

Introduction to Annex I grasslands



Botanical Society
of Britain & Ireland

Dr. Fionnuala O'Neill, MCIEEM
BEC Consultants Ltd.



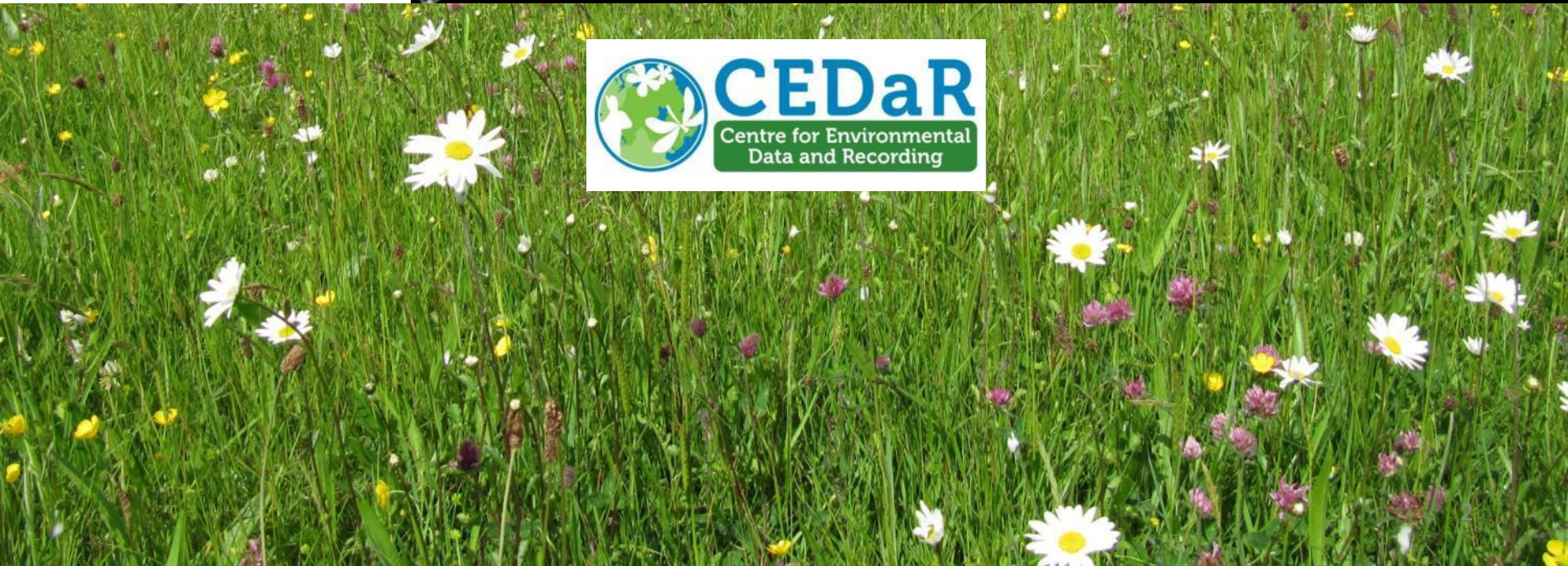
Thanks to project supporters:



An Roinn Cultúir,
Oidhreacht agus Gaeltachta
Department of Culture,
Heritage and the Gaeltacht



National Parks & Wildlife Service



CEDaR
Centre for Environmental
Data and Recording

Today's Webinar

- What is an Annex I habitat?
- What Annex I grassland habitats do we have in Ireland?
- Descriptions of Ireland's main Annex I grassland habitats
- Assessing Annex I grasslands (why and how?)
- Management to restore or maintain Annex I grasslands

What is an Annex I habitat?

