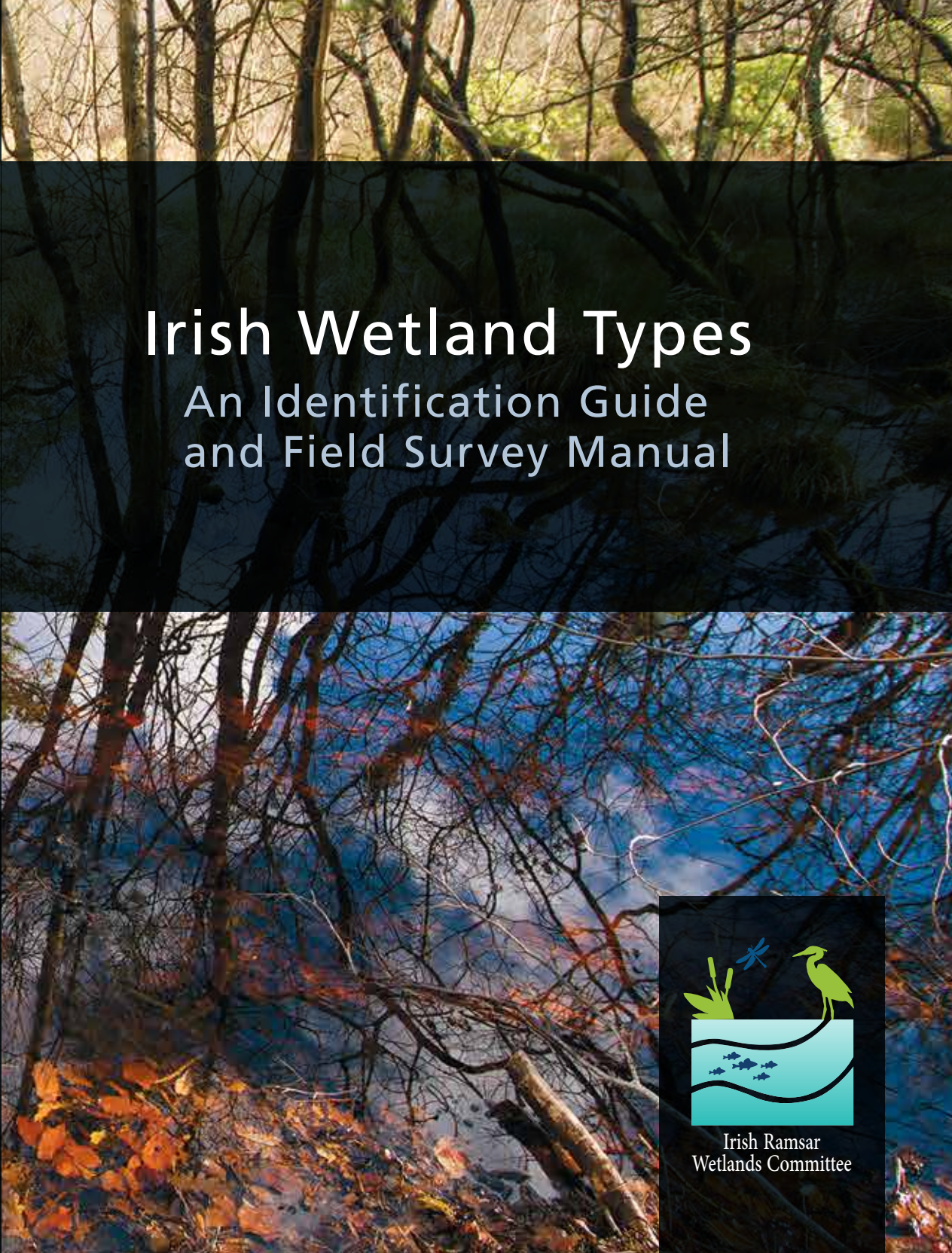
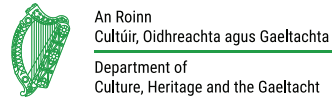


Irish Wetland Types

An Identification Guide and Field Survey Manual

Irish Ramsar Wetlands Committee




Wicklow County Council

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Cover Image: Tina Claffey

Irish Wetland Types

An Identification Guide and Field Survey Manual

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The IRWC is a widely representative group, set up to advance the protection, appreciation and understanding of wetlands in Ireland and to promote the implementation of the Ramsar Convention. The committee is composed of the following members; Maurice Eakin (National Parks and Wildlife Service); Catherine Keena (Teagasc); Ciara Maxwell/ Tadhg O Mahony (Environmental Protection Agency), Jerome Walsh (Department of Agriculture Food & Marine); Micheline Sheehy Skeffington (Plant Ecology Research Unit, NUI Galway), Nathy Gilligan (Office of Public Works); Karin Dubsky (Coastwatch); Niamh Fitzgerald (Birdwatch Ireland); Deirdre Burns (Wicklow County Council); Shirley Clerkin (Monaghan County Council); James King (Inland Fisheries Ireland), Paul Johnston (Trinity College Dublin); David Walker (Department of Housing, Planning and Local Government) and Gearóid Ó Foighil (Community Wetlands Forum).

Prepared by Irish Ramsar Wetlands Committee 2018

www.irishwetlands.ie

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Four spotted chaser

Contents

Bogbean

1. Introduction

The **Ramsar Convention** is an international agreement for the conservation and wise use of wetlands. It is also known as the **Convention on Wetlands** and it is named after the city of Ramsar in Iran, where the Convention was signed in 1971. It pre-dates current European legislation and agreements on the environment and is unique in being an international treaty dedicated to a specific ecosystem group.

Wetland habitats can range from the very small (like a freshwater spring) to habitats which dominate the Irish landscape such as lakes, rivers and bogs. They are home to a large diversity of plant and animal species and form an important network of ecological sites for many species on migration. However, in addition to their biodiversity value, wetlands contribute significantly to our economic wellbeing and quality of life in a number of ways, e.g.

- Improvement and maintenance of water quality by removing and sequestering pollutants and sediments.
- Reduction of the effects of storm and flood events by naturally storing water in the landscape, like a sponge, and releasing it slowly.
- Maintenance of water tables and nutrients in floodplains, thereby helping the production of crops and timber.
- Performance of a vital role in mitigating climate change effects by acting as a carbon store. Peatlands in particular store 20–30% of the world's soil carbon (three times more than the amounts stored in tropical rainforests).
- Over two-thirds of the world's fish harvest is linked to the health of coastal and inland wetland areas.
- Wetlands provide an aesthetic component to our lives, a sense of wilderness and open space, and a place for recreation such as hiking, fishing, shooting, boating and birdwatching.
- Wetlands are an intrinsic part of our cultural heritage in Ireland, providing material for traditional buildings, and contributing to place-names and folklore.

The biodiversity of wetlands in Ireland has been estimated to be worth €385 million per year to the Irish economy and wetlands also contribute a component of the €330 million nature and eco-tourism value of Irish habitats (Bullock *et al.*, 2008).

Subsequent to the Ramsar Convention, the ecological importance of wetland habitats has been recognised by the European Union, with several wetland types listed under Annex I of the EU Habitats Directive (CEC, 1992). These wetland habitats include "priority" habitats, such as lagoons, turloughs (in Ireland), active raised bogs and calcareous fens. The Annex I habitats are protected through the designation of areas of land under the Natura 2000 network of sites across Europe. This network includes Special Areas of Conservation (SACs) for the protection of species and habitats and Special Protection Areas (SPAs) for birds under the Birds Directive (CEC, 2009). Many wetland SACs and SPAs of international importance in Ireland are also listed as Ramsar sites. Many other wetlands occur outside of designated sites and also provide a host of ecological and other services.

The Irish Ramsar Wetlands Committee (IRWC) was set up by the Irish Government in 2010 and is co-hosted by the NPWS and the EPA. This manual was adapted for the Irish context by the IRWC to facilitate the identification of wetlands in Ireland by non-specialists. The need for such a resource was identified following a number of workshops and seminars relating to wetlands co-ordinated by the IRWC since 2010. The generous support of the Scotland & Northern Ireland Forum for Environmental Research (SNIFFER) in making an editable version of the original manual (SNIFFER, 2012) available and in permitting the use of material and content from it is deeply appreciated and acknowledged.

The purpose of this manual is to provide information for the non-specialist about the different types of wetlands in Ireland and how to identify them in the field. Wetlands such as lakes, rivers and ponds that are clearly identifiable as wetlands are not specifically described in this guide; instead there is a focus on the types that are more difficult to define. The typology is designed to enable a basic identification of wetlands in the field, by people who may not necessarily have ecological, hydrological or hydrogeological expertise. The divisions between "types" are therefore based on easily recognisable (visual) characteristics, including the landscape setting, hydrological features and vegetation found in the wetland. The typology is designed to be applied in the field, with no prior knowledge of the site required.

Where a wetland is identified in the field, the type may be recorded in the Wetland Survey Form using the methodology described in this manual. Using the survey form in the field will help to ensure that all necessary information about the wetland is recorded for future use.

2. What is a wetland?

A wetland is an area of land that is saturated with water either permanently or seasonally, and where the water table is near or at the surface. "Wetlands" may vary considerably in visual appearance, owing in part to the setting in which they occur and the vegetation type(s) present. There are special suites of plants adapted to cope with wet conditions and, as these wet conditions vary spatially, a mosaic of habitats comprising different plant communities may occur within a single wetland.

The Ramsar Convention (2010) defines wetlands as:

> **"areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres."**

The Convention uses a broad definition of wetlands. It includes all lakes and rivers, underground aquifers, swamps and marshes, wet grasslands, peatlands, oases, estuaries, deltas and tidal flats, mangroves and other coastal areas, coral reefs, and all anthropogenic sites such as fish ponds, rice paddies, reservoirs and salt pans.

