

Local Area Plan

MUNSTER SOUTH CONNAUGHT, EAST SOUTH-EAST
AND BREFINE COOPERATION PROJECT AREAS

1st ITERATION



Preface

The Hen Harrier Project Ltd was awarded the contract for the management of the Co-operation project teams in ACRES Breifne, ACRES Leinster and ACRES Munster South Connacht. We started work in May 2024, since then we have focussed on building the human, physical and IT infrastructure required to deliver our role in the ACRES Co-operation model. We have also worked closely with the Dept. of Agriculture, Food and the Marine and the project teams for the other five CP areas to develop the scorecards used for habitat assessment and the specifications for Non-Productive Investments and Landscape Actions that form the basis for the results-based approach.

Our team drafted the initial version for the Local Action Plans for the three CP areas in which we operate. This is the first stage of a process which ultimately will identify scheme objectives down to individual land parcel level. The first stage was largely derived from existing datasets held by various state agencies; the next stage of the process is to identify the pressures that apply to each of the defined objectives at a local level. This in turn will be followed by an evolving understanding of the drivers behind those pressures and ultimately by a plan for what we, the participating farmers, the project team, and other agencies can realistically do to address the identified pressures. While our team could complete stage 1, the later stages can only be accomplished with the active engagement of local stakeholders. Most of important of these are the participating farmers on whom we depend for local knowledge and to deliver effective on the responses at field and farm and local levels.

The project teams support the scheme and its participants through the delivery of specialist training and by bridging the gap between Govt Departments and research bodies and the farmer who manages the land. They will shoulder some of the regulatory burden associated with the delivery of works in NATURA 2000 sites and to help co-ordinate action by farmers and other land managers where this is required to achieve landscape level goals.

The scale of the task is considerable, it is not something that can be done behind closed doors. The teams must be public facing and it must be clear to all parties what they are trying to do and their strategy for supporting the participating farmer. Their work must be structured and methodical, and so it must be planned. This requires a detailed consideration of the tasks involved, the strategy to be employed and timelines for delivery. The Local Action Plan seeks to provide this insight and to guide the rollout of the scheme at Co-operation Project level.

The Local Action Plan is the blueprint for the operation of the scheme at Co-operation Project level. This plan consists of two distinct parts. The first deals with identifying local objectives for each part of the co-operation areas, prioritising these and presenting them spatially. The outputs from part 1 are largely map based and serve to guide the project team, participating farmers, and farm advisors on the selection of interventions. This will help ensure that actions are correctly sited and have optimal effect. The second part of the plan relates to operational role of the project teams, their structure, and a plan for further development of the service they provide over the contract period.

The role of the project teams extends beyond direct engagement with the participating farmer. To deliver on the scheme's objectives, the teams must also engage the broader community in support of

what farmers are working to achieve. They must develop the tools that are required to support their own work and to help farmers and others deliver on local objectives.

The Local Action Plan must be seen as a component of the overall approach. ACRES Co-operation operates at individual CP level but exists within a national framework. The Terms and Conditions and Specifications for the broader ACRES Scheme, along with the specifications for Non-Productive Investments and for Landscape Actions provide this framework. These documents set the rules for the operation of the scheme at a national level. The design of the screening processes for actions within ACRES and the Appropriate Assessment for ACRES itself are also managed at a national level. They apply equally to all eight Co-operation areas. However, within this space, there is considerable room for tailoring the rollout and operation of the scheme to meet local objectives. This can be done with consideration to local farming systems and an awareness of local constraints. The Local Action Plan sets out how the Project team will make use of this flexibility. The structure provides for the active involvement of local stakeholders and the ongoing refinement of local plans as our knowledge and understanding of the challenge develops.

The Local Action Plan must be seen as a living document, it is intended to continually develop throughout the operational period of the ACRES scheme. The development of the plan will be responsive to changing circumstances and to an evolving knowledge base and understanding about how best to address local challenges. The plan is a tool not a rule book. Its function is to help all parties to understand what ACRES is intended to achieve and how the scheme's structures can support farmers as they work to achieve our shared objectives.

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2 Introduction

2.1 ACRES Cooperation Project

Ireland's new agri-environment climate measure (AECM) is known as the Agri-Climate Rural Environment Scheme ('ACRES'). This scheme includes a co-operation approach, available to farmers in defined high priority geographical areas. High priority geographical areas were identified using a series of nature priority and high-status objective waterbody spatial layers. Cooperation Project (CP) areas were subsequently determined by grouping these high priority geographical areas (Figure 1), and CP Teams have been assigned to each of these CP areas to enable the roll-out of the scheme at a local level.

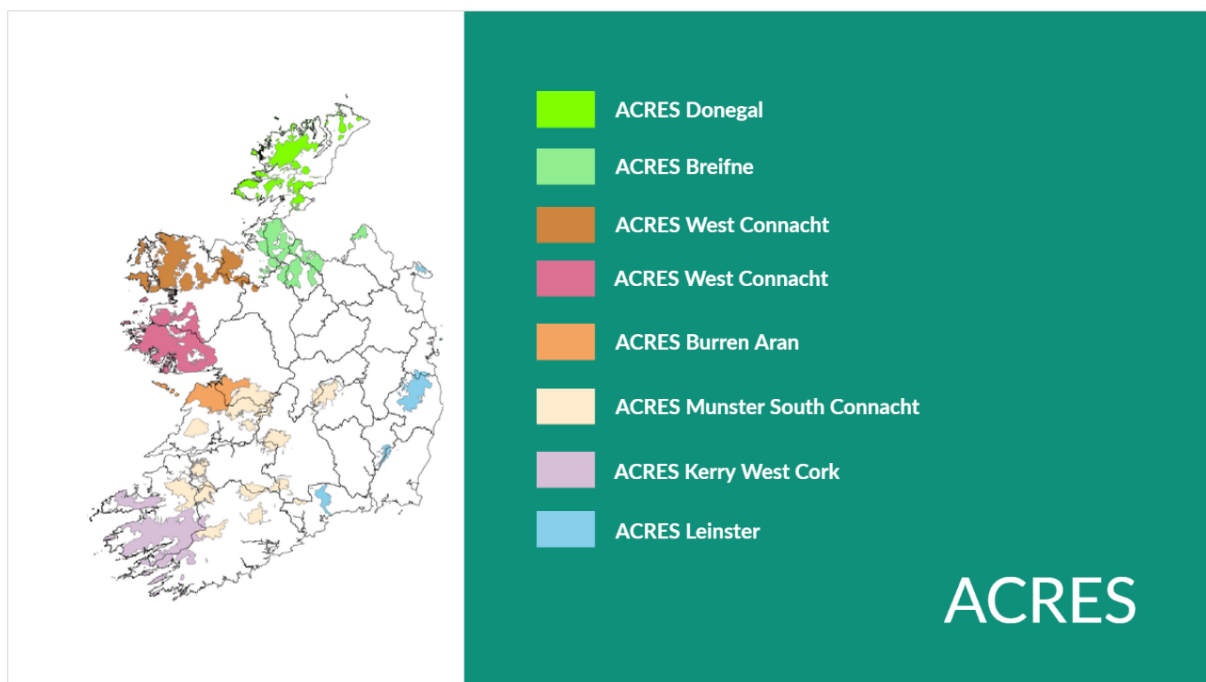


Figure 1: The eight ACRES CP areas.

Within the CP areas, all forage land is identified and mapped by CP teams according to three main habitat types: Grassland, Peatland and Woodland/Scrubland. Each habitat type has a corresponding score card which is used to assess the ecological integrity of the habitat within each field. All scorecards also score hydrological integrity and/or evidence of threats and pressures. Fields are scored three times throughout the duration of the five-year scheme. A yearly payment is made according to the most recent score, which incentivises the maintenance or improvement of the landscape being farmed. The full list of ten scorecards available in ACRES CP include three generic scorecards:

1. Acres Grassland (grassland habitat scorecard),
2. ACRES Peatland (peatland habitat scorecard),
3. ACRES Scrub/Woodland (scrub or woodland scorecard),

and seven habitat or species-specific scorecards:

4. ACRES Low Input Grassland on Peat (targeting grassland habitat adjacent to raised bogs)

5. ACRES Rough Grazing (scorecard targeting a mosaic of grassland and scrub habitat that is particularly suitable for Hen Harrier),
6. ACRES Winterage (scorecard targeting winterage habitat within the Burren CP),
7. ACRES Coastal Grassland (scorecard targeting coastal grassland habitats),
8. ACRES Chough (scorecard targeting chough grassland habitat near cliff/upland settings),
9. ACRES Breeding Wader (scorecard targeting grassland fields with or suitable for breeding waders),
10. Acres Corncrake (scorecard targeting grassland fields with or suitable for corncrake).

A suite of actions designed to improve the assessment score are available to each farmer in each year of their contract following the first baseline score assessment. These actions include a list of Non-productive Investments (NPIs) and Landscape Actions (LAs). All scorecards and actions assigned are included under Farm Sustainability Plans (FSP), which aim to achieve the underlying principle of the new AECM framework of “the right measure in the right place”.

2.2 The Hen Harrier Project CP Areas

The Hen Harrier Programme (HHP) is responsible for the development of a Local Area Plan (LAP) that encompasses three ACRES CP areas, namely: Munster South Connaught, Leinster, and Breifne.

To improve geographic coherence and operational efficiency, the central and most easterly region of Munster South Connaught CP (comprising of the Slieve Blooms, County Offaly) was regrouped into the Leinster CP. Similarly, the most south-westerly area of the Leinster CP was re-grouped into the Munster South-Connaught CP (Figure 2). This limited reconfiguration has sole implications for the operational management of CP areas by CP teams and is incorporated throughout this plan.

The ACRES Munster South Connacht CP area encompasses areas within the provinces of both Munster and Connacht. The CP includes areas located across several counties including Galway, Clare, Tipperary, Limerick, Kerry, Cork and Waterford, encompassing an area of 3205 km². The landscape of the CP area includes upland, extensive lowland, some coastal areas, and some area along the Shannon estuary. The number of first tranche applicants in this CP area is in the order of ~3,306 herd numbers.

The ACRES Leinster CP area falls entirely within the province of Leinster in the east of the country, including the mostly mountainous areas of seven counties: Carlow, Dublin, Laois, Louth, Offaly, Wexford, and Wicklow. It covers an area of approximately 973km² and is estimated to have the lowest intake of farmers of all the CP areas; the number of first tranche applicants is in the order of ~660 herd numbers. The area predominantly consists of uplands (with considerable areas of commonage lands), however some offshore islands are also included in addition to small lowland areas along rivers and at coastal sites.

The ACRES Breifne Co-Operation area is situated in the provinces of Connaught and Ulster and covers an area of approximately 1576 km². It extends from South Leitrim to the Sligo coast in a North Westly direction, additionally it includes smaller areas of West Cavan, East Sligo, North Roscommon and Sliabh Beagh in Co.Monaghan which stretches along with the border Northern Ireland. The CP is predominantly comprised of upland areas (mainly commonage) and extensively farmed lowlands and valleys. The land is principally occupied by agriculture, with significant areas of natural vegetation or

High Nature Value farmland (HNVf). The number of first tranche applicants in the ACRES Breifne CP is in the order of ~2,561 herd numbers.

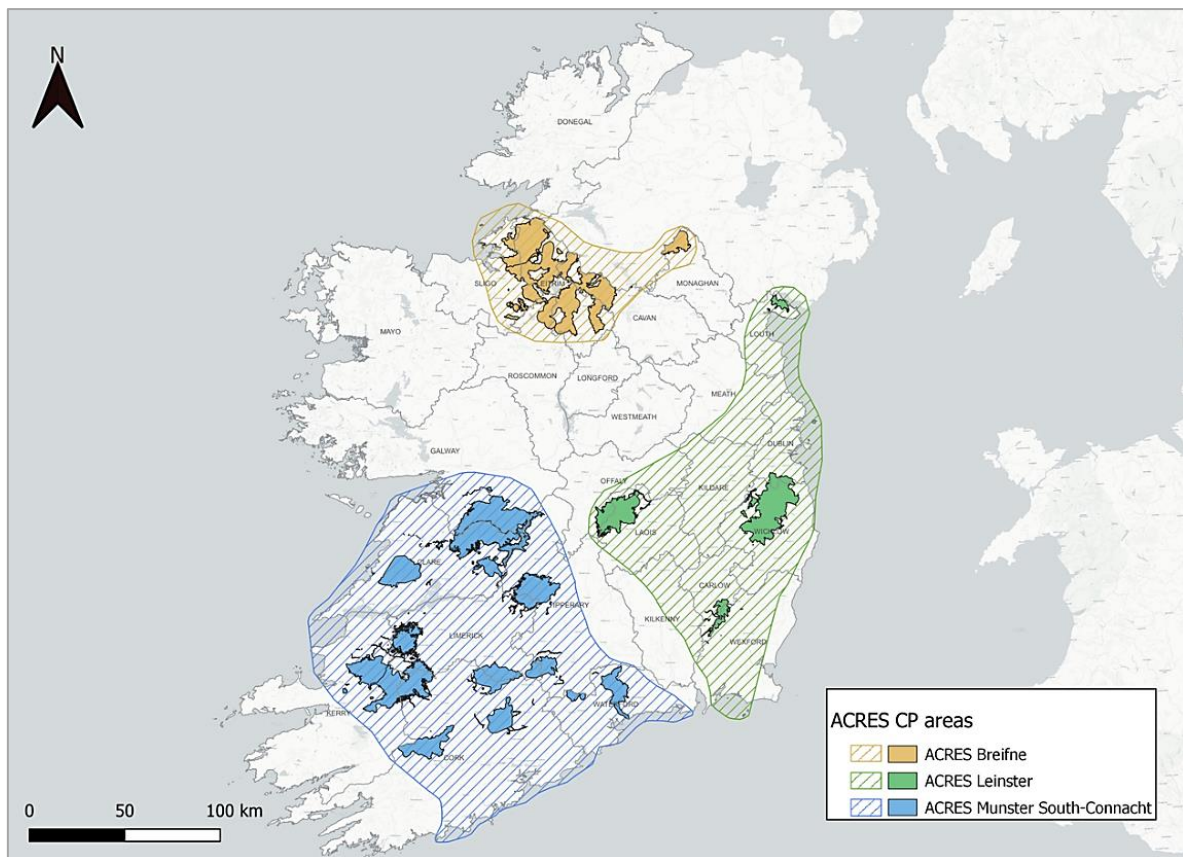


Figure 2: Map illustrating the spatial extent of the three HHP CP areas.

2.3 The Local Area Plan

The 'Local Action Plan' (LAP) provides inter alia summary descriptions and objectives for all three HHP CP areas. To assign the right measure to each field in a Farm Sustainability Plan, a transparent and objective approach is required. To achieve this, the Local Area Plan identifies the spatial location of various environmental objectives based on relevant data and stakeholder input. In this Local Area Plan, the setting of environmental objectives follows an iterative process and will be updated throughout the duration of the scheme (outlined in the following sections and illustrated in Figure 2& Figure 3).

2.3.1 Iteration 1: Broad Scale Objectives

In the first iteration, objectives are identified using national datasets that identify water quality, European designated areas (Special Area of Conservation and/or Special Protection Area), species of conservation interest, etc. Due to the nature of this data, objectives are identified at a broad scale and provide an initial spatial indication of their presence, extent and overlap within the various CP areas. This iteration thus results in a broad-scale, single spatial layer comprising objectives or combinations of objectives in the layer attributes.

The presence of certain objectives guides the appropriate assignment of scorecards within specifically defined areas. For example, the Special Protection Area 'Sligo/Leitrim SPA' which includes Chough as

a qualifying interest provides the spatial location and extent for where the ACRES Chough scorecard should be assigned. The identification of broad-scale objectives also enables the development of a bundle of actions that can benefit them or, where multiple objectives overlap, the development of a bundle of actions that can deliver co-benefits for these multiple objectives.

Broad-scale datasets are useful to determine relevant objectives at a landscape scale, such as coordinated water quality related actions along a watercourse adjoining multiple farms within a catchment. However, specifying the right action or action bundle in the right place should be informed at a field scale, with prior knowledge of the habitat type (via the assigned scorecard) and the condition of the habitat (via the assessment results), which will be the focus of the subsequent iterations of this plan.

Additionally, new data is likely to emerge from stakeholder engagement, local knowledge, and fieldwork etc., and will also be considered in subsequent iterations of the Local Area Plan.

2.3.2 Iteration 2: Field Scale Objectives

In this subsequent iteration, objectives will be defined at the field scale. This will be enabled by obtaining the spatial data from the 'Generic Land Management System' (GLAM), which is the Department's IT application for the capture and recording of mapped fields and actions. This iteration thus incorporates the first iteration objectives with a field-scale spatial layer, including the relevant field habitat objective (e.g., grassland, peatland, or scrub/woodland) within the layer attributes. This iteration may only be progressed following the acquisition of GLAM data post field delineation by CP Teams.

The delineated fields and their habitat types determine the selection of scorecards for each field. The initial assignment is carried out by the Project team, this will be updated following a field level assessment by the advisor or on inspection by DAFM staff. The confirmed scorecards will subsequently inform the field-scale objectives and the relevant action (or action bundles). For example, the assignment of the ACRES Breeding Waders scorecard will determine the precise location and extent of the breeding waders objective and enable field-scale targeted campaigns for actions relevant or specific to those species. Similarly, the assignment of a peatland scorecard on a field will result in a peatland habitat objective. If the peatland field spatially overlaps a water quality objective, the relevant actions campaigned for could include actions that are relevant to peatland habitat and benefit water quality.

Any additional objectives and relevant spatial data identified by stakeholders will also be considered for inclusion.

2.3.3 Iteration 3: Results-Based Field Scale Objectives

In this iteration, it is envisaged to refine the field scale objectives using data gathered from the field habitat assessments. This will enable the differentiation of targeted actions through an understanding of the field habitat condition. For example, if a field with a peatland habitat objective is assessed as having poor vegetation structure and spatially overlaps a water quality objective, the interventions that will be promoted by the project team will include co-benefitting actions relevant to improving peatland habitat and benefitting water quality. This iteration thus incorporates the first iteration objectives (broad-scale spatial layer) with a field-scale spatial layer (habitat objective e.g., grassland,

peatland, or scrub/woodland) in the layer attributes. This iteration may only be progressed following the acquisition of field habitat assessment results. Field-level data will be supplemented by an assessment of the drivers behind many of the threats and pressures noted on the scorecards. This assessment requires the local knowledge of local stakeholders.

Using this iteration of the LAP, it will be possible to process the spatial layer to determine objective priority areas for CP Team campaigns and Landscape Actions. Objective priority areas could include the identification of multiple fields with assessed threats or pressures adjacent to waterbodies within an area identified under a water quality objective.

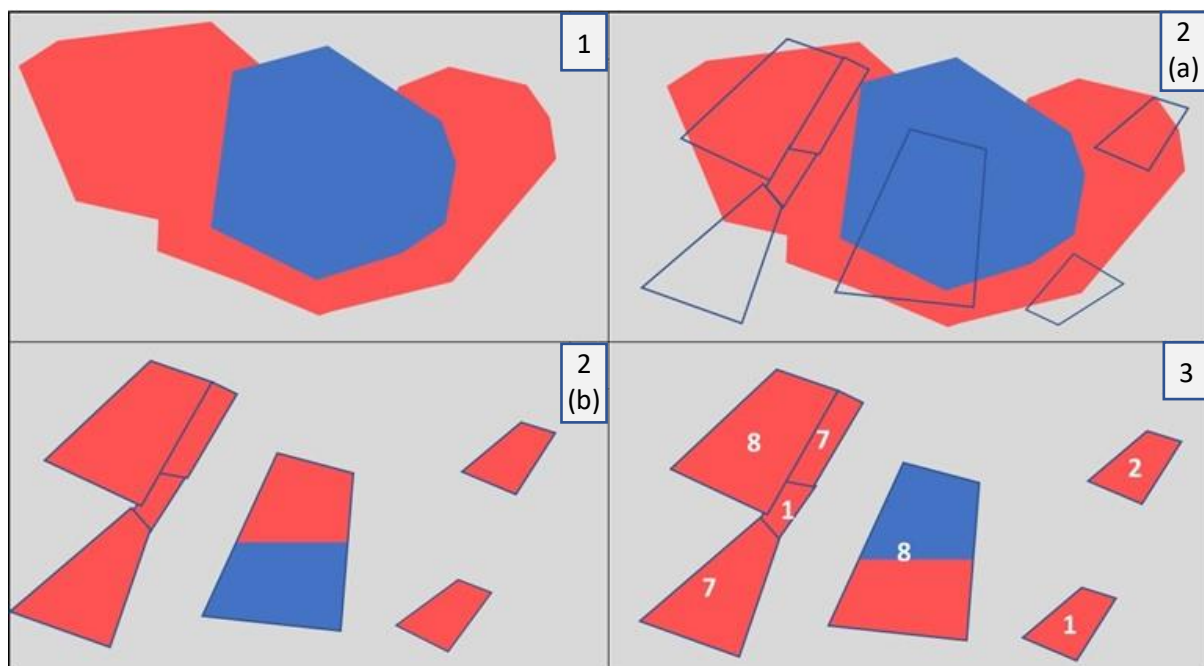


Figure 3: Schematic overview illustrating the successive iterations within the Local Area Plan. The red and blue areas represent two different hypothetical, broad scale objectives: red and blue. 2) (a) Delineation of LPIS parcels pertaining to successful ACRES CP applicants in this area. 2) (b) Scorecards are assigned to the 7 LPIS parcels which consequently determine the field-scale objectives while retaining the broad-scale objectives. 3) Resulting scores of the LPIS parcels guides the CP team in campaigning for necessary actions and developing LAs. As illustrated in 3); with regards to the red objective bundle, the easterly parcels could benefit from prioritisation as the scores indicate improvements are needed to deliver the objective.

3 Broad Scale Objectives

3.1 Spatial Data Diagnosis

A preliminary list of objectives was identified through deconstruction of the high-priority geographical areas (CP areas) used to determine the extent of the CP areas. Datasets specific to the Hen Harrier Project CP areas were identified and are listed in Table 1. These datasets determined the spatial extent of some of the objectives for the CP areas. Additional datasets were identified through initial consultations with stakeholders and further supplemented the identification of objectives (Table 2).

Table 1: Spatial datasets that were used to determine the extent of CP areas relevant to the Hen Harrier Project and identifying broad scale objectives.

	Dataset Name	Format	Relevance	Source
Designated sites	Natura 2000 (SACs & SPAs)	Vector (polygon)	European Designation area extent, species, and habitats conservation objectives, etc. Hen Harrier SPAs identify areas where the ACRES Rough Grazing Scorecard could be applied on grassland mapped fields. Also determines where HH is an objective. Chough SPAs identify areas where the ACRES Chough Scorecard could be applied on grassland mapped fields. Scale 1:5000.	NPWS
	Natural Heritage Areas (NHAs).	Vector (polygon)	National Designation area extent, species, and habitats conservation objectives, etc. Can be applied to identify site-specific qualifying interest targets that do not overlap Natura 2000. Scale 1:5000.	
Blue Dot River Sub Basins	High Status Objective Waterbodies	Vector (polygon and polyline)	To determine waterbodies that should be achieving high status objective. Can be applied to identify water quality targets. Scale: River Sub Basins.	EPA
	WFD Catchments data	Vector	To determine River Sub Basins that host Blue Dot Rivers or Blue Dot inputting headwaters. Can be applied to identify regions to prioritise water quality targets. Scale: River Sub Basins.	
Breeding Hen Harrier Regions		Vector (polygon)	Can be used to identify areas where the ACRES Rough Grazing Scorecard should be applied on grassland mapped fields. Scale: unknown.	CP staff knowledge
Curlew breeding areas	Curlew XY nest data	Vector (point)	To generate a three-kilometre buffer zone. Scale: N/A.	Not available.
Wild Atlantic Nature Areas	Overlaps with Natura 2000 sites, refer to relevant sites list.			
Annex I grassland sites	Irish Semi-natural Grassland Survey (ISGS)	Vector (polygon)	To identify areas of Annex I grasslands and prioritise seminatural grassland targets. Scale: unknown.	NPWS
Offshore Islands	NUTS2 Boundaries	Vector	To identify relevant islands within CP areas. Scale: unknown.	EPA

Table 2: Supplementary datasets identifying additional broad scale objectives of CP areas relevant to the Hen Harrier Project.

	Dataset Name	Format	Relevance	Source
Water quality	Margaritifera sensitive areas map	Vector (polygon)	To determine areas sensitive to water quality. Scale: River Sub Basins.	NPWS EPA
	WFD Areas for Action	Vector (polygon)	To identify ASSAP Priority Areas for Action Scale: River Sub Basins.	
	WFD Significant Pressures	Database (Table)	To identify areas prioritised for significant Phosphorous and Nitrogen loss pressures. Scale: River Sub Basins.	
Bird species distribution (Article 12 dataset)	Barn Owl	Vector (polygon)	To determine Barn Owl distribution Scale: 10 km cell.	NPWS
	Kestrel	Vector (polygon)	To determine Kestrel distribution. Scale: 10 km cell.	
	Peregrine	Vector (polygon)	To determine Peregrine distribution. Scale: 10 km cell.	
	Merlin	Vector (polygon)	To determine Peregrine distribution. Scale: 10 km cell.	
Hen Harrier distribution	Hen Harrier Distribution	Vector (polygon)	To determine Hen Harrier distribution. Scale: 10 km cell.	DAFM
Geese and Swans & other wintering waterfowl distributions	Geese and Swans (1 km grid)	Vector (polygon)	To determine Geese and Swans & other wintering waterfowl distributions. Scale: 1 km cell (Geese and Swans); otherwise unknown.	DAFM
	Barnacle Goose (unknown res)			
	Brent Goose			
	Whooper Swan			
	Greenland Goose			
Lesser Horseshoe Bat Roosts	Lesser Horseshoe Bat Data (1 km grid)	Vector (polygon)	To determine Lesser Horseshoe Bat roost locations Scale: 1 km cell.	NPWS
Elevation	EU-DEM v1.1	Raster	To determine elevation ranges and refine spatial extent of species distribution data. Scale: 1 m	Copernicus
Archaeology	Sites and Monuments Record	Vector (point)	To determine zones of archaeological interest. Scale: N/A.	National Monuments Service and CP staff knowledge.
	Zones of archaeological/ cultural heritage interest developed by project archaeologist. These can include sites post 1700 that are not included in the Sites and Monuments Record.			

3.2 Objectives List and Spatial Layer

3.2.1 Objective Coupling based on available Actions

To condense the preliminary list of objectives and reduce the complexity of objective overlaps, datasets from Table 1 and Table 2 were coupled based on action (NPI/LA) compatibility. Specifically, the presence of co-benefits inherent within each action with respect to each objective was investigated via a matrix to develop a list of action bundles (Appendix).

To develop these action bundles, the full list of NPIs and LAs were inspected for suitability with respect to each preliminary objective. Subsequently, three combination methods of coupling objectives based on action suitability were used where appropriate, namely: additive, overlap, and single. The additive method refers to using the cumulative list of actions beneficial to all objectives to create a bundle and was used when multiple objectives were non-conflicting. Conversely, when multiple objectives shared many of the same actions, it was sufficient to create a new action bundle from the overlap of respective actions. Finally, the single method refers to when no action bundling takes place and was commonly used in the instances where certain beneficial actions conflicted with other objectives.

Table 3: Combination method of constituent objectives comprising each resultant Action Bundle.

Objective	Combination Method	Objective Group
Water Quality	SINGLE	Water Quality
Geese and Swans	ADDITIVE	Geese and Swans
Barnacle Goose		
Brent Goose		
Whooper Swan		
Greenland Goose		
Semi-natural Grassland*	SINGLE	Semi-natural Grassland
Peatland*	SINGLE	Peatland
Red Grouse	SINGLE	Red Grouse
Breeding Wader*	SINGLE	Breeding Wader
Chough*	SINGLE	Chough
Hen Harrier	ADDITIVE	Raptors
Peregrine		
Merlin		
Kestrel	OVERLAP	Barn Owl and Kestrel
Barn Owl		
Lesser Horseshoe Bat	SINGLE	Lesser Horseshoe Bat
Archaeology	SINGLE	Archaeology

*Have an associated scorecard- determined in the first iteration of the LAP using national datasets (see Table 1). The assignment of scorecards will determine the full extent of these objectives in iteration 2 of the LAP.

3.2.2 Objectives List

Spatial datasets in Table 1 and Table 2 and the coupling method from Table 3 were used to generate a list of objectives relevant to the HHP CP areas.

Profiles were generated under each objective to provide more detailed evaluation of the objectives based on published and grey literature including inter alia the national distribution, population estimate in the CP area, habitat requirements, ecological coherence with Annex I habitats in the CP, relevant threats and pressures, and agricultural management measures.

All objective action bundles and profiles are included in Appendix 10.1 and 10.2 respectively. The list of objectives and relevant profile references are listed in Table 4.

Table 4: List of objectives and relevance, including Action Bundles and profile references from appendix.

Objective	Alias	Relevance
Water Quality <i>Includes Margeritifera sensitive areas, ASSAP Priority Areas for Action, High-Status Objective Waterbodies (Blue Dots), Areas with known significant agricultural phosphorous and nitrogen pressure (Water Framework Directive Significant Pressures)</i>	WaterQ	<p>Determines areas sensitive to water quality. Actions promoted in these areas should contribute towards improving or maintaining water quality.</p> <p>See Water Quality Action Bundle in Appendix 10.1.</p> <p>See Water Quality, Phosphorous and Nitrogen Loss profiles in Appendix 10.2 for detailed information.</p> <p>Scale: WFD River Sub Basin units.</p>
Peatland <i>Includes:</i> <ul style="list-style-type: none"> - Natura 2000 sites with peatland habitat qualifying interests - Natural Heritage Areas with peatland habitat qualifying interests - Mapped raised bogs 	Peatland	<p>Determines extent of mapped areas of designations with peatland qualifying interests and areas of raised bog. Actions promoted in these areas could include peatland restoration, etc.</p> <p>See Peatland Action Bundle in Appendix 10.1.</p> <p>See Peatland Habitat profile in Appendix 10.2 for detailed information.</p> <p>Scale: 1:5000</p>
Semi-Natural Grassland <i>Includes:</i> <ul style="list-style-type: none"> - Irish Semi-natural Grasslands Survey - Natura 2000 sites with semi-natural grassland qualifying interests 	SNGrass	<p>Determines extent of mapped areas of semi natural grassland. Can be applied to prioritise grazing management actions, etc.</p> <p>See Semi-natural grassland Action Bundle in Appendix 10.1.</p> <p>See Semi-natural grassland habitats profiles in Appendix 10.2 for detailed information.</p> <p>Scale: unknown</p>
Lesser Horseshoe Bat <i>Based on Habitats Directive Art. 17 distribution data.</i>	LHBat	<p>Provides an indication of the distribution extent of Lesser Horseshoe Bat species. Can be applied to prioritise targeted actions such as summer roosts, linear woodland, tree planting etc.</p> <p>See Lesser Horseshoe Bat Action Bundle in Appendix 10.1.</p> <p>See Lesser Horseshoe Bat profile in Appendix 10.2 for detailed information.</p> <p>Scale: 1 km grid squares</p>

Breeding Waders <i>Based on Breeding Waders hotspot score</i>	BWaders	<p>Provides an indication of the distribution extent of Breeding Waders. Actions promoted in these areas could include specialist wildlife supports such as wader scrapes, etc.</p> <p>See Breeding Waders Bundle in Appendix 10.1.</p> <p>See Breeding Waders profile in Appendix 10.2 for detailed information.</p> <p>Scale: 1 km grid squares (limited to score >500)</p>
Barn Owl and Kestrel <i>Based on Birds Directive Art. 12 distribution data.</i>	BOwl&Kestrel	<p>Determines the distribution extent of Barn Owl and Kestrel. Can be applied to prioritise targeted action such as the Barn Owl/Kestrel Nest box etc.</p> <p>See Barn Owl and Kestrel Action Bundle in Appendix 10.1.</p> <p>See Barn Owl and Kestrel profiles in Appendix 10.2 for detailed information.</p> <p>Scale: 10 km grid squares (limited to <250 m elevation and excluding a 500 m buffer zone around major roads).</p>
Red Grouse <i>Includes:</i> <ul style="list-style-type: none"> - Natura 2000 sites with Red Grouse, - Birds Directive Art. 12 distribution data. 	RGrouse	<p>Provides an indication of the distribution extent of Red Grouse. Actions promoted in these areas could include specialist wildlife support, targeted grazing, etc.</p> <p>See Red Grouse Action Bundle in Appendix 10.1.</p> <p>See Red Grouse profile in Appendix 10.2 for detailed information.</p> <p>Scale: 10 km grid squares (limited to >250 m elevation).</p>
Raptors <i>Includes Hen Harrier, Peregrine, and Merlin.</i> <i>Based on Birds Directive Art. 12 distribution data.</i>	Raptors	<p>Determines the distribution extent of this group of bird species. Actions promoted in these areas could include wild bird cover on grassland habitat or specialist wildlife support on peatland habitat, etc.</p> <p>See Raptors Action Bundle in Appendix 10.1.</p> <p>See Hen Harrier, Peregrine, and Merlin profiles in Appendix 10.2 for detailed information.</p> <p>Scale: 10 km grid squares.</p>
Geese and Swans <i>Includes:</i> <ul style="list-style-type: none"> - Geese and Swans, - Barnacle and Brent Geese, - Whooper Swan. <p>Based on data from DAFM.</p>	Geese&Swans	<p>Provides an indication of the distribution extent of this group of waterfowl species. Actions promoted in these areas could include Geese and Swans.</p> <p>See Geese and Swans+ Action Bundle in Appendix 10.1.</p> <p>See Geese and Swans profile in Appendix 10.2 for detailed information.</p> <p>Scale: 1 km grid squares + unknown (appears to be high resolution)</p>
Chough <ul style="list-style-type: none"> - Natura 2000 sites with Chough qualifying interests. 	Chough	<p>Provides an indication of the extent of habitat suitable for Chough. Actions promoted in these areas could include specialist wildlife support, targeted grazing, etc.</p> <p>See Chough Action Bundle in Appendix 10.1.</p> <p>See Chough profile in Appendix 10.2 for detailed information.</p> <p>Scale: 1:5000.</p>
Archaeology <i>Zones of archaeological/ cultural heritage interest developed by project archaeologist. These can include sites post 1700 that are not included in</i>	Archeaology	<p>Determines zones of archaeological interest where archaeology actions can be prioritised.</p> <p>See Archaeology Action Bundle in Appendix 10.1.</p> <p>Scale: not defined, encompasses clusters of monument points.</p>

Second Iteration -foreseeable objectives that will emerge from scorecard assignment		
Woodland	---	<p>Not currently defined in this iteration- these will be identified once participant farms are mapped and determined in Iteration 2 of the LAP.</p> <p>See relevant Action Bundle in Appendix 10.1.</p> <p>See relevant profiles in Appendix 10.2 for detailed information.</p>
Marsh Fritillary	---	<p>Not currently defined in this iteration- fields suitable for Marsh Fritillary will be identified during field assessment; this objective will be determined in Iteration 3 of the LAP.</p> <p>Action Bundle (to be developed).</p> <p>See Marsh Fritillary profile in Appendix 10.2 for detailed information.</p>

3.2.3 Objectives Spatial Layer and Cartographic Representation

To enable the CP Teams to visualise the spatial extent of the objectives, a GIS objectives layer and CP division maps have been developed. Various datasets representing the objectives were merged into a new shapefile, resulting in unique spatial combinations of objectives for the Breifne, Munster South Connaught and Leinster CP areas. These unique combinations capture the complexity of overlapping layers, allowing CP stakeholders and Teams to determine the priority objective(s) at as broad scale, as necessary. It also facilitates an understanding of where multiple management issues may need to be addressed.

A key point in understanding the structure of the GIS layer is that the objectives have been built into a single layer the data therefore comprise a single (flat) layer. There are no superimposed or duplicated polygons. Every individual polygon reflects all the objectives within a given location of the CP area. Conceptually, those objectives may be considered to exist across the entirety of a given polygon. To shorten map legends, objectives are identified by an alias where appropriate, chosen to be suggestive of the objective that they represent (e.g., WaterQ = 'Water Quality'; LHBat = 'Lesser Horseshoe Bat'; SNGrass = Semi Natural Grassland, etc.). The objectives layer and maps should be interpreted with reference to the current list of objectives, their alias and relevance provided in table 4. The sequence of the objectives does not indicate any ranking of their importance.

A simplified example of the objectives combinations in the spatial layer is provided below. The figure can be interpreted as six individual polygons comprising different combinations of three objectives. These principles underlie the interpretation of the objective maps of each CP area division. Similarly, opening the objectives layer in a GIS and clicking a given point in the CP areas will reveal the objectives for that location. Combinations of objectives, where they occur, are represented in the layer attributes or the map legend as a string of aliases e.g., "WaterQ + LHBat + SNGrass", etc.

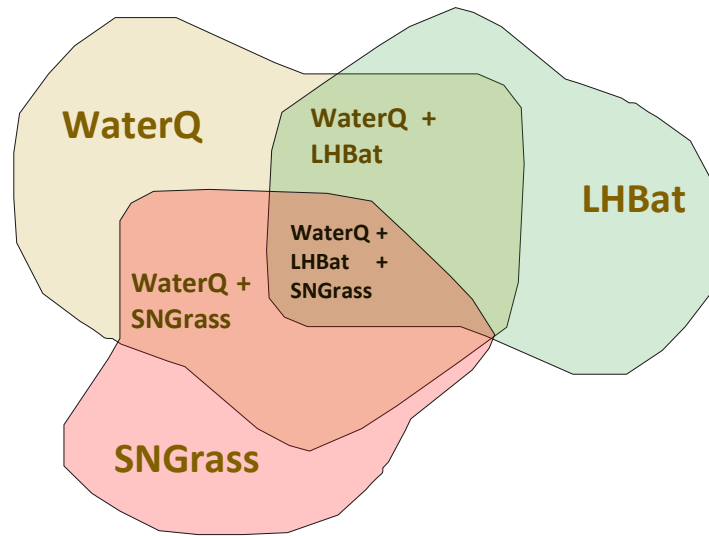


Figure 4: Example of the venn structure of the objectives layer.

3.3 Local Area Objectives

Cooperation Project areas were divided up to provide a more localised context to the objectives. The divisions provide the basis for local landscape characterisation and objective setting, while also supporting the CP teams for local planning and resource management. Table 5 provides a list and the method used to delineate each CP area division; Figure 5 illustrates the spatial extent of these.

Table 5: List of CP area divisions, including the method applied to delineate each area.

Cooperation Project	Division	Method
Munster South Connaught	1. Ballyhoura Mountains	Divisions delimited using existing contiguous areas; offshore islands grouped with nearest division.
	2. Comeragh Mountains	
	3. Galtee Mountains	
	4. Knockmealdown Mountains	
	5. Musheramore	
	6. Nagle's Mountains	
	7. Slieve Felims	
	8. Slieve Bearnagh	
	9. Slievecallan	
	10. Slieve Aughty (Clare)	Slieve Aughty divisions delimited along respective county boundaries.
	11. Slieve Aughty (Galway)	
	12. Sliabh Luachra/Mount Eagle	Sliabh Luachra/Mount Eagle and Stack's Mountains/West Limerick Hills were visually delimited.
	13. Stack's Mountains/West Limerick Hills	
Leinster	14. Slieve Blooms	Divisions delimited using existing contiguous areas; offshore islands grouped with nearest division.
	15. Dublin/Wicklow Mountains	
	16. Cooley Peninsula	
	17. Blackstairs	
Breifne	18. Sliabh Beagh	Division delimited using existing contiguous area.
	19. South Breifne	Delimited using Breifne Landscape Character Areas (GSI, 2004).
	20. Central Breifne	
	21. North-West Breifne	

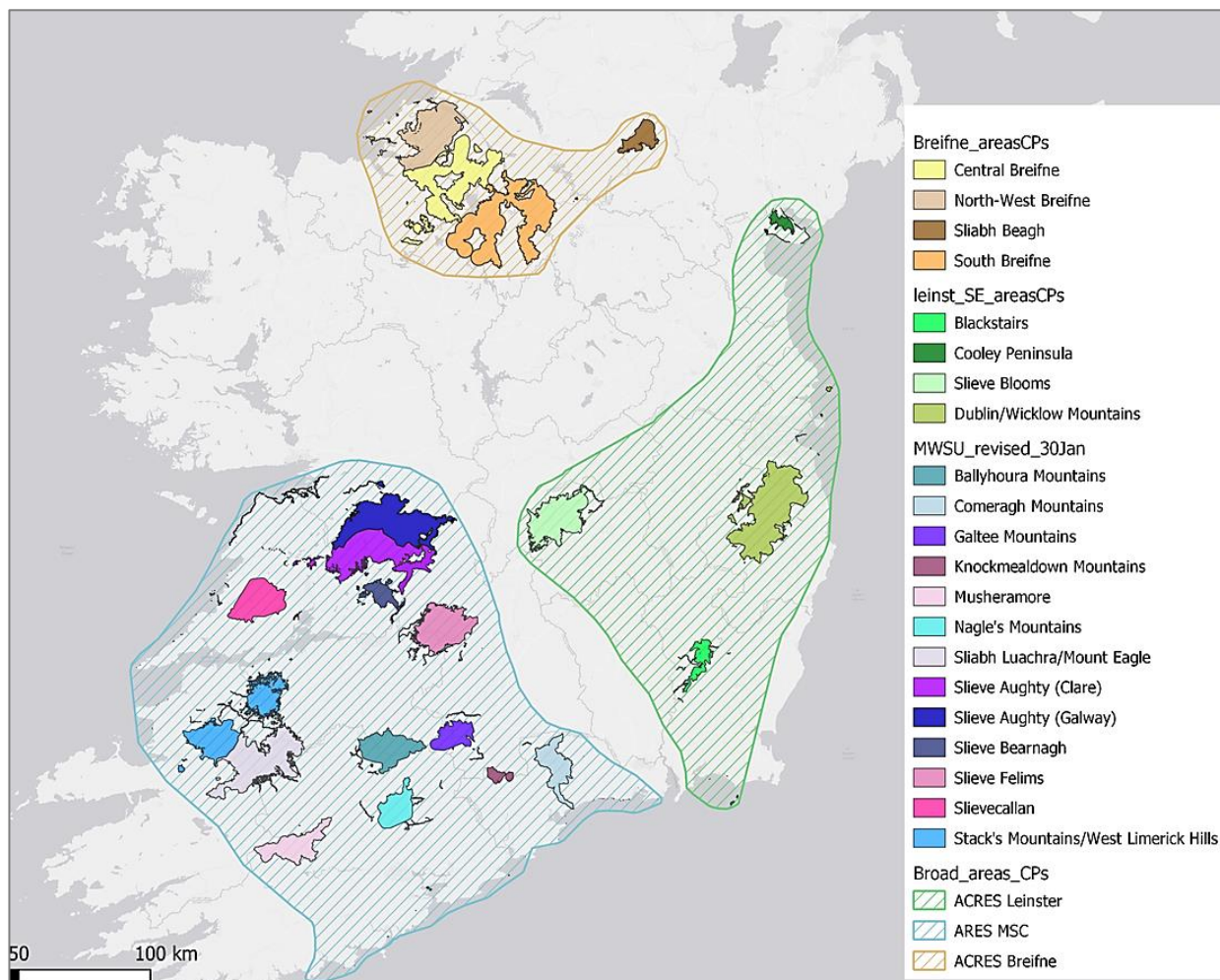


Figure 5: Map illustrating the various Hen Harrier Programme Cooperation Project areas and their respective divisions.

In the following sections, each CP division is described in terms of spatial extent, landscape character, topography, major rivers, lakes, and designations. For each division, the Objectives Layer was interrogated to generate a list of relevant objectives and their spatial extent illustrated in a map. Reference to Table 4 can be useful to determine the objective alias code(s) used in the map legends.

3.3.1 Munster South Connaught CP

A summary landscape context and list of high-level objectives for the 13 Munster South Connaught CP divisions is provided in the following pages of this document, including maps illustrating the spatial extent of their respective objectives and/or their overlap. The sequence of the objectives does not indicate any ranking of their importance.

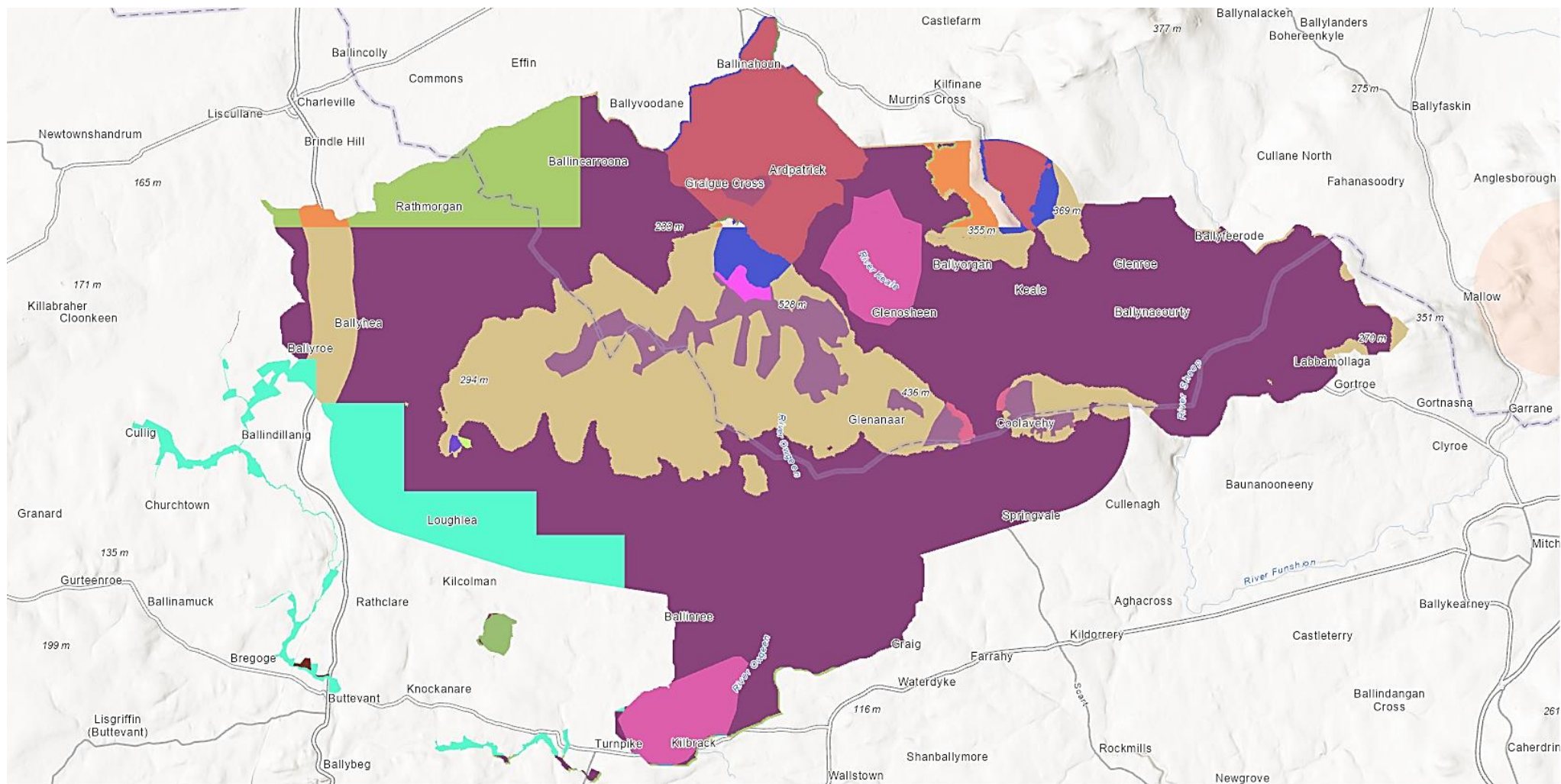
3.3.1.1 Ballyhoura Mountains Division

The Ballyhoura Mountains straddle the border between counties Limerick and Cork and are situated about 10 km south of Kilmallock. The portion of the site within Co. Cork side is largely afforested with commercial conifer plantations, while there are still extensive areas in Co. Limerick that remain as open heathland and blanket bog. The bedrock geology of the division consists of red sandstone & some conglomerate and Greywacke & dark green shale. The topography of the division can be described as mountain to hill. The division includes the summits of Seefin (528 m) and Carron Mountains (approx. 440 m) and descends to lower altitudes (270 m) at Glenosheen. Rivers situated within the division includes the Ogeen, Keale and Brogoge rivers.

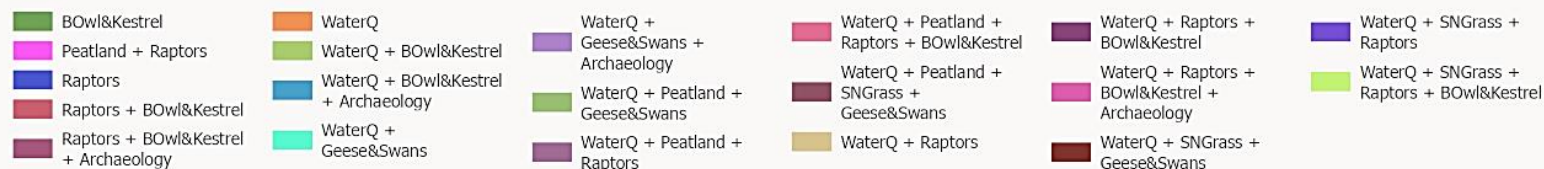
There are 295 archaeological sites recorded in the Sites and Monuments Record and over 60 structures listed by the National Inventory of Architectural Heritage, in addition to the more typical archaeological sites. Foremost among the archaeological sites is the ecclesiastical complex at Ardpatrick (1.2 km x 600 m), which is of national importance and contains an ecclesiastical enclosure, a church, a graveyard, a round tower, a holy well, a field system, a road/trackway, a settlement cluster and an enclosure.

The objectives for this division include:

- Water Quality
- Peatland
- Semi-natural Grassland
- Geese and Swans
- Raptors
- Barn Owl and Kestrel
- Archaeology



Munster South Connaught CP Objectives: Ballyhoura Mountains



0 5 10 20 Kilometers



3.3.1.2 Comeragh Mountains Division

The Comeragh Mountains are a glaciated mountain range situated in southeast Ireland in County Waterford.

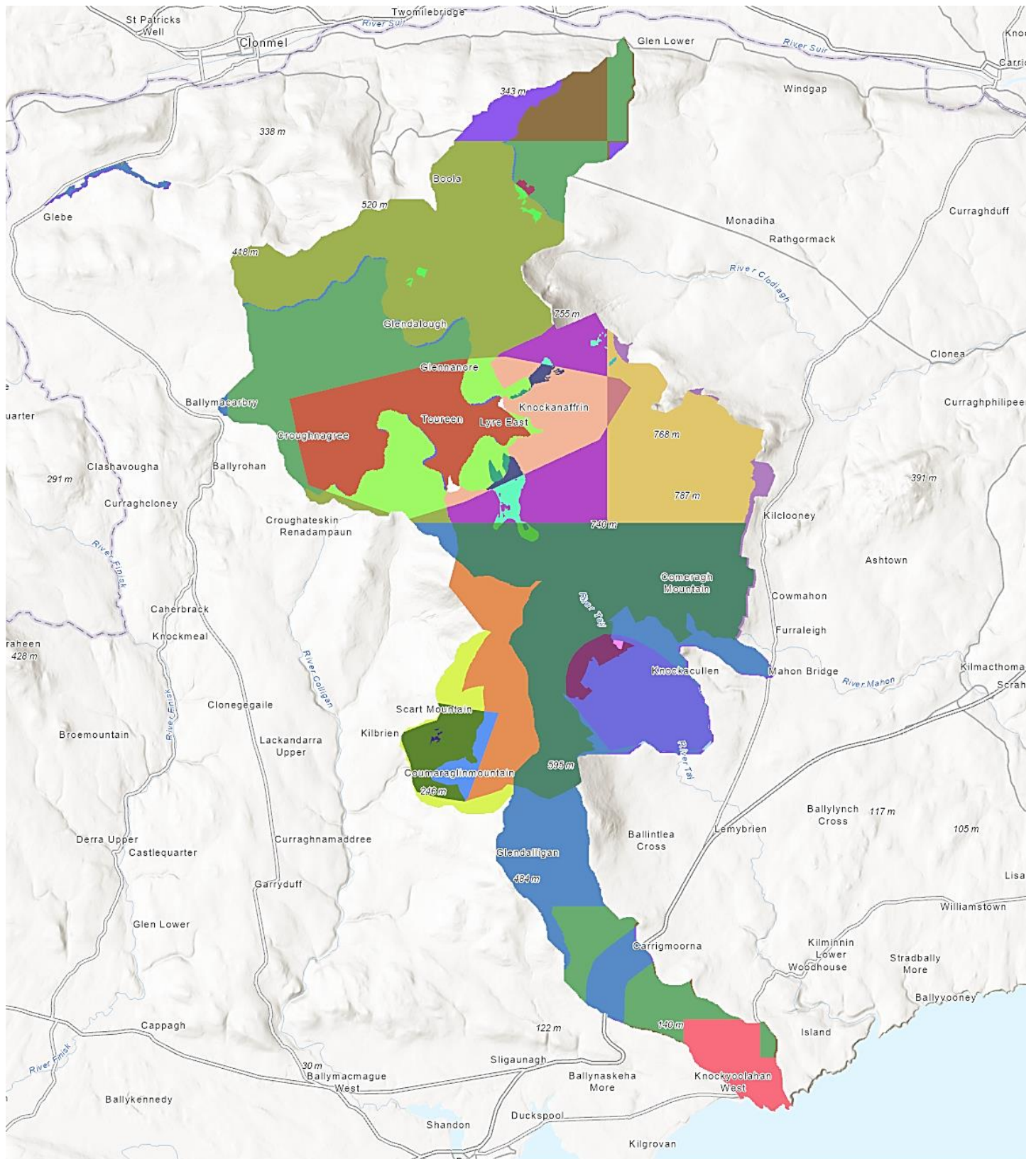
The mountains consist of a plateau of Old Red Sandstone with its edges deeply scarred by recent glaciation. Corries and deep valleys are cut into the eastern and western sides leaving a central ridge with a width reduced to 270 m at its narrowest point. The central plateau of the Comeragh Mountains is at an altitude of about 700 m and supports areas of blanket bog which is up to 2 m deep in places. Fauscoum, also known as Kilclooney Mountain is the highest mountain present at 792 m. The topography of the division can be described as mountain to hill. Coumshingaun Lough, which is located on the eastern slope, is an excellent example of an ultra-oligotrophic lake. Several other lakes/ loughs are present including Coumduala, Crottys, Coum Iarthar, Spilloge, Coumalocha and Coumfea loughs. The Dalligan, Owebeg and Mahon rivers are situated within the Comeragh Mountains division, which extends to include the Dalligan estuary and a small section of coastline.

There are approx. 320 recorded monuments present in the division, including a range of prehistoric sites, early medieval, high medieval sites, and post-medieval monuments, hut sites, booley huts and cairns. There are two significant concentrations of monuments evident, one on the southern side of the Nire Valley to the east of Ballymacarbery and one in Coumaraglin to the east of Kilbrien, with a third, lesser, concentration noted in the Tay Valley.

The Comeraghs division is part of the ACRES Leinster CP for contract management purposes. For operational purposes it is managed as part of the ACRES Munster South Connacht CP.

The objectives for this division include:

- Water Quality
- Peatland
- Semi-natural Grassland
- Geese and Swans
- Raptors
- Red Grouse
- Barn Owl and Kestrel
- Archaeology



Munster South Connaught CP Objectives: Comeragh Mountains

- | | | |
|------------------------------------|---|---|
| ■ BOW&Kestrel | ■ WaterQ + BOW&Kestrel | ■ WaterQ + Peatland + SNGrass + Raptors + RGrouse |
| ■ Geese&Swans | ■ WaterQ + Geese&Swans | ■ WaterQ + Peatland + SNGrass + Raptors + RGrouse + Archaeology |
| ■ Peatland + Raptors | ■ WaterQ + Peatland | ■ WaterQ + Raptors |
| ■ Peatland + Raptors + Archaeology | ■ WaterQ + Peatland + RGrouse | ■ WaterQ + Raptors + Archaeology |
| ■ Raptors | ■ WaterQ + Peatland + RGrouse + Archaeology | ■ WaterQ + Raptors + BOW&Kestrel |
| ■ Raptors + Archaeology | ■ WaterQ + Peatland + Raptors | ■ WaterQ + Raptors + BOW&Kestrel + Archaeology |
| ■ Raptors + BOW&Kestrel | ■ WaterQ + Peatland + Raptors + Archaeology | ■ WaterQ + Raptors + RGrouse |
| ■ Raptors + RGrouse | ■ WaterQ + Peatland + Raptors + RGrouse | ■ WaterQ + Raptors + RGrouse + Archaeology |
| ■ Raptors + RGrouse + Archaeology | ■ WaterQ + Peatland + Raptors + RGrouse + Archaeology | ■ WaterQ + SNGrass + Raptors |
| ■ SNGrass + Raptors + Archaeology | ■ WaterQ + Peatland + SNGrass + RGrouse | ■ WaterQ + SNGrass + Raptors + BOW&Kestrel |
| ■ WaterQ | ■ WaterQ + Peatland + SNGrass + Raptors | ■ WaterQ + SNGrass + Raptors + RGrouse |
| ■ WaterQ + Archaeology | ■ WaterQ + Peatland + SNGrass + Raptors + Archaeology | ■ WaterQ + SNGrass + Raptors + RGrouse + Archaeology |

0 4.5 9 18 Kilometers



3.3.1.3 *Galtee Mountains Division*

This division covers the Galtee Mountain range which extends for approx. 20 km across southeast Limerick and South Tipperary.

The Galtee Mountains are Ireland's highest range of inland mountains with the main ridge sitting mostly above 700 m, rising to 920 m at the peak of Galtymore. This ridge is derived from the folding of Old Red Sandstone and Silurian rock. The higher areas are mainly covered by poorly draining peat with areas of exposed bed rock found on peaks/the main ridge. The lower slopes consist of loam overlying sandstone till.

This area is predominately covered by Upland Heath. Significant areas of species rich grassland are found on steeper slopes towards the western extents of the mountain range. Blanket Bog is localised at the site and occurs generally on flatter areas at higher altitudes along the main ridge. The area is of high conservation value, and a large proportion falls within the Galtee Mountains SAC due to the presence of eight Annex I upland habitats. The site also supports a breeding population of Peregrine.

The upper reaches of the mountain range are noted as being under pressure from over-grazing by sheep and frequent burning. This is causing potentially serious damage to some areas of heath and grassland. Hill walking takes place at the site and may result in trampling damage in places. Erosion is severe on many ridges and cols where deep peat deposits (up to 2 m) have accumulated. In addition, the lower slopes and valleys around the main mountain range are threatened by afforestation.

The majority of the area lies with the Lower Suir (SAC) Catchment, with several of its tributaries flowing from the mountain range including the Aherlow and Shanbally rivers. A smaller area towards the southwest of the mountain range lies with the catchment of the River Blackwater (SAC). Alongside riparian areas to the north and south-east of the central area of this division the river Funshion (and several of its tributaries) flow downstream from the southwestern slopes of the mountain range into the River Blackwater.

There are 85 monuments recorded across the Galtee Mountains division. This includes twenty hut sites and one sheepfold which are indicators of early farming activity in this upland landscape. However, due to the dispersed nature of the sites recorded in the Galtees it is not possible to delimit any zones of particular interest.

The objectives for the Galtee Mountains include:

- Water Quality
- Peatland
- Semi-natural Grassland
- Raptors
- Red Grouse
- Barn Owl and Kestrel



3.3.1.4 *Knockmealdown Mountains Division*

The Knockmealdown division refers to the southern side of the mountain range which runs east-west along the Waterford-Tipperary border. The villages of Lismore and Cappoquin lie to the south in Co. Waterford.

The majority of the area lies above 200 m, rising to a maximum height of 792 m at the peak of Knockmealdown Mountain. There are several other significant peaks along the main ridge including Knockmoylan (768 m), Knocknafallia (668 m), Sugarloaf Hill (663 m), Knocknagnauv (655 m), Knockshanahullion (652 m) and Knocknalougha (630 m). The mountainous terrain is predominately underlain by sandstone, being flanked areas of limestone at lower elevations to the north and south. This area is predominately covered by blanket peat with some exposed rock at peaks. The lower slopes are comprised of deposits of loamy drift.

The northern side of the mountain range is drained by a series of small streams which flow into the river Tar. The river Tar is a tributary of the Lower Suir, which is designated as an SAC. The majority of the River Tar is contained within the boundaries of this designated site. The southern side of the mountain range lies within the catchment of the River Blackwater, which is designated as both an SAC and SPA. Several large watercourses rise along the southern slopes of this mountain range including the rivers Owennashad and Araglin which are tributaries of the River Blackwater. In addition to its Natura designations, the River Blackwater is also afforded protection as a Margaritifera sensitive catchment (for the protection of a population listed in the Statutory Instrument 296 of 2009).

While there are no natura designations within the Knockmealdown mountain range, several Annex I habitats are present including Wet heath [4110], Dry heath [4030], Siliceous Scree [8110] and Alpine/Boreal heath [4060]. The area is also of ornithological interest with several species of conservation concern being recorded including; Hen harrier, Kestrel, Barn Owl and Yellowhammer.

There are few monuments and no significant clusters within this division. However, a significant linear monument 'Rian Bo Phadraig' runs south of the Waterford-Tipperary border for approx. 4 km through the area CP area.

The objectives for the Knockmealdown Mountains include:

- Water Quality
- Semi-natural Grassland
- Raptors
- Red Grouse
- Barn Owl and Kestrel
- Archaeology

3.3.1.5 *Musheramore Division*

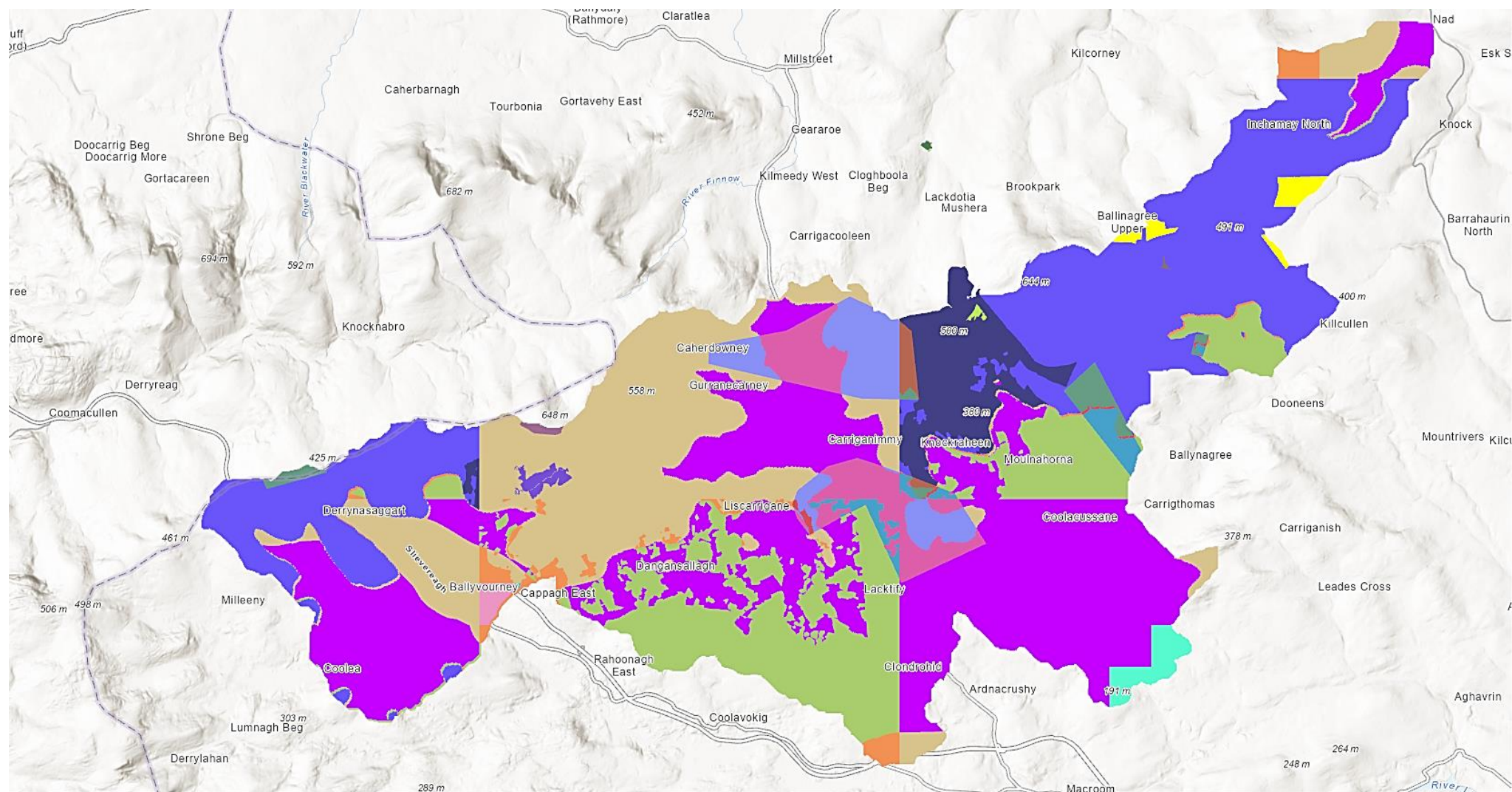
The Musheramore division contains the Mullaghanish to Musheramore Mountains SPA, Mullaghanish Bog SAC and St Gobnets Wood SAC. It comprises of a substantial part of the Boggeragh/Derrynasaggart Mountains in Co. Cork. Most of the Mullaghanish to Musheramore Mountains SPA is over 200 m in altitude, rising to heights of 475 m in the eastern sector (Musherabeg) and 462 m in the western sector (Knockullane). Mullaghanish mountain is the highest point at 649 m. The topography of the subunit can be described as mountain to hill. The site is underlain by Old Red Sandstone. The Foherish, Cusloura, Bohill and Awboy are rivers situated within the subunit.