- EU Habitats Directive
 - Drawn up in 1992, came into force in 1994, transposed into Irish law in 1997 (see NPWS website)
- “Annex I of the EU Habitats Directive lists habitats which the member states must protect by the designation and management of protected areas known as *Special Areas of Conservation*” (Evans, 2010)
- Annex I of the Directive lists habitats which are considered threatened in the EU territory
- Annex I habitat = A habitat listed on Annex I of the EU Habitats Directive
- Priority Annex I habitats (indicated by ‘*’) are habitats that are in danger of disappearance
- Currently there are 233 Annex I habitats listed; Ireland reports on 59 of them

Annex I habitat descriptions

- “An Interpretation Manual describes the habitats but there is often variation between member states in how they interpret the habitat types, sometimes there is variation between regions in the same country” (Evans, 2010)
- Search for “Interpretation manual EU habitats” or download it from https://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm

What Annex I grasslands are in Ireland?

- 32 grassland habitats listed in Annex I
- 6 currently monitored and reported on in Ireland
 - 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (*important orchid sites)
 - 6230 *Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)
 - 6410 *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)
 - 6510 Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*)

- 6130 Calaminarian grasslands of the *Violetalia calaminariae*
 - rocky, exposed ground, metal mines; characterised more by the mosses than the grasses
- 6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels
 - swamp, characterised by high cover of tall herbs; grasses usually a minor component
- Two others recorded recently by the National Survey of Upland Habitats
 - 6150 – Siliceous alpine and boreal grasslands
 - exposed ground with sedge-moss community
 - 6170 – Alpine and sub-alpine calcareous grasslands
 - very small area recorded in Dartry Mountains (Sligo/Leitrim)

General characteristics of Annex I grasslands

- Tend to have a high proportion of forbs (i.e. broad-leaved herbs) – important for pollinators, lots of flowers (the “*WOW!*” test)
- Usually a high number of plant species



General characteristics of Annex I grasslands

- Low levels of fertiliser input, if any (e.g. from grazing animals)
- Usually managed by low-intensity grazing or mowing
- Have not been ploughed or reseeded for many years
- Low proportion of tussocky grasses
- Low proportion of agricultural species such as white clover, docks, daisies and perennial ryegrass

Mowing for silage or hay



6210/6210* Calcareous grassland

- Species characteristic of calcareous (lime-rich) areas
- Very species rich
- Priority habitat if orchid-rich
- High prevalence in limestone-rich and esker areas, e.g. Clare, Galway, also northwest counties and midlands
- Soil is often thin, mineral-rich

Annex I grassland: 6210



Calcareous: pH 6.7

High sp. diversity: 58 spp. in 4 sq. m

Ballymachugh, Co. Westmeath

Clonmacnoise Esker, Co. Offaly



6210 indicator species

The presence/absence of the High-quality and Positive indicator species within each 2m x 2m monitoring plot should be recorded

High-quality Species		Positive Indicator Species	
<i>Antennaria dioica</i>	<i>Filipendula vulgaris</i>	<i>Arabis hirsuta</i>	<i>Lotus corniculatus</i>
<i>Anthyllis vulneraria</i>	<i>Gentiana verna</i>	<i>Brachypodium pinnatum</i>	<i>Origanum vulgare</i>
<i>Asperula cynanchica</i>	<i>Gentianella amarella/campestris</i>	<i>Bromopsis erecta</i>	<i>Pilosella officinarum</i>
<i>Blackstonia perfoliata</i>	<i>Geranium sanguineum</i>	<i>Carex flacca</i>	<i>Ranunculus bulbosus</i>
<i>Briza media</i>	<i>Knautia arvensis</i>	<i>Ctenidium molluscum</i>	<i>Sesleria caerulea</i>
<i>Campanula rotundifolia</i>	<i>Koeleria macrantha</i>	<i>Daucus carota</i>	<i>Thymus polytrichus</i>
<i>Carex caryophylla</i>	<i>Linum catharticum</i>	<i>Galium verum</i>	<i>Trisetum flavescens</i>
<i>Carlina vulgaris</i>	<i>Primula veris</i>	<i>Helictotrichon pubescens</i>	
<i>Centaurea scabiosa</i>	<i>Sanguisorba minor</i>	<i>Homalothecium lutescens</i>	
Orchid species	(record individual orchid species separately)	<i>Leontodon hispidus</i> / <i>L. saxatilis</i>	(record both but count as one in assessment)