Irish planning legislation (Government of Ireland, 2011) defines wetlands as:

> **"natural or artificial areas where biogeochemical functions depend notably on constant or periodic shallow inundation, or saturation, by standing or flowing fresh, brackish or saline water."**

Furthermore, guidance from the Department of Environment, Community and Local Government on this topic requires that the following habitats, where they include saturated soil, be considered wetlands:

- Lakes, reservoirs and ponds
- **Turloughs**
- Rivers and canals
- **Swamps and marshes**
- **Floodplains that are permanently or periodically inundated with water (including callows)**
- **Peatlands (bogs, wet heath and fens)**
- **Wet woodlands**
- Caves
- Cliffs
- **Salt marshes**
- **Dune slacks and wet machair**
- Transitional waters (e.g. estuaries and lagoons)
- Inter-tidal or sub-tidal habitats (to 6 m below the lowest spring tide level).

Please note that this manual only deals with the wetland habitats identified above in **bold**. Turloughs, lagoons, machair (in Ireland), active raised bogs and calcareous fens are priority habitats protected under Annex I of the Habitats Directive. Further information on Irish and corresponding EU habitat classifications, with full names and protection details, is contained in Appendix 1.

The wetlands dealt with here are less obvious and more difficult to identify than the others. Some are particularly vulnerable to damaging activities such as drainage, infilling, turf cutting, nutrient enrichment, over-grazing, agricultural improvements, afforestation and the spread of invasive species.

Some examples of wetlands are shown in the pictures that follow.

Bog pool at Garriskill, Co. Meath

Bog woodland at Burren, Co. Louth

Floodmeadow swamp, Shannon Callows, Co. Offaly

Turlough in winter, Ballinacourty, Co. Galway

Wet grassland, Connemara, Co. Galway

Is it a wetland? Some considerations:

In order to identify whether or not you are looking at a wetland, consider:

- Is it permanently open water like a pond, river or lake? If so, it is a wetland (though not covered in further detail in this guide – see above). If there are areas of permanently or normally wet ground around the edge of a lake or adjacent to a stream, those areas are also wetlands.
- Does standing water frequently occur due to flooding from areas of open water, from groundwater, or due to rainfall not being able to drain away? If this is a common occurrence, the area could be a wetland.
- If there is no standing water, is the ground generally very wet? Does it feel squishy when you stand on it, or does water seep out around your boots? If this is a common occurrence, the area could be a wetland.
- Is the soil type peat? Peat is a dark spongy soil with high organic matter content, i.e. lots of plant material that has not completely broken down. This results from permanent waterlogging that prevents bacterial breakdown of organic material and is found where there is a water table at or near the surface, which is characteristic of a wetland. Wetlands can also be found on other soil types such as mineral, river or lake deposit soils, but peat is the most likely to indicate the presence of a wetland.

It is best to avoid trying to identify wetlands immediately following heavy rain because it may be difficult to distinguish the temporary effects of the rainfall from more permanently wet areas.

Besides the wetness of the site and the soil type, the vegetation helps to define whether or not an area is a wetland. Cultivated areas with crops will not usually be included in an Irish context. Spatial changes in vegetation may help to define the extent of the wetland.

If you think an area might contain a wetland because it fits the descriptions above, record it and a more detailed judgement can be made later on. Applying the wetland typology will also help you to determine whether an area actually is a wetland: if none of the wetland type descriptions “fit” the area you are looking at and you are not sure whether the points above apply, then it is likely not to be a wetland.

3. Overview of the wetland typology

The wetland typology is based on two characteristics:

Landscape setting

The landscape setting describes the location of the wetland within the landscape and its proximity to surface waters (such as rivers, lakes or the sea). The range of landscape settings in which wetlands may be found is described in detail in Section 4.

Habitat type

The habitat type is identified by the kinds of vegetation and soil type that are present in the wetland. The vegetation and soil indicators are described in Section 5 and the habitat types are described in Section 6. In some cases the landscape setting will also help to define the wetland habitats, as some types are known to occur only in certain locations.

The landscape and the habitat can be combined to give an overall description of the wetland type. In some cases all that may be needed is the habitat type. However, the landscape component is important particularly where it describes the location of a wetland in relation to surface water such as the coast, a river or a lake. The wetland type can then be described as:

(Landscape) Habitat e.g. (floodplain) fen; or (montane) wet heath.

Blanket bog, Cooley Peninsula, Co. Louth

Fen vegetation in Skealoughan turlough, Co. Mayo

Mountain lake and upland blanket bog, Carrowcullen, Co. Sligo

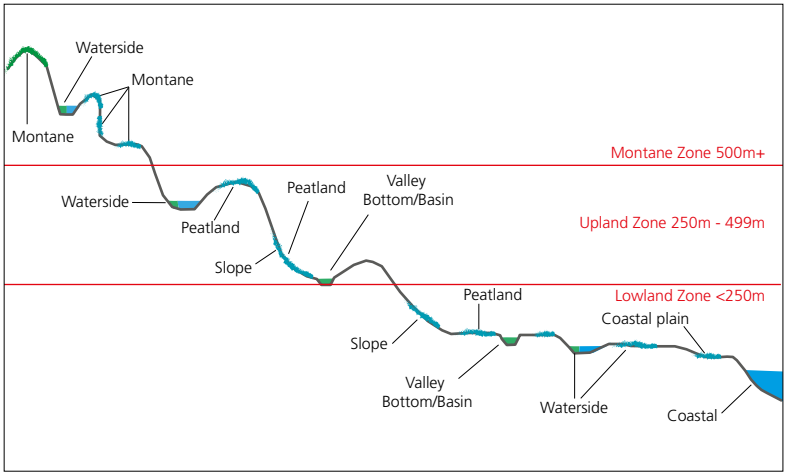
Swamp surrounded by willow trees, Mullaghmore, Co. Clare

Upland and lowland blanket bog, Connemara, Co. Galway

Marsh helleborine

4. Landscape settings

This section describes the landscape settings you should look for in and around the wetland to help identify its type. The sketch below should provide an indication of the general landscape setting, and the tables that follow should be referred to for more detail. Information is also provided on the wetland habitats that are likely to be found in each landscape setting.



Likely setting of wetlands in the landscape

EXAMPLES OF WETLANDS IN LANDSCAPE SETTINGS

Landscape setting	Description	Habitat types likely to be found in this setting*
Coastal		
Sand dunes	Sand dunes and shallow slopes of sand grading in to flat inland plains. 	10 Dune slacks, 11 Wet machair
Inter-tidal or near-tidal	Coastal areas either within the tidal zone or on raised areas of mud or other substrate, interspersed within and on the landward edge of the tidal zone. 	9 Salt marsh (including lagoonal salt marsh or areas of marshy grassland that have brackish, or partly saline, water)
Coastal plain	Flat, low-lying areas inland from the coast, beyond the range of coastal processes. These may extend for a significant distance inland but are at or close to sea level. 	1b Other wet woodland, 2 Marsh 3 Springs, Flushes & seepages, 4 Fen, 5 Swamp, 6 Reedbed, 7 Wet heath, 8b Blanket bog, 11 Wet machair (may also include areas of marshy grassland that have brackish waters), 12 Turlough

Landscape setting	Description	Habitat types likely to be found in this setting*
Waterside		
Floodplain	The floodplain of a river, which can include flat areas some distance from the river but that floods at least occasionally during periods of high river flow. These are likely to be found in lowlands, in valleys or flat areas. 	1b Other wet woodland, 2 Marsh, 4 Fen, 5 Swamp, 6 Reedbed, 8c Transition mire & Quaking bog, 13 Flood-meadows or callows
Isolated floodplain	An area that used to form the floodplain of the river but is now prevented from flooding by the presence of flood defences. These are likely to be found in lowlands, in valleys or flat areas.	1b Other wet woodland, 2 Marsh, 4 Fen, 5 Swamp, 6 Reedbed, 8c Transition mire & Quaking bog

Landscape setting	Description	Habitat types likely to be found in this setting*
Streamside	This term is used to describe wetlands located in proximity to a river or stream but not on a floodplain. For example, wetlands on cliffs or slopes adjacent to mountain streams. These may be found in upland or lowland settings, in valleys or on hillsides or mountainsides. 	1b Other wet woodland, 2 Marsh, 7 Wet heath
Lakeside	Located on the edge of a lake. 	1b Other wet woodland, 2 Marsh, 4 Fen, 5 Swamp, 6 Reedbed, 8c Transition mire & Quaking bog, 13 Flood-meadows or callows
Slope	A continually wet area on a slope or at the base of a slope. Springs may be clearly visible or there may be a more widespread area of wetness. These can be found in upland or lowland settings.	3 Springs, flushes & seepages, 7 Wet heath Other habitats may also occur on shallow slopes, e.g. 8b Blanket bog

Landscape setting	Description	Habitat types likely to be found in this setting*
Valley bottom/basin	This may include hollows, valley heads or areas below the base of a hill, where water collects due to the low topography. This can include the headwaters of a stream, where the stream first emerges. These may be found in upland or lowland settings. They include basins that have filled in with peat over millennia to form a fen or bog. 	1a Bog woodland, 1b Other wet woodland, 2 Marsh, 4 Fen, 5 Swamp, 6 Reedbed, 7 Wet heath, 8b Blanket bog, 8c Transition mire & Quaking bog

Landscape setting	Description	Habitat types likely to be found in this setting*
Peatland	Widespread peatland forms a distinctive landscape. Peatlands are found in lowland and upland settings on relatively flat land or on slopes. On mountain-tops, peat hags may often occur with areas of bare soil between the peat hags. This is often difficult terrain to cross. Peatlands can cover extensive areas and habitats can be further differentiated between dry heath, wet heath and blanket bog. Raised bogs are common in the lower-lying Irish midlands. 	4 Fen, 7 Wet heath, 8a Raised bog, 8b Blanket bog, 8c Transition mire & Quaking bog Can also contain other types e.g. 3 Springs, flushes & seepages

Landscape setting	Description	Habitat types likely to be found in this setting*
Upland		
Cliff ledges and boulder/scree fields	Cliff ledges, boulder or scree fields where seepages maintain wet areas and vegetation growth. Where tufa forms, they are more likely to be cascade tufas. 	3a Montane flushes, 3b Tufa-forming springs
Other montane	Continually wet areas in high mountain environments, on ridges, plateaux or summits.	3 Springs, flushes & seepages, 7 Wet heath, 8b Blanket bog

Table Note: *See Section 6 for descriptions of habitat types and reference codes.

