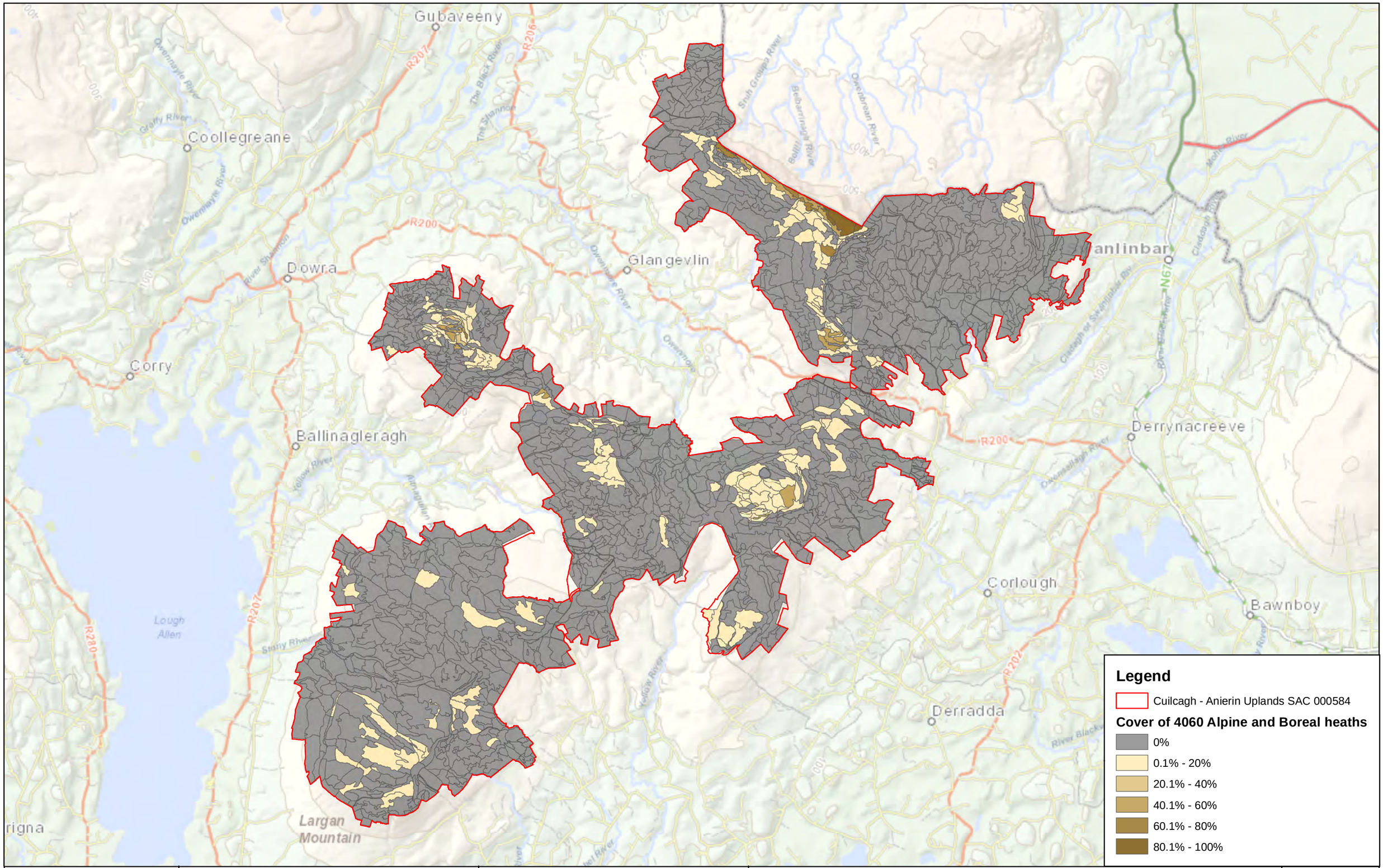


An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 5:
CUILCAGH - ANIERIN UPLANDS SAC
CONSERVATION OBJECTIVES
ALPINE AND BOREAL HEATHS