Number of High-quality species in 2m x 2m plot should be ≥ 2

Total number of positive indicator and High-quality species in 2m x 2m plot should be ≥ 7



Killure More, Co. Galway

Pilosella, Antennaria, Lotus corniculatus, Galium verum and Carex flacca

Fionnuala O'Neill

Anthills, Co. Donegal



Anthills, Co. Donegal







Murrooghkilly, Co. Clare





Harebells, Co. Donegal



6230 *Species-rich *Nardus* upland grassland

- Priority habitat
- Species-rich (by definition)
- Confined to siliceous (acidic) substrates in upland areas, usually near upper limit of enclosed farmland
- Extensive grazing, usually by sheep, is required to maintain the habitat

6230

- Often occurs in a mosaic with heath
- Mineral flushing is usually required to create a habitat that supports a more species-rich community
- Both a calcareous (calcareous flushing) and non-calcareous sub-community of this habitat have been identified in Ireland

*Species-rich *Nardus* upland grassland 6230

Acidic: pH 4.65

High sp. diversity: 43 spp.



Ballinloghig, Co. Kerry



6230 indicator species

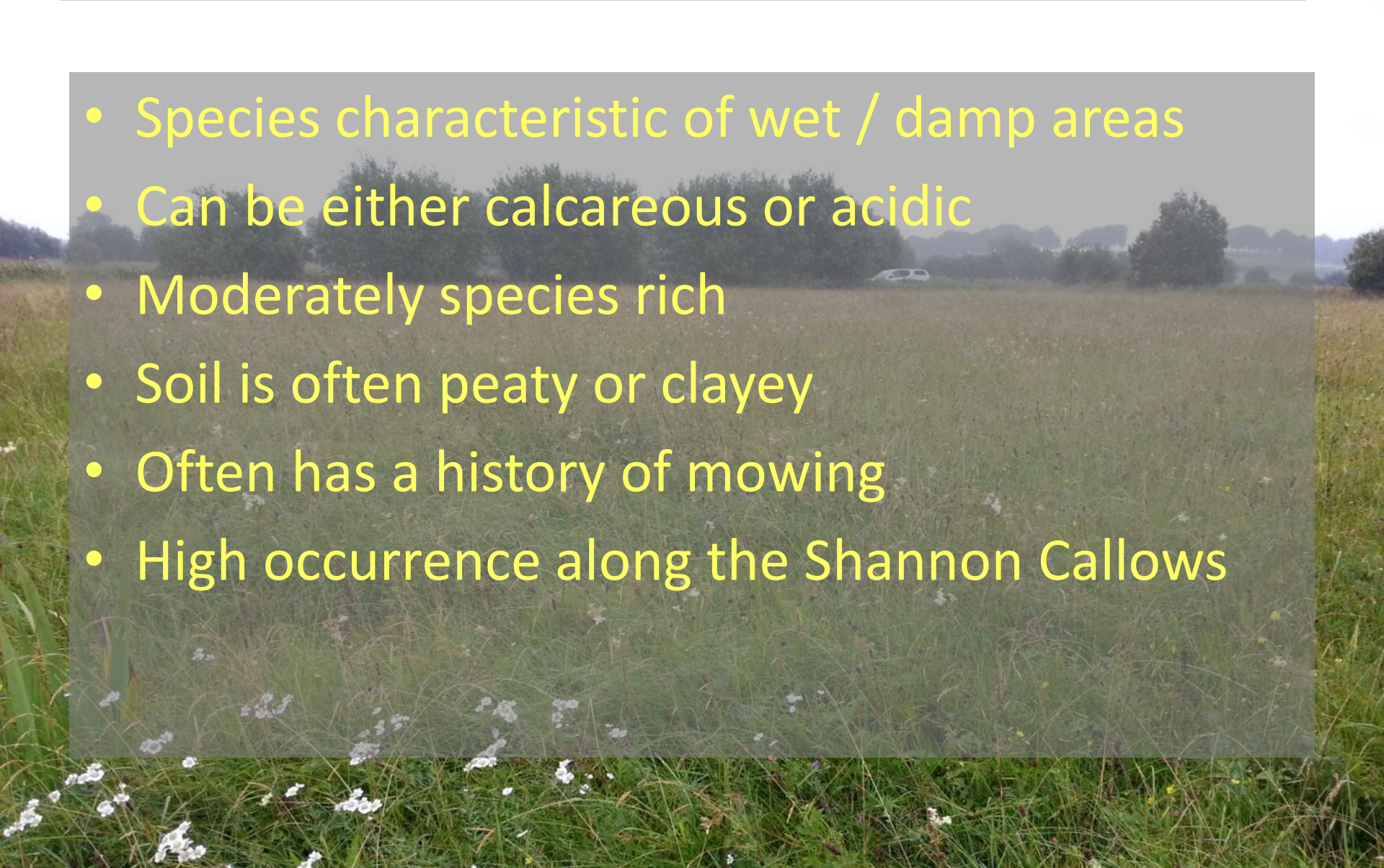
The presence/absence of the High-quality and Positive indicator species within each 2m x 2m monitoring plot should be recorded

