50 cm are usually, but not exclusively, indicative of blanket bogs.

Links with Annex I: Corresponds to the annexed habitat, 'northern Atlantic wet heaths with *Erica tetralix* (4010)'.

Montane heath HH4

This category is used for vegetation with a substantial cover of dwarf shrubs and/or mosses that occurs at high altitudes on mountains and in other very exposed locations in the uplands or on the coast. Montane heath is usually associated with shallow mineral soils or peats that are eroding and unstable. It can also be found on areas of loose rock and coarse sediment on mountain tops and ridges. High rainfall and humidity mean that montane heath is kept very wet even if soils are free-draining or rocky. Vegetation is characterised by stunted and wind-contoured dwarf shrubs such as Crowberry *(Empetrum nigrum)*, Ling *(Calluna vulgaris)* and Bearberry *(Arctostaphylos uva-ursi)* and/or prostrate shrubs such as Dwarf Willow *(Salix herbacea)* and Juniper *(Juniperus communis)*. Montane heath may also be dominated by mosses. Other components of the vegetation can include low-growing grasses *(Deschampsia flexuosa, Festuca vivipara, F. ovina, Nardus stricta)*, Heath Rush *(Juncus squarrosus)*, Stiff Sedge *(Carex bigelowii)*, Heath Bedstraw *(Galium saxatile)* and Sheep's Sorrel *(Rumex acetosella),* in addition to clubmosses *(Huperzia selago, Diphasiastrum alpinum)* and mosses (particularly *Racomitrium lanuginosum, Polytrichum alpinum and Dicranum fuscescens*). Montane heath may also have extensive and varied carpets of lichens. Vegetation cover is rarely complete but should exceed 50%. If the total area of exposed rock is greater than 50%, the habitat should be considered in the appropriate exposed rock category. Note that **eroding blanket bog - PB5** is treated as a separate category. Montane heath differs from other types of heath in terms of its wind-contoured and stunted growth form, and its species composition.

Links with Annex I: Corresponds to the annexed habitat, 'Alpine and Boreal heaths (4060)'.

DENSE BRACKEN

Dense bracken HD1

This category is used for areas of open vegetation that are dominated by Bracken *(Pteridium aquilinum)*. Cover of the fern may be either patchy or continuous, but should exceed 50% overall. Dense bracken is usually associated with areas of **dry-humid acid grassland - GS3** or **dry siliceous heath - HH1**. Areas of woodland with a bracken-dominated understorey are excluded, as are areas that are dominated by shrubs or brambles (see scrub - WS1). The ferns die back in the autumn but remains of fronds usually persist throughout the winter.

Bracken Pteridium aquilinum *(L. Scott)*

PEATLANDS

West of Ireland *(R. T. Mills)*

Habitat categories and codes	**PB** BOGS	**PB1** Raised bog
		PB2 Upland blanket bog
		PB3 Lowland blanket bog
		PB4 Cutover bog
		PB5 Eroding blanket bog
	PF FENS AND FLUSHES	**PF1** Rich fen and flush
		PF2 Poor fen and flush
		PF3 Transition mire and quaking bog

Peatlands are subdivided into two main types, bogs and fens. Bogs are ombrotrophic (rain-fed) peatlands where almost all inputs of water to the system are derived from precipitation and where acid, oligotrophic peat deposits accumulate. Fens are minerotrophic peatlands that, in addition to precipitation, are fed by groundwater or moving surface waters. They have a higher nutrient status than bogs and can be either acid or base-rich. Flushes, which may or may not form peat, are included with fens as they support similar vegetation communities. The category **cutover bog - PB4** is mainly associated with bogs but should also be used in situations where peat has been extracted from fens. Any peatland areas that are dominated by trees or shrubs, including conifer plantations, are excluded.

Note that intertidal or subtidal peat deposits are not included in this section of the classification but should be considered under the littoral or sublittoral rock categories in the marine section or, in the case of salt marshes that have developed on intertidal peats, in the coastland section.

BOGS

This section includes ombrotrophic (rain-fed) bogs where acid, oligotrophic peat has accumulated in areas of impeded drainage and/or high rainfall and humidity. The two main types are raised bog and blanket bog. Blanket bog is further subdivided into upland and lowland (Atlantic) types and the boundary between the two is taken as 150 m above sea level. However, this should be loosely applied as the distinction is also based on vegetation and other characteristics, including geographical location; lowland blanket bog in Ireland is confined to Atlantic seaboard counties.

Comparatively few raised bogs remain intact and in good condition in Ireland. A large proportion of the original raised bog resource has been damaged or destroyed by peat extraction, drainage and burning. The same is true of upland and lowland blanket bog where large expanses of the habitat resource have also been lost or degraded through overgrazing and afforestation. Damaged and degraded areas of bog are not distinguished as separate categories in this classification, except in the case of **cutover bog - PB4 and eroding blanket bog - PB5**. Note that in relation to overgrazing, damage is considered severe if 5-10% of an area is bare or eroding, or very severe if this figure exceeds 10%. Peat depths can be used to differentiate blanket bog and heath in situations where the vegetation cover has been altered or removed (e.g. overgrazed or burnt). As a general rule, peat depths of greater than 0.5 m are indicative of blanket bog while those of less than 0.5 m are indicative of heath, but there are exceptions. Charred woody remains of dwarf shrubs provide evidence of recent fires. Any areas of bogs that have been planted with conifers should be classified as **conifer plantation - WD4**.

Raised bog PB1

Raised bogs are accumulations of deep acid peat (3-12 m) that originated in shallow lake basins or topographic depressions. The name is derived from the elevated surface, or dome, that develops as raised bogs grow upwards from the surface; the domed effect is often exaggerated when the margins of a bog are damaged by turf cutting or drainage, and are drying out. Raised bogs are most abundant in the lowlands of central and mid-west Ireland. Exploitation has been extensive and no Irish raised bogs remain completely intact. Excavated face banks, whether active or inactive, are a common feature around the margins. Only the areas of high bog are included in this definition of the habitat, raised bog, and the condition of the high bog can range from very good to poor. Any areas where part of the bog has been removed should be considered under **cutover bog - PB4**. In a natural state, raised bogs are circled by a wetland fringe, known as the lagg zone, which is usually characterised by fen communities. In Ireland, most laggs have been lost through drainage and land reclamation; any remnants should be categorised separately on the basis of the habitats present.

The surface of a relatively intact raised bog is typically wet, acid and deficient in plant nutrients, and supports specialised plant communities that are low in overall diversity. The vegetation is open and *Sphagnum* mosses dominate the ground layer. Small-scale mosaics of plant communities are characteristic and reflect the complex microtopography of hummocks and hollows on the bog surface. Raised bogs are driest at the margins and wetness generally increases towards the centre of the peat mass where well-developed pool systems are most likely to occur. Dry areas and hummocks usually support Ling *(Calluna vulgaris)*, Hare's-tail Cottongrass *(Eriophorum vaginatum)*, Deergrass *(Trichophorum caespitosum)*, Cross-leaved Heath *(Erica tetralix)*, lichens (*Cladonia* spp.), and *Sphagnum (S. capillifolium, S. imbricatum, S. papillosum)* and other mosses *(Dicranum scoparium, Leucobryum glaucum)*. Wet areas and pools are characterised by Common Cottongrass *(Eriophorum angustifolium)*, White Beak-sedge *(Rhynchospora alba)*, Bog Asphodel *(Narthecium ossifragum)*, sundews (*Drosera* spp.), Bogbean *(Menyanthes trifoliata)*, bladderworts (*Utricularia* spp.) and Sphagnum mosses *(S.cuspidatum, S. auriculatum)*. Raised bogs may also contain soaks and flushed areas (wet or dry) where the supply of nutrients over time is increased through concentrated surface flows, or where there are links with groundwater or the underlying mineral substratum. Slight mineral enrichment enhances habitat and species diversity. Flushed areas can be recorded separately on the basis of the habitats present, or as an integral part of the raised bog habitat.

Round-leaved Sundew *Drosera rotundifolia (R. T. Mills)*

When damaged by peat extraction or drainage, the bog surface is relatively dry, pools are rare or absent, cover of *Sphagnum* is greatly reduced and Ling *(Calluna vulgaris)* increases in abundance. The effect is normally greatest around the margins and wetness may increase towards the centre of the bog. Trees such as Downy Birch *(Betula pubescens)* and Scots Pine *(Pinus sylvestris)* frequently invade the drier cut margins, but may also occur in flushed areas.

Links with Annex I: Raised bogs correspond to the priority habitat, '*active raised bogs (7110)' if they are still capable of peat formation, or if peat formation has temporarily ceased. 'Degraded raised bogs still capable of natural regeneration (7120)' are also listed as an annexed habitat. These are damaged bogs where it is judged that the peat-forming capability can be restored within 30 years. The annexed habitat, 'depressions on peat substrates of the Rhynchosporion (7150)' occurs in pockets as a sub-habitat of raised bog.

Upland blanket bog PB2

Upland blanket bog occurs on flat or gently sloping ground above 150 m and is widespread on hills and mountains throughout Ireland. The 150 m limit serves to distinguish upland from lowland blanket bog but is loosely applied. Peat depths vary and normally fall in the range of 1-2 m, but can be much deeper in pockets. Vegetation is typically dominated by Deergrass *(Trichophorum caespitosum),* cottongrasses (*Eriophorum* spp.) and dwarf shrubs such as Ling *(Calluna vulgaris)*, Cross-leaved Heath *(Erica tetralix)* and Bilberry *(Vaccinium myrtillus)*. Purple Moor-grass *(Molinia caerulea)* and Crowberry *(Empetrum nigrum)* may be locally abundant. Cover of *Sphagnum* mosses is usually high in areas of undamaged bog. Upland blanket bog can be extremely wet where it occurs on level terrain and may have surface drainage features that are typical of **lowland blanket bog - PB3**, but without any abundance of Black Bog-rush *(Schoenus nigricans)*. Upland blanket bog may be difficult to distinguish from **wet heath - HH3** as a number of key species are common to both habitats. They may also grade from one to the other, or form intimate mosaics with changes in slope or topography. Peat depths in excess of 0.5 m are usually indicative of blanket bog. Heath Rush *(Juncus squarrosus)* and Green-ribbed Sedge *(Carex binervis)* may occur in **wet heath - HH3** but not in upland blanket bog.

Only the area of uncut bog should be included here; **cutover bog - PB4** is considered as a separate habitat. The uncut bog may include areas that are severely damaged or degraded from overgrazing. Levels of damage are not assessed in this classification. Note, however, that damage is considered severe if over 5% of an area of bog is bare or eroding. Areas of bog that are heavily eroded (below the rooting zone of plants) should be considered under **eroding blanket bog - PB5**.

Links with Annex I: Blanket bogs that are still capable of peat formation correspond to the priority habitat, 'blanket bogs (*if active bog) (7130)'. The annexed habitat, 'depressions on peat substrates of the Rhynchosporion (7150)' occurs in pockets as a sub-habitat of blanket bog.

Lowland blanket bog PB3

Lowland blanket bog, also known as Atlantic or oceanic blanket bog, is more restricted in its distribution than the upland type and is largely confined to wetter regions along the western seaboard where the annual rainfall exceeds 1250 mm. Described as a climatic peat type, it occurs on flat or gently sloping ground below 150 m. Peat depths vary considerably (1.5-7 m) depending on the underlying topography, and are usually intermediate between those of **raised bog - PB1** and **upland blanket bog - PB2**. The vegetation of lowland blanket bog is typically 'grassy' in appearance and is characterised by abundant Black Bog-rush *(Schoenus nigricans)*, Purple Moor-grass *(Molinia caerulea)*, cottongrasses (*Eriophorum* spp.), Deergrass *(Trichophorum caespitosum)* and White Beak-sedge *(Rhynchospora alba)*. Heathers (*Calluna vulgaris, Erica* spp.) are common but cover is generally less extensive than in **upland blanket bog - PB2**. Cover of dwarf shrubs is reduced in areas that are overgrazed. Broadleaved herbs can include sundews (*Drosera* spp.), Heath Milkwort *(Polygala serpyllifolia)*, Lousewort *(Pedicularis sylvatica)* and Pale Butterwort *(Pinguicula lusitanica)*. Bog-myrtle *(Myrica gale)* may be locally abundant. *Sphagnum* mosses and mucilagenous algae, collectively known as *Zygogonium* ericetorum, may also be present; the latter increases in abundance in overgrazed areas where *Sphagnum* mosses are rare or absent. Wet areas of intact lowland blanket bog are characterised by a variety of surface drainage features which may include scattered pools and channels, small peat-basin lakes, streams, peat gullies and swallow holes that lead to underground drainage systems. Many of these support aquatic plants such as bladderworts (*Utricularia* spp.), Water Lobelia *(Lobelia dortmanna)* and, locally, Pipewort *(Eriocaulon aquaticum)*. Lowland blanket bog may form intimate mosaics with areas of **wet heath - HH3** and **dry siliceous heath - HH1**.

Sphagnum mosses *(L.Lysaght)*

As is the case with upland blanket bog, only the areas of uncut bog are included in this category; where part of the bog has been removed through turf cutting or any other form of peat extraction, this should be recorded as **cutover bog - PB4**. Areas of bog that are eroding should be considered under **eroding blanket bog - PB5**.

Links with Annex I: As for **upland blanket bog - PB2** above.

Cutover bog PB4

This category should be used in situations where part of the original mass of peat has been removed through turf cutting or other forms of peat extraction. Areas of high bog that have been exploited using *Difco* cutters, or 'sausage' machines, are included only if the surface vegetation has been removed. Cutover can be associated with all peat-forming systems, including fens and some areas of **wet heath - HH3**. Turf cutting activity is characterised by vertical face banks or rectangular peat ramparts where the cutover section is at a distinctly lower level than the uncut high bog. These banks vary in height, depending in part on the depth of peat, and remain in evidence for a long time after turf cutting ceases. Old turf banks may be overgrown with vegetation. Cutover bog occurs on a much larger scale in the case of industrial or commercial peatlands where peat is harvested mechanically (sod, milled or moss peat production). Areas of bog that are actively being worked are included in this category, as are areas of abandoned or exhausted cutover.

Cutover bog is a variable habitat, or complex of habitats, that can include mosaics of bare peat and revegetated areas with woodland, scrub, heath, fen and flush or grassland communities. The nature of the recolonising vegetation depends on numerous factors including the frequency and extent of disturbance, hydrology, the depth of peat remaining, and the nature of the peat and the underlying substratum. Standing water is usually present in drains, pools or excavated hollows. Some large areas of cutover bog have been reclaimed as farmland or planted with trees, particularly conifers. If the regenerating habitats of cutover bog cover a sizeable area and can easily be fitted elsewhere in the classification, this should be done. The full extent of the cutover may be difficult to establish as it frequently grades into other marginal habitats or farmland.

Links with Annex I: The annexed habitat, 'depressions on peat substrates of the Rhynchosporion (7150)' can occur in pockets on cutover bog, mostly in association with areas of cutover raised bog.

Eroding blanket bog PB5

This category should be used in situations where part of the original peat mass has been lost through erosion, as opposed to extraction (see **cutover bog - PB4**), and where sizeable areas of bare peat are exposed. Eroding blanket bog is most commonly associated with upland areas, and mountain peaks and ridges in particular. Causes are numerous; some erosion may have occurred as a natural process but, over the last two decades, overgrazing by livestock (particularly sheep) has been a major contributory factor. Eroding blanket bog is often characterised by networks of channels and gullies that have cut down through the protective layer of vegetation to expose the underlying peat. As erosion continues, these channels widen, deepen and coalesce until eventually the rocky substratum is reached. Some small blocks of the original bog, known as peat haggs, may remain.

To be categorised as eroding blanket bog, a substantial proportion of the original bog surface should be missing and peat should have eroded below the rooting zone of the surface vegetation. In such situations, the process is likely to be irreversible, or recovery very slow, even if damaging activities cease. If erosion has occurred to such an extent that large areas of the rocky substratum are exposed, the habitat should be considered elsewhere in the classification. This also applies to formerly eroded areas where most of the peat has been removed but where the underlying mineral or peaty substratum has been extensively recolonised by vegetation. Peatlands damaged by bog bursts can be included here if sizeable areas of bare peat are exposed.

FENS AND FLUSHES

Fens are peat-forming systems that differ from bogs in that they are fed by groundwater or moving surface waters. They occur in river valleys, poorly-drained basins or hollows, and beside open stretches of water (lake margins or river floodplains). Fens may also be associated with the fringes or other parts of acid bogs where there is enrichment of the water supply. Any areas of fen that have been modified by turf cutting should be considered under **cutover bog - PB4**. Flushes are usually smaller features that are maintained by the movement or seepage of water. They occur on slopes and may or may not be peat-forming. Some flushes feed into fens while others may be associated with a range of different habitat types including bogs, woodlands and grasslands. Flushes in bogs are usually characterised by changes in the vegetation that are brought about by an enhanced supply of nutrients. Note that springs are considered in the freshwater section (**FP1-2**).

Fens and flushes are divided into 'rich' (basic) and 'poor' (acid) types depending on the origin and nature of the water supply. A third category, **transition mire and quaking bog** - PF3, is also distinguished because it has vegetation characteristics that are intermediate between rich and poor fen categories.

Rich fen and flush PF1

Rich fens and flushes are fed by groundwater or flowing surface waters that are at least mildly base-rich or calcareous, and are usually found over areas of limestone bedrock. The substratum is waterlogged peat (except in the case of some flushes) and this usually has a high mineral content. Vegetation is typically dominated by Black Bog-rush *(Schoenus nigricans)* and/or small to medium sedges such as *Carex viridula, C. nigra, C. dioica* and *C. panicea*. Other prominent components of the vegetation include rushes, particularly Blunt-flowered Rush *(Juncus subnodulosus),* Purple Moor-grass *(Molinia caerulea)*, Marsh Pennywort *(Hydrocotyle vulgaris)*, Lesser Spearwort *(Ranunculus flammula)*, Water Mint *(Mentha aquatica)*, Common Marsh-bedstraw *(Galium palustre*), Grass-of-parnassus *(Parnassia palustris)*, Common Butterwort *(Pinguicula vulgaris)* and Devil's-bit Scabious

(Succisa pratensis). Rich fen and flush can be important for orchids such as *Epipactis palustris* and *Dactylorhiza* spp. A well-developed moss layer with *Campylium stellatum, Scorpidium scorpioides* and *Drepanocladus revolvens* is also characteristic. The tops of Black Bog-rush *(Schoenus nigricans)* tussocks are relatively dry and may support plants such as heathers *(Calluna vulgaris, Erica tetralix)*, Tormentil *(Potentilla erecta)*, Bog-myrtle *(Myrica gale)* and Bog Asphodel *(Narthecium ossifragum)*.

Rich fens and flushes may have some patchy cover of Common Reed *(Phragmites australis)*, Bulrush *(Typha latifolia)*, or tussock-forming species such as Great Fen-sedge *(Cladium mariscus)* and Greater Tussock-sedge *(Carex paniculata)*. If large areas are dominated by species-poor or monodominant stands of tall herbaceous plants, they should be considered under **reed and large sedge swamps - FS1**. Fens may contain patches of scrub or woodland, or bodies of open water with aquatics such as Bogbean *(Menyanthes trifoliata)*. If the surface is quaking and very wet, and the vegetation comprises some species that may also be found in acid bogs, consider the category t**ransition mire and quaking bog - PF3**.

Links with Annex I: This category corresponds to two annexed habitats, 'alkaline fens (7230)' and '*calcareous fens with *Cladium mariscus* and species of the Caricion davallianae (7210)'. The latter is a priority habitat that describes stands of species-rich alkaline fen vegetation in which Great Fen-sedge *(Cladium mariscus)* is dominant.