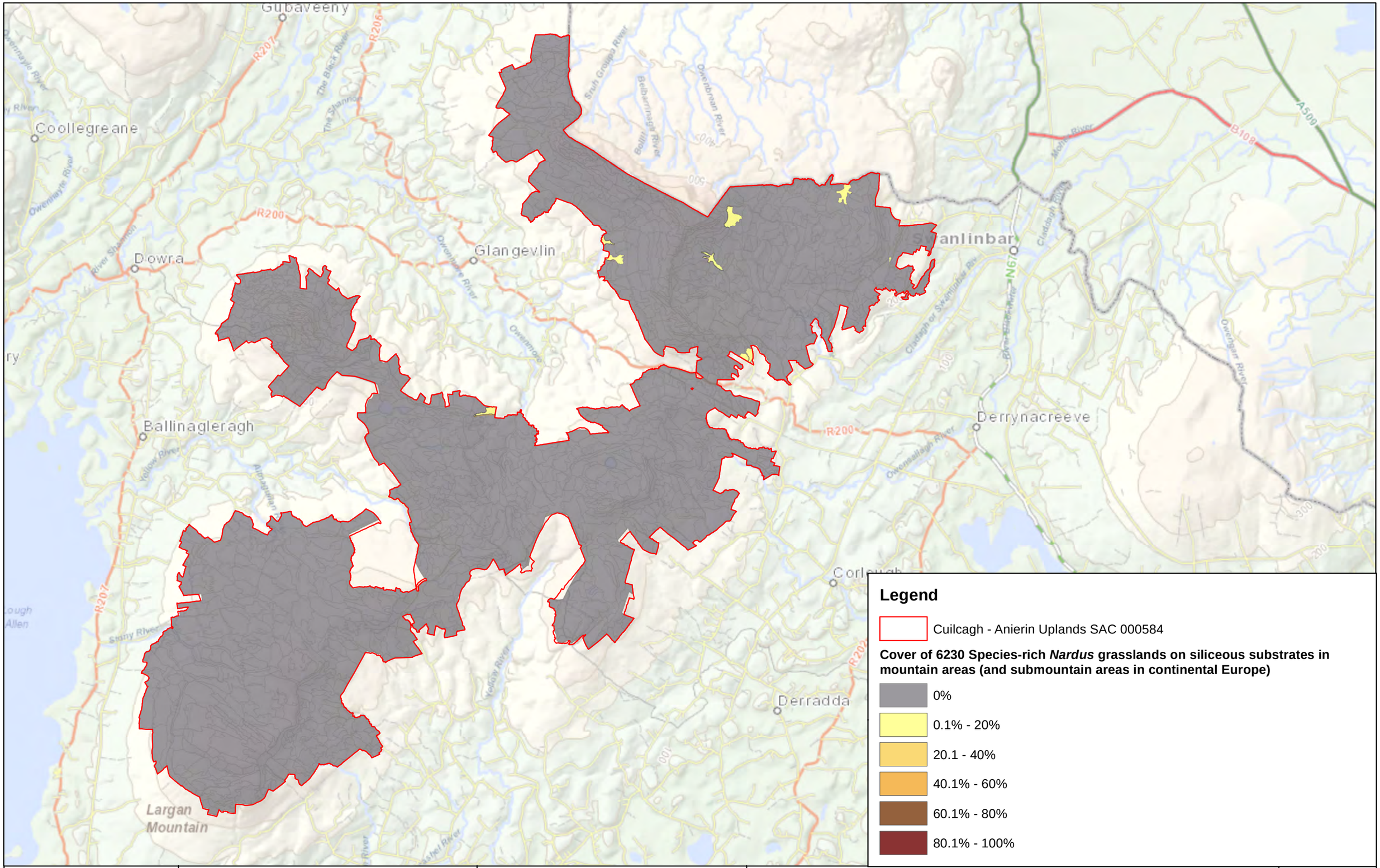
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000584; version 3.01. CO. CAVAN, CO. LEITRIM.

0 1 2 3 4 5 km

N

Map Version 1
Date: July 2016



An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 6:
CUILCAGH - ANIERIN UPLANDS SAC
CONSERVATION OBJECTIVES
SPECIES RICH NARDUS GRASSLAND*