Hen Harrier are an important breeding species in this division.

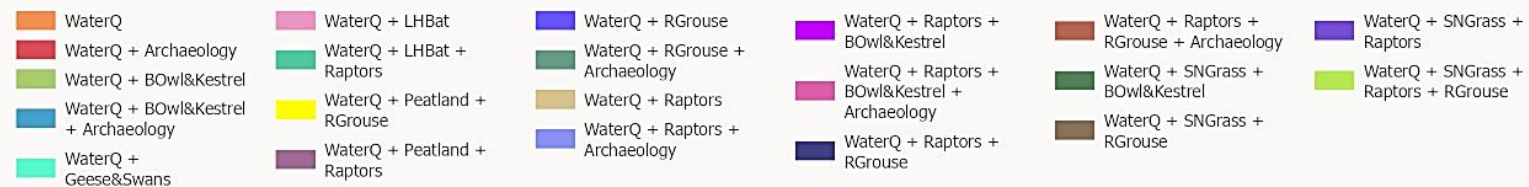
The archaeology of the area is quite interesting, which the late Neolithic and the Bronze Age strongly represented in certain areas and with ringforts common in the better lands to the south between Ballymakeery and Clondrohid.

The objectives for this division include:

- Water Quality
- Peatland
- Semi-natural Grassland
- Lesser Horseshoe Bat
- Geese and Swans
- Raptors (Hen Harrier)
- Red Grouse
- Barn Owl and Kestrel
- Archaeology



Munster South Connaught CP Objectives: Musheramore



0 5 10 20 Kilometers



3.3.1.6 *Nagle's Mountains Division*

This division of ACRES MSC is focused on the Nagle's Mountains in North Cork, between the villages of Ballyhooly and Killavullen to the north and Glenville to the south. The area is a varied landscape with lowlands along river valleys and forested uplands largely above 200 m, rising to a maximum height of 427 m at the peak of Knocknaskagh.

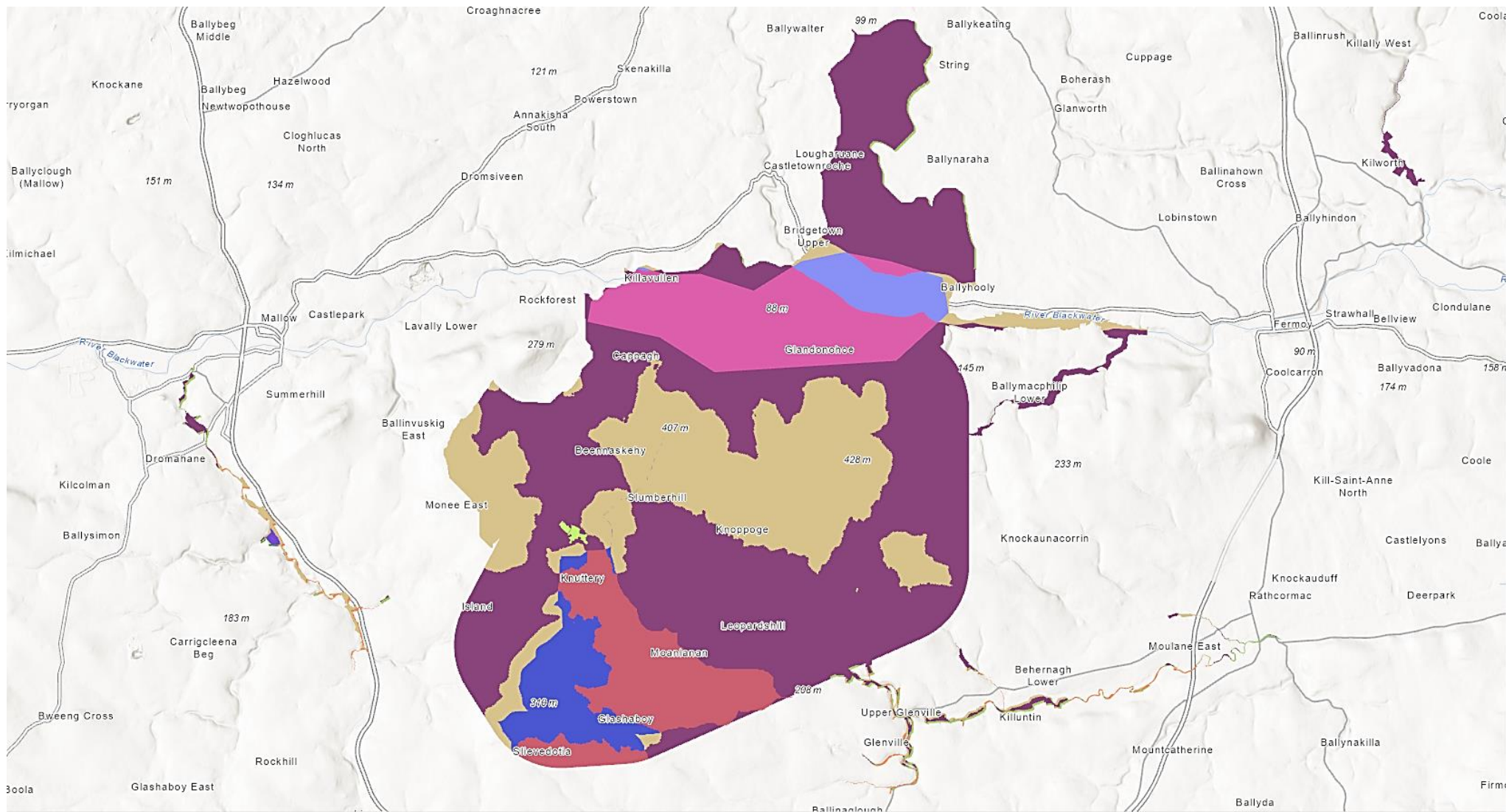
The area is underlain by sandstone but lies just south of a significant limestone formation around the Mallow/Casteltownroche area. The soils of the area are mainly comprised of loamy drift with an area of poorly draining blanket peat present at higher elevations on Seefin and Knocknasagh. There is a significant area of Annex I Dry heath [4030] and Alpine/Boreal Heath [4060] present along this tract of peat. Wet heath has also developed at the southwestern foot of Seefin, in the townland of Lyravarrig.

This division lies entirely within the catchment of the River Blackwater. The northern end of this division is also intersected by the Blackwater. There are no other designated sites present within this division. However, the area is further intersected by the River Blackwater SAC where it extends upstream along the course of the rivers Ross (Killavullen), Bunnaglanna, Bride and Inchinanagh. A number of other significant watercourses also rise within the area including the rivers Lackendarragh and Monaparson.

The archaeology of this division is varied with many castles and estates. However, there is one priority zone between Killavullen and Ballyhooly which contains: 14 ringforts, 15 enclosures, four souterrains, four castles, five churches, an Augustinian priory, five graveyards, a country house, an icehouse, three lithic scatters, 15 fulachta fiadh, a barrow, and ten other recorded monuments. This zone also contains 24 structures listed by the National Inventory of Architectural Heritage (NIAH), several of which are also listed in the SMR.

The objectives for the Nagle's Mountains division include:

- Water Quality
- Semi-natural Grassland
- Raptors
- Barn Owl and Kestrel
- Archaeology



Munster South Connaught CP Objectives: Nagles Mountains



3.3.1.7 *Slieve Felims Division*

The Slieve Felims division is an extensive upland area spread across north Limerick/Tipperary. Most of the site is elevated above 200 m, rising to a maximum height of 694 m at the peak of Keeper Hill which is located approximately five km south of Silvermines, Co. Tipperary. There are a number of other peaks throughout the range including Slieve Felim, Knockstanna, Knockappul, Mother Mountain, Knockteige, Cooneen Hill and Silvermine Mountain. The area is primarily underlain by Sandstone of the Silurian age. This is covered by poorly draining peat with some loamy drift in lower areas. There is a high proportion of forestry throughout, with approximately half the area being covered by first and second rotation plantations. Roughly one-quarter of the area consists of unplanted Blanket Bog, Wet Heath and Dry Heath. The remainder is comprised of rough grassland utilised for hill farming, with pockets of deciduous woodland dispersed throughout, especially along river valleys.

The majority of the site lies within the Lower Shannon catchment, with a small section along the eastern fringe draining into the catchment of the River Suir. The area draining into the River Suir also overlaps with two Margaritifera sensitive catchments (of an extant population); the Suir-Multeen and Suir-Clodaigh catchments. Several major watercourses rise within this area including the rivers Mulkear, Bilboa, Newport (Tipperary) and Clare. There are five Special Areas of Conservation within this sub-division, four of which have been designated for the presence of Annex I peatland or grassland habitats; Silvermines Mountains West SAC, Silvermine Mountains SAC, Keeper Hill SAC and Bolingbrook Hill SAC. The Lower River Shannon SAC also extends upstream along the Newport River and several of its tributaries within this sub-division. This SAC has been designated for 21 different qualifying interests including freshwater, coastal and marine species/habitats.

The area is of ornithological importance for breeding Hen Harrier and has been designated as a Special Protection Area for the species. The site is also a traditional breeding site for Peregrine and Merlin has been recorded within the area (though further work is needed to determine its status). Red Grouse can also be found on some of the remaining areas of unplanted bog and heath.

The archaeology of the Slieve Felims can be focused on two distinct areas. These include a loose cluster of Megalithic tombs on the south-eastern fringe of the Slieve Felims including 16 megalithic tombs / structures, three standing stones, two stone circles, one stone row, one cist, one boulder-burial, one ring barrow, and 15 other recorded monuments. Also a cluster of Bronze age monumnets towards the North-eastern fringe of the Slieve Felims includes three megalithic tombs / structures, five standing stones, one pair of standing stones, one stone row, 15 barrows, two cists, two fulachta fiadh, a kerb circle, a cairn, an enclosure and a hut site.

The objectives for the Slieve Felims include:

- Water Quality
- Peatland
- Semi-natural Grassland
- Raptors (Hen Harrier)
- Red Grouse
- Barn Owl and Kestrel
- Archaeology

3.3.1.8 *Slieve Bearnagh Division*

The Slieve Bearnagh division encompasses the Slieve Bearnagh mountain range situated to the west of Lough Derg/Killaloe including Moylusa (the highest peak in Co. Clare at 532 m), Cragnamurragh (526 m) and the surrounding peatland dominated regions.

The area is largely underlain by sandstone and siltstone to the north/west with the south/east of the area being underlain by a mixture of Mudstone/greywacke (impure sandstone). This is mainly covered by blanket peat transitioning into deposits of loam at lower elevations.

The summit plateau in Slieve Bearnagh is dominated by mountain blanket bog of varying peat depth and condition. At the western part of the region, the terrain is undulating with some areas of shallow and eroded peat. Further east the terrain is flatter, the peat depth much greater (> 4 m) and the surface wetter. Blanket bog also occurs on the low-lying flanks of the mountain range, in the townlands of Ballybroghan and Ballydonaghan. Wet heath vegetation has developed on the slopes beneath the mountain summits and in mosaic with blanket bog on the shallower peat soils, especially on the northern slopes of Cragnamurragh. On the drier, south facing slopes a dry heath community occurs in mosaic with upland grassland.

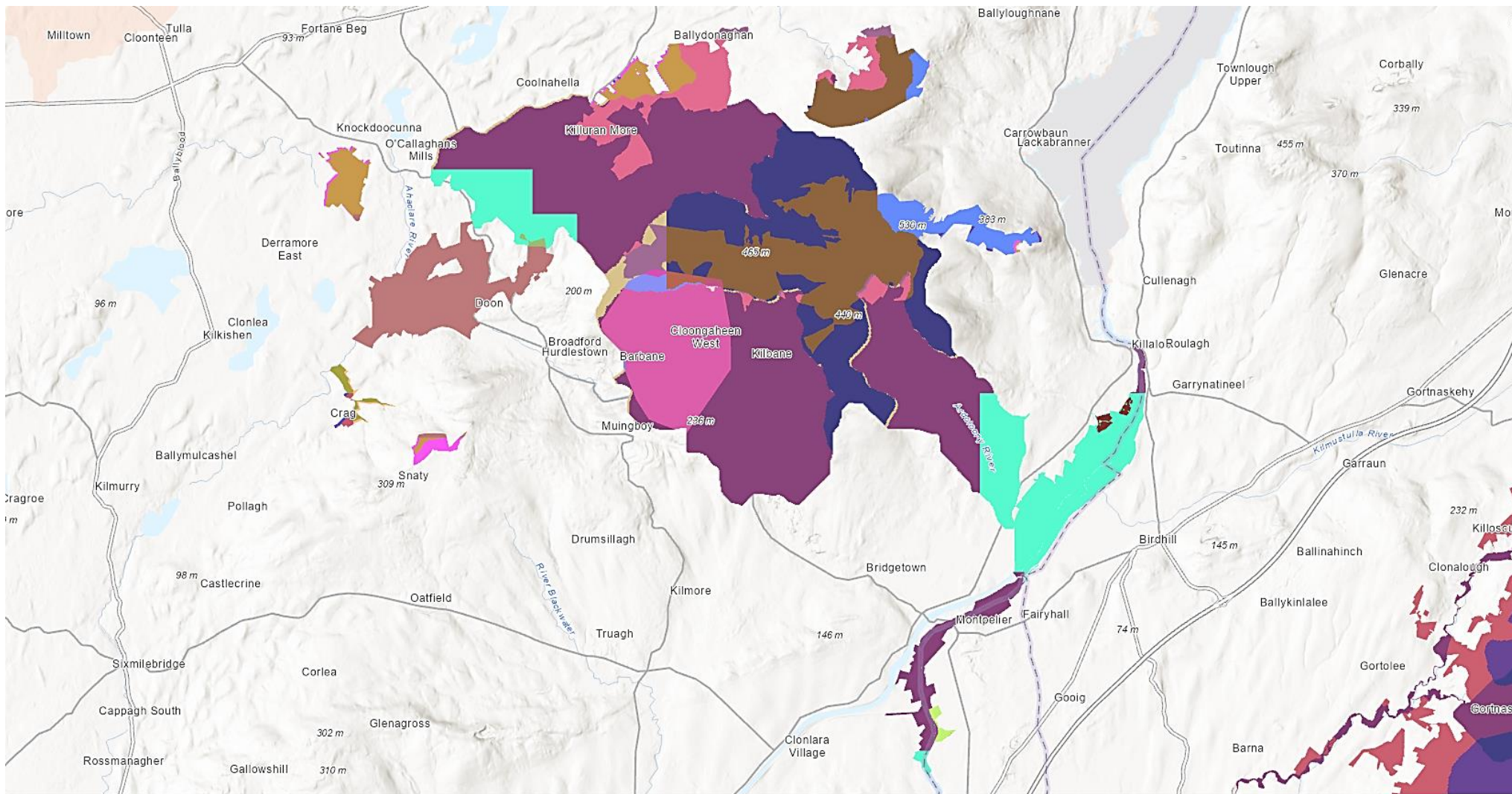
This division largely overlaps with the Slieve Bearnagh Bog SAC, which is of considerable conservation importance as it contains one of the last remaining areas of intact open moorland habitat in this part of Ireland. Several species of birds typical of open moorland have been recorded from this site. These include Skylark, Meadow Pipit, Red Grouse, Wheatear, Raven and Hen Harrier. The latter are known to occur within the Slieve Bearnagh to Keeper Hill region and use the SAC for foraging habitat. The presence of Irish hare has also been noted on the site.

The western side of the division drains into the Shannon estuary whilst the eastern side drains into the Lower Shannon and Lough Derg. Several important watercourses rise within the division including the rivers Owenogarney and Broadford. An area to the north of this sub-division lies within a Margaritifera sensitive catchment; the Shannon – Graney/Scariff. Lough Derg also lies to the immediate east of the Slieve Bearnagh division.

In terms of Archaeology, there are several megalithic monuments throughout the area, including one loose cluster towards Broadford. This cluster contains 16 megalithic tombs / structures, three standing stones, two stone circles, one stone row, one cist, one boulder-burial, one ring barrow, and 15 other recorded monuments.

The objectives for the Slieve Bearnagh division include:

- | | | |
|--------------------------|------------------------|------------------------|
| ▪ Water Quality | ▪ Lesser Horseshoe Bat | ▪ Red Grouse |
| ▪ Peatland | ▪ Geese and Swans | ▪ Barn Owl and Kestrel |
| ▪ Semi-natural grassland | ▪ Raptors | ▪ Archaeology |



Munster South Connaught CP Objectives: Slieve Bearnagh



0 5 10 20 Kilometers

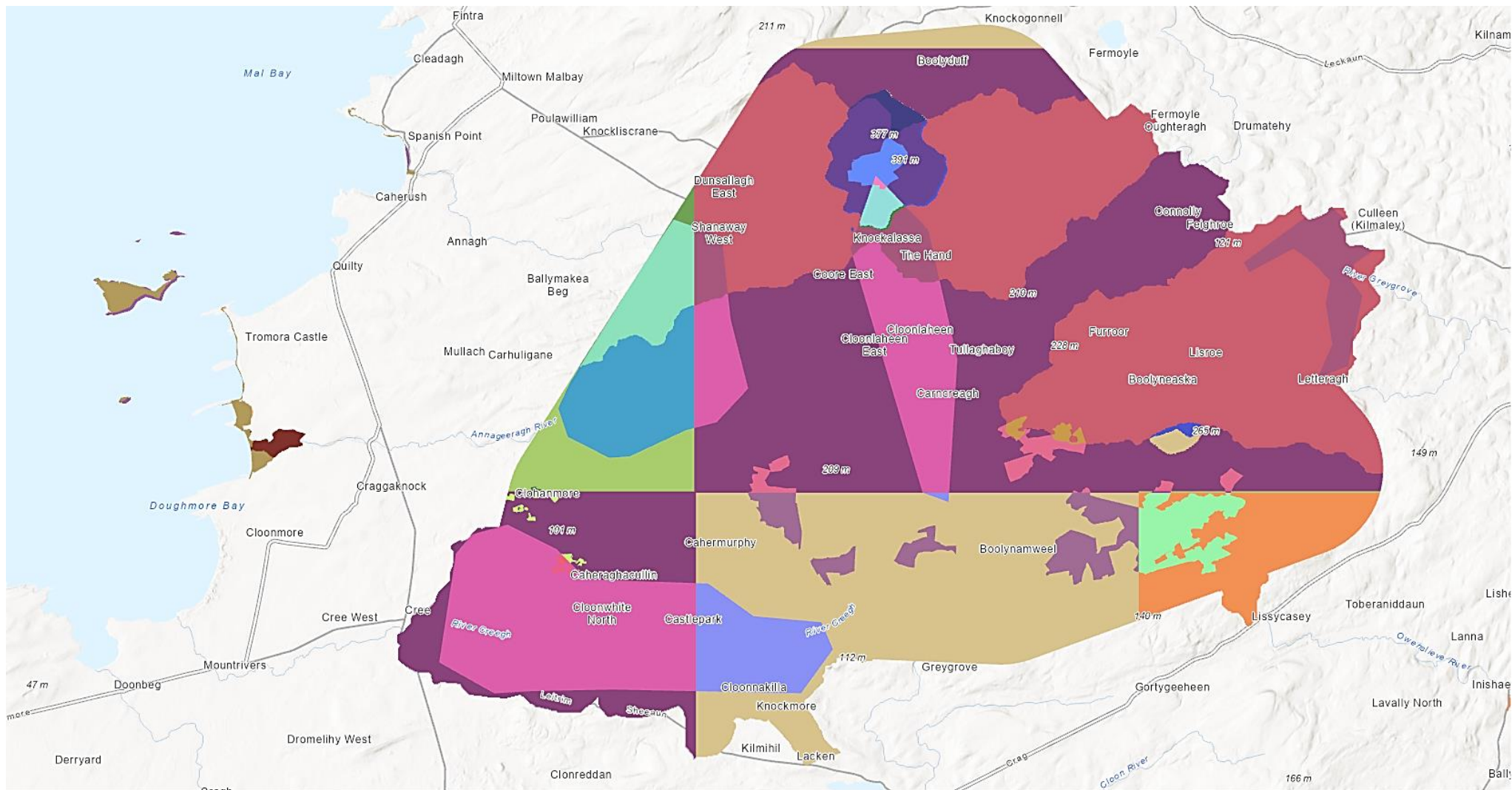


3.3.1.9 *Slievecallan Division*

Slievecallan or Slieve Callan (Irish: Sliabh Calláin), also historically called 'Mount Callan', is a mountain with a height of 391 m in west County Clare which lends its name to the division. The division also encompasses regions of the Mid-Clare Coast SPA and River Shannon and River Fergus Estuaries SPA. Slievecallan has a wet oceanic climate with an average annual rainfall of 2,000 mm and high average wind speeds. This is due to the proximity of the ocean (just eight kilometres away) and its prominence in the landscape. A wind farm development is present within the subunit consisting of 29 turbines with 11 in the "Slievecallan East" and 18 in the "Slievecallan West" developments. The topography for a majority of the Slievecallan subunit can be described as mountain to hill. The bedrock geology of the subunit is sandstone and shale. Mutton Island of the coast of Co. Clare resides within the Mid-Clare Coast SPA. There are several loughs within the subunit including Doolough, Nacrag, Acrow and Naminna. Rivers within the subunit includes Annageeragh, Annagh and Caheraran.

The archaeology of the Slievecallan area is not particularly renowned, but ringforts and megalithic tombs are the two most common monument types. The objectives for the Slievecallan division include:

- Water Quality
- Peatland
- Semi-natural Grassland
- Geese and Swans
- Raptors
- Red Grouse
- Barn Owl and Kestrel
- Archaeology



Munster South Connaught CP Objectives: Slievecallan



0 5 10 20 Kilometers



3.3.1.10 *Slieve Aughties (Clare) Division*

This division refers to the southern extent of the Slieve Aughty mountain range in Co. Clare. This area extends from the Clare-Galway border in the north, to the villages of Mountshannon, Scariff, Tulla and Crusheen in the south.

The mountain range is not notably high or pronounced, rising gradually to a high point of 400 m at the summit of Maghera approx. 4 km west of Caher, Co. Clare. This undulating landscape is primarily underlain by Red Sandstone with occasional outcrops of Palaeozoic rock found on hill tops. The majority of the area is covered by poorly draining peat which supports a range of upland habitats including Blanket Bog, Wet Heath and Dry Heath. Roughly half of the area is afforested with first and second rotation conifer plantations. The remainder of the site is comprised of rough grassland.

The area drains towards Lough Derg to the South/East, Galway Bay to the north/northwest and the Shannon Estuary to the southwest. The Slieve Aughty mountain range is also the source of several important watercourses within the region including the rivers Owendalulleagh, Graney and Kilchreest. There are also many small and medium sized lakes dispersed throughout the area which are of angling interest, the most notable being Lough Graney and Lough Atorick.

The sub-division largely overlaps with the Slieve Aughty Mountains SPA which has been designated for the protection of Hen Harrier and Merlin. The SPA also supports a breeding population of Merlin and Curlew, Red Grouse, Golden Plover and Snipe still nest on some of the unforested areas of bog and heath.

The archaeology of the Slieve Aughty (Clare) area is not particularly well known but can be focused on two features;

- Several isolated megalithic tombs and four clusters namely the Kiltannon Group, Killanena Group, Ballycroum Group and the Cappaghbaun Group.
- The island of Inishcealtra on Lough Derg which is one of the most important medieval ecclesiastical sites on the River Shannon and contains almost 200 recorded monuments.

The objectives for the Slieve Aughties (Clare) division include:

- Water Quality
- Peatland
- Semi-natural Grassland
- Lesser Horseshoe Bat
- Geese and Swans
- Raptors
- Red Grouse
- Barn Owl and Kestrel
- Archaeology



3.3.1.11 *Slieve Aughties (Galway) Division*

This division refers to the northern extent of the Slieve Aughty mountain range in Co. Galway. This area extends from the Clare-Galway border in the south, to the southern outskirts of Loughrea in the north.

The mountain range is not notably high or pronounced, rising gradually to a high point of 400 m at the summit of Maghera approx. 4 km west of Caher, Co. Clare. This undulating landscape is primarily underlain by Red Sandstone with occasional outcrops of Palaeozoic rock found on hill tops. The majority of the area is covered by poorly draining peat which supports a range of upland habitats including Blanket Bog, Wet heath and Dry heath. However, roughly half of the area is afforested with first and second rotation conifer plantations. The remainder of the site is comprised of rough grassland which is utilised in extensive hill farming systems.

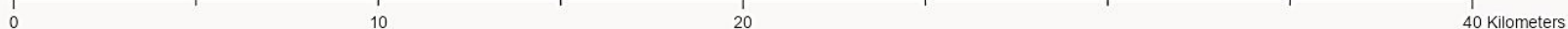
The area drains towards Lough Derg to the South/East, Galway Bay to the north/northwest and the Shannon Estuary to the southwest. The Slieve Aughties range are also the source of several important watercourses within the region including the rivers Owendalulleagh, Graney and Kilchreest. There are many small and medium sized lakes dispersed throughout the area, a few of which are of angling interest, the most notable being Lough Graney and Lough Atorick.

The division largely overlaps with the Slieve Aughty Mountains SPA which has been designated for the protection of Hen Harrier and Merlin. Curlew, Golden Plover Red Grouse are found on many of the unplanted peatland areas.

The archaeology of the Slieve Aughty (Galway) area can be focused on two distinct features; a range of monuments from the neolithic to the early modern period clustered together in the Marble Hill/Ballynakill Area and the 'Ultach' settlement between Woodford and Lough Atorick.

The objectives for the Slieve Aughties (Galway) division include:

- Water quality
- Peatland
- Semi-natural Grassland
- Lesser Horseshoe Bat
- Geese and Swans
- Raptors
- Red Grouse
- Barn Owl and Kestrel
- Archaeology



3.3.1.12 *Sliabh Luachra/Mount Eagle Division*

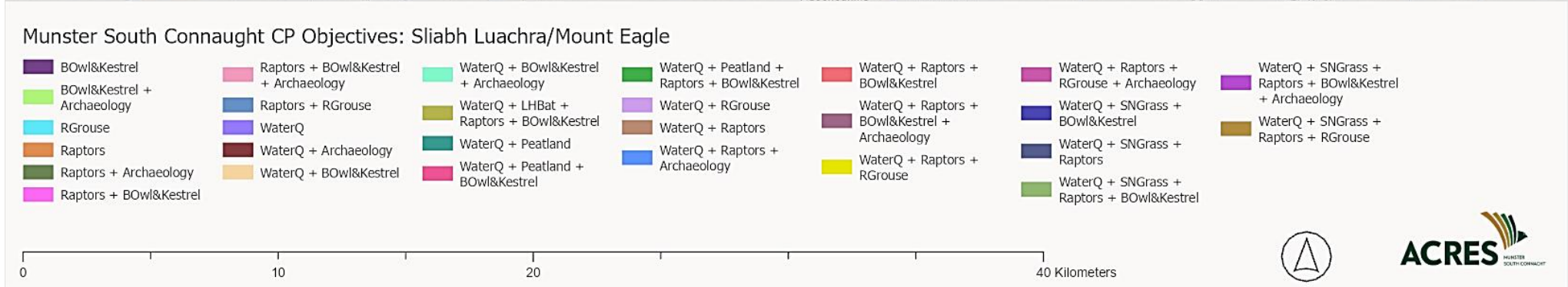
Sliabh Luachra is an upland region in Munster, Ireland. It is on the borders of counties Cork, Kerry and Limerick and bounded to the south by the River Blackwater. It includes the Mullaghareirk Mountains and Mount Eagle SPA's and Blackwater and Lower River Shannon SAC. The mountain peaks included in the site are not notably high or indeed pronounced, the highest being at Knockfeha (451 m) with another notable peak being Mount Eagle. The topography of the subunit can be described as mountain to hill. The bedrock geology of the subunit consists predominantly of Glenoween Shale Formation and Feale Sandstone Formation. Many rivers rise within the site, notably the Blackwater, Owenkeala, Glenlara, Feale, Dalua, Owentaraglin, Brown Flesk River and Shanowen.

A large part of the division is designated as an SPA for breeding Hen Harrier. The area is among the most important breeding area for the species in Ireland.

In relation to archaeology there are numerous fulachta fiadh found in the Slieve Luachra / Mount Eagle CP area. Our knowledge of these is largely due to intensive survey work undertaken in County Cork in the late 1980s. Several important clusters are evident, and early medieval sites are also common in the southwest of the area.

The objectives for the Sliabh Luachra/Mount Eagle division include:

- Water quality
- Peatland
- Semi-natural Grassland
- Lesser Horseshoe Bat
- Red Grouse
- Raptors
- Barn Owl and Kestrel
- Archaeology



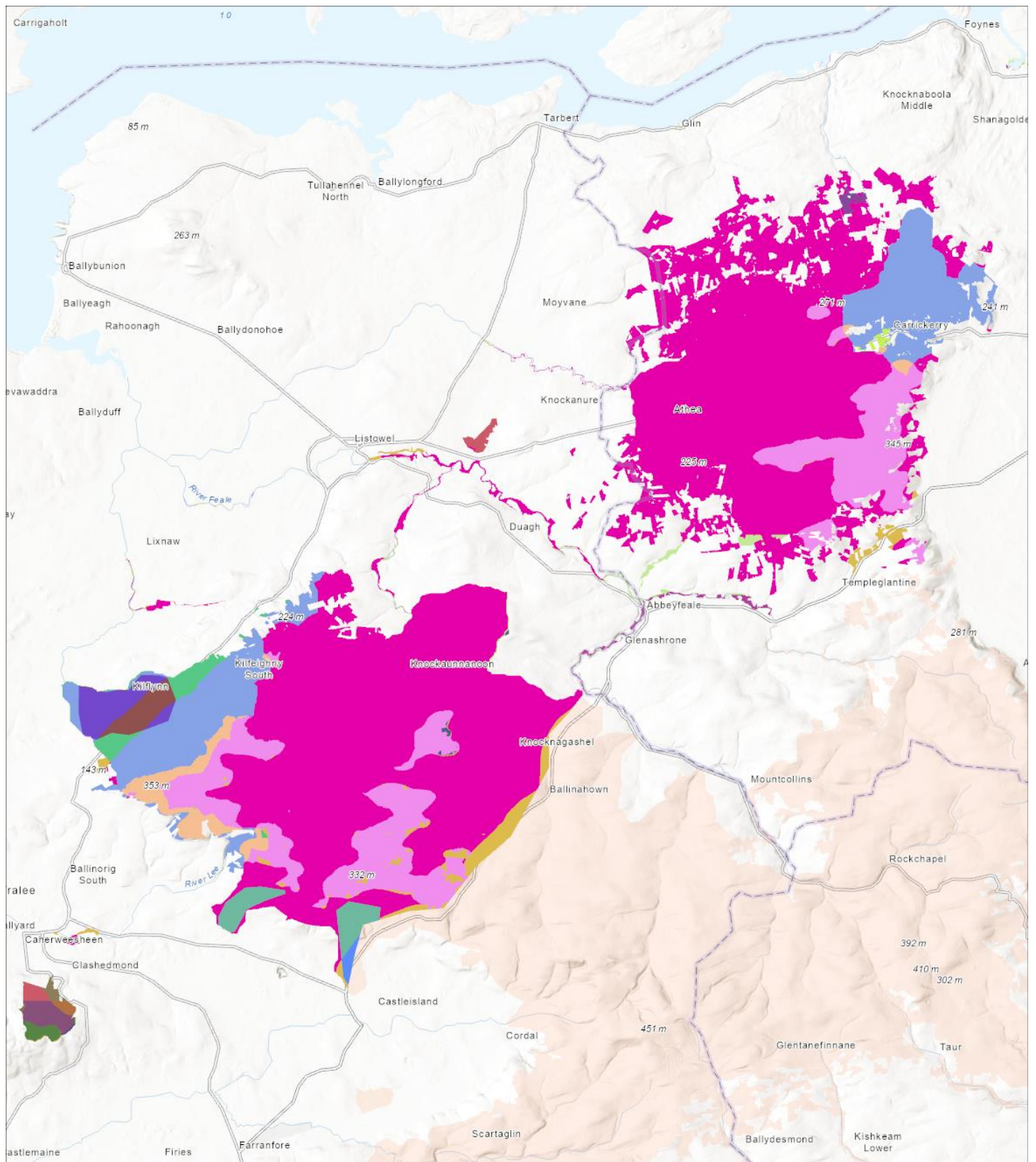
3.3.1.13 Stack's Mountains/West Limerick Hills Division

The Stack's Mountains are a mountain range about seven kilometres northeast of Tralee, along the N69 road in County Kerry, the West Limerick Hills are six kilometres to the west/northwest of Newcastle West Co. Limerick. The highest peak in the Stacks Mountain range is Crusline, which is 355 m high. Nearby summits include Ballincollig Hill, Beennageeha Mountain and Stack's Mountain. The highest peak in the West Limerick Hills is Knockanimpha which is 343 m high. The whole subunits topography can be described as mountain to hill. The bedrock geology of the subunit consists of Sandstone and Shale. Much of the division is included in the Lower River Shannon SAC. This includes the rivers Smearla and Glena in the Stacks Mountains and the Oolagh and Galey rivers in the West Limerick Hills. The river Feale flows between the two main blocks in this division with significant areas of riparian habitats along its course also included in the CP area.

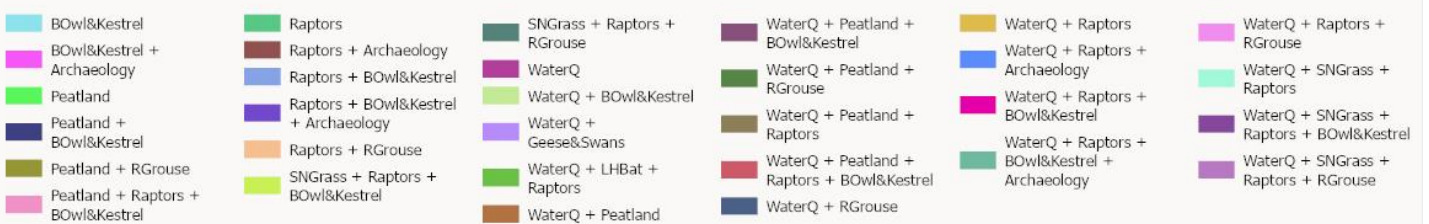
Several clusters of archaeological monuments can be found in the improved pasturelands on the fringes of the Stack's Mountains CP zone, with none of note being found in the West Limerick Hills.

The objectives for the Stack's Mountains/West Limerick Hills division include:

- Water quality
- Peatland
- Semi-natural Grassland
- Lesser Horseshoe Bat
- Geese and Swans
- Raptors
- Red Grouse
- Barn Owl and Kestrel
- Archaeology



Munster South Connaught CP Objectives: 'Stack's Mountains/West Limerick Hills'



0 5 10 20 Kilometers



3.3.2 Leinster CP

A summary landscape context and list of high-level objectives for the four Leinster CP divisions is provided in the following pages of this document, including maps illustrating the spatial extent of their respective objectives and/or their overlap. The sequence of the objectives does not indicate any ranking of their importance.

3.3.2.1 *Slieve Blooms Division*

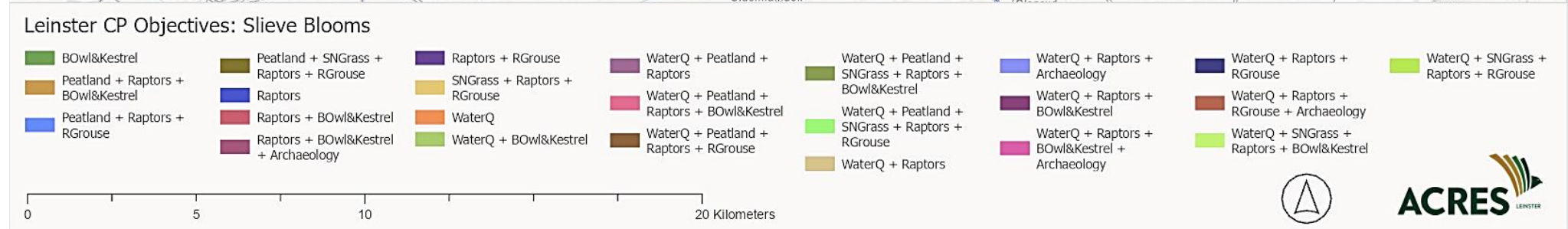
The Slieve Blooms division of ACRES Leinster is located on the border between Counties Laois & Offaly. While small areas of woodland and pasture exist within the area, it is a predominately mountainous area. Much of the site is over 200 m in altitude, rising to a high point of 527 m at the summit of Arderin and dominated by old red sandstone, flanked by Silurian rocks. The uplands largely consist of poorly drained peat soil, and the area is the source of many important watercourses including the rivers Barrow, Delour, and Silver.

The division contains over 180 archaeological monuments and 29 structures listed under the National Inventory of Architectural Heritage; there are significant concentrations of monuments at Srahanboy & Letter/Coolcreen.

The Slieve Blooms division is included for contract management purposes in ACRES Munster South Connacht. For operational purposes it is managed as part of ACRES Leinster.

The objectives for the Slieve Blooms division include:

- Water quality
- Peatland
- Semi-natural Grassland
- Raptors
- Red Grouse
- Barn Owl and Kestrel
- Archaeology



3.3.2.2 *Dublin/Wicklow Mountains Division*

The Dublin/Wicklow Mountains division of ACRES Leinster is a complex of upland mountainous areas in Counties Wicklow and Dublin, however small coastal areas and islands in Dublin are also included. Most of the sub-division includes the Wicklow Mountains National Park and is largely over 300 m in altitude, rising to a high point of 925 m at the summit of Lugnaquilla. The uplands comprise of a core of granites flanked by Ordovician schists, mudstones and volcanics. Glacial erosion has created the dominant topographical features, including high corrie lakes and deep valleys and glens.

Much of the area is covered by poorly draining peat, while poor mineral soil covers the slopes and rocky outcrops are frequent. Woodland habitats are also present to a lesser extent, mainly along watercourses in valleys and glens, some of which are within designated Nature Reserves, such as Knocksink Wood, Glenealo Valley, and Glendalough. Several important watercourses rise in the Wicklow mountains, including the Dargle, Liffey, Dodder, Slaney and Avonmore, and numerous waterbodies such as mountain loughs and corrie lakes are also present.

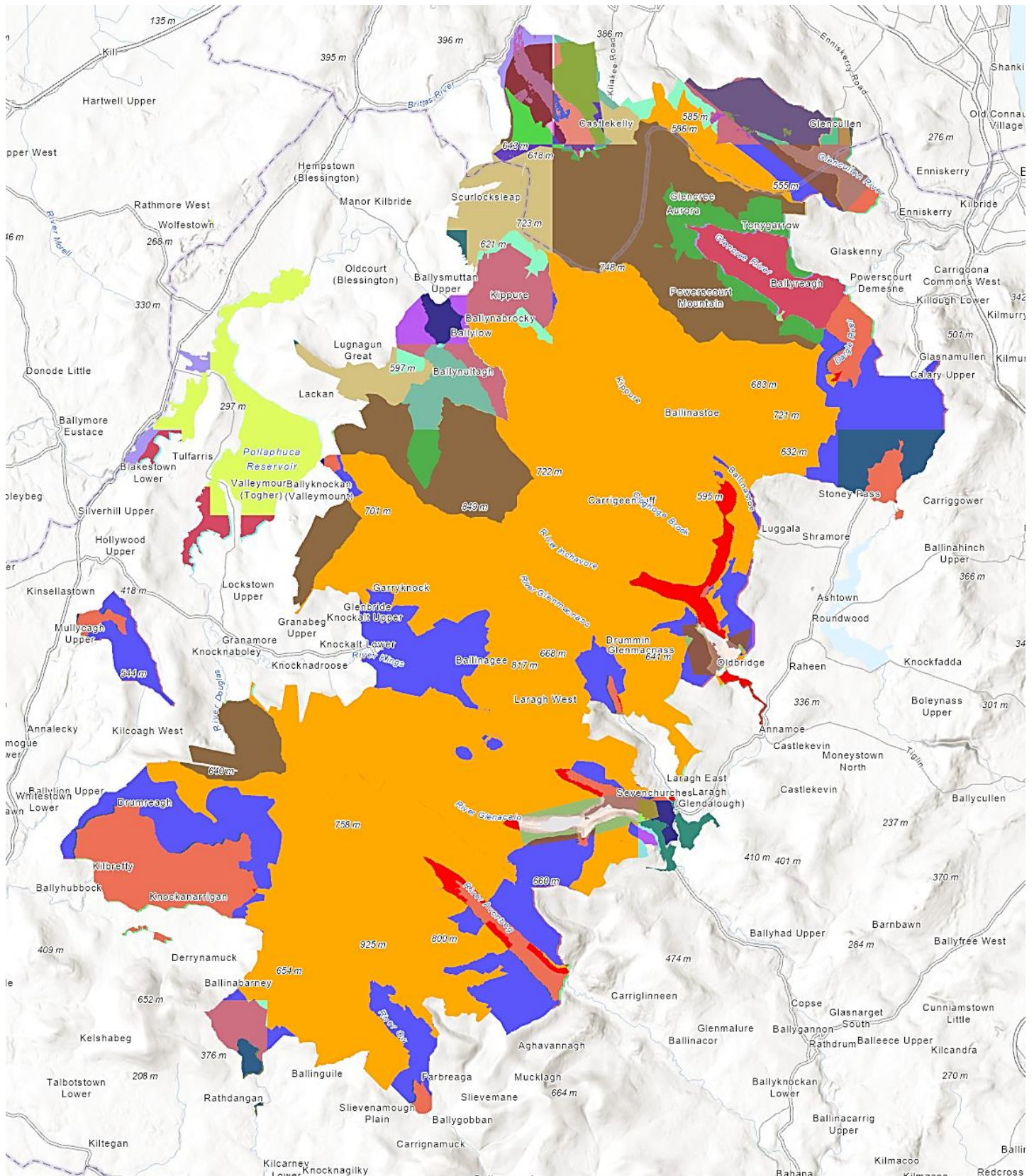
Recreational pressure is significant and large areas are in the ownership of the state, predominantly the National Parks and Wildlife Service and the Dept. of Defence. The grazing rights on much of the state lands are rented to farmers. As a result these areas are considered as commonage by the Dept. of Agriculture, Food and the Marine.

Although isolated from the main area, islands such as Lambay Island, Irelands Eye, and Dalkey Island also fall within the Dublin/Wicklow Mountains division, as do very small coastal areas of Dublin. These areas are lowland, characterised by grazed pasture, sea cliffs, beaches, wetland areas, and other coastal and estuarine habitats, with complex geology and a variety of soil types.

A significant number of archaeological monuments are located within the Dublin/Wicklow Mountains division of ACRES Leinster. Concentrations of monuments can be found , at Glendalough, Lough Dan, Glencullen, Glenasmole, & Lambay Island.

The objectives for the Dublin/Wicklow Mountains division include:

- Water quality
- Peatland
- Semi-natural Grassland
- Geese and Swans
- Red Grouse
- Raptors
- Barn Owl and Kestrel
- Archaeology



Leinster CP Objectives: Dublin/Wicklow Mountains



0 5 10 20 Kilometers



3.3.2.3 *Cooley Peninsula Division*

The Cooley Peninsula division of ACRES Leinster is located in County Louth. The division is a mountainous and hilly area dominated by dolerite rock. Granite, slates and gabbro also contribute to the geology of the area. The upland area rises to a height of 589 m at the summit of Slieve Foye and is characterised by poorly draining peat soil with frequently encountered areas of exposed bedrock. The division also includes small lowland areas at Dundalk Bay and around the coast of the peninsula. These coastal areas are characterised by well drained loamy soils, river alluvium, and tidal marsh.

The Cooley Peninsula division of ACRES Leinster has just a small number of typical upland archaeological sites at 44, these are grouped in three small concentrations.

The objectives for the Cooley Peninsula division include:

- Water quality
- Peatland
- Semi-natural Grassland
- Geese and Swans
- Raptors
- Barn Owl and Kestrel
- Archaeology



3.3.2.4 *Blackstairs Division*

The Blackstairs division of ACRES Leinster is located on the border of Counties Carlow and Wexford, and is comprised mainly of the Blackstairs Mountains, but also small areas along tributaries of the River Barrow, and the Islands Great Saltee, Little Saltee, and Keeragh. The main area of the Blackstairs Mountains is characterised by mountains and rolling hills including six peaks over 520 m, rising to a high point of 795 m at the summit of Mount Leinster. The upland area has a core of granite, and is dominated by poorly draining peat soil.

Lowland areas include the coastal Ballyteigue Burrow Nature Reserve, and islands off the south coast of Wexford. The island areas have a bedrock of schist, gneiss, and granite, and are characterised by exposed cliffs, shingle and boulder shores, and small areas of intertidal sand flats. Large areas of semi-natural grassland on the Saltee Islands have become increasingly dominated by bracken in recent decades. Other areas in the Blackstairs division exist along the River Barrow tributaries and are dominated by well drained alluvial soils, supporting both farmland and woodland areas.

The archaeological sites on located in the Blackstairs division of ACRES Leinster are unusual considering their concentration in a small area at Dranagh Mountain, and monument type in an Irish context at Nine Stones Therefore, both of these locations have been identified as heritage priority zones.

The objectives for the Blackstairs division include:

- Water quality
- Peatland
- Semi-natural Grassland
- Red Grouse
- Raptors
- Barn Owl and Kestrel
- Archaeology

3.3.3 Breifne CP

A summary landscape context and list of high-level objectives for the four Breifne CP divisions is provided in the following pages of this document, including maps illustrating the spatial extent of their respective objectives and/or their overlap. The sequence of the objectives does not indicate any ranking of their importance.

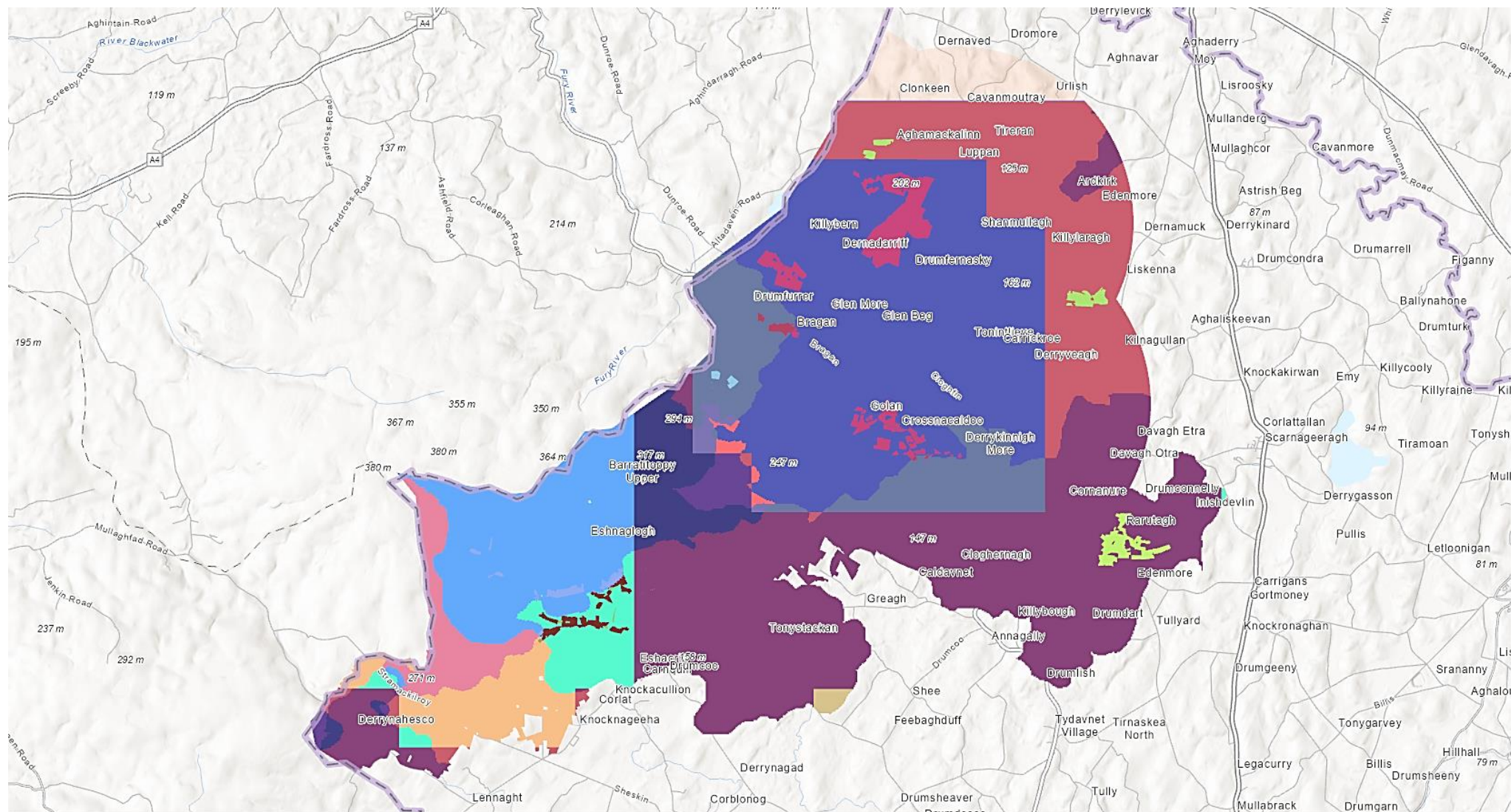
3.3.3.1 *Sliabh Beagh Division*

The Sliabh Beagh division is located on the north-western border of County Monaghan and includes a mountainous area along the border between County Monaghan in the Republic of Ireland and County Fermanagh and County Tyrone in Northern Ireland. Slieve Beagh mountain has many low, smooth summits in the region of 360-370 m. The highest is at 380 m and lies just inside County Fermanagh. The area is composed mainly of mountain to rolling hill covered in blanket bog in the uplands, while the lower regions are composed of a mix of extensive and intensive drumlin farmland, with many small lakes and streams throughout. The underlying geology is mainly of sandstones and shales overlain by peat, till and loam soils.

The Slieve Beagh SPA designated for breeding Hen Harrier extends across much of the eastern and south-eastern sectors of the Slieve Beagh upland area that extends from County Monaghan into Northern Ireland. Mountain blanket bog is well developed at the higher altitudes and especially at Eshbrack (peak of 365 m). Elsewhere the bog is mostly cutover with areas of wet and dry heaths also present. In total, bog and heath occupies 43% of the site. The mid-slopes are afforested (40% of the SPA), with plantations of various ages (open canopy, closed canopy, clear-fell). The remainder of the site is rough or marginal grassland (16%). Some of the old field systems support species-rich wet grassland vegetation dominated by Soft Rush (*Juncus effusus*). Several small dystrophic lakes are present within the site. The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for Hen Harrier. The site also supports breeding Merlin, however further survey is required to determine the exact status of this small falcon. Red Grouse is found in unplanted areas of bog and heath. Peregrine nest in the Northern Ireland sector of Slieve Beagh and can be seen over the site at times.

The objectives for the Sliabh Beagh division include:

- Water quality
- Peatland
- Semi-natural Grassland
- Breeding Waders
- Geese and Swans
- Red Grouse
- Raptors
- Barn Owl and Kestrel
- Archaeology



3.3.3.2 *South Breifne Division*

The South Breifne division of ACRES Breifne is a complex of upland mountainous areas and extensive High Nature Value farmland and forests in Counties Leitrim, Roscommon, and Cavan. This division covers south Leitrim and smaller parts of north Roscommon and Cavan. The most notable sites in this division are the Cuilcagh - Anierin Uplands SAC, Slieve Rushen Bog NHA and Cavan geopark karst landscape. The land in this division is typically of drumlin topography and principally occupied by agriculture and forestry, with significant areas of natural vegetation. Major rivers/lakes in this area include the River Shannon and Lough Allen, with numerous smaller lakes dispersed particularly in the southern region of the division. The underlying geology is mainly of limestone, sandstone, and shale, with notable areas of exposed calcareous bedrock occurring in the Cavan Burren region. Soils are predominantly peat, peaty podzols and gley soils, with surface water gleys occurring extensively in the southern area of the division.

The division drains into the upper Shannon Catchment. The boundary between it and the adjacent Central Breifne division is roughly along the water shed between this catchment and the rivers flowing west towards Sligo and Donegal Bays.

Cuilcagh SAC follows a series of shale uplands in the counties of Cavan and Leitrim, including to the north, Cuilcagh Mountain on the border with Northern Ireland, Benbrack, Bencroy, and to the south, Slieve Anierin, rising above Lough Allen. The biological interest of the site is associated with the presence of one of the largest expanses of intact mountain blanket bog in Ireland (north-east of the site), and also with upland grasslands on the steepest slopes of the peaks, fine examples of dry heath on the less steep slopes of these peaks and a gradation from these to wet heaths and wet rush (*Juncus* spp.) grasslands. The presence of a large number of streams (or river sources) adds to the biological interest. The blanket bog areas of this site are extensive and relatively undisturbed. Natural transitions from blanket bog to heath and acidic grassland are evident, and cliffs, small ravines and small woodland blocks add diversity to the site.

Slieve Rushen Bog NHA is an extensive upland blanket bog, occurring on the southeast margin of the Cuilcagh Mountain range, approximately 6.5 km south-east of Swanlinbar, Co. Cavan. Conifer plantations extending to the mountain plateau form parts of the north-west, west, south, and south-eastern boundaries. This large site occurs on a broad-topped mountain ridge, with a smaller parallel ridge to the north-west, with flat plateaux and gently sloping areas between the ridges. The bedrock geology is shale and sandstone.

The objectives for the South Breifne division include:

- Water Quality
- Breeding Waders
- Red Grouse
- Peatland
- Geese and Swans
- Barn Owl and Kestrel
- Semi-natural grassland
- Raptors
- Archaeology

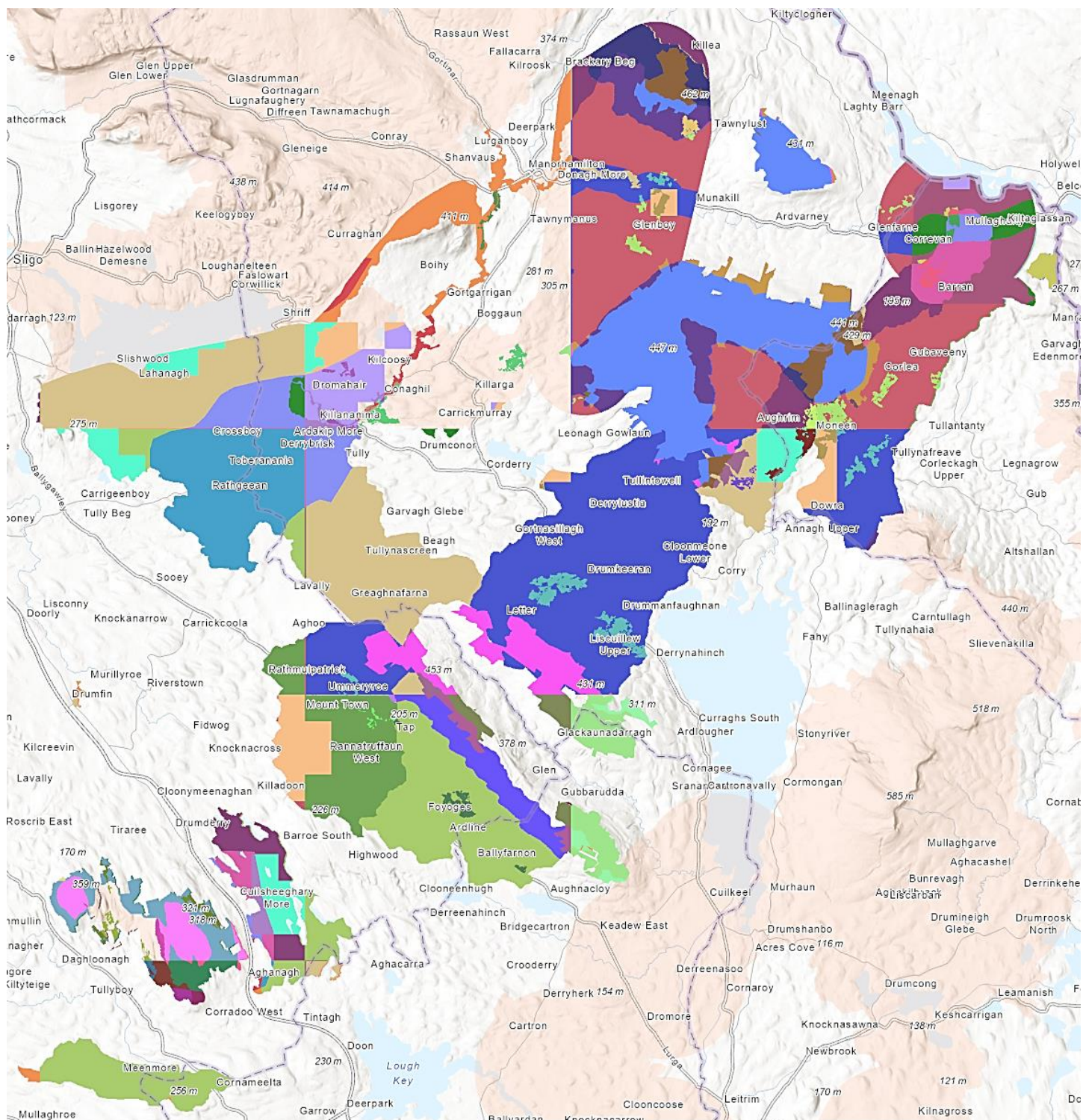
3.3.3.3 *Central Breifne Division*

The Central Breifne division of ACRES Breifne is a complex of upland mountainous areas with extensive lowland farmland in Counties Leitrim, Sligo, and Cavan. This subdivision covers large parts of Co. Leitrim and smaller parts of east Sligo, north Roscommon, and west Cavan. Similar to the South Breifne division, the land in this division is typically of drumlin topography, Principal land uses include agriculture and forestry, with significant areas of natural vegetation. Lakes in this area include Lough Macnean Upper and Lough Arrow, with numerous smaller lakes dispersed throughout. The underlying geology is mainly of sandstones and shales overlain by peat, peaty podzols and gley soils, with well drained brown podzols occurring more frequently in the south-western area of the division.

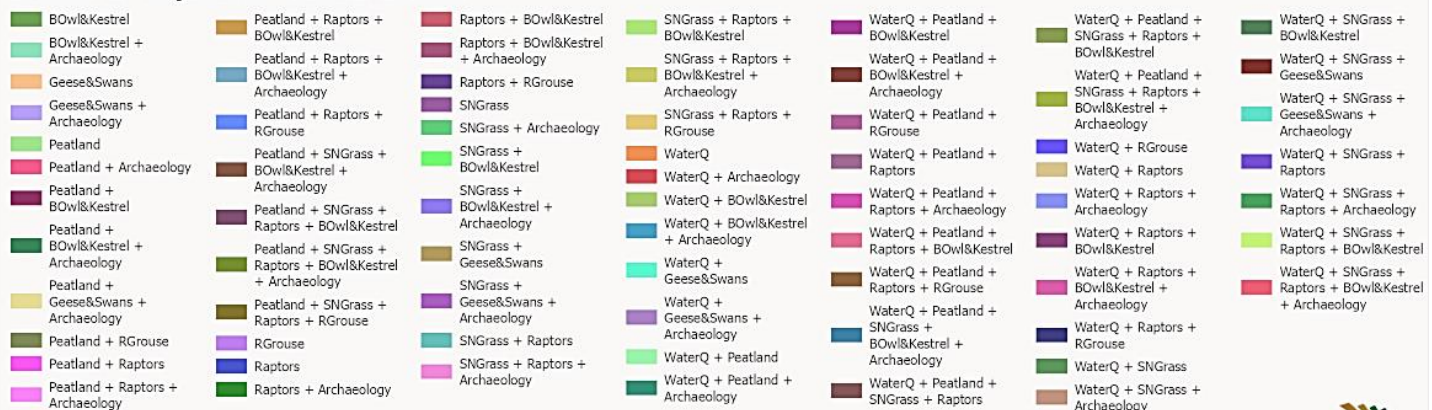
The Bricklieve Mountains and Keishcorran are located west of Lough Arrow and approximately 6 km north-west of the town of Boyle in Co. Sligo. The site is a large isolated block of carboniferous limestone that reaches a height of approximately 300 m. Carrane Hill Bog NHA is an upland blanket bog located approximately 2 km east of Lough Arrow, to the west of Geevagh Village, and 5 km to the south-west of Drumkeerin village in Co. Sligo with an altitude range of between 242 m and 455 m. Lough Arrow SAC, located in Counties Sligo and Roscommon, is a large limestone lake sheltered on three sides by hills and is the source of the Unshin River (SAC). Lough Arrow is unusual in being a mesotrophic natural lake which has changed little in the last 40 years. Kilronan Mountain Bog NHA consists primarily of upland blanket bog habitat located on the plateau of Kilronan Mountain, Co. Roscommon. It lies between altitudes of 240 m and 370 m and overlooks Lough Allen and the former coal-mining town of Arigna. Corry Mountain Bog NHA is an area of upland blanket bog, straddling the Roscommon/Leitrim County boundary, located about 4 km west of Lough Allen. Boleybrack Mountain SAC comprises an extensive upland plateau situated to the north of Lough Allen in Co. Leitrim. It is dominated by active mountain blanket bog and wet heath, with small oligotrophic/dystrophic lakes scattered throughout. Dough/Thur Mountains NHA is an area of upland blanket bog, heath and grassland located 4 km south of Kiltyclogher, in north-west Co. Leitrim. The site ranges in elevation from 170 m to 465 m and is underlain by shale, fine-grained sandstone and small amounts of limestone.

The objectives for the Central Breifne division include:

- Water quality
- Peatland
- Semi-natural Grassland
- Geese and Swans
- Red Grouse
- Raptors
- Barn Owl and Kestrel
- Archaeology



Breifne CP Objectives: Central Breifne



0 5 10 20 Kilometers

3.3.3.4 *North-West Breifne Division*

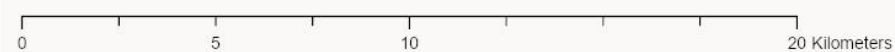
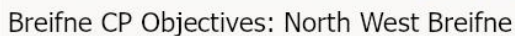
The North-West Breifne division of ACRES Breifne is a complex of upland mountainous areas with a mix of extensive and intensive lowland farmland in Counties Leitrim and Sligo. This division mainly covers north Leitrim and smaller parts of east Sligo. It includes the Dartry Mountain complex- a mountain range that lies between Lough Melvin, Lough Gill and Lough MacNea. The highest point is Truskmore at 647 metres. Other notable mountains in the range include Benbulbin at 526 m, Benwiskin at 514 m, and Tievebaun at 611 m. The underlying geology is mainly of limestone, sandstone and shale, with notable areas of exposed calcareous bedrock and scree occurring in the Ben Bulbin, Gleniff and Glenade Complex region. Soils are predominantly peat, peaty podzols and gley soils, interspersed by pockets of brown podzols.

Lough Gill SAC site includes Lough Gill, Doon Lough to the north-east, the Bonet River (as far as, but not including, Glenade Lough), and a stretch of the Owenmore River near Manorhamilton in Co. Leitrim. Lough Gill itself, 2 km east of Sligo town, is a large lake, being 8 km long, and has steep limestone shores and underwater cliffs. Arroo Mountain SAC is a large mountain complex forming most north-easterly part of the Ben Bulbin range of mountains. Together, Ben Bulbin and Arroo Mountain comprise one of the floristically richest areas in the country, supporting excellent examples of arctic-alpine vegetation communities. Aghavogil Bog NHA is a large upland blanket bog site, located 5 km east of the village of Kinlough and 1 km north-west of Rossinver, Co. Leitrim. Lough Melvin SAC is situated in the extreme north-west of Co. Leitrim, about 4 km south of Bundoran: a number of inflowing and outflowing streams and rivers are included in the site, for instance, the Drowes River links the lake to Donegal Bay. The Ben Bulbin, Gleniff and Glenade Complex SAC site is located in the uplands around Ben Bulbin, King's Mountain, Benwiskin, Truskmore and Tievebaun (or Eagle's Rock), straddling the Sligo/Leitrim County boundary. Crockauns/Keelogyboy Bogs NHA is an extensive, primarily upland site located 7 km north-east of Sligo town.

This division holds a unique inland population of Atlantic Chough and hosts an internationally significant wintering population of Barnacle Geese.

The objectives for the Northwest Breifne division include:

- Water quality
- Peatland
- Semi-natural Grassland
- Chough
- Geese and Swans
- Red Grouse
- Raptors
- Barn Owl and Kestrel
- Archaeology



4 Targeting

4.1 Scorecard allocation

In the Generic Land Management Scheme web-based map, all ACRES CP participants' parcels will be assigned the scorecard that best captures the respective habitat and in addition, this process is also informed by the availability of objective-related layers. The variety of scorecard assigned to ACRES CP parcels was informed by a sequential process involving these layers and from orthophoto interpretation of the habitat in question (Figure X). The order that the presence of objective layers is inspected determines the objective priority where objectives overlap, as the objective presence is verified singularly by assigning a relevant scorecard. Utilizing the objectives in this manner lowers the chances of allocating scorecards that will create conflict with the needs of the underlying objective.

The eight scorecards relevant to the HHP CP areas are listed below:

1. Acres Grassland (grassland habitat scorecard),
2. ACRES Peatland (peatland habitat scorecard),
3. ACRES Scrub/Woodland (scrub or woodland scorecard);
4. ACRES Low Input Grassland on peat (L.I.G.) (targeting grassland habitat adjacent to raised bogs)
5. ACRES Rough Grazing (scorecard targeting a mosaic of grassland and scrub habitat that is particularly suitable for Hen Harrier),
6. ACRES Coastal Grassland (scorecard targeting coastal grassland habitats),
7. ACRES Chough (scorecard targeting chough grassland habitat near cliff/upland settings),
8. ACRES Breeding Wader (scorecard targeting grassland fields with or suitable for breeding waders).