Poor fen and flush PF2

This category includes peat-forming fens and flushes that are fed by groundwater or flowing surface waters that are acid. Flushes that are acidic but not peat-forming should also be considered here. In most cases the substratum is acid peat which has a higher nutrient status than that of ombrotrophic bogs. The vegetation of poor fens and flushes is typically dominated by sedges (particularly *Carex rostrata, C. nigra, C. curta, C. lasiocarpa* and *C. echinata*) and/or rushes *(Juncus effusus, J. articulatus, J. acutiflorus)*. Other common components include Common Cottongrass *(Eriophorum angustifolium)*, Velvet Bent *(Agrostis canina)*, Purple Moor-grass *(Molinia caerulea),* Yorkshire-fog *(Holcus lanatus)* and broadleaved herbs such as Marsh Violet *(Viola palustris),* Bogbean *(Menyanthes trifoliata)*, Heath Bedstraw *(Galium saxatile)*, Tormentil *(Potentilla erecta)* and Marsh Cinquefoil *(Potentilla palustris)*. There may be some limited cover of dwarf shrubs. Extensive carpets of mosses including, in particular, *Sphagnum palustre, S. recurvum, S. auriculatum, Calliergon stramineum* and *Polytrichum commune*, are characteristic.

Although poor fen and flush is not listed in Annex I of the Habitats Directive, it is very limited in extent in Ireland and should be regarded as being of special conservation importance (C. Ó Críodáin, pers. comm.).

Transition mire and quaking bog PF3

Transition mires and quaking bogs are extremely wet peat-forming systems with characteristics that are intermediate between poor and rich fens. For this reason, they are considered as a separate habitat but they may occur within, or on the fringes of other peat-forming systems. Transition mires and quaking bogs are usually associated with the wettest parts of a bog or fen and can be found in wet hollows, infilling depressions, or at the transition to areas of open water. Vegetation frequently forms a floating mat or surface scraw over saturated, spongy or quaking peat. Standing water may occur in pools or along seepage zones. The vegetation typically comprises species that are characteristic of bog, fen and open water habitats. Small to medium sedges, mainly *Carex* spp. (particularly *Carex diandra, C. lasiocarpa, C. limosa and C. viridula*), usually dominate and may occur together with White Beak-sedge *(Rhynchospora alba)*, cottongrasses (*Eriophorum angustifolium*, and the much rarer *E. gracile*), Creeping Bent *(Agrostis stolonifera)*, Purple Moor-grass *(Molinia caerulea)*, and a range of broadleaved wetland herbs such as Bogbean *(Menyanthes trifoliata)*, Marsh Pennywort *(Hydrocotyle vulgaris),* Lesser Spearwort *(Ranunculus flammula)*, Marsh Cinquefoil *(Potentilla palustris)* and Marsh Lousewort *(Pedicularis palustris)*. Extensive moss cover is characteristic; *Sphagnum* spp., *Calliergon* spp. and *Scorpidium scorpioides* are usually abundant.

Links with Annex I: Corresponds to the annexed habitat, 'transition mires and quaking bogs (7140)'.

Devils Matchsticks *Cladonia floerkeana (L. Scott)*

WOODLAND AND SCRUB

Killarney woodlands, Co. Kerry *(R. T. Mills)*

Habitat categories and codes	**WN** SEMI-NATURAL WOODLAND	**WN1** Oak-birch-holly woodland categories **WN2** Oak-ash-hazel woodland and codes **WN3** Yew woodland **WN4** Wet pedunculate oak-ash woodland **WN5** Riparian woodland **WN6** Wet willow-alder-ash woodland **WN7** Bog woodland
	WD HIGHLY MODIFIED/ NON-NATIVE WOODLAND	**WD1** (Mixed) broadleaved woodland **WD2** Mixed broadleaved/conifer woodland **WD3** (Mixed) conifer woodland **WD4** Conifer plantation **WD5** Scattered trees and parkland
	WS SCRUB/ TRANSITIONAL WOODLAND	**WS1** Scrub **WS2** Immature woodland **WS3** Ornamental/non-native shrub **WS4** Short rotation coppice **WS5** Recently-felled woodland
	WL LINEAR WOODLAND/ SCRUB	**WL1** Hedgerows SCRUB **WL2** Treelines

This section groups habitats in which the predominant structural element of the vegetation is provided by trees, shrubs or brambles. It includes almost all types of woodland and scrub - natural, semi-natural or planted - in urban and rural situations, with the exception of woodland or scrub associated with sand dunes (see **dune scrub and woodland - CD4**) and commercial orchards or tree nurseries (see **horticultural land - BC2**). Linear boundary features that are dominated by trees and shrubs are also included in this section.

Woodland is defined here as any area that is dominated by trees, as opposed to shrubs, and where the canopy height is greater than 5 m, or 4 m in the case of woodland in wetland areas or on bogs. The canopy may be open but should be distinct. Scrub or transitional woodland includes areas that are dominated by shrubs, brambles and stunted or immature trees, and where the canopy height is less than that outlined above for woodland. Note that birches (*Betula* spp.), Hazel *(Corylus avellana)* and some willows (*Salix* spp.) can occur both as trees and shrubs. Sessile Oak *(Quercus petraea)* may also occur in stunted form in exposed locations. Areas that are dominated by young or sapling trees (with the exception of most stands of planted conifers) are categorised as **immature woodland - WS2**. The categories, **hedgerows - WL1** and **treelines - WL2**, should be used for any linear strips of woodland or scrub that are less than 4 m wide.

The main subdivision in the woodland section is between semi-natural woodlands and all other woodland types, including commercial plantations. Natural or 'ancient' woodland vegetation is now very rare in Ireland and most stands of trees have been modified and managed to some extent by humans over centuries. Because of this, the term 'semi-natural' is generally used for stands that resemble the potential natural woodland cover. To be considered as semi-natural, woodland should be dominated by native trees, the understorey should be reasonably well-developed, and there should be no systematic removal of timber, dead wood or fallen trees. Stands that originate from planting in the past may be included if they are now regenerating naturally, as may stands that were formerly coppiced. Some common non-native broadleaved trees that occur in Irish woodlands include Beech *(Fagus sylvatica)*, Sycamore *(Acer pseudoplatanus)*, limes (*Tilia* spp.), Horse Chestnut *(Aesculus hippocastanum)*, Spanish Chestnut *(Castanea sativa)* and Hornbeam *(Carpinus betulus)*. Yew *(Taxus baccata)* and Scots Pine *(Pinus sylvestris)* are the only conifers that can be considered native to Ireland; the latter has been widely re-introduced following a major decline and possible extinction in prehistoric times.

Seven types of semi-natural woodland are recognised. Most other woodland stands, except conifer plantations, can be classified in three general woodland categories that are subdivided on the basis of the different proportions of broadleaved trees and conifers that are present. They include various stands of native and non-native trees that were planted for a variety of reasons including commercial timber or energy production, landscaping, shelter or conservation in rural and urban areas. Broadleaved and mixed plantations are included, as are other stands of trees that may have originated naturally

but do not meet the criteria for semi-natural woodland above. In the case of broadleaved or conifer woodland categories, the term 'mixed' should be used in the title if a number of different species contribute significantly to the canopy. Conifer plantations are considered separately and are defined here as dense stands of planted conifers where the overriding influence is commercial timber production. The proportion of conifers should exceed 75%. All other plantations should be considered in the general woodland categories.

SEMI-NATURAL WOODLAND

Oak-birch-holly woodland WN1

Native, semi-natural broadleaved woodland that occurs on acid or base-poor soils that may be either dry or humid, but not waterlogged. Mor humus deposits are included, but not peats. Stands are usually dominated by Sessile Oak *(Quercus petraea)*, or mixed stands of Sessile and Pedunculate Oak *(Q. petraea and Q. robur)* or their hybrids. Other common trees include Downy Birch *(Betula pubescens)*, Holly *(Ilex aquifolium)* and Rowan *(Sorbus aucuparia)*. Downy Birch *(Betula pubescens)* can be the dominant tree in some situations. In places where the soils are less acid, Ash *(Fraxinus excelsior)* and Hazel *(Corylus avellana)* may also be present in small numbers. If either of these tree species is abundant, consider the following category, **oak-ash-hazel woodland - WN2**. The ground flora typically comprises Ling *(Calluna vulgaris),* Bilberry *(Vaccinium myrtillus),* Bracken *(Pteridium aquilinum)*, Hard Fern *(Blechnum spicant)*, Great Wood-rush *(Luzula sylvatica),* Velvet Bent (*Agrostis canina)*, Common Cow-wheat *(Melampyrum pratense)* and Wood Sage *(Teucrium scorodonia)*. The climber, Honeysuckle *(Lonicera periclymenum)*, is also common. The cover of mosses and lichens in the ground flora and on trees is often very high.

Links with Annex I: Corresponds to the annexed habitat, 'old sessile oak woods with Ilex and Blechnum in the British Isles (91A0)'.

Brimstone *Gonepteryx rhamni (L.Lysaght)*

Oak-ash-hazel woodland WN2

Native, semi-natural woodland that occurs on base-rich or calcareous soils that are generally dry or well-drained, or on rocky limestone terrain. This type of woodland is typically dominated by Pedunculate Oak *(Quercus robur)*, Ash *(Fraxinus excelsior)* or Hazel *(Corylus avellana)*, or by various mixtures of some or all of these trees. Other trees may be present but should not be abundant. This includes Yew *(Taxus baccata)* which, if dominant, should be assigned to the category **yew woodland - WN3**.

The composition of the ground flora varies and may include Ivy *(Hedera helix)*, Wood Anemone *(Anemone nemorosa)*, Bluebell *(Hyacinthoides non-scriptus)*, Wood Avens *(Geum urbanum)*, Sanicle *(Sanicula europaea)*, Early Dog-violet *(Viola reichenbachiana)*, Lords and Ladies *(Arum maculatum)*, Ramsons *(Allium ursinum)*, Wood Speedwell *(Veronica montana)*, Barren Strawberry *(Potentilla sterilis)*, Pignut *(Conopodium majus)*, False Brome *(Brachypodium sylvaticum)* and ferns *(Dryopteris filix-mas, Polystichum setiferum, Asplenium scolopendrium, Athyrium filix-femina)*. Areas of hazel scrub should be considered under **scrub - WS1**.

Although this woodland category is not an annexed habitat, it is very limited in extent in Ireland and should be regarded as being of conservation importance.

Yew woodland WN3

This category should be used for stands of native, semi-natural woodland that are dominated by Yew *(Taxus baccata)*. Yew woodland is very rare in Ireland and occurs mainly in limestone areas on rocky, calcareous soils. The ground flora is generally sparse and may comprise Slender St John's-wort *(Hypericum pulchrum)*, Wood Sage *(Teucrium scorodonia)* and Goldenrod *(Solidago virgaurea)*. Mosses may be abundant, especially on rocky ground.

Links with Annex I: Corresponds to the priority habitat, '*Taxus baccata woods of the British Isles (91J0)'.

Wet pedunculate oak-ash woodland WN4

This type of woodland is associated with areas that are flooded or waterlogged in winter but which dry out in summer. It occurs on periodically-flooded alluvial sites that are well above the limits of regular inundation, and on drumlins and other sites with heavy, poorly-drained clay soils that are subject to waterlogging. Woodland is dominated by Pedunculate Oak *(Quercus robur)* and/or Ash *(Fraxinus excelsior);* other common components include Hazel *(Corylus avellana)*, Hawthorn *(Crataegus monogyna)*, Holly *(Ilex aquifolium)* and willows (*Salix* spp.). Alder *(Alnus glutinosa)* can be locally abundant. The ground flora typically comprises Meadowsweet *(Filipendula ulmaria),* Primrose *(Primula vulgaris)*, Enchanter's-nightshade *(Circaea lutetiana)*, Ivy *(Hedera helix)*, Bramble *(Rubus fruticosus* agg.), Remote Sedge *(Carex remota),* Golden-saxifrage *(Chrysosplenium oppositifolium)* and Ramsons *(Allium ursinum)*. When flooding subsides in alluvial sites, exposed channels and depressions may remain wet or waterlogged. Alder *(Alnus glutinosa)* is often prominent in these situations.

Links with Annex I: On alluvial sites, this type of woodland corresponds to the priority habitat, '*alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-padion, Alnion incanae, Salicion albae) (91E0)'. The term 'residual' means that only small stands remain in Europe; these need not be of ancient origin.

Riparian woodland WN5

This category includes wet woodlands of river margins (gallery woodland) and low islands that are subject to frequent flooding, or where water levels fluctuate as a result of tidal movement (in the lower reaches of rivers). Riparian woodland is dominated by stands of willows that may include native *(Salix cinerea, S. purpurea, S. triandra)* and non-native *(Salix fragilis, S. alba, S. viminalis)* species. Alder *(Alnus glutinosa)* is occasional. The field layer is characterised by broadleaved herbs such as Nettle *(Urtica dioica)*, Creeping Buttercup *(Ranunculus repens)*, Wood Dock *(Rumex sanguineus)*, Meadowsweet *(Filipendula ulmaria)*, Wild Angelica *(Angelica sylvestris)*, Hemlock Water-dropwort *(Oenanthe crocata)* and Hedge Bindweed *(Calystegia sepium)*. Stands of Reed Canary-grass *(Phalaris arundinacea)* are common. Indian Balsam *(Impatiens glandulifera)*, an introduced species, is locally abundant. These woodlands often reveal an accumulation of river borne debris, including dead vegetation and plastic, when water levels are low. A fine coating of grey mud on vegetation and tree bases that are regularly submerged and emersed is also characteristic. Willows were widely coppiced and used for basket-making in the past; old Osier *(Salix viminalis)* beds are included in this category but any actively coppiced areas should be considered under **short rotation coppice - WS4**.

Wet willow-alder-ash woodland WN6

This broad category includes woodlands of permanently waterlogged sites that are dominated by willows (*Salix* spp.), Alder *(Alnus glutinosa)* or Ash *(Fraxinus excelsior)*, or by various combinations of some or all of these trees. It includes woodlands of lakeshores, stagnant waters and fens, known as carr, in addition to woodlands of spring-fed or flushed sites. Carr is dominated by Rusty Willow (*Salix cinerea* ssp. *oleifolia*) and Alder *(Alnus glutinosa)*. The field layer comprises Creeping Bent *(Agrostis stolonifera)*, Meadowsweet *(Filipendula ulmaria)*, Common Marsh-bedstraw *(Galium palustre)*, Purple-loosestrife *(Lythrum salicaria)* and Skullcap *(Scutellaria galericulata)*. Mosses such as *Climacium dendroides*, *Calliergon cordifolium* and *Homalia trichomanoides* are characteristic. Carr occurs on organic soils and fen peats that are subject to seasonal flooding but remain waterlogged even when flood waters recede.

Woodlands of flushed or spring-fed sites are typically dominated by Alder *(Alnus glutinosa)* or Ash *(Fraxinus excelsior)* and the ground flora is often 'grassy' in appearance with abundant Remote Sedge *(Carex remota)* and Creeping Bent *(Agrostis stolonifera)*. Other common components of the field layer include Bramble (*Rubus fruticosus* agg.), Creeping Buttercup *(Ranunculus repens),* Meadowsweet *(Filipendula ulmaria)*, Common Marsh-bedstraw *(Galium palustre)*, Yellow Pimpernel *(Lysimachia nemorum)* and Lady-fern *(Athyrium filix-femina)*. This type of woodland occurs on mineral soils or fen peats, and may occasionally be associated with river banks or lakeshores. Note that **riparian woodland - WN5** is treated as a separate category.

Also included in this category are woodlands of calcareous spring-fed hollows that are characterised by a mixture of trees including willows (*Salix* spp.), Alder *(Alnus glutinosa)*, Ash *(Fraxinus excelsior)* and Downy Birch *(Betula pubescens)*. Greater Tussock-sedge *(Carex paniculata)* dominates the field layer and tussocks may support species of drier land. Common Reed *(Phragmites australis)* may be abundant in open wet areas. The ground surface is often treacherous and water-filled hollows and channels typically support aquatic plants.

Bog woodland WN7

This category includes woodlands of intact ombrotrophic bogs, bog margins and cutover bog. Bog woodland typically occurs on deep acid peat that is relatively well-drained in the upper layers and is commonly associated with former turf cutting activity or drainage. It may also occur in areas of cutover bog where most of the peat has been removed. Downy Birch *(Betula pubescens)* is the usual dominant and may form pure stands. Other trees and shrubs can include Holly *(Ilex aquifolium)*, Rowan *(Sorbus aucuparia)*, Scots Pine *(Pinus sylvestris),* oaks (*Quercus* spp.) and willows (*Salix* spp.). Dwarf shrubs such as Ling *(Calluna vulgaris)* or Bilberry *(Vaccinium myrtillus)* may occur in the field layer, usually in association with Bracken *(Pteridium aquilinum)*, Bramble (*Rubus fruticosus* agg.), Ivy *(Hedera helix)*, Purple Moor-grass *(Molinia caerulea)* and Honeysuckle *(Lonicera periclymenum)*.

Woodland of waterlogged acid peat in hollows or depressions in areas of upland woodland on siliceous rocks should also be included in this category. Downy Birch *(Betula pubescens)* and/or willows (*Salix* spp.) dominate and the ground flora is characterised by extensive cover of mosses (*Sphagnum* and *Polytrichum* spp.), in addition to grasses *(Molinia caerulea, Anthoxanthum odoratum)*, Star Sedge *(Carex echinata)*, Soft Rush *(Juncus effusus)* and ferns *(Dryopteris dilatata, Blechnum spicant)*.

Links with Annex I: Since the Annex I habitat, '*bog woodland (91D0)', refers to woodland of intact raised bog, examples of this priority habitat are very rare in Ireland.

HIGHLY MODIFIED/NON-NATIVE WOODLAND

(Mixed) broadleaved woodland WD1

This general category includes woodland areas with 75-100% cover of broadleaved trees, and 0-25% cover of conifers. It should be used in situations where woodland stands cannot be classified as semi-natural on the basis of the criteria outlined above. Trees may include native and non-native species. Plantations of broadleaved trees are included if the canopy height is greater than 5 m, or 4 m in the case of wetland areas. Stands of immature or sapling trees are excluded (see **immature woodland - WS2**). If a number of different broadleaved tree species contribute significantly to the canopy, the term 'mixed' should be used in the habitat title.

Mixed broadleaved/conifer woodland WD2

This general category includes woodland areas with mixed stands of broadleaved trees and conifers, where both types have a minimum cover of 25%, and a maximum of 75%. Trees may be either native or non-native species. Mixed broadleaved/conifer plantations are included if the canopy height is greater than 5 m, or 4 m in the case of wetland areas. Stands of immature or sapling trees are excluded (see **immature woodland - WS2**).

(Mixed) conifer woodland WD3

This general category includes woodland areas with 75-100% cover of conifers, other than **conifer plantation - WD4**. The broadleaved component should be less than 25%. Woodlands that belong in this category are most likely to be found in parks or gardens, or in the grounds of old estates and institutions where there has been a history of planting. Non-native trees usually dominate. The term 'mixed' should be used in the habitat title if woodland stands comprise a number of different conifer species.