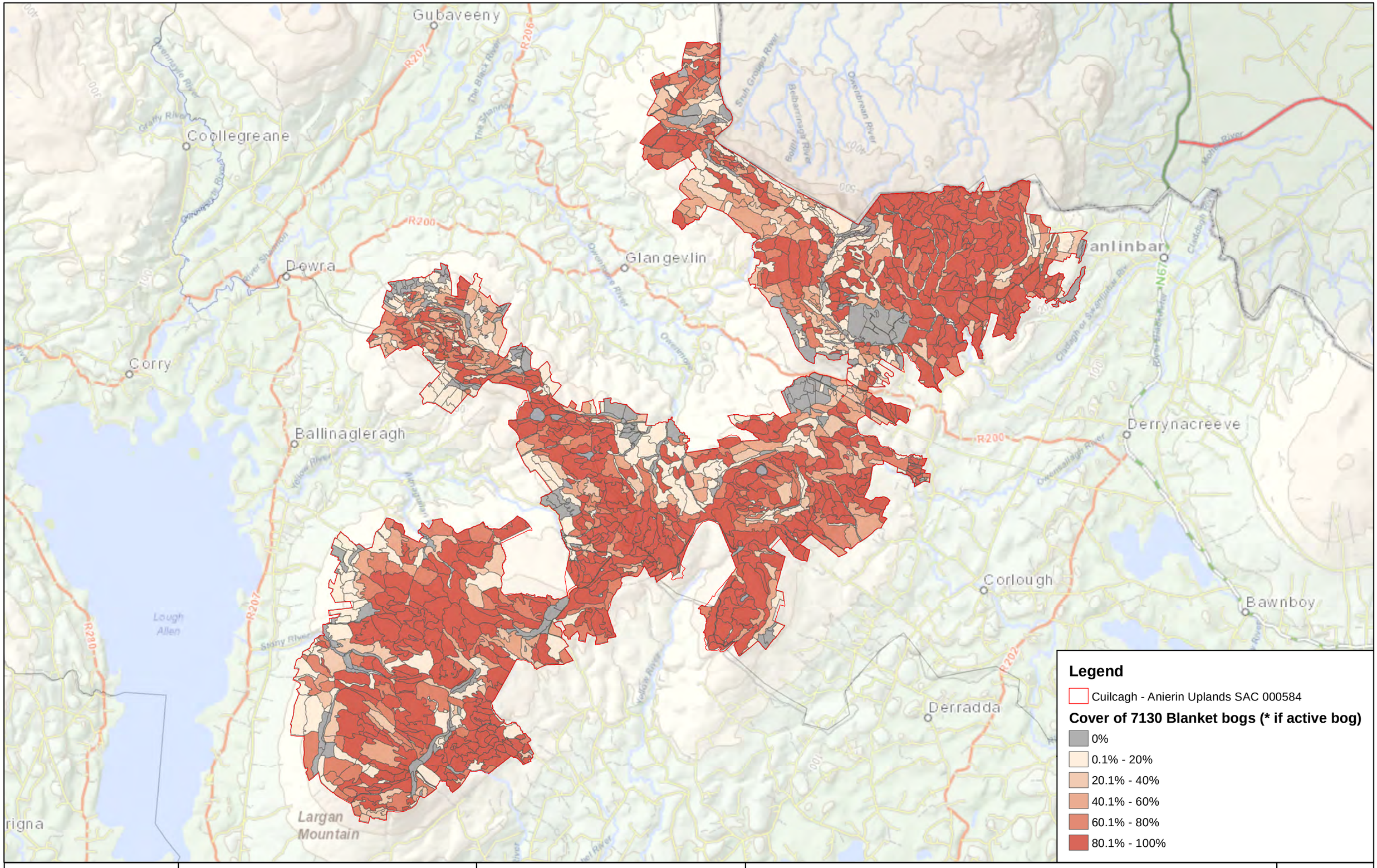
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000584; version 3.01. CO. CAVAN, CO. LEITRIM.

0 1 2 3 4 5 km

N

Map Version 1
Date: July 2016



Legend

Cuilcagh - Anierin Uplands SAC 000584

Cover of 7130 Blanket bogs (* if active bog)

- 0%
- 0.1% - 20%
- 20.1% - 40%
- 40.1% - 60%
- 60.1% - 80%
- 80.1% - 100%

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 7:
CUILCAGH - ANIERIN UPLANDS SAC
CONSERVATION OBJECTIVES
BLANKET BOGS (* IF ACTIVE BOG)