5. Field indicators

This section describes the soil and vegetation indicators you should look for in and around the wetland to help identify its type. Descriptions and photos of indicators that may be difficult to identify are provided. Hydrological indicators are not included, but any hydrological features (e.g. rivers, the sea, lakes) should also be recorded on the survey form (see Section 8).

To identify the soil type, it is not always necessary to dig into the ground. Look for signs of the soil type on the surface, for example on river banks or areas of bare ground.

5.1 Soil indicators

Peat

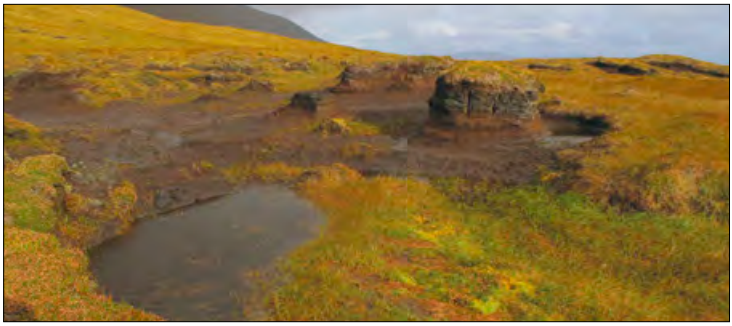
A dark brown 'spongy' soil with high organic matter content, i.e. lots of plant material that has not completely broken down. Found where there is a permanent supply of water and/or shallow water table (i.e. near the surface).

Likely to be found in: 1a Bog woodland, 1b Other wet woodland, 2a Marshy grassland, 4 Fen, 5 Swamp, 6 Reedbed, 7 Wet heath, 8a Raised bog, 8b Blanket bog, 8c Transition mire & Quaking bog, 9 Salt marsh, 13 Flood-meadows or callows.

Peat hags and peat gullies

Broken hummocks of deep peat, may be up to 1–3m deep. Peat bog vegetation found on the top of the hags, often with bare soil in the depressions between hags.

Likely to be found in: 8b Blanket bog, especially on mountain-tops.

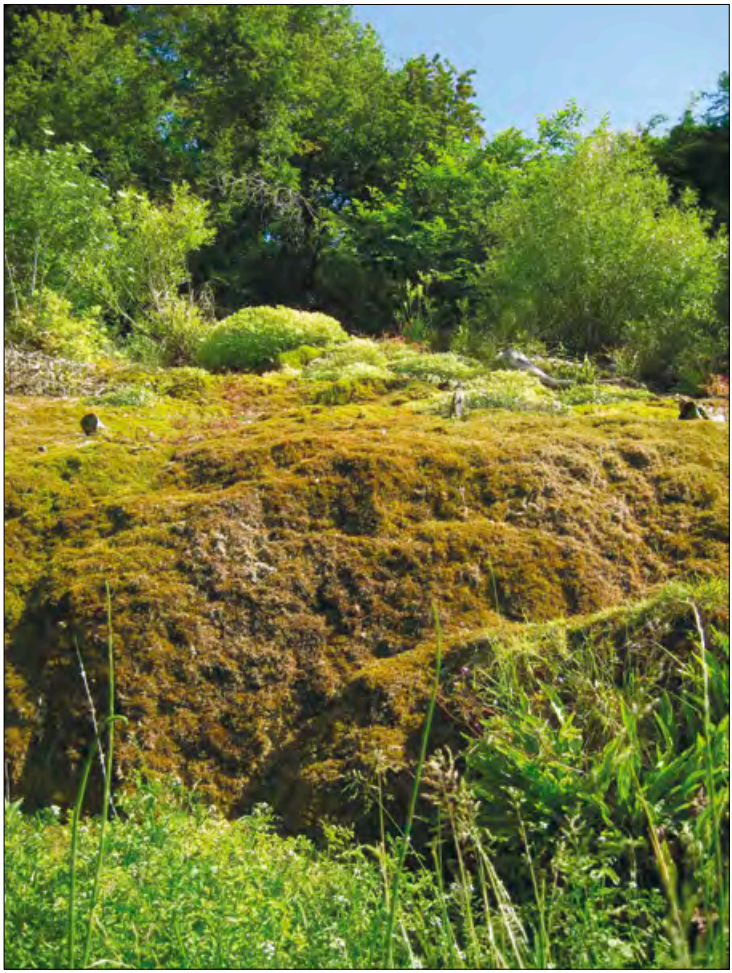


Peat hags, Achill, Co. Mayo

Tufa

Solidified deposits of calcium carbonate from limey groundwater discharging at the surface. White to cream gritty deposits covering stones and plants. Sometimes forming rock-like encrustations.

Likely to be found in: 3b Tufa-forming springs.



Tufa spring, Stackallen, Co. Meath

Mineral soil

Soil with relatively little organic matter. Composed of granular (silt or sand) or clay material.

Likely to be found in: 1b Other wet woodland, 2 Marsh, 3 Springs, Flushes & Seepages, 5 Swamp, 6 Reedbed, 9 Salt marsh, 12 Turlough, 13 Flood-meadows or callows.

Sand

Blown sand deposits on the coast.

Likely to be found in: 9 Salt marsh, 10 Dune slacks, 11 Wet machair.

Machair sands

Sand with a strong shell fragment component.

Likely to be found in: 11 Wet machair.

Bare rock

Exposed rock (outcrops/cliff ledges), and stone on slopes and boulder/ scree fields.

Likely to be found in: 3 Springs, flushes & seepages, 7 Wet heath, 8b Blanket bog.

5.2 Vegetation indicators

Willows (many species of *Salix*)

Deciduous trees/shrubs/under-shrubs up to 20m, usually less. All with one type of catkin (a cylinder-like pod – the "flowers"; male tree catkins have anthers, females have carpels, so less yellow) – "pussy willows". They are erect, not drooping down (Mar to May). The leaves are usually oval; in some species they are long and linear; always longer than wide, green or grey-green. Crusty bark on mature trees.

Likely to be found in: 1a Bog woodland, 1b Other wet woodland, 3d Seepages/flushes, 8a Raised bog, 13 Flood-meadows or callows.

Birch (Downy birch and Silver birch *Betula pubescens, Betula pendula*)

Small to medium-sized deciduous trees up to 20m. Branches angling upwards with slender twigs. Two different types of catkins (Apr/May), the male of which droops down shedding pollen. Leaves green, diamond or triangular-shaped, broad, jagged at the leaf edges. Outer bark of mature trees is whitish, papery, and peeling especially in the much less common Silver birch; more rough in the Downy birch. The more common Downy birch can be identified by its downy young twig-tips.

Likely to be found in: 1a Bog woodland, 1b Other wet woodland, 3d Seepages/flushes, 8a Raised bog.

Alder *(Alnus glutinosa)*

Medium-sized deciduous tree, 20-30m. Two different types of catkins – one is small and rounded (Mar/Apr), appearing before the leaves, developing into small dark cones (fruit) present all year round. Leaves green, slightly shining, broad, and rounded (no pointed tip). Outer bark of mature trees is very dark and crusty, not peeling. Tree canopy has a purple "hue" from a distance.

Likely to be found in: 1b Other wet woodland.

Rushes (many species of *Juncus*)

Distinguished from grasses by generally cylindrical (in cross-section) stems that may or may not be hollow and are hairless. Leaves (when present) are always narrow (often almost needle-like). Most commonly encountered plants usually a glossy green. Plant usually at knee height; can be taller or shorter, depending on species. Flowers (Jun to Aug) usually occur in clusters and flower heads are small, green-brown or yellowish. Seed capsules are a shiny brown.

Likely to be found in: 2 Marsh, 3c Other springs, 4 Fen, 10 Dune slacks, 13 Flood-meadows or callows.

Black bog rush (*Schoenus nigricans*)

A tougher, more wiry rush, with black shiny flower clusters. It grows 0.5-1.0m high, often in tussocks, and can give a characteristic grey hue to a fen in winter when the shoots lose their colour.

Likely to be found in: 3b Tufa-forming springs, 4 Fen, 8b Blanket bog (lowland).

Small sedges (many species of *Carex*)

Distinguished from grasses by the presence of a solid (not entirely hollow) rounded or triangular stem and V-shaped section or grass-like (i.e. not needle-like) leaves. Plants small and below knee height, often at ankle height. Species vary in colour – dark green, bluish green, bright green. Flowers (May to Jul) usually occur as compact clusters of spikelets (catkin-like), often with the male upright and spike-like, the female below these, drooping and cylindrical, often closely attached to the stem and developing distinctive fruit in a cone-like structure from mid-summer. Small sedges may form clumps but do not form tussocks.

Likely to be found in: 3a Montane flushes, 3b Tufa-forming springs, 3d Seepages/flushes, 4 Fen, 7 Wet heath, 8b Blanket bog, 8c Transition mire & quaking bog, 10 Dune slacks, 11 Wet machair, 12 Turlough, 13 Flood-meadows or callows.

Broad-leaved sedges (several species of *Carex*)

Triangular (or rounded) stem and V-shaped leaves in section, more robust than small sedges with distinctly long and usually broad leaves. Some plants may be up to around a metre tall and the leaves may be several centimetres in width.

Likely to be found in: 1b Other wet woodland, 3d Seepages/flushes, 4 Fen, 5 Swamp, 8c Transition mire & quaking bog, 12 Turlough, 13 Flood-meadows or callows.