Conifer plantation WD4

This category is used for areas that support dense stands of planted conifers where the broadleaved component is less than 25% and the overriding interest is commercial timber production. Conifer plantations are characterised by even-aged stands of trees that are usually planted in regular rows, frequently within angular blocks. Species diversity is low and single species stands are common. The majority of planted conifers are non-native species such as Sitka Spruce *(Picea sitchensis)*, Lodgepole Pine *(Pinus contorta)*, Norway Spruce (*Picea abies)* and larches (*Larix* spp.). Conifer plantations may be fringed with narrow bands of broadleaved trees, most of which are also planted. Any distinct blocks of broadleaved trees should be recorded separately in the appropriate woodland category. Mixed stands of conifers and broadleaved trees (at least 25% of each) should be considered under **mixed broadleaved/conifer woodland - WD2**. Young conifer plantations and Christmas tree farms are included in this category but note that plantations that have been felled and not replanted are excluded (see **recently-felled woodland - WS5**).

Scattered trees and parkland WD5

This category can be used in situations where scattered trees, standing alone or in small clusters, cover less than 30% of the total area under consideration but are a prominent structural or visual feature of the habitat. This usually occurs in areas of cultivated grassland, particularly amenity areas. In the case of parkland or parks which originate from former planting and landscaping, the proportion of non-native trees is typically high. This category can also be used for scattered fruit trees in orchards but commercial orchards with heavily pruned trees should be considered under **horticultural land - BC2**

SCRUB/TRANSITIONAL WOODLAND

Scrub WS1

This broad category includes areas that are dominated by at least 50% cover of shrubs, stunted trees or brambles. The canopy height is generally less than 5 m, or 4 m in the case of wetland areas. Scrub frequently develops as a precursor to woodland and is often found in inaccessible locations, or on abandoned or marginal farmland. In the absence of grazing and mowing, scrub can expand to replace grassland or heath vegetation. Trees are included as components of scrub if their growth is stunted as a result of exposure, poor soils or waterlogging. If tall trees are present, these should have a scattered distribution and should not form a distinct canopy. This category does not include areas that are dominated by young or sapling trees (<5 or 4 m in height) or young conifer plantations (see **immature woodland - WS2 or conifer plantation - WD4**). Linear boundary features of scrub that are less than 4 m wide should be considered under **hedgerows - WL1**.

Stonechat Saxicola torquata *(R. T. Mills)*

Scrub can be either open, or dense and impenetrable, and it can occur on areas of dry, damp or waterlogged ground. Common components include spinose plants such as Hawthorn *(Crataegus monogyna)*, Blackthorn *(Prunus spinosa)*, Gorse *(Ulex europaeus)*, Juniper *(Juniperus communis)*, Bramble (*Rubus fruticosus* agg.) and erect or scrambling roses (*Rosa* spp.), in addition to a number of willows (*Salix* spp.), small birches (*Betula* spp.) and stunted Hazel *(Corylus avellana)*. Scrub may also contain Bog-myrtle *(Myrica gale)* and Broom *(Cytisus scoparius)*. The field layer is often impoverished and poorly-developed but, in some situations, may be similar to that of woodland. Low-growing Western Gorse *(Ulex gallii)* and prostrate Juniper *(Juniperus communis)* can also be components of heath. Note that any areas that are dominated by non-native shrubs should be excluded (see **ornamental/non-native shrub - WS3**).

Links with Annex I: Stands of juniper scrub correspond to the annexed habitat, 'Juniperus communis formations on heaths or calcareous grasslands (5130)'.

Immature woodland WS2

Immature woodland includes areas that are dominated by young or sapling trees that have not yet reached the threshold heights (5 m, or 4 m in the case of wetland areas) for inclusion in the woodland categories previously described. Recently planted areas and young plantations should also be included here, with the exception of **conifer plantations - WD4**. Any areas that are dominated by shrubs or stunted trees should be considered under **scrub - WS1**.

Ornamental/non-native shrub WS3

This category should be used for areas that are dominated by ornamental and non-native shrubs. Most of these originate from planting and can be found in formal beds and borders in gardens, parks and other landscaped areas. It also includes areas where non-native shrubs have escaped and become naturalised in urban and rural situations. The range of possible non-native shrubs is extensive but some of the more common examples include Fuchsia *(Fuchsia magellanica)*, Butterfly-bush *(Buddleja davidii)*, Box *(Buxus sempervirens)*, Snowberry *(Symphoricarpos albus)*, Cotoneaster (*Cotoneaster* spp.), Rhododendron *(Rhododendron ponticum)* and Cherry Laurel *(Prunus laurocerasus)*. Ornamental/non-native shrubs should not be recorded as a separate habitat where they occur in the understorey of woodlands. Hedgerows that comprise non-native shrubs, and coastal dunes that have been planted with Sea-buckthorn *(Hippophae rhamnoides)* are excluded (see **hedgerows - WL1** and **dune scrub and woodland - CD4**). Note that there is a separate category for **flower beds and borders - BC4**.

Short rotation coppice WS4

Short rotation coppice includes areas where frequent coppicing or harvesting of trees and shrubs prevents the development of mature woodland. Stands of fast-growing willows (*Salix* spp.) and poplars (*Populus* spp.) that are planted for energy production (biomass) or basket-making should be included here. Older stands of trees that were coppiced in the past should be considered in the woodland categories above.

Recently-felled woodland WS5

This category should be used for areas of plantation or other woodland that have been clear-felled but have not been replanted or converted to another landuse. Common colonisers of open ground among the tree stumps and brash (discarded woody material) include Rosebay Willowherb *(Epilobium angustifolium)*, Wild Strawberry *(Fragaria vesca)*, Field Forget-me-not *(Myosotis arvensis)*, Foxglove *(Digitalis purpurea)* and ferns. If trees and shrubs have become established in areas that are left unplanted, the habitat should be considered under **scrub - WS1** or **immature woodland - WS2**. Note that recently coppiced areas are classified as **short rotation coppice - WS4**.

LINEAR WOODLAND/SCRUB

Hedgerows WL1

Linear strips of shrubs, often with occasional trees, that typically form field or property boundaries. Most hedgerows originate from planting and many occur on raised banks of earth that are derived from the excavation of associated drainage ditches. Dimensions of hedgerows vary considerably, depending largely on management and composition, and are taken here as being mainly less than 5 m high and 4 m wide. When wider or taller than this, or dominated by trees, the habitat should be considered as a narrow strip of scrub or woodland, or as a **treeline - WL2**. Some hedgerows may be overgrown or fragmented if management has been neglected, but they should still be considered in this category unless they have changed beyond recognition. Linear strips of low scrub are included in this category if they occur as field boundaries.

Species composition varies with factors such as age, management, geology, soils and exposure. Hedgerows commonly support a high proportion of spinose plants such as Hawthorn *(Crataegus monogyna)*, Blackthorn *(Prunus spinosa)*, Gorse *(Ulex europaeus)*, Holly *(Ilex aquifolium)*, Dog-rose *(Rosa canina)* or Bramble (*Rubus fruticosus* agg.), in addition to many other native and non-native trees and shrubs including, for example, Ash *(Fraxinus excelsior)*, Hazel *(Corylus avellana)*, Beech *(Fagus sylvatica)*, Elder *(Sambucus nigra)*, elms (*Ulmus* spp.) and willows (*Salix* spp.). Some of these may occur as scattered tall trees. Fuchsia *(Fuchsia magellanica)*, an introduced shrub, is a common component of hedgerows in parts of the south and west of Ireland. Hedgerows frequently support climbing plants such as Ivy *(Hedera helix),* Honeysuckle *(Lonicera periclymenum),* Hedge Bindweed *(Calystegia sepium)*, Cleavers *(Galium aparine)* and Bush Vetch *(Vicia sepium)*. Tall grasses, including False Brome *(Brachypodium sylvaticum)* and Hairy-brome *(Bromopsis ramosa)*, ferns, and woodland herbs are characteristic.

Drainage ditches are often closely associated with hedgerows and should be recorded separately if they contain standing water or support aquatic plants (see **drainage ditches - FW4**). Dry ditches are not distinguished as separate habitats. Linear boundaries of low scrub, Gorse *(Ulex europaeus)* and Bramble (*Rubus fruticosu*s agg.) in particular, should be included here, but note that **earth banks - BL2** and **stone walls and other stonework -BL1** are treated as separate categories.

Treelines WL2

A treeline is a narrow row or single line of trees that is greater than 5 m in height and typically occurs along field or property boundaries. This category includes tree-lined roads or avenues, narrow shelter belts with no more than a single line of trees, and overgrown hedgerows that are dominated by trees. Most treelines are planted and trees are often regularly spaced. They commonly comprise a high proportion of non-native species such as Beech *(Fagus sylvatica)*, Horse Chestnut (*Aesculus hippocastanum)*, Sycamore *(Acer pseudoplatanus)*, limes (*Tilia* spp.), some poplars (*Populus* spp.) and conifers. Trees may occur on level ground or on banks of earth. The presence or absence of hedgerow or scrub at the base should be noted. If treelines are greater than 4 m wide at the base they should be considered as narrow stretches of woodland.

EXPOSED ROCK AND DISTURBED GROUND

Burren, Co. Clare *(L.Lysaght)*

Habitat categories and codes	**ER**	EXPOSED ROCK	**ER1** Exposed siliceous rock **ER2** Exposed calcareous rock **ER3** Siliceous scree and loose rock **ER4** Calcareous scree and loose rock
	EU	UNDERGROUND ROCK AND CAVES	**EU1** Non-marine caves **EU2** Artificial underground habitats
	ED	DISTURBED GROUND	**ED1** Exposed sand, gravel or till **ED2** Spoil and bare ground **ED3** Recolonising bare ground **ED4** Active quarries and mines **ED5** Refuse and other waste

EXPOSED ROCK

Exposed rock includes all natural or artificial exposures of bedrock and loose rock with the exceptions of rocky shores and sea cliffs on the coast and any built stone structures. Disused or infrequently used stone quarries, or parts of quarries, can be considered here but active stone quarries with high levels of disturbance are excluded (see active quarries and mines - ED4). Rock includes solid bedrock and loose rock where particle sizes range from pebbles that are greater than 16 mm in diameter, to large boulders (see Table 2, page 85).

Exposed siliceous rock ER1

This category is used for all natural and artificial exposures of siliceous bedrock or loose rock, apart from some areas of rocky coastline, unstable accumulations of rocky material, and built stone structures. It occurs in upland and lowland areas and can include inland cliffs, crags and other naturally exposed bedrock surfaces, in addition to rock surfaces that are exposed through excavation and construction. Note that active rock quarries with ongoing high levels of disturbance are excluded (see **active quarries and mines - ED4**). Exposed siliceous rock may have some patchy cover of vegetation but this should not exceed 50% in total. Plant communities of rocky ledges and crevices may feature a wide range of herbs, ferns and mosses. Small, scattered pockets of grassland, heath or scrub vegetation may also be present. Common components include Ling *(Calluna vulgaris)*, Bilberry *(Vaccinium myrtillus),* grasses *(Deschampsia caespitosa, Anthoxanthum odoratum, Festuca ovina)*, Heath Bedstraw *(Galium saxatile)* and Tormentil *(Potentilla erecta)*. Exposed rock in montane areas can be important for saxifrages (*Saxifraga* spp.), Alpine Lady's-mantle *(Alchemilla alpina)*, Dwarf Willow *(Salix herbacea*) and clubmosses *(Huperzia selago, Diphasiastrum alpinum)*. Lichen cover is often extensive.

Links with Annex I: Corresponds to the annexed habitat, 'siliceous rocky slopes with chasmophytic vegetation (8220)'.

Exposed calcareous rock ER2

This category is used for all natural and artificial exposures of calcareous bedrock and loose rock, and any other exposures of basic rock, with the exception of unstable scree and areas of rocky coastline. It occurs in upland and lowland areas and can include inland cliffs and crags, limestone pavement, and rock surfaces that are exposed by excavation. Note that active rock quarries with ongoing high levels of disturbance are excluded (see **active quarries and mines - ED4**). There may be some patchy cover of vegetation but the total area of bare rock, with or without lichen cover, should exceed 50% for inclusion in this category. Exposed calcareous rock may support small pockets of species-rich calcareous grassland, heath or scrub vegetation. North-facing limestone cliffs in montane areas can be important for rare plant species.

Limestone pavement is a notable inclusion in this category. It includes areas of level, gently-sloping or terraced limestone bedrock that are fissured, broken or weathered along natural joints and faults to produce classic 'clint and gryke' features. Areas of loose limestone rubble known as 'shattered pavement' are also included. Large expanses of bare rock are common and, where soil cover is absent, plants are usually restricted to fissures and other spaces between the rocks. Typical colonisers include ferns (particularly *Cystopteris fragilis* and *Asplenium* spp.), and woodland plants such as Honeysuckle *(Lonicera periclymenum)*, Ivy *(Hedera helix)* and Sanicle *(Sanicula europaea)*. Small pockets of dry calcareous grassland, heath or scrub vegetation are common in areas where there is sufficient soil cover. The diversity of plant species on limestone pavement is typically very high. Unique combinations of arctic-alpine species such as Mountain Avens *(Dryas octopetala)* and Spring Gentian *(Gentiana verna)* occur together with Atlantic-Mediterranean species such as Wild Madder *(Rubia peregrina)*, Irish Orchid *(Neotinea maculata)* and Maidenhair Fern *(Adiantum capillus-veneris)* in the Burren, and other areas of limestone pavement.

Spring Gentian Gentiana verna *(L.Lysaght)*

Links with Annex I: Exposed calcareous rock corresponds to two annexed habitats, 'calcareous rocky slopes with chasmophytic vegetation (8210)' and '*limestone pavements (8240)'. The latter is a priority habitat.

Siliceous scree and loose rock ER3

Accumulations of loose or broken siliceous rock that are largely unvegetated because they are unstable and subject to ongoing disturbance. Scree occurs on steep slopes, or accumulates at the base of cliffs. Rock fragments are typically angular and vary in size from shifting gravel slides to large boulder screes. Some areas may support plant growth but bare rock predominates. In the case of loose rock on mountain tops and ridges, exposure is the main factor preventing vegetation development; it also causes erosion. Loose rock may occur with or without a matrix of finer mineral material or eroded peat. Vegetation cover should not exceed 50% for inclusion in this category. Plant communities of siliceous scree and loose rock are highly variable but typically include elements of acid grassland, heath or scrub vegetation. Lichens, mosses and ferns are usually well represented. In upland areas, scree and loose rock may support dwarf shrubs such as Crowberry *(Empetrum nigrum),* Bilberry *(Vaccinium myrtillus),* Cowberry *(Vaccinium vitis-idaea)* and Dwarf Willow *(Salix herbacea)*, in addition to Wavy-hair Grass *(Deschampsia flexuosa)*, Fir Clubmoss *(Huperzia selago)* and abundant mosses, particularly *Racomitrium lanuginosum* and *Andreaea rupestris*.

Links with Annex I: Corresponds to the annexed habitat, 'siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani) (8110)'.

Calcareous scree and loose rock ER4

Calcareous scree and loose rock comprises broken fragments of limestone and other basic rocks. It can be found in analogous situations to **siliceous scree and loose rock -ER3** described above. Note that areas of shattered limestone pavement are excluded and should be considered under **exposed calcareous rock - ER2**. The flora is typically rich and comprises elements of calcareous grassland, heath or scrub vegetation. Lichens, mosses and ferns (*Dryopteris* and *Polystichum* spp.) are usually well represented. Plant cover should not exceed 50% for inclusion in this category.

Links with Annex I: Corresponds to the annexed habitat, 'calcareous and calcshist screes of the montane to alpine levels (Thlaspietea rotundifolii) (8120)'.

UNDERGROUND ROCK AND CAVES

Non-marine caves EU1

This category includes all natural recesses in rock or subterranean cavities with a complete ceiling, with the exception of those that occur in the littoral zone of the coast (see **sea caves - LR5**). Some caves may contain water, including the underground sections of streams or rivers, while others may be dry. Caves that are open to the public are included. Note that some caves are important sites for bats. Narrow rocky gullies, ravines or fissures that lack complete ceilings are not included here but should be considered under the appropriate exposed rock category above.

Links with Annex I: This category can include the annexed habitat, 'caves not open to the public (8310)'.

Artificial underground habitats EU2

This category includes excavated underground passageways such as underground mine shafts (disused only) or wells, and rail or road tunnels. Underground archaeological features such as souterrains can also be considered here. Note that **active quarries and mines - ED4** are excluded. Artificial underground habitats are noted as possible refuges for wildlife, particularly bats.

DISTURBED GROUND

Exposed sand, gravel or till ED1

This category includes natural or artificial exposures of unconsolidated coarse or mixed sediment. Sand and gravel are mostly made up of sediment particles that are less than 16 mm in diameter (see Table 2, page 85). Till, or boulder clay, is an unsorted mixture of pebbles, cobbles or boulders in a matrix of finer material such as sand, silt or clay. Most exposures of these sediments are associated with sand and gravel pits, or with excavated glacial landscape features such as eskers, drumlins or moraines, and include road cuttings or construction sites. Deposits of sand, gravel or till may also be exposed through natural forces of erosion along river banks, and on some lake shores, but note that **sedimentary sea cliffs - CS3** are excluded. Depending on their nature, these sediments may support a wide range of broadleaved herbs and grasses. Red Hemp-nettle (Galeopsis angustifolia), a rare plant, can be found in sand and gravel pits. As in the case of exposed rock categories, vegetation cover should be less than 50% for inclusion here. Note that **active quarries and mines - ED4** with high levels of disturbance are excluded, and that there is a separate category for **spoil and bare ground - ED2**.

Spoil and bare ground ED2

This category includes heaps of spoil and rubble, and other areas of bare ground that are either very transient in nature, or persist for longer periods of time because of ongoing disturbance or maintenance. Spoil is generally associated with the excavation or construction of roads and buildings, or with drainage and dredging activities. Once the disturbance ends, spoil is readily colonised by plants. Note that heaps of unconsolidated material associated with ongoing mining or quarrying activity should be considered under **active quarries and mines - ED4**. Bare ground can include land that has recently been cleared for agriculture (but not yet tilled - see **tilled land - BC3**) or construction, and other areas with unconsolidated surfaces that are largely unvegetated because they are heavily trampled or regularly driven over or maintained (weeded or treated with chemicals). Examples of the latter can include unpaved forestry roads, paths and car parks, and derelict land in urban areas. If disturbance or maintenance ceased, these areas would readily be invaded by plants. Note that vegetation cover should not exceed 50% (see **recolonising bare ground - ED3**) and that any paved areas should be considered under **buildings and artificial surfaces - BL3**.

Recolonising bare ground ED3

Cinnebar *Tyria jacobaeae* **caterpillars on Ragwort** *Senecio* **sp.** *(L. Lysaght)*

This category is used for any areas where bare or disturbed ground, derelict sites or artificial surfaces of tarmac, concrete or hard core have been invaded by herbaceous plants. Vegetation cover should be greater than 50% for inclusion in this category. Most of the typical colonisers are ruderals, or weed plants. Common examples include Colt's Foot *(Tussilago farfara),* Nettle *(Urtica dioica),* Dandelion (*Taraxacum* spp.), willow-herbs (*Epilobium* spp.) and ragworts (*Senecio* spp.). Grasses are usually also present but should not dominate. Ground that is regularly trampled or driven over is usually characterised by Greater Plantain *(Plantago major),* Knotgrass *(Polygonum aviculare)*, Pineappleweed *(Matricaria discoidea)* and Shepherd's-purse *(Capsella bursa-pastoris)*. In urban areas, recolonising bare ground can be important for wildlife and may support a diverse flora, typically with a high proportion of non-native species, including Butterfly-bush *(Buddleja davidii)*, Japanese Knotweed *(Reynoutria japonica)* and many other garden escapes. Note that if shrubs or grasses dominate, the habitat should be considered under the appropriate scrub/transitional woodland or grassland category.