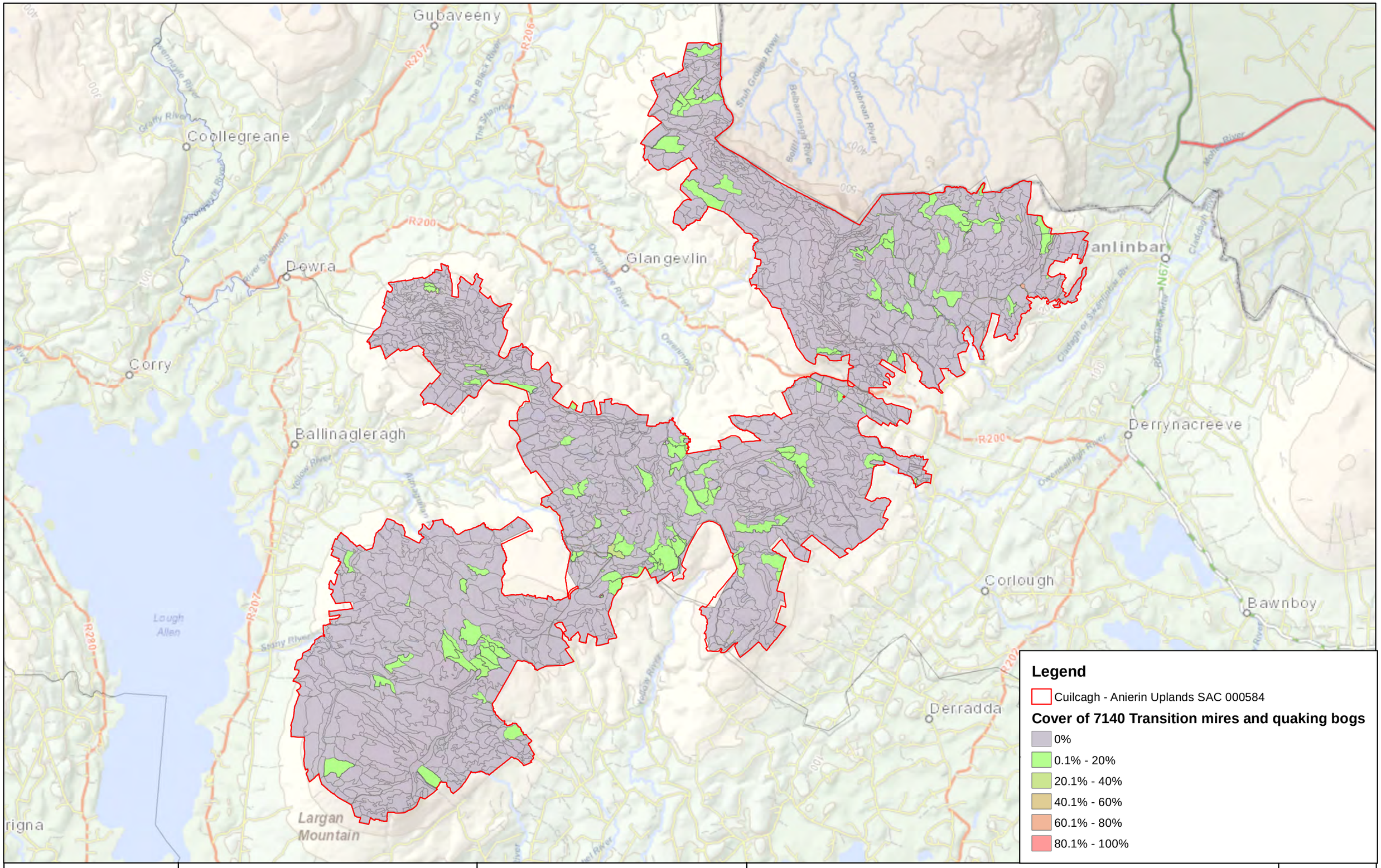
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000584; version 3.01. CO. CAVAN, CO. LEITRIM.

0 1 2 3 4 5 km

N

Map Version 1
Date: July 2016



An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 8:
CUILCAGH - ANIERIN UPLANDS SAC
CONSERVATION OBJECTIVES
TRANSITION MIRES

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000584; version 3.01. CO. CAVAN, CO. LEITRIM.

0 1 2 3 4 5 km

N

Map Version 1
Date: July 2016

Legend

Cuilcagh-Anierin Uplands SAC 000584

Cover of 7220 *Petrifying springs with tufa formation *(Cratoneurion)*

- 0%
- 0.1% - 20%
- 20.1% - 40%
- 40.1% - 60%
- 60.1% - 80%
- 80.1% - 100%

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 9:
CUILCAGH - ANIERIN UPLANDS SAC
CONSERVATION OBJECTIVES
PETRIFYING SPRINGS