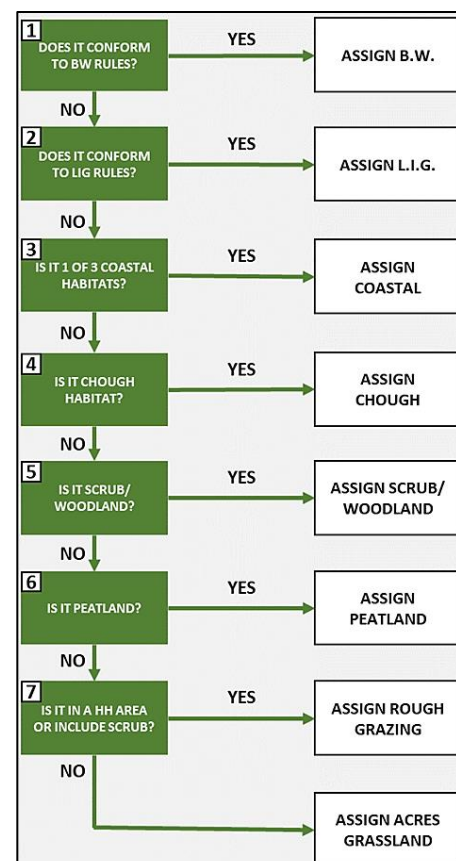


Figure 6: Process flow chart for assigning scorecards to eligible fields in the Generic Land Management application. Where objectives overlap, priority is ordered sequentially (i.e., Breeding Waders (B.W.) is prioritised over Low Input Grassland on peat (L.I.G.)).

4.2 Application

The Local Action Plan is the blueprint for the operation of the scheme at Co-operation Project level. It identifies local objectives for each division of the co-operation areas, prioritising these and presenting them spatially. The outputs are largely map based and serve to guide the project team, participating farmers, and farm advisors on the selection of interventions. This will help ensure that actions are correctly sited and have optimal effect.

The delineated fields and their habitat types determine the selection of scorecards for each field. The initial assignment is carried out by the Project team, this will be updated following a field level assessment by the advisor or on inspection by DAFM staff. The confirmed scorecards will subsequently inform the field-scale objectives and the relevant action (or action bundles). For example, the assignment of the ACRES Breeding Waders scorecard will determine the precise location and extent of the breeding waders objective and enable field-scale targeted campaigns for actions relevant or specific to those species. Similarly, the assignment of a peatland scorecard on a field will result in a peatland habitat objective. If the peatland field spatially overlaps a water quality objective, the relevant actions campaigned for could include actions that are relevant to peatland habitat and benefit water quality.

Additional objectives and relevant spatial data identified by stakeholders will also be considered for inclusion throughout the lifetime of the project.

4.2.1 Scorecards

Following an assessment period, scorecard results will indicate the extent to which the ongoing land management is contributing towards the respective objective(s). For example, a parcel or field assigned a chough scorecard will indicate that the needs of the underlying chough objective are being met (high scorecard result) or not (low scorecard result). In a more complex scenario, the Raptor objective might be represented by a combination of woodland, grassland, and peatland scorecards. In this case, high scores for each different scorecard will still represent a higher delivery of the specific ecosystem service: raptor biodiversity. The scorecard allocation procedure detailed in section 4.1. removes the possibility of mutual conflict between a scorecard type and the underlying objective. Figure 7 details the process of arriving at a stage where the CP team can use the scorecard results to guide the targeting of actions in keeping with ‘the right action in the right place’ (Iteration 3 of this LAP).

Unlike species-specific objectives or habitats, scorecard results do not necessarily act as a proxy for water quality. Instead, the water-based objective (WaterQ) benefits from the existence of fine-scale data on water quality for each waterbody in the CP. The resolution of this data provides the CP team an ability to visualise the relationship between water quality and the respective assigned scorecards. For example, an area of poor water quality might at first glance be a suitable area to campaign for water-based actions. However, if the LPIS scorecards all score highly with little evidence of water-related threats, then it can be deduced that the low quality of water is a product of a different

pressure. In this case, campaigning for NPIs and/or designing LAs on improving water quality could be an ineffective use of resources. Instead, an alternative area where threats to water have been recorded and the water quality is poor would benefit from CP attention.

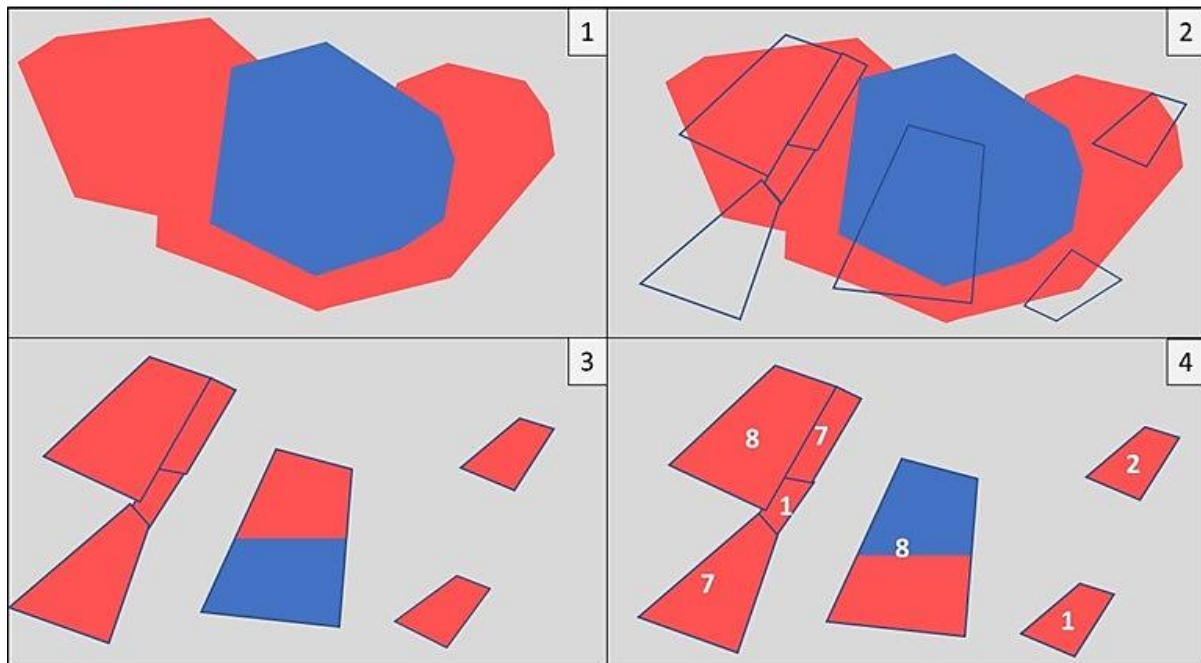


Figure 7: Schematic illustrating the successive iterations of field parcels and their objective layers within the Local Area Plan. The red and blue areas represent two different hypothetical objectives. 1) The objectives in a given area are red and blue and have respective Action Bundles. 2) Delineation of LPIS parcels pertaining to successful ACRES CP applicants in this area. 3) Scorecards are assigned to the 7 LPIS parcels which consequently reflect the underlying objectives and revise the CP area delineation. For example, the middle parcel has both red and blue objectives. At this point, each LPIS parcel has been assigned a scorecard, at least one action bundle with its respective list of possible actions. 4) Resulting scores of the LPIS parcels guides the CP team in campaigning for necessary actions and developing LAs. In the case illustrated, with regards to the red objective bundle, the easterly parcels could benefit from targeting as the scores represent improvements are needed to deliver the objective.

4.2.2 Stakeholder Engagement

For the species-specific objectives in particular, further knowledge is required for the CP team to ascertain the most suitable area within a species range that would benefit from specific actions. For example, campaigns and landscape actions could be better designed for hotspot areas (i.e., stronghold areas or areas that could be significant habitat and quickly utilized if subject to CP actions).

5 Monitoring

Monitoring is an essential component of a landscape level Agri-environment scheme. To ensure that monitoring activities are appropriate to the needs of the participating farmers and support the delivery of local objectives a detailed monitoring plan will be produced before the end of 2023. The Monitoring plan will focus on:

- Design of a monitoring campaign for quality control and risk assessment within the ACRES Breifne, ACRES Leinster and ACRES Munster South Connacht CP areas. This aspect of monitoring will detect anomalies within the data collected by farm advisors. In turn this will help to identify recurring errors and design an appropriate response. For example: the identification of training and mentoring needs for advisors.
- Following the progress of the scheme to determine if landscape level objectives are being attained over the lifespan of ACRES.
- Obtaining data required to inform the targeting and screening processes for NPI and LA where this cannot be obtained from other sources.
- Identifying possible improvements to the specifications for NPI and LA by following the short to medium-term impact of delivered actions.
- Identifying specialist training needs for participating farmers and third parties, e.g. Agricultural contractors, and the development of courses to meet these needs.
- Informing the design of possible responses to issues of local concern, e.g. Invasive species, and the need to involve third parties in order to deliver co-ordinated responses to these.

Monitoring is separate from the inspection process. Our staff have no role in the inspection process, our monitoring activities will be designed to identify opportunities to improve the delivery of the ACRES scheme both at CP and individual farm level. This contrasts with inspections carried out by Dept. of Agriculture, Food, and the Marine staff which are a regulatory requirement designed to determine compliance with the scheme itself. Consequently, the issue of penalties is a solely a matter for DAFM.

6 Service Delivery

The Hen Harrier Programme manages the project teams for the ACRES Breifne, ACRES Leinster and ACRES Munster/ South Connacht Co-operation areas. The operational structure to support the rollout of the ACRES scheme in these areas makes use of separate teams supported by a shared administrative and technical support unit.

This structure allows for a locally focussed model for delivery of services to participants. The local teams are not burdened with administrative functions and can focus on supporting the ACRES programme in their area. The local teams have access to a wide range of highly qualified specialists from across the company along with external expertise contracted in as required. This enhances the range and depth of skills available to the team. The structure also allows for the sharing of resources between the teams as circumstances demand. For example, the ACRES Leinster Team can avail of staff and other resources from the wider organisation for commonage assessment purposes.

The standardisation of training across all three CP teams provides additional resilience to the structure. This approach permits the temporary transfer of staff to cover short term vacancies within the local teams, helping to ensure continuity of service to participants.

6.1 Operational structure

6.1.1 ACRES Breifne

All project staff directly involved in supporting participants in all four divisions in this CP area are based in Manorhamilton, Co. Leitrim. Manorhamilton has adequate transport links to facilitate service provision to all parts of the CP area.

- The Project Team is headed by Dr. Caroline Sullivan with Dr. Julien Carlier as Deputy Project Manager.

6.1.2 ACRES Munster/ South Connacht

The CP team are headquartered in our offices in Tralee, Co. Kerry. Additional staff are based in the company's offices in Oranmore, Co. Galway. A further office is planned for the Tipperary/ West Waterford/ East Cork area. It is hoped to open this office in the Summer/ Autumn of 2023.

- Project staff supporting participants in the Stacks/ West Limerick hills, Sliabh Luachra/ Mount Eagle, Musheramore and Ballyhoura Mountains divisions are based in the Kerry office.
- Staff supporting participating farmers in the Slieve Aughty Mountains (Clare), Slieve Aughty Mountains (Galway), Slieve Bearnagh, Slievecallan and Slievefelim divisions operate out of our offices in Oranmore, Co. Galway.
- Staff to be based in the planned office in the Tipperary/ West Waterford, East Cork area will support participants in the Comeraghs, Knockmealdown Mountains, Nagle Mountains and Galtee Mountains, until the opening of this office these participants will be supported from the office in Tralee.

- The ACRES Munster/ South Connacht and ACRES Leinster CP teams are led by Padraig Cronin with Kristina Feeney as Deputy Project Manager.

6.1.3 ACRES Leinster

The CP team operates out of the company's offices in Blessington, Co. Wicklow.

- Due to the small number of farmers in the ACRES Leinster area, this CP team shares the same management structure as the Munster/ South Connacht area.

6.1.4 Administration and Technical Support Unit

The Administration and Technical Support Unit is responsible for the internal administration of all three CP teams. This includes:

- Administrative Tasks
 - Accounting
 - Human Resources including recruitment.
 - Payroll.
 - Purchasing, Insurance etc.
 - Property and Fleet Management.
 - Assistance to Local Teams with the operation of a micro grants scheme from the Local Action Fund.
 - Engaging professional services to support the company where required.
 - Compliance with regulatory requirements.
- Technical Support
 - Archaeology
 - Communications
 - IT support
 - Staff training
 - GIS
 - Remote Sensing and Data Analytics.
 - Co-ordination of the assessment of commonages
 - Engagement of external expertise and specialist sub-contractors
 - Implement company supported Research and Development plans.
 - Development and operation of a Partially Automated Screening System (PASS) to support the screening of proposed actions.

The Administration and Technical Support Unit is led by Programme Director Fergal Monaghan. The unit is based in the Company's Offices in Oranmore, Co. Galway.

6.2 Staffing levels

Within each division, participating farmers will be supported by two or three designated field staff (Project Officer/ Team Leader/ Deputy Project Manager). This structure, where farmers engage with a small team rather than an individual project officer sustains local engagement in the event of personnel changes. It provides greater resilience to the delivery of services by protecting our

understanding of local conditions from being degraded as a result of the unavailability of key personnel.

In all three CP areas we plan to maintain a ratio of field staff to participants of 1:300. The target date for achieving this ratio is September 1st, 2023. This level of support for tranche 1 participants requires approx. 22 field staff to maintain the desired ratio. Further staff will be recruited to support additional participants in tranche 2. The current numbers of field staff (as of May 24th, 2023) are detailed on the table below.

Table 6: Field staff numbers as of May 24th 2023.

Grade	ACRES Breifne	ACRES Leinster	ACRES Munster South Connacht	Totals
Deputy Project Managers	1		1*	2
Team Leaders	1		1	2
Project Officers	5	2	7	14
Sub Total	7	2	9	18
Tranche 1 Requirements	8	3	11	22

*The Deputy Project Manager in ACRES Munster/ South Connacht also covers ACRES Leinster.

- An additional two staff are due to join the company on June 12th. Both will be assigned to the ACRES Munster South Connacht team.
- A recruitment campaign to select additional Team Leaders and Project Officers is underway.

The current numbers of management and support personnel including the Programme Director, Project Managers and Administrative and Technical Support staff (as of May 24th, 2023) are detailed on the table below.

Table 7: Current management and support personnel as of May 24th, 2023.

Grade	ACRES Breifne	ACRES Leinster	ACRES Munster South Connacht	Admin and Tec Support Unit	Totals
Programme Director				1	1
Project Managers	1		1		2
Office Manager				1	1
Finance Officer				1	1
Operations Manager				1	1
Archaeologist				1	1
Chief Pilot (UAS)				1	1
Data & IT Services Manager				1	1
Environmental Data Management Officer				*	
Communications and Training Officer				*	
Subtotal	1		1	7	9
Planned Staffing Levels Sept 1 st , 2023	1		1	9	11

- Increases in support staff beyond these levels will be considered following determination of overall staff requirements after the 2nd tranche intake into the ACRES Scheme.
- The Communications and Training Officer position and the Environmental Data Management Officer position have been advertised. Closing date for applications is June 16th, 2023.

7 Stakeholder Engagement

The active involvement of local people is essential to the landscape level approach, our project teams will never have enough staff to do everything themselves, nor could they ever have the local knowledge required to address the challenges that exist. Our staff are there to assist and support, we will help with specialist advice, training, and funding. We will equip local farmers and advisors with the skills to lead on the delivery of local events and to contribute to planning local initiatives on their own farms and in their local areas. However, we will always be dependent on local people themselves to deliver for their area. The landscape approach can only work if it is bottom-up, with local communities and stakeholders driving the process, with project team staff there to facilitate and support them.

Engagement with stakeholders occurs at a number of levels. At a contract level there is the relationship between the Dept. of Agriculture, Food and the Marine and the Project Teams. As part of this process the CP teams will engage with National Level Stakeholders within the structures created by DAFM for this purpose.

At a regional level there is a need for structures to involve local stakeholders in the continued development of the ACRES Co-operation approach. The structures to deliver this will exist at two sub levels.

7.1 Steering Group

At CP level we will establish a steering group to guide the rollout of the co-operation project in each CP zone. This will involve a wide range of stakeholders, including farmer representatives, it will be chaired by the Project Manager.

The steering group is a vital resource for the project team. It helps ensure that the work of the team is transparent and open to scrutiny, and it provides an opportunity for stakeholders to input their perspective and expertise into the regional development of the ACRES Co-operation approach. Engagement at Steering group level also allows for and indeed requires stakeholders to feedback into their own organisations and facilitate co-ordinated responses to landscape level challenges. Examples of this could include planning for control of invasive species on lands farmed by participants and nearby non-agricultural lands, e.g. roadsides or forestry.

The composition of steering groups is being discussed with the Dept. of Agriculture, Food, and the Marine. We anticipate that following agreement on the terms of reference that steering groups will be established in each CP area in the Autumn of 2023.

7.2 Local Area Partnerships

Important as the Steering Group is, it does not provide the locally specific knowledge required to guide decision making at a local level. To address this challenge, we will build on the Local Area Partnership (LAPs) model that was developed in the Hen Harrier Project EIP. These partnership structures will involve local project team staff working with farmers, and farm advisors active in an area. The partnerships will inform the project team about issues and opportunities that exist at a local level. This will include the planning and delivery of local events such as open days, seminars, or specialist training

events. It will also provide a pathway for farmers and others to contribute to the ongoing development of the Local Action Plan.

We anticipate that a Local Area Partnership will be set up in each of the local divisions identified in this plan. Each partnership will be chaired by a local Project Officer. In divisions with large numbers of farmers we aim to have one Local Area Partnership established for every 300 farmers. It is planned to rotate farmer and farm advisor representatives in each partnership on a regular basis. This is to ensure that as many people as possible get an opportunity to contribute to the local delivery of ACRES.

Ideally farmer and advisor representatives on the Steering Group will be drawn from those who participate in one of the Local Area Partnerships. It is planned to establish the Local Area Partnerships by December 31st, 2023.

Table 8: Structure and role of CP Steering Groups and Local Area Partnerships

Structure	Number	Role
Steering Group	1 per Co-operation Project Area	<ul style="list-style-type: none"> ○ Examination of proposed amendments to the Local Action Plan ○ Assistance with Targeting strategy for NPI and LA. ○ Coordination of actions with external organisations ○ Forum for reporting of progress and developments with the CP area.
Local Area Partnerships	c.1 per 300 participants	<ul style="list-style-type: none"> ○ Identification of opportunities and challenges at a local level ○ Selection of topics for open days and specialist training events ○ Active participation in the delivery of specialist training and open days ○ Contribute to the targeting and co-ordination of actions at a local level.

8 Research and Development

A research and development programme will be supported by the Administration and Technical Support Unit. Research will focus on the development of digital tools for the efficient delivery of a landscape level approach. This will include the following.

1. Development of databases and digital tools for the collation of all data sets available to the project.
2. Development of a Partially Automated Screening System (PASS) to provide for a rules-based assessment of the potential impact of all proposed Non-Productive Investments and Landscape Actions. The PASS system will enable Project Staff to visualise all of the information required to make decisions within the screening process in a timely and efficient manner. Outputs from this process will inform the approval or rejection of proposed NPI or LA. Other planned outputs will include the automated generation of screening reports and notifications to statutory bodies.

This system will optimise the capacity of the Project teams to deal with the screening requirements for the very large number of NPI and LA applications that are anticipated. It will also reduce the administrative burden on farmers in NATURA areas who would otherwise have to commission screening assessments for agricultural developments.

3. The use of a machine learning approach to the interpretation of remote sensing imagery for the purpose of identifying features of interest in commonage areas. This will help the project team provide an objective and consistent approach to the assessment of commonages and will assist in the targeting of actions intended to address water quality, soil erosion, and wildfire risks.
4. Production of Wildfire Spread Models for use in upland areas with high wildfire risk. The objectives of this research will include.
 - a. Creation of decision-making aides for Fire Service Command and Control.
 - b. Training aides for fire service personnel and local stakeholders
 - c. Targeting of fire resilience interventions at locations where they can have maximum impact on the fire risk profile at a landscape level.
 - d. Production of demonstration models for communicating aspects of fire risk and possible resilience strategies to local stakeholders. Wildfire Spread models have been developed in other parts of the world; our research focus will be on adapting these to an Irish context.
5. An examination of the competition between mammalian predators, specifically Foxes and Pine Marten in upland environments with a mosaic of forest, peatland, and grassland habitats. The objective is to determine if management of foxes delivers net benefits to ground nesting birds or if it could result in increased activity of Pine Martens with consequent impacts on Waders, Hen Harrier, or Red Grouse.

The delivery of these research and development projects will be financed by the Hen Harrier Project from the company's own resources. They do not impact in any way on the funding available to participating farmers. The outputs from this research will enable the delivery of efficiencies for the delivery of the service for the benefit of participating farmers and other stakeholders.

- Items 1-3 are already underway and initial outputs will be delivered later in 2023.
- Research Partners will be sought to work with us in the development of Items 4 & 5 with work planned to commence in 2024.
- Company resources including drones, high-powered computers with specialist software and personnel will be made available to third party researchers where this is feasible and does not reduce capacity to deliver on obligations to the ACRES Scheme and its participants. We will consider supplying anonymised data to third party researchers with the agreement of the Dept. of Agriculture, Food, and the Marine. Details of participants, their lands or farm enterprises will not be shared without their consent.

9 Community Engagement

The Local Action Fund will open for applications by December 31st, 2023. This fund will issue micro grants to farmers to support the delivery of bespoke actions that cannot be accommodated within the main list of NPI and LA. This fund will also be available to schools, sports clubs and community groups for biodiversity or water quality initiatives. It will seek to attach a value to local environmental and biodiversity assets that is accessible to the community. The micro grants and technical support from the project team will also help local groups to leverage further resources elsewhere. It is anticipated that most grants will be in the €3,000- €5,000 range, the total funding available for this purpose is estimated at €300,000.

Funding for the Local Actions Fund is from the Hen Harrier Project's own resources. It does not impact on the funding available to farmers through the ACRES programme. An objective of the fund will be to highlight the important role of agriculture in the delivery of environmental and conservation objectives and to enhance awareness of key species and habitats in local communities.

10 Appendix

10.1 Non-Productive Investment and Landscape Action Bundles

Table 9: Matrix of NPIs and LAs comprising each of the compiled Objective Bundles. All Scrub Removal Actions regardless of hand/machine action and area are denoted by 'Scrub Removal*'. Invasive species management actions for: Himalayan Balsam, Japanese Knotweed, Rhododendron, Cherry Laurel, Salmonberry, Giant Hogweed, and Gunnera are not specified as these actions will be prioritised accordingly wherever the invasive species is detected. WQ, N, GAS, RAP, BO+, RG, BW, YH, CH, W, P, SNG, LHB and ARC indicate: Water Quality, Nitrate, Geese and Swans, Raptors, Barn Owl and Kestrel, Red Grouse, Breeding Waders, Yellowhammer, Chough, Woodlands, Peatlands, Semi-natural grasslands, Lesser-horseshoe bat, and Archaeology, respectively.

Note: Nitrate (N) and Yellowhammer (YH) are currently not represented in the Objective List (Section 3.2.2) and are not cartographically represented in the Local Area Objectives (Section 3.3). These changes are imminent and will be updated in a subsequent draft of this LAP document.

ACTIONS		OBJECTIVE BUNDLES													
Name	Type	WQ	N	GAS	RAP	BO+	RG	BW	YH	CH	W	P	SNG	LHB	ARC
Barn Owl/Kestrel Nest Box	NPI					1									
Bat boxes	NPI										1				
Bracken Management	NPI			1		1	1	1	1	1		1	1	1	1
Conservation of Cultural Heritage Sites on Arable Land	NPI														1
Conservation of Cultural Heritage Sites on Grassland	NPI														1
Field margin 3m	NPI	1	1		1	1			1				1		
Hedge Rejuvenation	NPI	1	1		1				1				1	1	
Invasive Species Follow up	NPI	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Planting New Hedgerows	NPI	1	1		1	1			1				1	1	
Planting Traditional Orchard 10 trees	NPI	1			1	1			1					1	
Planting trees	NPI	1			1	1			1					1	
Repair of Traditional Stone Wall 2 sides	NPI									1			1		
Repair of Traditional	NPI									1			1		

Stone Wall 1 side														
Riparian Margin Tree planting	NPI	1		1	1			1					1	
Riparian Margin 3m	NPI	1		1	1			1					1	
Rodenticide Free Rodent Control	NPI			1	1	1								
Small Woodland 160 trees 0.05Ha	NPI	1			1	1			1				1	
Small Woodland 300 trees 0.09Ha	NPI	1			1	1			1				1	
Swallow Boxes	NPI													
Swift Boxes	NPI													
Wader Scrapes	NPI							1						
Wild Bird Cover Plot	NPI				1	1			1					
Wild Bird Cover Strips (Upland Farms)	NPI				1	1								
Winter Stubble	NPI				1	1			1					
Culverts	NPI	1	1											
Fencing Barbed Wire	NPI												1	
Fencing Permanent Electric	NPI												1	
Fencing Sheep Wire	NPI												1	
Installation of Gates	NPI												1	
Installation of Heritage Gates	NPI												1	1
Mobile Cattle Feed Troughs	NPI	1											1	
Mobile Feed Storage Bins	NPI	1											1	
Pasture Pumps	NPI	1											1	
Rainwater Catchers	NPI	1											1	
Solar Electric Fencer Unit	NPI	1											1	
Solar Pumps	NPI	1											1	

Water Storage Tanks	NPI	1										1		
Water Troughs	NPI	1										1		
Predator Proof Fencing at Wader Nest Sites	LA						1							
Wildlife Friendly Mowing	LA		1				1							
Delayed Mowing/Grazing	LA		1				1	1						
Removal of Conifer Treelines	LA		1	1		1	1	1	1	1	1	1		
Rural darkening	LA				1								1	
Permanent Vegetation Change	LA										1	1		
Wildfire Resilience – Mowing Fire Breaks	LA					1					1			
Targeted Grazing (Bovines on Molinia)	LA					1					1			
Targeted Grazing (Equines on Gorse)	LA					1					1			
Targeted Grazing (Equines on Autumn Gorse/Molinia)	LA					1					1			
Targeted Grazing (Goats on Scrub)	LA					1					1			
Virtual Fencing	LA					1					1			
Exclosures	LA			1		1	1				1	1		1
Decommissioning of Old Sheep Dipping Stations	LA	1	1								1	1		
Specialist Training	LA	1	1	1	1	1	1	1	1	1	1	1	1	1
Construction of Lesser Horseshoe Bat	LA												1	

Summer Roosts														
Geese and Swan on Grasslands	LA		1											
Traditional Dry Stone Wall full rebuild	LA							1			1			
Single Span Bridges	LA	1	1											
Sediment Capture Ponds	LA	1	1				1							
Check Dams	LA	1				1					1			
Leaky Dams	LA					1					1			
Engineered Ditches	LA	1												
In Ditch Wetlands	LA	1												
Swales	LA	1	1											
Ditch Reprofilng	LA						1							
Drain Blocking – Peat Plugs and Wave Damming/Peat Zippering	LA					1					1			
Drain Blocking with Timber Dams	LA					1					1			
Peatland Bunding	LA					1					1			
Water Retention Structure in a Karst Landscape	LA	1												
Wildlife Ponds	LA						1						1	
Scrub Removal*	LA										1	1		

10.2 Objective Profiles

10.2.1 Water Quality

Context:

Water quality refers to the chemical, physical, and biological characteristics of water based on the standards of its usage, water quality monitoring in Ireland is carried out under the Water Framework Directive (WFD). The Environmental Protection Agency (EPA) undertakes this monitoring every three years in Ireland using numerous indicators. Gilligan & Quinlan (2022) outlines that the WFD establishes a legal framework to protect and restore clean water across Europe and to ensure its long-term, sustainable use ensuring effective water management based on catchments with the requirement for member states to produce River Basin Management Plans (RBMP).

The most recent Water Quality report 2016-2021 shows that in Ireland over half (54%) of our surface waters are in good or better ecological status yet overall, our water quality has declined. The EPA (2022) report states that we are failing to protect our highest quality surface waters, these high status and good status waters provide clean, healthy, resilient, and diverse ecosystems when functioning normally, in stark comparison to moderate, poor and bad status waters which have an altered ecosystem with reduced diversity, resilience and impaired function. In response to this the Blue Dot Catchments Programme was set up to specifically target the maintenance and restoration of high-status waterbodies. There are 384 waterbodies viewed as high status objective waters nationwide, 127 (33%) viewed at risk, 14 are under review and need further assessment and 243 are not under risk (LAWPRO, 2022).

It has been noted by McConigley (2022) that the CP zones encompass to some degree 252 High Status Objective Waters/ Blue Dots waterbodies, with a majority of these noted as high and good status. The trends of these Blue Dot water bodies outlined by Deakin (2022), shows that Poor water bodies status have improved, Good, Moderate and Bad have not changed but High-status water bodies have declined.

There are several threats and pressures to water quality including agriculture, hydro morphology, forestry, urban/ domestic wastewater, peat, industry etc. Moran and Sullivan (2017) emphasis the significant impact agriculture has on water quality, with the intensity of agriculture having a major influence on this yet, the relationship between intensity of land use and impact are not straightforward. Such pressures and threats identified in agriculture which affect water quality include phosphorus loss, nitrate loss, sedimentation, chemical loss, afforestation, land drainage and access of livestock to rivers and streams to name just a few. Several mitigation measures are available to deal with the threats and pressures on water quality from agriculture as outlined in the table below (Meehan, 2020).

Improving water quality or maintaining water quality to a high-level status will have numerous benefits to water-dependent and non-water dependant habitats and species. The delivery of improved water quality and other water-related ecosystem services, while maximising the cooperative effects with biodiversity, requires locally targeted mitigating measures and result orientated monitoring. The management of these High Nature Value Farmlands within the CP zones for biodiversity has the potential to have co-benefits for water quality and quantity (Moran and Sullivan, 2017).

Useful references:

- Gilligan, N. and Quinlan, E. (2022) Ireland changing the scale of heavily modified waters bodies designated under the Water Framework Directive, Useful Data for Irish River Conservation / Water Quality. Available at: <https://irishriverproject.com/2022/03/11/ireland-changing-the-scale-of-heavily-modified-waters-bodies-designated-under-the-water-framework-directive/> (Accessed: November 16, 2022). (Gilligan & Quinlan, 2022).
- EPA. Water Quality in Ireland 2016 – 2021. (EPA,2022).
- McConigley. 2022. Blue Dot waterbodies in Co-Op Area. (McConigley, 2022).
- Deakin. 2022. Water quality and agriculture. (Deakin, 2022).
- Department of Housing, Planning and Local Government (DHPLG) (2020) Significant Water Management Issues in Ireland. (DHPLG, 2020).
- Moran, J. and Sullivan, C., 2017. Co-benefits for water and biodiversity from the sustainable management of high nature value farmland (No. 209). Report. (Moran and Sullivan, 2017).
- Noel Meehan. 2020. Agricultural Sustainability Support and Advisory Programme (ASSAP). (Meehan, 2020).
- LAWPRO (2022) Blue Dot Catchments Programme Work Programme River Basin Management Plan 2018 -2021, Local Authority Water Programme. Available at: <https://lawaters.ie/blue-dot-programme/#:~:text=The%20Blue%20Dot%20Catchments%20Programme%20is%20a%20collaborative%20programme%20being,our%20high%20status%20objective%20waters.> (Accessed: November 18, 2022). (LAWPRO, 2022)

High Status Objective Waters in CP Zones	Ecological Coherence with Annex 1 Species	Ecological Coherence with SAC Habitats	Threats & Pressures to High Status Objective Waters	Agricultural Mitigation/ Conservation Measures	Benefits of Conservation Participation
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Looking at the distribution of Blue Dots Rivers across ACRES Breifne, Leinster and Munster South Connacht.	Fulmar (<i>Fulmarus glacialis</i>) [A009]	Sandbanks which are slightly covered by sea water all the time [1110]	Intensive grazing or overgrazing by livestock. (Run-off).	Riparian/buffer zones.	The management of land and implementation of mitigating measures to improve and maintain water quality will benefit both water dependant and non-water dependant species and habitats but also subsequently providing other ecosystem services i.e., recreation, economy, public health etc. (The following outlines just a few examples of benefitting species and habitats)
	Cormorant (<i>Phalacrocorax carbo</i>) [A017]	Estuaries [1130]		Establish field boundaries, hedges, woodlands/ tree lines.	
	Shag (<i>Phalacrocorax aristotelis</i>) [A018]	Mudflats and sandflats not covered by seawater at low tide [1140]		Wetlands, ponds, engineered ditches.	
	Cormorant (<i>Phalacrocorax carbo</i>) [A017]	Coastal lagoons [1150]		Minimise the level of poaching and compaction from livestock and machinery.	
ACRES Breifne: High 8, Good: 7, Moderate: 1, Poor: 0 and Bad: 0.	Greylag Goose (<i>Anser anser</i>) [A043]	Reefs [1170]	Machinery/ Livestock causing disruption and poaching of land.	Use of compaction alleviation techniques and technologies.	
	Barnacle Goose (<i>Branta leucopsis</i>) [A045]	Perennial vegetation of stony banks [1220]		Nutrient management planning.	
Total: 16	Light-bellied Brent Goose (<i>Branta bernicla hrota</i>) [A046]	Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	Agricultural activities generating marine pollution.	Management of critical source places (CSA's).	Margaritifera margaritifera (Freshwater Pearl Mussel) [1029]
	Hen Harrier (<i>Circus cyaneus</i>) [A082]	Salicornia and other annuals colonising mud and sand [1310]		Use of protected fertilisers.,	Austropotamobius pallipes (White-clawed Crayfish) [1092]
ACRES Leinster: High 10, Good: 9, Moderate: 2, Poor: 0 and Bad: 0.	Merlin (<i>Falco columbarius</i>) [A098]	Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>) [1330]	Afforestation and forestry activities generating pollution to surface or ground.	Use of Low Emission Slurry Spreading (LESS).	Petromyzon marinus (Sea Lamprey) [1095]
	Peregrine (<i>Falco peregrinus</i>) [A103]	Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]		Informing and educating farmers/contractors.	Lampetra planeri (Brook Lamprey) [1096]
Total: 21	Oystercatcher (<i>Haematopus ostralegus</i>) [A130]	Embryonic shifting dunes [2110]		Adhere to buffer zones and safeguard zones.	Lampetra fluviatilis (River Lamprey) [1099]
ACRES Munster South Connacht: High: 27, Good: 33, Moderate: 1, Poor: 0 and Bad: 0.	Sanderling (<i>Calidris alba</i>) [A144]	Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120]	Invasive alien species. (Unstabilize riverbanks).	Precision application of nutrients at correct rates.	Salmo salar (Salmon) [1106]
	Bar-tailed Godwit (<i>Limosa lapponica</i>) [A157]	Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]	Modification of hydrological flow or physical alternation of water bodies for agriculture.	Avoid fertiliser/ organic manure application at high-risk times or at high-risk places.	Lutra lutra (Otter) [1355]
	Redshank (<i>Tringa totanus</i>) [A162]	Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>) [3110]		Improvement of farm road/track design and location.	Redshank (<i>Tringa totanus</i>) [A162]
Total: 61.	Lesser Black-backed Gull (<i>Larus fuscus</i>) [A183]	Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or <i>Isoeto-Nanojuncetetea</i> [3130]		Preventing livestock accessing waters through fencing and providing drinking points.	Kittiwake (<i>Rissa tridactyla</i>) [A188]
	Herring Gull (<i>Larus argentatus</i>) [A184]	Natural dystrophic lakes and ponds [3160]		Improved management of collection and storage of farm wastes.	Guillemot (<i>Uria aalge</i>) [A199]
	Kittiwake (<i>Rissa tridactyla</i>) [A188]	Water courses of plain to montane levels with the <i>Ranunculus fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation [3260]	Peat Extraction.		Razorbill (<i>Alca torda</i>) [A200]
	Guillemot (<i>Uria aalge</i>) [A199]	Rivers with muddy banks with <i>Chenopodium rubri</i> p.p. and <i>Bidenton</i> p.p. vegetation [3270]	Excess ammonium from point sources such as farmyards or from diffuse sources such as the spreading of fertilisers and manures.		Puffin (<i>Fratercula arctica</i>) [A204]
	Razorbill (<i>Alca torda</i>) [A200]	Northern Atlantic wet heaths with <i>Erica tetralix</i> [4010]			Chough (<i>Pyrrhocorax pyrrhocorax</i>) [A346]
	Puffin (<i>Fratercula arctica</i>) [A204]	European dry heaths [4030]			Sandbanks which are slightly covered by sea water all the time [1110]
	Chough (<i>Pyrrhocorax pyrrhocorax</i>) [A346]	Alpine and Boreal heaths [4060]			Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or <i>Isoeto-Nanojuncetetea</i> [3130]
	Wetland and Waterbirds [A999]	<i>Juniperus communis</i> formations on heaths or calcareous grasslands [5130]			Natural dystrophic lakes and ponds [3160]
	Vertigo geyeri (Geyer's Whorl Snail) [1013]	Calaminarian grasslands of the <i>Violetalia calaminariae</i> [6130]	Herbicide /pesticide and sheep dip use.		Estuaries [1130]
	Vertigo angustior (Narrow-mouthed Whorl Snail) [1014]	Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites) [6210]			
	Margaritifera margaritifera (Freshwater Pearl Mussel) [1029]	Species-rich <i>Nardus</i> grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230]			
	Austropotamobius pallipes (White-clawed Crayfish) [1092]	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>) [6410]			
	Petromyzon marinus (Sea Lamprey) [1095]	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]			
	Lampetra planeri (Brook Lamprey) [1096]	Blanket bogs (* if active bog) [7130]			
	Lampetra fluviatilis (River Lamprey) [1099]	Transition mires and quaking bogs [7140]			
	Allosa fallax fallax (Twaite Shad) [1103]	Depressions on peat substrates of the <i>Rhynchosporion</i> [7150]	Bare land – inadequate cover crops.		
	Salmo salar (Salmon) [1106]	Petrifying springs with tufa formation (<i>Cratoneurion</i>) [7220]	Abandonment of grassland management (e.g. cessation of grazing or of mowing)		
		Alkaline fens [7230]			
		Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i>) [8110]			
		Calcareous and calcshist screes of the montane to alpine levels (<i>Thlaspietetea rotundifolii</i>) [8120]			

	<p><i>Tursiops truncatus</i> (Common Bottlenose Dolphin) [1349]</p> <p><i>Phocoena phocoena</i> (Harbour Porpoise) [1351]</p> <p><i>Lutra lutra</i> (Otter) [1355]</p> <p><i>Halichoerus grypus</i> (Grey Seal) [1364]</p> <p><i>Phoca vitulina</i> (Harbour Seal) [1365]</p> <p><i>Trichomanes speciosum</i> (Killarney Fern) [1421]</p> <p><i>Najas flexilis</i> (Slender Naiad) [1833]</p> <p><i>Hamatocaulis vernicosus</i> (Slender Green Feather-moss) [6216]</p>	<p>Calcareous rocky slopes with chasmophytic vegetation [8210]</p> <p>Siliceous rocky slopes with chasmophytic vegetation [8220]</p> <p>Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles [91AO]</p> <p>Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, <i>Alnion incanae</i>, <i>Salicion albae</i>) [91EO]</p>			
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Context:

Water quality refers to the chemical, physical, and biological characteristics of water based on the standards of its usage, water quality monitoring in Ireland is carried out under the Water Framework Directive (WFD). The Environmental Protection Agency (EPA) undertakes this monitoring every three years in Ireland using numerous indicators. Agriculture is just one of several human activities that can put pressure on water quality.

Phosphorus is a nutrient which is essential for plant growth. As with nitrogen, too much phosphorus in a water body can lead to the over-growth of plants and algae which disturb the ecosystem. Phosphorus loss is at the most risk in areas of poorly draining soils, with overland flow being dominant and a poor correlation with agricultural intensity. Excessive phosphorus leads to runoff from agricultural fields into surface water which causes overstimulation of growth of aquatic plants and algae. Excessive growth of these organisms, in turn, can clog water intakes, use up dissolved oxygen as they decompose, and block light to deeper waters. Eutrophication on surface water can then occur leading to algae blooms which can lead to a decrease in animal and plant diversity (Deakin, 2022).

There are threats and pressures to water quality caused by excessive phosphorus from agricultural activities. Kelly (2022) explains how once phosphorus is applied through chemical or organic manures it will be taken up by the crop until it has reached its required amount, phosphorus will then accumulate in the soil close to the surface. When you get high levels of rainfall, and the water can't drain down through the soil this water will "run-off" the surface. This in turn will carry phosphorus and sediment storing phosphorus into waterways. It should also be noted that when applying P to high organic matter or peat soils it has been shown that these soils cannot hold or build up the P the same as mineral soils (Daly and Styles, 2005). Therefore, leaching or "runoff" will be at a higher risk level on these types of soils. It should be noted that this pathway of phosphorus from source to receptor can happen very quickly, in a matter of weeks or months. Several mitigation measures are available to deal with the threats and pressures of phosphorus on water quality from agriculture as outlined in the table below.

Useful references:

- Deakin. 2022. Water quality and agriculture. (Deakin, 2022).
- Kelly 2022. Water Quality – Phosphorus & ACRES. (Kelly,2022)
- Daly, K. and Styles, D., 2005. Eutrophication from Agricultural Sources: Phosphorus Chemistry of Mineral and Peat Soils in Ireland (2000-LS-2.1. 1b-M2). Environmental Protection Agency. (Daly and Styles,2005)

Phosphorus Water Quality Status in CP Zones	Ecological Coherence with Annex 1 Species	Ecological Coherence with SAC Habitats	Phosphorus Threats & Pressures to Water Quality	Agricultural Mitigation/ Conservation Measures	Benefits of Conservation Participation
All CP areas to some degree will contain areas where pollution from phosphorus is shown present on pollution impact potential (PIP) maps. This can range from small areas or hotspots to larger areas. Yet a higher PIP from phosphorus is more likely to occur on poorly drained soils and has a correlation with low intensity agricultural systems.	<p>Fulmar (<i>Fulmarus glacialis</i>) [A009]</p> <p>Cormorant (<i>Phalacrocorax carbo</i>) [A017]</p> <p>Shag (<i>Phalacrocorax aristotelis</i>) [A018]</p> <p>Cormorant (<i>Phalacrocorax carbo</i>) [A017]</p> <p>Greylag Goose (<i>Anser anser</i>) [A043]</p> <p>Barnacle Goose (<i>Branta leucopsis</i>) [A045]</p> <p>Light-bellied Brent Goose (<i>Branta bernicla hrota</i>) [A046]</p> <p>Hen Harrier (<i>Circus cyaneus</i>) [A082]</p> <p>Merlin (<i>Falco columbarius</i>) [A098]</p> <p>Peregrine (<i>Falco peregrinus</i>) [A103]</p> <p>Oystercatcher (<i>Haematopus ostralegus</i>) [A130]</p> <p>Sanderling (<i>Calidris alba</i>) [A144]</p> <p>Bar-tailed Godwit (<i>Limosa lapponica</i>) [A157]</p> <p>Redshank (<i>Tringa totanus</i>) [A162]</p> <p>Lesser Black-backed Gull (<i>Larus fuscus</i>) [A183]</p> <p>Herring Gull (<i>Larus argentatus</i>) [A184]</p> <p>Kittiwake (<i>Rissa tridactyla</i>) [A188]</p> <p>Guillemot (<i>Uria aalge</i>) [A199]</p> <p>Razorbill (<i>Alca torda</i>) [A200]</p> <p>Puffin (<i>Fratercula arctica</i>) [A204]</p> <p>Chough (<i>Pyrrhocorax pyrrhocorax</i>) [A346]</p> <p>Wetland and Waterbirds [A999]</p> <p>Vertigo geyeri (Geyer's Whorl Snail) [I013]</p> <p>Vertigo angustior (Narrow-mouthed Whorl Snail) [I014]</p> <p>Margaritifera margaritifera (Freshwater Pearl Mussel) [I029]</p> <p>Austropotamobius pallipes (White-clawed Crayfish) [I092]</p> <p>Petromyzon marinus (Sea Lamprey) [I095]</p>	<p>Mudflats and sandflats not covered by seawater at low tide [I140]</p> <p>Perennial vegetation of stony banks [I220]</p> <p>Salicornia and other annuals colonising mud and sand [I310]</p> <p>Embryonic shifting dunes [2110]</p> <p>Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>) [3110]</p> <p>Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or <i>Isoeto-Nanojuncetea</i> [3130]</p> <p>Natural dystrophic lakes and ponds [3160]</p> <p>Water courses of plain to montane levels with the <i>Ranunculon fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation [3260]</p> <p>Rivers with muddy banks with <i>Chenopodion rubri</i> p.p. and <i>Bidention</i> p.p. vegetation [3270]</p> <p>Northern Atlantic wet heaths with <i>Erica tetralix</i> [4010]</p> <p>European dry heaths [4030]</p> <p>Alpine and Boreal heaths [4060]</p> <p><i>Juniperus communis</i> formations on heaths or calcareous grasslands [5130]</p> <p>Calaminarian grasslands of the <i>Violetalia calaminariae</i> [6130]</p> <p>Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites) [6210]</p> <p>Species-rich <i>Nardus</i> grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230]</p> <p>Molinia meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>) [6410]</p> <p>Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]</p> <p>Blanket bogs (* if active bog) [7130]</p> <p>Transition mires and quaking bogs [7140]</p> <p>Depressions on peat substrates of the <i>Rhynchosporion</i> [7150]</p> <p>Petrifying springs with tufa formation (<i>Cratoneurion</i>) [7220]</p> <p>Alkaline fens [7230]</p> <p>Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i>) [8110]</p> <p>Calcareous and calcshist scree of the montane to alpine levels (<i>Thlaspietalia rotundifolii</i>) [8120]</p> <p>Calcareous rocky slopes with chasmophytic vegetation [8210]</p> <p>Siliceous rocky slopes with chasmophytic vegetation [8220]</p> <p>Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles [91A0]</p>	<p>Phosphorus (P) loss through land overflow.</p> <p>Excessive application of P fertilisers and organic manures.</p> <p>Drain cleaning and maintenance.</p> <p>Sediment loss.</p> <p>Applying P to high organic matter or peat soils.</p> <p>Supplementary feeding and sacrifice paddocks</p> <p>Livestock accessing waterways.</p> <p>Poaching caused by livestock or machinery,</p> <p>Compaction from livestock and machinery.</p> <p>Bare land – inadequate cover crops.</p> <p>Hydromorphology</p>	<p>Need to break the phosphorus pathway.</p> <p>Riparian/buffer zones.</p> <p>Establish field boundaries, hedges, woodlands/ tree lines.</p> <p>Wetlands, ponds, engineered ditches.</p> <p>Minimise the level of poaching and compaction from livestock and machinery.</p> <p>Use of compaction minimisation or alleviation techniques and technologies.</p> <p>Nutrient management planning.</p> <p>Preventing livestock accessing waters through fencing and providing drinking points.</p> <p>Break the pathway of P from source to receptor.</p>	<p>The management of land and implementation of mitigating measures to mitigate the effect of phosphorus on water quality will benefit both water dependant and non-water dependant species and habitats but also subsequently providing other ecosystem services i.e., recreation, economy, public health etc. (The following outlines just a few examples of benefitting species and habitats)</p> <p><i>Margaritifera margaritifera</i> (Freshwater Pearl Mussel) [I029]</p> <p><i>Austropotamobius pallipes</i> (White-clawed Crayfish) [I092]</p> <p><i>Petromyzon marinus</i> (Sea Lamprey) [I095]</p> <p><i>Lampetra planeri</i> (Brook Lamprey) [I096]</p> <p><i>Lampetra fluviatilis</i> (River Lamprey) [I099]</p> <p><i>Salmo salar</i> (Salmon) [I106]</p> <p><i>Lutra lutra</i> (Otter) [I355]</p> <p>Redshank (<i>Tringa totanus</i>) [A162]</p> <p>Kittiwake (<i>Rissa tridactyla</i>) [A188]</p> <p>Guillemot (<i>Uria aalge</i>) [A199]</p> <p>Razorbill (<i>Alca torda</i>) [A200]</p>

	<p>Lampetra planeri (Brook Lamprey) [1096]</p> <p>Lampetra fluviatilis (River Lamprey) [1099]</p> <p>Alosa fallax fallax (Twaite Shad) [1103]</p> <p>Salmo salar (Salmon) [1106]</p> <p>Tursiops truncatus (Common Bottlenose Dolphin) [1349]</p> <p>Phocoena phocoena (Harbour Porpoise) [1351]</p> <p>Lutra lutra (Otter) [1355]</p> <p>Halichoerus grypus (Grey Seal) [1364]</p> <p>Phoca vitulina (Harbour Seal) [1365]</p> <p>Trichomanes speciosum (Killarney Fern) [1421]</p> <p>Najas flexilis (Slender Naiad) [1833]</p> <p>Hamatocaulis vernicosus (Slender Green Feather-moss) [6216]</p>	<p>Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91EO]</p>			<p>Puffin (Fratercula arctica) [A204]</p> <p>Chough (Pyrrhocorax pyrrhocorax) [A346]</p> <p>Sandbanks which are slightly covered by sea water all the time [1110]</p> <p>Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea [3130]</p> <p>Natural dystrophic lakes and ponds [3160]</p>
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Context:

Water quality refers to the chemical, physical, and biological characteristics of water based on the standards of its usage, water quality monitoring in Ireland is carried out under the Water Framework Directive (WFD). The Environmental Protection Agency (EPA) undertakes this monitoring every three years in Ireland using numerous indicators. Agriculture is just one of several human activities that can put pressure on water quality.

Nitrogen ends up in the environment mainly through agricultural processes, and thereby also ends up in water. The main source of nitrogen compounds in water are fertilizers that mainly contain nitrate, but also ammonia, ammonium, urea and amines. Nitrogen loss is most at risk on free draining soils, it is groundwater pathway dominant and has a strong correlation with agricultural intensity. Excess nitrogen can enter groundwater through leaching and also reach surface water through runoff from agricultural fields. Our estuaries and coastal waters are particularly sensitive to high nitrogen concentrations. Excessive nitrogen plays a role with phosphorus in causing overstimulation of growth of aquatic plants and algae. Excessive growth of these organisms, in turn, can clog water intakes, use up dissolved oxygen as they decompose, and block light to deeper waters. Eutrophication on surface water can then occur leading to algae blooms which can lead to a decrease in animal and plant diversity (Deakin, 2022).

Many rivers, groundwaters and estuaries in the south, southeast and east of Ireland are under pressure from excess nitrogen from agricultural activities. Nitrate leaching can occur during times of heavy or prolonged rainfall with free draining soils being most prone. The highest risk period is at the shoulders of the year in winter and early spring due to unfavourable weather and the nitrogen is not being used most effectively by the plant due to poor crop growth conditions. The Nitrogen pathway from source to pathway to receptor is usually a long-time lag over months to years but as we move to moderately drained areas it can take up to decades. Several mitigation measures are available to deal with the threats and pressures from nitrogen on water quality from agriculture as outlined in the table below.

The effects of nitrogen pollution on biodiversity as a whole is greatly diverse, encompassing direct toxicity, depleted oxygen resulting in eutrophication and incursions by invasive species that outcompete local populations or exclude their food sources. This in turn affects a broad range of biodiversity both flora and fauna with research by Hernández et al. (2016) showing that nitrogen pollution causes organismal harm and habitats which in turn leads to alterations resulting in population decline.

Useful references:

- Deakin. 2022. Water quality and agriculture. (Deakin, 2022).
- Hernández, D.L., Vallano, D.M., Zavaleta, E.S., Tzankova, Z., Pasari, J.R., Weiss, S., Selmants, P.C. and Morozumi, C., 2016. Nitrogen pollution is linked to US listed species declines. *BioScience*, 66(3), pp.213-222. (Hernández et al.2016).

Nitrogen Water Quality Status in CP Zones	Ecological Coherence with Annex 1 Species	Ecological Coherence with SAC Habitats	Nitrogen Threats & Pressures to Water Quality	Agricultural Mitigation/ Conservation Measures	Benefits of Conservation Participation
All CP areas to some degree will contain areas where pollution from nitrogen is shown present on pollution impact potential (PIP) maps. This can range from small areas or hotspots to larger areas. Yet a higher PIP from nitrogen is more likely to occur on free draining drained soils and has a strong correlation with high intensity agricultural systems.	<p>Fulmar (<i>Fulmarus glacialis</i>) [A009]</p> <p>Cormorant (<i>Phalacrocorax carbo</i>) [A017]</p> <p>Shag (<i>Phalacrocorax aristotelis</i>) [A018]</p> <p>Cormorant (<i>Phalacrocorax carbo</i>) [A017]</p> <p>Greylag Goose (<i>Anser anser</i>) [A043]</p> <p>Barnacle Goose (<i>Branta leucopsis</i>) [A045]</p> <p>Light-bellied Brent Goose (<i>Branta bernicla hrota</i>) [A046]</p> <p>Hen Harrier (<i>Circus cyaneus</i>) [A082]</p> <p>Merlin (<i>Falco columbarius</i>) [A098]</p> <p>Peregrine (<i>Falco peregrinus</i>) [A103]</p> <p>Oystercatcher (<i>Haematopus ostralegus</i>) [A130]</p> <p>Sanderling (<i>Calidris alba</i>) [A144]</p> <p>Bar-tailed Godwit (<i>Limosa lapponica</i>) [A157]</p> <p>Redshank (<i>Tringa totanus</i>) [A162]</p> <p>Lesser Black-backed Gull (<i>Larus fuscus</i>) [A183]</p> <p>Herring Gull (<i>Larus argentatus</i>) [A184]</p> <p>Kittiwake (<i>Rissa tridactyla</i>) [A188]</p> <p>Guillemot (<i>Uria aalge</i>) [A199]</p> <p>Razorbill (<i>Alca torda</i>) [A200]</p> <p>Puffin (<i>Fratercula arctica</i>) [A204]</p> <p>Chough (<i>Pyrrhocorax pyrrhocorax</i>) [A346]</p> <p>Wetland and Waterbirds [A999]</p> <p>Vertigo geyeri (Geyer's Whorl Snail) [I013]</p> <p>Vertigo angustior (Narrow-mouthed Whorl Snail) [I014]</p> <p>Margaritifera margaritifera (Freshwater Pearl Mussel) [I029]</p> <p>Austropotamobius pallipes (White-clawed Crayfish) [I092]</p> <p>Petromyzon marinus (Sea Lamprey) [I095]</p> <p>Lampetra planeri (Brook Lamprey) [I096]</p>	<p>Sandbanks which are slightly covered by sea water all the time [I110]</p> <p>Estuaries [I130]</p> <p>Mudflats and sandflats not covered by seawater at low tide [I140]</p> <p>Coastal lagoons [I150]</p> <p>Large shallow inlets and bays [I160]</p> <p>Reefs [I170]</p> <p>Perennial vegetation of stony banks [I220]</p> <p>Vegetated sea cliffs of the Atlantic and Baltic coasts [I230]</p> <p>Salicornia and other annuals colonising mud and sand [I310]</p> <p>Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>) [I330]</p> <p>Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [I410]</p> <p>Embryonic shifting dunes [I2110]</p> <p>Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [I2120]</p> <p>Fixed coastal dunes with herbaceous vegetation (grey dunes) [I2130]</p> <p>Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>) [I3110]</p> <p>Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or <i>Isoeto-Nanojuncetea</i> [I3130]</p> <p>Natural dystrophic lakes and ponds [I3160]</p> <p>Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation [I3260]</p> <p>Rivers with muddy banks with <i>Chenopodium rubri</i> p.p. and <i>Bidention</i> p.p. vegetation [I3270]</p> <p>Northern Atlantic wet heaths with <i>Erica tetralix</i> [I4010]</p> <p>European dry heaths [I4030]</p> <p>Alpine and Boreal heaths [I4060]</p> <p><i>Juniperus communis</i> formations on heaths or calcareous grasslands [I5130]</p> <p>Calaminarian grasslands of the <i>Violetalia calaminariae</i> [I6130]</p> <p>Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites) [I6210]</p> <p>Species-rich <i>Nardus</i> grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [I6230]</p> <p><i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>) [I6410]</p> <p>Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [I6430]</p> <p>Blanket bogs (* if active bog) [I7130]</p> <p>Transition mires and quaking bogs [I7140]</p> <p>Depressions on peat substrates of the <i>Rhynchosporion</i> [I7150]</p> <p>Petrifying springs with tufa formation (<i>Cratoneurion</i>) [I7220]</p>	<p>Applying N fertilisers in unfavourable weather conditions.</p> <p>Excess application of nitrogen fertiliser above the crop requirement.</p> <p>Not getting optimal use of N fertiliser by spreading on soils deficient in other nutrients or not in optimal pH.</p> <p>Not adhering to buffer zones when spreading fertilisers or organic manures.</p> <p>Soil compaction caused by livestock or machinery.</p>	<p>Minimise leaching (right product, right place, right time)</p> <p>Use of protected fertilisers.</p> <p>Use of Low Emission Slurry Spreading (LESS) equipment when spreading slurry.</p> <p>Applying chemical and organic fertilisers in favourable weather conditions.</p> <p>Ensure soil fertility is optimum for lime, P and K to ensure full optimisation of N.</p> <p>Adhering to buffer zones when spreading fertiliser and organic manures.</p> <p>Incorporating more clover into pastures, reducing requirement of N.</p> <p>Implementation of a Nutrient Management Plan (NMP)</p> <p>Minimise soil compaction, this will allow the root system of plants to access and absorb available N.</p> <p>Need to control the source from reaching the pathway.</p>	<p>The management of land and implementation of mitigating measures to mitigate the effect of nitrogen on water quality will benefit both water dependant and non-water dependant species and habitats but also subsequently providing other ecosystem services i.e., recreation, economy, public health etc. (The following outlines just a few examples of benefitting species and habitats)</p> <p><i>Austropotamobius pallipes</i> (White-clawed Crayfish) [I092]</p> <p><i>Petromyzon marinus</i> (Sea Lamprey) [I095]</p> <p><i>Lampetra planeri</i> (Brook Lamprey) [I096]</p> <p><i>Lampetra fluviatilis</i> (River Lamprey) [I099]</p> <p><i>Salmo salar</i> (Salmon) [I106]</p> <p><i>Lutra lutra</i> (Otter) [I355]</p> <p>Redshank (<i>Tringa totanus</i>) [A162]</p> <p>Kittiwake (<i>Rissa tridactyla</i>) [A188]</p> <p>Guillemot (<i>Uria aalge</i>) [A199]</p> <p>Razorbill (<i>Alca torda</i>) [A200]</p> <p>Puffin (<i>Fratercula arctica</i>) [A204]</p> <p>Chough (<i>Pyrrhocorax</i></p>

	<p>Lampetra fluviatilis (River Lamprey) [1099]</p> <p>Alosa fallax fallax (Twaite Shad) [1103]</p> <p>Salmo salar (Salmon) [1106]</p> <p>Tursiops truncatus (Common Bottlenose Dolphin) [1349]</p> <p>Phocoena phocoena (Harbour Porpoise) [1351]</p> <p>Lutra lutra (Otter) [1355]</p> <p>Halichoerus grypus (Grey Seal) [1364]</p> <p>Phoca vitulina (Harbour Seal) [1365]</p> <p>Trichomanes speciosum (Killarney Fern) [1421]</p> <p>Najas flexilis (Slender Naiad) [1833]</p> <p>Hamatocaulis vernicosus (Slender Green Feather-moss) [6216]</p>	<p>Alkaline fens [7230]</p> <p>Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani) [8110]</p> <p>Calcareous and calcshist screes of the montane to alpine levels (Thlaspietia rotundifolii) [8120]</p> <p>Calcareous rocky slopes with chasmophytic vegetation [8210]</p> <p>Siliceous rocky slopes with chasmophytic vegetation [8220]</p> <p>Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0]</p> <p>Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0]</p>			<p>pyrrhocorax) [A346]</p> <p>Sandbanks which are slightly covered by sea water all the time [1110]</p> <p>Estuaries [1130]</p>
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10.2.4 Freshwater Pearl Mussel (*Margaritifera margaritifera*)

Context:

The freshwater pearl mussel is a large, long-lived, bivalve mollusc found in clean, fast-flowing rivers. The species has a discontinuous holarctic distribution, being found in North America, north-western Europe and parts of central Europe.

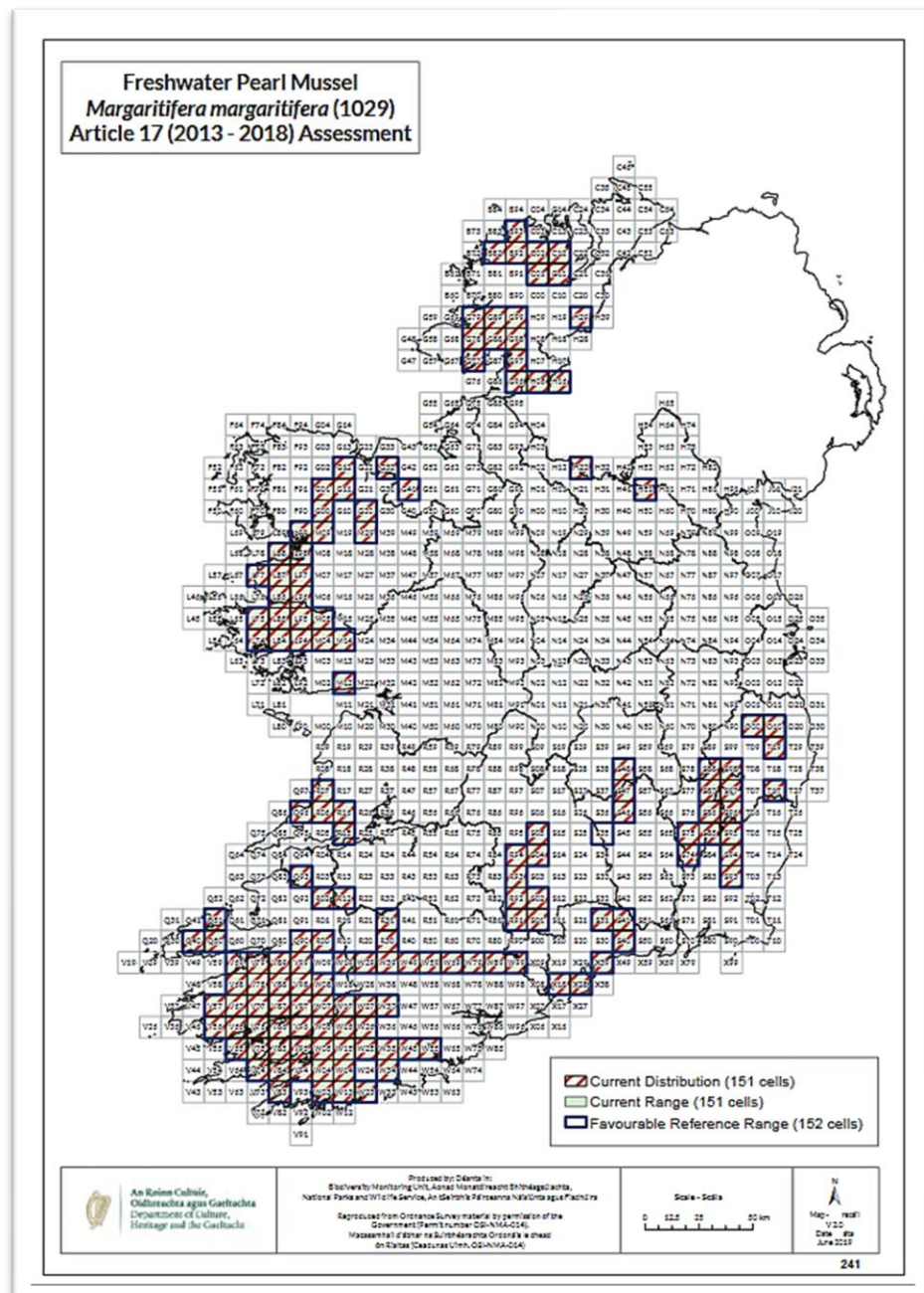
Individuals can grow to very large sizes relative to other freshwater molluscs, slowly building up thick calcareous shells in rivers with relatively soft water and low levels of calcium. In natural conditions, individual mussels can live to over a hundred years of age in Ireland. Like other members of its family, Margaritiferidae, the freshwater pearl mussel has a complex life cycle.

Mussels mature between seven and 15 years of age, and have a prolonged fertile period lasting into old age. The species produces glochidial larvae that use a temporary salmonid host, typically Atlantic salmon and sea trout in Ireland, but also brown trout. Juvenile mussels occupy interstitial habitats in the river bed for five years or more.

The freshwater pearl mussel is highly threatened: critically endangered in Ireland (Byrne et al., 2009) and across Europe (Moorkens, 2011). Owing to its threatened

status and dramatic decline, the freshwater pearl mussel is listed on Annex II and Annex V of the Habitats Directive.

The species' poor conservation status and severe declines have not resulted from exploitation but rather from habitat deterioration: a combination of hydrological and morphological changes, sedimentation and enrichment. Riverbeds have become so clogged with silt, algae and rooted plants that young mussels can no longer survive. In many rivers, adult mussels have become stressed and are prematurely dying owing to habitat deterioration. The pressures impacting on the species come from a combination and wide variety of sources (e.g. pollution from urban wastewater, development activities, farming and forestry), often quite removed from the habitat of the species. The species also suffers direct impacts from in-stream works such as channelisation, bridge repairs/ construction and recreational fishery structures. Flow changes, caused by activities such as land drainage, have been highlighted as an important contributor to the species' demise.