Active quarries and mines ED4

This category is used for all active rock or sediment quarries (including gravel pits) and mines, or parts of these, where levels of disturbance are so high that colonisation by plants and animals is almost entirely prevented. Piles of loose rock or sediment associated with mining or quarrying can be included here if they are unstable and regularly disturbed.

Refuse and other waste ED5

This category is used for any areas where domestic, industrial, agricultural and other waste is stored, treated or disposed. It includes rubbish dumps, tip heads, landfill sites, sewage plants, slurry pits and heaps of manure or spent mushroom compost. These areas are usually characterised by high nutrient levels and/or the presence of scavengers.

CULTIVATED AND BUILT LAND

Gowran, Co. Kilkenny *(L.Lysaght)*

Habitat categories and codes		
	BC CULTIVATED LAND	**BC1** Arable crops
		BC2 Horticultural land
		BC3 Tilled land
		BC4 Flower beds and borders
	BL BUILT LAND	**BL1** Stone walls and other stonework
		BL2 Earth banks
		BL3 Buildings and artificial surfaces

CULTIVATED LAND

Arable crops BC1

Agricultural land that is cultivated and managed for the production of arable crops, including cereals (wheat, barley, oats, maize), and root, leaf, energy or fibre crops such as sugar beet, turnips, rape and flax. Fields of potatoes can be included here, but most other vegetable crops are excluded, as are market gardens. If small plots of any of the above crops are mixed with other vegetables or grown in glasshouses or polythene tunnels, they should be classified as **horticultural land - BC2**. Note that rye-grass leys planted as part of an arable rotation are excluded (see **improved agricultural grassland - GA1**). Depending on the intensity of fertiliser or herbicide use, seed sources and soil type, arable crops may harbour a variety of weed species. Common Poppy *(Papaver rhoeas)*, Bladder Campion *(Silene vulgaris)*, Wild Carrot *(Daucus carota)*, Common Field-speedwell *(Veronica persica)*, Corn Spurrey *(Spergula arvensis)*, Corn Marigold *(Chrysanthemum segetum)* and knotgrasses (*Polygonum* spp.) may be abundant in some arable fields. Other weeds that were formerly very common in corn or flax fields in Ireland but are now extremely rare include Cornflower *(Centaurea cyanus)* and the grass, Darnel *(Lolium temulentum)*. Note that there is a separate category for **tilled land - BC3** that has been prepared for planting but where the type of crop is unknown.

Horticultural land BC2

This category includes areas of land that are cultivated and managed for the production of vegetables, fruit crops, culinary or aromatic herbs, flowers and other ornamental plants. It should also be used for market gardens, tree nurseries, garden centres, greenhouses, polythene tunnels and smaller vegetable plots in gardens and allotments. Note that potatoes, turnips and other agricultural, energy or fibre crops are excluded (see **arable crops - BC1**), as are **flower beds and borders - BC4**. Commercial orchards with heavily pruned fruit trees (usually less than 2 m tall) are included in this category, while orchards with scattered taller fruit trees should be considered under **scattered trees and parkland - WD5**. Horticultural land may support a variety of weed species depending on soil type and the intensity of management. Fertiliser, herbicide and pesticide use may range from very high in some market gardens, to almost none in the case of organic gardens. Some of the commoner weeds of cultivated land include Charlock *(Sinapis arvensis)*, dead-nettles (Lamium spp.), Common Chickweed *(Stellaria media)* and Fumitory (*Fumaria* spp.). Note that the category **tilled land - BC3** should be used for areas prepared for planting but where the type of crop is unknown.

Tilled land BC3

This category should be used in situations where land has been tilled and prepared for planting but where the type of crop, or future use of the land, cannot be established. Areas of reclaimed or cleared land should only be included here if they have been prepared for planting. Note that most other areas of disturbed or cleared land should be considered under spoil and bare ground - ED2.

Flower beds and borders BC4

This category is used for ornamental flower beds and borders where herbaceous plants or dwarf shrubs, rather than shrubs, dominate. Such features occur in gardens and parks, on roadsides and roundabouts, and in the grounds of various buildings and institutions. The majority originate from planting, usually for the purpose of decoration or landscaping, and most are regularly maintained and managed. They typically feature a high proportion of non-native species or varieties of plants. Scattered trees or shrubs, standing alone or in small groups, are included where cover does not exceed 25% of the area in question. If shrubs dominate, the habitat should be considered under **scrub -WS1** or **ornamental/ non-native shrub - WS3**. Note that lawns or areas of **amenity grassland (improved) - GA2** are excluded. Weeds may be common, particularly some of the smaller species such as Shepherd's-purse *(Capsella bursa-pastoris),* Groundsel *(Senecio vulgaris)* and Red Dead-nettle *(Lamium purpureum)*.

BUILT LAND

Stone walls and other stonework BL1

This category incorporates stone walls and most other built stone structures in rural and urban situations, apart from intact buildings (see **buildings and artificial surfaces -BL3**) and coastal constructions made of stone (see **sea walls, piers and jetties - CC1**).

Retaining wall *(L.Lysaght)*

It includes dry stone and old mortar walls that occur as field or property boundaries; retaining walls against banks of soil; stone walls that rise from rivers, canals or moats; stone bridges, viaducts and aqueducts; stone jetties or piers in lakes or rivers; derelict or ruinous buildings made of stone; and old stone monuments, fortifications or ruins. Note that modern or intact buildings made of stone are excluded, as are any structures made of bricks, cement blocks or mass concrete (see **buildings and artificial surfaces - BL3**).

Stone walls and other types of stonework differ in terms of physical structure and composition (type of stone, presence of mortar), age and the degree of maintenance. Older and more neglected structures are generally the most important for wildlife. Stone walls may support a diverse flora with abundant lichens, mosses and ferns (particularly *Asplenium trichomanes*, A. *ruta-muraria* and *A. ceterach*). Other common components include Ivy *(Hedera helix)* and other creepers, grasses (*Aira* and *Catapodium* spp.), stonecrops (*Sedum* spp.), Herb-robert *(Geranium robertianum)* and Navelwort *(Umbilicus rupestris)*. Non-native

species such as Red Valerian *(Centranthus ruber)*, Wallflower *(Erysimum cheiri)* and Ivy-leaved Toadflax *(Cymbalaria muralis)* are often prominent. Stone walls that are overgrown

by trees, shrubs or brambles should be considered in the woodland section under **hedgerows - WL1** or **treelines - WL2**. Bridges and derelict buildings can be important habitats for birds or bats in particular.

Lichens on gravestones *(L.Lysaght)*

Earth banks BL2

Earth banks are a common type of field boundary in many parts of Ireland. Constructed from local materials such as peat, earth, gravel or stone, these narrow linear ridges are often bordered by drainage ditches. Most are completely vegetated when intact and feature elements of a range of habitats, including grassland, heath, hedgerow and scrub. Earth banks usually support abundant grasses and a wide range of broadleaved herbs such as Foxglove *(Digitalis purpurea)*, violets (*Viola* spp.), Yarrow *(Achillea millefolium)*, Common Knapweed *(Centaurea nigra)*, Wild Strawberry *(Fragaria vesca)* and Primrose *(Primula vulgaris)*. Dwarf shrubs (*Calluna vulgaris, Vaccinium myrtillus, Erica* spp.), shrubs, ferns and Ivy *(Hedera helix)* may also be common. Earth banks differ from **hedgerows -WL1** in that the bank is the dominant physical feature in the former and, while trees and shrubs may be present, they do not dominate. They differ from **stone walls and other stonework - BL1** in that earth banks are usually wider, stones may be visible but not dominant, and vegetation cover is extensive.

Buildings and artificial surfaces BL3

This broad category incorporates areas of built land that do not fit elsewhere in the classification. It includes all buildings (domestic, agricultural, industrial and community) other than derelict stone buildings and ruins (see **stone walls and other stonework - BL1**). It also includes areas of land that are covered with artificial surfaces of tarmac, cement, paving stones, bricks, blocks or astroturf (e.g. roads, car parks, pavements, runways, yards, and some tracks, paths, driveways and sports grounds). Unpaved areas are excluded (see **spoil and bare ground - ED2**). Any other built structures that are not made of natural stone, including walls made of bricks, cement blocks and mass concrete, should be considered here. Note that greenhouses and polythene tunnels are excluded (see **horticultural land - BC2**), as are refuse dumps (see **refuse and other waste - ED5**). Plant cover should not exceed 50%.

COASTLAND

Ballyteige Burrows, Co. Wexford *(L.Lysaght)*

Habitat categories and codes	**CS**	SEA CLIFFS AND ISLETS	**CS1** Rocky sea cliffs categories **CS2** Sea stacks and islets **CS3** Sedimentary sea cliffs
	CW	BRACKISH WATERS	**CW1** Lagoons and saline lakes **CW2** Tidal river
	CM	SALT MARSHES	**CM1** Lower salt marsh **CM2** Upper salt marsh
	CB	SHINGLE AND GRAVEL BANKS	**CB1** Shingle and gravel banks
	CD	SAND DUNE SYSTEMS	**CD1** Embryonic dunes **CD2** Marram dunes **CD3** Fixed dunes **CD4** Dune scrub and woodland **CD5** Dune slacks **CD6** Machair
	CC	COASTAL CONSTRUCTIONS	**CC1** Sea walls, piers and jetties **CC2** Fish cages and rafts

This section includes habitats of the coast that are either above the level of high tides but have a strong marine influence, or those in the littoral (intertidal) zone that are dominated by terrestrial vascular plant communities. Vegetated strandlines are an exception as they are considered as part of the seashore under littoral sediment in the marine littoral section. Brackish water systems are included here.

SEA CLIFFS AND ISLETS

Rocky sea cliffs CS1

This category includes steep or vertical rocky cliffs on the coast that are greater than 5 m in height. They may ascend in steps and have ledges, crevices and overhangs. Rocky sea cliffs may either rise directly from the sea or be separated from it by a narrow shore. Note that any parts of the sea cliff within the littoral zone should be classified separately in the littoral rock section. Rocky sea cliffs are formed primarily of exposed bedrock but, in places, there may be accumulations of loose rock, gravel or soil. The physical nature of sea cliffs is determined largely by rock type and geological structure. Exposed rock dominates and should exceed 50% for inclusion in this category. Lichen cover is usually extensive. Rocky crevices and ledges may support salt-tolerant plants such as Thrift *(Armeria maritima)*, Sea Aster *(Aster tripolium)*, Sea Plantain *(Plantago maritima)*, Roseroot *(Rhodiola rosea)* and Bladder Campion *(Silene vulgaris)*. Pockets of grassland, typically with dense growth of ungrazed Red Fescue *(Festuca rubra),* or heath may occur in places where soils have accumulated; if cover exceeds 50%, the habitat should be considered elsewhere in the classification. Rocky sea cliffs may support important sea bird colonies.

Where coastal rock cliffs are less than 5 m in height they should be classified in the littoral rock section. Sea caves - LR5 are considered as a separate habitat but sea arches are included here unless they are an integral part of sea stacks and islets - CS2. Non-marine rocky cliffs should be considered under exposed rock (ER1-2).

Links with Annex I: Corresponds loosely to the annexed habitat, 'vegetated sea cliffs of the Atlantic and Baltic coasts (1230)'.

Sea stacks and islets CS2

This category includes small rocky outcrops (<1 ha) in the sea that are separated from the coast by open water and protrude above the level of the high tide. They are surrounded by cliffs (sea stacks) or rocky slopes (islets) and are typically exposed and inaccessible. A strong marine influence is characteristic. Apart from lichens, plant cover is generally sparse and resembles that of rocky sea cliffs - CS1. Patchy cover of ungrazed rank swards of Red Fescue *(Festuca rubra)* is common. Sea stacks and islets may have important sea bird colonies. Note that areas of rock in the littoral or sublittoral zones should be considered separately in the marine section. Larger marine islands are not included here but should be classified on the basis of the habitats they support.

Links with Annex I: Corresponds loosely to the annexed habitat, 'vegetated sea cliffs of the Atlantic and Baltic coasts (1230)'.

Sedimentary sea cliffs CS3

This category includes steep to almost vertical coastal cliffs that are greater than 3 m in height and are formed primarily of unconsolidated material. Sedimentary sea cliffs may comprise mud, sand, gravel or mixtures of these sediments. Stones and large boulders in a matrix of finer material may also be exposed on the cliff face in the case of sea cliffs that are composed of glacial till. Some sedimentary sea cliffs support substantial vegetation cover with a variety of seashore plants; others, especially those that are steep and unstable, may be completely unvegetated.

Links with Annex I: Corresponds loosely to the annexed habitat, 'vegetated sea cliffs of the Atlantic and Baltic coasts (1230)'.

BRACKISH WATERS

Lagoons and saline lakes CW1

This category includes all enclosed bodies of standing brackish water that are wholly or partially separated from the sea by banks of sand, shingle or rock, or by land barriers of rock or peat. Tidal influence is much reduced by these physical barriers or is totally absent. Water levels in lagoons generally undergo seasonal fluctuations (high in winter and low in summer) unless strictly controlled by pumping. Strong water currents are absent and this is a key feature which distinguishes lagoons from other marine water bodies. Salinity is highly variable both within and between different lagoonal systems. It fluctuates on a daily and seasonal basis, depending on tides and inputs of freshwater and, in some situations, may exhibit the full range from sea water to freshwater conditions. In addition to typical sedimentary lagoons, this category also includes brackish waters that have become impounded behind artificial barriers (usually as a result of construction), coastal lakes with natural outlets to the sea that experience some tidal exchange at high tide or during storm conditions, and other lakes that are isolated from the sea but which are slightly saline as a result of percolation of sea water or inputs from salt spray and storm waves or surges. The latter are mainly associated with **fixed dunes - CD3** and **machair - CD6**.

Saline lake *(L.Lysaght)*

For a body of water to be classified as a lagoon or saline lake, there should be detectable salinity in the water (>1‰) and, if there are fluctuations in water levels associated with tides, these are always much less than in nearby marine areas. Communities of submerged aquatic plants are characteristic. Tasselweeds (*Ruppia* spp.) are usually present and occur together with marine algae at high salinities, and with Fennel Pondweed *(Potamogeton pectinatus)*, Brackish Water-crowfoot *(Ranunculus baudotii)* and Spiked Water-milfoil *(Myriophyllum spicatum)* at low salinities. Green algae (*Enteromorpha* spp., *Cladophora* spp., *Chaetomorpha linum)* are common. Horned Wrack *(Fucus ceranoides)*, and dense beds of eelgrasses (*Zostera* spp.) and stoneworts (including the lagoonal specialists, *Chara canescens* and *Lamprothamnion papulosum*) may also be present. A faunal community of brackish water species, some of which are lagoonal specialists, is joined or replaced by marine species at high salinity, and by insects, especially beetles and water bugs, at low salinity. Fringing salt marshes (most likely **upper salt marsh - CM2**) and reed and **large sedge swamps - FS1** may be present and should be recorded as separate habitats.

Links with Annex I: Corresponds to the priority habitat, '*coastal lagoons (1150)'.

Tidal rivers CW2

This category should be used for the lower reaches of rivers or streams, and any artificial watercourses, that are tidal and where there are regular fluctuations in salinity and turbidity, and in the rate and direction of water flow. Only the areas that are influenced by brackish water conditions should be included here. Fluctuating water levels may extend beyond the limit reached by sea water but note that the freshwater tidal sections of rivers and streams are excluded (see **depositing/lowland rivers - FW2**). Small tidal creeks off the main river channel are considered as part of the tidal river habitat, as are muddy, sandy or rocky banks or flats that are exposed at low tide. Fringing reedbeds may also be present and, if extensive, these should be considered under **reed and large sedge swamps - FS1**. Islands in tidal rivers are excluded but their presence should be noted. The lower limit of a tidal river is defined as the point where the channel begins to widen as it enters the sea or estuary (the mouth of the river). The seaward extensions of tidal rivers should be considered under the appropriate marine littoral or sublittoral category on the basis of vertical zonation and substratum type.

Links with Annex I: Tidal rivers correspond approximately to the annexed habitat, 'estuaries (1130)'.

SALT MARSHES

Salt marshes are stands of vegetation that occur in marine and brackish water conditions on a range of substrata that are wet, waterlogged or periodically submerged by the sea.

They are typically found between the upper limits of the neap and spring tides in protected bays, estuaries, and other sections of sheltered coastline. Salt marshes are often associated with **sand shores - LS2, muddy sand shores - LS3** and **mud shores -LS4**, but can also be found along the margins of tidal rivers - CW2 and in some **lagoons and saline lakes - CW1**. The underlying sediments are mainly sands or muds, sometimes with mixtures of coarser material. Salt marshes may also develop on coastal peat deposits. These are mainly confined to the west coast of Ireland and often occur in areas where blanket bog has been encroached by the sea as a result of rising sea levels over long periods of time, frequently combined with the more recent cutting of peat.

The vegetation of salt marshes varies considerably depending on the degree of submersion by the sea, the salinity of the substratum or of the water (estuarine or lagoonal salt marshes), and on the intensity of grazing by livestock. Salt marshes are divided here into two types: lower and upper. Examples of both can usually be found in most salt marsh systems. Lower and upper salt marsh may form distinct zones in some situations, particularly along the east coast of Ireland. Complex mosaics may also occur where the underlying topography is varied. Pools, known as pans, and tidal creeks and channels are a common feature of many salt marshes, and of the larger ones in particular.

Lower salt marsh CM1

Lower salt marsh is subject to more prolonged submersion by sea water and is more strongly saline than **upper salt marsh - CM2**. As a result it is characterised by a predominance of halophytes, or salt-tolerant plants. Common Saltmarsh-grass *(Puccinellia maritima)* usually dominates the seaward edge of the salt marsh and often forms a short turf with glassworts (*Salicornia* spp.). Dense stands of cord-grasses (*Spartina* spp.), introduced perennials, or glassworts (*Salicornia* spp.) may also occur at the lower limit of the salt marsh in some places. Note that mudflats or sandflats with open or discontinuous stands of either of these plants are not included in this category but should be considered under littoral sediments. Further inland, Thrift *(Armeria maritima)*, Sea Plantain *(Plantago maritima)* and Sea Arrowgrass *(Triglochin maritima)* are prominent in the vegetation and may occur together with Common Saltmarsh-grass *(Puccinellia maritima)* and Sea Aster *(Aster tripolium)*. Lower salt marsh includes the typical 'middle marsh' communities (swards of *Armeria maritima* and *Plantago maritima*) of the east coast of Ireland. In contrast to **upper salt marsh - CM2**, there is little or no cover of rushes. Some regional differences in species composition are apparent around the Irish coast, e.g. Sea-purslane *(Halimione portulacoides)* and Lax-flowered Sea-lavender *(Limonium humile)* are locally abundant in the east and south, and rare or absent in the north and west.

Links with Annex I: Correspondence between lower salt marsh and four types of salt marsh habitat listed in Annex I of the Habitats Directive (habitat codes 1310, 1320, 1330 and 1420; see Appendix 1) is not exact.

Upper salt marsh CM2

Upper salt marsh is subject to less frequent and less prolonged inundation by the sea and, as a result, is not as saline in character as **lower salt marsh - CM1**. Vegetation is typically dominated by rushes (particularly *Juncus maritimus* and *J. gerardii*) and Red Fescue *(Festuca rubra)*. Creeping Bent *(Agrostis stolonifera)* may be locally abundant in more waterlogged areas. Upper salt marsh supports some species that also occur in **lower salt marsh - CM1**. Examples include Common Scurvygrass *(Cochlearia officinalis)*, Sea Aster *(Aster tripolium)* and Sea Plantain *(Plantago maritima)*. Upper salt marsh differs from **lower salt marsh - CM1** in that grasses and rushes are abundant, and species that are characteristic of freshwater conditions are also present in the former, including Lesser Hawkbit *(Leontodon taraxacoides)*, Marsh Arrowgrass *(Triglochin palustris)* and, on western coasts, Parsley Water-dropwort *(Oenanthe lachenalii)*.