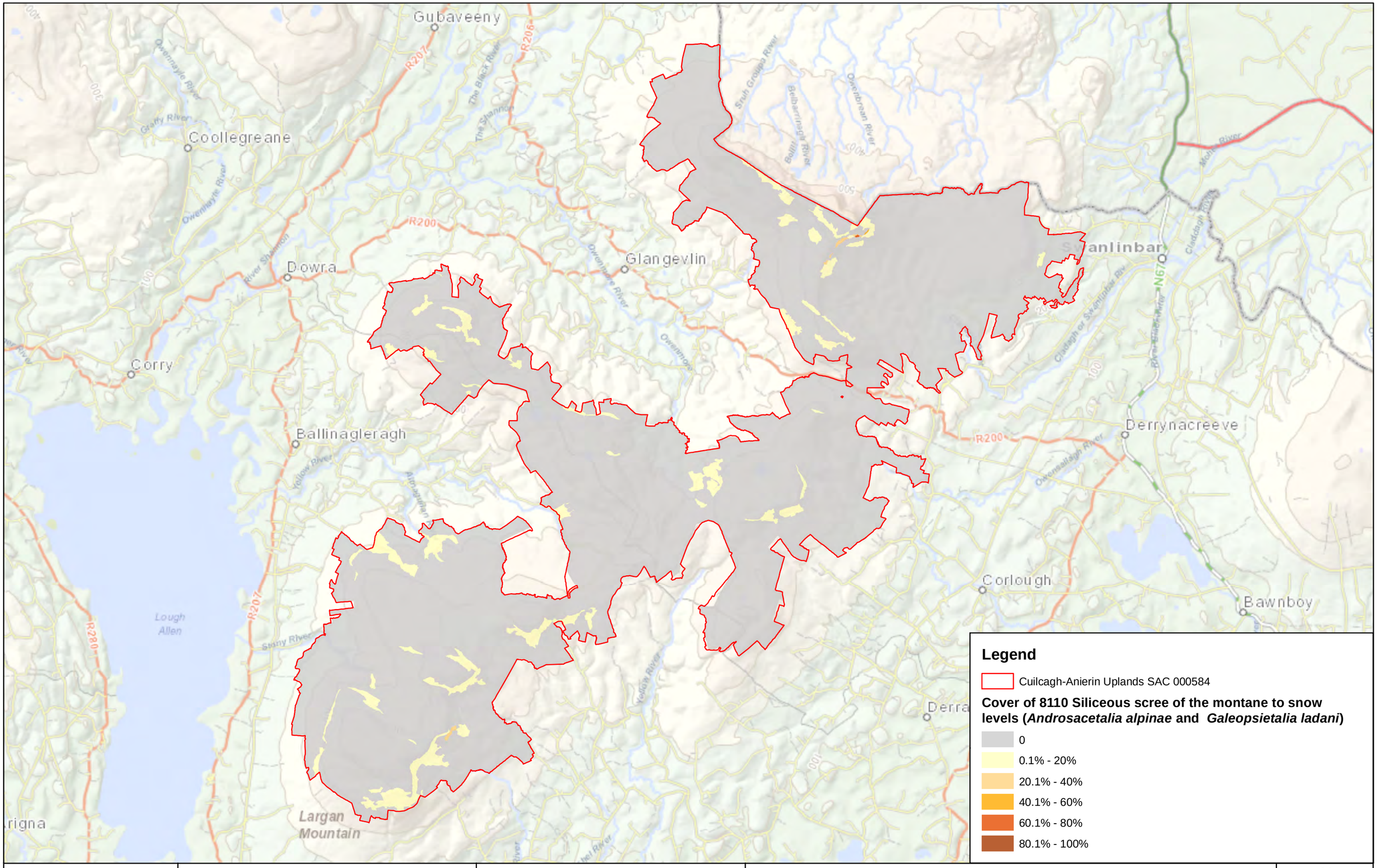
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000584; version 3.01. CO. CAVAN, CO. LEITRIM.

0 1 2 3 4 5 km

N

Map Version 1
Date: July 2016



An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 10:
CUILCAGH - ANIERIN UPLANDS SAC
CONSERVATION OBJECTIVES
SILICEOUS SCREE