High-quality species		General positive indicator species	
(a) Calcareous sub-community (target is ≥ 2 species)	(b) Non-calcareous sub-community (target is ≥ 1 species)		
<i>Alchemilla glabra</i>	<i>Breutelia chrysocoma</i>	<i>Agrostis capillaris</i>	<i>Rhytidiadelphus loreus</i>
<i>Antennaria dioica</i>	<i>Carex caryophylla</i>	<i>Anthoxanthum odoratum</i>	<i>Rhytidiadelphus squarrosus</i>
<i>Campanula rotundifolia</i>	<i>Carex pilulifera</i>	<i>Carex binervis</i>	<i>Veronica officinalis</i>
<i>Conopodium majus</i>	<i>Danthonia decumbens</i>	<i>Festuca ovina</i>	
<i>Ctenidium molluscum</i>	<i>Lathyrus linifolius</i>	<i>Galium saxatile</i>	
<i>Linum catharticum</i>	<i>Pseudorchis albida</i>	<i>Hylocomium splendens</i>	
<i>Lotus corniculatus</i>	<i>Viola canina</i>	<i>Luzula multiflora</i> / <i>L. campestris</i> (count <i>Luzula</i> spp. as one)	
<i>Lysimachia nemorum</i>	<i>Viola riviniana</i>	<i>Nardus stricta</i>	
<i>Primula vulgaris</i>		<i>Polygala serpyllifolia</i>	
<i>Prunella vulgaris</i>		<i>Potentilla erecta</i>	
<i>Thymus polytrichus</i>			

Target = Number of high-quality (HQ) and general positive indicator species present ≥ 7
NB: Count HQ species from EITHER (a) OR (b) but not both



6410 *Molinia* meadows

- 
- Species characteristic of wet / damp areas
 - Can be either calcareous or acidic
 - Moderately species rich
 - Soil is often peaty or clayey
 - Often has a history of mowing
 - High occurrence along the Shannon Callows

6410 indicator species

The presence/absence of the High-quality and Positive indicator species within each 2m x 2m monitoring plot should be recorded