Tussock sedges (several species of *Carex*)

More robust than small sedges, with a tightly clustered, hard, compact "hump" at the base (a tussock – consisting of a raised area which may be dark brown in colour). Tussocks can be up to 1m tall. Usually broad V-shaped leaves and triangular stems.

Likely to be found in: 1b Other wet woodland, 4 Fen, 5 Swamp.

Reeds (Common reed *Phragmites australis*)

Tall, robust, coarse grass, with a hard cane-like structure persisting through the winter. Can be up to 2.5m tall and often forming extensive reedbeds. Leaves greyish green, smooth edges and may be up to 5cm across. Plants may be stunted where recent cutting has occurred. Distinguished from the larger sedges as it does not have V-shaped leaves occurring just at the base, but flat leaves borne alternately along the stems. Distinguished from rushes by broad leaves. Flowering heads (Aug to Oct) are a dark purple. Used traditionally for thatching in many parts of Ireland.

Likely to be found in: 1b Other wet woodland, 3d Seepages/flushes, 5 Swamp, 6 Reedbed.

Ling and other heathers (*Calluna vulgaris* and *Erica* species)

Low shrubs usually knee height or below with small, leathery, narrow dark green/bluish green leaves (almost scale-like in the case of Ling), arranged along the dark woody stems. Leaves present all year round. Flowers (Jun to Oct) are typically small, purple and bell-shaped, or pink star-like (for Ling), occurring in clusters.

Likely to be found in: 1a Bog woodland, 7 Wet heath, 8 Peat bog.

Carpet-forming mosses (many species)

Very variable group of plants, many different colours including green, mustardy yellow, dark brown. All are small, soft plants growing together in wefts or compact clumps and often form extensive "carpets" in fens and bogs. Mosses do not have proper roots and leaves are small, simple and undivided. They do not "flower" but produce a pod-like capsule on a thin wiry stem.

Likely to be found in: 3 Springs, Flushes & seepages, 4 Fen, 8 Peat bog, 10 Dune slacks, 11 Wet machair, 12 Turlough, 13 Flood-meadows or callows.

Bog mosses (*Sphagnum*)

The bog-mosses (*Sphagnum* species) have a feathery appearance with a rounded head and there are "branches" of leaves occurring along a long thin stem. They are very spongy and hold a lot of water, which can be easily squeezed out. They are the main peat-forming plants in bogs. They occur in clumps, sometimes forming hummocks over 0.5m high. They are brightly coloured, often red, orange, yellow-ochre or green.

Likely to be found in: 1a Bog woodland, 3 Springs, Flushes & seepages (except tufa-forming springs), 4 Fen (rarely), 8 Peat bog.

Cottongrass/Bog cotton (several species of *Eriophorum*)

Flowers are spike-like and yellowy (Apr/May) while the distinctive white cottony "fruiting" heads develop May to Aug. The Hare's-tail cottongrass has a single head the others have clusters of heads When viewed from a distance the Common cottongrass (*E. angustifolium*) has a reddish tinge due to its reddening leaves in autumn.

Likely to be found in: 3c Other springs, 4 Fen, 7 Wet heath, 8 Peat bog.

Other vegetation encountered may include:

Plants with colourful flowers	
Meadowsweet ***(Filipendula ulmaria)*** Tall herb (up to 1m or more) with small white flowers from June to Sept. When crushed or dried, leaves have a strong sweet scent. *Likely to be found in:* 2a Marshy grassland, 4 Fen, 5 Swamp, 13 Flood-meadows or callows.	
Orchids Many species (e.g. Marsh helleborine ***Epipactis palustris***, spotted and marsh orchids ***Dactylorhiza*** species). Most are small plants (up to 25cm tall) with dense spikes of flowers, flowering in May to Sept. *Likely to be found in:* 2 Marsh, 3b Tufa-forming springs, 3d Seepages/flushes, 4 Fen, 7 Wet heath, 10 Dune slacks, 11 Wet machair, 12 Turlough, 13 Flood-meadows or callows.	
Marsh marigold ***(Caltha palustris)*** Marginal aquatic plant with large, scalloped, heart-shaped leaves. Yellow flowers in March to May. *Likely to be found in:* 2 Marsh, 4 Fen, 5 Swamp, 10 Dune slacks, 11 Wet machair, 13 Flood-meadows or callows.	

Other vegetation encountered may include:

Sundews (several species of *Drosera*)

Insect-eating plants with round or oval leaves with shiny glands on stalks secreting a sticky fluid. Often found on *Sphagnum* hummocks.

Likely to be found in: 8 Peat bog.

Marsh pennywort (*Hydrocotyle vulgaris*)

Creeping plant with small round leaves.

Likely to be found in: 1b Other wet woodland, 2 Marsh, 3 Springs, Seepages & Flushes, 4 Fen, 8c Transition mire & Quaking bog, 10 Dune slacks, 11 Wet machair, 12 Turlough, 13 Flood-meadows or callows.

Bogbean (*Menyanthes trifoliata*)

Broad trefoil leaves, often emerging from the water. Flowers (Apr to Jul) white inside with distinctive "hairs" and pink outside.

Likely to be found in: 4 Fen, 5 Swamp, 6 Reedbed, 8 Peat bog (pools) , 13 Flood-meadows or callows.

Bog myrtle (*Myrica gale*)

Low shrub (up to 1m) with twiggy, dark brown branches and grey-green leaves which are fragrant when crushed.

Likely to be found in:
1a Bog woodland,
3d Seepages/flushes, 8 Peat bog.

Cranberry (*Vaccinium oxycoccos*)

Small plant with tiny oblong alternate leaves creeping often on moss hummocks. Pink flowers (Jun to Jul) and produces fruit (bright red) in September.

Likely to be found in: 4 Fen, 8a Raised bog.

Horsetails (several *Equisetum* species)

Tall (up to 50cm) vertical stems arising from creeping rhizomes. Distinctive rings of often black scales up the stems, with or without accompanying "jointed" branches.

Likely to be found in: 1b Other wet woodland, 2 Marsh, 4 Fen, 5 Swamp, 8c Transition mire & quaking bog, 13 Flood-meadows or callows.

Purple moor-grass (*Molinia caerulea*)

Light green grass with purple hue to leaf edges, often growing in tussocks. It is the only deciduous Irish grass in that its leaves die back in winter, becoming deeper purple, to brown to straw colour with time. The green leaves in spring are distinctively fresh. Its flowers (Jun to Aug) form a fine feathery purple spike.

Likely to be found in: 4 Fen, 7 Wet heath, 8b Blanket bog, 13 Flood-meadows or callows.

Flag iris (*Iris pseudacorus*)

Flattened clumps of broad (ca 5cm) leaves, emerging from horizontal rhizomes in spring. In summer, plants produce tall spikes bearing clusters of 2-4 large yellow flowers.

NB, Flag iris is very common in wet fields, so its presence may not always indicate a wetland habitat. It sometimes does not flower, e.g. under wet woodland.

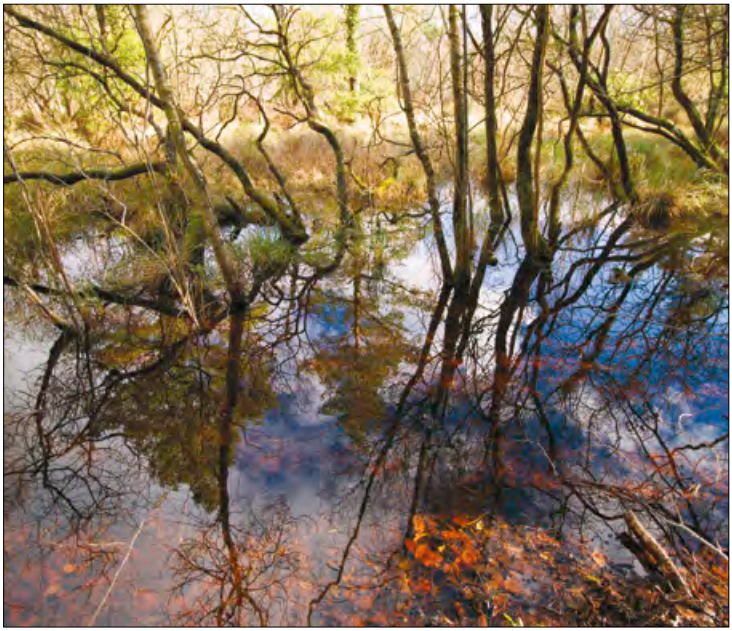
Likely to be found in: 1b Other wet woodland, 2 Marsh, 5 Swamp, 6 Reedbeds, 11 Wet machair, 12 Turlough, 13 Flood-meadows or callows.

6. The wetland habitat typology

This section describes the wetland habitats found in Ireland, separated into simple identifiable "types". The potential corresponding habitat classification according to Fossitt (2000), with two-letter alphanumeric code, and/or habitat type (abbreviated name) listed under Annex I of the EU Habitats Directive (an asterisk * indicates a priority habitat) are also outlined. However, the latter especially would generally require a detailed botanical survey by a suitably qualified ecologist to confirm. Brief descriptions of each type are provided, along with useful indicators to look out for to help identify them. Extra descriptions have been provided to help distinguish between types that may appear similar.

1 Wet woodland

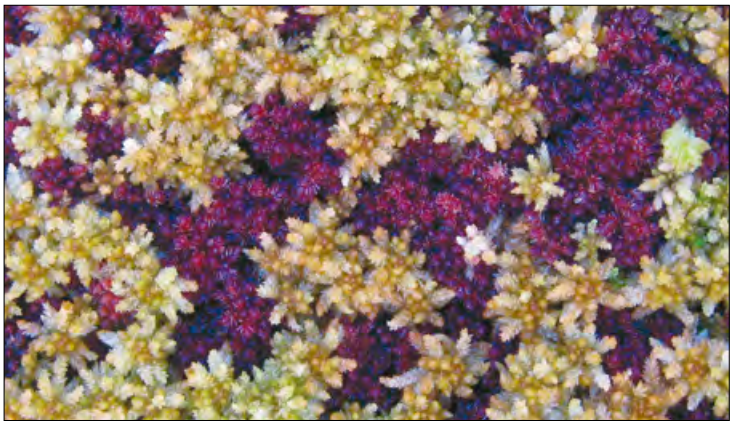
1a Bog woodland (WN7 Bog woodland; may correspond to Annex I priority habitat 91D0 *Bog woodland)



Willows, wet woodland

Occurs on intact or cut-away peat bog. The commonest species is Downy birch *Betula pubescens* that can form closed woodland stands, with willows such as Grey willow *Salix cinerea* and sometimes Rowan *Sorbus aucuparia* and Scots pine *Pinus sylvestris*, or other pines or spruce if the bog is adjacent to forestry; conifers often have stunted growth. See Type 8 for more detail of other characteristics of peat bog.