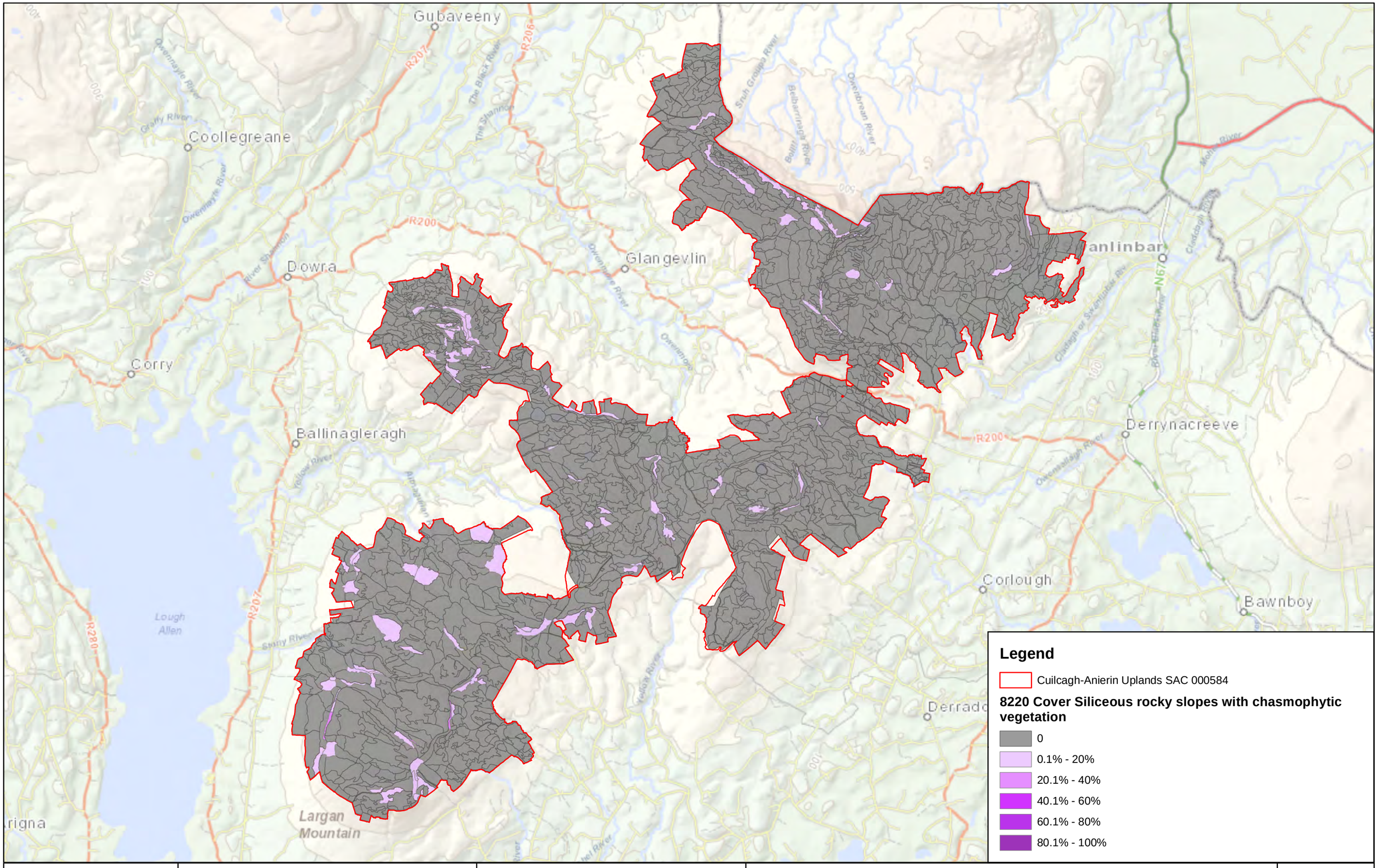
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000584; version 3.01. CO. CAVAN, CO. LEITRIM.

0 1 2 3 4 5 km

N

Map Version 1
Date: July 2016



Legend

Cuilcagh-Anierin Uplands SAC 000584

8220 Cover Siliceous rocky slopes with chasmophytic vegetation

- 0
- 0.1% - 20%
- 20.1% - 40%
- 40.1% - 60%
- 60.1% - 80%
- 80.1% - 100%

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 11:
CUILCAGH - ANIERIN UPLANDS SAC
CONSERVATION OBJECTIVES
SILICEOUS ROCKY SLOPES

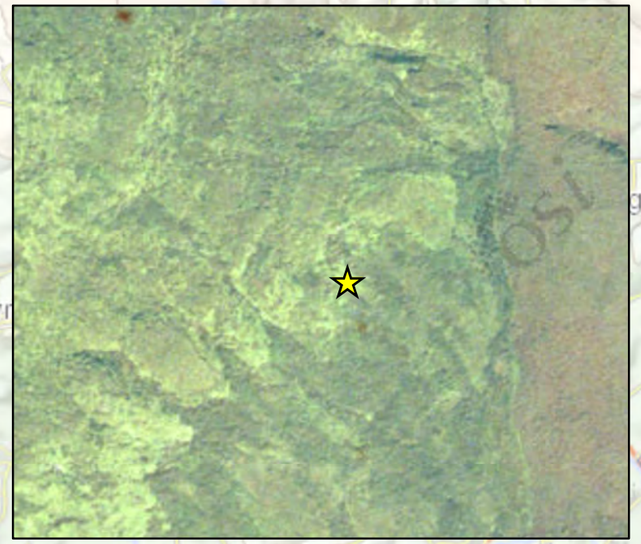
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000584; version 3.01. CO. CAVAN, CO. LEITRIM.