Useful references:

Population estimate in the CP	Habitat Requirements	Threats and Pressures relevant to the CP	Aligning with Site Specific Conservation Objectives	Ecological Coherence with Annex I habitats in the CP	Agricultural Management Measures	Benefits of conservation participation
All CP areas intersect Margaritifera sensitive catchments: one in Breifne, 13 in Leinster and 23 in Munster South Connaught.	<p>The species occurs in more than 160 rivers in 104 catchments or sub-catchments across 14 Irish counties (NPWS, 2013c).</p> <p>The Freshwater Pearl Mussel is a long-lived bivalve, frequently living for more than 100 years, particularly in northern Europe. Freshwater pearl mussels are generally dioecious, that is, individuals are either male or female. Its life cycle starts as a very small larvae, called a glochidium, measuring 0.6 to 0.7 mm long. Several million of these are ejected by each female Freshwater Pearl Mussel every year, following by male fertilization (Geist, 2010). The larvae develop by attaching themselves as external parasites to salmonid fish. The chances of a glochidium encountering its host and successfully parasitising it are very slim, and thus the species relies heavily on the presence of sufficient salmonid fish, namely Sea Trout (<i>Salmo trutta trutta</i>), Brown Trout (<i>Salmo trutta fario</i>) and Atlantic Salmon (<i>Salmo salar</i>) (Moorkens et al, 2017)</p> <p>The Freshwater Pearl Mussel requires very clean well-oxygenated river habitats to successfully</p>	<p>A31 Drainage for use as agricultural land (H)</p> <p>B27 Modification of hydrological conditions, or physical alteration of water bodies and drainage for forestry (including dams) (H)</p> <p>F31 Other modification of hydrological conditions for residential or recreational development (H)</p> <p>A26 Agricultural activities generating diffuse pollution to surface or ground waters (H)</p> <p>B23 Forestry activities generating pollution to surface or ground waters (H)</p> <p>F12 Discharge of urban waste water (excluding storm overflows and/or urban run-offs) generating pollution to surface or ground water (M)</p> <p>C05 Peat extraction (M)</p>	<p>Distribution of Margaritifera: target length relating to distribution.</p> <p>Number of adult mussels in the population.</p> <p>Percentage per size class in the population.</p> <p>Percentage of adult population in senescence.</p> <p>Extent of suitable habitat.</p> <p>Condition of suitable habitat.</p> <p>Water quality as per ecological status.</p> <p>Substratum quality in relation to macrophyte and filamentous algal targets.</p> <p>Substratum quality in relation to attenuation or lessening of sedimentation.</p> <p>Substratum quality in relation to redox potential (water to substrate oxygenation).</p>	Water courses of plain to montane levels with the <i>Ranunculus fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation [3260]	<p>CA15 Manage drainage and irrigation operations and infrastructures in agriculture.</p> <p>CA11 Reduce diffuse pollution to surface or ground waters from agricultural activities.</p> <p>CA05 Adapt mowing, grazing and other equivalent agricultural activities.</p> <p>CA09 Manage the use of natural fertilisers and chemicals in agricultural (plant and animal) production.</p> <p>CB14 Manage drainage and irrigation operations and infrastructures</p> <p>Ensuring the long-term future of the freshwater pearl mussel requires significant, integrated catchment management to prevent direct impacts, to restore the natural hydrological regime and to reduce losses of sediment and nutrients from all indirect sources.</p>	<p><i>Austropotamobius pallipes</i> (White-clawed Crayfish) [1092]</p> <p><i>Petromyzon marinus</i> (Sea Lamprey) [1095]</p> <p><i>Lampetra planeri</i> (Brook Lamprey) [1096]</p> <p><i>Lampetra fluviatilis</i> (River Lamprey) [1099]</p> <p><i>Alosa fallax fallax</i> (Twait Shad) [1103]</p> <p><i>Salmo salar</i> (Salmon) [1106]</p> <p><i>Lutra lutra</i> (Otter) [1355]</p> <p><i>Margaritifera durrovensis</i> (Nore Pearl Mussel) [1990]</p> <p>S.I. No. 296/2009 – The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 and support the achievement of favourable conservation status for freshwater pearl mussels (<i>Margaritifera margaritifera</i>).</p>

	<p>reproduce. The species is found within stable cobble and gravel beds which contain very little fine material. This type of substrate allows for free water exchange between the open river and the water within the substrate. The continuous exchange of water ensures high oxygen levels in the substrate, which is essential for juvenile development. No inorganic silt, organic peat, and detritus should be present in the water as this material can not only block oxygen exchange but also consume oxygen as a result of decomposition processes. Extremely low levels of nutrients in the water are therefore also key for the species to complete its life cycle (Moorkens et al, 2017).</p>	<p>F28 Modification of flooding regimes, flood protection for residential or recreational development (M)</p> <p>D02 Hydropower (dams, weirs, run-off-the-river), including infrastructure (M)</p> <p>F33 Abstraction of ground and surface waters (including marine) for public water supply and recreational use (M)</p>				
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10.2.5 Chough (*Pyrrhocorax pyrrhocorax*)

Context:

The Chough is listed on Annex I of the EU's Birds Directive. There are 18 Special Protection Areas for which this species is a Special Conservation Interest.

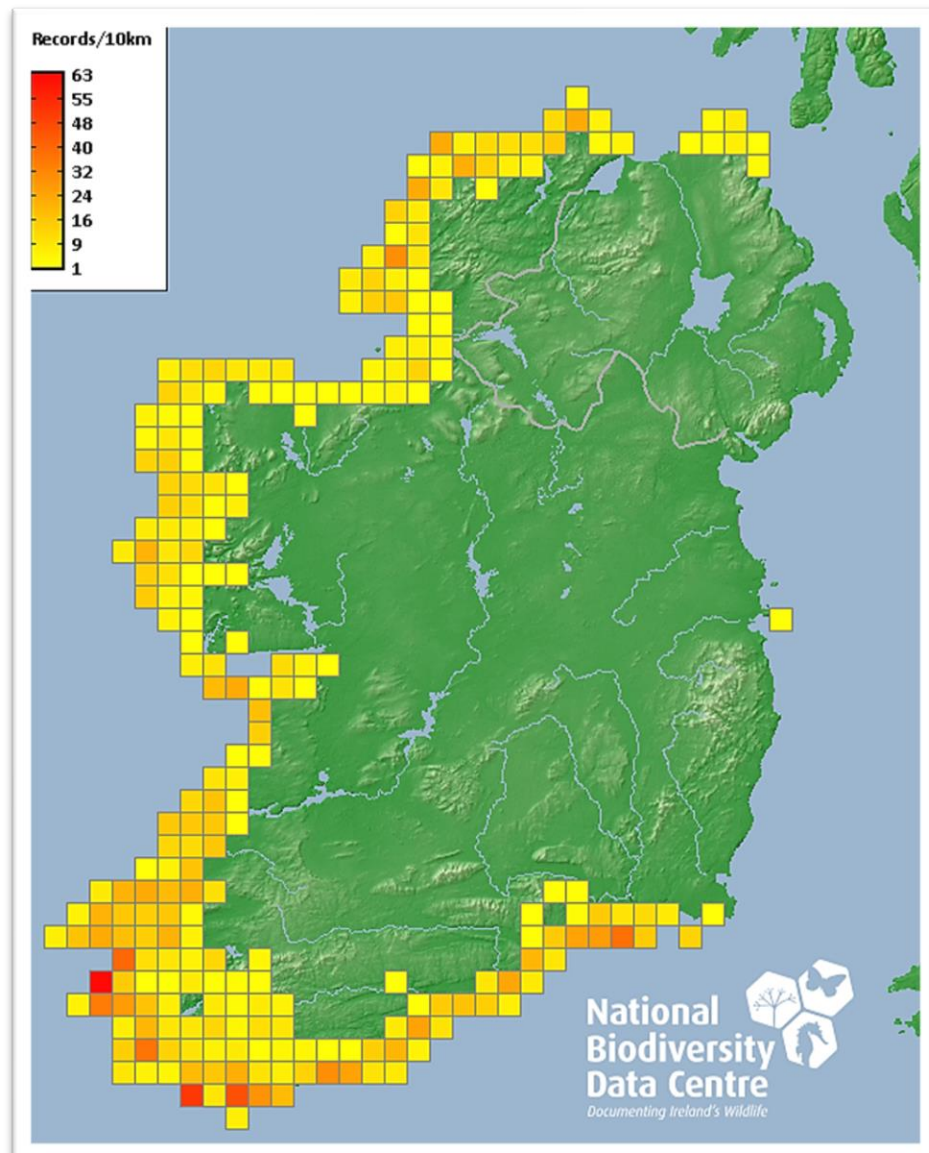
Ireland holds an estimated 63% of the biogeographic share of this species, with an estimated 65% of the all-Ireland population within listed SPA sites (SPA Review, 2013). The last national survey for Chough in Ireland was in 2021 (Colhoun et al. 2022 *in prep*) recording an estimated XX pairs. Prior to this a biennial breeding survey was conducted in 2002 and 2003 (Gray et al. 2003).

Flocks of Choughs are dependent on the sheep grazed, agricultural unimproved grassland on well-drained, south-facing slopes within the site. Over the summer (post-fledging), the nursery flock associated with the King's Mountain foraging more widely, making extensive use of the plateau above Glendarragh and Gleniff. While unimproved grassland is widely available within the study area, it was where this habitat type occurs on steep, sheep grazed south facing slopes, are most frequently used by Choughs. The most heavily utilised slopes stretched from the King's Mountain to the start of the cliffs on the southern face of Benbulin (Cartronwilliamoge) and large flocks (up to 48 birds) and are encountered in every season.

Zoning will be undertaken through the selection of LPIS parcels on and around the west facing to south and west facing slopes of the SPA adjacent to and within proximity of breeding and roosting sites. Important coastal grassland foraging sites will also be included within the CP boundary. Selection will be done on a parcel-by-parcel basis manually by eye from orthophotography and using key reference work by Trewby et al. (2010a).

In terms of foraging ranges Robertson et al. (1995) provide indicative radial measurements of between 1.2km and 2km for Chough. Inclusion of LPIS parcels to this radial will be taken under advisement of the National Parks & Wildlife Service.

Useful references:



- Carroll, D., Gaj-McKeever, R., Trewby, M., & Newton, S. (2010) The seasonal distribution and foraging behaviour Bird species' status and trends reporting format for the period 2008-2012 (Annex 2) of Red-billed Choughs *Pyrrhocorax pyrrhocorax* in County Clare, February 2009 to January 2010. Unpublished BirdWatch Ireland Report to National Parks & Wildlife Service.
- Colhoun, K. et al. in prep (2022) National Survey of breeding Red-billed Chough in the Republic of Ireland. Report for National Parks & Wildlife Service, Department of Housing, Local Government and Heritage.
- Gray, N., Thomas, G., Trewby, M. & Newton, S. (2003) The status and distribution of Choughs *Pyrrhocorax pyrrhocorax* in the Republic of Ireland 2002/03. *Irish Birds* 7: 147-156.
- NPWS. 2015. Site Synopsis for the Sligo/Leitrim Uplands Special Protection Area (SPA) Site Code: 004187. National Parks & Wildlife Service, Department of Housing, Local Government and Heritage. Accessed September 2022. <https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY004187.pdf>
- Robertson, A., Jarvis, A.M. and Day, K.R., 1995, June. Habitat selection and foraging behaviour of breeding Choughs *Pyrrhocorax pyrrhocorax* L. in county Donegal. In *Biology and Environment: Proceedings of the Royal Irish Academy* (pp. 69-74). Royal Irish Academy.
- Trewby, M., Carroll, D., Farrell, F., Gaj- McKeever, R., Mugan, N. & Newton, S. (2010a). The seasonal distribution and foraging behaviour of Red-billed Choughs *Pyrrhocorax pyrrhocorax* in Counties Sligo and Leitrim, February 2009 to January 2010. Unpublished BirdWatch Ireland Report to National Parks & Wildlife Service.
- Trewby, M., Carroll, D., Gaj-McKeever, R., & Newton, S. (2010b) The seasonal distribution and foraging behaviour of Red-billed Choughs *Pyrrhocorax pyrrhocorax* in north Co. Kerry, September 2008 to September 2009. Unpublished BirdWatch Ireland Report to National Parks & Wildlife Service.
- Trewby, M., Carroll, D., Mugan, N. O'Keeffe, D. & Newton, S. (2010c) The seasonal distribution and foraging behaviour of Red-billed Choughs *Pyrrhocorax pyrrhocorax* in Counties Waterford and Cork, February 2008 to January 2009. Unpublished BirdWatch Ireland Report to National Parks & Wildlife Service.
- National Biodiversity Data Centre, Ireland, Red-billed Chough (*Pyrrhocorax pyrrhocorax*), image, accessed 05 April 2023, <<https://maps.biodiversityireland.ie/Species/TerrestrialDistributionMapPrintSize/11757>>

Population estimate in the CP	Habitat Requirements	Threats and Pressures relevant to the CP	Aligning with Site Specific Conservation Objectives	Ecological Coherence with Annex I habitats in the CP	Agricultural Management Measures
<p>The Chough population in the NCU CP occurs in the Sligo/Leitrim Uplands SPA.</p> <p>The Sligo/Leitrim Uplands SPA is located north-east of the town of Sligo in the mountain ranges of Ben Bulbin, Arroo and Cope's Mountain/Crockauns. Inland cliffs and scree slopes are the predominant habitats of the site (NPWS 2015).</p> <p>The cliffs hold an internationally important population of breeding Chough with 14 breeding pairs recorded from the site in the 1992 survey and 9 to 18 pairs in the 2002/03 survey (NPWS 2015). The local population was shown to have declined to 9-10 pairs in 2009 (Trewby et al. 2010a).</p> <p>Chough forage mostly in unimproved, closely grazed grassland and flocks of up to 29 birds have been seen. The suitable grassland occurs mainly on the steep slopes below the cliffs (NPWS 2015).</p>	<p>Choughs breed in caves and crevices along cliffs. During the breeding season, and particularly during the critical period when pairs are provisioning young, the adults feed close to the breeding site.</p> <p>Choughs mainly feed on soil invertebrates found among the roots of grasses and short sward vegetation, including larvae of Tipulidae, Coleoptera and Hymenoptera. Chough favour very short swards (<4cm) and often forage around interfaces between vegetated and rocky, bare ground where these prey species are accessible.</p> <p>Chough are highly sociable birds, usually forming flocks of variable size and age composition, feeding and roosting communally. From late summer onwards Chough feed on dune and coastal grasslands.</p> <p>Juvenile survival, the probability of recruitment to the breeding population and breeding longevity are positively correlated with the quality of the natal environment. Offspring fledging under good conditions are more likely to survive to breeding age and recruit, and have longer breeding lives than offspring fledging under poor.</p>	<p>A03 – Conversion from mixed farming and agroforestry systems to specialised (e.g. single crop) production.</p> <p>A02 – Conversion from one type of agricultural land use to another (excluding drainage and burning).</p> <p>A06 – Abandonment of grassland management (e.g. cessation of grazing or mowing).</p> <p>A14 Livestock farming (without grazing) [impact of antihelminthic dosing on dung fauna] (M)</p> <p>A21 – Use of plant protection chemicals in agriculture.</p> <p>Closely tied to nesting sites during the breeding season, changes/losses of their preferred feeding habitats can negatively affect breeding birds.</p> <p>Chough mortality can be variable, however highest mortality in the first months after fledging, especially in years with poor invertebrate populations. Numbers surviving to adulthood can be affected by food shortages and persistent cold inclement weather.</p>	<p>No SSCOs developed for this site. Generic objective applies.</p> <p>To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA.</p>	<p>Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) [6210]</p> <p>Species-rich Nardus grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230]</p>	<p>CA03 – Maintain existing extensive agricultural practices and agricultural landscape features.</p> <p>CA05 – Adapt mowing, grazing and other equivalent agricultural activities.</p> <p>CA09 – Manage the use of natural fertilisers and chemicals in agricultural (plant and animal) production.</p> <p>Management changes that either reduce invertebrate numbers or render them inaccessible through vegetation growth are likely to be inimical to Chough.</p> <p>It is very important for the effectiveness of agricultural management options that Avermectin-based drugs are not used on stock, particularly at Chough breeding and chick-rearing times. Chough rely heavily on dung insects for feeding and these drugs reduce the number of insects within the dung.</p>

10.2.6 Lesser Horseshoe Bat (*Rhinolophus hipposideros*)

Context:

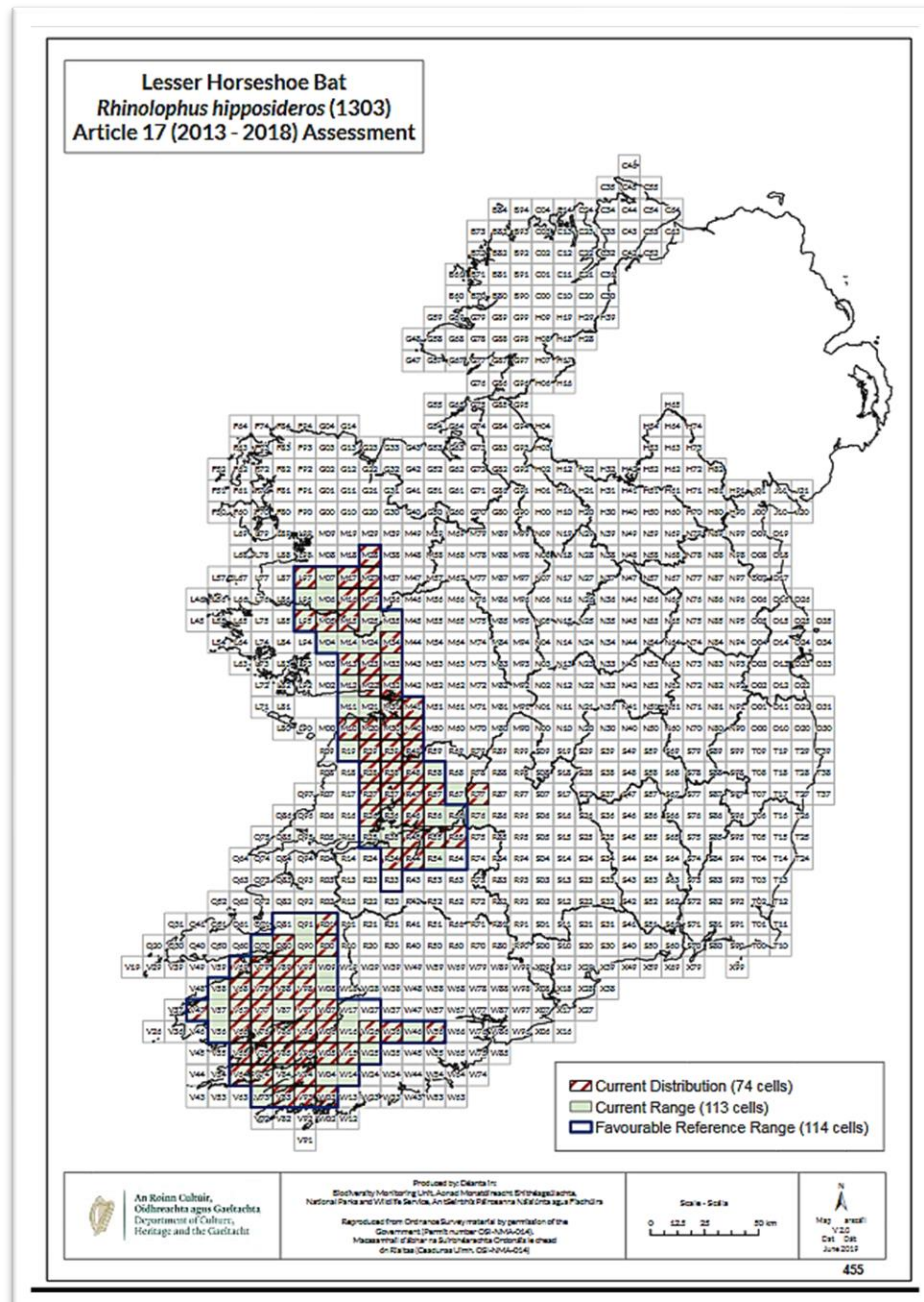
The Lesser Horseshoe Bat (*Rhinolophus hipposideros*) is protected in the EU as an Annex II and Annex IV listed species in the Habitats Directive. In Ireland, it is also protected under the Wildlife (Amendment) Act, 2000 (NPWS, 2018). Despite these protections, it is reported that the Irish population falls under the 'Unfavourable, inadequate' category (NPWS & VWT, 2022), and is confined to just six counties (Figure 1; NPWS, 2018; NPWS & VWT, 2022). Their conservation should be prioritised as, notably, Ireland is considered a stronghold for the species, with numbers decreasing significantly in other European countries (NPWS, 2018).

There are nine bat species established in Ireland, however the Lesser Horseshoe Bat is the only member of the *Rhinolophidae* family found here (NPWS, 2018). The species differs from other Irish bats with its highly specialised echolocation system, allowing it to fly in cluttered environments such as dense vegetation (NPWS & VWT, 2022).

There is a large body of information associated with the species in Ireland, as it has been the focus of surveys, monitoring, research, and conservation since the 1970s (NPWS & VWT, 2022). Therefore, there has been a comprehensive Lesser Horseshoe Bat Species Action Plan (2022- 2026) recently published (NPWS & VWT, 2022) which clearly outlines conservation actions that can be easily implemented on farmland through the ACRES CP scheme. The benefits of such actions has been demonstrated in the past, especially regarding the creation of roosts and corridors for foraging and commuting (NPWS & VWT, 2022).

Useful references:

- Aughney, T., Roche, N. and Langton, S., 2018. The Irish Bat Monitoring Programme 2015-2017. *Irish Wildlife Manuals*, (103).



- Roche, N., Langton, S. and Aughney, T. (2012) Lesser Horseshoe Bat: Population, Trends and Threats 1986 to 2012. Unpublished report from Bat Conservation Ireland to the National Parks & Wildlife Service. Dublin, Ireland.
- NPWS (2018) Conservation objectives supporting document – lesser horseshoe bat (*Rhinolophus hipposideros*) Version 1. Conservation Objectives Supporting Document Series. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Dublin, Ireland.
- NPWS & VWT (2022) Lesser Horseshoe Bat Species Action Plan 2022- 2026. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland

Population estimate in the CP	Habitat Requirements	Threats and Pressures relevant to the CP	Aligning with Site Specific Conservation Objectives	Ecological Coherence with Annex I habitats in the CP	Required Agricultural Management Measures	Benefits of conservation participation
<p>The Irish distribution of the Lesser Horseshoe bat is confined to six counties; Mayo, Galway, Clare, Limerick, Kerry and Cork (Aughney <i>et al.</i>, 2018; NPWS, 2018; NPWS & VWT, 2022). Consequently, the MSC CP area is the only HHP CP area where they are found. Of particular importance in MSC is their population stronghold in east Clare.</p> <p>In previous years, NPWS (2018) reported an overall 'favourable' conservation status for the Lesser Horseshoe Bat, with an estimated population of 14,000 in Ireland. However, this has decreased to the rank of 'unfavourable inadequate' in the most recent report. Nationwide, there are now estimated to be 12,720 individuals confined to clusters, with large areas containing few or no colonies (NPWS & VWT, 2022).</p>	<p>The species relies on a network of roost sites with suitable foraging habitat within 2.5km of these, connected by linear landscape features (NPWS, 2018; NPWS & VWT, 2022).</p> <p>Roosting Requirements:</p> <p>The roost network may include satellite, transitional, night, summer, winter, and maternity roosts (NPWS, 2018). Unlike other bat species, the Lesser Horseshoe Bat is unable to land and crawl, and therefore needs a structure suitable to fly directly into to roost (NPWS & VWT, 2022). Such roosts are often large, unoccupied old buildings. In general, slate-roofed stone structures with open windows and doors for access are favoured. Other roost sites include caves, fissures, cellars, mines, and purpose built structures (NPWS & VWT, 2022).</p> <p>Foraging Requirements:</p> <p>When foraging, the species has a positive association for both broadleaf woodland and mixed forests (NPWS & VWT, 2022), including riparian vegetation (NPWS, 2018). Due to the threat of predation and the</p>	<p>There are many threats to the population of Lesser Horseshoe Bat in Ireland, and all exacerbate the main issue of isolated sub-populations. Connectivity constraints have led to genetically distinct clusters within the national population, isolated from each other to varying degrees (Aughney <i>et al.</i>, 2018; NPWS & VWT, 2022). This has been the result of agricultural intensification and increasing urbanisation, as these cause widespread linear landscape feature loss, habitat fragmentation, disturbance, and light pollution (Roche <i>et al.</i>, 2012; NPWS, 2018; NPWS & VWT, 2022).</p> <p>In addition to the loss of connectivity features, Lesser Horseshoe Bat roosts are often threatened by the renovation or deterioration of old</p>	<p>The Lesser Horseshoe Bat [1303] is Annex II-listed in the Habitats Directive, and therefore requires the designation of Special Areas of Conservation (Aughney <i>et al.</i>, 2018; NPWS, 2018). 41 SACs have been designated for the species, containing between 5000 & 7000 individuals (NPWS & VWT, 2022).</p> <p>Eight of these SACs falls within the MSC CP area; Old Domestic Buildings, Rylane SAC; Ballycullinan, Old Domestic Buildings SAC; Cregg House Stables, Crusheen SAC; Danes Hole, Poulmalacka SAC; Dromore Woods & Loughs SAC; Lough Cutra SAC; Newgrove House SAC; and Old Farm Buildings, Ballymacrogan SAC.</p> <p>If specific actions to promote connectivity were taken, other SACs within the CP areas have the potential to be colonised by the species. These include:</p> <p>Drummin Wood SAC [002181]</p> <p>Pollnacknockuan Wood Nature Reserve SAC [000319]</p> <p>Derrycrag Wood Nature Reserve SAC [000261]</p>	<p>Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, Alnion incanae, Salicion albae) [91EO]</p> <p>Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles [91AO]</p> <p><i>Taxus baccata</i> woods of the British Isles [91JO]</p>	<p>CA01: Prevent conversion of natural and semi-natural habitats, and habitats of species into agricultural land</p> <p>CA02: Restore small landscape features on agricultural land</p> <p>CA03: Maintain existing extensive agricultural practices and agricultural landscape features</p> <p>CA09: Manage the use of natural fertilisers and chemicals in agricultural (plant and animal) production</p> <p>CA16: Other measures related to agricultural practices</p> <p>CB01: Prevent conversion of (semi-) natural habitats into forests and of (semi-)natural forests into intensive forest plantation</p> <p>CB04: Adapt/manage reforestation and forest regeneration</p> <p>CB05: Adapt/change forest management and exploitation practices</p> <p>CB08: Restoration of Annex I forest habitats</p>	<p>The management of land to promote suitable Lesser Horseshoe Bat habitat will benefit the following (including but not limited to):</p> <ul style="list-style-type: none"> Native broadleaved woodlands and the vast variety of species that are associated with them Other species which may rely entirely on linear features such as hedgerows, including pollinators, small mammals, other bat species, and a large variety of birds. Species which often use linear features to forage, particularly raptors such as hen harrier, kestrel, and barn owl. Species which use old structures to roost or nest, such as other bat species, barn owl, and kestrel. Water quality where native deciduous trees are planted in riparian areas.

	<p>specialisation of it's echolocation call to fly in dense vegetation, the Lesser Horseshoe bat is reluctant to fly more than 5m from a feature (NPWS & VWT, 2022). Therefore, linear landscape features such as treelines, hedgerows, stone walls, and even reedbeds are vital for navigation and commuting between roosts and feeding areas (NPWS, 2018; NPWS & VWT, 2022). The species is the most photophobic of all the Irish bats, keeping a great distance from light polluted areas (NPWS & VWT, 2022).</p> <p>Their diet reflects an opportunistic and generalist forager, hunting flying insects such as diptera (midges, crane flies etc.) lepidoptera (moths, butterflies, etc.), a wide variety of invertebrates associated with aquatic habitats, and particularly dung flies in winter (NPWS & VWT, 2022).</p>	<p>buildings (Roche <i>et al.</i>, 2012; NPWS, 2018) and the unsympathetic management or destruction of native deciduous woodland for foraging (NPWS, 2018).</p> <p>Studies are required to assess the impact of anthelmintic use on prey availability for the species, which may be an issue in winter (NPWS & VWT, 2022).</p>	<p>Rosturra Wood SAC [001313]</p> <p>Gortacarnaun Wood SAC [002180]</p> <p>Loug Derg, North-East Shore SAC [002241]</p> <p>Slieve Bloom Mountains SAC [000412]</p> <p>River Barrow and River Nore SAC [002162]</p> <p>Blackwater River (Cork/Waterford) SAC [002170]</p> <p>Lower River Suir SAC [002137]</p>		<p>CB09: Manage the use of chemicals for fertilisation, liming and pest control in forestry</p>	
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10.2.7 Barn Owl (*Tyto alba*)

Context:

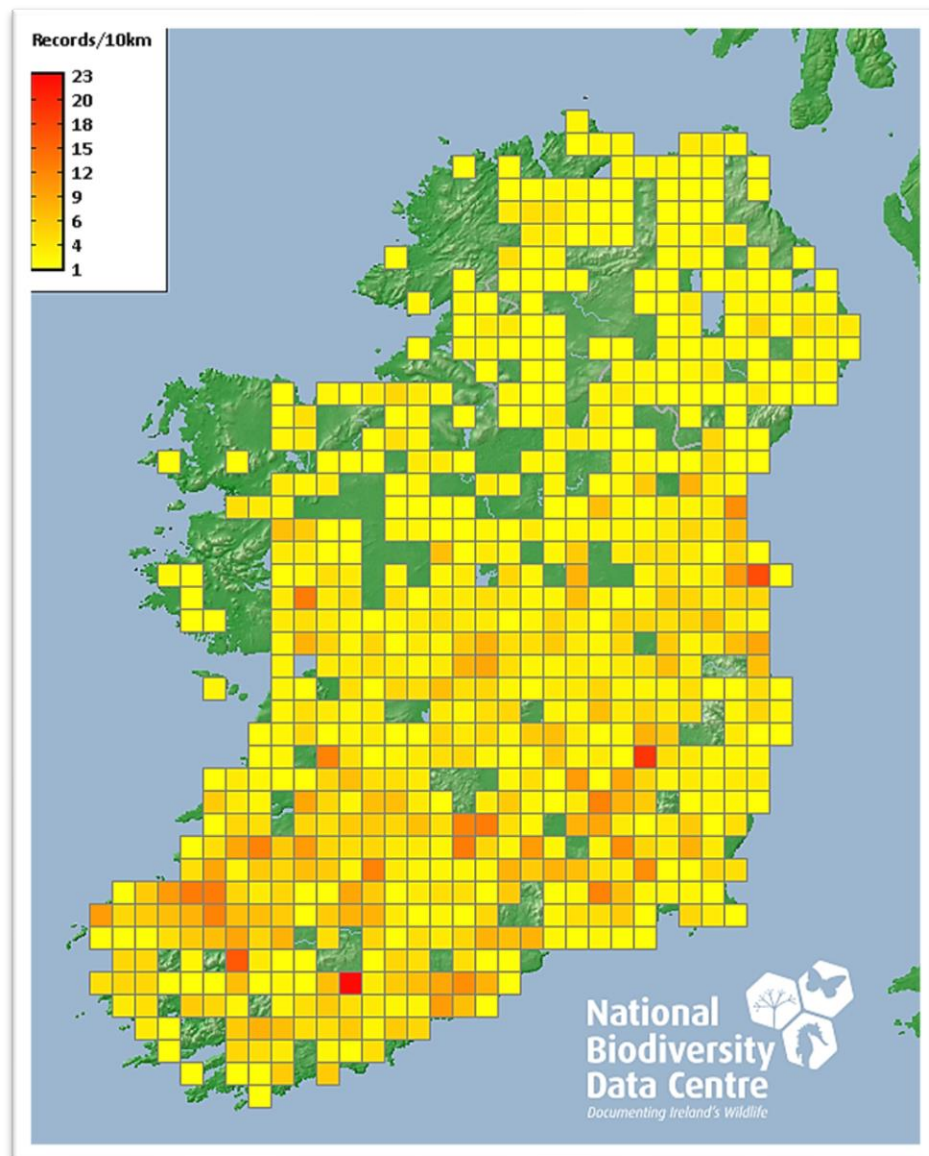
The barn owl is a distinctive bird of prey belonging to the owl family *Tytonidae*, associated with farmland habitats in Ireland (Hardey *et al.*, 2009; Lusby & O'Clery, 2014). As a largely nocturnal species, it is highly secretive and can go unnoticed in an area while being sensitive to disturbance (Hardey *et al.*, 2009).

Strong links exist between the barn owl and the cultural heritage of Ireland, and the conservation prioritisation of this 'farmer's friend' is well supported and advocated for amongst local communities (Lusby & O'Clery, 2014). Despite this, the most recent figures indicate a long-term population decline of 50% in the Irish landscape (Gilbert *et al.*, 2021). There are several contributing issues behind this decline which affect both suitable habitat and prey availability; agricultural landscape alteration, the loss of suitable nesting and roosting sites (Lusby & O'Clery, 2014), the increased use of anti-coagulant rodenticide, and the expansion of major road infrastructure (Lusby & O'Clery, 2014; O'Donoghue *et al.*, 2020).

Barn owls exhibit high site fidelity, usually remaining in the same territory their whole lives after they disperse as juveniles (Hardey *et al.*, 2009; Lusby & O'Clery, 2014). Therefore, maintaining quality habitat within their current range should be prioritised, especially in stronghold areas. The MWSU CP area is ideally placed for this, as it overlaps greatly with the highest densities of barn owl according to the most recent Bird Atlas (2007–2011; Balmer *et al.*, 2013).

Useful references:

- Balmer, D. E., Gillings, S., Caffrey, B. J., Swann, R. L., Downie, I. S. & Fuller, R. J. (2013). Bird Atlas 2007–2011: The Breeding and Wintering Birds of Britain and Ireland. BTO Books, Thetford
- Gilbert, G., Stanbury, A., & Lewis, L. (2021). Birds of Conservation Concern in Ireland 4: 2020–2026. Irish Birds, 43, 1–22.
- Hardey J., Crick H., Wernham C., Riley H., Etherridge B., Thompson D., 2009. Raptors: a field guide for surveys and monitoring.- Scottish Natural Heritage, Edinburgh.- Second edition.



- Lusby, J. & O’Clery, M. (2014). Barn Owls in Ireland: Information on the ecology of Barn Owls and their conservation in Ireland. BirdWatch Ireland.
- O’Donoghue, B.G., Casey, M.J., Malone, E., Carey, J.G.J, Clarke, D. & Conroy, K. (2020) Recording and Addressing Persecution and Threats to Our Raptors (RAPTOR): a review of incidents 2007–2019. Irish Wildlife Manuals, No. 126. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.
- National Biodiversity Data Centre, Ireland, Barn Owl (*Tyto alba*), image, accessed 05 April 2023, <<https://maps.biodiversityireland.ie/Species/TerrestrialDistributionMapPrintSize/11644>>

Population estimate in the CP	Habitat Requirements	Threats and Pressures relevant to the CP	Aligning with Site Specific Conservation Objectives	Ecological Coherence with other Annex I habitats in the CP	Required Agricultural Management Measures	Benefits of conservation participation
<p>The most recent reports show an estimated barn owl population of approximately 562–702 breeding pairs in Ireland (O'Donoghue <i>et al.</i>, 2020). While the species resides in all three HHP CP areas, the MWSU CP area particularly overlaps with a large section of the breeding range 'stronghold' as indicated in the most recent Bird Atlas (2007–2011; Balmer <i>et al.</i>, 2013; Lusby & O'Clery, 2014).</p> <p>The barn owl is red listed on the Birds of Conservation Concern in Ireland 4: 2020–2026 (Gilbert <i>et al.</i>, 2021), with numerous reports indicating a decline in both population numbers and distribution (Balmer <i>et al.</i>, 2013; O'Donoghue <i>et al.</i>, 2020; Gilbert <i>et al.</i>, 2021). The most recent figures suggest a 33% decline in breeding population in the short term, while this increases to a 50% decline in the long term</p>	<p>The barn owl is a bird of lowland farmland, with the majority of nest sites located below 150m in altitude (Hardey <i>et al.</i>, 2009; Lusby & O'Clery, 2014). Ruined or derelict buildings are important for nesting and roosting opportunities. In the absence of these, the species is becoming increasingly reliant on man-made nest boxes, while hollow cavities in trees may also occasionally be used (Lusby & O'Clery, 2014).</p> <p>Foraging activity around the nest or roost site is dependent on habitat quality and prey availability, with large variation in home range size as a consequence (Lusby & O'Clery, 2014). Optimal foraging areas include rough grassland, grassy margins, hedgerow and woodland edges, and wetland sites (Hardey <i>et al.</i>, 2009; Lusby & O'Clery, 2014). Intensively farmed landscapes can still support the species, if sufficient areas of rough grassland and edge habitats are available (Lusby & O'Clery, 2014).</p> <p>Small rodents are relied upon as prey, such as rats, mice, shrews, and voles, while birds and frogs may also be taken (Lusby & O'Clery, 2014).</p>	<p>Threats to the species include secondary poisoning and road collision, with 45 confirmed injuries and fatalities from such incidents recorded between 2007–2019 in Ireland (O'Donoghue <i>et al.</i>, 2020). The national expansion of road network infrastructure increases the risk of collisions when birds are in low flight, particularly amongst juveniles who use roadways as easy hunting areas (Lusby & O'Clery, 2014). Road collisions are concentrated in the MWSU CP area, focused in the areas of the M7 & M8 motorways (O'Donoghue <i>et al.</i>, 2020).</p> <p>Due to their reliance on small mammals, the majority of Irish barn owls have sub-lethal concentrations of rodenticide in their system. Exposure to the inappropriate use of such anti-</p>	<p>Barn owls are not Annex I species, and therefore have no designated special protection areas (SPAs).</p> <p>Within the CP areas, the only SAC cited to support the barn owl is the Blackwater River (Cork/Waterford) SAC [002170] in the MWSU CP area.</p>	<p>Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites) [6210]</p> <p>Lowland hay meadows (<i>Alopecurus pratensis</i>, <i>Sanguisorba officinalis</i>) [6510]</p> <p>Wetland and Waterbirds [A999]</p>	<p>CA01: Prevent conversion of natural and semi-natural habitats, and habitats of species into agricultural land</p> <p>CA02: Restore small landscape features on agricultural land</p> <p>CA03: Maintain existing extensive agricultural practices and agricultural landscape features</p> <p>CA09: Manage the use of natural fertilisers and chemicals in agricultural (plant and animal) production</p> <p>CB01: Prevent conversion of (semi-) natural habitats into forests and of (semi-) natural forests into intensive forest plantation</p> <p>CE01: Reduce impact of transport operation and infrastructure</p>	<p>The management of land to promote suitable barn owl habitat will benefit the favourable conservation status of (including but not limited to):</p> <ul style="list-style-type: none"> species which use extensively grazed grassland and grassy margins, such as the marsh fritillary and other pollinators, farmland passerine species, and the Irish hare other predators with similar prey requirements, that are susceptible to secondary rodenticide poisoning, such as the kestrel, buzzard, long-eared owl etc. species which use hedgerows and other linear landscape features, such as bat species, pine marten, hen harrier etc. species which use derelict/ruined buildings, such as bat species, chough, kestrel etc.

(Gilbert <i>et al.</i> , 2021). In terms of range contraction, the most recent data indicates a 47% decrease in the long term (Gilbert <i>et al.</i> , 2021).		<p>coagulants on farmyards is often fatal (Lusby & O'Clery, 2014).</p> <p>The intensification of agriculture in recent decades has included a switch from hay to silage, the increased use of pesticides, and the loss of suitable habitat (hedgerow removal and the decline of small-scale tillage). These changes have significantly affected prey availability for the barn owl. Additionally, the loss of nesting and roosting sites such as the demolition or refurbishment of old ruined buildings has put further pressure on the breeding success of the species (Lusby & O'Clery, 2014).</p>				
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Context:

EU member states have a legal obligation to protect all migratory species and their habitats under the Birds Directive, with a particular focus on protecting wetland areas. Irish wetlands are abundant and diverse, providing suitable habitat for over 1 million waterbirds each winter. Due to the characteristics of Ireland's wetlands, they play a critical role in the ecology of eight species of goose and swan and are particularly attractive due to the location on the East Atlantic Flyway and mild generally ice-free climate (Crowe et al., 2009).

Considering their prevalence in the HHP CP areas and their conservation status, this document focuses on the Barnacle Goose (*Branta leucopsis*), Whooper Swan (*Cygnus cygnus*), and Light-Bellied/Pale-Bellied Brent goose (*Branta bernicla hrota*; referred to as Brent goose in this document), which are all migratory species overwintering in Ireland. As herbivorous species, these birds arrive from Iceland, Canada, and Greenland to graze on large areas of farmland close to wetland roosting sites during the winter (Crowe et al., 2009; Doyle et al., 2018; Brides et al., 2021).

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Population estimate in the CP	Habitat Requirements	Threats and Pressures relevant to the CP	Aligning with Site Specific Conservation Objectives	Ecological Coherence with other Annex I habitats in the CP	Required Agricultural Management Measures	Benefits of conservation participation
<p>Barnacle geese, Brent geese, and Whooper swans are Amber Listed on the Birds of Conservation Concern in Ireland 4: 2020-2026, and can be found in all three HHP CP areas.</p> <p>Of significance is that internationally important populations of both Barnacle and Brent goose are found here, defined as more than 20% of the European wintering population (Gilbert <i>et al.</i>, 2021).</p> <p>Despite strong evidence of positive long term trends for migratory geese and swan populations (Doyle <i>et al.</i>, 2018; Brides <i>et al.</i>, 2021; Kennedy <i>et al.</i>, 2022), there has been declines highlighted in recent years (Doyle <i>et al.</i>, 2018; Kennedy <i>et al.</i>, 2022).</p> <p>Barnacle Goose: The most recent census identified >16,000 Barnacle Geese wintering in</p>	<p>All three species graze, most often found in a single species flock (Crowe <i>et al.</i>, 2009). Barnacle and Brent geese follow a coastal distribution while wintering in Ireland, while whooper swans are widespread across the entire country (Crowe <i>et al.</i>, 2009; Balmer <i>et al.</i>, 2013).</p> <p>Barnacle Goose: Barnacle geese can be found grazing on farmland a significant distance away from wetlands. They are distributed mostly on the islands along the west and northwest coast of Ireland, feeding predominantly on grasslands. (Crowe <i>et al.</i>, 2009).</p> <p>Brent Goose: Brent geese are the most maritime of goose species, often seen in estuarine areas and traditionally relying on vegetation in intertidal coastal areas (Doyle <i>et al.</i>, 2009; Tadeo & Gammell, 2018). However, since the dramatic depletion of eelgrass meadows in the 1930s, the species has become reliant on managed grassland, such as pasture, golf courses, and sports pitches, especially in late winter (Tadeo & Gammell, 2018; Crowe <i>et al.</i>, 2009).</p> <p>Whooper Swan: The majority of wintering whooper</p>	<p>There have been no specific studies identified in Ireland to outline the threats to wintering populations of geese and swans. Across Europe, their populations are affected by conflicts with agricultural interests due to grazing pressure. Additionally, disturbance, habitat deterioration, illegal hunting, lead poisoning, and collisions with structures such as powerlines and wind turbines are highlighted as threats to populations (European Commission, 2023).</p> <p>H5N1 avian influenza virus has been identified as a potential threat to all waterfowl species in Ireland, due to the mass movement of migratory species and the use of a habitat by multiple species (Crowe <i>et al.</i>, 2009).</p>	<p>As SCI species, SPAs can be designated for all three species. The barnacle goose and whooper swan are also listed as Annex I species.</p> <p>The Breifne CP area is of particular importance for these species as a qualifying interest (QI). Ardboline Island and Horse Island SPA, Ballintemple and Ballygilgan SPA, and Inishmurray SPA all list Barnacle Goose (<i>Branta leucopsis</i>) [A045] as a QI.</p> <p>For Light-Bellied Brent Goose (<i>Branta bernicla hrota</i>) [A046], Cummeen Strand SPA and Donegal Bay SPA are designated.</p> <p>More broadly, Wetland and Waterbirds [A999] is listed as a QI for Drumcliff Bay SPA, Lough Arrow SPA, Cummeen Strand SPA, Donegal Bay SPA, and Lough Derg (Shannon) SPA.</p> <p>All SPAs mentioned above fall within the Breifne CP area, with the exception of Lough Derg (Shannon) SPA, which lies in the MSC CP area.</p>	<p>Wetland and Waterbirds [A999]</p> <p>Estuaries [1130]</p> <p>Large shallow inlets and bays [1160]</p> <p>Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>) [1330]</p> <p>Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]</p>	<p>CA04 Reinstatement appropriate agricultural practices to address abandonment, including mowing, grazing, burning or equivalent measures</p> <p>CA05 Adapt mowing, grazing and other equivalent agricultural activities</p> <p>CA15 Manage drainage and irrigation operations and infrastructures in agriculture</p> <p>CC03 Adapt/manage renewable energy installation, facilities and operation</p> <p>CF10 Manage changes in hydrological and coastal systems and regimes for construction and development</p> <p>CH03 Reduce impact of other specific human actions</p>	<p>The management of land to promote suitable swan and goose habitat will benefit the favourable conservation status of (including but not limited to):</p> <ul style="list-style-type: none"> The vast range of species which use wetland sites, including invertebrates, amphibians, birds, and mammals. Other waterfowl and waders that are susceptible to disturbance and habitat loss.

<p>Ireland, representing a 7% decrease since the previous estimate in 2013. In contrast to the short term decline, the population has risen from just 2,800 individuals in the 1950s before legal protection was in place for the species (Doyle <i>et al.</i>, 2018).</p> <p>The Breifne CP area is of particular importance for wintering barnacle geese (Balmer <i>et al.</i>, 2013; Doyle <i>et al.</i>, 2018). Of note is a flock of 4,410 Barnacle geese wintering in Co.Sligo, which falls within the Breifne CP area. This single flock represents over 27% of the national population (Doyle <i>et al.</i>, 2018).</p> <p>Brent Goose: According to I-WeBS survey data, the Brent goose population in Ireland has suffered a decline of 11.2% over the short term (5 year period). This is again in contrast with the long term data, which indicates a 93.3% increase over 23 years (Kennedy <i>et al.</i>, 2022).</p> <p>Whooper Swan: At over 14,000 birds, the Republic of Ireland hosts</p>	<p>swans use farmed pasture, at over 70%, while permanent waterbodies and arable land is also used to a lesser extent (Brides <i>et al.</i>, 2021). Even when grazing, they tend to remain close to waterbodies at all times (Crowe <i>et al.</i>, 2009).</p> <p>All of these species leave their foraging grounds and return to roost on wetlands by night, which occasionally may be over 20km away (Crowe <i>et al.</i>, 2009).</p>					
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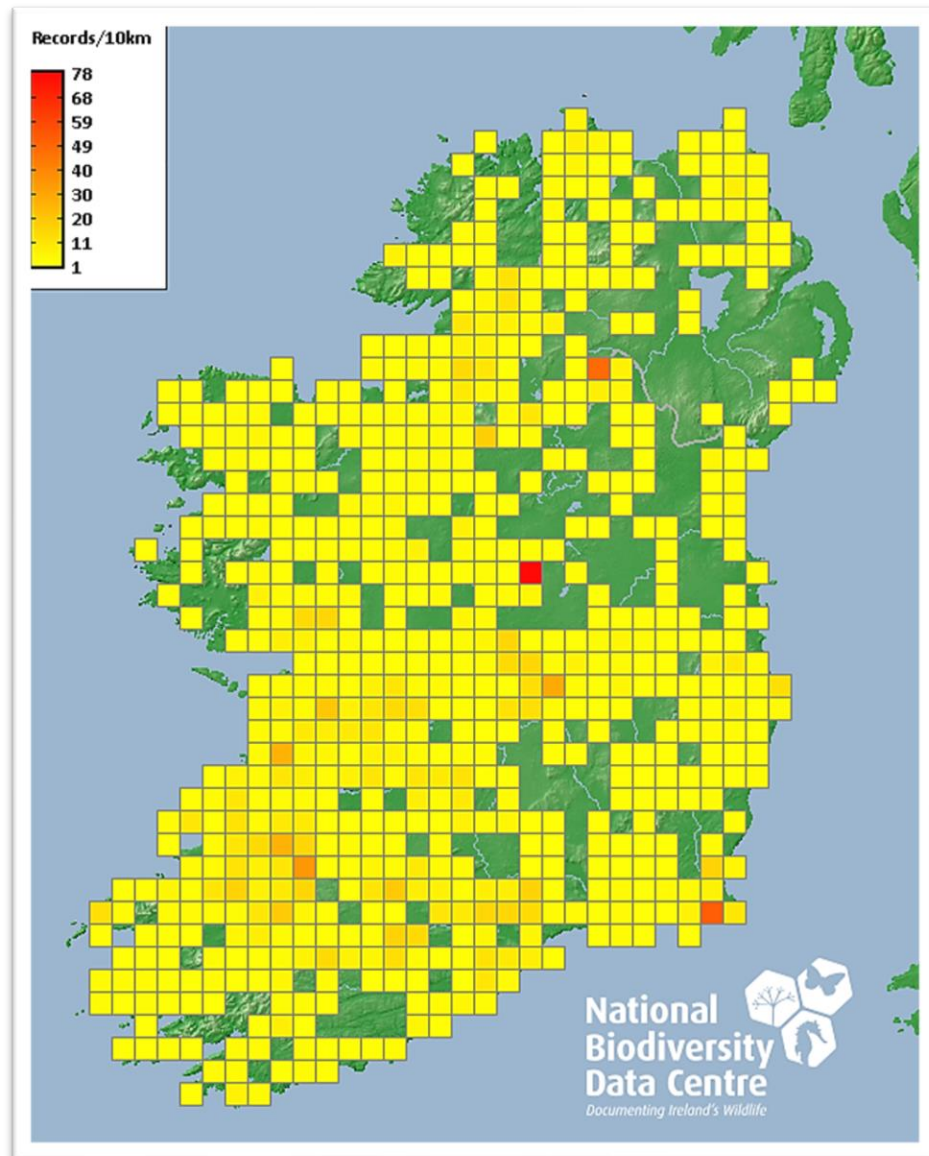
over 33% of the Icelandic population of whooper swans during the winter months. In contrast to the geese species, their population has risen by 22% in the short term (5 year period) (Brides *et al.*, 2021). While wintering whooper swans are distributed in all three HHP CP areas, the Breifne CP area overlaps with high density areas, as indicated by the most recent Bird Atlas (2007–2013; Balmer *et al.*, 2013).

10.2.9 Hen Harrier (*Circus cyaneus*)

Context:

The Hen Harrier is a ground nesting, sexually dimorphic medium sized raptor specialised for foraging and breeding in open treeless habitats (Cramp & Simmons 1980). The Hen Harrier is sensitive to habitat loss (O'Donoghue 2012), changing habitat suitability (Madders 2003; Irwin et al. 2012; Wilson et al. 2012); fragmentation (Sheridan et al. 2020), predation (Green & Etheridge 1999; McMillan 2014; Fernández-Bellon et al. 2018) and human disturbance (Ruddock & Whitfield 2007; Whitfield et al. 2008).

The threats and pressures acting on the breeding Hen Harrier population in Ireland have been rigorously documented by Ruddock et al. (2016), and later modelled by Carravagi et al. (2020). A review of expert opinion on perceived threats on the European population of Hen Harrier was undertaken by Fernandez-Bellon et al. (2021). However, these pressures are not limited to the breeding season, a period that accounts for only 4-5 months of the year (O'Donoghue 2019). Hen Harriers will spend at least 8 months (mid-July to mid-March) either remaining on breeding grounds, dispersing widely, and establishing a core winter range (O'Donoghue 2010; Murphy 2019; 2021).



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Population estimate in the CP	Habitat Requirements	Threats and Pressures relevant to the CP	Aligning with Site Specific Conservation Objectives	Ecological Coherence with other Annex I habitats in the CP	Required Agricultural Management Measures	Benefits of conservation participation
<p>Over the last 15 years, the Irish Hen Harrier Winter Survey (IHHWS) has amassed a large dataset that provides vital information on Hen Harrier wintering ecology (O'Donoghue 2019). A combination of the citizen science based IHHWS and the satellite tracking information identified 203 winter roost locations in Ireland (O'Donoghue 2020).</p> <p>A national winter population estimate using best available data on productivity and mortality values estimated a range of 311 – 435 individuals wintering in Ireland (Wilson-Parr 2013).</p> <p>In the ESE CP area the IHHWS indicate there are 2 known winter roost areas.</p> <p>In the MWSU CP the IHHWS has indicated that there are 36 winter roost areas.</p> <p>In the NCU there are 4 known roost</p>	<p>Hen Harrier tend to utilise wintering grounds which are typically lowland sites below 100m (O'Donoghue 2010). However there is substantial overlap with breeding areas and continued use of upland regions in winter (O'Donoghue 2020).</p> <p>Outside the breeding season Hen Harriers gather at communal roost sites at night. Hen Harrier roost sites can be communal (frequently used by several individuals and other raptor species) or solitary (used by individual birds regularly and/or infrequently). The numbers of individual wintering birds occupying each roost site are highly variable and patterns of roost site use are poorly understood.</p> <p>Hen Harrier select roost sites with suitable cover, low ambient levels of disturbance and presumably close to suitable foraging areas to roost (O'Donoghue, 2010). In Ireland the majority of roosts are located in reedbeds, heather/bog and rank grassland but also fen, bracken gorse and saltmarsh (O'Donoghue 2020).</p>	<p>B01 – Conversion to forest from other land uses, or afforestation (excluding drainage).</p> <p>A03 – Conversion from mixed farming and agroforestry systems to specialised (e.g. single crop) production.</p> <p>A02 – Conversion from one type of agricultural land use to another (excluding drainage and burning).</p> <p>D01 – Wind, wave and tidal power, including infrastructure</p> <p>B09 Clear-cutting, removal of all trees (M).</p> <p>A13 – Reseeding of grasslands and other semi-natural habitats.</p> <p>A31 – Drainage for use as agricultural land.</p> <p>A21 – Use of plant protection chemicals in agriculture.</p> <p>A15 – Tillage practices (e.g. ploughing) in agriculture.</p>	<p>No Special Protection Areas designated for wintering Hen Harrier occur within either the MWSU, NCU or ESE CP areas.</p> <p>There are two Special Protection Areas designated for wintering Hen Harrier. Lough Corrib SPA, and Wexford Harbour and Slobbs SPA. Tacumshin Lake SPA is cited as a site that supports winter Hen Harrier however is not a listed Species of Conservation Interest.</p> <p>No SSCOs have been developed for either of the two wintering SPAs, however generic objective applies:</p> <p>To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA.</p>	<p>Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinia caerulea) (6410).</p> <p>Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430)</p>	<p>CA02 – Restore small landscape features on agricultural land.</p> <p>CA15 – Manage drainage and irrigation operations and infrastructures in agriculture.</p> <p>CA01 – Prevent conversion of natural and semi-natural habitats, and habitats of species into agricultural land.</p> <p>CA03 – Maintain existing extensive agricultural practices and agricultural landscape features.</p> <p>CB04 – Adapt/manage reforestation and forest regeneration.</p> <p>CC03 – Adapt/manage renewable energy installation, facilities and operation.</p> <p>Agricultural management measures in the CP will contribute to the Draft Threat Response Plan (NPWS 2021):</p>	<p>The encouragement of low intensity management of late succession Juncus-Galium pasture within important wintering areas and the establishment of new hedgerows will benefit (including but not limited to):</p> <p>The objectives of the All Ireland Pollinator Plan 2021 – 2025.</p> <p>The favourable conservation status of eight other resident bat species occurring within the Member State, contributing to the Agreement on the Conservation of Populations of European Bats (EUROBATS).</p> <p>Within the CP, hedgerows will also benefit the prey species of the Hen Harrier [A802] within breeding and wintering home ranges.</p>

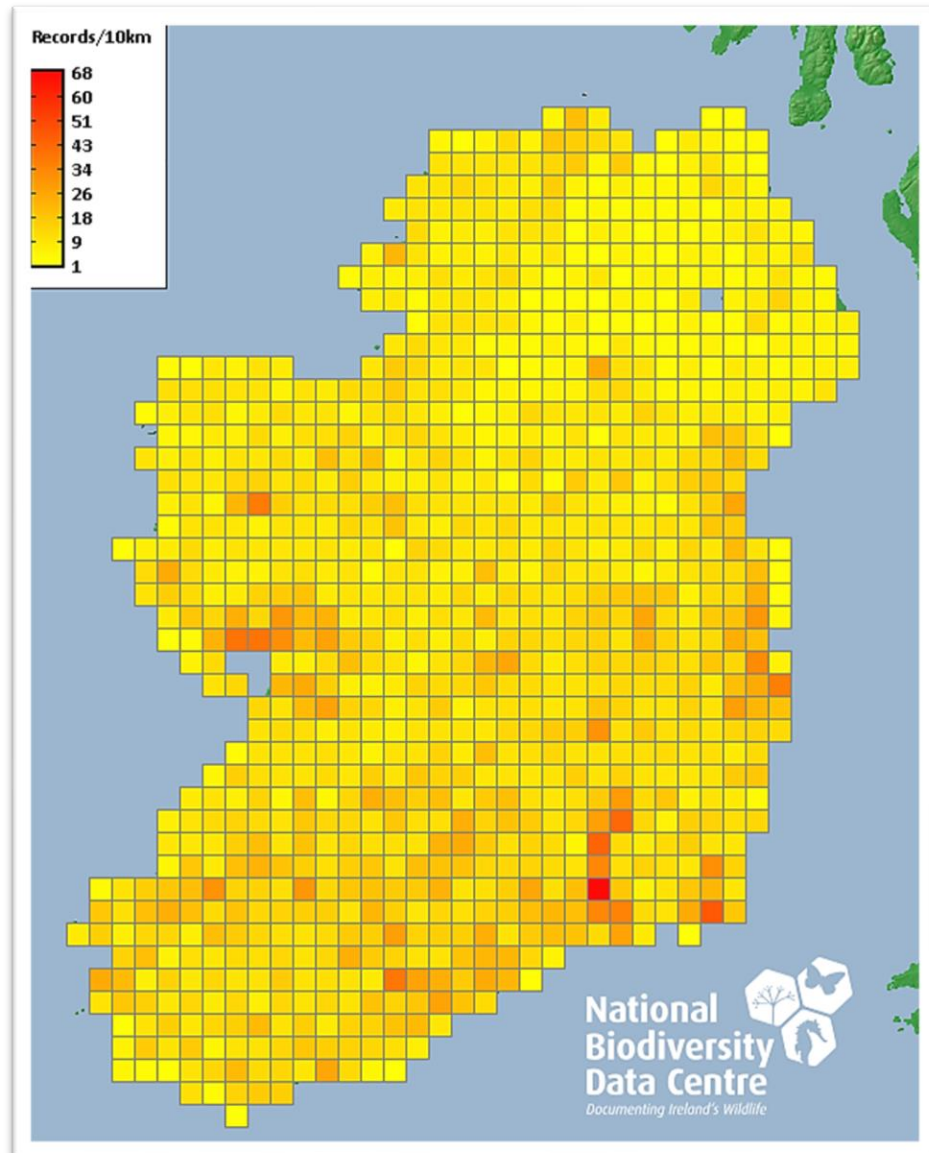
<p>sites, however no roosts have been found in County Leitrim, but there have been casual sightings of harriers there each winter that suggest there are likely to be roosts in the county.</p>		<p>It is recognised that the operation and administration of the CPs could represent a threat to winter Hen Harrier where the design of ecologically relevant scorecards and co-ordination of monitoring effort is lacking. The former could incentivise and value the increasingly unsuitable vegetation structure in wet grassland and peatland habitats. The latter could result in survey effort replication and disturbance at sensitive roost sites.</p>				
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Context:

The kestrel, or *Pócaire Gaoithe* (Wind Puncher), is a distinctive bird of prey in the falcon family, known for its characteristic hovering behaviour when foraging. They are the most widely distributed raptor in Ireland, occurring in 88% of survey squares during the Bird Atlas (2007-2011) monitoring period (Balmer *et al.*, 2013). However, they appear on the Red List of Birds of Conservation Concern Ireland (2020-2026; Gilbert *et al.*, 2021), and the most recent indications show a staggering population decline of 45%, using figures between 1998 & 2016 (Lewis *et al.*, 2019). Particular hotspots for the species occur in all three HHP CP regions (Figure 1; Kennedy *et al.*, 2022), and conservation efforts to support the species would have benefits for a wide range of habitats and species as they are a generalist bird species (Gilbert *et al.*, 2021; Kennedy *et al.*, 2022).

Useful references:

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- Wilson-Parr, R. & O'Brien, I. (Eds.) (2019) Irish Raptor Study Group Annual Review 2018.



- National Biodiversity Data Centre, Ireland, Common Kestrel (*Falco tinnunculus*), image, accessed 05 April 2023, <<https://maps.biodiversityireland.ie/Species/TerrestrialDistributionMapPrintSize/11324>>

Population estimate in the CP	Habitat Requirements	Threats and Pressures relevant to the CP	Aligning with Site Specific Conservation Objectives	Ecological Coherence with Annex I habitats in the CP	Required Agricultural Management Measures	Benefits of conservation participation
<p>There is no dedicated national survey for the kestrel, however it is included in the Countryside Bird Survey (CBS; Lewis <i>et al.</i>, 2019). The most recent results indicate population somewhere between 9,918–17,393 birds, with a best estimate of 13,500 (Lewis <i>et al.</i>, 2019 ; O'Donoghue <i>et al.</i>, 2020).</p> <p>The CBS highlights that the survey methodology used was not well suited to accurately assessing numbers of the species, however it can be used to give a good indication of population trend; in Ireland, the kestrel population has declined by 45% between 1998 & 2016 (Lewis <i>et al.</i>, 2019).</p> <p>The species can be found in all three HHP CP areas as its breeding distribution covers the majority of the country, however this too has seen dramatic declines:</p>	<p>As a generalist species, the kestrel may occupy almost any habitat type in Ireland if there is sufficient nesting and foraging opportunities. These include, but are not limited to, all types of farmland, upland heath, urban areas, young conifer plantations, dune systems, and quarries. Montane areas, large dense forests, and treeless wetlands tend to be avoided, (Hardey <i>et al.</i>, 2006).</p> <p>In these habitats, they largely prey on small mammals and birds, with rodents constituting most of their diet (Hardey <i>et al.</i>, 2006).</p> <p>Nesting site requirements are broad, with birds using old stick-built nests from other species, natural and manmade ledges, hollows in trees, and occasionally on the ground in heather. The species will readily use nest boxes, and will tolerate close proximity to humans relative to other falcon species. As a typically lowland species (Kennedy <i>et al.</i>, 2022), nests are usually located below 480m ASL (Hardey <i>et al.</i>, 2006).</p> <p>The breeding season lasts from March to August, however birds can be territorial all year round. Home ranges for kestrel can range from 1km² to 10km²</p>	<p>There have been no studies into the decline of kestrel in Ireland in recent decades, however sources suggest they centre around prey availability, intensification on agricultural farmland, and secondary rodenticide poisoning (Wilson-Parr & O'Brien, 2019); Lewis <i>et al.</i>, 2019; Gilbert <i>et al.</i>, 2021). There have been several incidents of poisoning of kestrel across Ireland due to rodenticide, all of which proved fatal (O'Donoghue <i>et al.</i>, 2020).</p>	<p>Like many farmland birds, the kestrel appears on the Red List in the Birds of Conservation Concern Ireland (2020–2026; Gilbert <i>et al.</i>, 2021) report & is protected under Schedule 4 of the Wildlife Act (1976).</p> <p>It is not an Annex I species under the Birds Directive, and therefore has no designated SPAs. However, it is cited as occupying Derrycrag Wood SAC and Dromore Woods and Loughs SAC, both of which are found in the MSC CP area.</p> <p>Given their country-wide distribution and (though declining) substantial population, it is probable that they the species is widespread throughout all HHP CP areas.</p>	<p>Active raised bogs [7110]</p> <p>Alpine and boreal heaths [4060]</p> <p>Atlantic decalcified fixed dunes (Calluno-Ulicetia) [2150]</p> <p>Blanket bogs (* if active bog) [7130]</p> <p>Bog woodland [91D0]</p> <p>Calaminarian grasslands of the Violetoia calaminariae [6130]</p> <p>Calcareous and calcshist screes of the montane to alpine levels (Thlaspietea rotundifolii) [8120]</p> <p>Calcareous rocky slopes with chasmophytic vegetation [8210]</p> <p>Decalcified fixed dunes with Empetrum nigrum [2140]</p> <p>Degraded raised bogs still capable of natural regeneration [7120]</p> <p>Dunes with Salix repens ssp. argentea (Salicion arenariae) [2170]</p> <p>European dry heaths [4030]</p>	<p>CA02 Restore small landscape features on agricultural land</p> <p>CA03 Maintain existing extensive agricultural practices and agricultural landscape features</p> <p>CA16 Other measures related to agricultural practices</p> <p>CB01 Prevent conversion of (semi-) natural habitats into forests and of (semi-)natural forests into intensive forest plantation</p>	<p>The management of land to promote suitable Kestrel habitat will benefit the following (including but not limited to):</p> <ul style="list-style-type: none"> All lowland farmland birds species, many of which are Red Listed and rapidly declining. Other species which use manmade purpose built boxes, such as barn owl and bat species. All species subject to secondary rodenticide poisoning, including barn owl, buzzard, eagles, and fox. An extensive range of habitats and the vast number of species reliant upon them.