Vegetation indicators: Downy birch, willows, purple moor-grass *Molinia caerulea*, *Sphagnum* mosses and other plant species found on peat bog. Dwarf shrubs such as Ling heather or Bilberry may be common, along with bramble.



Sphagnum carpets

Soil indicator: peat

1b Other wet woodland (WN4 Wet pedunculate oak-ash woodland, WN5 Riparian woodland, WN6 Wet willow–ash–alder woodland; may correspond to Annex I priority habitat 91E0 *Alluvial forests)

Wet woodland, Cong, Co. Galway

Wet woodland varying from tall to scrubby. Likely to include willow and alder trees, sometimes with birch. Often found close to rivers, streams or lakes, but can also be found away from surface water in basins/depressions. May also be found in seepage/flush situations (Type 3d). Very varied, with several plant communities described for Ireland.

Vegetation indicators: Trees, including willow, alder and sometimes birch, but also ash and oak on higher ground. Reeds, sedges, meadowsweet, flag iris grows beneath the trees.

Soil indicator: peat or mineral soil.

2. Marsh (GM1 marsh; may contain elements of Annex I habitat 6430 hydrophilous tall herb communities)

Marsh with rushes, Shannon Callows, Co. Roscommon

Wet or marshy area consisting mostly of sedges and rushes, but also tall herbs. Marshes can be distinguished from swamps due to the absence of permanently or frequently standing water, though the water table is at or near the surface most of the year.

Vegetation indicators: vegetation up to around knee or even waist height, that must not comprise >50% sedges; if it does, it may be a fen (Type 4). If >50% rushes, check soil is permanently waterlogged/ with high water table, as if not, it may be wet grassland (not a true wetland). Tall herbs include meadowsweet, flag iris, yellow loosestrife and wild angelica.

Soil indicator: shallow peat or mineral soil.

3 Springs, flushes and seepages

3a Upland flushes (occur with ER1 Exposed siliceous rock/ER2 Exposed calcareous rock)

Upland flush

Water seeping/dripping down on a rocky cliff ledge. Medium-tall grasses and herbs and/or short scrubby willow trees found in continually wet areas in rocky mountainous environments. Rare. Not easily accessible.

Vegetation indicators: abundant mosses and liverworts with grasses or flowering plants up to 1m, occasionally with short scrubby willow trees.

Soil indicator: bare rock (rocky cliff ledge).

Landscape indicators: upland environments with rock faces.

Some very rare and specialised alpine plant species can occur in these areas on north-facing cliffs/slopes above 350m and they may correspond to the Annex I habitats 8210 Calcareous rocky slopes with chasmophytic vegetation or 8220, Siliceous rocky slopes with chasmophytic vegetation.

3b Tufa-forming springs (FP1 Calcareous springs; may correspond to the Annex I priority habitat 7220 *Petrifying springs with tufa formation (*Cratoneurion*))

Tufa formation

Visible spring, with shallow flowing water and tufa deposits. May be found within wet woodland or fen.

Vegetation indicators: carpet of "brown" and other sometimes bright green mosses, small sedges, rushes, some aquatic (submerged) plant species.

Soil indicators: tufa, bare rock, mineral soil.

3c Other springs (FP2 Non-calcareous springs)

Flush, Lisoughter, Connemara, Co. Galway

Visible spring, with shallow flowing water over bare rock, peat, or mineral soil. May be found in blanket bog on slopes, or (rarely) in raised bogs.

Vegetation indicators: carpet of often bright-green moss, aquatic (submerged) plant species.

Soil indicators: bare rock, mineral soil, peat.

3d Seepages/flushes (PF1 Rich fen and flush/PF2 Poor fen and flush; may correspond to Annex I priority habitat 7210 *Calcareous fens or to 7230 Alkaline fen)

Rich flush indicated by line of black bog rush

Variable vegetation associated with a diffuse spring on a hill-slope. Groundwater cannot clearly be seen emerging, but the ground is consistently wet. Rich flushes are fed by lime-rich water and are characterised by "brown mosses" and small sedge communities; poor flushes are more acidic and may support *Sphagnum* mosses, rushes and small sedges.

Vegetation indicators: variable vegetation which may include rushes, sedges, mosses, some grasses; some willow and birch trees if in lowland sheltered situations. Change from "drier" to "wet" vegetation (may be seen as a transition from dull to brighter green vegetation), as the water flows in a linear or more diffuse pattern downslope.

Soil indicators: bare rock, peat, mineral soil.

Hydrological indicator: permanently wet area on a slope.

4 Fen (PF1 Rich fen and flush/PF2 Poor fen and flush; may correspond to Annex I priority habitat 7210 *Calcareous fens or to 7230 Alkaline fen)

Alkaline fen, Ballymore, Co. Westmeath

Peaty habitat, often groundwater-fed, found mainly on flat or gently sloping topography, or in a valley bottom/basin setting, and may contain springs (including tufa-forming springs). If the water is limey, they are rich fens; poor fens are fed by more acidic water. Rich fens often are dominated by black bog-rush and/ or tall sedges; poor fens may have more rushes and tall herbs.

Fen is sometimes confused with marsh or swamp. It can be distinguished from marsh by the predominance of sedges and more permanently wet conditions and is generally more species-rich than swamp; swamp is found in wetter situations where there is often standing water.

Vegetation indicators: rich fen: black bog rush, saw sedge, or other tall sedges, "brown" mosses; poor fen: tall rushes and flowering plants, or lower-growing (knee-height) rush and sedge.

Soil indicators: peat at least for some depth; white limey deposits on soil surface (rich fen).

5 Swamp (FS1 Reed and large sedge swamps/FS2 Tall-herb swamps. The latter may correspond to Annex I habitat 6430 Hydrophilous tall herb fringe communities)

Swamp, Lough Derg shore, Co. Galway

Tall sedges, grasses and herbs, with generally little variation in the vegetation type, growing in shallow standing water or very wet ground often as a transition to more open water, which can be brackish. Swamp can sometimes be confused with other wetland types including marsh, fen and reedbed. It can be distinguished from marsh and fen by being found on usually very wet ground, often with standing water. Reedbed is also often found in standing water, but differs in being predominantly composed of reeds, while swamp may contain a variety of other species.

Vegetation indicators: usually broad-leaved sedges, tussock sedges, tall grasses and some reeds between knee and head height; generally little variation in vegetation, but can have tall herbs such as wild angelica, yellow loosestrife or hemp-agrimony.

Soil indicators: peat or mineral soil/mud.

Landscape indicators: water-side, valley bottom/basin.

Hydrological indicators: shallow standing water or very wet ground.

6 Reedbed (FS1 Reed and large sedge swamps)

Reedbed and tall swamp, Boora Bog, Co. Offaly

A dense stand of tall reeds, generally growing in shallow standing water. Reedbed is similar to swamp, but is distinguished by the predominance of tall reed. The common reed is the most common, but there can be other single-species stands of e.g. common club-rush, reed-mace or reed canary-grass.

Vegetation indicators: head-height reeds and little variation in vegetation.

Soil indicators: peat or mineral soil/mud.

Hydrological indicators: shallow or deeper standing water.

7 Wet heath (HH3 Wet heath; may correspond to Annex I habitat 4010 Northern Atlantic wet heaths)

Wet heath

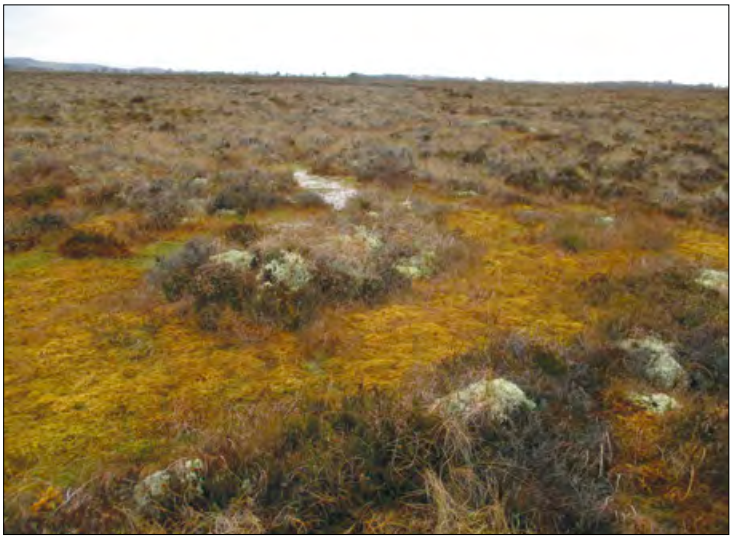
Vegetation usually dominated by heather, on either shallow peat (with a solid, continuous surface, 0.15–0.5 m deep) or sandy mineral soil. Wet heath can be distinguished from dry heath (not a wetland) by the presence of bog mosses (*Sphagnum*), small sedges and little or no Ling heather. Wet heath may be confused with dry heath or peat bog. In wet heath, the smaller Cross-leaved heath replaces the Ling of dry heath, whereas in peat bog other species including cottongrass and *Sphagnum* moss are more abundant. If the peat is thick (>0.5m) or exposed in peat "hags", the habitat type is more likely to be blanket bog. Wet heaths usually form a mosaic on hillsides with drier heath and especially with deeper blanket bog.