Salt marshes that fringe lagoons are included in this category because they are rarely subjected to inundation by full sea water and, as the tidal range is usually greatly reduced, there is little differentiation of the vegetation into zones. The lower fringe may be dominated by Thrift *(Armeria maritima)*, Sea Plantain *(Plantago maritima)* and Common Saltmarsh-grass *(Puccinellia maritima)* but overall the vegetation is usually characterised by swards of Red Fescue *(Festuca rubra)* with Creeping Bent *(Agrostis stolonifera)* in more waterlogged situations. Sea Rush *(Juncus maritimus)*, Saltmarsh Rush *(J. gerardii)* and Sea-milkwort *(Glaux maritima)* are common, and Marsh Arrowgrass *(Triglochin palustris)* replaces Sea Arrowgrass *(Triglochin maritima)* in waterlogged but less saline areas.

Links with Annex I: Correspondence between this category and the annexed habitats, 'Atlantic salt meadows (Glauco-Puccinellietalia maritimae) (1330)' and 'Mediterranean salt meadows (Juncetalia maritimi) (1410)' is not exact.

SHINGLE AND GRAVEL BANKS

Shingle and gravel banks CB1

This category includes coastal areas where shingle (cobbles and pebbles) and gravel have accumulated to form elevated ridges or banks above the high tide mark. Most of the rocky material should be less than 256 mm in diameter for inclusion in this category (see Table 2, page 85). Shingle and gravel banks, also known as storm beaches, are subject to intermittent disturbance during storms. Vegetation cover is

Sea Mayweed *Tripleurospermum maritimum (R. T. Mills)*

typically sparse on the more exposed seaward side; the leeward side, or back beach, may be extensively vegetated. Common colonisers of stony banks include Sea Sandwort *(Honkenya peploides)*, Annual Sea-blite *(Suaeda maritima)*, Sea Beet *(Beta vulgaris)*, Rock Samphire *(Crithmum maritimum)*, Sea Mayweed *(Tripleurospermum maritimum)*, Herb-robert *(Geranium robertianum)* and Cleavers *(Galium aparine)*. Lichen and moss cover may be extensive. Heath or scrub vegetation may develop on the more stable and sheltered back beaches. Two rare perennial plants, Sea-kale *(Crambe maritima)* and Oysterplant *(Mertensia maritima)*, can also be found on shingle. Note that the strandline is excluded and should be considered under **shingle and gravel shores - LS1**.

Links with Annex I: Corresponds to the annexed habitat, 'perennial vegetation of stony banks (1220)'.

SAND DUNE SYSTEMS

Embryonic dunes CD1

Embryonic, or shifting dunes are unstable low hills or mounds of sand that occur on the upper extreme of the littoral zone, or seashore, between the high tide mark and **marram dunes - CD2**, if present. Embryonic dunes rarely exceed 1 m in height and represent the initial stages of sand dune formation. They are largely unvegetated but typically accumulate in situations where Sand Couch *(Elymus juncea)* and Lyme-grass *(Leymus arenarius)* impede the movement of wind-blown sand. Embryonic dunes may support other salt-tolerant plants such as Sea Rocket *(Cakile maritima)*, Saltwort *(Salsola kali)* and Sea Sandwort *(Honkenya peploides)*. Marram *(Ammophila arenaria)* is generally absent.

Links with Annex I: Corresponds to the annexed habitat, 'embryonic shifting dunes (2110)'.

Marram dunes CD2

Marram dunes are partially stabilised hills or ridges of sand that occur along the seaward edge of the main sand dune system. As the name suggests, these dunes are dominated by the dune-building species, Marram *(Ammophila arenaria)*. Marram dunes are larger than **embryonic dunes - CD1** and may accumulate to heights of 15-20 m. Vegetation cover is incomplete and loose sand at the surface is subject to wind-blow. Sand Sedge *(Carex arenaria)*, Sea Spurge *(Euphorbia paralias)*, Sea-Holly *(Eryngium maritimum)*, Cat's-ear *(Hypochoeris radicata)* and ragworts (*Senecio* spp.) frequently colonise bare sand between tussocks of Marram *(Ammophila arenaria)*. Lichens and mosses are largely absent where the sand is unstable. Marram dunes that are formed primarily of siliceous (acid) sands are known as 'yellow dunes'; those comprising mainly calcareous sands are known as 'white dunes'. Blow-outs or eroded and damaged dune areas with mobile sand are included in this category.

Links with Annex I: Marram dunes correspond to the annexed habitat, 'shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes") (2120)'. This includes yellow dunes.

Fixed dunes CD3

Dark Green Fritillary Argynnis aglaja *(L.Lysaght)*

Fixed dunes are stabilised ridges or hills of sand with a more or less complete cover of vegetation, and where humus has accumulated in the soil. Species composition is highly variable but vegetation is usually characterised by herb-rich grassland or heath communities. Fine-leaved perennial grasses such as Red Fescue *(Festuca rubra)* and bents (*Agrostis* spp.) typically dominate. Marram *(Ammophila arenaria)* may be present but should not be abundant. Dwarf shrubs include Ling *(Calluna vulgaris)* and Bell Heather *(Erica cinerea)*. Creeping Willow *(Salix repens)* may also occur as a dune fixer. Common broadleaved herbs include Lady's Bedstraw *(Galium verum)*, Common Bird's-foot Trefoil *(Lotus corniculatus)*, Kidney Vetch *(Anthyllis vulneraria)*, Ribwort Plantain *(Plantago lanceolata)*, eyebrights (*Euphrasia* spp.), Yarrow *(Achillea millefolium)*, Cat's-ear *(Hypochoeris radicata)*, hawkbits (*Leontodon* spp.) and Wild Thyme *(Thymus praecox)*. Fixed dunes are also important for orchids such as *Dactylorhiza majalis* and *Anacamptis pyramidalis*. Extensive cover of mosses and lichens is characteristic. 'Grey dunes', a type of fixed dune, are so-called because of the abundance of grey-coloured lichens (mainly *Cladonia* and *Peltigera* spp.) in the vegetation.

Fixed dunes also include consolidated and flattened dune areas that typically occur behind the main dune ridges. As these flat sandy areas are frequently used for agriculture, grassland communities may contain 'agricultural' herbs such as Perennial Rye-grass *(Lolium perenne)*, White Clover *(Trifolium repens)*, Daisy *(Bellis perennis),* Dandelion (*Taraxacum* spp.) and Common Ragwort *(Senecio jacobaea)*, but these should not dominate. Areas of **improved agricultural grassland - GA1** should be excluded and note also that machair - CD6 is treated as a separate habitat. Any dune areas with substantial cover of scrub or woodland should be considered under **dune scrub and woodland - CD4** below.

Links with Annex I: Fixed dunes include the priority habitat, '*fixed coastal dunes with herbaceous vegetation ("grey dunes") (2130)'. Occasionally, decalcified fixed dunes are encountered which are dominated by dwarf shrubs. These can be assigned to one of two priority habitats, '*decalcified fixed dunes with *Empetrum nigrum* (2140)' or '*Atlantic decalcified fixed dunes (Calluno-Ulicetea) (2150)', depending on vegetation composition. The annexed habitat, 'dunes with *Salix repens* ssp. *argentea* (Salicion arenariae) (2170)' can also occur but is more commonly associated with **dune slacks - CD5**.

Dune scrub and woodland CD4

This category includes fixed or flattened dunes where scrub or woodland has replaced herbaceous or dwarf shrub communities. This may occur naturally as a result of succession; trees and shrubs may also be planted on dunes. Dune scrub typically comprises spinose species such as gorse (*Ulex* spp.), Hawthorn *(Crataegus monogyna)*, Blackthorn *(Prunus spinosa)*, Juniper *(Juniperus communis)*, Burnet Rose *(Rosa pimpinellifolia)* and Bramble (*Rubus fruticosus* agg.). The introduced shrub, Sea-buckthorn *(Hippophae rhamnoides)*, is occasionally planted to stabilise sand dunes. Elder *(Sambucus nigra)* is another common component of dune scrub. Most of the woodland on dunes originates from planting and comprises mainly non-native species such as Sycamore *(Acer pseudoplatanus)* and conifers. Dune scrub and woodland is comparatively rare in Ireland owing to high levels of disturbance in sand dune systems, particularly from grazing, amenity pressure and agricultural improvement. All other areas of coastal scrub or woodland that are not associated with sand dunes should be considered in the woodland section.

Links with Annex I: 'Dunes with *Hippophae rhamnoides* (2160)' constitute an annexed habitat but the EU has ruled that Irish examples do not qualify for the purposes of the Habitats Directive at present as the species in question is considered to be non-native.

Dune slacks CD5

Dune slacks are nutrient-enriched wet areas that occur in hollows or depressions either behind or between dune ridges, or in blow-outs in the sand dunes. The water table is either at, or close to the surface for much of the year and dune slacks may or may not dry out in summer. Vegetation typically comprises Creeping Willow *(Salix repens)*, Creeping Bent (*Agrostis stolonifera)*, Common Reed *(Phragmites australis)*, sedges (*Carex* spp.), rushes *(Juncus effusus, J. maritimus)* and broadleaved wetland herbs such as Common Marsh-bedstraw *(Galium palustre)*, Water Mint *(Mentha aquatica)*, Silverweed *(Potentilla anserina)* and Bog Pimpernel *(Anagallis tenella)*. Orchids such as *Dactylorhiza incarnata, Gymnadenia conopsea and Epipactis palustris* are common. Dune slacks that remain permanently wet are characterised by Mare's-tail *(Hippuris vulgaris)* and Water Horsetail *(Equisetum fluviatile)*. Note that open bodies of standing brackish water should be considered under **lagoons and saline lakes - CW1**.

Links with Annex I: This category corresponds to the annexed habitat, 'humid dune slacks (2190)'; those with Creeping Willow *(Salix repens)* may also fit in a second annexed category, 'dunes with *Salix repens* ssp. *argentea* (Salicion arenariae) (2170)'.

Machair CD6

This is the term used for coastal grassy plains that are formed of wind-blown calcareous sands. Machair develops in places with a cool, moist and windy climate and, in Ireland, can be found along the west coast from Galway Bay to Malin Head, in Donegal, where gales and high winds are frequent. The grassy plains are usually nearly level and close enough to the water table for small undulations to produce mosaics of wet and dry areas. Machair may also have an undulating or hillocky surface, and can even occur on hills. It is characterised by herbaceous vegetation that is often species-rich and features elements of sand dune communities and calcareous grassland. Also present are wetland species that tolerate fluctuating water levels. The commonest species are Red Fescue *(Festuca rubra)*, Ribwort Plantain *(Plantago lanceolata)*, Daisy *(Bellis perennis)*, Common Bird's-foot Trefoil *(Lotus corniculatus)*, Lady's Bedstraw *(Galium verum)* and White Clover *(Trifolium repens)*. Development of machair is strongly associated with agriculture and human activity. Machair was widely cultivated in the past but is now universally grazed, often heavily, or used for amenity (sports pitches, camp sites, caravan parks) or development. The sandy substrate tends to be unstable and may be disturbed by winter gales, especially if grazing is heavy.

Links with Annex I: Machair is unique to western Ireland and Scotland but is listed as a priority habitat in Ireland only, 'machairs (*in Ireland) (21A0)'.

COASTAL CONSTRUCTIONS

Sea walls, piers and jetties CC1

This category is used for all coastal constructions that are partially or totally inundated by sea water at high tide, or subject to wetting by sea spray or wave splash. It includes sea walls, piers, jetties, slipways, causeways and other structures associated with ports and docks in urban or rural areas. Any other artificial structures that are exposed along the coast at low tide should also be included: coastal defences or groynes, wrecks, and pipes or pipelines. Most buildings are excluded and should be classified under **buildings and artificial surfaces - BL3**. Coastal constructions may be made from a range of artificial and natural materials such as rock, cement, metal, wood or plastic. Note that in the littoral and sublittoral zones of sea walls, piers and jetties, the plant and animal communities that develop are similar to those of natural rocky substrata described in the marine section of the classification.

Fish cages and rafts CC2

This category includes all commercial fish and shellfish farms that occur in coastal waters but which can also be found in freshwater habitats and lagoons. It includes floating fish cages, shellfish rafts and any other associated structures that occur in open water at varying distances from the shore.

MARINE LITTORAL (INTERTIDAL)

Kilmore Quay, Co. Wexford *(L.Lysaght)*

Habitat categories and codes	**LR** LITTORAL ROCK	**LR1** Exposed rocky shores
		LR2 Moderately exposed rocky shores
		LR3 Sheltered rocky shores
		LR4 Mixed substrata shores
		LR5 Sea caves
	LS LITTORAL SEDIMENT	**LS1** Shingle and gravel shores
		LS2 Sand shores
		LS3 Muddy sand shores
		LS4 Mud shores
		LS5 Mixed sediment shores

This section covers habitats of the seashore in the littoral or intertidal zone, defined here as the area between the upper limit of the supralittoral zone (the spray zone on rocky shores and the strandline on sediment shores) and the MLWS tide mark. There are exceptions and a number of habitats that are subject to tidal influence at the upper limit of the littoral zone have been placed in the coastland section of the classification. These include salt marshes (**CM1-2**), sea cliffs (**CS1-3**), **lagoons and saline lakes - CW1** and **tidal rivers - CW2**. Note also that the intertidal sections of any coastal constructions are considered separately under **sea walls, piers and jetties - CC1**. The sublittoral fringe, or extreme lower shore between the mean and extreme low water spring tides, is not included in the littoral zone.

The term 'exposure', as used in relation to the marine environment, refers to wave action or tidal currents, and not to air. Instead, the terms 'emersion' (exposed to air) or 'submersion' (submerged by water) are used.

Littoral, or seashore, habitats are subdivided on the basis of substratum type into two broad sections: littoral rock (hard substrata colonised mainly by epibiota) and littoral sediment (unconsolidated material colonised mainly by infauna). Rock includes bedrock and accumulations of loose rocky material (boulders, cobbles and pebbles - see Table 2) that are largely stable. Sediment includes accumulations of mobile, rounded cobbles and pebbles, known as shingle, in addition to deposits of gravel, sand and mud (the silt/clay fraction). Shores with mixed substrata of rock and sediment are categorised in the littoral rock section. Intertidal peat deposits are treated as solid substrata with rock. Artificial substrata of built stone, concrete, metal, wood or plastic should be considered under **sea walls, piers and jetties - CC1** in the coastland section. Note, however, that artificial substrata generally support the same communities of marine species as natural substrata.

Mudflats, sandflats and estuarine channels that are emersed at low tide are not treated as separate habitats in this classification but should be categorised on the basis of substratum type in the littoral section. Estuarine channels that retain water at low tide (freshwater or brackish) should be considered in the sublittoral section. Reedbeds in estuaries should be categorised as **reed and large sedge swamps - FS1**.

Table 2: Particle size ranges for loose rocky material and sediment

Particle type	Size range - diameter (mm)
Boulder	>256
Cobble	64-256
Pebble	16-64
Gravel	4-16
Coarse sand	1- 4
Medium sand	0.25-1
Fine sand	0.063-0.25
Mud (silt/clay fraction)	<0.063

LITTORAL ROCK

Littoral rock includes rocky habitats of the littoral, or intertidal zone that extends from the upper limit of the supralittoral, or spray zone, to the MLWS tide mark. The extreme lower shore, or sublittoral fringe is excluded. Rock includes bedrock, stable accumulations of loose and mainly angular rock (ranging in size from boulders to pebbles), and intertidal peats. Shores with mixed substrata of rock and sediment are included in the littoral rock section. Accumulations of rounded and mobile rocky material, or shingle, should be considered under **shingle and gravel shores - LS1**.

Rocky shores are subdivided into three main categories on the basis of wave exposure since the degree of wave action on a shore determines, to a large extent, what animal and plant communities are present. It also determines the width of the supralittoral zone because, on the most exposed shores, the effects of sea spray and wave splash can be far-reaching. Low rocky cliffs (<5 m in height), overhangs, rocky headlands and rock pools should be included in this section if they are subject to regular wetting by wave splash or sea spray, and if the cover of terrestrial vascular plant communities does not exceed 50%. **Sea caves - LR5** are treated as a separate habitat, and **rocky sea cliffs - CS1** (>5 m in height) and **sea stacks and islets - CS2** are included in the coastland section. Areas of built stone and other artificial structures in the littoral zone should be considered under **sea walls, piers and jetties - CC1**.

Most rocky shores exhibit distinct zonation patterns that relate to the length of time a particular area is emersed, or exposed by the tide. Rocks of the extreme upper shore, including the supralittoral or spray zone, are typically dominated by lichens. Grey lichens (*Ramalina* spp.) usually occur above yellow lichens (*Xanthoria* spp.) at the top of the littoral zone. A distinctive band of the black lichen *(Verrucaria maura)*, occurs below these at the bottom of the lichen zone. The width of the lichen zone varies with the degree of exposure, as does the height; both are greatest on the most exposed shores. On sheltered shores the lichen zone is usually greatly reduced. The more exposed rocky shores may support patchy cover of terrestrial vascular plant communities in the spray zone. Typical components of the vegetation include Thrift *(Armeria maritima)*, Sea Aster *(Aster tripolium)* and the salt-tolerant grass, Red Fescue *(Festuca rubra)*. On sheltered shores, the transition to terrestrial habitats is usually abrupt. Cover of terrestrial vascular plants should not exceed 50% for inclusion in any of the littoral rock categories.

All rocky shores may feature rock pools that remain water-filled at low tide. Rock pools support a wide variety of communities depending on their size, depth and position on the shore. Those on the upper shore are subject to variable or reduced salinity (mainly rainwater influence) and wide temperature fluctuations, and are typically dominated by ephemeral green seaweeds (E*nteromorpha* and *Cladophora* spp.). Rock pools of the mid-shore are characterised by encrusting coralline algae and the red seaweed, *Corallina officinalis*. Seaweeds such as fucoids and kelps may occur in deeper rock pools on the lower shore.

Links with Annex I: Littoral rock categories may contain examples of the annexed habitat, 'reefs (1170)'.

Exposed rocky shores LR1

Limpets Patella sp. *(R.T. Mills)*

This category includes extremely exposed to exposed bedrock and boulder shores of the open coast. The effects of sea spray and wave splash are usually far-reaching and the lichen zone, described above, may be up to 30-40 m wide on the most exposed shores. At the upper extreme, these shores may support some patchy cover of terrestrial vegetation with Thrift *(Armeria maritima)*, Sea Aster *(Aster tripolium)* and Red Fescue *(Festuca rubra)*. Snails such as *Littorina saxatilis* and *Melarhaphe neritoides* are common in the supralittoral zone. Below this, exposed rocky shores are typically dominated by communities of Common Mussel *(Mytilus edulis)* and barnacles (*Semibalanus balanoides, Chthamalus* spp.). Limpets (*Patella* spp.) are common throughout. Robust algae that can tolerate the physical stresses of wave wash are often abundant on the mid- and lower shore. These include red seaweeds such as *Corallina officinalis* and *Mastocarpus stellatus*, and the brown seaweed, Thongweed *(Himanthalia elongata)*. Red seaweeds can form dense turfs that are resilient to wave wash; coralline crusts are also common.