High-quality Species	Positive Indicator Species	
<i>Carex pulicaris</i>	<i>Achillea ptarmica</i>	<i>Lotus pedunculatus</i>
<i>Carum verticillatum</i>	<i>Carex echinata</i>	<i>Luzula multiflora</i>
<i>Cirsium dissectum</i>	<i>Carex flacca</i>	<i>Mentha aquatica</i>
<i>Crepis paludosa</i>	<i>Carex nigra</i>	<i>Molinia caerulea</i> (Pass = present in one plot or within 20 m of a plot)
<i>Galium uliginosum</i>	<i>Carex panicea</i>	<i>Potentilla anglica</i>
<i>Juncus conglomeratus</i>	<i>Carex viridula</i>	<i>Potentilla erecta</i>
<i>Lathyrus palustris</i>	<i>Equisetum palustre</i>	<i>Ranunculus flammula</i>
<i>Ophioglossum vulgatum</i>	<i>Filipendula ulmaria</i>	<i>Succisa pratensis</i>
<i>Viola persicifolia</i>	<i>Galium palustre</i>	<i>Viola palustris</i>
Orchid species (record individual orchid species separately)	<i>Juncus acutiflorus</i> /(<i>J. articulatus</i>) (record both but count as one in assessment)	

Number of High-quality species in 2m x 2m plot should be ≥ 1

Total number of positive indicator + High-quality species in 2m x 2m plot should be ≥ 7

Note: *Molinia caerulea* has a late leaf emergence (June onwards) and may not be visible early in season, though dead leaves may be evident

Cirsium dissectum (Meadow thistle)



Annex I habitat: 6410 *Molinia* meadows



Drumlosh, Co. Roscommon

Acidic/Neutral: pH 5.8

Medium sp. diversity: 25 spp.

Annex I habitat: 6410 *Molinia* meadows



Cream Point, Co. Clare

Acidic/Neutral: pH 5.55

Medium sp. diversity: 22 spp.

Annex I habitat: 6410 *Molinia* meadows

Inset photos of Devil's bit scabious (*Succisa pratensis*) © Zoe Devlin
<http://www.wildflowersofireland.net/>



Derrysallagh, Co. Sligo





Marsh Fritillary butterflies in Co. Clare



Acidic/Neutral: pH 5.57

Low-medium sp. diversity: 16 spp.

6410 habitat at Glenasmole Valley, Co. Dublin



Moystown Demesne and Bullock Island, Co. Offaly

Molinia meadow, Co. Donegal - mown



Molinia meadow, Co. Donegal – unmown



6510 Lowland hay meadows

- Species characteristic of neutral or calcareous habitats
- May be damp or dry but shouldn't be waterlogged
- Moderately species rich
- Highest prevalence along the Shannon Callows and the River Moy in Co. Mayo
- Soil may be alluvial if meadows occur along river callows
- Usually a history of mowing

6510 indicator species

The presence/absence of the High-quality and Positive indicator species within each 2m x 2m monitoring plot should be recorded

High-quality Species	Positive Indicator Species	
<i>Bromus racemosus</i>	<i>Alopecurus pratensis</i>	<i>Plantago lanceolata</i>
<i>Hordeum secalinum</i>	<i>Centaurea nigra</i>	<i>Prunella vulgaris</i>
<i>Knautia arvensis</i>	<i>Crepis capillaris</i>	<i>Ranunculus acris</i>
<i>Leucanthemum vulgare</i>	<i>Daucus carota</i>	<i>Trifolium pratense</i>
<i>Lotus corniculatus</i>	<i>Filipendula ulmaria</i>	<i>Trisetum flavescens</i>
<i>Pimpinella major</i>	<i>Heracleum sphondylium</i>	<i>Vicia cracca</i>
<i>Rhinanthus minor</i>	<i>Hypochaeris radicata</i>	
<i>Sanguisorba officinalis</i>	<i>Lathyrus pratensis</i>	
<i>Tragopogon pratensis</i>	<i>Leontodon autumnalis</i>	
Orchid species (record individual orchid species separately)	<i>Leontodon hispidus</i>	

Number of High-quality species in 2m x 2m plot should be ≥ 1
 Total number of positive indicator and High-quality species in 2m x 2m plot should be ≥ 7

Lowland Hay Meadows 6510



Calcareous-Neutral: pH 6

Med-High sp. diversity: 29 spp.