<p>10 year trend (2006–2016): – 31%</p> <p>25 year trend (1991–2016): – 22%</p> <p>44 year trend (1972–2016): – 35%</p> <p>These declines are most apparent in the west and midlands (Lewis <i>et al.</i>, 2019), particularly in the MSC CP area.</p>	<p>depending on prey abundance in the area (Hardey <i>et al.</i>, 2006).</p>			<p>Fixed coastal dunes with herbaceous vegetation ("grey dunes") [2130]</p> <p>Lowland hay meadows (<i>Alopecurus pratensis</i>, <i>Sanguisorba officinalis</i>) [6510]</p> <p>Mediterranean and thermo-Atlantic halophilous scrubs (<i>Sarcocornetea fruticosi</i>) [1420]</p> <p>Northern Atlantic wet heaths with <i>Erica tetralix</i> [4010]</p> <p>Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles [91A0]</p> <p>Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) [6210]</p> <p>Siliceous rocky slopes with chasmophytic vegetation [8220]</p> <p>Species-rich <i>Nardus</i> grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe) [6230]</p> <p>Vegetated sea cliffs of the Atlantic and Baltic Coasts [1230]</p>		
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Context:

The Kingfisher (*Alcedo atthis*) known as Cruidin in Irish is a resident on Irish streams, rivers and canals. The Kingfisher is very distinctive with brightly coloured plumage, its underparts are bright red/ orange while its wings and back of head are blue. Kingfisher on average is around 16cm in length, has a wingspan of 25cm with a dagger-shaped bill.

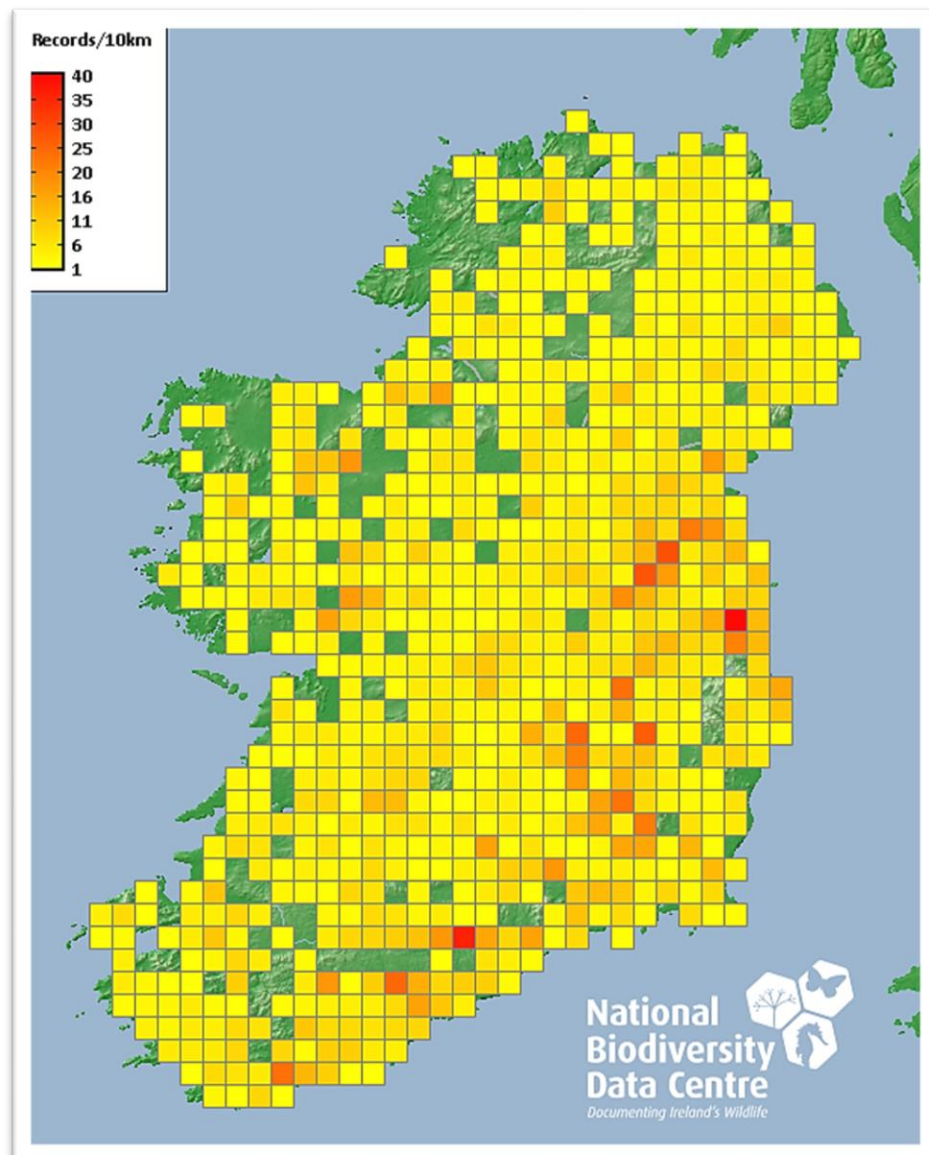
Wicklow (2010), Libois (1997) and Morgan and Glue (1977) provide a comprehensive overview of the habitat requirements of the Kingfisher with the availability of good quality, clear and slow flowing water being the foundation of suitable nesting and feeding habitat for the bird.

The Kingfisher appears on the Amber List in the Birds of Conservation Concern Ireland (2020-2026; Gilbert et al., 2021) report & is protected under Schedule 4 of the Wildlife Act (1976). The Kingfisher is an Annex I protected species under the Birds Directive. Gilbert et al., (2021) notes how the species has seen a 45% decline in recent decades and grows ever closer to appearing on the red list. Several

threats and pressures noted by Fuller (2020) have been outlined in the table below which have contributed to the decline of the Kingfisher in Ireland with the weather and in particular cold patches highlighted as a significant threat.

Useful references:

- Colhoun, K. and Cummins, S., 2013. Birds of conservation concern in Ireland. *Irish Birds*, 9, pp.523-544. (Colhoun and Cummins, 2013)
- Gilbert, G., Stanbury, A. and Lewis, L., 2021. Birds of conservation concern in Ireland 4: 2020–2026. *Irish Birds*, 43, pp.1-22. (Gilbert et al, 2021)
- Morgan, R. and Glue, D., 1977. Breeding, mortality and movements of Kingfishers. *Bird Study*, 24(1), pp.15-24. (Morgan and Glue, 1977)
- Wicklow, C., 2010. Assessment of the distribution and abundance of Kingfisher *Alcedo atthis* and other riparian birds on six SAC river systems in Ireland. (Wicklow, 2010)
- Libois, R., 1997. *Alcedo atthis*: Kingfisher. 0-85661-091-7. (Libois,1997).



- Fuller, R. (2020) "5 CHALLENGES KINGFISHERS FACE & HOW TO HELP THEM," Robert E Fuller Wildlife Artist, 18 June. Available at: <https://www.robertefuller.com/diary/5-challenges-kingfishers-face-how-to-help-them/> (Accessed: March 1, 2023). (Fuller, 2020)
- National Biodiversity Data Centre, Ireland, Common Kingfisher (*Alcedo atthis*), image, accessed 05 April 2023, <<https://maps.biodiversityireland.ie/Species/TerrestrialDistributionMapPrintSize/11112>>

Population estimates in the CP Zones.	Habitat Requirements	Ecological Coherence with Annex I habitats in the CP	Threats and Pressures relevant to the CP	Aligning with Site Specific Conservation Objectives	Agricultural Management Measures	Benefits of conservation participation
<p>It is noted by Colhoun and Cummins (2013) that information in relation to the abundance and range of waterbirds such as the kingfisher are far from comprehensive in Ireland. The Kingfisher population is believed to be widespread in Ireland with habitat quality and its abundance influencing their presence.</p> <p>Libois (1997) notes how it is difficult to access actual kingfisher bird numbers precisely on a large scale unless carried out across a long period with large fluctuations seemingly characteristic.</p> <p>The Kingfisher population has seen a 45% decline as noted by Gibert et al., (2021) and is close to becoming a red listed bird species.</p>	<p>Kingfishers breed near water where there is a readily available source of food. Nesting habitat and the nest site will mostly be in the bank of a stream or tributary of a major watercourse. Kingfishers prefer vertical or overhanging banks; those sloping away from the river are not normally chosen (Morgan and Glue, 1977).</p> <p>Kingfisher habitats in relation to waterways suitability includes whether the waterway is slow flowing, perches available for fishing and if a tall vertical bank is present with soft material into which they can dig their burrows (Wicklow, 2010).</p> <p>The basic habitat requirement for the Kingfisher comes down to the availability of clear water which supports small fish such as Stickleback, Minnow, and Chub and also larger aquatic insects (Libois, 1997).</p>	<p>Estuaries [1130]</p> <p>Mudflats and sandflats not covered by seawater at low tide [1140]</p> <p>Reefs [1170]</p> <p>Salicornia and other annuals colonising mud and sand [1310]</p> <p>Atlantic salt meadows (Glaucopuccinellietalia maritimae) [1330]</p> <p>Mediterranean salt meadows (Juncetalia maritimi) [1410]</p> <p>Water courses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion vegetation [3260]</p> <p>European dry heaths [4030]</p> <p>Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]</p> <p>Petrifying springs with tufa formation (Cratoneurion) [7220]</p> <p>Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0]</p> <p>Alluvial forests with Alnus glutinosa and Fraxinus excelsior</p>	<p>Kingfishers face several possible threats and pressures within the HHP CP zones.</p> <p>The weather and in particular cold temperatures and effects of hard winters can outweigh all other threats to Kingfishers' survival. Kingfishers struggle to hunt in freezing conditions and obviously cannot fish at all when water is frozen. But even summer cold snaps are a threat to kingfishers since these tiny birds are featherless for the first few weeks of their lives and the adult birds struggle to keep them warm if it gets too cold.</p> <p>Heavy rainfall can cause flooding which can lead to faster flowing water, which is clouded with mud, making it impossible for kingfisher to hunt. Flooding can also in turn see the destruction of nest sites.</p> <p>Chemical and biological pollution of</p>	<p>The Kingfisher appears on the Amber List in the Birds of Conservation Concern Ireland (2020-2026; Gilbert et al., 2021) report & is protected under Schedule 4 of the Wildlife Act (1976).</p> <p>It is an Annex I species under the Birds Directive and is a qualifying interest in the River Nore SPA and also mentioned present in the Middle Shannon Callows SPA.</p>	<p>Improving the status of waterways, preventing and or mitigating the pollution of waterways from industry/ agriculture and forestry.</p> <p>Providing Kingfishers with a nest site. Kingfishers nest in vertical mud banks at least three feet high with little or no vegetation on it. If you have a suitable bank, make sure it is clear of vegetation, particularly brambles as well as other debris.</p> <p>Kingfishers are early nesters and maintenance should be carried out where possible outside the breeding season. Education is key here. (Fuller, 2020)</p> <p>CA09 Manage the use of natural fertilisers and chemicals in agricultural (plant and animal) production.</p> <p>CA10 Reduce/eliminate point pollution to surface or ground waters from agricultural activities</p> <p>CA11 Reduce diffuse pollution to surface or ground waters from agricultural activities.</p> <p>CBO1 Prevent conversion of (semi-) natural</p>	<p>The management of land to promote suitable Merlin habitat will benefit the favourable conservation status of (including but not limited to):</p> <ul style="list-style-type: none"> Enhancement of habitats in proximity to kingfisher habitat waterways. Maintaining and improving the water quality of waterways. Enhancement of habitat for species such as lamprey, salmon, otter etc.

		<p>(Alno-Padion, Alnion incanae, Salicion albae) [91EO]</p> <p>Vertigo moulinsiana (Desmoulin's Whorl Snail) [1016]</p> <p>Margaritifera margaritifera (Freshwater Pearl Mussel) [1029]</p> <p>Austropotamobius pallipes (White-clawed Crayfish) [1092]</p> <p>Petromyzon marinus (Sea Lamprey) [1095]</p> <p>Lampetra planeri (Brook Lamprey) [1096]</p> <p>Lampetra fluviatilis (River Lamprey) [1099]</p> <p>Alosa fallax fallax (Twait Shad) [1103]</p> <p>Salmo salar (Salmon) [1106]</p> <p>Lutra lutra (Otter) [1355]</p> <p>Trichomanes speciosum (Killarney Fern) [1421]</p> <p>Margaritifera durrovensis (Nore Pearl Mussel) [1990]</p>	<p>rivers by industry and agriculture affects the availability of fish in the water, making long stretches of waterways uninhabitable.</p> <p>A lack of good nest sites is a big problem for kingfishers. This can be due to activities such as drainage, channelisation, overgrazing, bank erosion etc. Successful breeding is most common in vertical soil riverbanks. If the bank isn't steep enough, they are much more vulnerable to predation.</p> <p>Kingfishers have many predators, ranging from cats, rats, stoats, weasels, sparrowhawks and mink, they are particularly vulnerable to attack when nesting.</p> <p>Disturbance is also a threat to Kingfisher as nest can be destroyed unintentionally when maintaining waterways. Kingfishers are early nesters and maintenance should be carried out where possible outside the breeding season. Education is key here.</p>		<p>habitats into forests and of (semi-)natural forests into intensive forest plantation</p> <p>CBO4 Adapt/manage reforestation and forest regeneration</p> <p>CB10 Reduce diffuse pollution to surface or ground waters from forestry activities</p>	
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			(Fuller, 2020)			
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10.2.12 Semi-natural Grasslands

Six Annex I semi-natural grassland habitats are present in the HHP CP areas. Profiles have been developed for each habitat and are presented under this section; semi-natural grassland habitat in the HHP CP areas are likely to include variations of or be a combination of these.

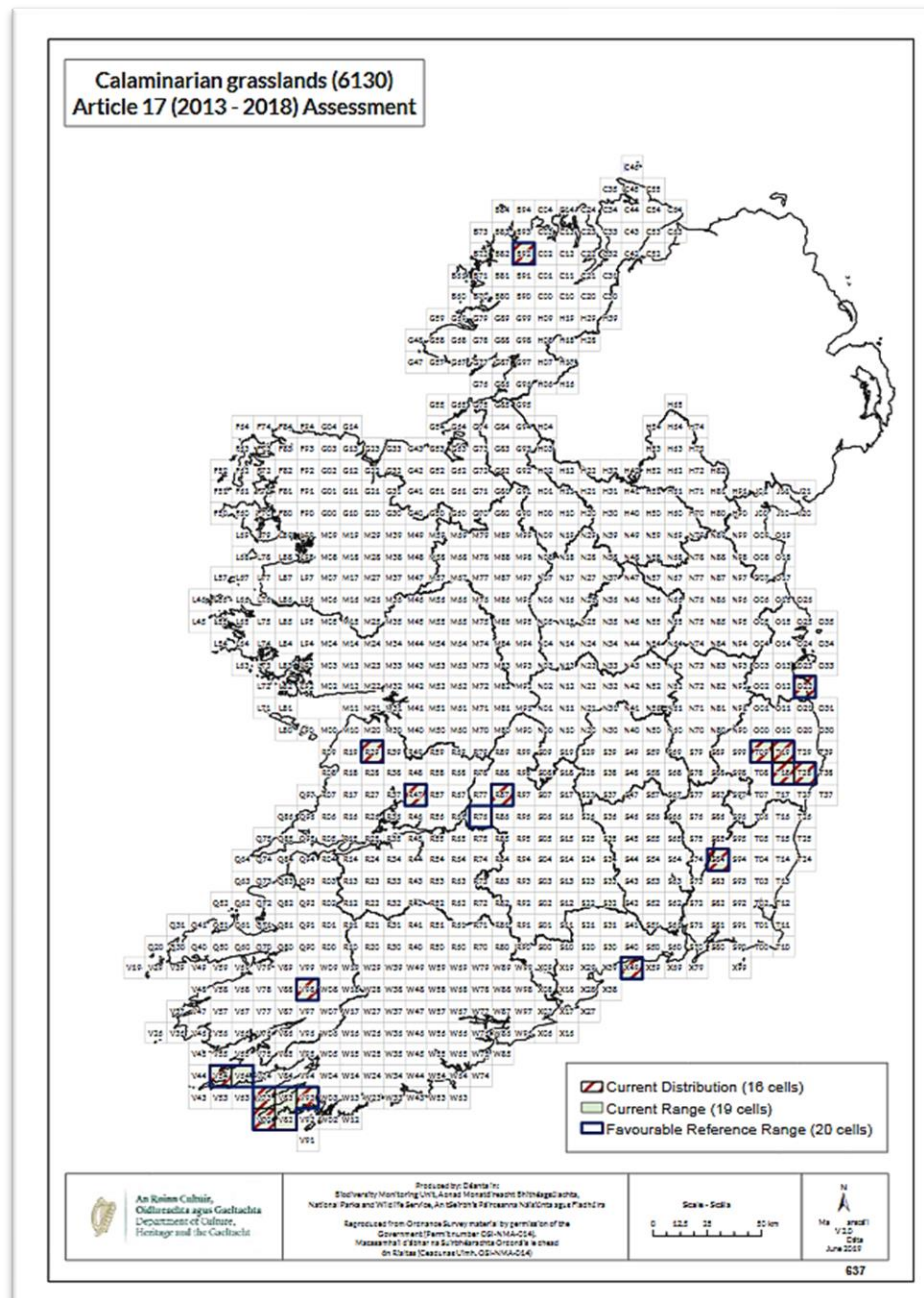
10.2.12.1 Calaminarian grasslands of the *Violetalia calaminariae* [6130]

Context:

Calaminarian grassland vegetation is characterised by the presence of metallophyte plants, i.e. plants that can tolerate high levels of heavy metals. In Ireland, this habitat is restricted to artificial habitats on spoil heaps in the vicinity of old mine workings (Holyoak & Lockhart, 2011). Of particular note is a suite of rare bryophyte species which are tolerant of heavy metal-rich conditions and are restricted to ground with high concentrations of Cu, Pb and Zn. These species include *Cephaloziella nicholsonii*, *C. integerrima*, *C. massalongi*, *Ditrichum cornubicum*, *D. plumbicola*, *Scopelophila cataractae* and *Pohlia andalusica*, all of which are listed as threatened in the Irish red data list (Lockhart et al., 2012) and four of which are protected under the Flora (Protection) Order, 2015. Holyoak (2008) identified very few vascular plant indicators of Calaminarian grassland, the exception being *Minuartia verna*, which grows at one Calaminarian grassland site in Ireland, and inland, lowland stands of *Armeria maritima* and *Silene uniflora*.

Useful references:

- Holyoak, D.T. & Lockhart, N.D. (2011) A survey of bryophytes and metallophyte vegetation of metalliferous mine spoil in Ireland. *Journal of the Mining Heritage Trust of Ireland* 11:3-16.
- Lockhart, N., Hodgetts, N. & Holyoak, D. (2012) Rare and Threatened Bryophytes of Ireland. National Museums Northern Ireland, Belfast.



- Holyoak, D. T. (2008) Bryophytes and metallophyte vegetation on metalliferous mine-waste in Ireland. National Parks and Wildlife Service Unpublished Report
- NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill

Habitat extent in the CP	Habitat Requirements	Ecological Coherence with Annex I habitats in the CP	Threats and Pressures relevant to the CP	Agricultural Management Measures
<p>Within the CP zone [6130] occurs in counties; Donegal, Clare, Tipperary, Limerick., Kerry and Cork</p> <p>Surface area: 1900km²</p> <p>In the last reporting period (2008–2012), a total area of 13.58 ha was derived from field survey (Holyoak, 2008) using best estimates from paper maps. Holyoak (2008) estimated that there might be a further 2 ha of Calaminarian grassland present at lead mines in Co. Wicklow, in the upper Glendasan valley, Glendalough and Glenmalur, which had not been surveyed. There are also mines on a number of islands in Roaringwater Bay in Co. Cork with potential areas of Calaminarian grassland. A more recent survey (Hodd & Hodgetts, 2019) visited all sites previously surveyed in 2008. A total area of 6.169 ha, calculated from ESRI Shapefiles, is a more accurate estimate of the area of Calaminarian grassland. This figure should be taken as a minimum area, rather than as an absolute area, although the total area of Calaminarian grassland in Ireland is still likely to be less than 10 ha. Declines in area were noted at Tankardstown, Co. Waterford, Shallee, Co. Tipperary and Muckross Peninsula, Co. Kerry, and one small site at Lackamore, Co. Tipperary has been lost due to reclamation. The area of the majority of sites, however, including the largest and more important sites at Allihies, Co. Cork and Glendasan, Co. Wicklow, is regarded as relatively stable. An increase in area was recorded at one site, Keeldrum, Co. Donegal, due to the scraping back of soil with a digger.</p>	<p>Calaminarian grassland is a habitat that occurs on metalliferous substrates, in Ireland occurring only on spoil artificially derived from mining activity. Its presence in Ireland is indicated by the presence of metalliferous bryophyte (moss and liverwort) and vascular plant species, with a suite of rare bryophytes present in this habitat that are of high conservation value and are not found in other habitats. One moss species of this habitat, <i>Ditrichum cornubicum</i>, is of particular conservation importance, as it is only known worldwide to occur at three locations, one of which is in Ireland.</p>	<p>Blanket bogs (* if active bog) [7130]</p> <p>Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]</p> <p>Lowland hay meadows (<i>Alopecurus pratensis</i>, <i>Sanguisorba officinalis</i>) [6510]</p> <p>Molinia meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinia caerulea</i>) [6410]</p> <p>Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites) [6210]</p> <p>Species-rich <i>Nardus</i> grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230]</p>	<p>L01 – Abiotic natural processes</p> <p>L02 – Natural succession</p> <p>F07 – Sports, tourism and leisure activities</p> <p>A10 – Extensive grazing</p> <p>F09 – Deposition of waste</p>	<p>CL01 – Management of habitats (others than agriculture and forest) to slow, stop or reverse natural processes</p> <p>CC07 – Habitat restoration/creation from resources, exploitation areas or areas damaged due to installation of renewable energy infrastructure</p> <p>CA04 – Reinstate appropriate agricultural practices to address abandonment, including mowing, grazing, burning or equivalent measures</p> <p>CFO4 – Reduce/eliminate point source pollution to surface or ground waters from industrial, commercial, residential and recreational areas and activities.</p>

Context:

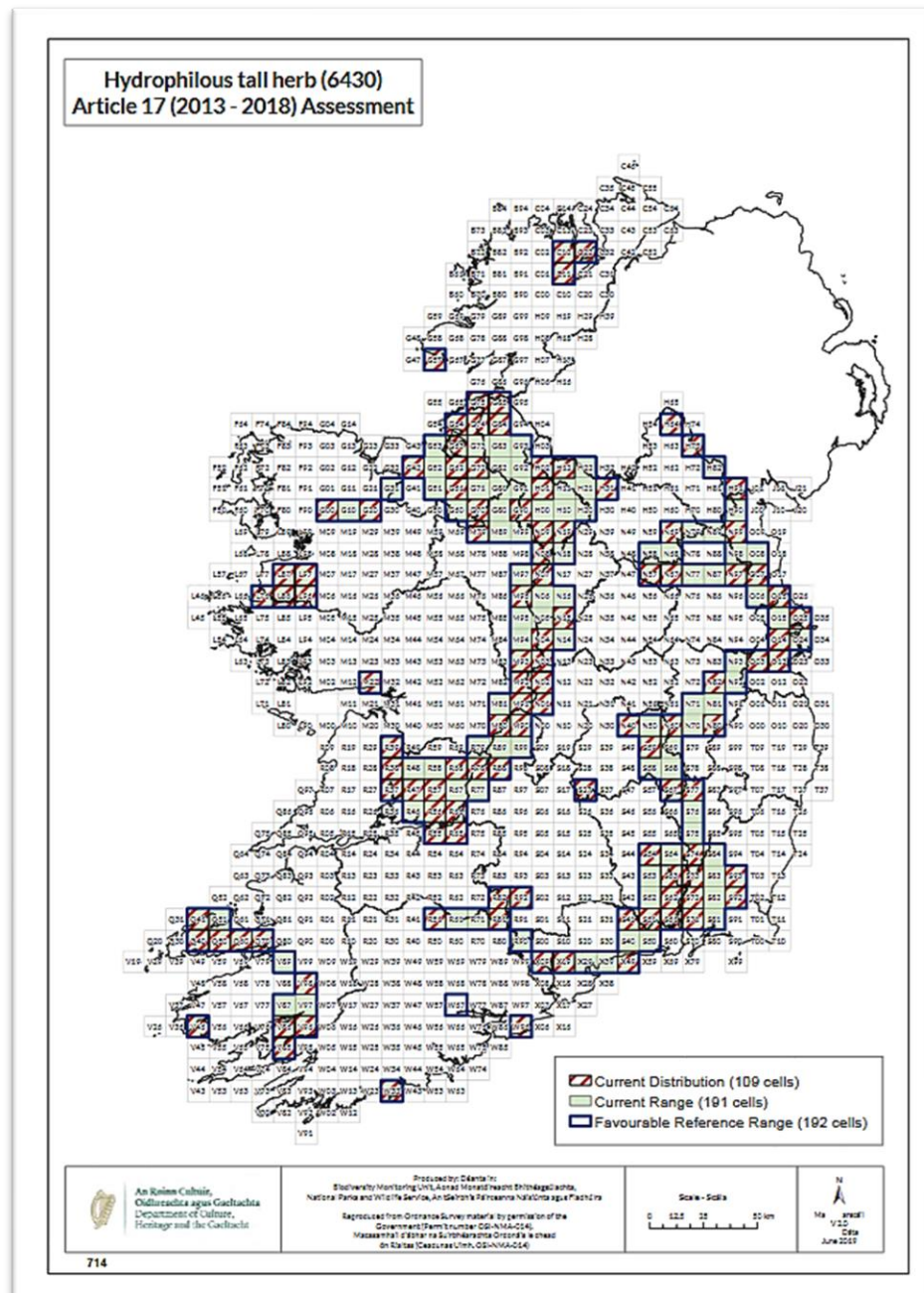
Three distinct communities can be considered for the 6430 habitat in Ireland. The first is a lowland community of watercourses, particularly of unmanaged edges of slow-moving rivers and lake margins. The second occurs in the uplands on ungrazed or lightly grazed cliff ledges, typically occurring as small individual patches less than one metre across. The third variant is another lowland community that possibly occurs as a nitrophilous tall-herb community of woodland edges, referred to as a ‘saum’ community (O’Neill et al. 2013)

Three distinct communities can be considered for the habitat [6430] “Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels” in Ireland:

i) In the lowlands, the [6430] habitat occurs as a community of watercourses, particularly unmanaged edges of slow-moving rivers and the margins of lakes. Nutrient levels may be naturally high. The community is dominated by tall hydrophilous herbs, for example *Angelica sylvestris*, *Filipendula ulmaria*, *Iris pseudacorus*, *Lysimachia vulgaris*, *Lythrum salicaria* and *Valeriana officinalis*. Horsetails such as *Equisetum fluviatile* and *E. palustre*

are a common feature, but monospecific stands of horsetails should not be included. Reed beds, large sedge swamps, large areas of fallow wet meadow and neophyte communities (e.g. with *Impatiens glandulifera*) are also not included. This community largely falls within the Filipendulion alliance which is listed under this habitat in the Interpretation Manual of EU habitats (European Commission, 2013). It has an affinity to the GL1B *Agrostis stolonifera*-*Filipendula ulmaria* marsh grassland community of the Irish Vegetation Classification (IVC) (Perrin, 2015).

ii) In the uplands, the [6430] habitat occurs as a community of ungrazed or lightly grazed cliff ledges. These occur on calcareous cliffs and on wet siliceous cliffs where there is some base enrichment from the water. Individual patches of the community are typically small (< 1 m across). Floristically, there may be some overlap with communities of habitats 8210 and 8220, but in this community hydrophilous herbs are characteristic rather than ferns. Such species include *Alchemilla* spp., *Angelica sylvestris*, *Crepis paludosa*, *Filipendula ulmaria*, *Geum rivale* and *Thalictrum minus*. *Luzula sylvatica* may be present but ledges strongly dominated by this species are not included. This community corresponds with the U17 *Luzula*



sylvatica-Geum rivale tall herb community of the British NVC which is listed under this habitat in the Interpretation Manual (European Commission, 2013), and it has an affinity to the RH2D Angelica sylvestris-Breutelia chrysocoma ledge community of the IVC (Perrin, 2017).

iii) In the lowlands, the habitat also possibly occurs as a nitrophilous tall herb community of woodland borders, referred to as a saum community. This habitat has been little studied in Ireland (see Wilmanns & Brun-Hool, 1982) but typical species are likely to include Alliaria petiolata, Anthriscus sylvestris, Eupatorium cannabinum, Geranium robertianum, Geum urbanum, Petasites hybridus and Vicia sepium. Archaeophytes such as Artemisia vulgaris and Lamium album may occur. Whilst Urtica dioica and Aegopodium podagraria may occur, species-poor stands dominated by these species should probably not be included. This community would fall within the Glechoma hederaceae order which is listed under this habitat in the Interpretation Manual (European Commission, 2013). Only the first two communities are included in the present assessment for 2013-2018. The third community is not included; further investigation and discussion is required to determine if Ireland supports examples of this community which should be considered under this habitat category.

Useful references:

- Perrin, P. (2015) Irish Vegetation Classification: Technical Progress Report No. 1. Report submitted to National Biodiversity Data Centre. http://www.biodiversityireland.ie/wordpress/wpcontent/uploads/IVC_Technical-Progress-Report-No.1.pdf
- Perrin, P. (2017) Irish Vegetation Classification: Technical Progress Report No. 3. Report submitted to National Biodiversity Data Centre. <http://www.biodiversityireland.ie/projects/nationalvegetation-database/irish-vegetation-classification/explore>
- European Commission (2013) Interpretation manual of European Union habitats EUR 28, European Commission, DG Environment.
- Wilmanns, O. & Brun-Hool, J. (1982) Irish mantel and saum vegetation. Journal of Life Sciences of the Royal Dublin Society 3: 165-174.
- NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill.
- 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.

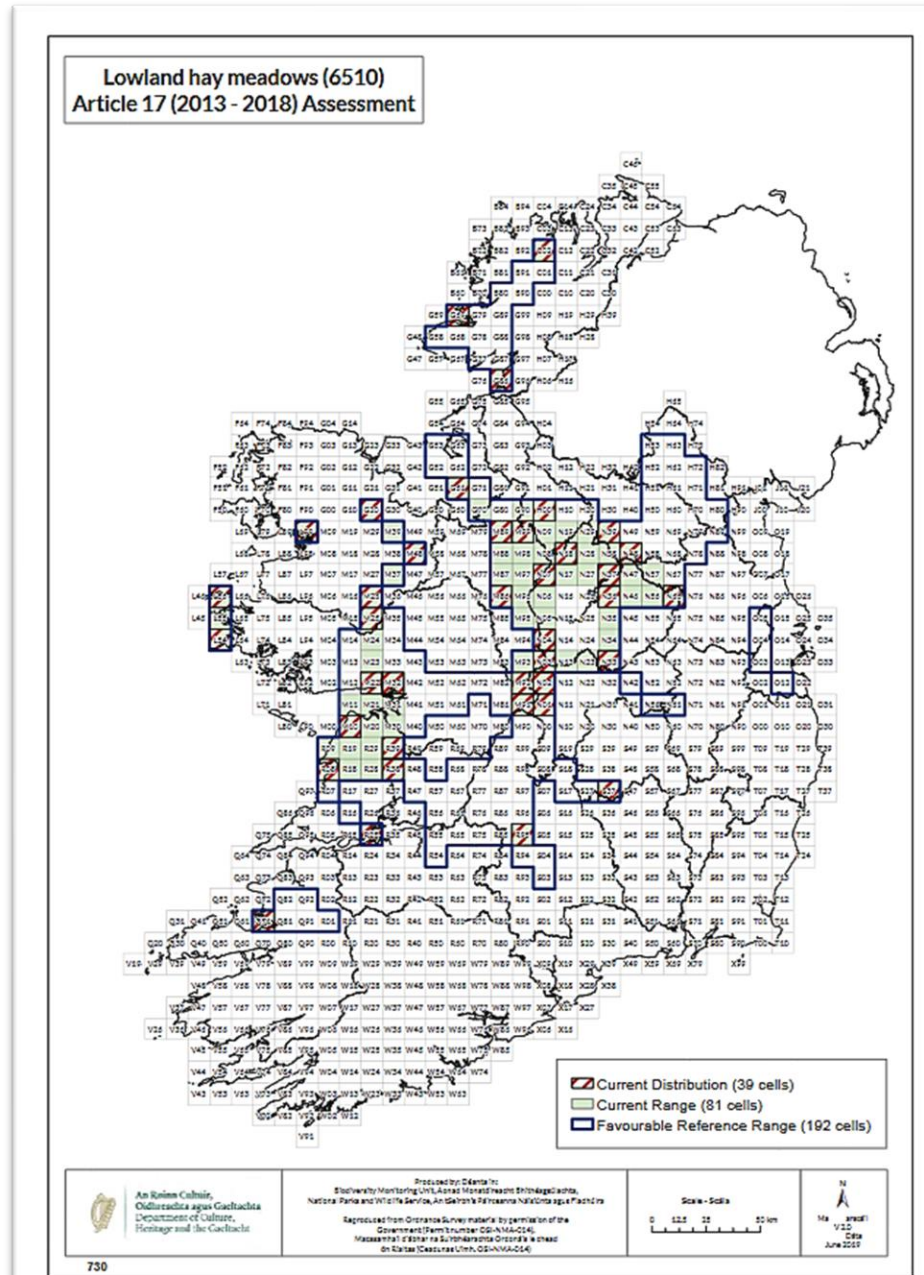
Habitat extent in the CP	Habitat Requirements	Ecological Coherence with Annex I habitats in the CP	Threats and Pressures relevant to the CP	Agricultural Management Measures
<p>Within the CP zone [6430] occurs in counties; Donegal, Sligo, Leitrim, Mayo, Galway, Cavan, Monaghan, Offaly, Cork, Kerry</p> <p>Surface area: 19,100km²</p> <p>[6430] Hydrophilous tall herb communities was the least abundant Annex I grassland habitat found during the ISGS 2007–2012, with just 27.0 ha recorded from 39 sites, the largest area was recorded from Donegal (4.7 ha, 17% of all 6430 recorded). It was the most common Annex I grassland habitat in Meath, where 4.4. ha were recorded and mapped.</p> <p>60% of [6430] is located in SACs</p>	<p>Variation within the habitat type is related chiefly to geographical position, altitude, and soil conditions and rock type.</p>	<p>Lowland hay meadows (<i>Alopecurus pratensis</i>, <i>Sanguisorba officinalis</i>) [6510]</p> <p>Molinia meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinia caerulea</i>) [6410]</p> <p>Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites) [6210]</p> <p>Species-rich <i>Nardus</i> grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230]</p> <p>Calaminarian grasslands of the <i>Violetalia calaminariae</i> [6130]</p>	<p>A09 – (Intensive grazing or overgrazing by livestock)</p> <p>A31 – (Drainage for use as agricultural land)</p> <p>IO1 – (Invasive alien species of Union concern) –</p> <p>IO2 – (Other invasive alien species (other than species of Union concern))</p> <p>** A31 (Drainage for use as agricultural land) is likely to cause an increased frequency in the pressure LO2 (Natural succession resulting in species composition change) so this may be ranked as a higher importance pressure in future</p>	<p>CA03 – Maintain existing extensive agricultural practices and agricultural landscape features</p>

Context:

The Annex I habitat 6510 Lowland hay meadows is represented in Ireland by mesotrophic semi-natural grasslands that are almost always managed as traditional hay meadows (cut only once a year in late summer or autumn with the hay crop removed). These meadows are synonymous with the fertile plains of the larger river systems such as the Shannon and Moy. However, they have been found on flatter ground amongst low hills, drumlins, and there are also some sites on the coast. The habitat is only rarely found in submontane (200-400 m) areas. Overall, the Shannon Callows account for 27% of the area of 6510 within the State. The 6510 habitat is comprised of a few distinct meadow communities belonging to the Arrhenatherion. These communities can be classified within the GL3E *Festuca rubra*-*Rhinanthus minor* grassland (Perrin, 2018), *Lathyrus pratensis* community (Heery, 1991) and MG4/MG5 (Rodwell, 1992).

Useful references:

- Rodwell, J.S. (ed.) (1992). British plant communities Volume 3: Grasslands and montane communities. Cambridge Community Press, Cambridge
- Heery, S. and Keane, S. (1999). Shannon Callows Management Plan. MPSU. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin.
- Perrin (2018) Irish Vegetation Classification: Community synopsis *Festuca rubra* – *Rhinanthus minor* grassland. <http://www.biodiversityireland.ie/wordpress/wpcontent/uploads/GL3E.pdf>
- NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill.
- 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.



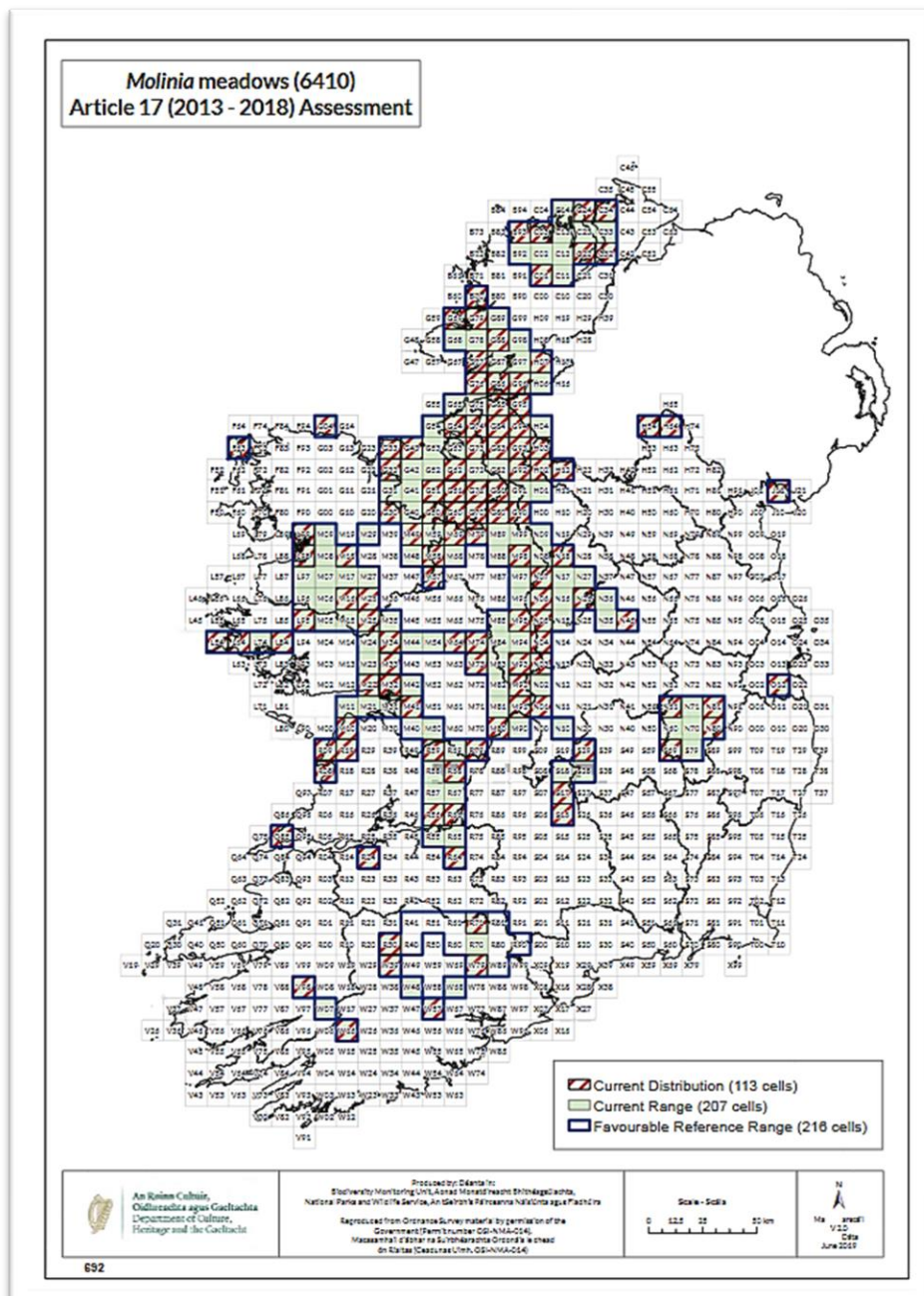
Habitat extent in the CP	Habitat Requirements	Ecological Coherence with Annex I habitats in the CP	Threats and Pressures relevant to the CP	Agricultural Management Measures
<p>Within the CP zones [6510] occurs in counties; Sligo, Leitrim, Cavan, Monaghan, Offaly, Laois, Tipperary, Limerick, Clare, Galway, Mayo, Kerry</p> <p>Surface area: 8,100 km²</p> <p>157ha of [6510] habitat is currently mapped within the State. Forty-one percent of the national area of [6510] is within SACs and the habitat is listed as a Qualifying Interest (QI) for 48ha of the 64ha within SACs.</p> <p>The Shannon Callows account for 27% of the area of [6510] within the State.</p>	<p>These are semi-natural habitats, whose maintenance depends on human activity. They are nutrient rich, mesic, regularly mowed and manured in a non-intensive manner. Without manuring and when mowing is carried out more than once a year, they tend to develop towards Mesobromion grasslands (habitat 6210) (Lasen & Wilham 2004).</p> <p>Irish examples of the Annex I habitat 6510 are mesotrophic semi-natural grasslands that are managed as traditional hay meadows. These meadows are synonymous with the fertile plains of the larger river systems such as the Shannon. However, they have been found on flatter ground amongst low hills and drumlins, and there are a limited number of coastal sites.</p> <p>The geographical distribution of this habitat has reduced over the last 50 years due to a decline in the use of traditional hay meadows in farming systems. The 6510 habitat is comprised of a few distinct meadow communities belonging to the Arrhenatherion. These communities can be classified within the GL3E <i>Festuca rubra</i> – <i>Rhinanthus minor</i> community (Perrin 2018c), <i>Lathyrus pratensis</i> community (Heery 1991) and NVC communities MG4/MG5 (Rodwell 1992).</p>	<p>Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) [6410]</p> <p>Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) [6210]</p> <p>Species-rich <i>Nardus</i> grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230]</p> <p>Calaminarian grasslands of the <i>Violetalia calaminariae</i> [6130]</p> <p>Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]</p>	<p>A02 – Conversion from one type of agricultural land use to another</p> <p>A19 – Application of natural fertilisers on agricultural land</p> <p>A20 – Application of synthetic (mineral) fertilisers on agricultural land</p> <p>A06 – Abandonment of grassland management (e.g. cessation of grazing or of mowing)</p> <p>A14 – Livestock farming (without grazing)</p>	<p>CA03 – Maintain existing extensive agricultural practices and agricultural landscape features</p> <p>The maintenance of non-intensive mowing (included under measure CA03) is the most frequent conservation measure applied to the [6510] habitat (see Table 28 in Martin et al., 2018).</p> <p>CA04 – Reinstate appropriate agricultural practices to address abandonment, including mowing, grazing, burning or equivalent measures</p> <p>CA05 – Adapt mowing, grazing and other equivalent agricultural activities</p>

Context:

The Annex I habitat 6410 *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) is represented in Ireland by both fen and grassland communities on nutrient-poor soils. The 6410 habitat is either managed as traditional hay meadows (cut only once a year in late summer or autumn with the hay crop removed) or more usually by extensive pasture. Within Ireland *Molinia* meadows occur in lowland plains on neutral to calcareous gleys, sometimes with a marl layer beneath the surface, or on peaty soils both in lowland and upland situations. *Molinia* meadows generally have a central to north-western distribution in Ireland that follows the distribution of *Cirsium dissectum*, one of the key indicator species for the habitat. The Annex I habitat is very rare in the east of the country with only one site recorded within the five eastern counties that border the Irish Sea. The 6410 habitat is comprised of a few distinct communities belonging to the Junco-Molinion. These communities can be classified within GL1C: *Molinia caerulea*-*Succisa pratensis* grassland (Perrin, 2018), the *Carex panicea*-*Festuca rubra* community (Heery, 1991) and M24: *Molinia caerulea*-*Cirsium dissectum* fen meadow (Rodwell, 1991).

Useful references:

- Perrin (2018) Irish Vegetation Classification: Community synopsis *Molinia caerulea* – *Succisa pratensis* grassland. <http://www.biodiversityireland.ie/wordpress/wpcontent/uploads/GL1C.pdf>.
- Rodwell, J.S. (ed.) (1991) British plant communities Volume 2: Mires and heaths. Cambridge Community Press, Cambridge.
- Heery, S. and Keane, S. (1999) Shannon Callows Management Plan. MPSU. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin.



- NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill.

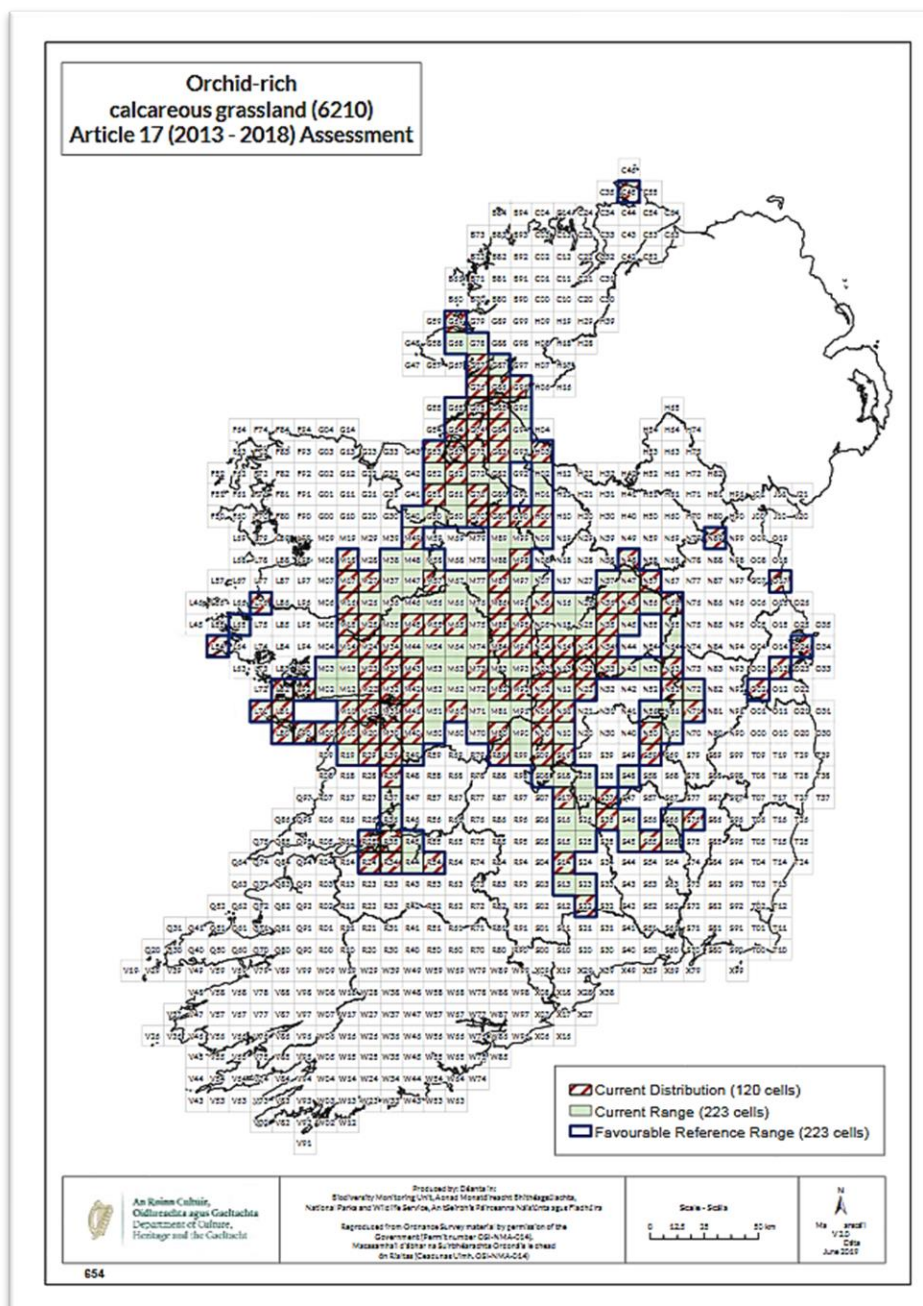
Habitat extent in the CP	Habitat Requirements	Ecological Coherence with Annex I habitats in the CP	Threats and Pressures relevant to the CP	Agricultural Management Measures
<p>Within the CP zones [6410] occurs in counties; Leitrim and Dublin.</p> <p>Surface area: 20,700 km²</p>	<p>Transitions towards the subtype found on neutral-alkaline to calcareous soils may occur in depressions, along lake and river shorelines etc.</p>	<p>Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) [6210]</p> <p>Species-rich Nardus grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230]</p> <p>Calaminarian grasslands of the Violetalia calaminariae [6130]</p> <p>Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]</p> <p>Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis) [6510]</p>	<p>A02 – Conversion from one type of agricultural land use to another</p> <p>A06 – Abandonment of grassland management (e.g., cessation of grazing or of mowing)</p> <p>A10 – Extensive grazing or under grazing by livestock</p> <p>B01 – Conversion to forest from other land uses, or afforestation (excluding drainage)</p> <p>A14 – Livestock farming (without grazing)</p> <p>A31 – Drainage for use as agricultural land</p>	<p>CA03 – Maintain existing extensive agricultural practices and agricultural landscape features</p> <p>CA15 – Manage drainage and irrigation operations and infrastructures in agriculture</p>

Context:

The Annex I habitat 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) comprises species-rich plant communities found on shallow, well-drained calcareous substrates. It is considered a priority habitat only if it is an important orchid site. The Annex I habitat includes a mixture of grasses and herbs, with calcicole species typically frequent. It usually occurs on obvious geological features such as eskers, outcropping limestone rock and in association with limestone pavement. The Burren and Aran Islands (Clare/Galway) and Dartry Mountains (Sligo/Leitrim) are particularly important areas within the State for this Annex I habitat. The 6210 habitat is comprised of a diverse group of plant communities belonging to the Bromion-erecti, including GL3A Briza media-Thymus polytrichus grassland (Perrin, 2018) and CG1/CG2 (Rodwell, 1992).

Useful references:

- Perrin, P.M. (2018) Irish Vegetation Classification: Community synopsis Briza media -Thymus polytrichus grassland.
- Rodwell, J.S. (ed.) (1992). British plant communities Volume 3: Grasslands and montane communities. Cambridge Community Press, Cambridge.



Habitat extent in the CP	Habitat Requirements	Ecological Coherence with Annex I habitats in the CP	Threats and Pressures relevant to the CP	Agricultural Management Measures
<p>Within the CP zones [6510] occurs in counties; Donegal, Sligo, Leitrim, Cavan, Monaghan, Offaly, Laois, Tipperary, Limerick, Clare, Galway, Mayo</p> <p>Surface area: 22,300 km²</p>		<p>Calaminarian grasslands of the <i>Violetalia calaminariae</i> [6130]</p> <p><i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinia caerulea</i>) [6410]</p> <p>Lowland hay meadows (<i>Alopecurus pratensis</i>, <i>Sanguisorba officinalis</i>) [6510]</p> <p>Species-rich <i>Nardus</i> grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230]</p> <p>Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]</p>	<p>A02 – Conversion from one type of agricultural land use to another</p> <p>A10 – Extensive grazing or undergrazing by livestock</p> <p>C01 – Extraction of minerals</p> <p>A09 – Intensive grazing or overgrazing by livestock</p> <p>I02 – Other invasive alien species</p> <p>I04 – Problematic native species</p>	<p>CA03 – Maintain existing extensive agricultural practices and agricultural landscape features</p> <p>CA05 – Adapt mowing, grazing and other equivalent agricultural activities</p>

Context:

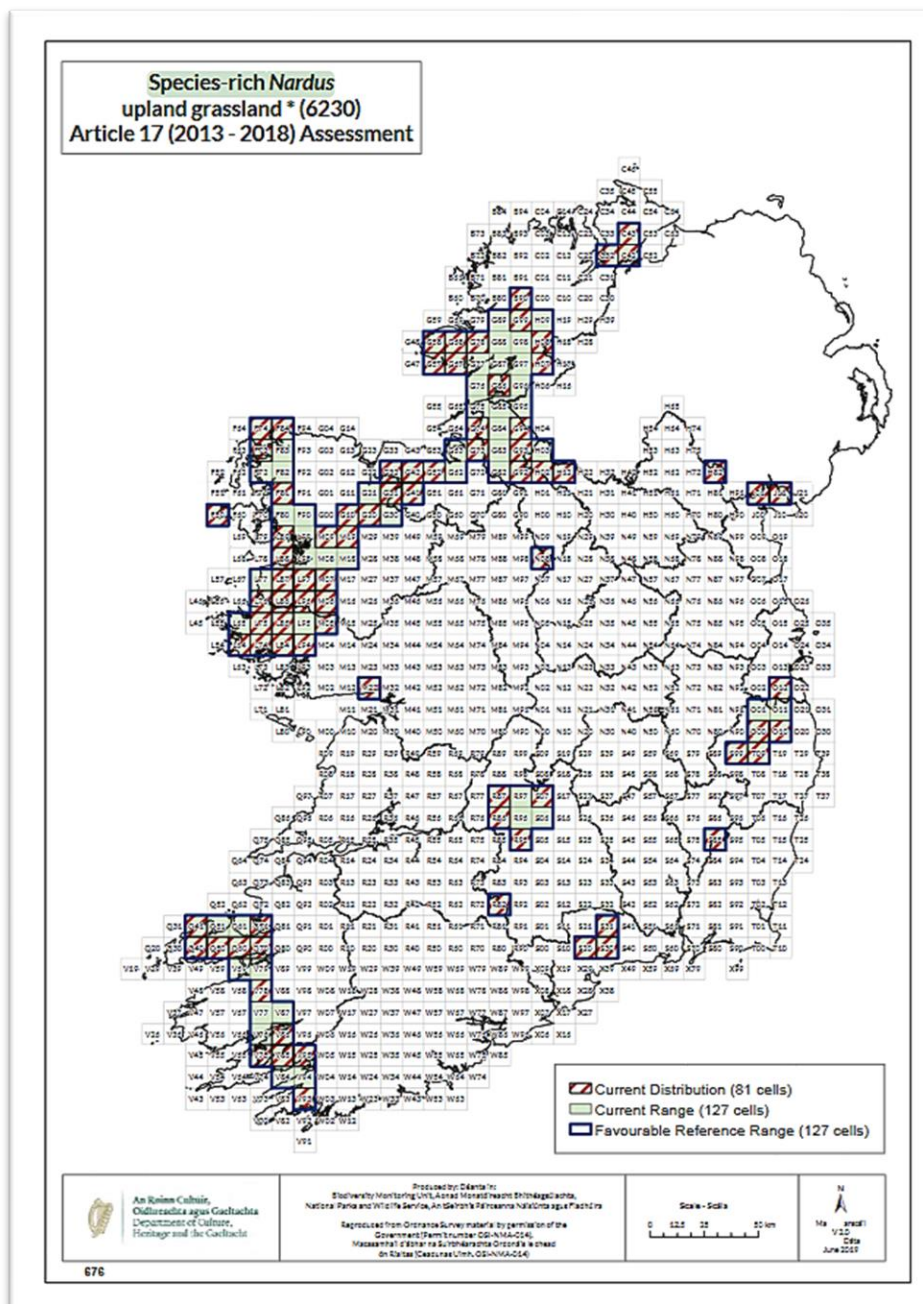
Habitat 6230 “Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)” is restricted to siliceous substrates in upland areas (montane and sub-montane zone), usually near the upper limit of enclosed farmland. It has probably always been a rare habitat within Irish uplands, and it relies on extensive grazing, usually by sheep, to maintain the habitat over almost all of its range. 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 calcareous (calcareous flushing) and non-calcareous subcommunities of 6230 habitat have been identified in Ireland. The habitat has an affinity to the *Violion caninae* association (Perrin, 2015), and according to the Irish Vegetation Classification, relevant communities include the *Nardus stricta*-*Potentilla erecta* (GL4B) and *Agrostis capillaris*-*Potentilla erecta* (GL4C) grassland communities (Perrin, 2015).

Typical species for 6230 habitat are: *Agrostis capillaris*, *Anthoxanthum odoratum*, *Carex binervis*, *Festuca ovina*, *Galium saxatile*, *Hylocomium splendens*, *Luzula multiflora* / *L. campestris* (count as one), *Nardus stricta*, *Polygala serpyllifolia*, *Potentilla erecta*, *Rhytidadelphus loreus*, *Rhytidadelphus squarrosus* and *Veronica officinalis*.

High-quality species for the calcareous sub-community are: *Alchemilla glabra*, *Antennaria dioica*, *Campanula rotundifolia*, *Conopodium majus*, *Ctenidium molluscum*, *Linum catharticum*, *Lotus corniculatus*, *Lysimachia nemorum*, *Primula vulgaris*, *Prunella vulgaris* and *Thymus polytrichus*.

High-quality species for the acidic sub-community are: *Breutelia chrysocoma*, *Carex caryophyllea*, *Carex pilulifera*, *Danthonia decumbens*, *Lathyrus linifolius*, *Pseudorchis albidus*, *Viola canina* and *Viola riviniana*.

Useful references:



- NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill.
- Perrin, P. (2015) Irish Vegetation Classification: Technical Progress Report No. 1. Report submitted to National Biodiversity Data Centre. http://www.biodiversityireland.ie/wordpress/wpcontent/uploads/IVC_Technical-Progress-Report-No.1.pdf

Habitat extent in the CP	Habitat Requirements	Ecological Coherence with Annex I habitats in the CP	Threats and Pressures relevant to the CP	Agricultural Management Measures
<p>Within the CP zone [6510] occurs in counties; Sligo, Leitrim, Cavan, Monaghan, Galway, Mayo, Cork, Kerry, Wicklow</p> <p>Surface area: 12,700 km²</p>		<p>Calaminarian grasslands of the <i>Violetalia calaminariae</i> [6130]</p> <p>Molinia meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinia caerulea</i>) [6410]</p> <p>Lowland hay meadows (<i>Alopecurus pratensis</i>, <i>Sanguisorba officinalis</i>) [6510]</p> <p>Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]</p>	<p>IO4 – Problematic native species</p> <p>LO2 – Natural succession resulting in species composition change (other than by direct changes of agricultural or forestry practices)</p>	<p>CA03 Maintain existing extensive agricultural practices and agricultural landscape features</p> <p>CA04 – Reinstatement of appropriate agricultural practices to address abandonment, including mowing, grazing, burning or equivalent measures</p> <p>CA05 – Adapt mowing, grazing and other equivalent agricultural activities</p> <p>CBO1 – Prevent conversion of (semi-) natural habitats into forests and of (semi-) natural forests into intensive forest plantation</p> <p>CF03 – Reduce impact of outdoor sports, leisure and recreational activities</p> <p>CHO3 – Reduce impact of other specific human actions</p> <p>CI03 – Management, control or eradication of other invasive alien species</p> <p>CI05 – Management of problematic native species</p>

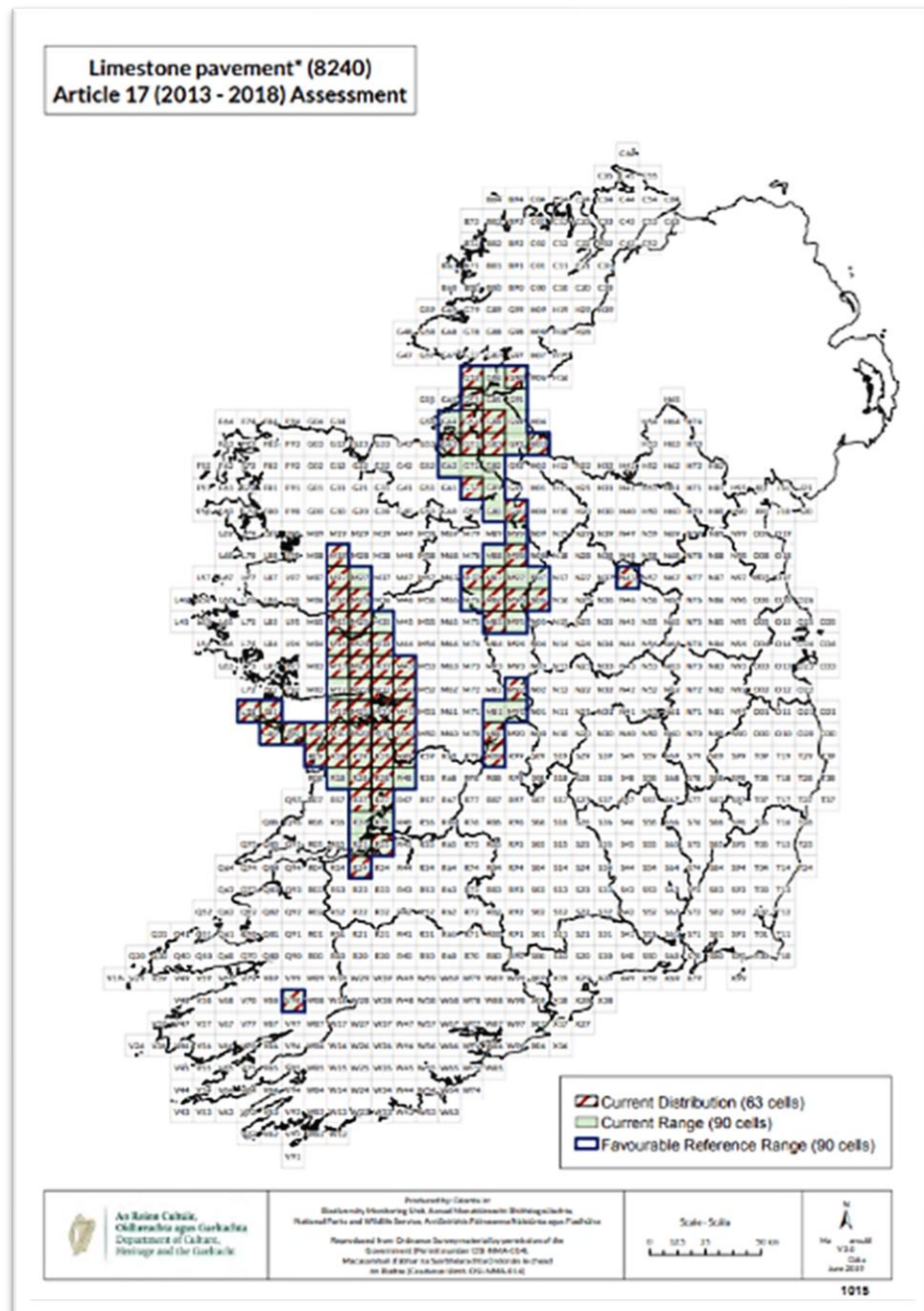
Context:

Limestone pavement is a priority EU Annex I habitat. The structure of Limestone pavement habitat typically consists of blocks of rock, known as clints, separated by fissures or grikes. Sometimes due to weathering this structure is less defined, especially in the 'shattered' variant of pavement. Limestone pavement can occur as areas of exposed rock with very little vegetation or in association with grassland, heath, scrub, or woodland communities.

The main vascular plant species associated with the habitat include scattered low-growing woody species such as *Corylus avellana*, *Hedera helix*, *Ilex aquifolium*, *Rosa spinosissima* and *Rubus fruticosus*, and herbaceous species such as *Sesleria caerulea*, *Teucrium scorodonia*, *Myelis muralis*, *Geranium robertianum*, *Senecio jacobaea*, *Carlina vulgaris* and *Carex flacca*. A suite of calcicole ferns are also usually found, including *Asplenium rutamuraria*, *Ceterach officinarum* and, in the deeper grikes, the shadeloving *Phyllitis scolopendrium*. Characteristic bryophytes are *Ctenidium molluscum*, *Tortella tortuosa* and *Neckera crispa*.

The wooded variant of Limestone pavement has been recorded in areas of hazel woodland with a low canopy of at least 3 m and minimal soil depth. Under canopy the surface of the limestone pavement is sometimes completely covered by bryophytes such as *Eurhynchium striatum*, *Neckera crispa* and *Thamnobryum alopecurum*.

The habitat has been defined within Irish vegetation communities RH1A *Asplenium trichomanes*-*Ctenidium molluscum* crevice community, RH1B *Teucrium scorodonia*-*Myelis muralis* pavement community, and the woodland community WL2E *Corylus avellana*-*Potentilla sterilis* (Perrin, 2018a-c).

Useful references:

- Williams, P.W. (1966) Limestone pavements with special reference to Western Ireland. Transactions of the Institute of British Geographers, 40: 155-172.
- Pender (Ed.) (2008) Our Limestone Heritage. Irish Wildlife Trust.
- Murphy, S. & Fernández, F. (2009) The development of methodologies to assess the conservation status of limestone pavement and associated habitats in Ireland. Irish Wildlife Manuals, No. 43. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.
- Perrin (2018a) Irish Vegetation Classification: Community synopsis RH1A *Asplenium trichomanes* - *Ctenidium molluscum* crevice community. <http://www.biodiversityireland.ie/wordpress/wpcontent/uploads/RH1A.pdf>. Accessed February 2018.
- Perrin (2018b) Irish Vegetation Classification: Community synopsis RH1B *Teucrium scorodonia* - *Mycelis muralis* pavement community. <http://www.biodiversityireland.ie/wordpress/wpcontent/uploads/RH1B.pdf>. Accessed February 2018.
- Perrin (2018c) Irish Vegetation Classification: Community synopsis WL2E *Corylus avellana* - *Potentilla sterilis* woodland. <http://www.biodiversityireland.ie/wordpress/wpcontent/uploads/WL2E.pdf>. Accessed February 2018.
- DAERA, (2018). *Northern Ireland Priority Habitat Guide: Limestone pavement*.