0 1 2 3 4 5 km

N

Map Version 1
Date: July 2016



Gubaveeny
greane
Tawr
Dowra
Glangevlin
Swanlinbar
Drumkeeran
Corry
Ballinagleragh
Derryna
Seltannasaggart or Corry Mountain
Lough Allen
Corlough
Derradda
Kilronan Mountain
Arigna
Largan Mountain
R207
R206
R200
R280
R202
N87

Legend

- Cuilcagh Anierin Uplands SAC 000584
- 1393 Slender Green Feather Moss - *Drepanocladus vernicosus*

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 12:
CUILCAGH - ANIERIN UPLANDS SAC
CONSERVATION OBJECTIVES
SLENDER GREEN FEATHER-MOSS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000584; version 3.01. CO. CAVAN, CO. LEITRIM.

0 1 2 3 4 5 km

N

Map Version 1
Date: July 2016

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Donegal Bay (Murvagh) SAC 000133

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht

National Parks and Wildlife Service,
Department of Arts, Heritage and the Gaeltacht,

7 Ely Place, Dublin 2, Ireland.

Web: www.npws.ie
E-mail: nature.conservation@ahg.gov.ie

Citation:
NPWS (2012) Conservation Objectives: Donegal Bay (Murvagh) SAC 000133. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

Series Editors: Rebecca Jeffrey & Naomi Kingston
ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

000133	Donegal Bay (Murvagh) SAC
1140	Mudflats and sandflats not covered by seawater at low tide
1365	Harbour Seal *Phoca vitulina*
2130	*Fixed coastal dunes with herbaceous vegetation ('grey dunes')
2190	Humid dune slacks

Please note that this SAC overlaps with Donegal Bay SPA (004151) and is adjacent to Lough Eske and Ardnamona Wood SAC (000163). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping and adjacent sites as appropriate.

Supporting documents, relevant reports & publications (listed by date)

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

Title: Donegal Bay (Murvagh) SAC (000133). Conservation objectives supporting document - marine habitats and species [Version 1]

Year: 2011

Author: NPWS

Series: Unpublished Report to NPWS

Title: Donegal Bay (Murvagh) SAC (000133). Conservation objectives supporting document - coastal habitats [Version 1]

Year: 2011

Author: NPWS

Series: Unpublished Report to NPWS

Title: Donegal Bay Baseline Intertidal Survey Report

Year: 2011

Author: RPS

Series: Unpublished Report to NPWS & MI

Title: Subtidal Benthic Investigations in Donegal Bay SPA (Site Code:IE004151) and Donegal Bay cSAC (Site Code: IE000133) Co. Donegal

Year: 2010

Author: Aquafact

Series: Unpublished Report to NPWS & MI

Title: Saltmarsh Monitoring Report 2007-2008

Year: 2009

Author: McCorry, M.; Ryle, T.

Series: Unpublished Report to NPWS

Title: Coastal Monitoring Project 2004-2006

Year: 2009

Author: Ryle, T.; Murray, A.; Connolly, C.; Swann, M.

Series: Unpublished Report to NPWS

Title: The phytosociology and conservation value of Irish sand dunes

Year: 2008

Author: Gaynor, K.

Series: Unpublished PhD thesis, National University of Ireland, Dublin

---

Title: Harbour seal population assessment in the Republic of Ireland: August 2003

Year: 2004

Author: Cronin, M.; Duck, C.; Ó Cadhla, O.; Nairn, R.; Strong, D.; O'Keeffe, C.

Series: Irish Wildlife Manuals No. 11

Title: Summary of National Parks & Wildlife Service surveys for common (harbour) seals (*Phoca vitulina*) and grey seals (*Halichoerus grypus*), 1978 to 2003

Year: 2004

Author: Lyons, D.O.

Series: Irish Wildlife Manuals No. 13

Title: A Survey of Irish Links Golf Courses

Year: 1999

Author: Gaynor, K.; Browne, A.

Series: Unpublished Report to NPWS

Title: National Shingle Beach Survey of Ireland 1999

Year: 1999

Author: Moore, D.; Wilson, F.

Series: Unpublished Report to NPWS

Title: 1989 survey of breeding herds of common seal *Phoca vitulina* with reference to previous surveys

Year: 1990

Author: Harrington, R.