Shannon Callows, Co. Roscommon



6510, Glenasmole Valley, Co. Dublin



6510, Glenasmole Valley, Co. Dublin

Traditional hand-cutting



Lowland hay meadow 6510



Glencolumbkille, Co. Clare

Sward of Yellow rattle (*Rhinanthus minor*)

Clonmacnoise, Co. Offaly



6510



Inset photo of Yellow rattle (*Rhinanthus minor*)
©Zoe Devlin <http://www.wildflowersofireland.net/>



6430 Hydrophilous tall-herb swamp

- Swamps with high proportion of tall, broad-leaved herbs
- Usually waterlogged
 - e.g. drains, lake-edges
- Low/Moderate species richness
- True soil may be lacking – vegetation occurs in infilling situations

6430 indicator species

The presence/absence of the Positive indicator species within each 2m x 2m monitoring plot should be recorded ; there are no high-quality species

Positive Indicator Species	
<i>Alisma lanceolatum</i>	<i>Hypericum tetrapterum</i>
<i>Alisma plantago-aquatica</i>	<i>Iris pseudacorus</i>
<i>Angelica sylvestris</i>	<i>Lysimachia vulgaris</i>
<i>Calystegia sepium</i>	<i>Lythrum salicaria</i>
<i>Cicuta virosa</i>	<i>Mentha aquatica</i>
<i>Crepis paludosa</i>	<i>Myosotis scorpioides</i>
<i>Epilobium hirsutum</i>	<i>Persicaria amphibia</i>
<i>Epilobium palustre</i>	<i>Rumex hydrolapathum</i>
<i>Epilobium parviflorum</i>	<i>Sium latifolium</i>
<i>Equisetum fluviatile</i>	<i>Solanum dulcamara</i>
<i>Equisetum palustre</i>	<i>Stachys palustris</i>
<i>Eupatorium cannabinum</i>	<i>Symphytum officinale</i>
<i>Filipendula ulmaria</i>	<i>Trollius europaeus</i>
<i>Galium palustre</i>	<i>Valeriana officinalis</i>

Total number of positive indicator species in 2m x 2m plot should be ≥ 3

Cover of indicator species should be $\geq 40\%$

Hydrophilous Tall-herb swamp 6430



Tulcon, Co. Leitrim

Acidic/neutral: pH 5.8

Low-Medium sp. diversity: 16 spp.

Hydrophilous Tall-herb swamp 6430



Assessment of Annex I habitats (Why?)

- EU Habitats Directive
 - Requires Member States to maintain or restore habitats and species listed on the Annexes at a *favourable conservation status*
 - What constitutes “favourable conservation status” is largely left up to the individual member states
- Article 11 of the Directive
 - Each member state must undertake surveillance of the conservation status of the habitats and species listed on the Annexes (species are listed in Annexes II, IV and V)
- Article 17 of the Directive
 - Each member state must report to the European Commission every six years on their status and on the implementation of the measures taken under the Directive
- In April 2019, Ireland submitted the third assessment of conservation status for 59 Annex I habitats

Assessment of Annex I habitats (How?)

- Set of assessment criteria to examine the habitat regarding its structure and functioning
 - Drawn up by each member state
- The habitat can pass or fail the assessment depending on whether it meets these criteria
- **NB: Failure of the assessment does not mean that it is not Annex I habitat!**
 - It only means that it's *not in favourable condition*
 - implies that it can be restored to favourable condition by proper management
 - You must determine beforehand if it is an Annex I habitat (e.g. enough indicator species present) – only assess if it is
 - Don't use the assessment to decide whether or not it's Annex I!

Assessment of Annex I habitats (How?)