Moderately exposed rocky shores LR2

This category includes moderately exposed shores of bedrock, boulders and stable cobbles. The lichen zone is generally less extensive than on **exposed rocky shores - LR1** and, within this, there may also be some limited cover of terrestrial vascular plants. Moderately exposed rocky shores are dominated by communities of barnacles and fucoids on the mid- and upper shore, or by fucoids and red seaweeds on the lower shore. Cover of fucoids is typically incomplete and is less continuous than on **sheltered rocky shores - LR3**. Fucoids occur in distinct horizontal bands; the upper shore is characterised by Channel Wrack *(Pelvetia canaliculata)* and Spiral Wrack *(Fucus spiralis)*, the mid-shore by Bladder Wrack *(Fucus vesiculosus)*, and the lower shore by Serrated Wrack *(Fucus serratus)*. Red seaweeds (including *Mastocarpus stellatus, Chondrus crispus, Palmaria palmata* and *Corallina officinalis*) may form dense turfs of single species, or mixtures of species. The variety of other associated species depends on the influence of microtopography, salinity (inputs of freshwater) and sand scour. Communities of Common Mussel *(Mytilus edulis)*, limpets (*Patella* spp.), snails *(Littorina littorea, L. obtusata, Nucella lapillus)*, amphipod crustaceans and crabs are common; ephemeral green and red seaweeds (*Enteromorpha, Ulva* and *Porphyra* spp.) may also be present. The sedentary polychaete worm, *Sabellaria alveolata*, may form honeycomb reefs if there is a plentiful supply of sediment. The presence of boulders and cobbles on the shore increases microhabitat diversity which, in turn, may give rise to greater species richness.

Sheltered rocky shores LR3

This category includes sheltered to extremely sheltered rocky shores of bedrock, and stable accumulations of boulders, cobbles and pebbles. At the upper extreme, the lichen zone is usually compressed to a narrow band as the influence of sea spray and wave action is greatly reduced in sheltered locations. The transition to terrestrial habitats above this is usually abrupt and distinct. Sheltered rocky shores are characterised by very dense growth of fucoids. Different species form distinct zones, typically with Channel Wrack *(Pelvetia canaliculata)* above Spiral Wrack *(Fucus spiralis)* on the upper shore, Knotted Wrack *(Ascophyllum nodosum)* and/or Bladder Wrack *(Fucus vesiculosus)* on the mid-shore, and Serrated Wrack *(Fucus serratus)* on the lower shore. On the mid-shore, Knotted Wrack *(Ascophyllum nodosum)* increases in abundance with increasing shelter, and may support a dense underturf of red seaweeds such as *Corallina officinalis, Mastocarpus stellatus* and *Chondrus crispus*. Snails *(Littorina saxatilis, L. littorea, Melarhaphe neritoides)*, barnacles and limpets may be present in low numbers under the dense seaweed canopy. In situations where salinity is reduced through inputs of freshwater, Horned Wrack *(Fucus ceranoides)*, and ephemeral green seaweeds (*Cladophora* spp.) may be common.

Mixed substrata shores LR4

This category should be used in situations where the shore comprises a mixture of rock and sediment, and where the sediment may include gravel, sand or mud. Mixed substrata shores occur in moderately exposed to sheltered locations and may support fucoid communities that are similar in composition to those of sheltered rocky coasts, but usually with less dense canopy cover, and with a reduced variety of epifaunal species. Barnacles or dense aggregations of Common Periwinkle *(Littorina littorea)* or Common Mussel *(Mytilus edulis)* may also be present. In summer months, blankets of ephemeral green and red seaweeds (*Enteromorpha, Ulva* and *Porphyra* spp.) can dominate these shores. Horned Wrack *(Fucus ceranoides)* occurs in upper estuarine conditions and at stream outlets.

Sea caves LR5

This category includes sea caves of the littoral zone only. Fully submerged caves are not distinguished in this classification (see sublittoral rock section) and **non-marine caves** -EU1 are treated as a separate habitat. Caves are defined as natural recesses in rock that have a complete ceiling. Narrow gullies, ravines or fissures in coastal rock that lack complete ceilings are excluded, as are sea arches; these should be considered under the appropriate littoral rock category, or as **rocky sea cliffs - CS1**. The colonising communities are determined by the position of the sea cave on the shore with regard to tidal fluctuations, and the degree of exposure to wave action. Reduced desiccation and increased shade inside the cave allow certain species to proliferate including, in particular, bryozoans, sponges, ascidians, barnacles, calcareous tubeworms and shade-tolerant red seaweeds.

Links with Annex I: Corresponds loosely to the annexed habitat, 'submerged or partially submerged sea caves (8330)'.

LITTORAL SEDIMENT

This section covers habitats of the seashore in the littoral, or intertidal zone where the substratum comprises mainly unconsolidated material: shingle (mobile cobbles and pebbles), gravel, sand or mud, or mixtures of sediments of different grades. Habitats are classified according to sediment type since this determines the water-holding properties of the substratum and reflects, to some extent, the conditions of wave exposure. Both factors are important in influencing species distributions. Note, however, that making distinctions between the various different sediment categories, particularly the finer sands and muds, can be difficult in practice.

The littoral zone is taken as the area between the uppermost limit of the strandline and the MLWS tide mark. It includes the supralittoral zone which is subject to wetting by sea spray and wave splash, and excludes the sublittoral fringe, or extreme lower shore. The strandline is a zone on the upper shore where organic debris from the sea (mainly decaying seaweed) is deposited by the falling tide. Strandlines, at their upper limit, may support open communities of terrestrial vascular plants. Note that all other coastal or intertidal habitats that are characterised by terrestrial vascular plants should be considered elsewhere in the classification. Littoral sediment does not include salt marshes (**CM1-2**), sand dune systems (**CD1-6**), **shingle and gravel banks - CB1**,or **sedimentary sea cliffs - CS3**.

Estuarine sediments of the littoral zone that are emersed at low tide are included in this section. Note that **tidal rivers - CW2, lagoons and saline lakes - CW1**, and **reed and large sedge swamps - FS1** are categorised as separate habitats. Any estuarine channels that remain occupied by water at low tide should be considered on the basis of substratum type under sublittoral sediments.

Shingle and gravel shores LS1

This category includes exposed or moderately exposed shores with accumulations of loose, coarse but usually rounded and mobile rocky material. Sediments comprise mainly shingle and gravel, where particle sizes are generally larger than coarse sand and smaller than boulders (mostly 4-256 mm in diameter). Shell fragments may also be common. Coastal accumulations of dead maerl, so-called 'coral beaches', are included in this category. The strandline at the upper limit of the shore may be characterised by open communities of terrestrial vascular plants including Annual Sea-blite *(Suaeda maritima)*, oraches (*Atriplex* spp.), Sea Sandwort *(Honkenya peploides)*, Sea Beet *(Beta vulgaris)* and Sea Mayweed *(Tripleurospermum maritimum)*. Two rare perennial plants, Sea-kale *(Crambe maritima)* and Oysterplant *(Mertensia maritima)*, are associated with shingle shores. Note that elevated ridges and banks of shingle and gravel are treated as a separate habitat in

the coastland section (see **shingle and gravel banks - CB1**). Coarse, mobile sediments typically support little marine life other than opportunist amphipod and isopod crustaceans and oligochaete worms. Ephemeral green seaweeds (*Enteromorpha* spp.) may also be present in summer months.

Links with Annex I: This category may contain examples of the annexed habitat, 'annual vegetation of drift lines (1210)'.

Shingle shore, Co. Galway *(J. Fossitt)*

Sand shores LS2

This category includes exposed to sheltered shores of coarse, medium or fine-grained sand, usually with a very small proportion of gravel and mud (<10%). Most of the sediment particles should range from 0.063-4 mm in diameter for inclusion in this category but scattered shells or stones may occur on the surface. Bedrock and loose rock may also be exposed in places. Intertidal sandflats and strandlines are considered as part of the sand shore, but note that any ridges and mounds of sand should be considered under **embryonic dunes - CD1**. Strandlines may support open communities of annual terrestrial vascular plants such as oraches (*Atriplex* spp.), Sea Rocket *(Cakile maritima)*, Saltwort *(Salsola kali)* and Annual Sea-blite *(Suaeda maritima)*. There may also be some sparse cover of Sand Couch *(Elymus juncea),* Lyme-grass *(Leymus arenarius)*, Sea Sandwort *(Honkenya peploides)* and Sea-holly *(Eryngium maritimum)*. Lines of decaying seaweed are characterised by communities of beach fleas and sand hoppers. Mobile sand of the upper shore is typically impoverished of animal and plant life. The lower shore is characterised by amphipod (*Pontocrates* spp., *Bathyporeia* spp., *Haustorius arenarius*) and isopod *(Eurydice pulchra)* crustaceans, with some polychaete worms *(Scolelepis squamata, Nephtys cirrosa, Lanice conchilega)* and bivalve molluscs *(Angulus tenuis)*. Eelgrasses (*Zostera* spp.) may colonise sand along the lower seashore.

Sea-holly Eryngium maritimum *(L.Lysaght)*

Links with Annex I: Sand shores may contain examples of the annexed habitats, 'mudflats and sandflats not covered by sea water at low tide (1140)' and 'annual vegetation of drift lines (1210)'.

Muddy sand shores LS3

This category includes shores where most of the sand is medium or fine (<1 mm in diameter) and where muds (the silt/clay fraction) make up 10-30% of the sediment. Muddy sand usually occurs as gently sloping flats in sheltered areas and these remain water-saturated throughout the tidal cycle. Characteristic components of the fauna include communities of lugworms *(Arenicola marina)* and bivalve molluscs (particularly *Macoma balthica* and *Cerastoderma edule*).

Mudflats may also support beds of eelgrasses (*Zostera* spp.), vascular plants that stabilise sediments and provide a colonising surface for other marine species. Muddy sand shores frequently occur at the seaward edge of salt marshes and may support open or discontinuous stands of cord-grasses (*Spartina* spp.) and glassworts (*Salicornia* spp.). Dense stands of any of these plants should be considered under lower salt marsh - CM1. At low tide, any channels that remain occupied by water, including estuarine channels with freshwater, should be considered under sublittoral sediments.

Lugworm *Arenicola marina* **casts** *(EcoServe)*

Links with Annex I: This category may contain examples of the annexed habitat, 'mudflats and sandflats not covered by sea water at low tide (1140)'.

Mud shores LS4

Mud shores are formed primarily of very fine sediment and usually occur along the most sheltered sections of coastline. The silt/clay fraction of the sediment (particle sizes of <0.063 mm in diameter) should be at least 30%. Small amounts of coarser material, mainly gravel and pebbles, may also be present. This category includes some sandy muds (with 20-70% sand and 30-80% silt/clay), in addition to soft mud shores (>80% silt/clay) that are typically found in the upper reaches of estuaries. They are subject to variable, reduced or low salinity conditions. Mud shores are often characterised by elevated mudflats that are dissected by networks of shallow channels associated with flooding and drainage. They support communities of polychaete worms *(Hediste diversicolor, Nephtys hombergii, Pygospio elegans)*, bivalve molluscs *(Macoma balthica, Scrobicularia plana, Cerastoderma edule, Mya arenaria)*, mud snails (*Hydrobia* spp.) and amphipod crustaceans (*Corophium* spp.). Oligochaete worms are also characteristic if there is a significant freshwater influence. Mud shores may support open or discontinuous stands of glassworts (*Salicornia* spp.), and this may indicate the pioneer formation of salt marsh. Cord-grasses (*Spartina* spp.) may also be present. Dense stands of either of these two plants should be considered under **lower salt marsh - CM1** in the coastland section.

Links with Annex I: Mud shores may contain examples of the annexed habitat, 'mudflats and sandflats not covered by sea water at low tide (1140)'.

Mixed sediment shores LS5

This category should be used for sheltered shores that comprise poorly sorted mixtures of sediments of different grades, including pebbles, gravel, sand and mud. Larger stones and cobbles may be present and these often support some cover of fucoids (particularly *Fucus* spp.) or ephemeral green seaweeds (*Cladophora* spp.). Depending on substratum type, mixed sediment shores may support communities of polychaete worms *(Hediste diversicolor, Scoloplos armiger, Pygospio elegans)*, bivalve molluscs *(Cerastoderma edule, Mytilus edulis, Mya arenaria, Macoma balthica)*, oligochaete worms, amphipod crustaceans and mud snails (*Hydrobia* spp.).

Common Prawn Teach Mor *Palaemon serratus (L. Scott)*

MARINE SUBLITTORAL (SUBTIDAL)

Snakelocks Anemone *Anemonia viridis (R. T. Mills)*

Habitat categories and codes	**SR** SUBLITTORAL ROCK	**SR1** Exposed infralittoral rock
		SR2 Moderately exposed infralittoral rock
		SR3 Sheltered infralittoral rock
		SR4 Exposed circalittoral rock
		SR5 Moderately exposed circalittoral rock
		SR6 Sheltered circalittoral rock
	SS SUBLITTORAL SEDIMENT	**SS1** Infralittoral gravels and sands
		SS2 Infralittoral muddy sands
		SS3 Infralittoral muds
		SS4 Infralittoral mixed sediments
		SS5 Circalittoral gravels and sands
		SS6 Circalittoral muddy sands
		SS7 Circalittoral muds
		SS8 Circalittoral mixed sediments

This section includes habitats of the seabed in the sublittoral, or subtidal zone that extends seawards from the MLWS tide mark. It incorporates the sublittoral fringe, an area that is occasionally emersed during the lowest spring tides. Elsewhere the sublittoral zone is permanently submerged by water. The sublittoral section is subdivided into habitat categories on the basis of factors such as vertical zonation (infralittoral and circalittoral zones), substratum type (rock or sediment), and levels of exposure to wave action and tidal currents. Mixed substrata of rock and sediment are not differentiated as a separate habitat category but are included instead with rock. Note that the sublittoral sections of any coastal constructions, including artificial substrata of built stone, concrete, metal, wood or plastic, should be considered in the coastland section (**CC1-2)**. Any estuarine channels that retain water at low tide (freshwater or brackish) should be categorised under sublittoral sediment. **Tidal rivers - CW2** and **lagoons and saline lakes - CW1** are treated as separate categories in the coastland section.

The term 'exposure', as used in relation to the marine environment, refers to wave action or tidal currents, and not to air. Instead, the terms 'emersion' (exposed to air) or 'submersion' (submerged by water) are used.

SUBLITTORAL ROCK

This section covers habitats of the rocky seabed in the sublittoral, or subtidal zone. Rock includes bedrock and stable accumulations of loose rock (boulders, cobbles and pebbles - see Table 2, page 85), in addition to subtidal peat deposits. There is no separate category for mixed substrata of rock and sediment; these are included instead with sublittoral rock. Sublittoral rock is subdivided into habitat categories on the basis of vertical zonation, and the degree of exposure to wave surge and tidal currents. The infralittoral is the shallow sublittoral zone that extends seawards from the MLWS tide mark, to the lower limit of kelp growth, or of dense seaweed growth, as determined by the depth of light penetration through the water (usually about 10-25 m below chart datum). It includes the sublittoral fringe, or extreme lower shore that is occasionally emersed. Elsewhere, the infralittoral zone remains permanently submerged.

The circalittoral is the deeper sublittoral zone where the rocky seabed is dominated by communities of animals, and plants are occasional or absent. It extends downwards from depths of 10-25 m below chart datum. The character of the circalittoral fauna varies enormously and the species present are determined by factors such as wave action, tidal stream strength, salinity, turbidity, sand scour conditions and rock topography. Communities are typically dominated by mixtures of a range of different species, as opposed to single species. Salinity can range from full sea water to variable or reduced salinity conditions.

Built stone and other artificial structures, including fish farms, in the sublittoral zone should be considered under coastal constructions (CC1-2). Note that artificial substrata generally support the same communities of marine species as natural substrata. Sea caves are not treated as a separate habitat in the sublittoral section but should be included in the appropriate sublittoral rock category. They are characterised by species that are tolerant of wave surge. Vertical rock faces, overhangs and caves are characterised by animal-dominated communities that may occur across a range of exposures. Communities of anemones, soft corals *(Alcyonium digitatum)*, short bryozoan turfs and red seaweeds typically dominate vertical rock faces and overhangs in the infralittoral zone. Circalittoral vertical rock faces support a varied fauna depending on the degree of water movement. Sponges, anemones and cup-corals are particularly characteristic of overhangs and caves in the circalittoral zone.

Links with Annex I: Sublittoral rock categories may contain examples of the annexed habitats, 'reefs (1170)' and 'submerged or partially submerged sea caves (8330)'.

Exposed infralittoral rock SR1

This category includes areas of the rocky seabed in the infralittoral zone that are exposed or extremely exposed to wave action, or to strong tidal currents. Kelps usually dominate. The sublittoral fringe is characterised by dense growth of Dabberlocks *(Alaria esculenta)* or, occasionally, Furbelows *(Saccorhiza polyschides)*. Below this, Laminaria hyperborea dominates and, as depth increases, kelp forest (dense growth) thins out to become kelp park (sparse growth). An understorey of foliose red or brown seaweeds is characteristic; these may form a dense band below the main kelp zone at the bottom of the infralittoral. Sea urchins *(Echinus esculentus)* and Common Mussel *(Mytilus edulis)* may also be present. Animals become more prominent and replace kelps in areas with the strongest water movement. Surge gullies and shallow sublittoral caves (with vertical bedrock walls and overhangs) are typically colonised by communities of encrusting or cushion sponges, colonial ascidians, short turf-forming bryozoans, anemones, barnacles and calcareous tubeworms. Red seaweeds may be present if there is sufficient light, but kelps are absent. The floors of caves and gullies that are abraded and scoured by moving boulders, cobbles and pebbles are usually colonised by coralline crusts and barnacles.

Saccorhiza polyschides **with foliose red algae** *(EcoServe)*

Moderately exposed infralittoral rock SR2

This category includes areas of the rocky seabed in the infralittoral zone that are subject to moderate wave exposure, or to moderately strong tidal currents on more sheltered coasts. Kelps usually dominate; *Laminaria digitata* typically forms a dense narrow band in the sublittoral fringe above *Laminaria hyperborea* forest or park. Kelp generally thins out with depth. Seaweeds, particularly red types such as *Delesseria sanguinea*, *Phycodrys rubens, Corallina officinal*is and *Palmaria palmata*, are common in the understorey and the variety of delicate filamentous types increases as exposure decreases. Characteristic animals include hydroids *(Obelia geniculata)*, calcareous tubeworms *(Pomatoceros triqueter)*, starfish *(Asterias rubens)* and top shells *(Gibbula cineraria)*. Grazing by sea urchins *(Echinus esculentus)* may significantly alter and impoverish these communities. If grazing pressure is intense, there may be little other than barren algal-encrusted rocks beneath the kelp, with animals confined to crevices and spaces beneath boulders that are too small to be penetrated by sea urchins. Dense aggregations of brittlestars *(Ophiothrix fragilis, Ophiocomina nigra)* will give rise to similarly barren communities because of their smothering effect. Communities may also be influenced by disturbance if the substratum is unstable, or by abrasion or covering by coarse sediments. Where this occurs, the kelps, *Laminaria saccharina* and *Saccorhiza polyschides*, or Sea Oak *(Halidrys siliquosa)* are often prominent and replace the typical *Laminaria hyperborea* communities.