Vegetation indicators: low heather with *Sphagnum* mosses, and small sedges.

Soil indicators: peat (generally <0.5m thick) or sandy mineral soil.

8 Peat bog

8a Raised bog (PB1 Raised bog/PB4 cutover bog; may correspond to Annex I priority habitats 7110 *Active raised bog, 7130 blanket bog (*if active bog) or to 7120 degraded raised bogs capable of regeneration, 7150 Depressions on peat substrates of the *Rhynchosporion*)



Raised bog pool system with Ling heather and white Cladonia lichen

Areas of wet peat (depth >0.5m) with heather, cottongrass and bog (*Sphagnum*) mosses. If in good condition (well hydrated), there will be abundant pools in the centre, with adjacent hummocks formed by *Sphagnum* mosses supporting heathers and sedges.

There may also be cottongrass, with cranberry and sundew on the moss hummocks. The "lagg", which is the area of wetland vegetation around the edge of some peat bogs, may include areas of swamp, fen or wet woodland. However, this has disappeared in most Irish raised bogs due to cutting, and is replaced by cut faces of peat 2–5m in height. Drains cut through raised bogs can result in degraded bog with Ling heather and hummocks of green-white lichens *(Cladonia)* predominating, with no pool system left. Healthy pool systems will have specific vegetation including the white beak sedge *(Rhynchospora alba)* that gives its name to Annex I habitat 7150.

Birch woodland is rare on raised bog, but, if sufficiently large and intact, it should be classed as Bog woodland (Type 1a). This must not be confused with scattered trees invading partially drained bog.

Vegetation indicators: knee-height or taller heather, cottongrass, abundant bog mosses (*Sphagnum*), small sedges.

Soil indicators: peat, 6-10m or more in depth.

8b Blanket bog (PB2 Upland blanket bog/PB3 Lowland blanket bog/ PB5 eroding blanket bog; may correspond to Annex I priority habitat 7130 Blanket bog (*if active bog) or to 7150 Depressions on peat substrates of the *Rhynchosporion*)

Upland and lowland blanket bog, Connemara, Co. Galway

Sphagnum carpets, lowland blanket bog, Roundstone, Co. Galway

Blanket bog spreads over the landscape and comprises areas of wet peat (>0.5m deep) with heather, small sedges, purple moor-grass, cottongrass and bog mosses. It occurs on most mountains over 300m (upland blanket bog) and peat hags may occur where it is eroding on top. Lowland blanket bog carpets low-lying land along the Atlantic sea-board; it has a more "grassy" appearance due to extensive areas of purple moor-grass and black bog rush; this last disappears above ca 250m, grading into upland blanket bog. It may be hummocky and broken up due to heavy grazing. Blanket bog grades into wet heath, where the peat is more shallow. Valley bogs may be associated with this habitat; they are deeper and may have some quaking bog in the centre.

Vegetation indicators: heather, cottongrass, bog mosses, small sedges; in lowland blanket bog, purple moor-grass and black bog rush are dominant along with *Sphagnum* mosses. Lower than knee-height.

Soil indicators: peat >0.5m deep.

8c Transition mire and quaking bog (PF3 Transition mire and quaking bog; may correspond to Annex I habitat 7140 Transition mires and quaking bogs)

Transition mire, Punchbowl Lough, Co. Sligo

Transition mire, Letts Lough, Tullaher, Co. Clare

Short (generally less than knee-height) vegetation growing on a peat or moss raft, floating over watery peat or mud. The peat raft can be distinguished from solid ground by an unstable or bouncy feeling when walking across it. In some situations it can be difficult to distinguish "quaking" bogs from other types of bog. The clearest identifying factor is, as the name suggests, that the ground "quakes", i.e. feels unstable as the vegetation often forms a floating mat or scraw over saturated spongy peat. They may occur in wetter parts of lowland blanket bog. If at the transition between fens and open water, the vegetation comprises tall sedges, bog bean or water horsetail.

Vegetation indicators: short (less than knee-height) broadleaved or tall sedges, white beak sedge, water horsetail, bog bean, bog mosses.

Soil and hydrological indicators: peat. Bouncy "quaking" feeling. Peat raft may break up to expose pools of water.

Landscape indicators: may be found around the edge of a lake or slow-flowing river, Blanket bog, or in a valley bottom/basin. Can be dangerous to traverse.

9 Salt marsh (CM1 Lower salt marsh/CM2 Upper salt marsh; may correspond to Annex I habitats including 1310, *Salicornia* and other annuals colonising mud and sand, 1320, Spartina swards (*Spartinion maritimae*), 1330, Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*), 1410 – Mediterranean salt meadows (*Juncetalia maritimi*))

Salt marsh with Sea purslane, Lough Rusheen, Co. Galway

Grazed salt marsh, Ballinacourty, Co. Galway

Short vegetation growing on mud, sand or even peat in the inter-tidal or near-tidal zones. In the west of Ireland, the vegetation is usually grazed and is very short, unless it is the unpalatable *Spartina* cord-grass that grows in the lower less accessible mud. The upper marsh zone can be distinguished by the wiry knee-high salt marsh rush. On the east coast and in ungrazed areas, salt marsh vegetation can appear shrubby, as it is dominated by the grey-leaved shrubby sea-purslane.

Vegetation indicators: "grassy" or "rushy" appearance. Vegetation below knee height and often much lower (stunted growth) in most western marshes, many succulent species forming rosettes of leaves at the soil surface; knee-high sea rush or shrubby sea-purslane, especially in the east; tall cord-grass in lower levels.

Soil indicators: mud or sand; submerged peat in the west. Often quite firm underfoot and not "marshy".

Landscape indicators: coastal, usually flat areas between the neap and spring tides in sheltered bays.

10 Dune slacks (CD5 Dune slacks; may correspond to Annex I habitats 2170, Dunes with *Salix repens (Salicion arenariae*) or 2190 Humid dune slacks)

Dune slack, Portmarnock, Co. Dublin

Dune slack species, Marsh helleborine

Wet low-lying vegetated areas within sand dunes, which may contain permanent or seasonal ponds. Vegetation may be similar to fen or marsh but is distinguished by being located in sand dunes.

Vegetation indicators: variable vegetation that can include alder or willow scrub, small sedges, rushes, mosses, and orchids such as the marsh helleborine or the marsh orchid.

Soil indicators: sand, sometimes shallow peat.

Landscape indicators: coastal setting with sand dunes.

11. Wet machair (CD6 Machair; part corresponds to Annex I priority habitat 21A0 Machair (*in Ireland))

Machair wetland, Mannin Bay, Connemara, Co. Galway

Wet machair is part of a mosaic of flat to very slightly undulating coastal wet and dry machair grassland. It forms from calcareous sand being wind-blown inland onto an adjacent plain or lagoon, behind a usually narrow line of mobile dunes. Machair in Ireland occurs only on the west coast from Galway Bay to Malin Head in Donegal. Lower-lying areas are similar to marsh or fen, as the water table is at or close to the surface, but is distinguished by the predominance of sand and the adjacent flower-rich flat dry machair grassland. Most machair is not fenced and all is grazed, often as commonage. This habitat is unique in Europe to Ireland and Scotland.

Vegetation indicators: fine-leaved grasses, small sedges, abundant herbs, including many orchids such as marsh orchid. Normally ankle height, rarely up to knee height.

Soil indicator: machair sand (sand composed predominantly of shell fragments), peaty soil.

Landscape indicator: extensive flat grassland in coastal settings, inland from and next to sand dunes.

12. Turlough (FL6 Turloughs; corresponds to Annex I priority habitat 3180 *Turloughs)

Turlough in early summer, Ballinacourty, Co. Galway

Turlough in late winter, Ballinacourty, Co. Galway

Turloughs are groundwater-fed seasonally occurring lakes that occupy basins or depressions in limestone areas where water levels fluctuate markedly during the year. They are very common in Ireland and their greatest concentration is in counties Clare, Galway and Roscommon, but they can occur anywhere where pure limestone rock is at or near the surface. Most are grazed, the central basins as commonage.

Vegetation indicators: Grassy appearance, but sedges, rather than grasses, often predominate. Wetland species occur towards the middle of the basin such as creeping bent, small sedges, silverweed, meadowsweet and marsh pennywort. Spike-rush, water plantain and pondweeds may be present in the centre of the basin in turloughs where water lies more permanently.

Soil indicator: May include marls, peat, clays or loams.

Landscape indicator: Basins, sometimes several ha in size, in karst (exposed limestone) areas. Large boulders or exposures of bedrock may also be present and may be covered in black moss. When flooded (usually in winter), walls running into the "lake" system indicate the presence of fields that become exposed in the dry season.

13. Flood-meadows or callows (GS4 Wet grassland & GM1 Marsh; may contain Annex I 6410 *Molinia* meadows on calcareous, peaty or clay-silt-laden soils (*Molinion caeruleae*) and 6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels)

Ragged robin, Shannon Callows, Co. Offaly

Flood-meadows or callows form often extensive areas of grassland along the major river-banks, especially the Shannon. They flood for 3-6 months, usually only in winter and the duration of the flood determines the plant communities. Most are pastures in summer, but many are managed as hay-meadows and support tall herbs and grasses. In wetter zones, these may support tall herb marsh or if wetter, swamp communities but, where water lies for less time, wet meadow plant communities include tall grasses and tall herbs such as meadowsweet and smaller herbs. Grazed pastures, because of the short sward, are harder to identify as wetlands and may simply be wet grassland. Identification should rely on noting their position relative to winter floods (i.e. low-lying enough to be flooded at least 3 months in winter) and a frequency of wetland species that might include creeping bent and small sedges.