Population estimate in the CP	Habitat Requirements	Ecological Coherence with Annex I habitats in the CP	Threats and Pressures relevant to the CP	Agricultural Management Measures
<p>CP areas within habitat range: Breifne, MSC.</p> <p>Current Surface Area: 320.05km²</p> <p>Counties: Cavan, Leitrim, Sligo, Roscommon, Mayo, Galway, Longford, Westmeath, Clare, Tipperary, Limerick, Kerry.</p> <p>The habitat is found mainly in the west of Ireland with counties Clare, Galway and Mayo containing the largest extent. Smaller areas are found in Sligo, Leitrim, Donegal, Offaly, Kerry, Cavan, Limerick, Longford, Tipperary, Roscommon and Westmeath.</p> <p>Limestone pavement is also found in Fermanagh in Northern Ireland (Pender, 2008).</p> <p>Ireland has the largest area of limestone pavement in the EU, over 32,187ha compared to less than 3,000ha in the UK. The most extensive limestone pavement occurs in the Burren/East Galway area (Williams 1966).</p>	<p>The conversion of land using techniques such as fertilisation, drainage and reseeding can ultimately result in the loss of this habitat and thus should be prevented at all costs.</p> <p>The extent of bare, scrubby or thin soil covered limestone is of primary importance to maintaining this habitat, as is the local hydrological regime which supports the habitat. Limestone pavements are best managed by light, extensive grazing (cattle grazing is preferred).</p> <p>Undergrazing and/or overgrazing should be avoided. Risk of poaching should be minimised and any livestock removed off site in very wet conditions. Allowing the natural processes to continue will help maintain the important physical and biological characteristics of the habitat. Organic and inorganic fertilisers should not be applied as this reduces species-richness and diversity with a loss of conservation value.</p> <p>Encroaching scrub should be controlled by cutting as it can spread at the expense of the priority habitat. Machinery should only be used where ground conditions permit. Trees should not be planted or felled on this grassland type and nor should it be used for</p>	<ul style="list-style-type: none"> • European Dry heaths [4030] • Alpine and Boreal Heaths [4060] • <i>Juniperus communis</i> formations on heaths or calcareous grasslands [5130] • Semi-natural dry grasslands and scrub facies on calcareous substrates (<i>Festuco-Brometalia</i>) [6210] • <i>Taxus baccata</i> woods [91J0] 	<ul style="list-style-type: none"> • A01 Conversion into agricultural land (H) • A10 Extensive grazing or undergrazing by livestock (M) 	<ul style="list-style-type: none"> • CA03 Maintain existing extensive agricultural practices and agricultural landscape features • CA05 Adapt mowing, grazing and other equivalent agricultural activities

	supplementary feeding or storage areas. (DAERA, 2018)			
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Context:

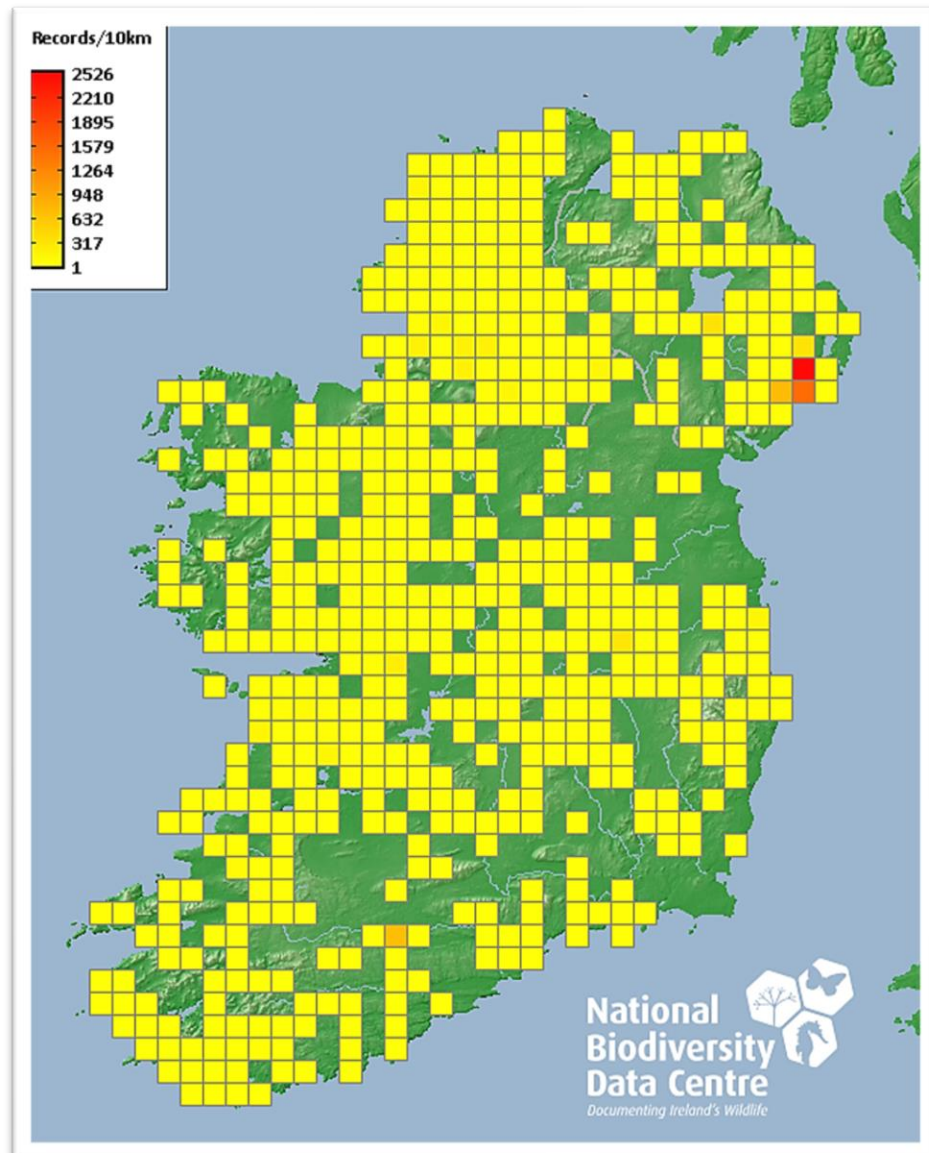
The Marsh Fritillary (*Euphydryas aurina*) butterfly is the only Irish insect listed as protected under Annex II of the EU Habitats Directive; the habitat of the Marsh Fritillary is currently protected within Special Areas of Conservation where it is listed as a Qualifying Interest. The Marsh Fritillary is one of the four fritillary butterfly species in Ireland, these species are medium to large species and mainly orange with patterns of black chequering. The Marsh Fritillary is the smallest of the four with a wingspan of between 35-50 mm and is the most brightly coloured. Identifiable by its orange and cream chequered pattern. The margin of the upper wing has a broad orange band with black dots at the centre of each square patch. The underwing has a similar colour scale but is much paler often lacking any dark brown colour (Phelan et al., 2021).

Pelan et al., 2021 discusses how the Marsh Fritillary life cycles sees the female butterfly lay eggs on the underside of the Devils-bit Scabious (*Succisa pratensis*) plant, the caterpillars are 'gregarious', meaning that they

stay together within a protective sheet of silk that they spin over a Devil's-bit Scabious plant. Through their development, all the caterpillars go through five stages of growth, these are called 'instars'. The caterpillar 'moults' between each instar and after the 5th instar the caterpillar pupates in April.

The importance of Devils bit Scabious in the life cycle of the marsh fritillary is evident, therefore its presence in the required habitat is crucial. As noted by Smee et al., 2011 the habitat requirements of the Marsh Fritillary at larval stage and adult stage differ, the larval stage requiring a high density of Devils bit scabious for caterpillars to feed and the adult butterflies requiring nectar from other flowering plants such as Cuckooflower (*Cardamine pratensis*), Buttercups (*Ranunculus* spp.), Ragged Robin (*Lychnis flos-cuculi*), Dandelion (*Taraxacum* agg.), Tormentil (*Potentilla erecta*), Thistles (*Cirsium* spp. and *Carduus* spp.) Knapweeds (*Centaurea* spp.) and Hawkweeds (*Hieracium* spp./*Hypochoeris* spp.).

The historic threats and pressures to this habitat noted by Phelan et al., 2021 has been agricultural intensification, this involving such practices as land drainage, monoculture sward reseeding, high fertiliser application, overgrazing and overall fragmentation of suitable habitats. Johansson et al., 2020 also notes how severe weather conditions such as drought periods which are becoming more frequent due to climate change is also a threat.



Useful references:

- Phelan, N., Nelson, B. & Lysaght, L. (2021) Ireland's Butterflies Series No. 1: Habitat Management for the Marsh Fritillary. National Biodiversity Data Centre, Waterford. (Phelan et al.,2021)
- Botham, M.S., Ash, D., Aspey, N., Bourn, N.A.D., Bulman, C.R., Roy, D.B., Swain, J., Zannese, A. and Pywell, R.F., 2011. The effects of habitat fragmentation on niche requirements of the marsh fritillary, *Euphydryas aurinia*, (Rottemburg, 1775) on calcareous grasslands in southern UK. *Journal of Insect Conservation*, 15(1), pp.269-277. (Botham et al.,2011)
- Smee, M., Smyth, W., Tunmore, M. and Hodgson, D., 2011. Butterflies on the brink: habitat requirements for declining populations of the marsh fritillary (*Euphydryas aurinia*) in SW England. *Journal of Insect Conservation*, 15(1), pp.153-163. (Smee et al., 2011)
- Johansson, V., Kindvall, O., Askling, J. and Franzén, M., 2020. Extreme weather affects colonization–extinction dynamics and the persistence of a threatened butterfly. *Journal of Applied Ecology*, 57(6), pp.1068-1077.(Johansson et al., 2020)
- Johansson, V., Kindvall, O., Askling, J., Säwenfalk, D.S., Norman, H. and Franzén, M., 2022. Quick recovery of a threatened butterfly in well-connected patches following an extreme drought. *Insect Conservation and Diversity*.(Johanssin et al.,2022).
- Muller, S., 2002. Appropriate agricultural management practices required to ensure conservation and biodiversity of environmentally sensitive grassland sites designated under Natura 2000. *Agriculture, ecosystems & environment*, 89(3), pp.261-266. (Muller, 2002)
- National Biodiversity Data Centre, Ireland, Marsh Fritillary (*Euphydryas aurinia*), image, accessed 05 April 2023, <<https://maps.biodiversityireland.ie/Species/TerrestrialDistributionMapPrintSize/77487>>

Population estimates in the CP Zones.	Habitat Requirements	Ecological Coherence with Annex I habitats in the CP	Threats and Pressures relevant to the CP	Aligning with Site Specific Conservation Objectives	Agricultural Management Measures	Benefits of conservation participation
The marsh fritillary has a wide yet patchy distribution across Ireland. The CP zones align along areas indicated to contain Marsh Fritillary as the habitat of the Marsh Fritillary is currently protected within Special Areas of Conservation. Although it has a favourable range, the population is considered inadequate and its overall conservation status is declining (Phelan et al.,2021).	The loss of suitable habitat caused by agricultural intensification is thought to be a major source of Marsh Fritillary decline. With the fragmentation of the required habitat also having negative effects (Botham et al.,2011) It is noted by Smee et al., 2011 that the habitat requirements of the Marsh Fritillary larval stage and adult differ. The density of the host plant for the larvae in Ireland is the Devil's-bit Scabious. The caterpillars will feed only on this plant. Devil's-bit Scabious prefer to grow in areas of low nutrient availability, intermediate soil moisture and a high pH. Adult butterflies feed opportunistically upon the nectar of other flowering plants. Nonetheless healthy populations will only be found where suitable habitat quality is provided by good sward structure and good land management conditions. A structured sward with a varying vegetation height is preferred by the Marsh Fritillary. Varied vegetation height conditions create heat traps	<p>Mudflats and sandflats not covered by seawater at low tide [1140]</p> <p>Large shallow inlets and bays [1160]</p> <p>Reefs [1170]</p> <p>Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120]</p> <p>Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]</p> <p>Humid dune slacks [2190]</p> <p>Machairs (* in Ireland) [21A0]</p> <p><i>Juniperus communis</i> formations on heaths or calcareous grasslands [5130]</p> <p>Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites) [6210]</p> <p>Alkaline fens [7230]</p> <p><i>Petalophyllum ralfsii</i> (Petalwort) [1395]</p> <p>Turloughs [3180]</p>	The draining of land for agricultural improvement. Under grazing or over grazing of sites, leading to fewer Devil's-bit Scabious plants and loss of vegetation structure. Fragmentation of habitats resulting in smaller and more isolated colonies impairing the formation of its metapopulation structure. (Phelan et al.,2021) Reseeding grassland monocultures with perennial ryegrass. High level applications of organic and inorganic fertilisers. Extreme weather events such as drought. (Johansson et al., 2020)	<p>The marsh fritillary is listed under Annex II, core areas of their habitat are designated as sites of community importance (SCIs) and included in the Natura 2000 network. These sites must be managed in accordance with the ecological needs of the species.</p> <p>The following SAC's within the CP areas list Marsh Fritillary as a qualifying interest:</p> <p>–Bunduff Lough and Machair/Trawalua/Mullaghmore SAC</p> <p>–Bricklieve Mountains and Keishcorran SAC</p>	<p>Mowing – might be a once-off option for rehabilitating sites that have become overgrown and very tussocky. Livestock grazing management – cattle and horse grazing is recommended as they are less selective grazers and provide the varied grass structure. The goal is a structured sward height between 12–25cm.</p> <p>Scrub management – will be required on some sites where there is too much encroachment. Small patches of scrub can be beneficial. (Phelan et al.,2021)</p> <p>Shelter – Features that provide shelter from wind such as hedgerows, scrub patches, ditches and earth banks should be maintained.</p> <p>Low/Minimal Fertilizer Application – inputs must stay low (for mesotrophic habitats) or very low (for oligotrophic habitats), in order to maintain biodiversity desirable plant species such as the Devils-bit Scabious. (Muller,2002).</p>	The management of land to promote suitable Marsh Fritillary habitat will benefit the favourable conservation status of (including but not limited to): The reduction or ceasing application of fertiliser will allow traditional grasses, herbs and plants to succeed agricultural plants such as rye grasses and create a more species rich sward. Creating & Maintaining Species Rich Grassland–species rich grassland containing devils' bit scabious and pollinator plants to support the Marsh Fritillary lifecycle will also provide a valuable habitat and support several ecosystem services. Grazing management – managing the grazing of livestock to provide a more varied structure will benefit both flora allowing for a more diverse plant population and fauna for such birds as hen harrier, snipe, curlew etc., that preferred a varied sward structure.

	<p>or 'microclimates' that provide shelter for developing caterpillars and structure to allow the caterpillars to spin their web. (Phelan et al.,2021).</p>	<p>Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) [6210]</p> <p>Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis) [6510]</p> <p>Calcareous and calcshist screes of the montane to alpine levels (Thlaspietea rotundifolii) [8120]</p>				
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Context:

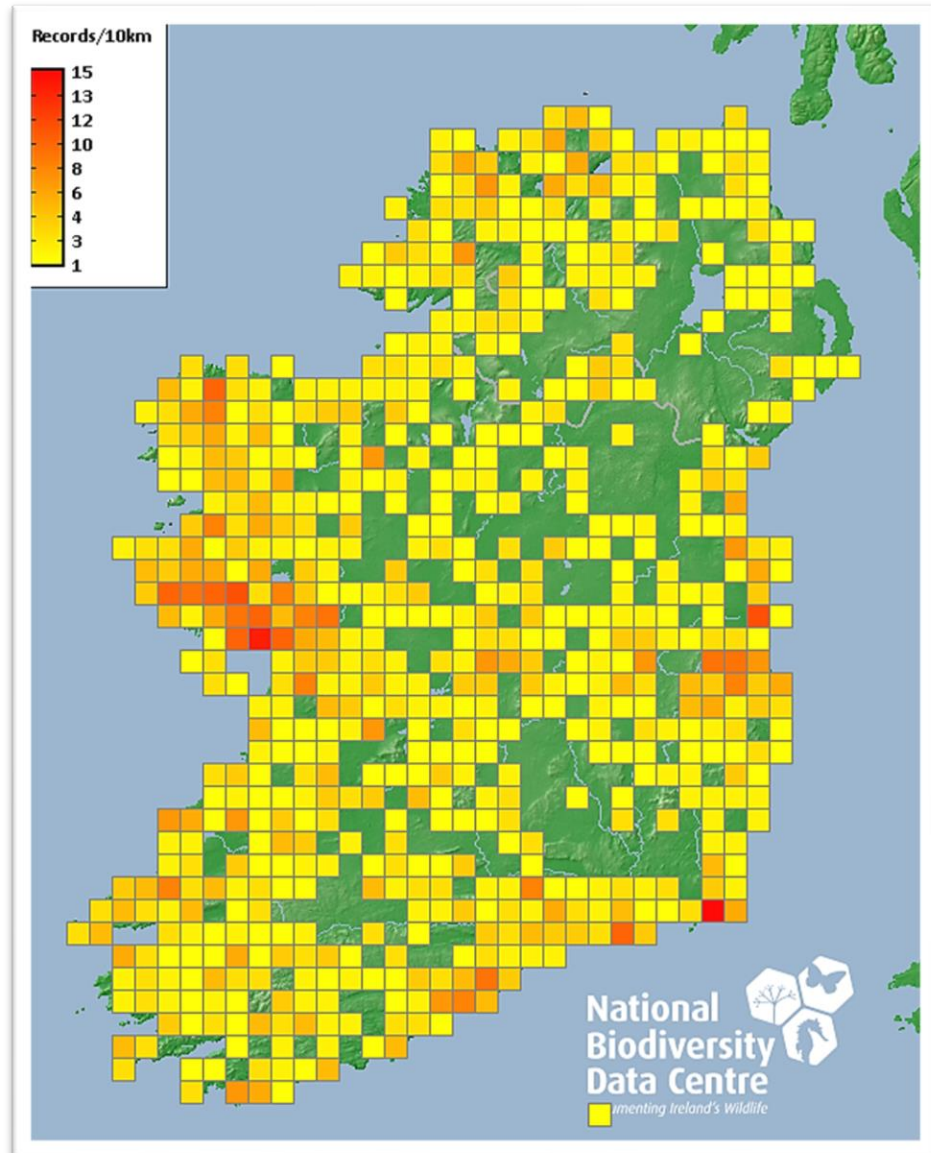
Merlin in Ireland have a widespread but sporadic distribution across upland habitats, lowland bogs and coastal regions during the winter. They are commonly found at altitudes between 150m-600m. Adult Merlin males are identifiable by their blue-grey upperparts, dark streaked rusty underparts and smaller size. They are easily separated from the brown females and young which themselves can be hard to identify. Merlin show favour to nesting in heather moorland and other open upland habitats but as noted by Lusby et al., (2022) in recent decades with the spread of conifer plantations in these areas, Merlin have been recorded to nest in trees in proximity to open habitat (Hardey et al., 2006).

Merlin is an Annex I species on the European Birds Directive 2009/147/EC, and as such there is a requirement for Member States to take appropriate measures to ensure the protection of their populations.

Lusby et al., (2022) research provides the most recent and comprehensive survey of the Merlin population in Ireland within the six SPA's which it is a qualifying interest. Lusby et al., (2022) and O'Donoghue et al., (2020) highlight several pressures and threats facing the Merlin population in Ireland, yet there are several conservation measures available to help mitigate these threats and pressures.

Useful references:

- Lusby, J., O'Brien, I., Lauder, A., Wilson-Parr, R., Breen, D., Cummins, S. and Tierney, D., 2022. Survey of breeding Merlin in the Special Protection Area network 2018. (Lusby et al., 2022)
- Wilson-Parr, R. & O'Brien, I. (Eds.) (2019) Irish Raptor Study Group Annual Review 2018. (Wilson-Parr and R & O'Brien, 2019)
- McCarthy, A. and Lusby, J., Duhallow Merlin Survey 2017. (McCarthy and Lusby, 2017)
- O'Donoghue, B.G., Casey, M.J., Malone, E., Carey, J.G., Clarke, D. and Conroy, K., 2020. Recording and Addressing Persecution and Threats to Our Raptors (RAPTOR): a review of incidents 2007–2019. (O'Donoghue et al., 2020)



- Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B., Thompson, D. 2006. *Raptors: A Field Guide to Survey and Monitoring*. The Stationery Office. (Hardey et al., 2006)
- National Biodiversity Data Centre, Ireland, Merlin (*Falco columbarius*), image, accessed 05 April 2023, <<https://maps.biodiversityireland.ie/Species/TerrestrialDistributionMapPrintSize/11701>>

Populati on estimate s in the CP areas.	Habitat Requiremen ts	Threats and Pressure s relevant to the CP	Aligning with Site Specific Conservation Objectives	Ecological Coherence with other Annex I habitats in the CP	Required Agricultural Managemen t Measures	Benefits of conservation participation
Merlin in Ireland have a widespread but sporadic distribution across upland habitats, lowland bogs and coastal regions during the winter. O'Donoghue et al., (2020) notes an estimation of 200–400 breeding pairs in Ireland. There has been no national census of breeding Merlin in Ireland. Breeding range declines of 8% and 49% over 20- and 40-year periods have been recorded by the breeding bird atlases. This recorded range declines have informed the inclusion of Merlin as an Amber-listed Bird of Conservation Concern in Ireland 2020–2026. (Lusby et al., 2022) (Wilson-Parr and R & O'Brien, 2019). It is noted by McCarthy and Lusby (2017) that the core breeding areas which are known for	Merlin utilises a variety of open habitats as a source of feeding and historically nesting habitat. This includes bog, heather moorland and open rough farmland, with suitable nesting opportunities in the form of mature forest plantations and suitable trees in proximity to open habitats (McCarthy and Lusby, 2017). Lusby et al., (2022) highlight that the degradation of these suitable open rough farmland, heath and bog habitats has led to Merlin now nesting in the abandoned nests of other bird species in forest plantations. Their study discovered Merlin now predominantly nest in trees (99.5%), mostly selecting nests at the edge (within 10 m) of mature conifer plantations (80.8%), with proximity to open habitats to provide feeding habitat which they would have usually ground nested in.	Afforestation in Ireland has been primarily concentrated in upland habitats, this has greatly altered the breeding range of Merlin, with Merlin now occurring in areas with substantial forestry present. Merlin will now predominate nest in forestry as noted by Lusby et al., (2020), this leaves them vulnerable to direct disturbance from forest management operations. Afforestation in upland areas can also affect the availability and suitability of foraging habitats for Merlin. Agricultural intensification and land use change is another threat to Merlin, such as upland habitats conversion into agricultural land through drainage or burning. The increase in sheep populations	Merlin is an Annex I species on the European Birds Directive 2009/147/EC, and as such there is a requirement for Member States to take appropriate measures to ensure the protection of their populations Merlin is a qualifying interest within six SPA's nationally with the Slieve Aughty Mountains SPA and Wicklow Mountains SPA the only two within our three CP zones. Merlin is mentioned as sighted in the following SPA's. - Mullaghinish to Musheramore SPA. - Slieve Beagh SPA. - Slieve Bloom Mountains SPA. - Slievefelim to Silvermines Mountain SPA. - Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA. - Middle Shannon Callows SPA.	- Estuaries (1130) - Lagoons (1150) - Wet Heath (4010) - Dry Heath (4030) - Alpine and Subalpine Heath (4060) - Raised Bogs (7110) - Degraded Raised Bog (7120) - Blanket Bog (7130) - Rhynchosporion Depressions (7150) - Alkaline Fens (7230) - Silceous Scree (8110) - Siliceous Rocky Slopes (8220) - Limestone Pavement (8240) - Old Oak Woodland (91AO) - Residual Alluvial Forests (91EO) - Species Rich Upland Grassland (6230) - Molinia Meadows (6410)	CA01 Prevent conversion of natural and semi-natural habitats, and habitats of species into agricultural land. CA02 – Restore small landscape features on agricultural land. CA03 Maintain existing extensive agricultural practices and agricultural landscape features CA15 – Manage drainage and irrigation operations and infrastructures in agriculture. CBO1 Prevent conversion of (semi-) natural habitats into forests and of (semi-)natural forests into intensive forest plantation. Enhancement of habitats used by Merlin i.e., upland habitats, lowland bogs, and coastal regions. Several actions are available to improve the quality of habitats used by Merlin for foraging and nesting such reduced stocking rates, drain blocking, peatland restoration, target grazing etc.	The management of land to promote suitable Merlin habitat will benefit the favourable conservation status of (including but not limited to): - The enhancement of upland habitats to benefit merlin will also benefit numerous other upland bird species. - Allow numerous upland flora such as heather and sphagnum moss to regenerate. - Improving upland habitats such as blanket bog will in turn allow more carbon sequestration to occur.

Merlin in Ireland include the Wicklow Mountains, Connemara and uplands of north and west Donegal. Lusby et al., (2022) survey of the six SPAs which Merlin are qualifying interest recorded a population between 27.5 to 41 breeding pairs, based on the number of confirmed and possible pairs recorded within the portion of the breeding Merlin SPA network surveyed.		in upland areas has led to overgrazing and increased pressure on available heather cover vegetation. Anthropogenic or man-made disturbance activities also cause disturbance to breeding Merlin pairs through affecting the suitability and quality of habitats used by Merlin. These activities include peat extraction, illegal burning and wind energy development (Lusby et al., 2022). Shotting, trapping and poisoning of raptor birds is also noted as a disturbance activity by O'Donoghue et al., (2020) with 338 incidents reported between 2007 and 2019 across all raptor bird species.				
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10.2.16 Peatland habitat

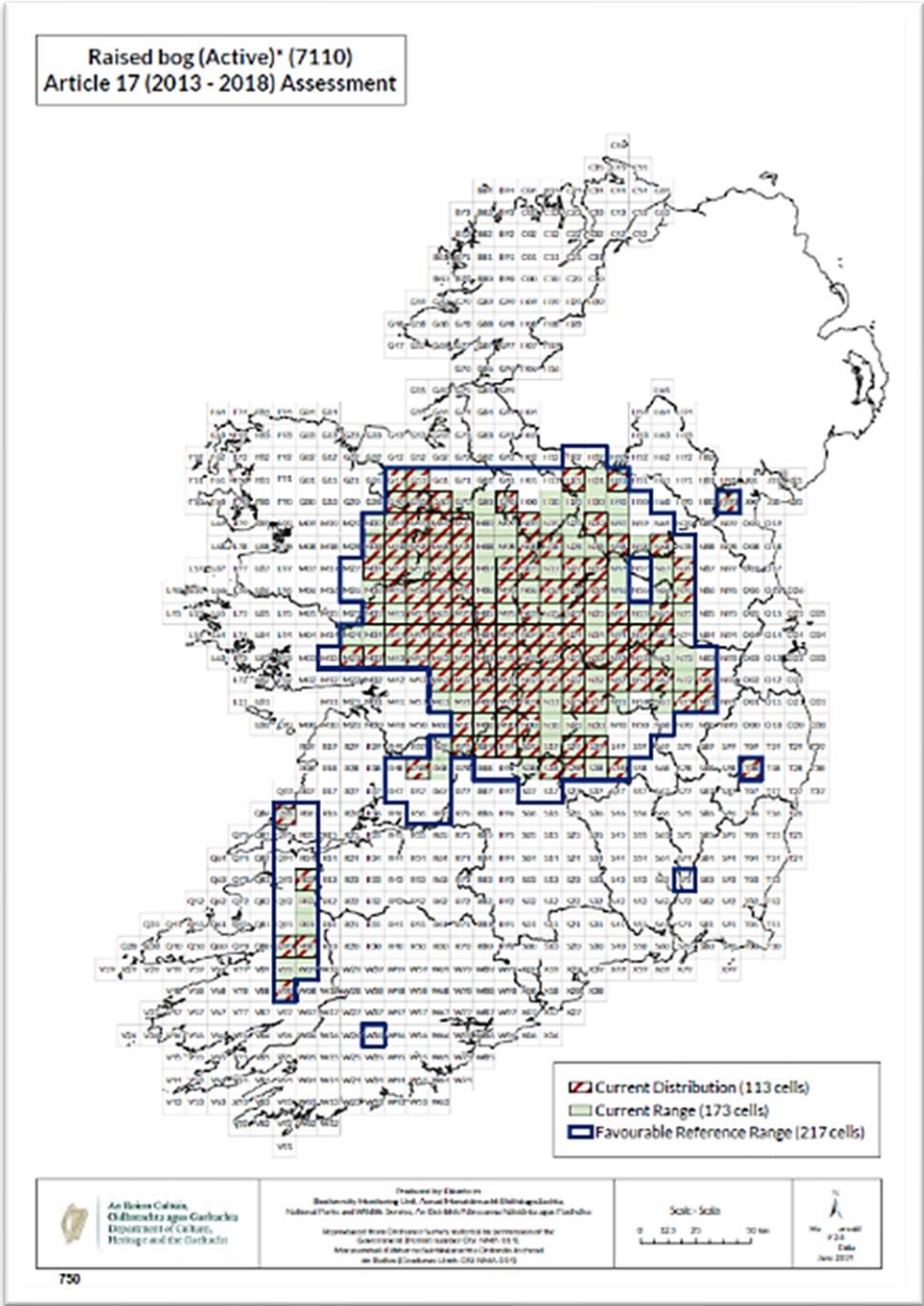
Eleven Annex I peatland habitats are present in the HHP CP areas. Profiles have been developed for each habitat and are presented under this section; peatland habitat in the HHP CP areas are likely to include variations of or be a combination of these.

10.2.16.1 Active Raised Bog [7110]

Context:

Although low in overall diversity, raised bogs support specialised plant assemblages dominated by a range of mosses of the genus *Sphagnum*. The bog surface may support a patterned microtopography of pools, hummocks and lawns that provide a range of water regimes supporting different species assemblages. Intact raised bogs are characterised by the presence of ericoid and *Cyperaceae* species and an abundance of *Sphagnum* species. Irish raised bogs are classified as Oceanic raised bog mire (Moore & Bellamy, 1974). This mire type has a very restricted distribution on the Atlantic fringe of the north-west of Europe. The vegetation of a typical, intact raised bog is assigned to the *Oxycocco-Sphagnetum* and to the *Erico-Sphagnetum magellanici* phytosociological association (White & Doyle, 1982). Recently, the Irish Vegetation Classification (Perrin, 2018) assigned Active Raised Bog (ARB) to vegetation communities within two main bog vegetation groups: *Rhynchospora alba-Sphagnum cuspidatum* (BG1) and *Erica tetralix-Sphagnum capillifolium* (BG2).

ARB is characterised by the presence of an acrotelm, which is defined as the living, actively growing upper layer of a raised bog, the surface of which is composed mainly of living bog mosses (*Sphagnum* spp.). The presence of the acrotelm is vital to a raised bog as this is the peat-forming layer and it strongly influences the rate of water runoff. In an Irish context, ARB (which is currently defined as occurring only on the high bog) encompasses active peat-forming ecotopes (central and sub-central) as defined by Kelly (1993) and Kelly & Schouten (2002), and actively peat-forming flushes. Bog Woodland habitat (91D0) is



also peat forming and, when found on the high bog is also classed as ARB habitat (7110). Depressions on peat substrates of the *Rhynchosporion* (7150) are also frequently found within ARB habitat (7110).

Although ARB is currently described as confined to the high bog, surveys in recent years have indicated the occurrence of peat forming vegetation on cutover areas at some sites. These areas occasionally correspond to regenerating ombrotrophic vegetation characterised by *Sphagnum* cover greater than 40-50%, but they generally lack the diversity and abundance of *Sphagnum* species, micro-topographical features and good quality indicators associated with ARB. These cutover areas have the capacity to develop into embryonic ARB but longer time periods (50-100 years) are likely to be required for high quality ARB to develop.

Useful references:

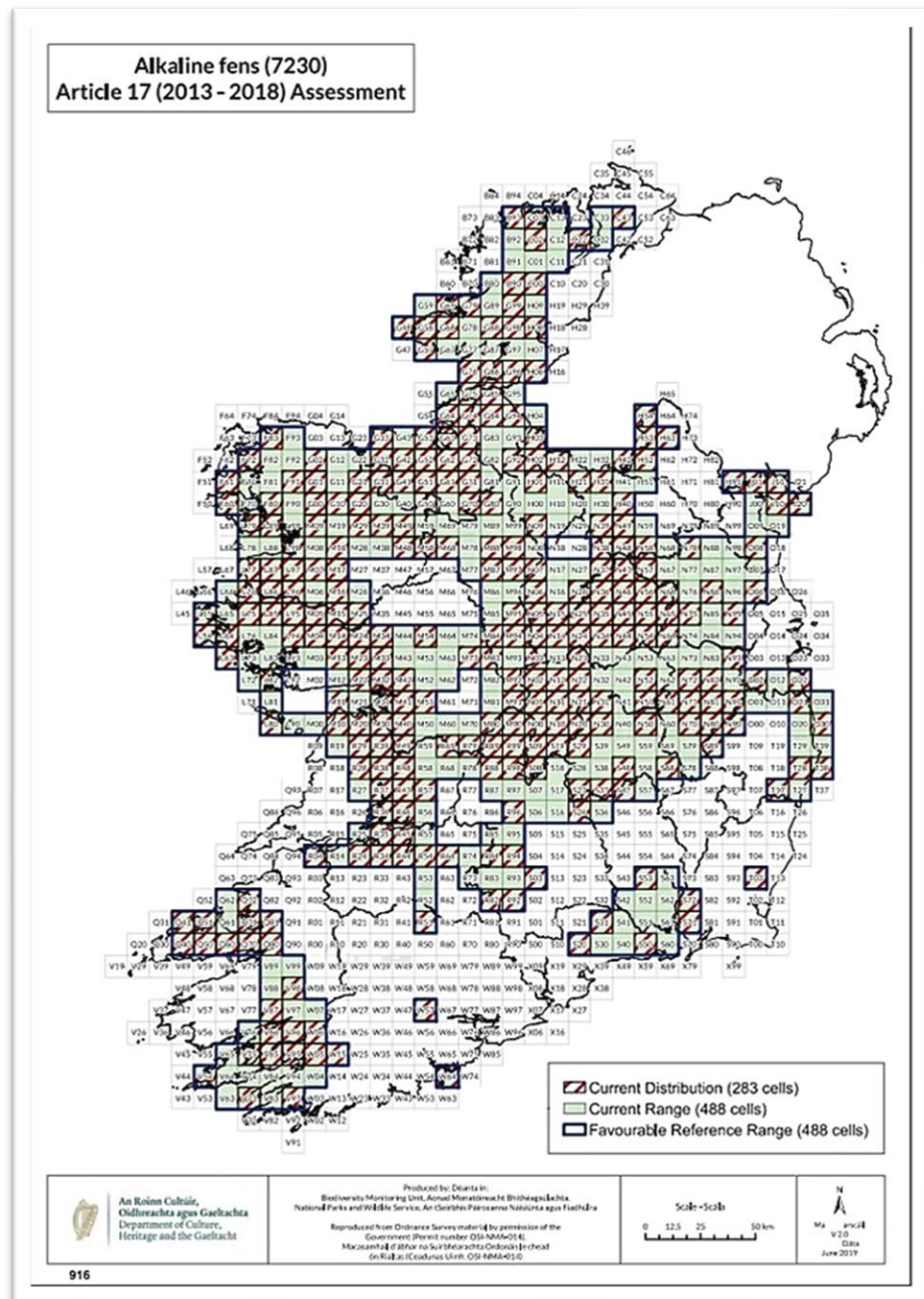
- Perrin, P.M., Barron, S.J., Roche, J.R. & O'Hanrahan, B. (2014). Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland. Version 2.0. Irish Wildlife Manuals, No. 79. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.
- Moore, P.D. & Bellamy, D.J. (1974) Peatlands. Elek Science, London. 221pp.
- White, J. & Doyle, G. (1982) The vegetation of Ireland: a catalogue raisonné. J. Life Sci. 3: 289-368.
- Perrin, P. (2018) Irish Vegetation Classification: Technical Progress Report No. 3. Report submitted to National Biodiversity Data Centre. <http://www.biodiversityireland.ie/projects/nationalvegetation-database/irish-vegetation-classification/explore/>
- Kelly, L. (1993) Hydrology, Hydrochemistry and Vegetation of Two Raised Bogs in Co. Offaly, Ph.D. Thesis, University of Dublin, Trinity College, Dublin.
- Kelly, L. & Schouten, M.G.C. (2002) Vegetation. In: M. G. C. Schouten (Ed.), Conservation and Restoration of Raised Bogs: Geological, Hydrological and Ecological Studies. pp.110-169, Department of Environment and Local Government, Dublin, Ireland/Staatabosbeheer, The Netherlands.
- Hammond, R.F. (1979) The Peatlands of Ireland. An Foras Talúntais, Dublin.
- Schouten, M.G.C. (1984) Some Aspects of the Geographical Gradient in Irish Ombrotrophic Bogs. Proceedings of the Seventh International Peat Congress, Dublin 1: 414-432.

Population estimate in the CP	Habitat Requirements	Ecological Coherence with Annex I habitats in the CP	Threats and Pressures relevant to the CP	Agricultural Management Measures
<p>CP areas within habitat range: Breifne, MSC</p> <p>Current Surface Area: 16.59km²</p> <p>Counties: Sligo, Leitrim, Mayo, Galway, Roscommon, Clare, Kerry, Tipperary, Cavan, Monaghan, Louth, Meath, Westmeath, Longford, Offaly, Laois, Kildare, Wicklow.</p> <p>Raised bogs are more abundant in the lowlands of central and mid-west Ireland. In Ireland raised bogs are confined to areas with an annual rainfall below 1,250 mm (Hammond, 1984). They occur principally on land below 130m and are classified into two sub-types: Western raised bogs (or Intermediate) and True Midland raised bogs (Schouten, 1984), with the boundary between the two being taken as the 1,000mm isohyet.</p>	<p>Raised bogs are accumulations of deep acid peat (3–12m) that originated in shallow lake basins or topographic depressions. They have a typical elevated surface or dome, which develops as raised bogs grow upwards from the surface (Fossitt, 2000). The bog dome is primarily rainwater fed (ombrotrophic) and isolated from the local groundwater table. This gives rise to acid conditions deficient in plant nutrients, which in turn support a distinctive suite of vegetation types.</p>	<ul style="list-style-type: none"> • Alkaline Fens [7230] • Alpine and Boreal heaths [4060] • Bog Woodland • Calcareous Fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> [7210] • Degraded raised bogs still capable of natural regeneration [7120] • Depressions on peat substrates of the Rhynchosporion [7150] • European Dry Heath [4030] • Juniperus communis formations on heaths or calcareous grasslands [5130] • Limestone pavements [8240] • Northern Atlantic Wet heath with <i>Erica tetralix</i> [4010] • Petrifying springs with tufa formation (Cratoneurion) [7220] • Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani) [8110] • Transition mires and quaking bogs [7140] 	<ul style="list-style-type: none"> • A11 Burning for agriculture (M) 	<ul style="list-style-type: none"> • C103 Management, control or eradication of other invasive alien species • C105 Management of problematic native species • C103 Restore habitats impacted by multi-purpose hydrological changes

Context:

Alkaline fens are groundwater-fed, generally peat-forming systems with extensive areas of species-rich small sedge and brown moss communities. They occur in areas where there is a high water table and a base-rich, often calcareous water supply. Alkaline fens can develop in areas where vertical water movement predominates (topogenous), such as poorly drained basins or hollows and open water transitions; or where horizontal water movement is also important (soligenous), such as flushes, valley fens and the lags of raised bogs. However, this distinction is not always clear (such as in large floodplain fens which can include both elements). Fen systems are often a complex mosaic of habitats, with tall sedge beds, reedbeds, wet grasslands, springs and open-water co-occurring.

A full account of the vegetation of alkaline fens in Ireland is provided in Long et al., 2018, and a preliminary vegetation classification of fens in Ireland has just recently been made available as part of the Irish Vegetation Classification



(<http://www.biodiversityireland.ie/projects/nationalvegetation-database/>)

Useful references:

- Perrin, P.M., Barron, S.J., Roche, J.R. & O’Hanrahan, B. (2014). Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland. Version 2.0. Irish Wildlife Manuals, No. 79. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.
- EC. 2008. Management of Natura 2000 habitats. 7230 Alkaline fens

- Long, M.P., Crowe, O., Kimberley, S and Denyer, J. (2018) Backing document – National Conservation Status Assessments (NCAs) for three fen habitat types: 7140 – Transition mires and quaking bogs, 7210 – Calcareous fens with *Cladium mariscus* and species of *Caricion davallianae*, 7230 – Alkaline fens. Unpublished report to NPWS.

Population estimate in the CP	Habitat Requirements	Ecological Coherence with Annex I habitats in the CP	Threats and Pressures relevant to the CP	Agricultural Management Measures
<p>CP areas within habitat range: Breifne, MSC, Leinster</p> <p>Current Surface Area: 125.31km²</p> <p>Counties within Range: all except Carlow.</p> <p>Alkaline fens are relatively widespread in Ireland. The most extensive areas of alkaline fens are thought to occur in lowland basins associated with limestone groundwater bodies (often in midland areas). Alkaline fens associated with flushes and open water transitions tend to be smaller, but may be more widespread than those in lowland basins.</p>	<p>The formation of mires requires a positive water balance and the accumulation of peat (Mitsch & Gosselink 2000). Both groundwater regime and quality determine whether fens are formed. In topogenous fens the ground water level is high due to the local relief – water movement is often slow. They include basin fens and floodplain fens. Soligenous fens are largely the result of flowing surface water. They include mires associated with springs, mountain flushes, valley mires, and water tracks and ladder fens in blanket and raised bogs. (EC, 2008)</p>	<ul style="list-style-type: none"> • Active Raised Bog [7110] • Alpine and Boreal heaths [4060] • Blanket bogs (* if active bog) [7130] • Bog Woodland • Calcareous Fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> [7210] • Degraded raised bogs still capable of natural regeneration [7120] • Depressions on peat substrates of the Rhynchosporion [7150] • European Dry Heath [4030] • Juniperus communis formations on heaths or calcareous grasslands [5130] • Limestone pavements [8240] • Northern Atlantic Wet heath with <i>Erica tetralix</i> [4010] • Petrifying springs with tufa formation (Cratoneurion) [7220] • Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani) [8110] • Transition mires and quaking bogs [7140] 	<ul style="list-style-type: none"> • A06 Abandonment of grassland management (H) • A09 Intensive grazing or overgrazing by livestock (H) 	<ul style="list-style-type: none"> • CA04 Reinstate appropriate agricultural practices to address abandonment including mowing, grazing, burning or equivalent measures; • CA05 Adapt mowing, grazing and other equivalent agricultural activities; • CA06 Stop mowing, grazing and other equivalent agricultural activities; • CA11 Reduce diffuse pollution to surface or groundwaters from agricultural activities;

Context:

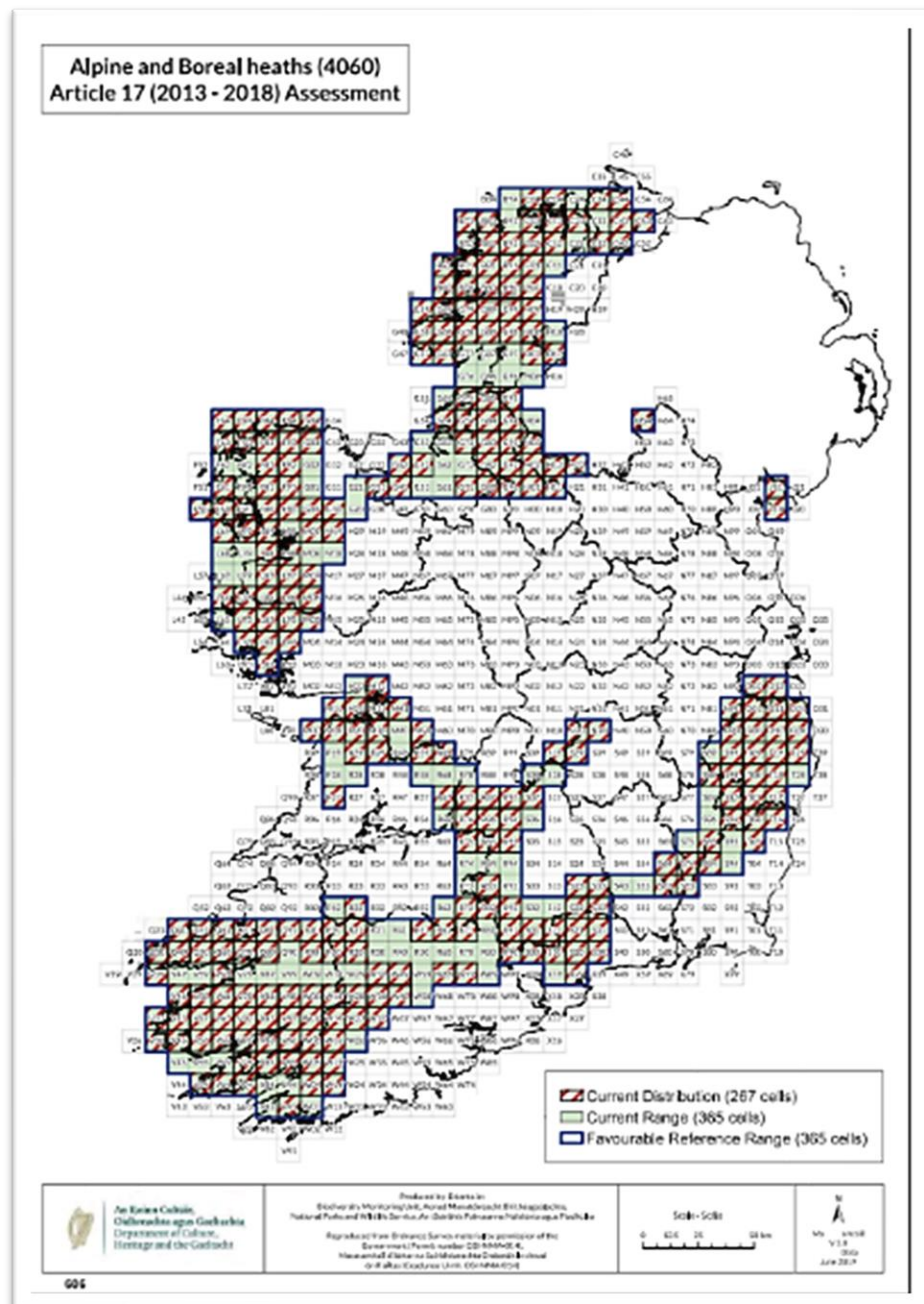
In Ireland, Alpine and Boreal heath is mainly confined to the mountainous areas (Coll, 2016). Alpine heaths develop above the natural altitudinal tree line, whereas boreal heaths develop below the tree line in gaps among scrubby high-altitude woodland. The habitat in Ireland is one where vegetation cover is rarely complete but normally exceeds 50% (Fossitt, 2000) and is predominately associated with shallow mineral soils, being occasionally found on areas of loose rock/coarse sediment on mountain tops and ridges (Zaghi, 2008). It is typically dominated by a range of low-growing, windclipped dwarf shrubs. In oceanic areas, dwarf shrub cover is often low, with the moss *Racomitrium lanuginosum* becoming dominant (Hodd & Sheehy Skeffington 2011a, Perrin et al. 2014).

Alpine and Boreal heath consists of two distinct subtypes in Ireland:

The upland subtype occurs on the exposed summits and upper slopes of mountains on acidic substrate. It typically occurs from around 350-400 m upwards, but can occur at lower altitudes in more exposed locations. The vegetation is characterised by low-growing, wind-clipped dwarf shrubs, with *Calluna vulgaris* typically the most frequent, and by the abundance of the bryophyte *Racomitrium lanuginosum*. Whilst the presence of arctic-alpine species indicates high quality examples of this variant, it is not deemed a requisite.

The lowland subtype comprises *Dryas* heath on limestone. The vegetation is characterised by mats of *Dryas octopetala* accompanied by species typical of calcareous grassland.

This habitat may include communities with affinities to the *Loiseleuria procumbentis*-*Vaccinium*, *Calluno-Genistion pilosae*, *Ericion-tetralicis* and *Kobresio-Dryadion* associations (Perrin, 2017). According to Perrin (2017) most examples of Irish Vegetation Classification (IVC) heath communities *Calluna vulgaris*-*Nardus stricta* (HE3C), *Calluna vulgaris*-*Racomitrium lanuginosum* (HE3D) and *Racomitrium lanuginosum*-*Festuca vivipara* (HE3E) occur in habitat 4060, and elements of other



communities within IVC heath groups *Vaccinium myrtillus-Racomitrium lanuginosum* (HE3), *Dryas octopetala-Sesleria caerulea* (HE1) and *Erica cinerea-Calluna vulgaris* (HE2) can also occur.

Useful References;

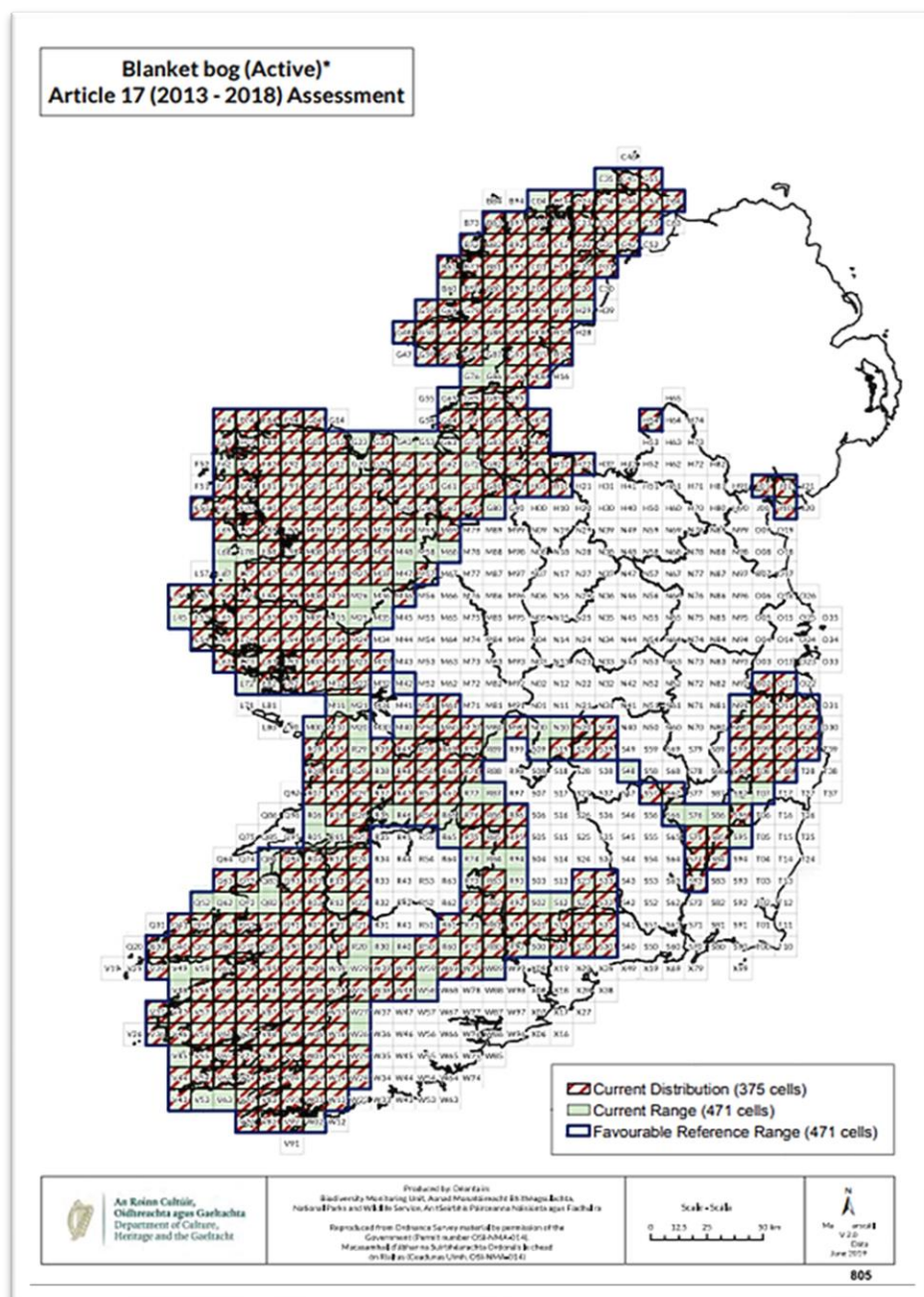
- Coll, J., Bourke, D., Hodd, R.L., Skeffington, M.S., Gormally, M. and Sweeney, J., 2016. Projected climate change impacts on upland heaths in Ireland. *Climate Research*, 69(2), pp.177-191.
- English Nature 2003. Lowland Heathland SSSIs: Guidance on conservation objectives setting and condition monitoring. English Nature No. 511.
- Fossitt JA (2000) A guide to habitats in Ireland. The Heritage Council, Dublin (reprint 2007)
- Hodd RL, Sheehy Skeffington MJ (2011a) Climate change and oceanic montane vegetation: a case study of the montane heath and associated plant communities in western Irish mountains. In: Hodkinson T, Jones M, Waldren S, Parnell J (eds) Climate change, ecology and systematics. Cambridge University Press, Cambridge
- Perrin PM, Barron SJ, Roche JR, O'Hanrahan B (2014) Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland. Version 2.0. Irish Wildlife Manuals No. 79. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin
- Zaghi D (2008) Management of Natura 2000 habitats. 4060 alpine and boreal heaths. European Commission, Brussels
- Perrin, P. (2017) Irish Vegetation Classification: Technical Progress Report No. 3. Report submitted to National Biodiversity Data Centre.
- Hampton M. 2008. Management of Natura 2000 habitats. 4010 Northern Atlantic wet heaths with *Erica tetralix*. European Commission

Habitat Extent in the CP	Habitat Requirements	Ecological Coherence with Annex I habitats in the CP	Threats and Pressures relevant to the CP	Agricultural Management Measures
<p>CP areas within habitat range: Breifne, Leinster, MSC</p> <p>Current Surface Area: 150.74 km²</p> <p>Counties within habitat range: Cavan, Monaghan, Sligo, Leitrim, Galway, Roscommon, Mayo, Clare, Tipperary, Limerick, Cork, Kerry, Waterford, Louth, Offaly, Laois, Kilkenny, Wexford, Carlow, Kildare, Wicklow, Dublin.</p>	<p>A variation in vegetation structure is required in order to maintain high niche diversity and high species richness of plants and animals. This variation should be evident in terms of heterogenous vegetation height, amount of canopy closure and presence of a 'patch' structure.</p> <p>In some sites, the structure of the vegetation can be altered by natural and human actions. For instance, wind-pruned dwarf-shrubs can be short and at the same time fairly mature and heather structure can be altered if grazing is present (English Nature 2003).</p>	<ul style="list-style-type: none"> Blanket bogs (* if active bog) [7130] Bog woodland European dry heaths [4030] <i>Juniperus communis</i> formations on heaths or calcareous grasslands [5130] Limestone pavements [8240] Northern Atlantic wet heaths with <i>Erica tetralix</i> [4010] Petrifying springs with tufa formation (<i>Cratoneurion</i>) [7220] Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i>) [8110] Transition mires and quaking bogs [7140] 	<ul style="list-style-type: none"> A09 Intensive grazing or overgrazing by livestock (H) A27 Agricultural activities generating air pollution (H) 	<ul style="list-style-type: none"> CA03 Maintain existing extensive agricultural practices and agricultural landscape features CA04 Reinstatement appropriate agricultural practices to address abandonment, including mowing, grazing, burning or equivalent measures CA05 Adapt mowing, grazing and other equivalent agricultural activities CI03 Management, control or eradication of other invasive alien species CI05 Management of problematic native species

Context:

The character species for Lowland Blanket are; Liverwort (*Pleurozia purpurea*), the moss *Campylopus atrovirens* and Black Bog-rush (*Schoenus nigricans*). White-beaked Sedge (*Rhynchospora alba*) is also an important species in the deeper areas of Lowland Atlantic blanket bog. The absence of the species Bog Rosemary (*Andromeda polifolia*) and Cranberry (*Vaccinium oxycoccos*) from Atlantic Blanket Bog vegetation further distinguishes this bog type from raised bog vegetation in Ireland. Species preferential to lowland Atlantic blanket bog include the Lusitanian Butterwort (*Pinguicula lusitanica*), Bog Lousewort (*Pedicularis sylvatica*) and Milkwort (*Polygala serpyllifolia*), and in bog pools Pipewort (*Eriocaulon aquaticum*) and Water Lobelia (*Lobelia dortmanna*) (Schouten, 1984).

Typical species composition of mountain blanket bogs includes a dominance of Ling Heather (*Calluna vulgaris*), Bog Cottons (*Eriophorum vaginatum*), and some *Eriophorum angustifolium* and Deer Grass (*Trichophorum germanicum*) together with the more typical montane species Crowberry (*Empetrum nigrum*) and Bilberry (*Vaccinium myrtillus*), and the liverwort *Diplophyllum albicans*. Species of lowland and highland blanket bogs such as Purple Moor-grass (*Molinia caerulea*) and Cross-leaved Heath (*Erica tetralix*) are, in general, very scarce. *Racomitrium lanuginosum* is often a very widespread moss in mountain blanket bogs and is an important component species of most Irish mountain blanket bogs. Schouten (1984) commented on floristic differences between western and eastern mountain blanket bogs, with the former found to have *Molinia caerulea*, *Pedicularis sylvatica*, *Polygala serpyllifolia*, Tormential (*Potentilla erecta*), the liverwort *Pleurozia purpurea*, the moss *Campylopus atrovirens* and a lesser contribution from sphagna than the eastern mountain bogs, which have a higher Sphagnum content and often contain species characteristic of true midland raised bogs (Hammond, 1981), *Andromeda polifolia* and *Vaccinium oxycoccos*. Lichens of the *Cladonia* genus are a characteristic feature of both upland and lowland blanket bog.



Areas of ‘active’ and ‘inactive’ blanket bog qualify as Annex I habitat. The former should support significant areas of peat-forming vegetation (e.g. *Schoenus nigricans*, *Molinia caerulea*, *Eriophorum spp.* and *Sphagnum spp.*). ‘Inactive’ blanket bog is a poorly defined term and depends on rates of recovery of blanket bog vegetation, ecohydrology and peat-forming function.

Useful references:

- Hammond, R.F. (1981) The Peatlands of Ireland. Soil Survey Bulletin No. 35, 2nd edition. An Foras Talúntais, 19 Sandymount Avenue, Dublin 4.
- Irish peatland Conservation Council, (2022) <<http://www.ipcc.ie/a-to-z-peatlands/blanket-bogs/>> [accessed November 2022].
- Perrin, P. (2017) Irish Vegetation Classification: Technical Progress Report No. 3. Report submitted to National Biodiversity Data Centre. <http://www.biodiversityireland.ie/projects/nationalvegetation-database/irish-vegetation-classification/explore>
- Perrin, P.M., Roche, J.R., Barron, S.J., Daly, O.H., Hodd, R.L. & Devaney, F.M. (2014). National Survey of Upland Habitats (Phase 4, 2013-2014), Site Report No. 16: Caha Mountains SAC (000093), Cos. Cork and Kerry. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.
- Schouten, M.G.C. (1984) Some Aspects of the Geographical Gradient in Irish Ombrotrophic Bogs. Proceedings of the Seventh International Peat Congress, Dublin 1: 414-432

Habitat Extent in the CP	Habitat Requirements	Ecological Coherence with Annex I habitats in the CP	Threats and Pressures relevant to the CP	Agricultural Management Measures
<p>CP areas within habitat range: ESE, NCU, MSC</p> <p>Current Surface Area: 2,574.51 km²</p> <p>Counties within Range: Sligo, Leitrim, Cavan, Monaghan, Louth, Roscommon, Mayo, Galway, Clare, Limerick, Kerry, Cork, Waterford, Tipperary, Offaly, Laois, Kilkenny, Carlow Wicklow, Dublin, Wexford.</p> <p>Atlantic Blanket Bogs are found in low-lying coastal plains and valleys in mountainous areas of western counties, below 200m O.D. They are particularly well developed in counties Donegal, Mayo, Galway, Kerry, Clare and Sligo</p> <p>Mountain Blanket Bogs occur on relatively flat terrain in the higher Irish mountains above 200m O.D. and are more widely distributed than Atlantic blanket bogs.</p> <p>Atlantic blanket bogs and mountain blanket bogs are the most extensive of the Irish peatland types and originally covered an area of 774,360ha.</p>	<p>Blanket bog occurs on flat or sloping land with poor surface drainage, in cool, wet, oceanic climates. Development of blanket bog is reliant on climatic factors (i.e. cool summers, high rainfall > 1,250 mm) with key requirements being more than 225 rain days per annum and very high atmospheric humidity (Hammond, 1981). Blanket Bog also requires a minimum peat thicknesses of typically 0.5m with shallower peats supporting heath habitats. Peat thicknesses are generally c. 1 to 2 m in uplands but can be up to 8 m in lowlands. Blanket bog generally occurs on flat or gently sloping terrain but can occur on steeper ground (up to 40°) in wetter areas. It often occurs in a complex mosaic with heath, transition mire, fen and freshwater habitats.</p> <p>Blanket Bogs form where the climate is sufficiently cool and wet. Basins, plateaus and gentle slopes come to be swamped by peat formed from acid vegetation. Over time, the Peatland formed on basins, plateaus and gentle slopes at different places in the same landscape coalesces into a blanket bog complex. Therefore, blanket bogs are complexes which combine several congruent and hydrologically inter-related peatland sites into a continuous peatland system. Within the complex, the underlying peat varies considerably in depth and humification, according especially to the angle of the slope and the degree of waterlogging. (Irish Peatland Conservation Council, accessed 2022)</p>	<ul style="list-style-type: none"> • Active raised bogs [7110] • Alkaline Fens [7230] • Alpine and Boreal heaths [4060] • Bog Woodland • Calcareous Fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> [7210] • Degraded raised bogs still capable of natural regeneration [7120] • Depressions on peat substrates of the <i>Rhynchosporion</i> [7150] • European Dry heaths [4030] • <i>Juniperus communis</i> formations on heaths or calcareous grasslands [5130] • Limestone pavements [8240] • Northern Atlantic wet heaths with <i>Erica tetralix</i> [4010] • Petrifying springs with tufa formation (<i>Cratoneurion</i>) [7220] • Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i>) [8110] • Transition mires and quaking bogs [7140] 	<ul style="list-style-type: none"> • A09 Intensive grazing or overgrazing by livestock (H) • A11 Burning for agriculture (H) • A27 Agricultural activities generating air pollution (H) • C05 Peat extraction (H) • K02 Drainage (M) 	<ul style="list-style-type: none"> • CA05 Adapt mowing, grazing and other equivalent agricultural activities • CA06 Stop mowing, grazing and other equivalent agricultural activities • CA15 Manage drainage and irrigation operations and infrastructure in agriculture

Context:

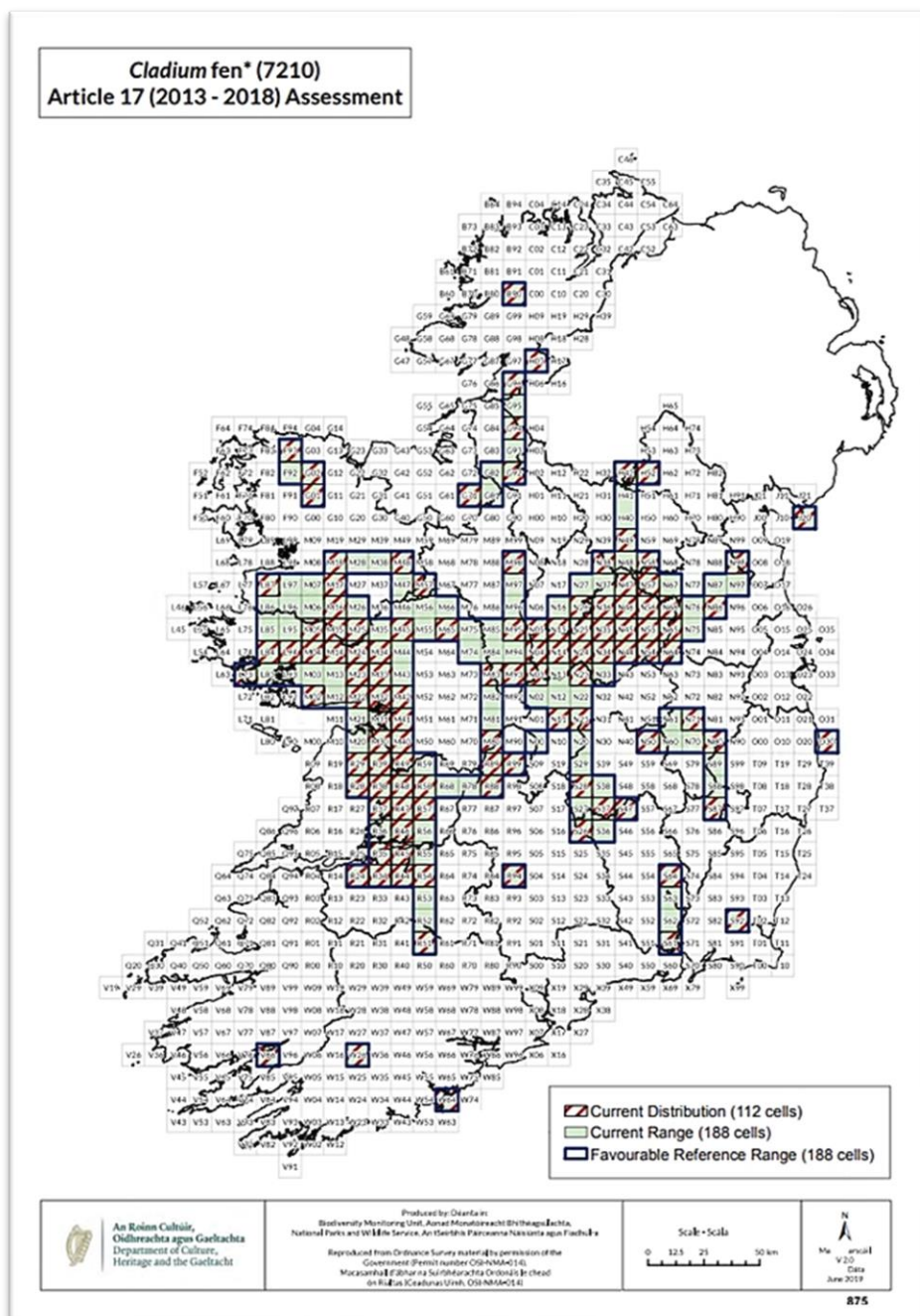
The Annex I habitat *Cladium* fens refers to *Cladium mariscus* beds which are in contact with species-rich vegetation of small-sedge fens (i.e. *Cladium mariscus* and species of the *Caricion davallianae*). This can occur where there are species-rich open swards of *Cladium mariscus* with elements of small-sedge fen, fen meadow and tallherb fen. These may be naturally species-rich or managed to prevent dominance of *Cladium mariscus*. However, the Annex I habitat can also occur where species-poor or mono-dominant stands of *Cladium mariscus* transition to species-rich alkaline fen vegetation types at their margins or occur in a mosaic of species-poor and species-rich vegetation. This latter situation tends to be more common in Ireland. In these instances, the whole stand of *Cladium mariscus*, including areas that support species-poor vegetation, is referable to the Annex I habitat. *Cladium* fen can occur in a wide range of habitats, in both topogenous and soligenous situations, such as the emergent zone of calcareous lakes, valley fens, floodplains, wet meadows and calciumrich flush areas within blanket bogs in the west. The habitat is characterised by waterlogged peat soils, a high water table (at or above the surface), and near neutral to alkaline oligotrophic to mesotrophic water.