Sheltered infralittoral rock SR3

This category includes areas of the rocky seabed in the infralittoral zone that are wave and tide-sheltered, and subject to silting. Sheltered infralittoral rock is characterised by kelp-dominated communities with *Laminaria hyperborea* and/or *Laminaria saccharina*. Among the other associated seaweeds, there is usually a high proportion of silt-tolerant and delicate filamentous types. Grazing by sea urchins *(Echinus esculentus)* and chitons (*Leptochiton* spp.) may impoverish these communities, particularly in the lower infralittoral zone. In the turbid waters of estuaries, kelps and seaweeds are usually replaced by animal-dominated communities comprising barnacles *(Balanus crenatus)*, Common Mussel *(Mytilus edulis)* and shore crabs *(Carcinus maenas)*.

Exposed circalittoral rock SR4

This category covers the rocky seabed in the circalittoral zone on wave exposed coasts or in areas with strong tidal currents, including tidal channels and tide-swept narrows. It is characterised by robust faunal communities that are capable of withstanding strong water movement. Low-lying crusts, cushions and turfs typically dominate but communities of large soft corals such as *Alcyonium digitatum*, and sponges with massive growths *(Haliclona viscosa, Cliona celata, Pachymatisma johnstonia)* may also be present. Jewel Anemone *(Corynactis viridis),* Devonshire Cup-coral *(Caryophyllia smithii)*, and a range of crustose or low-growing bryozoans, anemones, sponges and hydroids are prominent on wave exposed rock. Current-swept and sand-scoured areas are usually colonised by hydroids (*Sertularia* spp.),

bryozoans *(Flustra foliacea)*, anemones *(Urticina felina)*, barnacles *(Balanus crenatus)* and calcareous tubeworms *(Pomatoceros triqueter)*. In areas subject to very strong tidal streams, communities are characterised by various combinations of hydroids *(Tubularia indivisa)*, barnacles *(Balanus crenatus)* and cushion-forming sponges (*Halichondria* spp.). Tide-swept steep or vertical rock often supports dense masses of soft corals *(Alcyonium digitatum)*, in addition to large sponges *(Pachymatisma johnstonia, Cliona celata)* and hydroids *(Tubularia indivisa)*. Grazing by sea urchins *(Echinus esculentus)* can reduce the diversity of communities and lead to a proliferation of encrusting species.

Moderately exposed circalittoral rock SR5

This category covers areas of the rocky seabed in the circalittoral zone that are subject to moderate wave exposure, or to some degree of tidal current in more sheltered situations. Communities vary considerably depending on factors such as water quality (the amount of suspended silt or sand), tidal current strength, topography and rock type. Mixed faunal turfs in areas with moderately weak currents and low levels of suspended silt are characterised by branching and cup sponges, hydroids, anemones, feather stars, sea fans, axinellid sponges and turf-forming bryozoans. Areas influenced by sand typically support a prominent turf of bryozoans *(Flustra foliacea)* and hydroids (*Sertularia* spp., *Hydrallmania falcata*). Moderately exposed circalittoral rock or mixed substrata may also support honeycomb reefs with *Sabellaria spinulosa*, beds of mussels (dominated by *Mytilus edulis, Musculus discors* or *Modiolus modiolus*), or dense beds of brittlestars (typically dominated by *Ophiothrix fragilis* and/or *Ophiocomina nigra*). Dense beds of a variety of ascidians (including *Polycarpa* and *Molgula* spp.) may colonise rocks where silting occurs. High grazing pressure by sea urchins *(Echinus esculentus)* reduces the extent and diversity of faunal communities.

Sheltered circalittoral rock SR6

This category covers areas of the rocky seabed in the circalittoral zone that are sheltered from wave action and significant tidal currents. Under still and sheltered conditions, silting is common. The rock is often well grazed and is typically dominated by encrusting algae *(Aglaozonia, Pseudolithoderma extensum, coralline crusts)*. Large solitary ascidians (*Ascidia* spp., *Ascidiella* spp., *Corella parallelogramma, Ciona intestinalis*) are usually prominent and brachiopods *(Neocrania anomala, Terebratulina retusa)* may occur. On mixed substrata, there may be clumps or more extensive beds of Horse Mussel *(Modiolus modiolus)*.

SUBLITTORAL SEDIMENT

This section includes habitats of the seabed in the sublittoral, or subtidal zone where the substratum comprises mainly unconsolidated material. Sediments may range in size from shingle (mobile cobbles and pebbles) to fine muds; mixtures of sediments of various different grades may also occur. For details of sediment particle sizes see Table 2 (Page 85

). Sublittoral sediment is subdivided into habitat categories on the basis of vertical zonation and sediment type. The infralittoral is the shallow sublittoral (subtidal) zone which extends seawards from the MLWS tide mark, to the lower limit of extensive plant growth as determined by the depth of light penetration through the water (usually about 10-25 m below chart datum). With the exception of the sublittoral fringe, or extreme lower shore, which is occasionally emersed, there is permanent cover of water. The circalittoral is the deeper sublittoral zone that is characterised by communities of animals, and where plants are occasional or absent. It extends below the lower limit of the infralittoral zone, beginning at a depth of about 10-25 m below chart datum. Note that zonation of the sublittoral is less distinct on sediment than it is on rock. Salinity conditions can range from full sea water to freshwater in the case of some estuarine channels.

Infralittoral gravels and sands SS1

This category covers gravels and sands in the infralittoral zone where conditions range from exposed to sheltered. They occur along sections of the open coast and in sea inlets. Infralittoral gravels and sands support faunal communities that are influenced by high levels of disturbance from wave action or tidal currents, or by communities of loose-lying coralline algae known as maerl beds. In shallow water, coarse clean gravels are colonised by a robust fauna of venerid bivalve molluscs *(Spisula elliptica)*, anemones *(Cerianthus lloydii, Edwardsia timida, Halcampa chrysanthellum)* and brittlestars (*Ophiura* spp.), while coarse sands contain amphipod crustaceans (*Bathyporeia* spp.) and robust polychaete worms *(Nephtys cirrosa, Lanice conchilega)*. Maerl beds in coarse clean sediments on the open coast or in tide-swept channels are usually dominated by *Phymatolithon calcareum* and/or *Lithothamnion coralloides*. Eelgrass (*Zostera* spp.) beds may also be present. In estuarine conditions, faunal communities are characterised by robust species that are tolerant of brackish water conditions including amphipod crustaceans, polychaete worms and mysid shrimps.

Links with Annex I: This category may contain examples of the annexed habitats, 'sandbanks which are slightly covered by sea water all the time (1110)' and 'estuaries (1130)'.

Infralittoral muddy sands SS2

This category covers muddy sands in the infralittoral zone where conditions range from exposed to sheltered, and tidal streams are weak. Muddy sands are characterised by a variety of animal-dominated communities including, in particular, polychaete worms *(Arenicola marina, Lanice conchilega)*, bivalve molluscs, burrowing brittlestars (*Amphiura* spp.) and sea urchins *(Echinocardium cordatum)*. Other characteristic species include razor shells (Ensis spp.), hermit crabs *(Pagurus bernhardus)* and starfish *(Asterias rubens)*. Muddy sands may support beds of oysters *(Ostrea edulis)* or maerl *(Phymatolithon calcareum, Lithophyllum* spp.). Seagrass beds with eelgrasses (*Zostera* spp.) and Beaked Tasselweed *(Ruppia maritima)* may also be present. The latter occurs only in estuarine or reduced salinity conditions.

Links with Annex I: This category may contain examples of the annexed habitats, 'sandbanks which are slightly covered by sea water all the time (1110)' and 'estuaries (1130)'.

Infralittoral muds SS3

This category covers sandy muds and soft muds of the open coast or marine inlets where conditions range from fully marine to estuarine, and where tidal streams are weak. Infralittoral muds are characterised by communities of polychaete and oligochaete worms and bivalve molluscs (*Abra* spp.); these may occur together with seapens *(Virgularia mirabilis)*, anemones (*Cerianthus lloydii, Sagartiogeton* spp.), burrowing brittlestars (Amphiura spp.), sea slugs *(Philine aperta)* and sea cucumbers. In estuarine situations with variable and reduced salinity, infralittoral muds typically support communities of oligochaete (*Tubificoides* spp.) and polychaete *(Aphelochaeta marioni, Nephtys hombergii)* worms. Seagrass beds similar to those of **infralittoral muddy sands - SS2** may also develop on infralittoral muds.

Links with Annex I: This category may correspond to the annexed habitat, 'estuaries (1130)'.

Infralittoral mixed sediments SS4

This category covers areas of the seabed in the infralittoral zone that comprise various mixtures of sediments (gravel, sand and mud), often with shells and stones on the surface. The varied substratum may result in a wide variety of plant and animal communities being present. Under sheltered conditions, seaweeds can attach to shells and stones on the seabed, or grow as loose-lying mats on the sediment surface. Characteristic species include the kelp, *Laminaria saccharina,* the bootlace weed, *Chorda filum*, and various other red and brown seaweeds including many filamentous types. Maerl beds with *Lithothamnion* and *Phymatolithon* spp. may develop on muddy gravels. Oyster beds with the native species, *Ostrea edulis*, may occur on mixed sediments in very sheltered conditions. Faunal communities of bivalve molluscs and anemones may also be present depending on the nature of the sediment. In estuarine conditions, mixed sediments are often quite species-rich and support epifaunal communities of slipper limpets *(Crepidula fornicata)* and Common Mussel *(Mytilus edulis)*, as well as infaunal communities of polychaete worms and amphipod crustaceans.

Links with Annex I: This category may correspond to the annexed habitat, 'estuaries (1130)'.

Circalittoral gravels and sands SS5

This category includes gravels and sands of the seabed in the circalittoral zone on coasts that are exposed or moderately exposed to wave action, and where tidal currents range from strong to weak. Characteristic components of the fauna include razor shells (*Ensis* spp.), brittlestars *(Ophiura albida)*, sea cucumbers *(Neopentadactyla mixta*), polychaete worms, scallops *(Pecten maximus)*, hermit crabs *(Pagurus bernhardus)* and starfish *(Astropecten irregularis)*.

Circalittoral muddy sands SS6

This category includes muddy sands of the seabed in the circalittoral zone that are characterised by a variety of animal-dominated communities including, in particular, polychaete worms, bivalve molluscs *(Abra alba, Pecten maximus, Nucula nitidosa)*, sea urchins *(Echinocardium cordatum)*, brittlestars (*Amphiura and Ophiura* spp.) and low densities of seapens *(Virgularia mirabilis)*. Other common components include starfish, tube anemones and hermit crabs.

Circalittoral muds SS7

This category includes areas of the muddy seabed in the circalittoral zone where communities of burrowing megafaunal species such as prawns *(Nephrops norvegicus)* often become established under relatively stable conditions on the open coast or in marine inlets. Seapens *(Virgularia mirabilis)*, brittlestars (*Amphiura* spp.), auger shells *(Turritella communis)* and tube anemones *(Cerianthus lloydii)* may also be present.

Circalittoral mixed sediments SS8

This category includes areas of the seabed in the circalittoral zone where sediments comprise various mixtures of gravel, sand and mud, often with shells and stones on the surface. As with infralittoral mixed sediments - SS4, the mix of hard substrata (stones and shells) and finer sediments means that both epifaunal and infaunal communities are present with the result that species diversity can be high. The development of honeycomb reefs *(Sabellaria spinulosa)* and Horse Mussel *(Modiolus modiolus)* beds helps to stabilise the sediment surface. Other characteristic species include tube anemones *(Cerianthus lloydii)*, calcareous tubeworms *(Pomatoceros triqueter)*, hermit crabs *(Pagurus bernhardus)*, starfish *(Asterias rubens)* and brittlestars *(Ophiura albida)*.

MARINE WATER BODY

Connemara, Co. Galway *(L.Lysaght)*

Habitat categories and codes	**MW** MARINE WATER BODY	**MW1** Open marine water **MW2** Sea inlets and bays **MW3** Straits and sounds **MW4** Estuaries

These categories facilitate the classification of marine water bodies beyond the lower limit of the littoral zone. Note that the underlying seabed may comprise substrata of rock and/or sediment. For a classification of marine habitats based on substratum type and zonation, see the marine sublittoral section.

Open marine water MW1

All areas of marine water along the open coast or around offshore rocks and islands that are less than 50% enclosed by land, and excluding any of the coastal features described below.

Sea inlets and bays MW2

Semi-enclosed coastal waters, or indentations of the coast, which are usually sheltered and where the influence of freshwater is generally limited. Sea inlets and bays should be at least 50% enclosed by land. This category includes any narrows or rapids at the entrance to the inlets but note that **estuaries - MW4** are excluded.

Links with Annex I: Corresponds loosely to the annexed habitat, 'large shallow inlets and bays (1160)'.

Straits and sounds MW3

Any relatively narrow channels linking two larger areas of sea and occurring between islands, or between islands and the mainland. Straits and sounds are often characterised by strong tidal currents.

Estuaries MW4

Estuaries are semi-enclosed bodies of water which have a free connection with the open sea. They differ from other coastal inlets in that sea water is measurably diluted by inputs of freshwater and this, combined with tidal movement, means that salinity is permanently variable. The mixing of two very different water masses gives rise to complex sedimentological and biological processes and patterns.

Links with Annex I: Corresponds loosely to the annexed habitat, 'estuaries (1130)'.

GLOSSARY

Abiotic - Of or relating to the non-living components of a habitat or ecosystem

Alluvial - Of or relating to silty deposits transported by water, or occurring on river floodplains

Annual plant - Plant that completes its life cycle within a single growing season

Backwater - Part of a river where water has minimal velocity and silting occurs

Biotic - Of or relating to the living components of a habitat or ecosystem

Biotope - Combination of the physical habitat and its recurring community of animals and plants

Blow-out - Wind-eroded section of a sand dune

Boulder - Large rock that is greater than 256 mm in diameter

Brackish - Where salinity is intermediate between that of freshwater and sea water

Calcareous - Rich in calcium salts (lime-rich), or pertaining to limestone or chalk

Calcicolous - Organisms that have an affinity for habitats that are rich in calcium (lime-loving)

Circalittoral - Lower part of the marine sublittoral, below the infralittoral zone, where the seabed is dominated by animals, and plants are occasional or absent

Clay - Very fine sediment particles that are less than 0.004 mm in diameter -component of mud

Clint - Surface unit of almost horizontal limestone rock that is bounded by fissures Cobble - Sediment particle, or rock, that is between 64-256 mm in diameter

Coppicing - Form of woodland management where trees are regularly cut back to ground level to encourage growth of new shoots from the base

Cultivar - Variety or strain of plant produced by horticultural techniques and not normally found in wild populations

Draw-down zone - Area exposed when water levels are reduced, normally as a result of abstraction in the case of reservoirs, or of drying out in the case of ponds

Drumlin - Streamlined, oval-shaped hill formed by glacial activity and usually comprising unsorted sediment, or till

Edaphic - Of the soil, or influenced by the nature of the soil

Emersed - Above the level of the water, or exposed to air

Epibiota - Surface-dwelling animals and plants

Epifauna - Surface-dwelling animals

Esker - Long, sinuous, steep-sided ridge, comprising layers of sediments (cross-bedded sands and gravels) laid down by glacial meltwaters

Eutrophic - Having high levels of primary productivity or nutrients

Foliose - Of or relating to lower plants that have leaf-like structures

Fucoids - Group of brown seaweeds of the family Fucaceae, known also as wracks

Gley - Soil type subject to waterlogging because of the high content of impermeable clays

Gravel - Sediment particles that are between 4-16 mm in diameter

Gryke - Deep, tapering fissure, normally widened by solution, and cut into the surface of a near level area of limestone rock

Groyne - Breakwater of rock, concrete, wood or metal erected on a beach to inhibit the movement of sand and shingle, and protect against longshore drift

Halophyte - Plant adapted to growing in salt-rich soils and salt-laden air

Herbaceous - Of or relating to non-woody plants or vegetation

Humic acid - Dark brown acid derived from humus or partially decomposed organic material in soils, particularly peats

Hypertrophic - Over-enriched with nutrients, polluted

Immersed - Submerged by water

Infauna - Animals living within sediment

Infralittoral - Upper part of the marine sublittoral extending from the MLWS tide mark to the lower limit of dense plant growth at depths of about 10-25 m below chart datum

Lagg - Fringing wetland area around raised bogs where groundwater mixes with bog water, and where vegetation communities are transitional between bog and fen

Littoral - Of or relating to the intertidal zone, or seashore, which extends from the upper limit of the spray zone or strandline to the top of the sublittoral fringe at the MLWS tide mark

Loam - Friable or crumbly soil comprising sand, silt, clay and organic matter

Maerl - Loose-lying coralline algae, often accumulated into large masses in the sublittoral zone - some beaches are formed almost entirely of dead fragments of such algae (so-called 'coral beaches')

Marl - White calcareous clay or precipitate with a high proportion of soft calcium carbonate, usually found as an alluvial deposit

Megafauna - Animals that are visible to the naked eye

Mesotrophic - Having moderate levels of primary productivity or nutrients (intermediate between oligotrophic and eutrophic)

MHWS - Mean high water spring tide

MLWS - Mean low water spring tide

Montane - Of or relating to mountains

Mor humus - Organic soil that is acid and comprises layers of plant litter

Moraine - Ridge or mound of unsorted mineral material deposited by glaciers

Mosaic - Complex pattern or patchwork of habitats or species occurring in intimate associations

Mud - Silt/clay fraction where sediment particles are less than 0.063 mm in diameter

Naturalised - Relating to introduced or non-native species that have invaded native communities and become established successfully

Oligotrophic - Having low levels of primary productivity or nutrients

Ombrotrophic - Rain-fed, of or relating to vegetation or ecosystems that receive most of their nutrients from precipitation

Pebble - Sediment particle, or stone, that is between 16-64 mm in diameter

Perennial plant - Plant that normally lives for more than two seasons

Phytosociology - Study and classification of plant communities based primarily on floristic considerations

Podzol - Acid soil with an organic layer over a highly leached mineral layer

Reefs - Hard substrata that are raised above the seabed and are formed of rock, or by organisms such as coral or tubeworms

Riffle - Shallow section of a river where water flows swiftly over coarse gravels, rocks and boulders

Riparian - Of or relating to a river bank

Ruderal - Weed plant that inhabits disturbed ground

Run - Section of a river where deep water flows over firm substrata

Sand - Sediment particles that are 0.063-4 mm in diameter

Shingle - Accumulations of loose, usually rounded rocky material (mobile cobble and pebbles) where sediment particles are mostly 16-256 mm in diameter

Siliceous - Of or relating to rocks or sediments that contain silica and are acid

Silt - Fine sediment particles that are between 0.004-0.063 mm in diameter -component of mud

Sinkhole - Steep-sided, enclosed depression linking to underground drainage systems in a limestone region

Skeletal soil - Stony, shallow soil that is poorly developed (lithosol)

Slack - Wet depression in a sand dune system or, in the case of rivers, a backwater Souterrain - Archaeological feature - underground chamber or passageway

Spinose plant - Plants with branches bearing many spines, thorny

Spray zone - Area of the upper seashore that is not submerged at high tides but is sprayed by seawater and may be subject to wave splash

Spring tide - Tide with the greatest difference between the heights of low and high water

Strandline - Area of upper seashore where loose seaweed and other floating debris is deposited by the falling tide

Sublittoral - Of or relating to the subtidal zone which extends seawards from the MLWS tide mark and includes the sublittoral fringe

Sublittoral fringe - Zone between mean and extreme low water spring tides that is only rarely emersed

Submersed - Submerged or covered by water

Supralittoral - Uppermost part of the shore, subject to wetting by wave splash and sea spray but rarely submerged by the sea (above the MHWS tide mark)

Till - Unsorted sediments laid down directly by glacier ice without the intervention of water

Trophic - Of or relating to nutrient levels or nutrition

Tufa - Deposit or precipitate of calcium carbonate around calcareous springs

Vascular plants - Higher plants with specialised conducting tissue, including angiosperms (flowering plants), ferns and clubmosses

Slievemore, Achill Island *(L.Scott)*

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APPENDIX 1: Habitat categories in this classification and their relationships with EU Annex I habitats, and with habitat complexes from the BioMar marine biotope classification. Note that correspondence is approximate in many cases.