Vegetation indicators: Wetter hay-meadow areas support e.g. yellow loosestrife and wild angelica, but where water lies for less time, species may include tall grasses such as tall fescue, along with meadowsweet, water forget-me-not, water mint and marsh marigold. Pastures may have creeping bent, marsh ragwort, small sedges, marsh marigold and cuckooflower (or lady's smock). These or similar wetland species must be in abundance, as if not, the meadows do not classify as wetlands.

Soil indicator: Clay alluvium, sometimes with peat or an underlying layer of marl.

Landscape indicator: In a large river floodplain, sometimes several 100m wide each side of the river.

7. Identifying existing pressures

The table below includes a variety of indicators that may suggest existing human influences on a wetland. These activities will not necessarily have a negative effect on the wetland but will provide additional information about management and external influences.

Existing activity or pressure	Indicator	Possible effect on wetland
Impoundment	Includes structures such as sluices, weirs and dams. Can be in the wetland or on a nearby river or lake.	Alteration of water levels; alteration of hydrological regime.
Infilling	Dumping of soils, boulders, inorganic waste, building debris, etc.	Alteration of water levels; alteration of hydrological regime and potentially water chemistry. Opportunity for weedy species to become established and dominate.
Flood defences	Includes structures such as flood walls and embankments. Can be on a river, lake or coastal area.	Alteration of water levels; alteration or prevention of natural flooding regime.
Drainage	Includes presence of artificial drainage channels/ditches or alteration of natural watercourses (e.g. to be made straighter/deeper/ wider) to be more efficient at conveying water. The ongoing maintenance of existing drainage works through dredging, desilting, etc. can also have an impact. Drains, even small, in bogs have a strong impact on those ecosystems.	Alteration or lowering of water levels; alteration of hydrological regime. Removal of vegetation and substrata.
Nutrient enrichment	Can occur from a number of different pressures including discharges/high livestock densities. In the wetland, indicators include the presence of livestock dung, cowpats, nettles or docks. In nearby rivers or lakes, indicators include murky water, abundant algal growth resulting in a green layer on the water surface and/ or a green tinge to water.	Change to vegetation species composition; certain species become more dominant at the expense of others. May affect invertebrate communities, both terrestrial and aquatic.

Existing activity or pressure	Indicator	Possible effect on wetland
Agricultural reclamation	Can occur following extensive drainage works, infilling, re-profiling of ground, fertilisation and reseeding.	Alteration of water levels; alteration of hydrological regime. Change to plant species composition; certain vigorous species become more dominant.
Over-grazing	Over-grazing from high livestock densities. Indicators include presence of livestock/ little or no tall vegetation/ patchy vegetation at various heights/evidence of vegetation chewed off at the top/extensive poaching or bare, trampled peat with sparse clumps of vegetation in blanket bogs.	Over-grazing can lead to loss of plant species and even soil erosion. However, grazing can be beneficial at the correct livestock density.
Poaching of ground	Erosion of the ground from heavy livestock/human use. Indicators include deep hoof-marks, presence of bare soil or evidence of livestock/people/ vehicles.	Loss of vegetation. Opportunity for weedy species to become established and dominate. Light poaching can be beneficial, as it opens up the ground for plants to colonise.
Cutting of vegetation	Vegetation cut for various reasons, e.g. reeds for thatch roofing, amenity reasons or to encourage plant diversity. Indicators include vegetation at uniform height, storage/piles of cut vegetation. Hay-cutting is a natural part of the callows habitat.	Can lead to loss of plant species. Can be beneficial at the right level, such as for hay-saving.
Lack of management	Vegetation may be tall (above head height) and dense with few species, and with a significant build-up of old vegetation on the ground surface ("litter"). However, some wetlands such as reedbeds and wet woodland are naturally like this.	Can lead to loss of species – lower growing species become shaded out.
Peat cutting	Can be industrial peat extraction or small-scale cutting for local use. Indicators include sharp-edged peat banks, or drying cut peat in adjacent area.	Causes loss of habitat. Can cause drying out through lowering of water levels in the peat bog.

Existing activity or pressure	Indicator	Possible effect on wetland
Forestry	Occurs mainly on blanket bog wetland habitat. Drainage, fertilising and planting, resulting in total cover of dense evergreen trees, with eventual machine-felling.	Causes loss of habitat and potential run-off of acidic and/or fertilizer into adjacent streams.
Invasive non-native plant species	Plant species include Himalayan balsam, Giant hogweed, Japanese knotweed (see photos below), rhododendron and Giant rhubarb (on the Atlantic sea-board).	Can cause loss or reduction in native species.
Other	Any other pressures, e.g. fly tipping or other pollution.	Various.

Himalayan balsam

Giant rhubarb or Gunnera tinctoria. Tape = 1m. NB this is not the, similar but non-invasive, Brazilian rhubarb Gunnera manicata

Japanese knotweed

Giant hogweed

8. The field survey

Overview

The aim of the field survey is to identify and describe the wetlands included in this typology. The survey form provided will guide you through recording the necessary information and identifying the wetland features.

In the field, all information about the wetland should be recorded so that even if it is not used directly in defining the wetland type, it can be used for further assessment of the wetland as necessary. The following features of the wetland and surrounding area should be considered:

- Define the local topography and landscape situation, e.g. in a basin, on a mountain plateau, or near the coast;
- Identify any water features nearby, and describe their proximity to the wetland. This may include the sea, rivers, streams, lakes or springs;
    - These two components can be used to identify the **landscape setting**.
- Identify the kinds of vegetation found in the wetland;
- If possible, identify the soil type;
    - These two components can be used to identify the **habitat type**.
- Identify any observable **existing pressures** or human influences on the wetland, for example drainage or signs of nutrient enrichment.

In the field, it may not be easy to determine a wetland type from the typology by simply reading the descriptions themselves, for example if the description discusses plant species you do not recognise. The vegetation indicators described in Section 5 and the habitat types described in Section 6 should be referenced.

Outline of the Field Survey Form

The **field survey form** allows information to be recorded in a standard format and should be filled in during the site visit.

Page 1 of the form provides space for you to provide information about the date and timing of your visit and the wetland itself, including:

Location	The location should be described generally, for example proximity to the nearest road or other identifiable feature. A grid reference should be provided, which can be obtained from an Ordnance Survey map or using a GPS set to Irish National Grid.
Weather	The current weather should be recorded. In addition, it is useful to know the weather over the preceding weeks or even months (e.g. whether it has been generally wet/dry, hot/cold). It can be useful to ask the landowner if you do not know this information.
Photos	Photographs of the habitat and surrounding landscape are valuable for referring back to after the field visit, and for other people to look at to assist with the assessment. All useful photographs should be numbered and listed on the field survey form, with a brief description of what they are showing.
Landscape setting	Describe the landscape of the area surrounding the wetland, with reference to the table of landscape settings in Section 4. If you do not think any of the settings describe the area you are looking at, provide a description in the box underneath.
Hydrological features	Identify and briefly describe any hydrological features (e.g. lakes, streams, rivers, springs) within or adjacent to the wetland. If the hydrological feature is not in the list, include it in the box underneath.
Soil indicators	If you can see the soil or geology beneath the wetland (e.g. any exposed peat or rock), select the soil type here. If the soil does not fit with any types, provide a description in the box underneath.
Vegetation indicators	Identify the vegetation types in the wetland. If the vegetation is not in the list, include it in the box underneath and take a photograph.
Existing pressures	Identify any existing pressures or human influences on the wetland (these are discussed in more detail in Section 7). If the pressure is not in the list, include it in the box underneath and take a photograph.

Sketch	Draw a sketch map of the wetland and surrounding features. This should include all hydrological features (e.g. lakes, ponds or streams), an indication of topography (e.g. whether surrounding areas are higher or lower than the wetland), and any other identifying landmarks. The extent of each habitat type identified in the wetland should be outlined and labelled on the sketch. If you have access to Ordnance Survey maps or aerial photographs, you may find it useful to use these as the base of your sketch and draw over the top of them.

Page 2 of the form includes a table with tick-boxes for each wetland type. Using the descriptions of wetland habitat type in Section 6 of the guidance manual and the indicators you have ticked on page 1, select the most appropriate wetland types in this table. If you think there is more than one type, tick all relevant types and note next to them if there is a corresponding photo or an identifying number on the sketch. There is also space in each type to briefly describe the extent or any other information about the wetland habitat type.

As suggested above, it is possible that a wetland may contain more than one type. For example, a floodplain wetland may contain both Marsh and Wet woodland types. It is also possible that one type can occur within another, for example a Tufa-forming spring (type 3b) within a Fen (type 4). You should select all types that are present, and then note in the space below the table which are the dominant wetland types.

Glossary

Brown moss This is a collective term for several species of yellow-brown moss (e.g. *Scorpidium scorpioides*) that are abundant in very limey waters. As the leaves are often strongly sickle-shaped, the stems can look like "worms".

Chasmophytic vegetation a collection of plants that grow in rock crevices.

Flush The wetland habitat associated with a seepage.

Groundwater Water found in pore spaces in soil and rocks.

Herb A non-woody plant that is not a grass, rush or sedge; usually with colourful flowers.

Lagg Fen or wet woodland found around the edge of some peat bogs.

Lowland Elevation less than 250m above sea level.

Liverwort Related to mosses, liverworts either form carpets of green scale-like "leaves" or are tiny translucent leafy stems that can form cushions or wefts in very damp situations.

Marl A white mud layer 10cm – ca 1m thick. It is very limey and usually indicates that a lake existed at the site in the past (where millennia of lime has settled to the bottom of the lake in a limestone landscape).

Montane land above 400m.

Peat A dark "spongy" soil with high organic matter content, found where there is a shallow water table.

Peat hags Broken hummocks of deep peat, may be up to 1–3m deep. Peat bog vegetation found on the top of the hags, often with bare soil in the depressions between hags.

Poaching Areas trampled by heavy stock leading to local compaction of the ground on wet, soft soils. Hoof-marks leave depressions of bare soil up to 10cm deep.

Seepage Groundwater emerging at the ground surface across a diffuse area. Less clearly defined than a spring. Generally forms a permanently wet area on a slope.