Structure and functions criteria

- Species data
 - Positive indicator species – different for each country, help to define the habitat
 - In Ireland, we have both a “high-quality” and a “general” positive species list for some of our Annex I grasslands
 - Negative indicator species
 - Indicators of abandonment, intensification, etc.
 - Should not exceed a certain cover
 - e.g. Yorkshire fog, false oat-grass, cock’s-foot, docks, thistles, white clover

- Vegetation structure
 - Cover of forbs should ideally reach a certain threshold
 - Thresholds also for leaf litter, sward height
 - Too much leaf litter or too tall a sward may indicate unsuitable management, e.g. insufficient mowing
- Physical structure
 - e.g. Disturbance, overgrazing, drainage

Molinia meadow, Co. Donegal - mown





Assessment of Annex I habitats (How?)

Pressures and Threats

- Activities taking place that are currently having a negative impact on the habitat? (pressures)
 - e.g. slurry application, overgrazing
- Activities that could potentially have a negative impact in the future? (threats)
 - e.g. Conversion to other landuse, e.g. forestry
 - Change of ownership → intensification or abandonment
- How much of the habitat is affected?

Abandoned *Molinia* meadow – no longer Annex I habitat



Same field beforeand after slurry spreading



Annex I Lowland hay meadow 2009



Non-Annex grassland 2016

Further pressures/threats

- Landowner worries
 - Some landowners unsure about what they are allowed to do on designated land
 - Some decide to do nothing, for fear of doing the wrong thing
 - This leads to succession to non-grassland habitats (e.g. scrub) or very rank, tussocky swards of low biodiversity value

Restoring or Maintaining Favourable Conservation Status

- Sustained management
 - Abandonment is a problem
 - Competitive species and shrub encroachment
- Appropriate management
 - Low intensity
 - Low input
- Maintenance of existing hydrological regimes
 - Flood management and drainage systems may be damaging

Molinia meadow at Inch Level, Co. Donegal – naturally inundated



Donegal cattle grazing in 6210 Calcareous grassland



Horses grazing in 6410 *Molinia* meadow in Offaly



Sheep grazing on Annex I grassland, Co. Sligo





(Semi-) Abandoned Annex I grassland



Exposure can help maintain grassland habitats, including Annex I grasslands



Restoring or Maintaining Favourable Conservation Status

- Communication and landowner engagement
 - Results-based incentive schemes, e.g. Burren programme, RBAPS in Leitrim and the Shannon Callows
 - Farmers are paid for results – how they get there is up to them!
 - Uses the farmers' knowledge of the land to maintain the habitats
 - Knock-on benefits of biodiversity to the farm and wider environment

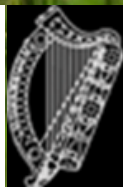
More info on Annex I grasslands in Ireland

- **Baseline grassland survey**
 - O'Neill, F.H., Martin, J.R., Devaney, F.M. & Perrin, P.M. (2013) The Irish semi-natural grasslands survey 2007-2012. Irish Wildlife Manuals, No. 78. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Ireland
- **Most recent round of Annex I grassland monitoring**
 - Martin, J.R., O'Neill, F.H. & Daly, O.H. (2018) The monitoring and assessment of three EU Habitats Directive Annex I grassland habitats. Irish Wildlife Manuals, No. 102. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland
- **See also Article 17 reports on NPWS website:**
<https://www.npws.ie/publications/article-17-reports>

Míle buíochas
Thank you!



An Roinn Cultúir,
Oidhreacht agus Gaeltachta
Department of Culture,
Heritage and the Gaeltacht



National Parks & Wildlife Service

Image acknowledgements

- Habitat photos taken by BEC Consultants staff and associated field ecologists for the Irish Semi-natural Grasslands Survey (2007-2012) and the Grassland Monitoring Survey (2015-2018)
- All habitat photos © NPWS
- This presentation is for personal study use only – not for redistribution