NON-MARINE	**EU Annex I habitats** (Natura 2000 code) (*= priority type)
FRESHWATER	
FL1 Dystrophic lakes	Natural dystrophic lakes and ponds (3160)
FL2 Acid oligotrophic lakes	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) (3110) Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea (3130
FL3 Limestone/marl lakes	Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. (3140)
FL4 Mesotrophic lakes	
FL5 Eutrophic lakes	Natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation (3150)
FL6 Turloughs	*Turloughs (3180)
FL7 Reservoirs	
FL8 Other artificial lakes and ponds	
FW1 Eroding/upland rivers	Watercourses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation (3260) Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation (3270)
FW2 Depositing/lowland rivers	
FW3 Canals	
FW4 Drainage ditches	
FP1 Calcareous springs	*Petrifying springs with tufa formation (Cratoneurion) (7220)
FP2 Non-calcareous springs	
FS1 Reed and large sedge swamps	
FS2 Tall-herb swamps	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430)
GRASSLAND AND MARSH	
GA1 Improved agricultural grassland	
GA2 Amenity grassland (improved)	
GS1 Dry calcareous and neutral grassland	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometea) (*important orchid sites) (6210) *Juniperus communis* formations on heaths or calcareous grasslands (5130) Calaminarian grasslands of the Violetalia calaminariae (6130)
GS2 Dry meadows and grassy verges	Lowland hay meadows *(Alopecurus pratensis, Sanguisorba officinalis)* (6510)
GS3 Dry-humid acid grassland	*Species-rich *Nardus* grasslands on siliceous substrates in mountain areas (and submountain areas in continental Europe) (6230) Calaminarian grasslands of the Violetalia calaminariae (6130)
GS4 Wet grassland	*Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) (6410)
GM1 Marsh	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430)
HEATH AND DENSE BRACKEN	
HH1 Dry siliceous heath	European dry heaths (4030) *Juniperus communis* formations on heaths or calcareous grasslands (5130)
HH2 Dry calcareous heath	
HH3 Wet heath	Northern Atlantic wet heaths with *Erica tetralix* (4010)
HH4 Montane heath	Alpine and Boreal heaths (4060)
HD1 Dense bracken	

	PEATLANDS	
PB1	Raised bog	*Active raised bogs (7110) Degraded raised bogs still capable of natural regeneration (7120) Depressions on peat substrates of the Rhynchosporion (7150)
PB2	Upland blanket bog	Blanket bog (*if active bog) (7130)
PB3	Lowland blanket bog	Depressions on peat substrates of the Rhynchosporion (7150)
PB4	Cutover bog	Depressions on peat substrates of the Rhynchosporion (7150)
PB5	Eroding blanket bog	
PF1	Rich fen and flush	*Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae (7210) Alkaline fens (7230)
PF2	Poor fen and flush	
PF3	Transition mire and quaking bog	Transition mires and quaking bogs (7140)
	WOODLAND AND SCRUB	
WN1	Oak-birch-holly woodland	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles (91A0)
WN2	Oak-ash-hazel woodland	
WN3	Yew woodland	**Taxus baccata* woods of the British Isles (91J0)
WN4	Wet pedunculate oak-ash woodland	*Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-padion, Alnion incanae, Salicion albae) (91E0)
WN5	Riparian woodland	
WN6	Wet willow-alder-ash woodland	
WN7	Bog woodland	*Bog woodland (91D0)
WD1	(Mixed) broadleaved woodland	
WD2	Mixed broadleaved/conifer woodland	
WD3	(Mixed) conifer woodland	
WD4	Conifer plantation	
WD5	Scattered trees and parkland	
WS1	Scrub	*Juniperus communis* formations on heaths or calcareous grasslands (5130)
WS2	Immature woodland	
WS3	Ornamental/non-native shrub	
WS4	Short rotation coppice	
WS5	Recently-felled woodland	
WL1	Hedgerows	
WL2	Treelines	
	EXPOSED ROCK/ DISTURBED GROUND	
ER1	Exposed siliceous rock	Siliceous rocky slopes with chasmophytic vegetation (8220)
ER2	Exposed calcareous rock	Calcareous rocky slopes with chasmophytic vegetation (8210) *Limestone pavements (8240)
ER3	Siliceous scree and loose rock	Siliceous scree of the montane to snow levels *(*Androsacetalia alpinae and Galeopsietalia ladani*)* (8110)
ER4	Calcareous scree and loose rock	Calcareous and calcshist screes of the montane to alpine levels *(*Thlaspietea rotundifolii*)* (8120)
EU1	Non-marine caves	Caves not open to the public (8310)
EU2	Artificial underground habitats	
ED1	Exposed sand, gravel or till	
ED2	Spoil and bare ground	
ED3	Recolonising bare ground	
ED4	Active quarries and mines	
ED5	Refuse and other waste	

CULTIVATED AND BUILT LAND	
BC1 Arable crops	
BC2 Horticultural land	
BC3 Tilled land	
BC4 Flower beds and borders	
BL1 Stone walls and other stonework	
BL2 Earth banks	
BL3 Buildings and artificial surfaces	
COASTLAND	
CS1 Rocky sea cliffs	Vegetated sea cliffs of the Atlantic and Baltic coasts (1230)
CS2 Sea stacks and islets	
CS3 Sedimentary sea cliffs	
CW1 Lagoons and saline lakes	*Coastal lagoons (1150)
CW2 Tidal rivers	Estuaries (1130)
CM1 Lower salt marsh	*Salicornia* and other annuals colonising mud and sand (1310) *Spartina* swards (Spartinion maritimae) (1320) Atlantic salt meadows (Glauco-Puccinellietalia maritimae) (1330) Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi) (1420)
CM2 Upper salt marsh	Atlantic salt meadows (Glauco-Puccinellietalia maritimae) (1330) Mediterranean salt meadows (Juncetalia maritimi) (1410)
CB1 Shingle and gravel banks	Perennial vegetation of stony banks (1220)
CD1 Embryonic dunes	Embryonic shifting dunes (2110)
CD2 Marram dunes	Shifting dunes along the shoreline with *Ammophila arenaria* (“white dunes”) (2120)
CD3 Fixed dunes	*Fixed coastal dunes with herbaceous vegetation (“grey dunes”) (2130) *Decalcified fixed dunes with *Empetrum nigrum* (2140) *Atlantic decalcified fixed dunes (Calluno-Ulicetea) (2150) Dunes with *Salix repens* ssp. *argentea* (Salicion arenariae) (2170)
CD4 Dune scrub and woodland	Dunes with *Hippophae rhamnoides* (2160)
CD5 Dune slacks	Dunes with *Salix repens* ssp. *argentea* (Salicion arenariae) (2170) Humid dune slacks (2190)
CD6 Machair	Machairs (*in Ireland) (21A0)
CC1 Sea walls, piers and jetties	*[See littoral/sublittoral rock sections]*

MARINE	EU Annex I habitats (Natura 2000 code)	BioMar marine biotope classification Level 2 - habitat complexes
LITTORAL ROCK		
LR1 Exposed rocky shores	Reefs (1170)	Exposed littoral rock
LR2 Moderately exposed rocky shores		Moderately exposed littoral rock
LR3 Sheltered rocky shores		Sheltered littoral rock
LR4 Mixed substrata shores		
LR5 Sea caves	Submerged or partially submerged sea caves (8330)	*[Various littoral rock categories]*
LITTORAL SEDIMENTS		
LS1 Shingle and gravel shores	Annual vegetation of drift lines (1210)	Littoral gravels and sands
LS2 Sand shores	Mudflats and sandflats not covered by sea water at low tide (1140) Annual vegetation of drift lines (1210)	
LS3 Muddy sand shores	Mudflats and sandflats not covered by sea water at low tide (1140)	Littoral muddy sands
LS4 Mud shores		Littoral muds
LS5 Mixed sediment shores		Littoral mixed sediments
SUBLITTORAL ROCK		
SR1 Exposed infralittoral rock	Reefs (1170) Submerged or partially submerged sea caves (8330)	Exposed infralittoral rock
SR2 Moderately exposed infralittoral rock		Moderately exposed infralittoral rock
SR3 Sheltered infralittoral rock		Sheltered infralittoral rock
SR4 Exposed circalittoral rock	Reefs (1170) Submerged or partially submerged sea caves (8330)	Exposed circalittoral rock
SR5 Moderately exposed circalittoral rock		Moderately exposed circalittoral rock
SR6 Sheltered circalittoral rock		Sheltered circalittoral rock
SUBLITTORAL SEDIMENTS		
SS1 Infralittoral gravels and sands	Sandbanks which are slightly covered by sea water all the time (1110) Estuaries (1130)	Infralittoral gravels and sands
SS2 Infralittoral muddy sands		Infralittoral muddy sands
SS3 Infralittoral muds	Estuaries (1130)	Infralittoral muds
SS4 Infralittoral mixed sediments		Infralittoral mixed sediments
SS5 Circalittoral gravels and sands		Circalittoral gravels and sands
SS6 Circalittoral muddy sands		Circalittoral muddy sands
SS7 Circalittoral muds		Circalittoral muds
SS8 Circalittoral mixed sediments		Circalittoral mixed sediments
MARINE WATER BODY		
MW1 Open marine water		*[Various littoral and sublittoral rock and sediment categories]*
MW2 Sea inlets and bays	Large shallow inlets and bays (1160)	
MW3 Straits and sounds		
MW4 Estuaries	Estuaries (1130)	

APPENDIX 2: Habitat categories in this classification and their relationships with phytosociological units, or syntaxa. Syntaxonomic nomenclature is derived from Rodwell (2000). For further details see 'Links with other schemes' in the introduction. Note that the correspondence is approximate in many cases and that the marine section of the classification has been omitted.

Code	*Habitat category*	*Phytosociological Class(es)*	*Phytosociological Order(s), with Alliances in parentheses*
FL1	Dystrophic lakes	Isoeto-Littorelletea	Utricularietalia intermedio-minoris
FL2	Acid oligotrophic lakes	Isoeto-Littorelletea	Littorelletalia
FL3	Limestone/marl lakes	Charetea fragilis	Nitelletalia flexilis
FL4	Mesotrophic lakes	Potametea	Nupharo-Potametalia
FL5	Eutrophic lakes	Lemnetea	Lemnetalia minoris
FL6	Turloughs	Polygono arenastri-Poetea annuae	Agrostetalia stoloniferae
FL7	Reservoirs	Isoeto-Littorelletea	Littorelletalia
		Potametea	Nupharo-Potametalia
FL8	Other artificial lakes and ponds	Isoeto-Littorelletea	Littorelletalia
		Potametea	Nupharo-Potametalia
FW1	Eroding/upland rivers	Potametea	Callitricho-Potametalia
FW2	Depositing/lowland rivers Potametea	Potametea	Callitricho-Potametalia
FW3	Canals	Potametea	Callitricho-Potametalia
FW4	Drainage ditches	Potametea	Callitricho-Potametalia
FP1	Calcareous springs	Montio-Cardaminetea	Montio-Cardaminetalia (Cratoneurion commutati)
FP2	Non-calcareous springs	Montio-Cardaminetea	Montio-Cardaminetalia (Cardamino-Montion)
FS1	Reed and large sedge swamps	Phragmito-Magnocaricetea	Phragmitetalia
FS2	FS2 Tall-herb swamps	Phragmito-Magnocaricetea	Nasturtio-Glycerietalia
GA1	Improved agricultural grassland	Polygono arenastri-Poetea annuae	Polygono arenastri-Poetalia annuae
GA2	Amenity grassland (improved)	Polygono arenastri-Poetea annuae	Polygono arenastri-Poetalia annuae
GS1	Dry calcareous and neutral grassland	Festuco-Brometea	Brometalia erecti
		Molinio-Arrhenatheretea	Arrhenatheretalia (Cynosurion cristati)
GS2	Dry meadows and grassy verges	Molinio-Arrhenatheretea	Arrhenatheretalia (Arrhenatherion elatioris)
GS3	Dry-humid acid grassland	Calluno-Ulicetea	Nardetalia strictae
GS4	Wet grassland	Molinio-Arrhenatheretea	Molinietalia caeruleae (Junco conglomerati-Molinion; Juncion acutiflori)
GM1	Marsh	Molinio-Arrhenatheretea	Molinietalia caeruleae (Calthion; Filipendulion ulmariae)

Code	Habitat category	Phytosociological Class(es)	Phytosociological Order(s)
HH1	Dry siliceous heath	Calluno-Ulicetea	Calluno-Ulicetalia
HH2	Dry calcareous heath	Calluno-Ulicetea	Calluno-Ulicetalia
HH3	Wet heath	Oxycocco-Sphagnetea	Erico-Sphagnetalia papillosi
HH4	Montane heath	Carici rupestris-Kobresietea bellardii Loiseleurio-Vaccinietea	Kobresio-Dryadetalia Rhododendro-Vaccinietalia
HD1	Dense bracken	Rhamno-Prunetea	Prunetalia spinosae
PB1	Raised bog	Oxycocco-Sphagnetea	Sphagnetalia magellanici
PB2	Upland blanket bog	Oxycocco-Sphagnetea Oxycocco-	Sphagnetalia magellanici
PB3	Lowland blanket bog	Sphagnetea *Depends on surface*	Sphagnetalia magellanici
PB4	Cutover bog	*vegetation Depends on surface*	
PB5	Eroding blanket bog	*vegetation*	
PF1	Rich fen and flush	Scheuchzerio-Caricetea nigrae	Caricetalia davallianae
PF2	Poor fen and flush	Scheuchzerio-Caricetea nigrae	Caricetalia nigrae
PF3	Transition mire and quaking bog	Scheuchzerio-Caricetea nigrae	Scheuchzerietalia palustris (*Caricion lasiocarpae - this syntaxon is not recognised in Rodwell's scheme)*
WN1	Oak-birch-holly woodland	Querco-Fagetea	Quercetalia robori-petraeae
WN2	Oak-ash-hazel woodland	Querco-Fagetea	Fagetalia sylvaticae
WN3	Yew woodland	Querco-Fagetea	Fagetalia sylvaticae
WN4	Wet pedunculate oak-ash woodland	Querco-Fagetea	Fagetalia sylvaticae
WN5	Riparian woodland	Salicetea purpureae	Salicetalia purpureae
WN6	Wet willow-alder-ash woodland	Alnetea glutinosae	Salicetalia auritae Alnetalia glutinosae
WN7	Bog woodland	Vaccinio-Piceetea	Piceetalia excelsae
WD1	(Mixed) broadleaved woodland	} *Assign to the closest woodland*	
WD2	Mixed broadleaved/conifer woodland	} *category, if possible*	
WD3	(Mixed) conifer woodland	Vaccinio-Piceetea	Piceetalia excelsae
WD4	Conifer plantation	Vaccinio-Piceetea	Piceetalia excelsae
WD5	Scattered trees and parkland	} *Assign to the closest woodland category, if possible*	

Code	*Habitat category*	*Phytosociological Class(es)*	*Phytosociological Order(s)*
WS1	Scrub	Rhamno-Prunetea	Prunetalia spinosae
WS2	Immature woodland	Rhamno-Prunetea	Prunetalia spinosae *[or nearest woodland category]*
WS3	Ornamental/non-native shrub	*No close phytosociological equivalent*	
WS4	Short rotation coppice	*No close phytosociological equivalent*	
WS5	Recently-felled woodland	Epilobietea angustifolii	Atropetalia
WL1	Hedgerows	} *Assign to the closest woodland*	
WL2	Treelines	} *category, if possible*	
HD1	Dense bracken	Rhamno-Prunetea	Prunetalia spinosae
ER1	Exposed siliceous rock	Asplenietea trichomanis	Potentilletalia caulescentis
ER2	Exposed calcareous rock	Asplenietea trichomanis	Potentilletalia caulescentis
ER3	Siliceous scree and loose rock	Thlaspietea rotundifolii	Galio-Parietarietalia
ER4	Calcareous scree and loose rock	Thlaspietea rotundifolii	Androsacetalia alpinae rock
EU1	Non-marine caves	*No equivalent*	
EU2	Artificial underground habitats	*No equivalent*	
ED1	Exposed sand, gravel or till	Stellarietea medii	Sisymbrietalia
ED2	Spoil and bare ground	Stellarietea medii	Sisymbrietalia
ED3	Recolonising bare ground	Stellarietea medii	Sisymbrietalia
ED4	Active quarries and mines	Stellarietea medii	Sisymbrietalia
ED5	Refuse and other waste	Stellarietea medii	Sisymbrietalia
BC1	Arable crops	Stellarietea medii	Polygono-Chenopodietalia; Centaureetalia cyani
BC2	Horticultural land	Stellarietea medii	Polygono-Chenopodietalia; Centaureetalia cyani
BC3	Tilled land	Stellarietea medii	Polygono-Chenopodietalia; Centaureetalia cyani
BC4	Flower beds and borders	Stellarietea medii	Centaureetalia cyani
BL1	Stone walls and other stonework	Asplenietea trichomanis	Tortulo-Cymbalarietalia
BL2	Earth banks	*Depends on cover vegetation*	
BL3	Buildings and artificial surfaces	Stellarietea medii	Sisymbrietalia *[where weed communities occur]*

Code	*Habitat category*	*Phytosociological Class(es)*	*Phytosociological Order(s)*
CS1	Rocky sea cliffs	Honkenyo-Elymetea	Elymetalia arenariae *[where cliffs are enriched with detritus]*
		Crithmo-Limonietea	Crithmo-Armerietalia maritimae
CS2	Sea stacks and islets	Honkenyo-Elymetea	Elymetalia arenariae *[where cliffs are enriched with detritus]*
		Crithmo-Limonietea	Crithmo-Armerietalia maritimae
CS3	Sedimentary sea cliffs	Honkenyo-Elymetea	Elymetalia arenariae *[where cliffs are enriched with detritus]*
		Crithmo-Limonietea	Crithmo-Armerietalia maritimae
CW1	Lagoons and saline lakes	Ruppietea	Ruppietalia
CW2	Tidal rivers	Ruppietea	Ruppietalia
CM1	Lower salt marsh	Thero-Salicornietea	Thero-Salicornietalia
		Saginetea maritimae	Saginetalia maritimae
		Spartinetea	Spartinetalia maritimae
CM2	Upper salt marsh	Juncetea maritimi	Glauco-Puccinellietalia
CB1	Shingle and gravel banks	Cakiletea maritimae	Cakiletalia maritimae
		Honkenyo-Elymetea	Elymetalia arenariae
CD1	Embryonic dunes arenariae	Cakiletea maritimae	Cakiletalia maritimae
CD2	Marram dunes	Ammophiletea arenariae	Ammophiletalia
CD3	Fixed dunes	Koelerio-Corynephoretea	Corynephoretalia canescentis
		Calluno-Ulicetea	Calluno-Ulicetalia *[on dune heaths]*
CD4	Dune scrub and woodland	Rhamno-Prunetea	Prunetalia spinosae
CD5	Dune slacks	Polygono arenastri-Poetea annuae	Agrostetalia stoloniferae
CD6	Machair	Koelerio-Corynephoretea	Sedo-Scleranthetalia
CC1	Sea walls, piers and jetties	Crithmo-Limonietea	Crithmo-Armerietalia maritimae
CC2	Fish cages and rafts		

Meadow Saffron *(L. Scott)*