Fens can be separated into two categories based on the level of nutrient enrichment;

"Poor" fens; very low concentrations of plant nutrients and floristically similar to a bog.

"Rich" fens; relatively high concentrations of mineral nutrients but still characterised by peat accumulation (likely to be from the remains of plants other than sphagnum mosses, such as sedges and brown mosses).

Useful references:



- Doyle, G.J. and Ó'Críodáin, C., 2003. Peatlands—fens and bogs. *Wetlands of Ireland—Distribution, Ecology, Uses and Economic Value*, pp.79-108.
- Joint Nature Conservation Committee, 2004. *Common Standards Monitoring Guidance for Lowland Wetland Habitats*.

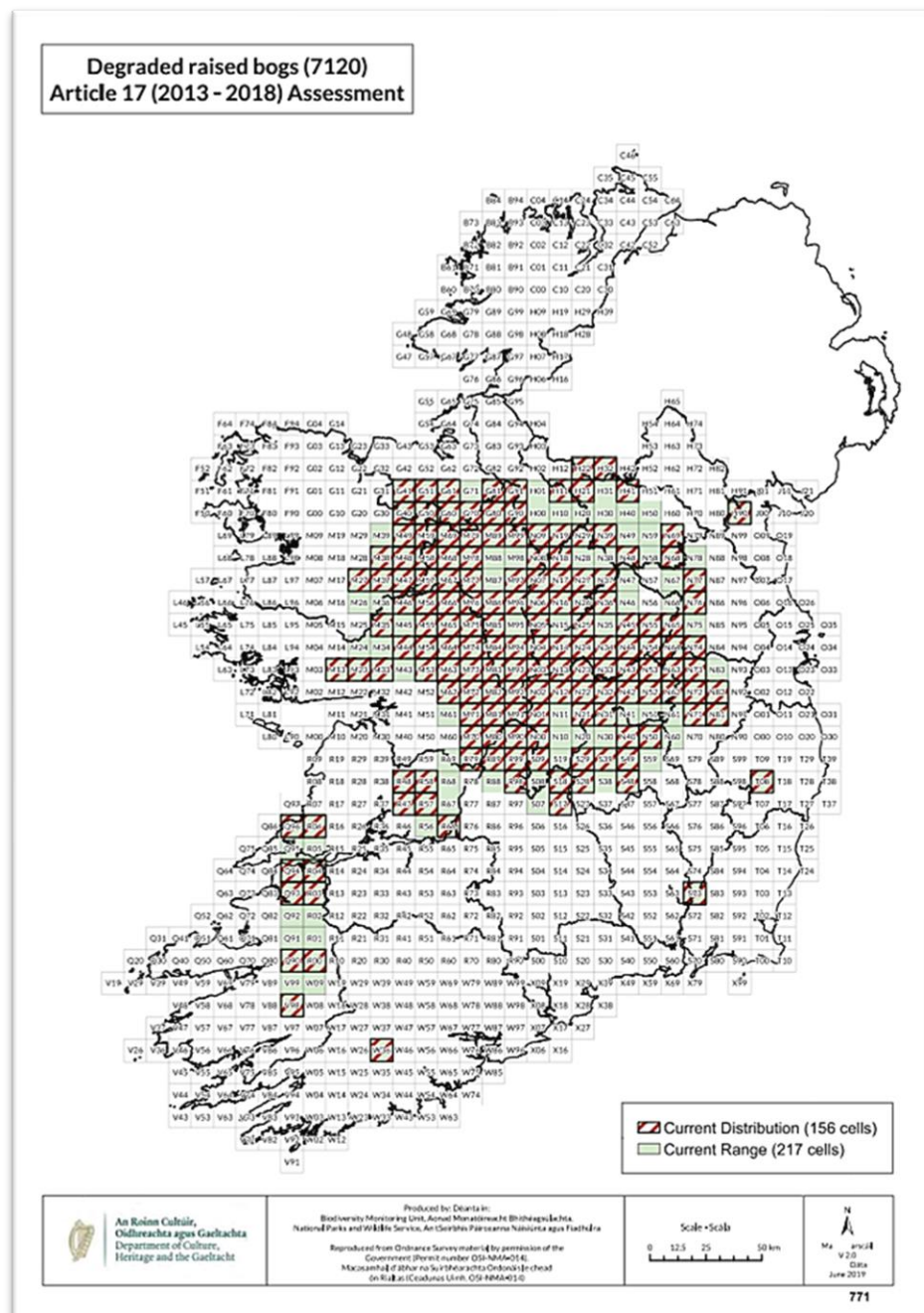
Population estimate in the CP	Habitat Requirements	Ecological Coherence with Annex I habitats in the CP	Threats and Pressures relevant to the CP	Agricultural Management Measures
<p>CP areas within habitat range: Breifne, MSC, ESE</p> <p>Current Surface Area: 150.74km²</p> <p>Counties within Range: all except Dublin</p> <p>Alkaline fens are relatively widespread in Ireland. The most extensive areas of alkaline fens are thought to occur in lowland basins associated with limestone groundwater bodies (often in midland areas). Alkaline fens associated with flushes and open water transitions tend to be smaller, but may be more widespread than those in lowland basins. Cladium fens are found throughout Ireland, most commonly in lowland areas in the midlands, west and south-east. They are occasional elsewhere.</p> <p>-</p>	<p>Fens require a alkaline or slightly acidic peat substrate and a permanently high water level (i.e at or just below ground-level) for formation. Mineral nutrients are received from sources other than precipitation, this is usually from upslope sources through drainage or from groundwater movement. Subsequently, Fens are generally not as acidic as bogs and have relatively higher mineral levels. This allows fens to support a wider range of plant and animal species when compared to bogs.</p> <p>Fens are generally poor in Nitrogen and Phosphorus, with the latter being the limiting nutrient in most sites. Multiple studies show that nutrient enrichment (with nitrogen and phosphorus) leads to changes in species composition, decline in overall plant species diversity, and loss of rare and uncommon species (Doyle & O Críodáin 2003).</p>	<ul style="list-style-type: none"> • Active Raised Bog [7110] • Alkaline Fen [7230] • Alpine and Boreal heaths [4060] • Blanket bogs (* if active bog) [7130] • Bog Woodland • Degraded raised bogs still capable of natural regeneration [7120] • Depressions on peat substrates of the Rhynchosporion [7150] • European Dry Heath [4030] • Juniperus communis formations on heaths or calcareous grasslands [5130] • Limestone pavements [8240] • Northern Atlantic Wet heath with <i>Erica tetralix</i> [4010] • Petrifying springs with tufa formation (Cratoneurion) [7220] • Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani) [8110] • Transition mires and quaking bogs [7140] 	<ul style="list-style-type: none"> • A09 Intensive grazing or overgrazing by livestock (H) • A27 Agricultural activities generating air pollution (H) 	<ul style="list-style-type: none"> • CA03 Maintain existing extensive agricultural practices and agricultural landscape features • CA04 Reinstate appropriate agricultural practices to address abandonment, including mowing, grazing, burning or equivalent measures • CA05 Adapt mowing, grazing and other equivalent agricultural activities

Context:

The vegetation of a typical, intact raised bog is assigned to the *Oxycocco-Sphagnetum* and to the *Erico-Sphagnetum magellanicum* phytosociological association (White and Doyle, 1982). Recently, the Irish Vegetation Classification assigned Degraded Raised Bog (DRB) to vegetation communities under the two main bog vegetation groups: *Rhynchospora alba-Sphagnum cuspidatum* (BG1) and *Erica tetralix-Sphagnum capillifolium* (BG2) (Perrin, 2018).

DRB is characterised by the complete absence, or at best the presence of only a patchy thin cover, of an 'acrotelm' layer. The acrotelm is the living, actively growing upper layer of a raised bog. The acrotelm is vital to the maintenance and development of an active raised bog as this is the peat-forming layer and its presence strongly influences the rate of water runoff. Previously all the vegetated areas of high bog which were not delineated as Active Raised Bog (ARB) were classified as DRB, on the assumption that most of it could be restored to active peat-forming condition after implementation of comprehensive restoration works. The habitat was therefore considered to encompass sub-marginal, marginal and face bank ecotopes, (Kelly, 1993; Kelly and Schouten, 2002), as well as inactive flushes and dry woodland on the high bog.

Note: Based on the results of a comprehensive programme of research on Irish bogs by Irish and Dutch scientists in the 1990s, an eco-hydrological model has recently been developed based on LiDAR (Light Detection and Ranging) data. The model predicts where there is potential to restore active conditions on the high bog (NPWS, 2017). As a result, only those areas with the right combination of physical conditions (including surface shape, slope and drainage patterns) ultimately capable of supporting ARB are now considered as DRB. These are the areas of raised bogs whose hydrology has been disturbed so that their surfaces have dried out and suffered some species change or loss. Bog species of drier conditions now dominate, and peat formation has ceased. The water level is generally 10 cm or more below the surface and drops to 30+ cm below during dry summer weather. To qualify as DRB, these areas must still be capable of natural regeneration to



active bog within 30 years if their hydrology is repaired (usually after restoration works, particularly blocking of drains). The remainder of the high bog that is neither ARB nor DRB is now referred to as 'Supporting Raised bog habitat'

Useful references:

- Fossitt, J.A. (2000) A guide to habitats in Ireland. The Heritage Council, Kilkenny.
- Kelly, L. (1993) Hydrology, Hydrochemistry and Vegetation of Two Raised Bogs in Co. Offaly, Ph.D. Thesis. Trinity College, Dublin.
- Kelly, L. and Schouten, M.G.C. (2002) Vegetation. In: M. G. C. Schouten (Ed.), Conservation and Restoration of Raised Bogs: Geological, Hydrological and Ecological Studies. pp.110-169, Department of Environment and Local Government, Dublin, Ireland/Staatabosbeheer, The Netherlands.
- Moore, P.D. and Bellamy, D.J. (1974) Peatlands. Elek Science, London. 221pp.
- NPWS (2017) National Raised Bog Special Areas of Conservation Management Plan 2017-2022. National Parks and Wildlife Services, Department of Culture, Heritage and the Gaeltacht. Dublin.
- Perrin, P. (2018) Irish Vegetation Classification: Technical Progress Report No. 3. Report submitted to National Biodiversity Data Centre. <http://www.biodiversityireland.ie/projects/nationalvegetation-database/irish-vegetation-classification/explore/>
- Perrin, P. (2018) Irish Vegetation Classification: Technical Progress Report No. 3. Report submitted to National Biodiversity Data Centre.
- Schouten, M.G.C. (1984) Some Aspects of the Geographical Gradient in Irish Ombrotrophic Bogs. Proceedings of the Seventh International Peat Congress, Dublin 1: 414-432.
- White, J. and Doyle, G. (1982) The vegetation of Ireland: a catalogue raisonné. J. Life Sci. 3: 289-368.

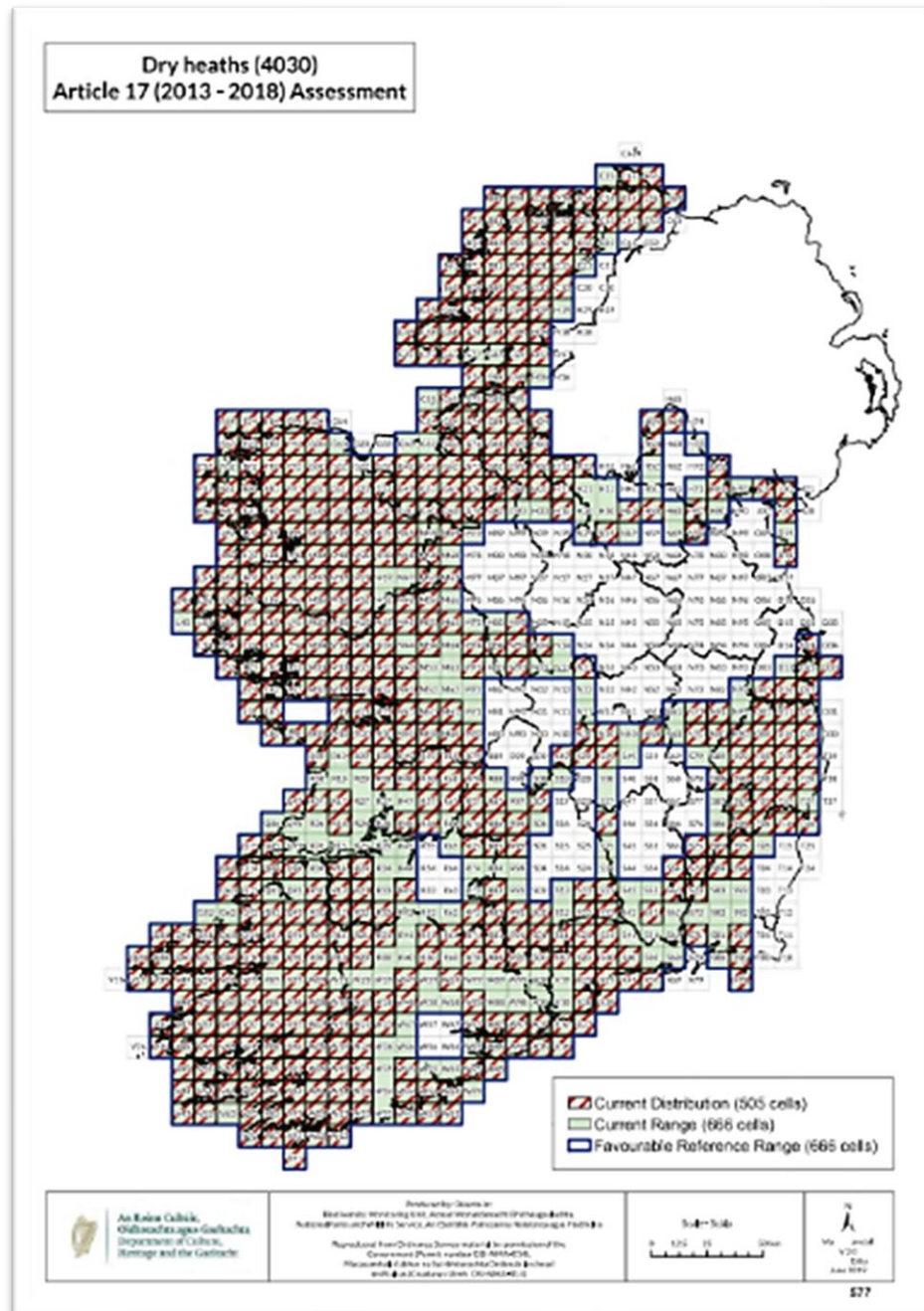
Population estimate in the CP	Habitat Requirements	Ecological Coherence with Annex I habitats in the CP	Threats and Pressures relevant to the CP	Agricultural Management Measures
<p>CP areas within habitat range: Breifne, MSC, ESE</p> <p>Current Surface Area: 12.18 km²</p> <p>Counties within Range: Cavan, Sligo, Leitrim, Mayo, Galway, Roscommon, Clare, Tipperary, Limerick, Kerry, Cork, Louth, Meath, Westmeath, Longford, Kildare, Offaly, Laois, Wicklow.</p> <p>Irish raised bogs are classified as Oceanic raised bog mire (Moore and Bellamy, 1974). This mire type has a very restricted distribution on the Atlantic fringe of the north-west of Europe. Raised bogs are more abundant in the lowlands of central and mid-west Ireland. In Ireland raised bogs are confined to areas with an annual rainfall below 1,250 mm. They usually occur on land below 130m and are classified into two sub-types: Western raised bogs (or Intermediate) and True Midland raised bogs (Schouten, 1984), with the boundary between the two being taken as the 1,000mm isohyet.</p>	<p>Raised bogs are accumulations of deep acid peat (3–12m) that originate in shallow lake basins or topographic depressions. They typically have an elevated surface or dome, which develops as raised bogs grow upwards from the surface (Fossitt, 2000). The bog dome is primarily rainwater fed (ombrotrophic) and isolated from the local groundwater table. Degraded Raised Bogs are typically distinguished from Active Raised Bogs by the complete absence or presence of a severely diminished acrotelm. This differentiation has been recently updated. DRB now refers to areas capable of natural regeneration to active bog within 30 years if their hydrology is repaired. The remainder of the high bog that is neither ARB nor DRB is now referred to as 'Supporting Raised bog habitat'.</p>	<ul style="list-style-type: none"> • Alkaline Fens [7230] • Alpine and Boreal heaths [4060] • Blanket bogs (* if active bog) [7130] • Bog Woodland • Calcareous Fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> [7210] • Depressions on peat substrates of the Rhynchosporion [7150] • European Dry Heath [4030] • Juniperus communis formations on heaths or calcareous grasslands [5130] • Limestone pavements [8240] • Northern Atlantic Wet heath with <i>Erica tetralix</i> [4010] • Petrifying springs with tufa formation (Cratoneurion) [7220] • Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani) [8110] • Transition mires and quaking bogs [7140] 	<ul style="list-style-type: none"> • All Burning for agriculture (M) 	N/A

Context:

Dry heath comprises vegetation dominated by ericaceous dwarf shrubs and usually occurs on well-drained, nutrient-poor and acidic mineral soils or shallow peats (typically < 50 cm deep) on sloping ground. *Calluna vulgaris* is usually the main species but *Erica cinerea*, *Ulex gallii* and *Vaccinium myrtillus* may also be important components. Dry heaths occur from sea level up to around 400 m, where they start to merge into 4060 Alpine and Boreal heaths. Calcareous dry heaths, where dwarf shrub communities have developed on leached soils over a base-rich substrate (e.g. in the Burren), are also included; these communities tend to contain several species of calcareous grassland. Stands of *Ulex europaeus* are deemed to be scrub communities and are not included. The habitat has affinities to the *Ericion cinereae*, *Daboecion cantabricae*, *Ulicion*, *Kobresio-Dryadion* and *Calluno-Genistion pilosae* associations (Perrin, 2017). According to the Irish Vegetation Classification (Perrin, 2017) most examples of the *Calluna vulgaris*-*Hypnum jutlandicum* heath community (HE2B) occur in habitat 4030, and elements of other communities within the *Dryas octopetala*, *Sesleria caerulea* (HE1), *Erica cinerea*-*Calluna vulgaris* (HE2) and *Vaccinium myrtillus*-*Racomitrium lanuginosum* (HE3) heath groups, can also occur.

Useful references:

- JNCC. 2008c. SAC Interest Features. Habitats: European dry heaths. <http://www.jncc.gov.uk/protectedsites/sacselection/habitat.asp?FeatureIntCode=H4030>. (February 2008).
- Perrin, P.M., Barron, S.J., Roche, J.R. & O'Hanrahan, B. (2014). Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland. Version 2.0. Irish Wildlife Manuals, No. 79. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.



- Perrin, P. (2017) Irish Vegetation Classification: Technical Progress Report No. 3. Report submitted to National Biodiversity Data Centre

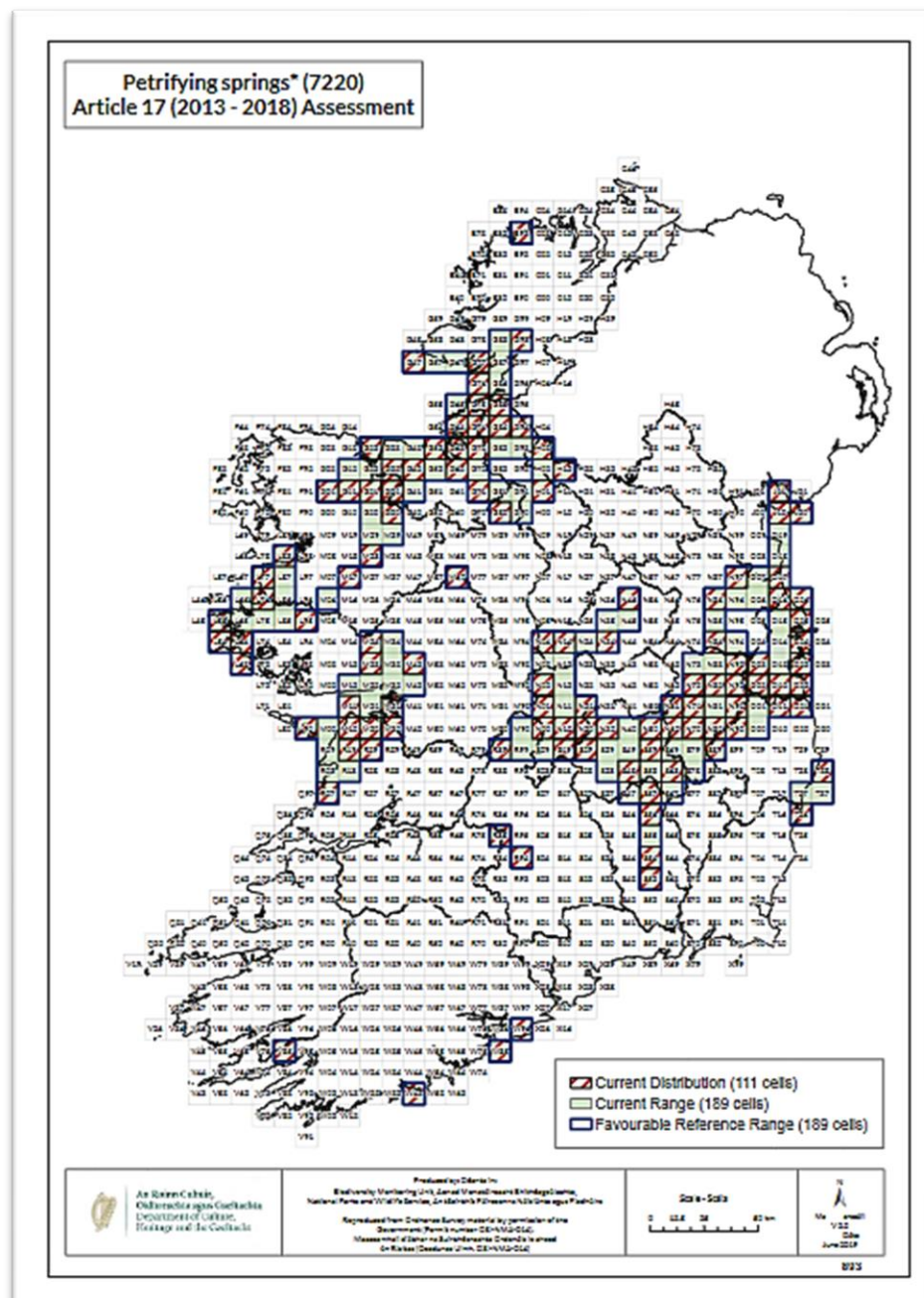
Habitat Extent in the CP	Habitat Requirements	Ecological Coherence with Annex I habitats in the CP	Threats and Pressures relevant to the CP	Agricultural Management Measures
<p>CP areas within habitat range: Breifne, Leinster, MSC</p> <p>Current Surface Area: 1,230.01km²</p> <p>Counties within Range: Cavan, Monaghan, Sligo, Leitrim, Mayo, Galway, Roscommon, Clare, Limerick, Cork, Kerry, Tipperary, Waterford, Wexford, Carlow, Kilkenny, Offaly, Laois, Wicklow, Kildare, Dublin, Louth & Meath.</p>	<p>European dry heaths typically occur on freely-draining, acidic to calcareous soils with generally low nutrient content. Dwarf-shrubs dominate the vegetation, with the most common being heather <i>Calluna vulgaris</i>, in combination with <i>Ulex spp.</i> (gorse), <i>Vaccinium spp.</i> and <i>Erica cinerea</i>. Nearly all dry heath is semi-natural, having developed through a long history of grazing and burning. Most dry heaths are managed as extensive grazing for livestock or in upland areas in the UK and Ireland as grouse moors (JNCC 2008c).</p>	<ul style="list-style-type: none"> • Active raised bogs [7110] • Alkaline Fens [7230] • Alpine and Boreal heaths [4060] • Blanket bogs (* if active bog) [7130] • Bog Woodland • Calcareous Fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> [7210] • Degraded raised bogs still capable of natural regeneration [7120] • Depressions on peat substrates of the Rhynchosporion [7150] • Juniperus communis formations on heaths or calcareous grasslands [5130] • Limestone pavements [8240] • Northern Atlantic Wet heath with <i>Erica tetralix</i> [4010] • Petrifying springs with tufa formation (Cratoneurion) [7220] • Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani) [8110] • Transition mires and quaking bogs [7140] 	<ul style="list-style-type: none"> • A09 Intensive grazing or overgrazing by livestock (H) • A11 Burning for agriculture (H) 	<ul style="list-style-type: none"> • CA03 Maintain existing extensive agricultural practices and agricultural landscape features • CA04 Reinstate appropriate agricultural practices to address abandonment, including mowing, grazing, burning or equivalent measures • CA05 Adapt mowing, grazing and other equivalent agricultural activities

Context:

Petrifying springs are lime-rich water sources which deposit tufa. The emerging spring water is rich in carbon dioxide and dissolved calcium carbonate. On contact with the atmosphere, carbon dioxide is outgassed and calcium carbonate is deposited as tufa. The resulting ecological conditions, with high pH and constant inundation by water and deposition of precipitated calcium carbonate, constitute a challenging environment for plants and animals to colonise, and the communities associated with petrifying springs are therefore highly specialised. The ecological significance of petrifying springs is seldom confined to a point source; rather, there is often a continuum of intergrading hydrological conditions from the spring head, through a flushed slope and into small streams. Spring heads may be distinct point locations giving rise to small streams immediately below the point of emergence, or water may seep to the surface in a more diffuse pattern over a larger area (Lyons and Kelly, 2016).

Irish petrifying spring vegetation has been classified into eight plant communities (Lyons and Kelly, 2016). These groups encompass a broad range of variation within petrifying springs as they occur in Ireland and include lowland, upland, wooded, unwooded and coastal springs.

Ecologically significant species of petrifying springs which serve as positive indicators of habitat status consist largely of mosses and liverworts, with a smaller number of vascular plants. The mosses *Palustriella commutata*, *P. falcata*, *Philonotis calcarea*, *Eucladium verticillatum*, *Didymodon tophaceus*, *Campylium stellatum*, *Scorpidium cossonii*, *S. scorpioides*, *Bryum pseudotriquetrum* and *Fissidens adianthoides* are highly characteristic, positive indicators, along with the liverworts *Pellia endiviifolia*, *Aneura pinguis* and *Jungermannia atrovirens*. Forbs which serve as positive indicators are *Pinguicula vulgaris*, *Parnassia palustris* and *Anagallis tenella*, and, especially in woodland springs, *Chrysosplenium oppositifolium* and *Crepis paludosa*. The graminoids *Festuca rubra*, *Carex lepidocarpa*, *C. panicea* and *Eriophorum latifolium* are positive indicators, as are the pteridophytes *Equisetum telmateia*, *E. variegatum* and *Selaginella selaginoides*. Stoneworts, especially *Chara vulgaris*, may also be present and serve as positive indicators (Lyons and Kelly, 2016).



Useful references

- JNCC. SAC Interest Features. Habitats: Petrifying springs. <https://sac.jncc.gov.uk/habitat/H7220/>.
- Irish Wildlife Manual 94: Monitoring Guidelines for the Assessment of Petrifying Springs in Ireland. <https://www.npws.ie/sites/default/files/publications/pdf/IWM94.pdf>

Habitat Extent in the CP	Habitat Requirements	Ecological Coherence with Annex I habitats in the CP	Threats and Pressures relevant to the CP	Agricultural Management Measures
<p>CP areas within habitat range: Breifne, Leinster, MSC</p> <p>Current Surface Area: 1,598.51km²</p> <p>Counties within Range: Present in all counties other than Longford & Westmeath</p>	<p>Tufa formation is associated with hard-water springs, where groundwater rich in calcium bicarbonate comes to the surface. On contact with the air, carbon dioxide is lost from the water and a hard deposit of calcium carbonate (tufa) is formed. These conditions occur most often in areas underlain by limestone or other calcareous rocks. Tufa-forming spring-heads are characterised by the swelling yellow-orange mats of the mosses <i>Cratoneuron commutatum</i> and <i>C. filicinum</i>.</p> <p>Tufa-forming springs are often associated with Alkaline fens, where they may form prominent upwelling masses of short open vegetation around the spring-heads that feed the fen system. There may also be transitions to a wide range of other habitats, particularly calcareous grassland, acid grassland, heath, Limestone pavements, and calcareous cliff and scree.</p>	<ul style="list-style-type: none"> Alkaline Fens [7230] Alpine and Boreal heaths [4060] Blanket bogs (* if active bog) [7130] Bog Woodland Calcareous Fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> [7210] Degraded raised bogs still capable of natural regeneration [7120] Depressions on peat substrates of the <i>Rhynchosporion</i> [7150] European Dry Heath [4030] <i>Juniperus communis</i> formations on heaths or calcareous grasslands [5130] Limestone pavements [8240] Northern Atlantic Wet heath with <i>Erica tetralix</i> [4010] Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i>) [8110] Transition mires and quaking bogs [7140] 	<ul style="list-style-type: none"> A06 Abandonment of grassland management (e.g. cessation of grazing or mowing) (M) A10 Extensive grazing or undergrazing by livestock (M) 	<ul style="list-style-type: none"> CA03 Maintain existing extensive agricultural practices and agricultural landscape features CA04 Reinstate appropriate agricultural practices to address abandonment, including mowing, grazing, burning or equivalent measures CA05 Adapt mowing, grazing and other equivalent agricultural activities

Context:

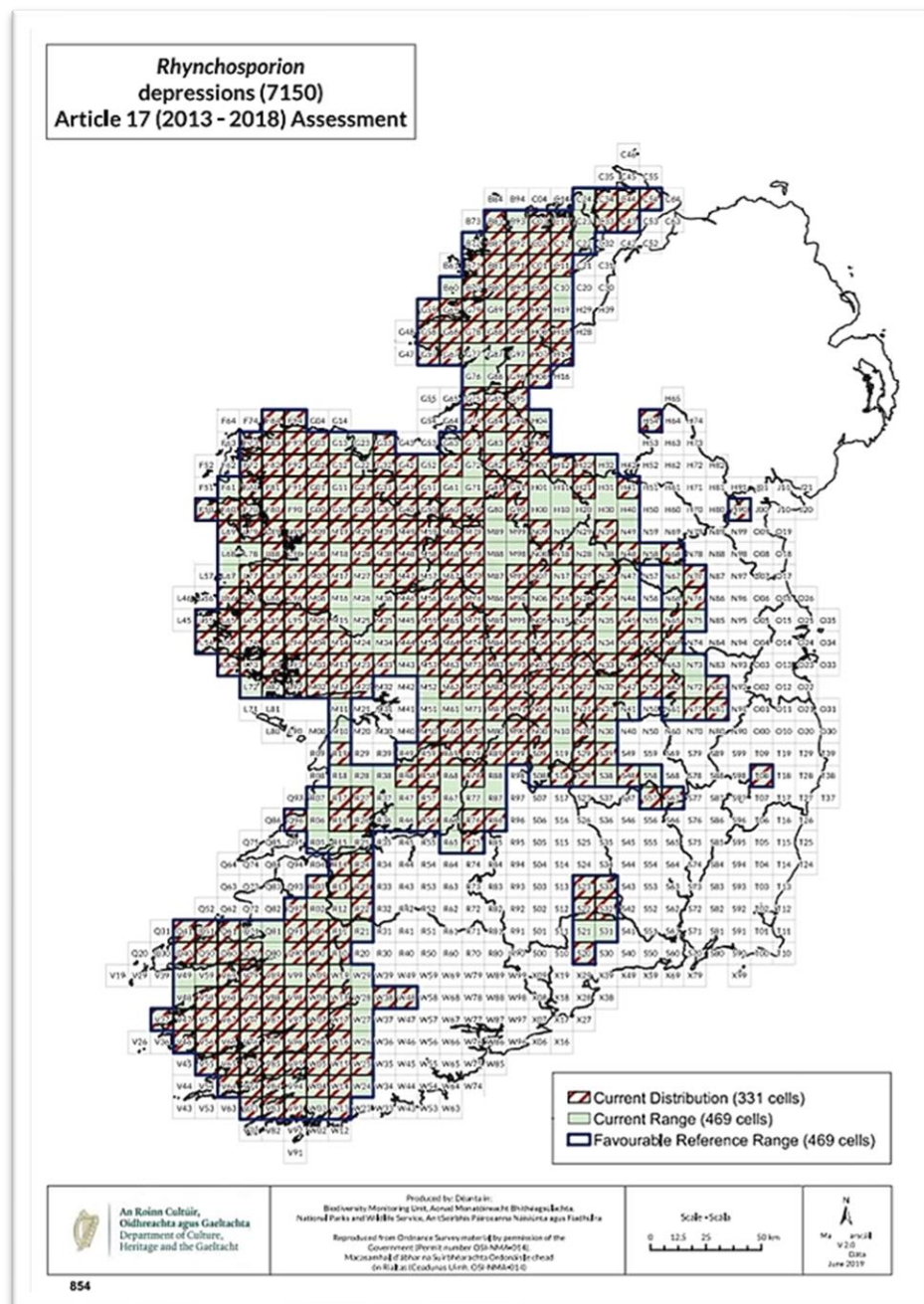
Rhynchosporion depressions are characterised by the presence of *Rhynchospora alba* and *R. fusca*. This microhabitat is considered to be an integral part of Active Raised Bog as well as lowland (<150m) and highland (>150m) blanket bog, flushes and transition mires (and rarely wet heath). However, *Rhynchosporion* vegetation (7150) does not appear to occur on mountain blanket bog sites above 300m (Schouten, 1984; Conaghan et al., 2000).

In raised bogs, *Rhynchospora* vegetation communities are only considered Annex I habitat when they occur in their most developed form in the wettest sections of the Active raised bog i.e. pools, *Sphagnum* lawns and hollows. Whilst in Blanket Bog (and other associated wetland habitats), *Rhynchospora* vegetation is only considered as Annex I habitat when it is associated with plant communities of the most sensitive/least disturbed parts of the bog/wetland complex. This corresponds with small depressions, flushed areas, water tracks, interconnecting shallow pools around hummocks of *Sphagnum*, along pool margins and on low-level flats or lawns between hummocks and bog pools.

R. alba can colonise rapidly and form pioneer communities i.e., after cutting/drainage/burning if enough peat is left and conditions are wet enough. Subsequently, *Rhynchospora* communities can be found in man-modified situations such as degraded raised bog (e.g. tracks and cutover areas) and blanket bogs (e.g. areas impacted by overgrazing and trampling by livestock; peat-cutting; tracks).

Useful references

- Conaghan, J. et al. (2000) Distribution, Ecology and Conservation of Blanket Bog in Ireland. (A synthesis of the reports of the blanket bog surveys carried out between 1987 and 1991 by the National Parks and Wildlife Service). Unpublished report commissioned by NPWS, Dúchas, The Heritage Service, Dublin.



- Perrin, P.M., Roche, J.R., Barron, S.J., Daly, O.H., Hodd, R.L., & Devaney, F.M. (2014d) National Survey of Upland Habitats. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.
- Schouten, M.G.C. (1984) Some Aspects of the Geographical Gradient in Irish Ombrotrophic Bogs. Proceedings of the Seventh International Peat Congress, Dublin 1: 414-432.

Population estimate in the CP	Habitat Requirements	Ecological Coherence with Annex I habitats in the CP	Threats and Pressures relevant to the CP	Agricultural Management Measures
<p>CP areas within habitat range: Breifne, MSC, Leinster</p> <p>Current Surface Area: 21.43 km²</p> <p>Counties within Range: ALL except Dublin & Wexford.</p> <p>Rhynchosporion depressions are deemed to be an integral part of blanket bog ecosystems but can also be found in poor fens/flushes and transition mires which can occur in close association with blanket bog.</p> <p>Due to this symbiotic relationship, Rhynchosporion depressions are mainly found in depressions on blanket bogs in the west. However, this microhabitat is also found throughout Ireland in areas where the wetland habitats mentioned above are present exist (including many raised bogs in the midlands).</p>	<p>Rhynchosporion depressions are a pioneer community of humid exposed peat (or occasionally sandy areas). This micro-habitat has a symbiotic relationship with Blanket Bog ecosystems and thus, generally requires the presence of a Blanket Bog system to develop. However, it can also naturally occur on steep or frost-eroded areas of wet heaths, in flushes and in the fluctuation zone of oligotrophic pools where there is a sandy, slightly peaty substratum.</p>	<ul style="list-style-type: none"> • Active Raised Bog [7110] • Alkaline Fen [7230] • Alpine and Boreal Heath [4060] • Blanket Bogs [7130] • Bog Woodland [91D0] • Degraded Raised Bogs still capable of natural regeneration [7120] • European Dry Heaths [4030] • Juniperus communis formations on heaths or calcareous grassland [5130] • Limestone Pavements [8240] • Northern Atlantic Wet Heaths with <i>Erica tetralix</i> [4010] • Petrifying springs with tufa formation [7220] • Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i>) [8110] • Transition mires and quaking bogs [7140] 	<ul style="list-style-type: none"> • A09 Intensive grazing or overgrazing by livestock (H) • A11 Burning for agriculture (H) 	<ul style="list-style-type: none"> • CA03 Maintain existing extensive agricultural practices and agricultural landscape features • CA05 Adapt mowing, grazing and other equivalent agricultural activities • CA06 Stop mowing, grazing and other equivalent agricultural activities

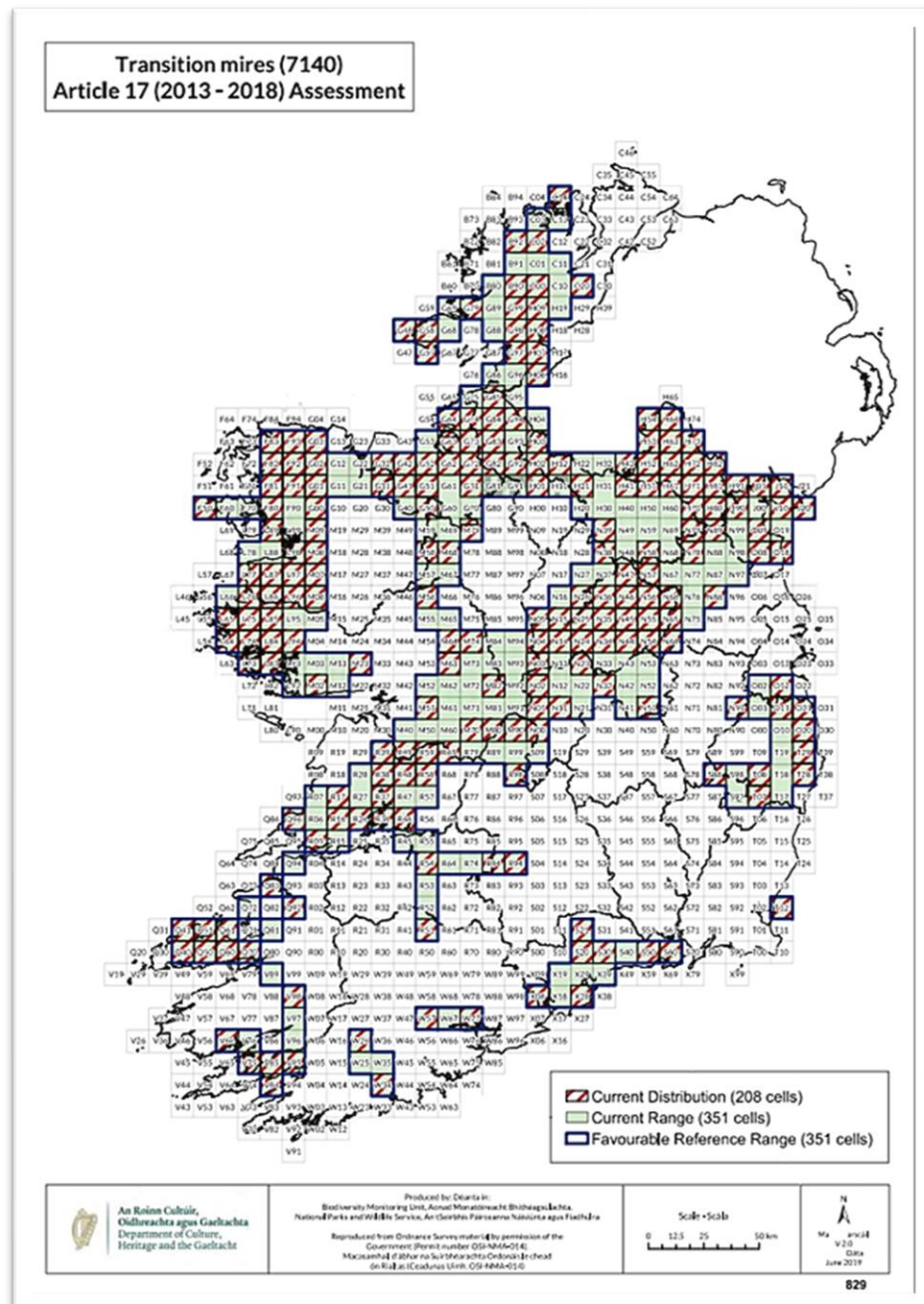
Context:

Transition mires and quaking bogs are physically unstable peat forming communities which typically occur as swards or floating mats over saturated peat or open water. The habitat type encompasses a broad range of plant communities that are characteristic of ombrotrophic to soligenous waters. There is usually an abundant bryophyte layer. Vegetation ranges from extensive floating mats of small/medium sedges with *Sphagnum* on open water to localised basic flushes over acid peat with *Sphagnum* and brown mosses. Aquatic and semi-aquatic vegetation is frequently present. Whilst some plant communities (e.g. those in infilling dystrophic pools) are typical of acid waters, it is also characteristic to find communities that are intermediate between acid bog/ poor fen and basic rich fen (NPWS, 2019).

There are a number of rare and protected species which occur/ are confined to transition mire habitats in Ireland, such as the Annex II species *Hamatocaulis vernicosus* (also listed on the Flora (Protection) Order, FPO) and species *Hammarbya paludosa* and *Eriophorum gracile* (NPWS, 2019).

Useful references

- NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neil
- Perrin, P.M., Roche, J.R., Barron, S.J., Daly, O.H., Hodd, R.L. & Devaney, F.M. (2014) National Survey of Upland Habitats. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.



Habitat Extent in the CP	Habitat Requirements	Ecological Coherence with Annex I habitats in the CP	Threats and Pressures relevant to the CP	Agricultural Management Measures
<p>CP areas within habitat range: Breifne, Leinster, MSC</p> <p>Current Surface Area: 77.41km²</p> <p>Counties within Range: Present in all counties other than Carlow & Kilkenny.</p> <p>Transition mire and quaking bogs is a widespread (but localised) habitat in Ireland. It is probably under-recorded as there is a lack of a national survey and classification however it is recorded most frequently in;</p> <ul style="list-style-type: none"> - blanket bog regions in the north and west - limestone regions in the north-west and midlands - inter-drumlin hollows and lakes in the border counties. - In the Connemara region, where transition mires develop in the infilling margins of coastal lakes. 	<p>Transition mires generally require a mineral rich substrate (but not necessarily calcium rich) and oligotrophic to mesotrophic water which has a slightly basic to moderately acid pH. Transition mires often occupy transitional zones between bog and fen vegetation (such as in the lagg zone of a raised bog) or where groundwater seeps through deep peat. They can also be found between groundwater fed fen and rainwater fed bog where the accumulation of peat isolates the vegetation from groundwater (for instance in lowland topogenous depressions and open water transitions). Transition mire vegetation may also be found in damaged habitats, such as flooded peat cuttings over calcareous substrate.</p>	<ul style="list-style-type: none"> • Active raised bogs [7110] • Alkaline Fens [7230] • Alpine and Boreal heaths [4060] • Blanket bogs (* if active bog) [7130] • Bog Woodland • Calcareous Fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> [7210] • Degraded raised bogs still capable of natural regeneration [7120] • Depressions on peat substrates of the <i>Rhynchosporion</i> [7150] • European Dry heath [4050] • <i>Juniperus communis</i> formations on heaths or calcareous grasslands [5130] • Limestone pavements [8240] • Northern Atlantic wet heaths with <i>Erica tetralix</i> • Petrifying springs with tufa formation (<i>Cratoneurion</i>) [7220] • Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i>) [8110] 	<ul style="list-style-type: none"> • AO6 Abandonment of grassland management • AO9 Intensive grazing or overgrazing by livestock 	<ul style="list-style-type: none"> • CA04 Reinstate appropriate agricultural practices to address abandonment, including mowing, grazing, burning or equivalent measures • CA05 Adapt mowing, grazing and other equivalent agricultural activities • CA06 Stop mowing, grazing and other equivalent agricultural activities;

Context:

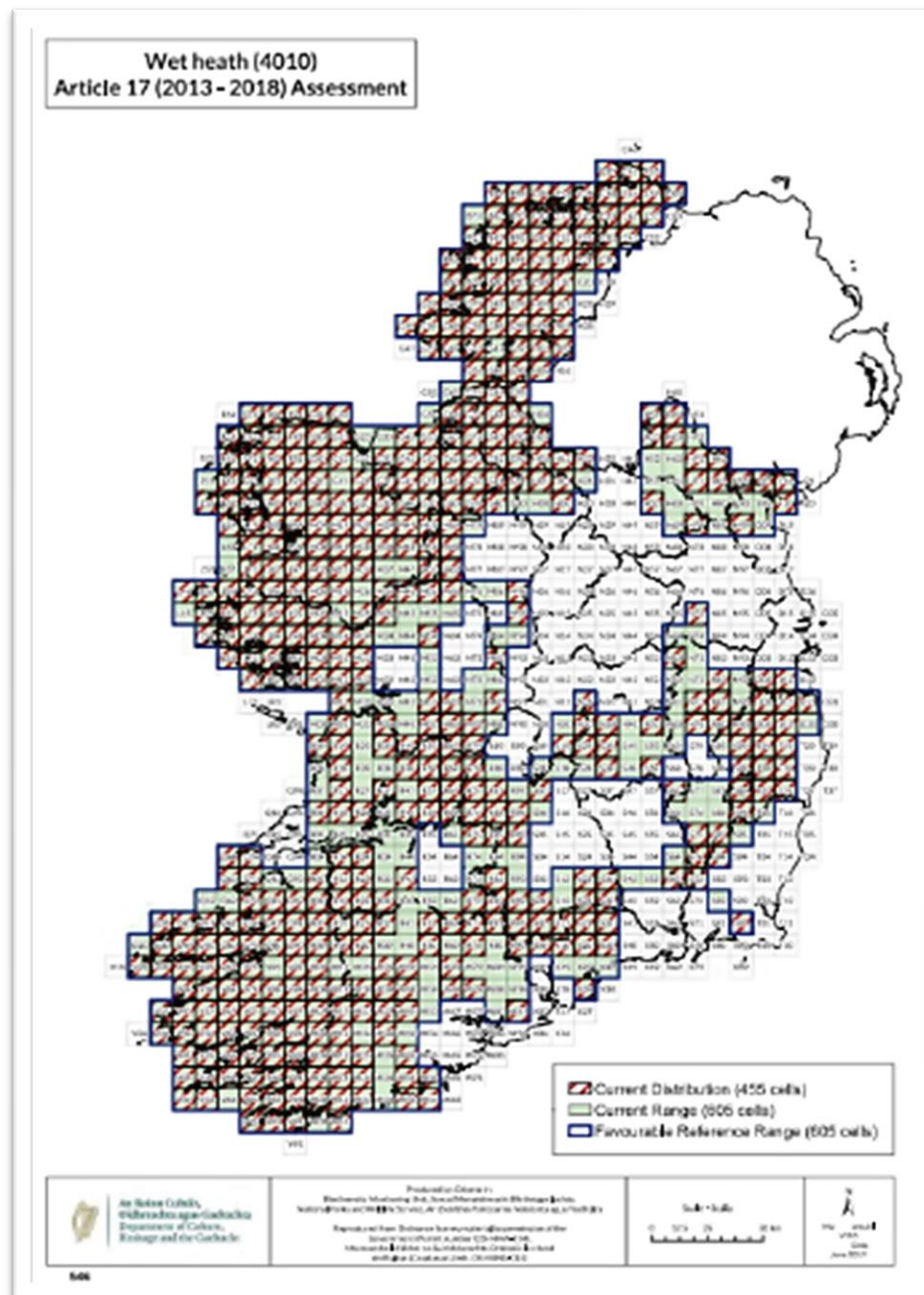
Wet heath is a highly variable peatland habitat that is intermediate between dry heath and blanket bog. It generally occurs on gently sloping, poorly draining ground which is underlain by shallow or intermediate peat depths (<50cm). It is characterised by a mixture of *Molinia caerulea*, *Erica tetralix*, *Trichophorum germanicum* or *Calluna vulgaris* and occasionally *Myrica gale* although these species may not all be present.

Dwarf shrubs may be scarce or absent in degraded examples of wet heath where *Trichophorum germanicum* or *Molinia caerulea* will be dominant instead. Ground cover is variable but *Sphagnum* mosses, pleurocarpous mosses and lichens of the *Cladonia* genus are characteristic.

Wet heath may support communities with affinities to the *Ericion tetralicis*, *Oxycocco-Ericion tetralicis*, *Daboecion cantabricae* and *Calluno-Genistion pilosae* associations (Perrin, 2017). According to the Irish Vegetation Classification (Perrin, 2017) most examples of the *Molinia caerulea*-*Calluna vulgaris*-*Erica cinerea* heath community (HE2D) and *Molinia caerulea*-*Calluna vulgaris*-*Erica tetralix* heath community (HE4E) occur in habitat 4010, and elements of other communities within the *Erica cinerea*-*Calluna vulgaris* (HE2), *Vaccinium myrtillus*-*Racomitrium lanuginosum* (HE3), *Molinia caerulea*-*Polygala serpyllifolia* (HE4) heath groups and *Erica tetralix*, *Sphagnum capillifolium* (BG2) bog group can also occur.

Useful references

- JNCC – Joint Nature Conservation Committee 2006. Common Standards Monitoring Guidance for Upland Habitats. <http://www.jncc.gov.uk/page-2237>.
- Luxmoore, R. & Fenton, J. 2005: The role of large herbivores in shaping the upland landscape of Britain. What does the science of herbivore ecology tell us? Report of a seminar at Battelby, Perth, Scotland, 16th February 2005. The National Trust for Scotland.



- Perrin, P. (2017) Irish Vegetation Classification: Technical Progress Report No. 3. Report submitted to National Biodiversity Data Centre. <http://www.biodiversityireland.ie/projects/national-vegetationdatabase/irish-vegetation-classification/explore/>
- Tubbs, C. R. 2001: The New Forest. New Forest Ninth Centenary Trust, New Forest Museum, Lyndhurst, Hampshire, England

Habitat Extent in the CP	Habitat Requirements	Ecological Coherence with Annex I habitats in the CP	Threats and Pressures relevant to the CP	Agricultural Management Measures	Monitoring Requirements
<p>CP areas within habitat range: Breifne, Leinster, MSC</p> <p>Current Surface Area: 1,598.51km²</p> <p>Counties within Range: Present in all counties other than Longford & Westmeath</p> <p>Wet heaths are widespread on lowlands and uplands along Ireland's western seaboard. This habitat is generally confined to uplands throughout the rest of the country, and is rarely encountered in lowlands outside western districts. The presence of Wet heath is generally rarer in the east/southeast.</p>	<p>Wet heath is a naturally occurring community formed over millions of years due to climate, soil conditions, competition between species and grazing from large herbivores (Tubbs 2001, Luxmoore & Fenton 2005). Its present variability is mainly due to human activities.</p> <p>The open heathland complexes found in Ireland are attributable to grazing, burning and cutting (which began c. 6000 years ago) which prevented succession to woodland.</p> <p>Without traditional forms of management areas of wet heath would succeed to scrub and eventually woodland. However, the reduction of soil nutrient levels through removal of vegetation, coupled with leaching of nutrients in areas of high rainfall means that many areas may no longer support significant tree growth.</p>	<ul style="list-style-type: none"> • Active raised bogs [7110] • Alkaline Fens [7230] • Alpine and Boreal heaths [4060] • Blanket bogs (* if active bog) [7130] • Bog Woodland • Calcareous Fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> [7210] • Degraded raised bogs still capable of natural regeneration [7120] • Depressions on peat substrates of the <i>Rhynchosporion</i> [7150] • European Dry heath [4050] • <i>Juniperus communis</i> formations on heaths or calcareous grasslands [5130] • Limestone pavements [8240] • Petrifying springs with tufa formation (<i>Cratoneurion</i>) [7220] • Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i>) [8110] • Transition mires and quaking bogs [7140] 	<ul style="list-style-type: none"> • A09 Intensive grazing or overgrazing by livestock (H) • A11 Burning for agriculture (H) 	<ul style="list-style-type: none"> • CA03 Maintain existing extensive agricultural practices and agricultural landscape features • CA04 Reinstate appropriate agricultural practices to address abandonment, including mowing, grazing, burning or equivalent measures • CA05 Adapt mowing, grazing and other equivalent agricultural activities 	

Context:

Peregrine Falcon (*Falco peregrinus*) in Irish referred to as Fabhcún gorm is widespread across Ireland, found on coastal and inland mountain cliffs, the raptor species have also been noted to breed at lower levels such as on quarry cliffs and quite successfully in an urban environment within towns and cities.

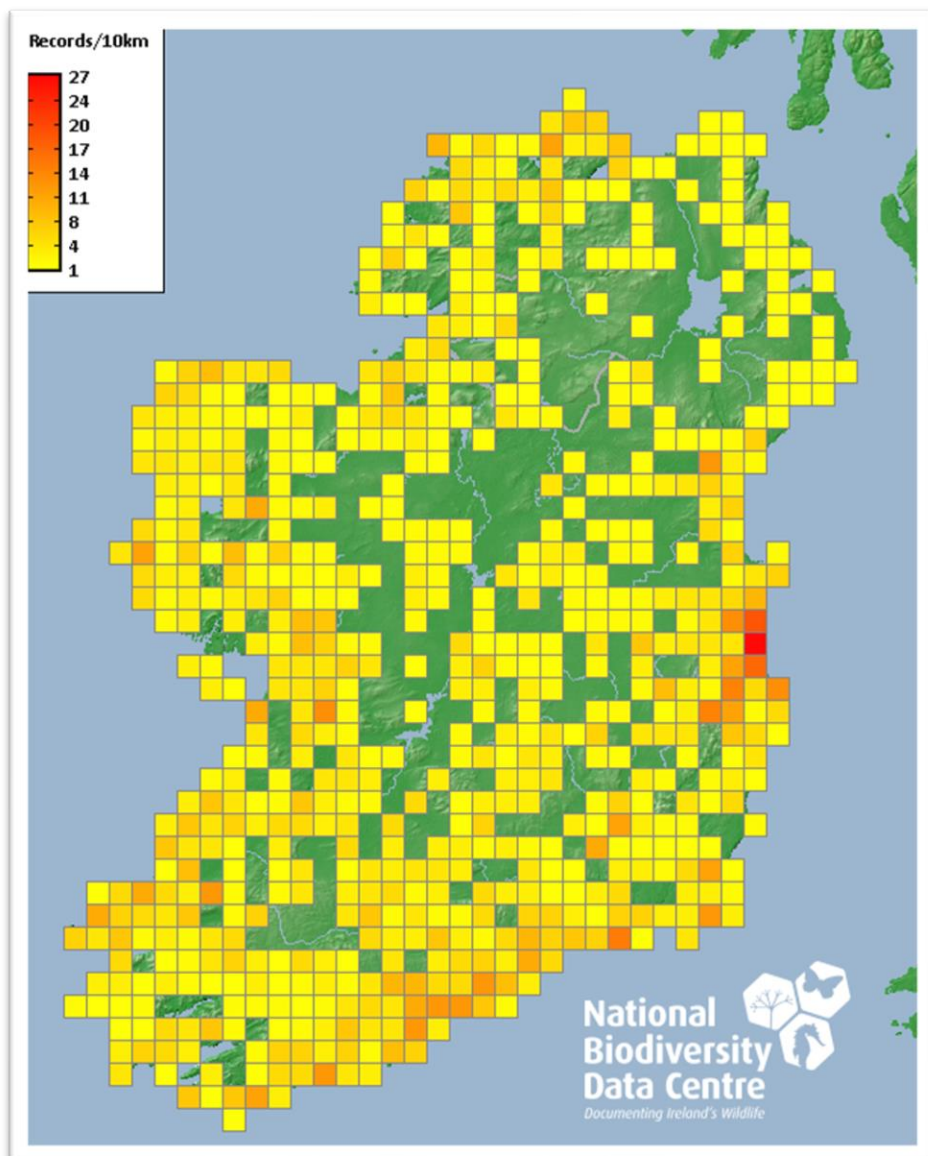
The peregrine falcon sexes differ with respect to identification with the female being larger than the male. The adult peregrines are bluey grey above, with a barred tail; the underparts are white and finely barred, the check, throat and upper breast are plain white and contrast with a black hood and thick moustachial stripe. Juvenile birds are similar to adults but have brownish upperparts and streaked, not barred, feathers on the body.

The Peregrine appears on the Green List in the Birds of Conservation Concern Ireland (2020–2026; Gilbert et al., 2021) report & is protected under Schedule 4 of the Wildlife Act (1976). It is an Annex I species under the Birds Directive and is a qualifying interest in the Mid-Waterford Coast, Sligo/Leitrim Uplands and Wicklow Mountains SPAs within the Hen Harrier Project (HHP) CP areas.

While the Peregrine population has seen successful rejuvenation in recent decades the species still faces several threats and pressures such as persecution, poisoning and land use change. There are several agricultural measures available to aid in the conservation of Peregrine and increasing awareness and appreciation of the importance of birds of prey such as the peregrine and their role in the environment is key among participants and the general public.

Useful references

- O'Donoghue, B.G., Casey, M.J., Malone, E., Carey, J.G., Clarke, D. and Conroy, K., 2020. Recording and Addressing Persecution and Threats to Our Raptors (RAPTOR): a review of incidents 2007–2019. (O'Donoghue et al., 2020).
- Burke, B.J., Clarke, D., Fitzpatrick, A., Carnus, T. and McMahon, B.J., 2015, September. Population status and factors affecting the productivity of peregrine falcon *Falco peregrinus* in County Wicklow, Ireland, 2008–2012. In *Biology and Environment: Proceedings of the Royal Irish Academy* (Vol. 115, No. 2, pp. 115–124). Royal Irish Academy. (Burke et al., 2015).



- Norriss, D.W., 1995. The 1991 survey and weather impacts on the Peregrine Falco peregrinus breeding population in the Republic of Ireland. *Bird Study*, 42(1), pp.20-30. (Norriss, 1995).
- Norriss, D.W. and Wilson, H.J., 1983. Survey of the Peregrine Falco peregrinus breeding population in the Republic of Ireland in 1981. *Bird Study*, 30(2), pp.91-101.(Norriss and Wilso, 1983).
- Kettel, E.F., Gentle, L.K., Yarnell, R.W. and Quinn, J.L., 2019. Breeding performance of an apex predator, the peregrine falcon, across urban and rural landscapes. *Urban ecosystems*, 22, pp.117-125. (Kettel et al., 2019)
- King, A. (2018) *Flying high: Peregrine falcons return to Irish skies*, 11 January. Available at: <https://www.irishtimes.com/news/science/flying-high-peregrine-falcons-return-to-irish-skies-1.3339249> *Flying high: Peregrine falcons return to Irish skies*, 11 January. Available at: <https://www.irishtimes.com/news/science/flying-high-peregrine-falcons-return-to-irish-skies-1.3339249> (Accessed: February 27, 2023). (Accessed: February 27, 2023). (King, 2018)
- Gilbert, G., Stanbury, A. and Lewis, L., 2021. Birds of conservation concern in Ireland 4: 2020–2026. *Irish Birds*, 43, pp.1-22. Gilbert et al., 2021)
- National Biodiversity Data Centre, Ireland, Peregrine Falcon (Falco peregrinus), image, accessed 05 April 2023, <<https://maps.biodiversityireland.ie/Species/TerrestrialDistributionMapPrintSize/11320>>

Population estimates in the CP Zones.	Habitat Requirements	Ecological Coherence with Annex I habitats in the CP	Threats and Pressures relevant to the CP	Aligning with Site Specific Conservation Objectives	Agricultural Management Measures	Benefits of conservation participation
<p>The Peregrin Falcon population in Ireland is estimated in the region of 400 breeding pairs with Burke et al., (2015) and O'Donoghue et al., (2020) stating 390 and 425 breeding pairs, respectively.</p> <p>While Peregrine can be expected to be present in all HHP CP areas it is noted by Burke et al., (2015) that the most recent national Peregrine survey found that Co. Wicklow had the highest density of Peregrine in the Republic of Ireland. Previous surveys in 1991, 1981 and before supported these findings as they further emphasised Wicklow's importance as a core stronghold for the peregrine in the ROI (Norris and Wilson 1983; Norris 1995).</p> <p>Peregrine populations are still recovering from devastating declines in the 1960s linked to DDT pesticide, this caused thin eggshells</p>	<p>Peregrine have been identified using several habitat types in Ireland. The peregrine is adaptable to many habitats from the uplands to the lowlands. Traditionally peregrine would usually breed on naturally formed coastal and inland cliffs. Most birds on the coast breed on the south, west and north coasts, coastal breeding on the east coast is limited by the availability of suitable nesting cliffs. Most inland birds breed on mountain cliffs but will also breed at lower levels both on natural and quarry cliffs (Burke et al., 2015).</p> <p>Peregrines have also acclimatised to the urban habitat nesting in towns and cities, making use of tall city structures such as cathedrals, bridges or skyscrapers to provide a great deal of open space and an excellent perch for scanning the hunting area. Urban areas provide a valuable habitat for some predators such as peregrine with an abundant availability of prey such as feral pigeon (Kettel et al., 2019).</p>	<p>Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, <i>Alnion incanae</i>, <i>Salicion albae</i>) [91E0]</p> <p>Alpine and Boreal heaths [4060]</p> <p>Blanket bogs (* if active bog) [7130]</p> <p>Calaminarian grasslands of the <i>Violetalia calaminariae</i> [6130]</p> <p>Calcareous rocky slopes with chasmophytic vegetation [8210]</p> <p>European dry heaths [4030]</p> <p><i>Halichoerus grypus</i> (Grey Seal) [1364]</p> <p>Large shallow inlets and bays [1160]</p> <p><i>Lutra lutra</i> (Otter) [1355]</p> <p>Mudflats and sandflats not covered by seawater at low tide [1140]</p> <p>Natural dystrophic lakes and ponds [3160]</p> <p>Northern Atlantic wet heaths with <i>Erica tetralix</i> [4010]</p> <p>Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles [91A0]</p>	<p>Raptor persecution and poisoning is a concern globally and nationally, impacting on the abundance and range of the species at various scales.</p> <p>The RAPTOR (Recording and Addressing Persecution and Threats to Our Raptors) protocol has recorded 33 reported incidents and 36 reported individual peregrines killed/ injured from 2007 - 2019. These figures only represent the cases which were reported with such incidents including secondary poisoning, direct poisoning, shooting, powerline collision, road collision and traumatic death (O'Donoghue et al., 2020).</p> <p>Weather such as heavy rain and prolonged adverse weather conditions have shown to be a threat to peregrine directly, through chilling of eggs and</p>	<p>The Peregrine appears on the Green List in the Birds of Conservation Concern Ireland (2020-2026; Gilbert et al., 2021) report & is protected under Schedule 4 of the Wildlife Act (1976).</p> <p>It is an Annex I species under the Birds Directive and is a qualifying interest in the Mid-Waterford Coast, Sligo/Leitrim Uplands and Wicklow Mountains SPAs. Peregrine are also mentioned within the Lambay Island, Loop Head, Saltee Islands, Slieve Beagh, Slieve Bloom Mountains and Slievefelim to Silvermines Mountains.</p> <p>Given their country-wide distribution and population, it is probable that the species is widespread throughout all HHP CP areas.</p>	<p>Increasing awareness and appreciation of the importance of birds of prey such as the peregrine and their role in the environment is essential among the general public and agricultural community.</p> <p>CA02 Restore small landscape features on agricultural land</p> <p>CA03 Maintain existing extensive agricultural practices and agricultural landscape features</p> <p>CA16 Other measures related to agricultural practices</p> <p>CBO1 Prevent conversion of (semi-) natural habitats into forests and of (semi-)natural forests into intensive forest plantation</p>	<p>The management of land to promote suitable Kestrel habitat will benefit the following (including but not limited to):</p> <ul style="list-style-type: none"> All lowland farmland birds species, many of which are Red Listed and rapidly declining. Other species which use manmade purpose built boxes, such as barn owl and bat species. All species subject to secondary rodenticide poisoning, including barn owl, buzzard, eagles, and fox. An extensive range of habitats and the vast number of species reliant upon them.

and breeding failure. (King, 2018).		<p>Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>) [3110]</p> <p><i>Phoca vitulina</i> (Harbour Seal) [1365]</p> <p>Reefs [1170]</p> <p>Siliceous rocky slopes with chasmophytic vegetation [8220]</p> <p>Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i>) [8110]</p> <p>Species-rich <i>Nardus</i> grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230]</p> <p>Submerged or partially submerged sea caves [8330]</p> <p>Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]</p>	<p>exposure of chicks, and indirectly, by making it difficult for adults to hunt (Burke et al., 2015).</p> <p>Land use change and the loss of habitat (reduction in the extent and quality of habitat available to birds of prey has affected their populations and reduced prey availability). Afforestation (extensive planting of non-native conifer forests which has caused the loss of habitat).</p>			
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Context:

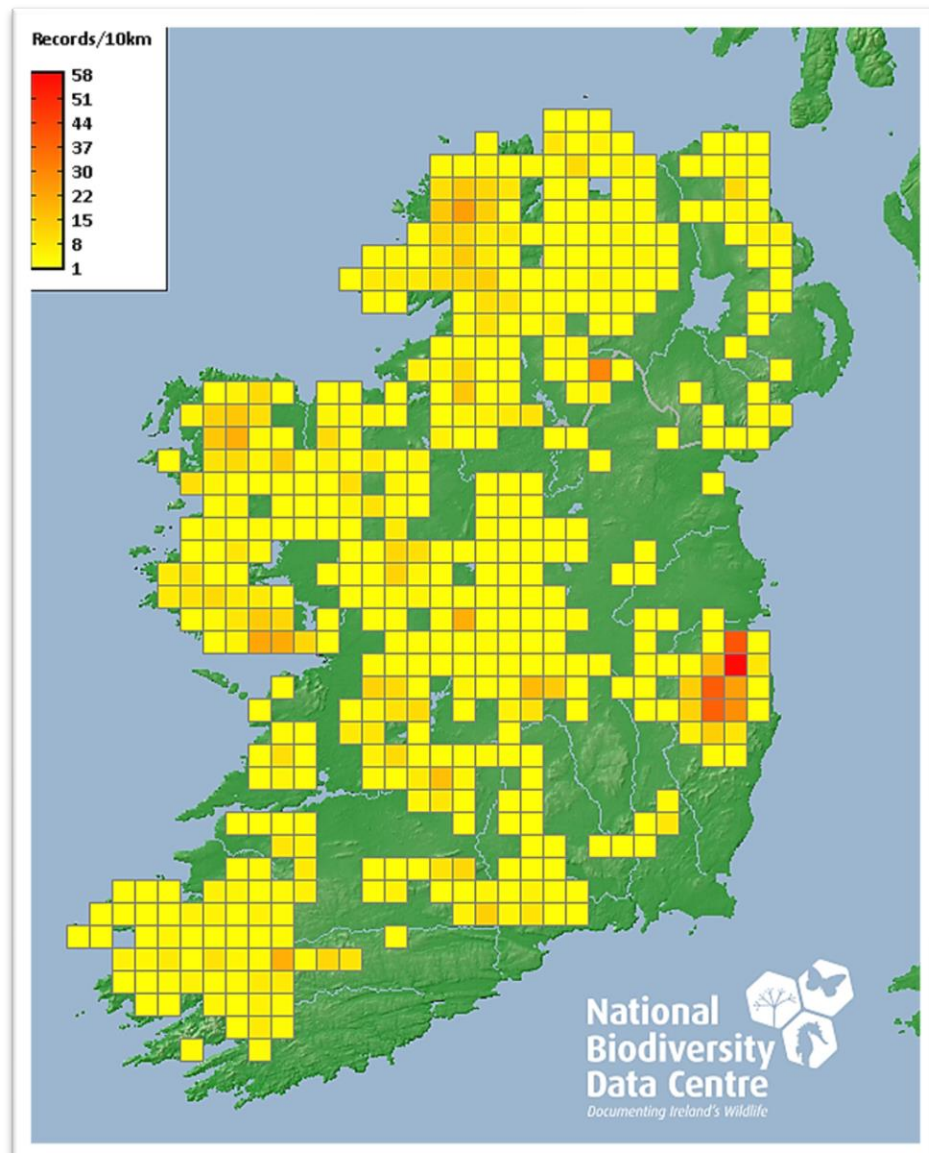
The red grouse is not protected as an Annex I species under the Birds Directive, and therefore is not afforded designated Special Areas of Protection (SPA). However, they are Red Listed on the Birds of conservation concern in Ireland 4 (2020–2026) as their distribution in the Republic of Ireland declined by 50% in the 40 years leading up to the most recent published national survey results (Cummins et al., 2010; Gilbert et al., 2021). Notably, the red grouse is the only Irish bird species exclusively reliant upon peatland, and their population status is directly connected to the continued degradation, loss, and fragmentation of peatland habitats in Ireland (Cummins *et al.*, 2010; National Red Grouse Steering Committee, 2013).