Spring Groundwater emerging at the ground surface at a well-defined location, e.g. forming the head of a stream.

Succulent plants Plants that store water in fleshy leaves or stems. In Ireland, the succulence develops in some salt marsh species to dilute the high salinity absorbed from the soil.

Tufa Solidified whitish deposits of calcium carbonate from groundwater discharging at the surface.

Typology Classification according to characteristics.

Upland Elevation between 250m and 400m above sea level.

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This is not a comprehensive list, but is intended to give a broad range of relevant recent reports and reference material.

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Appendix 1 – Irish habitat classification and protection

The main habitat classification system used in Ireland is The Heritage Council's "Guide to the Habitats of Ireland" (Fossitt, 2000). The wetland habitats and their corresponding EU Habitats Directive Annex I habitat type are presented below, with full names.

Wetland Habitats

Code	Description	EU Annex I habitats (Natura 2000 code, * = priority type)
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)
FL2	Acid oligotrophic lakes	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)
FW2	Depositing/lowland rivers	Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation (3270)
FW3	Canals	
FW4	Drainage ditches	

Code	Description	EU Annex I habitats (Natura 2000 code, * = priority type)
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)
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)
HH3	Wet heath	Northern Atlantic wet heaths with *Erica tetralix* (4010)
HH4	Montane heath	Alpine and Boreal heaths (4060)
PB1	Raised bog	*Active raised bogs (7110)
PB1	Raised bog	Degraded raised bogs still capable of natural regeneration (7120)
PB1	Raised bog	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)
PF1	Rich fen and flush	Alkaline fens (7230)
PF2	Poor fen and flush	
PF3	Transition mire and quaking bog	Transition mires and quaking bogs (7140)
WN4	Wet pedunculate oak–ash woodland	*Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-padion, Alnion incanae, Salicion albae)* (91E0)
WN5	Riparian woodland	

Code	Description	EU Annex I habitats (Natura 2000 code, * = priority type)
WN6	Wet willow-alder-ash woodland	
WN7	Bog woodland	*Bog woodland (91D0)
WL2	Treelines	
ER1	Exposed siliceous rock	Siliceous rocky slopes with chasmophytic vegetation (8220)
ER2	Exposed calcareous rock	Calcareous rocky slopes with chasmophytic vegetation (8210)
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)
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)
CM1	Lower salt marsh	*Spartina* swards (*Spartinion maritimae*) (1320)
CM1	Lower salt marsh	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) (1330)
CM1	Lower salt marsh	Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*) (1420)
CM2	Upper salt marsh	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) (1330)
CM2	Upper salt marsh	Mediterranean salt meadows (*Juncetalia maritimi*) (1410)
CD5	Dune slacks	Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*) (2170)
CD5	Dune slacks	Humid dune slacks (2190)
CD6	Machair	Machairs (*in Ireland) (21A0)
LR5	Sea caves	Submerged or partially submerged sea caves (8330)
LS2	Sand shores	Mudflats and sandflats not covered by sea water at low tide (1140)
LS3	Muddy sand shores	Mudflats and sandflats not covered by sea water at low tide (1140)

Code	Description	EU Annex I habitats (Natura 2000 code, * = priority type)
SR1	Exposed infralittoral rock	Reefs (1170)
SS1	Infralittoral gravels and sands	Sandbanks which are slightly covered by sea water all the time (1110)
SS2	Infralittoral muddy sands	Estuaries (1130)
SS3	Infralittoral muds	Estuaries (1130)
MW1	Open marine water	
MW2	Sea inlets and bays	Large shallow inlets and bays (1160)
MW3	Straits and sounds	
MW4	Estuaries	Estuaries (1130)

A variety of habitats that are listed under Annex I of the EU Habitats Directive are dependent on groundwater and surface waters as detailed above. Many sites containing examples of these habitats are protected as Special Areas of Conservation (SACs), Special Protection Areas (for birds) (SPAs) or proposed Natural Heritage Areas (pNHAs). Once a pNHA has undergone the statutory designation process it becomes a Natural Heritage Area (NHA).

EU Habitats Directive – Species

Species listed under Annex II of the EU Habitats Directive that are dependent on groundwater and surface waters include:

- 1013 *Vertigo geyeri* (Geyer's whorl snail)
- 1014 *Vertigo angustior* (Narrow-mouthed whorl snail)
- 1016 *Vertigo moulinsiana* (Desmoulin's whorl snail)
- 1029 *Margaritifera margaritifera* (Freshwater pearl mussel)
- 1065 *Euphydryas aurinia* (Marsh fritillary butterfly)
- 1092 *Austropotamobius pallipes* (White-clawed crayfish)
- 1095 *Petromyzon marinus* (Sea lamprey)
- 1096 *Lampetra planeri* (Brook lamprey)
- 1099 *Lampetra fluviatilis* (River lamprey)
- 1102 *Alosa alosa* (Allis shad)
- 1103 *Alosa fallax* (Twaite shad)
- 1106 *Salmo salar* (Atlantic salmon)
- 1355 *Lutra lutra* (Otter)
- 1393 *Drepanocladus (Hamatocaulis) vernicosus* (Slender green feather-moss)
- 1395 *Petalophyllum ralfsii* (Petalwort)
- 1421 *Trichomanes speciosum* (Killarney fern)
- 1528 *Saxifraga hirculus* (Marsh saxifrage)
- 1831 *Luronium natans* (Floating water-plantain)
- 1833 *Najas flexilis* (Slender naiad)
- 1990 *Margaritifera durrovensis* (Nore pearl mussel)

Water Framework Directive

Article 6 of the Water Framework Directive (WFD) requires member states to compile a Register of Protected Areas for water-dependent habitats and species lying within each river basin district. The register must include protected areas covered by Annex IV of the WFD where the protection or improvement of the status of water is an important feature for their protection. At present this involves all Natura 2000 sites that contain water-dependent habitats and species but there are proposals that sites of national significance such as NHAs would also be included. These sites include many areas of wetland habitats, and additional wetland sites that warrant designation as both SACs and NHAs are being regularly identified as county wetland surveys and accompanying GIS datasets are developed.

Planning and Development Regulations

Following the European Court of Justice Judgment in Case C-66/0606, Irish planning legislation was amended in 2011 to bring land reclamation involving wetlands within the scope of planning regulations. The Planning and Development (Amendment) (No.2) Regulations 2011 and the European Communities (Amendment to Planning and Development) Regulations 2011 provide for new thresholds both for applications for planning permission and for environmental impact assessment.

Specifically in the case of drainage and/or reclamation of wetlands for the purpose of agriculture; a development consisting of drainage and/or reclamation of wetlands (including estuarine marshes or callows) **above 2 ha** now requires a mandatory Environmental Impact Assessment, and a development consisting of drainage and/or reclamation of wetlands (including estuarine marsh or callows) **above 0.1 ha** now requires planning permission (and screening for EIA). Within the Planning and Development Regulations a definition of "wetlands" has been inserted into Article 5 of the Regulations as meaning: "natural or artificial areas where biogeochemical functions depend notably on constant or periodic shallow inundation, or saturation, by standing or flowing fresh, brackish or saline water". Furthermore it is stated that all definitions broadly agree on wetlands involving saturated soils that include the following Irish habitats:

- Lakes, reservoirs and ponds
- **Turloughs**
- Rivers and canals
- **Swamps and marshes**
- **Floodplains that are permanently or periodically inundated with water (including callows)**
- **Peatlands (bogs, wet heath and fens)**
- **Wet woodlands**
- Caves
- Cliffs
- **Salt marshes**
- **Dune slacks and machair**
- Transitional waters (e.g. estuaries and lagoons)
- Inter-tidal or sub-tidal habitats (to 6m below the lowest spring tide level).

Please note that this typology only deals with the terrestrial wetland habitats identified above in **bold**.

Appendix 2 – Wetland habitats not included in this typology

The habitats listed below as described by Fossitt (2000) are all wetland habitats (typically of open water) but are not described in this typology:

- FL1 Dystrophic lakes
- FL2 Acid oligotrophic lakes
- FL3 Limestone/marl lakes
- FL4 Mesotrophic lakes
- FL5 Eutrophic lakes
- FL7 Reservoirs
- FL8 Other artificial lakes and ponds
- FW 1 Eroding/upland rivers
- FW2 Depositing/lowland rivers
- FW3 Canals
- FW4 Drainage ditches
- CW1 Lagoons and saline lakes
- CW2 Tidal rivers

The other habitats that are listed under Annex I of the EU Habitats Directive (* indicates priority habitat) but are not included in this typology include:

- 1110 Sandbanks which are slightly covered by sea water all the time
- 1130 Estuaries
- 1140 Mudflats and sand flats not covered by sea water at low tide
- 1150 *Coastal lagoons
- 1160 Large shallow inlets and bays
- 1170 Reefs

- 1230 Vegetated sea cliffs of the Atlantic and Baltic coasts
- 3110 Oligotrophic waters containing very few minerals of sandy plains: *Littorelletalia uniflorae*
- 3130 Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*
- 3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.
- 3150 Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation
- 3160 Natural dystrophic lakes and ponds
- 3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
- 3270 Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation
- 8310 Caves not open to the public
- 8330 Submerged or partly submerged sea caves

Appendix 3 – Local wetland surveys

Wetland surveys have been carried to varying degrees at each of the counties listed below. For more information and access to the surveys please contact the relevant local authority. To access a Map of Irish wetlands visit *www.wetlandsurveysireland.com*.

Carlow

Cavan

Clare

Cork

Donegal

Dublin

Galway

Kerry

Kildare

Kilkenny

Laois

Leitrim

Limerick

Longford

Louth

Mayo

Meath

Monaghan

Offaly

Roscommon

Sligo

Tipperary

Waterford

Westmeath

Wexford

Wicklow

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An Roinn
Cultúir, Oidhreachta agus Gaeltachta

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epa
Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

Ramsar