A distinctive and iconic species, the red grouse is familiar to Irish people from many walks of life, such as farmers, ecologists, hill-walkers, and game hunters. As their traditional name *Cearc fhraigh* (Heather Hen) indicates, they are mainly ground-dwelling birds reliant on heather for food, shelter, and nesting (National Red Grouse Steering Committee, 2013).

Despite their plummeting numbers, they are still recognised as a game species, with an Open Season during the month of September. While this tradition has continued, the 1800s saw the large-scale loss of game keepers in Ireland who managed the land effectively to support the game population, and this has directly contributed to their historical decline. This is an example of how the level of habitat management can significantly impact the overall population status, and as a result, clear and easily implemented red grouse conservation actions have been outlined in a Framework for Action (2016-2023) to conserve the species (National Red Grouse Steering Committee, 2013).

Useful references

- Cummins, S., Bleasdale, A., Douglas, C., Newton, S., O'Halloran, J. & Wilson, H.J. (2010) The status of Red Grouse in Ireland and the effects of land use, habitat and habitat quality on their distribution. Irish Wildlife



Manuals, No. 50. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.

- Gilbert, G., Stanbury, A. and Lewis, L., 2021. Birds of conservation concern in Ireland 4: 2020–2026. *Irish Birds*, 43, pp.1-22.
- National Red Grouse Steering Committee, 2013. Red Grouse Species Action Plan.
- National Biodiversity Data Centre, Ireland, Red Grouse (*Lagopus lagopus*), image, accessed 05 April 2023, <<https://maps.biodiversityireland.ie/Species/TerrestrialDistributionMapPrintSize/11386>>

Population estimate in the CP	Habitat Requirements	Threats and Pressures relevant to the CP	Aligning Conservat
<p>Red grouse appear on the Irish Red List of Birds of Conservation Concern (Gilbert et al., 2021).</p> <p>The results of the most recent Red Grouse National Survey (2021/2022) have not yet been released, and this document should be updated in due course.</p> <p>In 2008, the Republic of Ireland population was estimated to be at 4,200 adult birds, representing a breeding range decline of 50% in the previous 40 years (Cummins et al., 2010; National Red Grouse Steering Committee, 2013).</p> <p>Their distribution incorporates areas of all three HHP CP areas, particularly Breifne and ESE due to the abundance of peatland habitats.</p> <p>Of particular note for the HHP CP areas, 60% of the Irish red grouse population occupy commonages, & the south east (ESE CP) has seen the most significant declines in numbers (Cummins et al., 2010).</p>	<p>Blanket bog is the preferred habitat of the red grouse, but it can be found in all peatland habitats (Cummins et al., 2010; National Red Grouse Steering Committee, 2013). As adults, the species is reliant on ling heather (<i>Calluna vulgaris</i>) which constitutes 90% of their diet, and is also used for nesting and shelter. A patchwork of heather at various stages of maturity is ideal, as mature heather provides little value in terms of shoots to graze on (National Red Grouse Steering Committee, 2013).</p> <p>Red grouse may also occasionally forage on bilberry, crowberry, cranberry, sedges, cotton grasses, wild strawberry, bog myrtle, moss capsules and oats (National Red Grouse Steering Committee, 2013).</p> <p>Similar to other bird species, invertebrates make up a large proportion of young chick diet. Consequently, wet flushes are vital foraging areas during the summer, integral for breeding success. Areas of tall grasses, sedges, and rushes, are also important in the provision of cover from predators (National Red Grouse Steering Committee, 2013).</p>	<p>The National Red Grouse Steering Committee (2013) highlighted that the most critical threat to the species is the absence of policy focusing on red grouse. For example, despite being a Red Listed bird suffering widespread population decline, there is no mitigation requirement or guidance for developments such as afforestation or wind farms. This issue is linked to the many other threats facing the species.</p> <p>In terms of threats that can be impacted by HHP CP actions, habitat loss, degradation, fragmentation, & land-use change is the most important issue, and is often associated with afforestation and agriculture (Cummins et al., 2010; National Red Grouse Steering Committee, 2013).</p> <p>Connected to this is the management of land using burning. Strategically planned burning regimes can be highly beneficial for red grouse in terms of providing a patchwork of young and mature heather. However, uncontrolled or illegal burning is detrimental to the species, not only destroying their foraging resources, but also destroying nests (Cummins et al., 2010; National Red Grouse Steering Committee, 2013).</p> <p>Additionally, the lack of public awareness and education about the species can be addressed through the CP teams, as the National Red Grouse Steering Committee (2013) highlights this as a threat.</p> <p>The species tends to avoid high-traffic areas in terms of hillwalkers which is an issue impacting populations in popular areas of the HHP CP areas such as the Wicklow mountains. Other disturbance also affects populations, such as the use of offroad vehicles (quads, scramblers, etc; National Red Grouse Steering Committee, 2013).</p> <p>Finally, other threats include hunting. Red grouse are a game bird, and may be legally targeted during the month of September; however illegal and unsustainable hunting is a localised issue in some areas (Cummins et al., 2010; National Red Grouse Steering Committee, 2013). Associated with this, the restocking of birds for game that are not of Irish provenance also poses a threat to the genetic integrity of populations in Ireland (National Red Grouse Steering Committee, 2013).</p>	<p>In addition to be are protected and under the are listed under also Annex II wh so as not to end</p> <p>As they are no designated SPA populations fou three HHP CP ar limited to).</p> <p>SPAs:</p> <p>Slieve Beagh SP</p> <p>Wicklow Mounta</p> <p>Slieve Aughty M</p> <p>Slievefelim to Si</p> <p>Slieve Bloom Mo</p> <p>Stack's to Mulla</p> <p>Mount Eagle SP</p> <p>SACs:</p> <p>Cuilcagh – Anier</p> <p>Wicklow Mounta</p> <p>Blackstairs Mou</p> <p>Sonnagh Bog SA</p> <p>Loughatorick Sc</p> <p>Glendree Bog S</p> <p>Slieve Bernagh E</p> <p>Silvermine Moun</p> <p>Keeper Hill SAC</p> <p>Bolingbrook Hill</p> <p>Boleybrack Mou</p> <p>Of note is th operational in Breifne & Leins Grouse habitat management pr Red Grouse pro</p>

Context:

In general, seabirds are defined as birds dependent on the marine environment for most or all of the year, typically breeding in large colonies on sea cliffs and offshore islands. There are a few exceptions however, and seabird colonies may also include colonies such as cormorant (*Phalacrocorax aristotelis aristotelis*) nesting at inland lakes, and gulls using urban environments. Furthermore, colonies may be single-species or multi-species, containing any number of birds from just a handful of pairs to tens of thousands. 24 species of regularly breeding seabird can be found in Ireland, and globally important populations of several species exist here, such as the Manx shearwater (*Puffinus puffinus*), storm petrel (*Hydrobates pelagicus*), & roseate tern (*Sterna dougallii*; Cummins *et al.*, 2019). The vast majority, at 21 species, have been reported within HHP CP areas, as outlined in Figure 1. 15 of these species are listed as Qualifying Interests for Special Protection Areas (SPAs) within the HHP CP area boundary, including Loop Head SPA, Lough Derg (Shannon) SPA, Inishmurray

	Shag (<i>Phalacrocorax aristotelis aristotelis</i>)	Cormorant (<i>Phalacrocorax carbo carbo</i>)	Fulmar (<i>Fulmaris glacialis</i>)	Gannet (<i>Morus bassanus</i>)	Black-Headed Gull (<i>Larus ridibundus</i>)	Lesser black-backed gull (<i>Larus fuscus</i>)	Common Gull (<i>Larus canus</i>)	Herring gull (<i>Larus argentatus</i>)	Kittiwake (<i>Rissa tridactyla</i>)	Roseate tern (<i>Sterna dougallii</i>)	Common tern (<i>Sterna hirundo</i>)	Arctic tern (<i>Sterna bergii</i>)	Guillemot (<i>Uria aalge</i>)	Razorbill (<i>Alca torda</i>)	Puffin (<i>Fratercula arctica</i>)	Great black-backed gull (<i>Larus melanotos</i>)	Littoral (<i>Larus marinus</i>)
Present in a HHP CP Area	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Designated SPA in a HHP CP Area	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
BoCCI Listed	AMBER	AMBER	AMBER	AMBER	AMBER	AMBER	AMBER	AMBER	AMBER	RED	AMBER	AMBER	AMBER	AMBER	AMBER	RED	RED

SPA, Lambay Island SPA, Saltee Islands SPA, & Mid-Waterford Coast SPA. Many of these SPAs have seen dramatic declines of specific species in populations in recent years. For example, one of Ireland's most important seabird colonies and an internationally important site, Lambay Island, has seen shag numbers decline by 58% in the last 20 years (Cummins *et al.*, 2019). This decline is of note, as the SPA lies within the Leinster CP area & is the largest shag colony in Ireland. Furthermore, all but one of Ireland's seabirds are classified as either Red or Amber listed in the Birds of Conservation Concern Ireland (BoCCI) report (Gilbert *et al.*, 2021), highlighting their unfavourable conservation status. It is well documented that seabird colonies can benefit greatly from active management (Cummins *et al.*, 2019), and therefore correct advice to landowners along with targeted NPIs & LAs could prove to be very effective.

Useful references

- Cummins, S., Lauder, C., Lauder, A. & Tierney, T. D. (2019) The Status of Ireland's Breeding Seabirds: Birds Directive Article 12 Reporting 2013 – 2018. Irish Wildlife Manuals, No. 114. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland

- Gilbert, G., Stanbury, A. and Lewis, L., 2021. Birds of conservation concern in Ireland 4: 2020–2026. *Irish Birds*, 43, pp.1-22.
- NPWS (2023) *Special Protection Areas (SPAs)*. Available at: <https://www.npws.ie/protected-sites/spa> (Accessed: 01/03/2023)

Population estimate in the CP	Habitat Requirements	Threats and Pressures relevant to the CP	Alignment with Conservation Objectives
<p>Up to 750,000 seabirds breed in colonies every year in Ireland. While the population trend for most species is either stable or increasing, four of the regularly breeding species have declined significantly since the 1980s; kittiwake, herring gull, black-headed gull, & common gull (Cummins <i>et al.</i>, 2019).</p> <p>Although many of the species appear to be increasing or stable in terms of population trend since the previous survey (Seabird 2000: 1998–2002), a closer look at the most recent data reveals dramatic declines of specific species at specific sites within the HHP CP areas. For example, on Lambay Island, fulmar have declined by 36%, cormorant by 56%, shag by 58%, and great black-backed gull by 49% (Cummins <i>et al.</i>, 2019). These declines are of a very serious nature, as Lambay Island is highlighted as an internationally important seabird colony & has the largest colonies of cormorant and shag in Ireland (NPWS, 2023).</p> <p>Elsewhere, on the Great Saltee Island, fulmar have declined by 50%, shag by 58%, and kittiwake by 51% (Cummins <i>et al.</i>, 2019). Again, this falls within the internationally important breeding seabird site of Saltee Islands SPA in the Leinster CP area, hosting over 20,000 seabirds annually.</p> <p>The most recent population numbers for most seabird species at a national level can be found in Appendix 1. Up to date information is not available for the population status of burrow nesting species such as puffin, Manx shearwater, and storm petrel (Cummins <i>et al.</i>, 2019). A survey has been recently completed, & when a report becomes available this document should be updated to reflect this</p> <p>It is not feasible to estimate the populations of seabird species at a HHP CP region level; the most recent data for all SPA site synopses was collected in the 1990s (NPWS, 2023). While bearing this in mind, the SPA site synopses do indicate nationally important populations of various species in all HHP CP areas:</p> <ul style="list-style-type: none"> • Loop Head SPA (MSC): Guillemot & kittiwake • Lough Derg (Shannon) SPA (MSC): Cormorant & common tern • Inishmurray SPA (Breifne): Arctic tern, shag, herring gull, & black guillemot • Lambay Island SPA (Leinster): fulmar, lesser black-backed gull, herring gull, kittiwake, razorbill, & puffin. • Saltee Islands SPA (Leinster): Gannet, fulmar, cormorant, shag, lesser black-backed gull, herring gull, kittiwake, guillemot, razorbill, & puffin. • Mid-Waterford Coast SPA (Leinster): Cormorant & herring gull. <p>Of note is also the internationally important populations on Lambay Island in the Leinster CP area (1999 data):</p> <ul style="list-style-type: none"> • Cormorant (675 pairs) • Shag (1,122 pairs) • Guillemot (40,705 pairs) <p>Despite highlighted declines, there are some very positive trends in some areas. For example, between 2004–2014, the gannet population on Great Saltee increased by 93%, and the shag population on Inishmurray increased by 274% between survey periods (Cummins <i>et al.</i>, 2019). This highlights the importance of site specific knowledge when targeting conservation measures.</p>	<p>Seabird colonies use a variety of nest site types, but all breeding sites are in close proximity to rich foraging habitat; examples of which include open ocean near the continental shelf and freshwater lakes.</p> <p>Most seabirds nest on cliffs; both on the mainland and on offshore marine islands. Natural ledges, cracks, and crevices on cliffs are used by most seabirds (eg. Kittiwake, guillemot, gannet etc.) however there are other species with specific needs. For example, little terns nest on the ground on shingle beaches, & several species such as puffins are burrow nesting.</p> <p>Other nest sites include trees & manmade structures which replicate natural nest site characteristics.</p>	<p>While species-specific threats exist, all Irish seabirds are threatened by issues outside of the ACRES scheme ability to combat; the inappropriate location of offshore wind energy developments, climate change, overfishing & bycatch, & ocean plastic pollution (Cummins <i>et al.</i>, 2019).</p> <p>Evidence is also expected in the coming years regarding the impact of bird flu on seabird colonies.</p> <p>There are some threats which can be addressed within the scheme through management advice and NPIs. These include mammalian predation, recreational disturbance, and both under or over grazing (Cummins <i>et al.</i>, 2023). For example, under grazing allows the spread of bracken & scrub on grassy slopes which burrow nesting birds rely on.</p>	<p>Annex I of the SEA Directive lists the seabirds of conservation concern, including the common tern, little tern, roseate spoonbill, and the Atlantic petrel.</p> <p>Six SPAs for seabirds are listed in the 2023 SPA Review. Leinster includes Mid-Waterford Coast SPA, Inishmurray SPA, and Lambay Island SPA (Shannon).</p> <p>Three SPAs are also listed in the 2020–2023 SPA Review. These include the Green Island SPA, the Great Saltee Island SPA, and the Loop Head SPA.</p> <p>The remainder of the seabirds of conservation concern are listed in the 2020–2023 SPA Review.</p>

Swift is currently not included as an objective in the LAP

Context:

The Common Swift (*Apus Apus*) is a monomorphic species and therefore visual identification of the sexes is impossible. The bird is identified by dark brown all over, often appearing black against the sky, with a small, pale patch on its throat. They are larger than swallows and house martins, with long curving wings that make them look a bit like a boomerang when in the air. It is a migratory bird and spends most of the year outside of Ireland, it is noted that the swift usually begins to arrive in late April and March with the period of time the bird remains depending on chicks fledging time, food source availability and weather conditions, therefore the departure date can vary from mid-July to early September (Majkusiak, 2022).

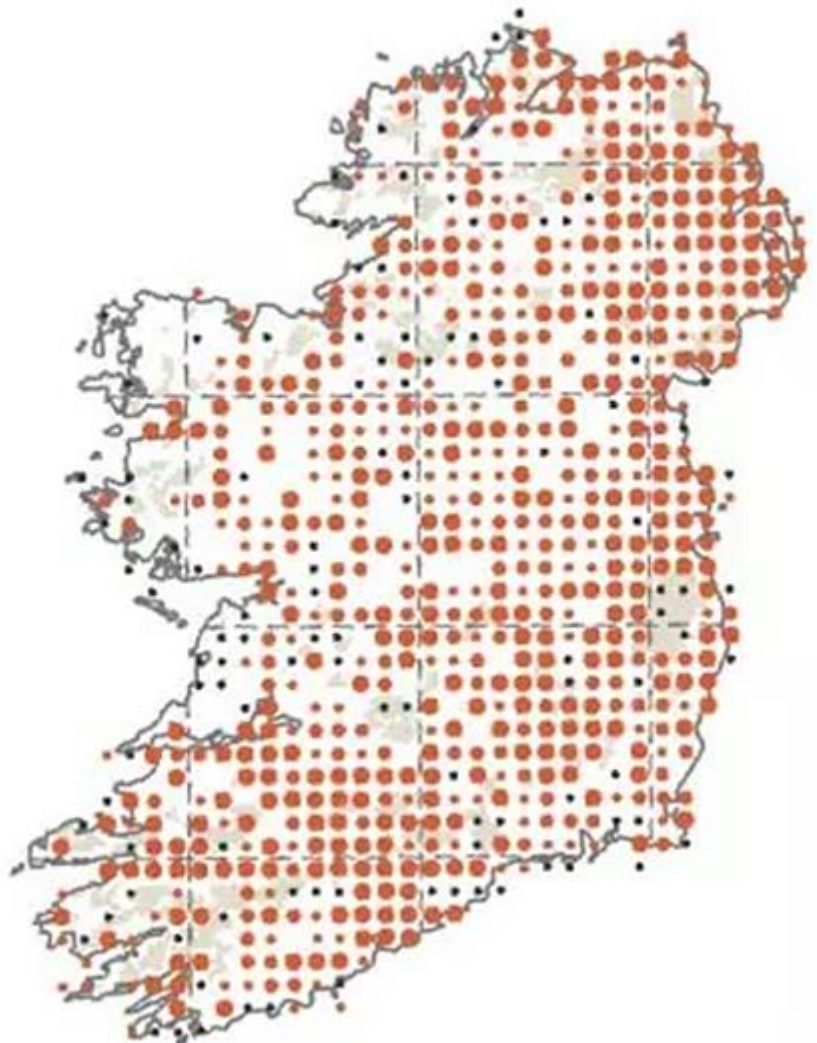
The Swift is not protected as an Annex I species under the Birds Directive and therefore is not afforded designated Special Areas of Protection (SPA). However, the swift is red listed and is seen as high conservation concern within Birds of Conservation Concern

in Ireland 2020-2026. The Swift is perhaps the most intriguing of our urban bird species, yet it has been recorded that the species has seen a decline of 52.8% in a 44-year period (1972-2016) (Lewis et al., 2019).

Majkusiak's (2022) research highlights the possible factors shaping the species decline in Ireland, yet there are a few measures available and works being carried out by such groups as Swift Conservation Ireland, Birdwatch Ireland (Saving Swifts), Tidy Towns and various county councils to help stop the downward trend of the species population in recent decades.

Useful references

- Lewis, L., Coombes, D., Burke, B., O'Halloran, J., Walsh, A., Tierney, D. and Cummins, S., 2019. Countryside Bird Survey: Status and trends of common and widespread breeding birds 1998-2016. (Lewis et al., 2019)
- Majkusiak, J., 2022. Breeding biology of the Common Swift (*Apus apus*) in Ireland—the most north-westerly edge of the nesting habitat. (Majkusiak, 2022)



- Crowe, O., Coombes, R.H., Lysaght, L., O'Brien, C., Choudhury, K.R., Walsh, A.J., Wilson, J.H. and O'Halloran, J., 2010. Population trends of widespread breeding birds in the Republic of Ireland 1998–2008. *Bird Study*, 57(3), pp.267-280. (Crowe et al., 2010)
- https://birdwatchireland.ie/app/uploads/2019/10/Saving-Swifts-Guide_pdf.pdf
- <https://www.swiftconservation.ie/#:~:text=Swift%20Conservation%20Ireland%20is%20a,the%20website%20please%20email%20us.>

Population estimates in the CP areas.	Habitat Requirements	Threats and Pressures relevant to the CP
<p>The Swift population has seen decline in recent decades with the current population estimate of 51,728 (2011–2016) seeing a decline of 17,000 since 2010. The breeding population has seen a trending decline of 52.8% in the last 44-year period (1972–2016) with the greatest decline recorded in the western half of the country as well as Co. Cavan, Monaghan, and Leitrim. The population has a patchy distribution nationally with notable gaps from lack of swift presence in upland areas and exposed parts of western coastal regions from Co. Donegal to Kerry (Lewis et al., 2019).</p>	<p>Majkusiak (2022) notes that the Swift has adapted to several habitats with its population often concentrated in areas of human occupancy.</p> <p>Swifts have taken advantage of the built environment for nesting habitat, with this most likely having occurred due to the decline in ancient forests.</p> <p>The swift will almost nest exclusively in old buildings and older building conversions (Crowe et al., 2010).</p> <p>In relation to feeding habitat the swift is insectivores feeding on moths, beetles, flies, spiders etc. These hunting habitats are usually open areas, like meadows, above forests, open woodlands, grasslands etc. The birds will hydrate through rain drops or by skimming the surface of water.</p>	<p>A valid factor in relation to the decline of swifts is raised by Majkusiak (2022) that notes the decline in nesting habitat opportunity in the environment of modern Ireland. Modern building design and modifications has seen a reduction in gaps and crevices which are favoured by swifts. While also more older buildings such as churches, stone houses and derelict buildings are being renovated or demolished.</p> <p>Another threat to the swift population is the worldwide decline in insects, its main food source. This is due to the destruction and clearance of wild habitats that support insects and the widespread use of insecticides.</p>

Context:

There are several definitions of a wetland from the relevant governing and monitoring bodies, due to the range of habitats and landscapes they encompass. Generally, 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. This includes both natural and artificial sites, with fresh, brackish, salt, static or flowing water (IRWC, 2018). Artificial wetlands include canals, reservoirs and fish ponds, while natural wetlands include a huge diversity of habitats including (but not limited to):

- Turloughs
- Rivers
- Lakes
- 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)

Ireland has an abundance of wetlands, both coastal & inland, which have biodiversity-rich habitats associated with them all year round. Bird populations associated with wetlands are excellent indicators of ecological condition, as many breeding, wintering, and passage birds are reliant on them. Ireland's geographical position on the East Atlantic Flyway migratory route results in Irish wetland sites being of particular importance for vast numbers of birds and species for overwintering (Lewis *et al.*, 2019). This has been cause to designate Special Protection Areas (SPAs) for them; Wetlands & Waterbirds (A999) is a Qualifying Interest for 14 SPAs in the HHP CP areas, including many different habitats from estuaries to peatland. Despite designation, wetlands include some of the most damaged & degraded habitats in Ireland, and they are vulnerable to a vast array of damaging activities which the ACRES scheme has the ability to combat, including drainage, nutrient enrichment, over-grazing, agricultural improvements, afforestation, and the spread of invasive species (IRWC, 2018; NPWS, 2019). The damaged state of Ireland's wetlands is reflected in the population status of the species that rely upon them. Of the 54 species that are Red Listed in the Birds of Conservation Concern Ireland 4 (2020-2026), 44% are waterbirds which are reliant upon wetland habitats (eg. Curlew, pochard, snipe). Excluding waterbirds, 40% of the remaining birds on the Red List use or rely on wetland sites (eg. Red grouse, grey wagtail, white-tailed sea eagle etc.; Gilbert *et al.*, 2021). This highlights the importance of promoting, protecting, & restoring wetland sites across all HHP CP areas to have a meaningful impact on the biodiverse habitats which they support.

Useful references:

- Colhoun, K., Flannelly, F., O'Neill, J., Phelan, E., Servignat, H., O'Donoghue, B. & Kelly, S. (2022) Status and distribution of breeding Eurasian Curlew in Ireland 2021. Irish Wildlife Manuals, No. 138. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.
- Gilbert, G., Stanbury, A. and Lewis, L., 2021. Birds of conservation concern in Ireland 4: 2020–2026. *Irish Birds*, 43, pp.1-22.
- Irish Ramsar Wetlands Committee, 2018. Irish Wetland Types – an identification guide and field survey manual. EPA, Johnstown Castle, Ireland. ISBN: 978-1-84095-740-2
- Kennedy, J., Burke, B., Fitzgerald, N., Kelly, S.B.A., Walsh, A.J. & Lewis, L.J. 2022. Irish Wetland Bird Survey: I-WeBS National and Site Trends Report 1994/95 – 2019/20. BirdWatch Ireland Waterbird Report to the National Parks and Wildlife Service. BirdWatch Ireland, Wicklow. (https://birdwatchireland.ie/app/uploads/2022/04/iwebs_trends_report.html)
- Lewis, L. J., Burke, B., Fitzgerald, N., Tierney, T. D. & Kelly, S. (2019) Irish Wetland Bird Survey: Waterbird Status and Distribution 2009/10-2015/16. Irish Wildlife Manuals, No. 106. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland
- NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 1: Summary Overview. Unpublished NPWS report.

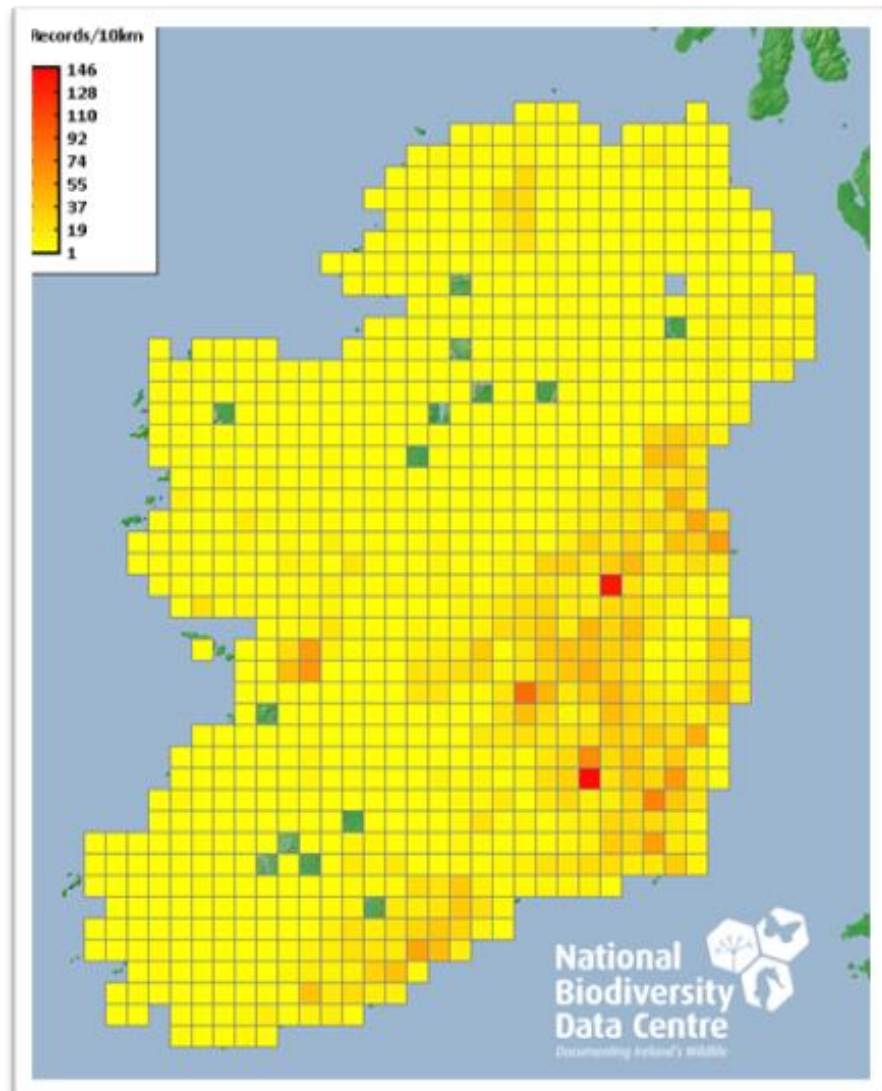
Population estimate in the CP	Habitat Requirements	Threats and Pressures relevant to the CP	Aligning with Site Specific Conservation Objectives
<p>The most recent Article 17 report shows many wetland habitats have a status of Bad (eg. Lagoons, large shallow inlets & bays, wet heaths, dry heaths, blanket bog, raised bog, alkaline fens, hydrophilous tall herb swamp etc.) (NPWS, 2019).</p> <p>This status is reflected in their declining ability to support biodiversity. The Irish Wetland Bird Survey (I-WeBS) has been gathering data on wintering populations of wetland birds in Ireland since the 1990s. Between 1994–2020, it has recorded dramatic declines nationally of many species which can be considered as farmland birds:</p> <ul style="list-style-type: none"> Lapwing: –64% Golden plover: –54% Curlew: –43% <p>Some of the sites surveyed for I-WeBS fall within HHP CP areas. A concerning example is within the Leinster CP area at the Cull & Killag (Ballyteigue), where both wintering lapwing & golden plover have declined by 77% (Kennedy <i>et al.</i>, 2022). Similar trends are seen throughout the other HHP CP areas.</p> <p>The statistics for breeding populations using wetlands show an even larger decline for species of interest in a farmland context. Of note is the curlew, both a farmland and a wetland bird, once ubiquitous in the Irish countryside but now on the brink of extinction as a breeding species here. Colhoun <i>et al.</i>, (2022) on behalf of NPWS has reported a decline of 98% since the 1980s. Breeding pairs still exists within the Breifne CP area.</p>	<p>The habitat type of a wetland can be identified using the vegetation and soil type that exists there as indicators (IRWC, 2018).</p> <p>For example, the presence of sphagnum moss & peat soil may indicate blanket bog.</p> <p>The surrounding landscape or location of the wetland may also be of use in some cases. For example, a blanket bog may be refined as an upland blanket bog (IRWC, 2018).</p> <p>The vegetation, soil type, and landscape should all be considered when defining the wetland type present. Two examples with characteristics outlined are below.</p> <p style="text-align: center;">Transition Mire</p> <p>Vegetation indicators: Short (less than knee-height) broadleaved or tall sedges, white beak sedge, water horsetail, bog bean, bog mosses.</p> <p>Soil indicators: Peat with a bouncy “quaking” feeling. Peat raft may break up to expose pools of water.</p> <p>Landscape indicators: May be found around the edge of a lake or slow-flowing river, blanket bog, or in a valley bottom/basin.</p> <p style="text-align: center;">Wet machair</p> <p>Vegetation indicators: Fine-leaved grasses, small sedges, abundant herbs, including many orchids such as marsh orchid. Normally ankle height, rarely up to knee height.</p> <p>Soil indicator: Machair sand (sand composed predominantly of shell fragments), peaty soil.</p> <p>Landscape indicator: extensive flat grassland in coastal settings, inland from and next to sand dunes.</p>	<p>Agriculture is reported to be the most significant pressure on wetland habitats (NPWS, 2019). This includes a vast range of activities such as drainage, reclamation, over-grazing, poaching, cutting of vegetation, nutrient enrichment, & lack of management among others (IRWC, 2018).</p> <p>Wetlands are also vulnerable to damaging activities from other sectors which the ACRES scheme may be able to combat, such as turf cutting, afforestation, dumping, & the spread of invasive species (IRWC, 2018).</p>	<p>Wetlands & Waterbirds are Listed a qualifying interest in 14 Special Protection Areas (SPAs) within the HHP CP area.</p> <p>Leinster CP has four SPAs protecting Wetlands & Waterbirds:</p> <ul style="list-style-type: none"> Ballyteigue Burrow SPA Carlingford Lough SPA Dundalk Bay SPA Poulaphouca Reservoir SPA <p>Breifne CP has three SPAs protecting Wetlands & Waterbirds:</p> <ul style="list-style-type: none"> Cummeen Strand SPA Drumcliff Bay SPA Lough Arrow SPA <p>MSC CP has seven SPAs protecting Wetlands & Waterbirds:</p> <ul style="list-style-type: none"> Kilcolman Bog SPA Lough Derg (Shannon) SPA Lough Rea SPA Mid-Clare Coast SPA Middle Shannon Callows SPA River Shannon and River Fergus Estuaries SPA <p>44% of birds Red Listed on the Birds of Conservation Concern Ireland 4 (2020–2026; Gilbert <i>et al.</i>, 2021) are waterbirds that are reliant on wetlands. These are the black-necked grebe, woodcock, red-necked phalarope, curlew sandpiper, Bewick’s swan, long-tailed duck, goldeneye, scaup, Slavonian grebe, grey plover, bar-tailed godwit, black-tailed godwit, knot, purple sandpiper, pochard, common scoter, shoveler, oystercatcher, golden plover, lapwing, curlew, dunlin, snipe, redshank. 15 of these species are known to be found within the HHP CP area.</p> <p>Other birds on the Red List that are not specifically waterbirds, but use wetland habitats include the white-tailed eagle, barn owl, golden eagle, kestrel, ring ouzel, meadow pipit, & grey wagtail (Gilbert <i>et al.</i>, 2021).</p>

Context:

Yellowhammer (*Emberiza citrinella*) distribution in Ireland shows a concentration throughout the south, south-east, east and parts of the midlands with some outlying concentrations across the country. The distribution has followed the shadow of decline in mixed and arable farming systems in Ireland in recent decades with mixed/ arable farming shrinking to areas in the south-east, east and parts of the midlands (Finch et al., 2022).

Lewis et al., 2019 notes that the species has seen some relative stabilisation between 2011-2016, yet a great distribution decline (58.1%) in past decades (1972-2016) is also evident. The species is red listed and is seen as high conservation concern within Birds of Conservation Concern in Ireland 2020-2026.

Yellowhammers are sexually dimorphic with males having a brighter yellow plumage, a rich chestnut rump and a distinctive call, with females having a duller brown streaked colour. The species is found across Ireland, The United Kingdom, continental Europe and as far as western Russia. Yellowhammer is abundant breeding across mixed and arable farming while also found at a lower density in pastoral farming. Yellowhammer require nesting habitat, song posts, and foraging habitat nearby, such as field margins which adults preferentially forage in during the breeding season. Female yellowhammers will build a nest, at times assisted by the male close to the ground, concealing it in thick vegetation, hedges or ditches (Anderson, 2014).

**Useful references:**

- Lewis, L., Coombes, D., Burke, B., O'Halloran, J., Walsh, A., Tierney, D. and Cummins, S., 2019. Countryside Bird Survey: Status and trends of common and widespread breeding birds 1998-2016 (Lewis et al., 2019).
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- Anderson, D.E., 2014. *Yellowhammer (Emberiza citrinella) ecology in an intensive pastoral dominated farming landscape* (Doctoral dissertation, University of Glasgow). (Anderson, 2014)
- McDonagh, J., 2022. Designation, Incentivisation and Farmer Participation—Exploring Options for Sustainable Rural Landscapes. *Sustainability*, 14(9), p.5569. (McDonagh, 2022)

- McHugh, N.M., Goodwin, C.E., Hughes, S., Leather, S.R. and Holland, J.M., 2016. Agri-environment scheme habitat preferences of Yellowhammer *Emberiza citrinella* on English farmland. *Acta Ornithologica*, 51(2), pp.199-209. (McHugh et al., 2016)
- National Biodiversity Data Centre, Ireland, Yellowhammer (*Emberiza citrinella*), image, accessed 31 January 2023, <https://maps.biodiversityireland.ie/Species/TerrestrialDistributionMapPrintSize/11686>

Population estimates in the CP areas.	Habitat Requirements	Threats and Pressures relevant to the CP
<p>The yellowhammer population in Ireland has shown a decreasing trend over a 44-year period (1972–2016) with the breeding population decreasing by 58% in this time (Lewis et al., 2019). The yellowhammer population once ranged across much of Irish farmland, but the contraction of its population range to the east, south-east and parts of the midlands has followed the contraction of tillage farming in Ireland to certain hotspots where tillage remains. Yellowhammer populations do persist outside of tillage production hotspot areas in Ireland yet are limited. (Finch et al., 2022).</p>	<p>Yellowhammers during the breeding season require foraging habitat near to breeding habitat i.e. vegetated ditches and hedges. While these field boundary structures provide nesting habitat, they also provide a foraging habitat. While Yellowhammers dislike tree lines the odd tree along a hedgerow provides a sing post for male yellowhammers. Yellowhammer require arable land to forage and will avoid pastoral habitat with breeding pairs avoiding pasture and silage leys. Habitat in winter focuses on concentration and distribution of food, avoidance of predators and shelter from weather conditions. Wintering birds will therefore forage on winter stubble ground (Anderson, 2014). Past Agri-Environmental Schemes have implied the use of wild bird cover strips that have been deemed beneficial, however the response of Yellowhammer populations to habitat creation and enhancement measures in Ireland is not well known. As noted above Yellowhammer are highly reliant on tillage and especially cereal production, yet they require a mosaic of habitats. Hedgerows and uncultivated margins which provide a source of invertebrates during the chick rearing stage of the breeding season. Hedgerows, vegetated ditches and grass field margins which contain dense vegetation provide nesting areas (Finch et al., 2022).</p>	<p>The Yellowhammer bird is associated with farmland and is therefore greatly affected by agricultural practices. It and other farmland bird species such as Curlew, Lapwing, Corncrake etc have been greatly affected by the intensification and modernisation of agriculture (McDonagh, 2022). The decline of the Yellowhammer in the UK has been associated with the removal of hedgerows, absence of field margins, and increased use of pesticides. These factors have the potential to affect the yellowhammer population similarly in Ireland. In Ireland, the movement away from mixed farming to specialised farming enterprises and a reduction in arable farming overall has significantly affected the species. Such change in the arable ecosystem in the Irish landscape has been the change from spring-sown to autumn-sown cereal. This has reduced the levels of crop stubble present, which is an important overwintering habitat for the species (Finch et al., 2022). The removal of hedgerows at present and in the past has been noted as having a significant effect on Yellowhammer populations but also their management and even lack of has been shown to affect population preference. McHugh et al., 2016 discusses how Yellowhammer prefer successional hedgerows which have been cut more frequently between January and March which are therefore denser.</p>

10.2.24 Woodland habitat

Eleven Annex I woodland habitats are present in the HHP CP areas. Profiles have been developed for each habitat and are presented under this section; woodland habitat in the HHP CP areas are likely to include a variation of or be a combination of these.

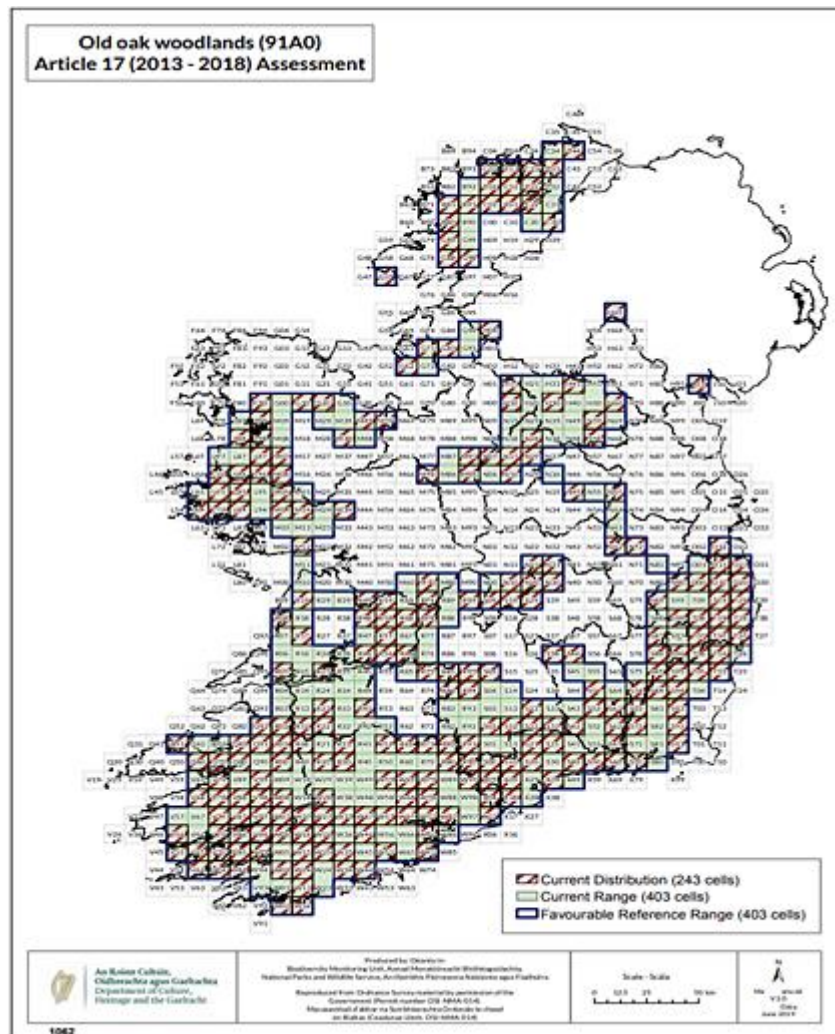
10.2.24.1 *Old sessile oak woods [91A0]*

Context:

91A0 Old sessile oak woods is defined in the interpretation manual of EU habitats as “acidophilous *Quercus petraea* woods, with low, low-branched, trees, with many ferns, mosses, lichens and evergreen bushes.” Three indicative species are listed: *Quercus petraea*, *Ilex aquifolium* and *Blechnum ssp.* (sic). The interpretation of the habitat used for this national assessment is wider, in that it also includes woods with *Quercus x rosacea* (hybrid between *Q. petraea* and *Q. robur*) and, locally, *Quercus robur*, provided the ground flora is acidic in character. Exact specifications for the habitat definition used are given in Perrin & Martin (2007) and O'Neill & Barron (2013). Effectively, it includes all three sub-associations of the *Blechno Quercetum petraeae* association.

The Irish Vegetation Classification (IVC; Perrin, 2016) primarily places 91A0 habitat in the WL1 *Quercus petraea* – *Luzula sylvatica* group. All vegetation communities in this group have an affinity to the Annex I habitat: WL1A *Quercus robur* – *Luzula sylvatica* woodland (78.7% affinity), WL1B *Quercus petraea* – *Luzula sylvatica* woodland (97.9% affinity), WL1C *Quercus petraea* – *Corylus avellana* woodland (66.3% affinity) and WL1D *Quercus petraea* – *Vaccinium myrtillus* woodland (98.7% affinity). The high rate of fragmentation of this resource is cause for concern. As well as area increases, greater connectivity needs to be established to increase gene and species flow between woodlands (NPWS, 2013).

Useful references:



Habitat Extent in the CP	Habitat Requirements	Ecological Coherence with Annex I habitats in the CP	Threats and Pressures relevant to the CP	Agricultural Management Measures
<p>CP areas within habitat range: All.</p> <p>Current Surface Area: 60.08 km²</p> <p>Counties within Range: Mayo, Leitrim, Sligo, Galway, Clare, Kerry, Cork, Waterford, Wicklow, Dublin, Louth, Monaghan, Roscommon, Limerick, Tipperary, Laois, Offaly, Wexford, Carlow, Laois</p>	<p>An old sessile oak wood is characterised by a number of diverse elements coming together in a fully functioning system. The soil is usually acidic, often a podzol, brown earth or grey-brown podzol, and generally well drained. This supports a characteristic flora. The woodland itself is typically multi-layered, well-developed sessile oak wood having a canopy, understorey, shrub, dwarf shrub, field and ground layers. A good proportion of the canopy should be composed of <i>Quercus petraea</i> or the hybrid <i>Quercus x rosacea</i>, although other native species such as <i>Betula</i> spp., and <i>Sorbus aucuparia</i> also occur. The cover of non-native species should not be greater than 10%, and regeneration of non-native species should be absent.</p>	<ul style="list-style-type: none"> • Active raised bogs [7110] • Alkaline Fens [7230] • Alpine and Boreal heaths [4060] • Blanket Bog [7130] • Calcareous Fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> [7210] • Degraded raised bogs still capable of natural regeneration [7120] • Depressions on peat substrates of the <i>Rhynchosporion</i> [7150] • European Dry heaths [4030] • <i>Juniperus communis</i> formations on heaths or calcareous grasslands [5130] • Limestone pavements [8240] • Northern Atlantic wet heaths with <i>Erica tetralix</i> [4010] • Petrifying springs with tufa formation (<i>Cratoneurion</i>) [7220] • Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i>) [8110] • Transition mires and quaking bogs [7140] 	<ul style="list-style-type: none"> • IO2 Other invasive alien species (other than species of Union concern) • A09 Intensive grazing or overgrazing by livestock • IO4 Problematic native species • B09 Clear-cutting, removal of all trees • M07 Storm, cyclone 	<ul style="list-style-type: none"> • CA05 Adapt mowing, grazing and other equivalent agricultural activities • CBO2 Maintain existing traditional forest management and exploitation practices • CBO4 Adapt/manage reforestation and forest regeneration • CBO5 Adapt/change forest management and exploitation practices • CBO8 Restoration of Annex I forest habitats • CE01 Reduce impact of transport operation and infrastructure • CIO3 Management, control or eradication of other invasive alien species • CIO5 Management of problematic native species • CJ01 Reduce impact of mixed source pollution

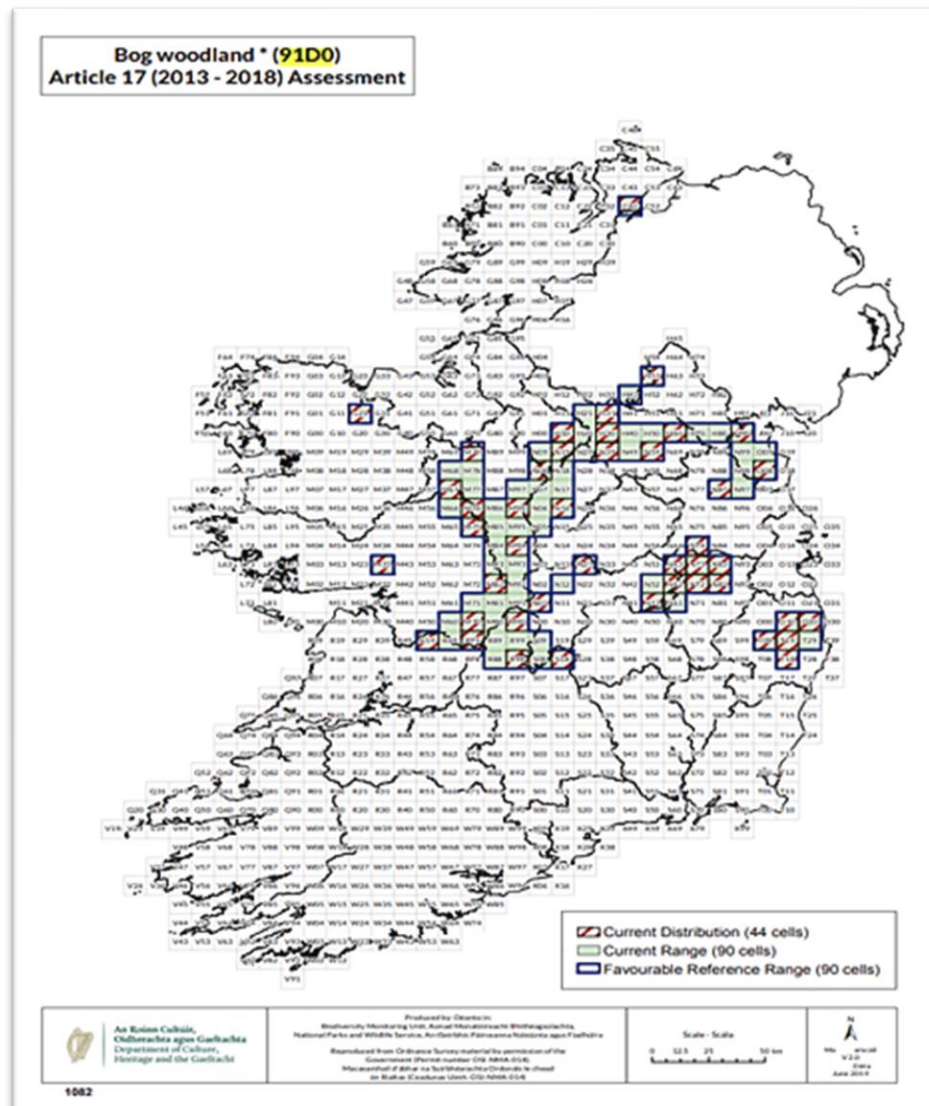
Context:

Bog woodland is a priority Annex I habitat. It occurs in three distinct habitats in Ireland: on intact raised bogs, where it is associated with low flow flushes on the high bog; on cutover bog, where it occurs in association with a weak ground-water influence; and within sessile oak woodlands in association with nutrient-poor flushes. They are mostly found in the midlands, the mid-west, the drumlin belt of the north midlands and in upland valleys. Bog woodlands are dominated by *Betula pubescens*, with small amounts of willow, mostly *Salix aurita* or *Salix cinerea*. Locally, there may be small amounts of *Pinus sylvestris*, especially on raised bogs. The dwarf shrub and field layers may be poorly to well developed. Dwarf shrub species can include *Calluna vulgaris*, *Vaccinium myrtillus* and *Vaccinium oxycoccos*. Field layer species can include *Molinia caerulea*, *Juncus effusus* and *Dryopteris* spp. The bryophyte layer has a characteristic luxuriant growth of *Sphagnum* species. *Polytrichum commune* and *Aulacomnium palustre* are also typical.

Bog woodlands are closely linked to precise hydrological conditions that are required for both their initiation and maintenance. These conditions are characteristically restricted to small areas, and consequently the area of individual bog woodlands is typically small. The long-term dynamics of bog woodlands is still poorly understood (O'Connell, 1988; O'Connell & Doyle, 1990). Bog woodlands on raised bog and within sessile oak woodlands are considered more or less permanent, provided hydrology remains stable, whereas bog woodlands on cutover may represent a more transient community that gradually reverts to raised bog or dries out to become another woodland type (Cross & Lynn, 2013).

The Irish Vegetation Classification (IVC; Perrin, 2016) places 91D0 habitat within the WL4 *Betula pubescens* – *Molinia caerulea* group. Two vegetation communities in this group have an affinity to the Annex I habitat comprising WL4C *Betula pubescens* – *Sphagnum palustre* woodland (77.8% affinity) and WL4E *Betula pubescens* – *Salix cinerea* woodland (17.0% affinity).

Useful references:



- Cross, J. & Lynn, D. (2013) Results of a monitoring survey of bog woodland. Irish Wildlife Manuals, No. 69. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.
- O'Connell, C.A. & Doyle, G.J. (1990) Local vegetation history of a pine woodland on Clonfinane Bog, County Tipperary. Ecology and conservation of Irish peatlands (ed. by G.J. Doyle), pp. 23-40. Royal Irish Academy, Dublin.
O'Connell, C.A. (1988)
- A comparative palynological study of contemporary and subfossil pine and birch woodlands in Irish raised bogs. PhD Thesis, University College Dublin, Dublin.

Habitat Extent in the CP	Habitat Requirements	Ecological Coherence with Annex I habitats in the CP	Threats and Pressures relevant to the CP	Agricultural Management Measures
<p>CP areas within habitat range: All.</p> <p>Current Surface Area: 2.13 km²</p> <p>Counties within Range: Donegal, Monaghan, Cavan, Mayo, Leitrim, Roscommon, Galway, Louth, Meath, Westmeath, Longford, Offaly, Kildare, Tipperary, Clare</p> <p>Bog Woodland occurs in three distinct habitats in Ireland: on intact raised bogs, where it is associated with low flow flushes on the high bog; on cutover bog, where it occurs in association with a weak ground-water influence; and within sessile oak woodlands in association with nutrient-poor flushes. They are mostly found in the midlands, the mid-west, the drumlin belt of the north midlands and in upland valleys.</p>	<p>Bog woodlands are closely linked to precise hydrological conditions that are required for both their initiation and maintenance. In particular, Bog woodlands require a wet peaty substrate which has a permanently high-water level (usually higher than the surrounding water table). This groundwater is always very poor in nutrients. These conditions are restricted to small areas, and consequently the area of individual bog woodlands is typically small. The long-term dynamics of bog woodlands is still poorly understood (O'Connell, 1988; O'Connell & Doyle, 1990). Bog woodlands on raised bog and within sessile oak woodlands are considered more or less permanent, provided hydrology remains stable, whereas bog woodlands on cutover may represent a more transient community that gradually reverts to raised bog or dries out to become another woodland type (Cross & Lynn, 2013).</p>	<ul style="list-style-type: none"> • Active raised bogs [7110] • Alkaline Fens [7230] • Alpine and Boreal heaths [4060] • Blanket Bog [7130] • Calcareous Fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> [7210] • Degraded raised bogs still capable of natural regeneration [7120] • Depressions on peat substrates of the Rhynchosporion [7150] • European Dry heaths [4030] • Juniperus communis formations on heaths or calcareous grasslands [5130] • Limestone pavements [8240] • Northern Atlantic wet heaths with <i>Erica tetralix</i> [4010] • Petrifying springs with tufa formation (Cratoneurion) [7220] • Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i>) [8110] • Transition mires and quaking bogs [7140] 	<ul style="list-style-type: none"> • K01 Abstraction from groundwater, surface water or mixed water • I02 Other invasive alien species (other than species of Union concern) • C05 Peat extraction • A11 Burning for agriculture • B09 Clear-cutting, removal of all trees 	<ul style="list-style-type: none"> • CA05 Adapt mowing, grazing and other equivalent agricultural activities • CB02 Maintain existing traditional forest management and exploitation practices • CB05 Adapt/change forest management and exploitation practices • CB08 Restoration of Annex I forest habitats • CB14 Manage drainage and irrigation operations and infrastructures • CC07 Habitat restoration/creation from resources, exploitation areas or areas damaged due to installation of renewable energy infrastructure • CE01 Reduce impact of transport operation and infrastructure • CI03 Management, control or eradication of other invasive alien species • CI05 Management of problematic native species • CJ01 Reduce impact of mixed source pollution

Context:

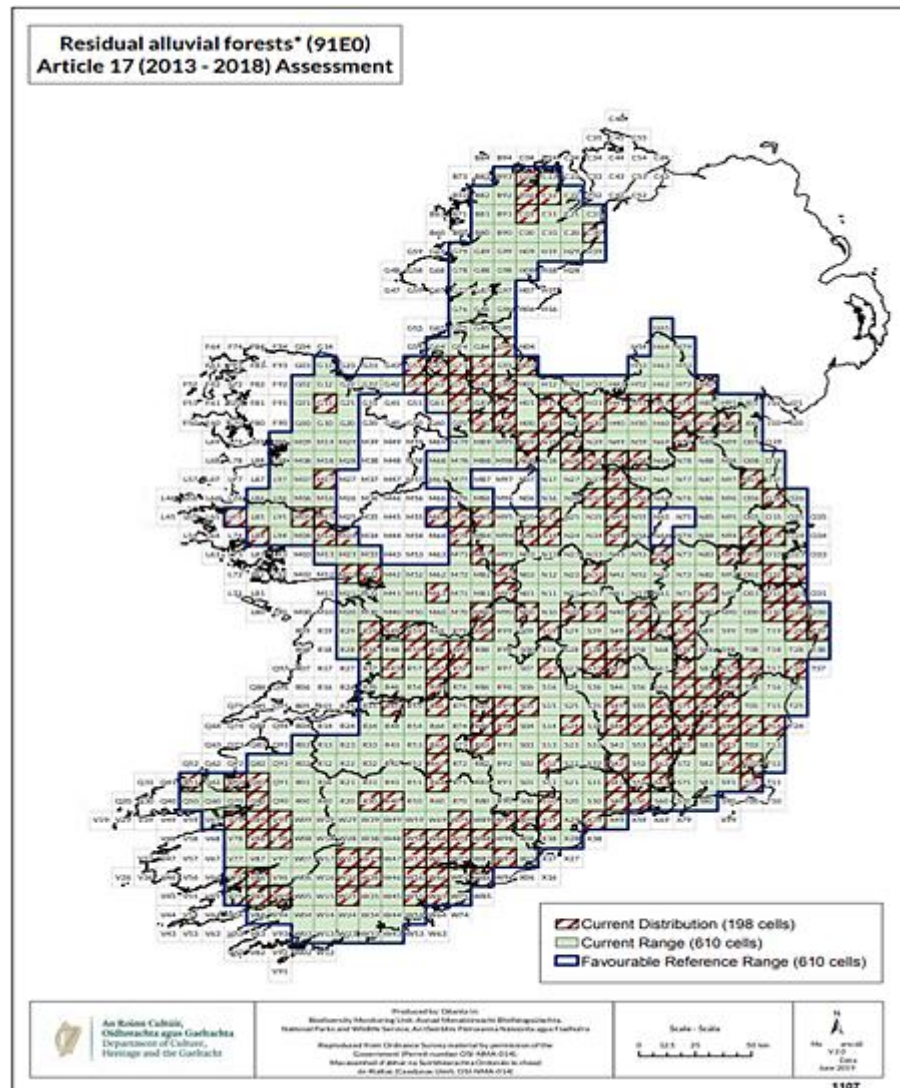
Alluvial woodland is a priority Annex I habitat. A number of variants of this habitat exist, of which riparian forests of *Fraxinus excelsior* and *Alnus glutinosa* (Alno-Padion) of temperate and Boreal Europe lowland and hill watercourses are the most common type found in Ireland. The Interpretation Manual of EU habitats 2013 (CEC, 2013) states that all types occur on heavy soils which are periodically inundated by the annual rise of river levels, but which are otherwise well-drained and aerated during low water. The herbaceous layer includes many large species such as *Filipendula ulmaria*, *Angelica sylvestris*, *Rumex sanguineus* and *Carex* spp., vernal species such as *Ficaria verna* and *Anemone nemorosa*, and other indicative species such as *Carex remota*, *Lycopus europaeus*, *Urtica dioica* and *Geum rivale*.

In addition, there are gallery forests of tall willows (*Salicion albae*) alongside river channels and occasionally on river islands, where the tree roots are almost continuously submerged. These are dominated by *Salix alba*, *S. viminalis* and *S. triandra*, sometimes with *S. cinerea*, but *Alnus glutinosa*

should be rare. There is a luxuriant herb layer of species such as *Phalaris arundinacea*, *Urtica dioica* and *Filipendula ulmaria*. The Irish Vegetation Classification (IVC; Perrin, 2016) primarily places 91E0 habitat within the WL3 *Alnus glutinosa* – *Filipendula ulmaria* group. All vegetation communities in this group (WL3A-WL3F) have an affinity to the Annex I habitat.

Alluvial woodland corresponds to four vegetation types described in Perrin et al. (2008). Three are in the *Alnus glutinosa* – *Filipendula ulmaria* group: *Fraxinus excelsior* – *Carex remota* type; *Alnus glutinosa* – *Rubus fruticosus* type; and *Salix cinerea* – *Equisetum fluviatile* type. The fourth type is in the *Fraxinus excelsior* – *Hedera helix* group: the *Salix-triandra* – *Urtica dioica* type. European Commission (2007) states that all types occur on heavy soils that are periodically inundated by the annual rise of river levels, but that are otherwise well drained and aerated during low water.

Useful references:



Habitat Extent in the CP	Habitat Requirements	Ecological Coherence with Annex I habitats in the CP	Threats and Pressures relevant to the CP	Agricultural Management Measures
<p>CP areas within habitat range: All.</p> <p>Current Surface Area: 16.64 km²</p> <p>Counties within Range: Every county in R.O.I.</p>	<p>The herbaceous layer includes many large species such as <i>Filipendula ulmaria</i>, <i>Angelica sylvestris</i> and <i>Carex acutiformis</i>, vernal species such as <i>Ranunculus ficaria</i> and <i>Anemone nemorosa</i>, and other indicative species such as <i>Carex remota</i>, <i>Lycopus europaeus</i>, <i>Urtica dioica</i> and <i>Geum rivale</i>.</p> <p>A functioning alluvial forest with a good structure is, in common with sessile oak woods, a multi-layered system, although the individual layers may be less distinct than in oak woods. Non-native species should be no more than occasional, with a cover not exceeding 10%, and preferably absent, although an exception is made for gallery woodlands in which non-native species of <i>Salix</i>, such as <i>S. fragilis</i> or <i>S. alba</i>, may be frequent. Typical canopy species include <i>Salix</i> spp., <i>Fraxinus excelsior</i> and <i>Alnus glutinosa</i>, one or more of which should make up the greater proportion of the canopy. <i>Betula</i> spp. and <i>Crataegus monogyna</i> are frequently found, with other tree species such as <i>Quercus robur</i> and <i>Ulmus glabra</i> occurring in drier examples of the habitat. Alluvial woodlands should have a good complement of dead wood, including coarse and fine, standing and fallen dead wood, to accommodate the greatest possible range of invertebrates and other saproxylic organisms.</p> <p>Alluvial woodlands in Ireland occur within the hydrological system of a river or lake and are usually periodically inundated.</p>	<ul style="list-style-type: none"> • Active raised bogs [7110] • Alkaline Fens [7230] • Alpine and Boreal heaths [4060] • Blanket Bog [7130] • Calcareous Fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> [7210] • Degraded raised bogs still capable of natural regeneration [7120] • Depressions on peat substrates of the Rhynchosporion [7150] • European Dry heaths [4030] • <i>Juniperus communis</i> formations on heaths or calcareous grasslands [5130] • Limestone pavements [8240] • Northern Atlantic wet heaths with <i>Erica tetralix</i> [4010] • Petrifying springs with tufa formation (Cratoneurion) [7220] • Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani) [8110] • Transition mires and quaking bogs [7140] 	<ul style="list-style-type: none"> • I02 Other invasive alien species (other than species of Union concern) • I04 Problematic native species • B09 Clear-cutting, removal of all trees • I05 Plant and animal diseases, pathogens and pests 	<ul style="list-style-type: none"> • CA05 Adapt mowing, grazing and other equivalent agricultural activities • CB02 Maintain existing traditional forest management and exploitation practices • CB04 Adapt/manage reforestation and forest regeneration • CB05 Adapt/change forest management and exploitation practices • CB08 Restoration of Annex I forest habitats • CB14 Manage drainage and irrigation operations and infrastructures • CE01 Reduce impact of transport operation and infrastructure • CI03 Management, control or eradication of other invasive alien species • CI05 Management of problematic native species • CI07 Controlling and eradicating plant and animal diseases, pathogens and pests