Series: Unpublished Report to Wildlife Service

Title: An assessment of the breeding populations of common seals (*Phoca vitulina vitulina* L.) in the Republic of Ireland during 1979

Year: 1983

Author: Warner, P.J

Series: Irish Naturalists' Journal 21: 24-26

Title: An assessment of the status of the common seal *Phoca vitulina vitulina* in Ireland

Year: 1980

Author: Summers, C.F.; Warner, P.J; Nairn, R.G.W.; Curry, M.G.; Flynn, J.

Series: Biological Conservation 17: 115-123

Spatial data sources

Year:	Interpolated 2011
Title:	Intertidal surveys 2009, 2010
GIS operations:	Polygon feature classes from marine community types base data sub-divided based on interpolation of marine survey data. Expert opinion used as necessary to resolve any issues arising
Used for:	Marine community types, 1140 (maps 3 and 4)
Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	High water mark (HWM) and low water mark (LWM) polyline feature classes converted into polygon feature classes and combined; EU Annex I Saltmarsh and Coastal data erased out if present
Used for:	Marine community types base data (map 4)
Year:	2009
Title:	Coastal Monitoring Project 2004-2006. Version 1
GIS operations:	QIs selected; clipped to SAC boundary; overlapping regions with Saltmarsh CO data investigated and resolved with expert opinion used
Used for:	2130, 2190 (map 5)
Year:	2011
Title:	NPWS rare and threatened species database
GIS operations:	Dataset created from spatial references in database records. Expert opinion used as necessary to resolve any issues arising
Used for:	1365 (map 6)
Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	High Water Mark (HWM) polyline feature class converted into polygon feature class; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	1365 (map 6)

1140 Mudflats and sandflats not covered by seawater at low tide

To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in Donegal Bay (Murvagh) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 3	Habitat area was estimated as 1069ha using OSi data. See marine suporting document for further details
Community distribution	Hectares	Conserve the following community types in a natural condition: Estuarine fine sands dominated by polychaetes and oligochaetes community complex; and Intertidal muddy sand to sand dominated by polychaetes, bivalves and crustaceans community complex. See map 4	The likely area of the sediment communities was derived from intertidal surveys undertaken in 2009 and 2010 (Aquafact, 2010; RPS, 2011)

1365 Harbour Seal *Phoca vitulina*

To maintain the favourable conservation condition of Harbour Seal in Donegal Bay (Murvagh) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Access to suitable habitat	Number of artificial barriers	Species range within the site should not be restricted by artificial barriers to site use. See map 6	See marine supporting document for further details
Breeding behaviour	Breeding sites	The breeding sites should be maintained in a natural condition. See map 6	Attribute and target based on background knowledge of Irish breeding populations, review of data summarised by Summers et al. (1980), Warner (1983), Harrington (1990), Lyons (2004) and unpublished National Parks & Wildlife Service records. See marine supporting document for further details
Moulting behaviour	Moult haul-out sites	The moult haul-out sites should be maintained in a natural condition. See map 6	Attribute and target based on background knowledge of Irish populations, review of data from Lyons (2004), Cronin et al. (2004) and unpublished National Parks & Wildlife Service records. See marine supporting document for further details
Resting behaviour	Resting haul-out sites	The resting haul-out sites should be maintained in a natural condition. See map 6	Attribute and target based on background knowledge of Irish populations, review of data from Lyons (2004) and unpublished National Parks & Wildlife Service records. See marine supporting document for further details
Disturbance	Level of impact	Human activities should occur at levels that do not adversely affect the harbour seal population at the site	See marine supporting document for further details

2130 *Fixed coastal dunes with herbaceous vegetation ('grey dunes')

To restore the favourable conservation condition of Fixed coastal dunes with herbaceous vegetation (grey dunes) in Donegal Bay (Murvagh) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area increasing, subject to natural processes including erosion and succession. For sub-sites mapped: Mullanasole - 19.19ha and Mountcharles - 7.82ha. See map 5	Based on data from the Coastal Monitoring Project (Ryle et al., 2009). Two sub-sites (Mullanasole and Mountcharles) were mapped, giving a total estimated area of 27.01ha. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 5 for known distribution	Based on data from the Coastal Monitoring Project (Ryle et al., 2009). Fixed dunes known to occur at Mullanasole and Mountcharles. See coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation resulting in increased rates of erosion. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	A range of coastal habitats form a dynamic mosaic at this site according to Ryle et al. (2009); McCorry and Ryle (2009) and Moore and Wilson (1999). See coastal habitats supporting document for further details
Vegetation structure: bare ground	Percentage cover	Bare ground should not exceed 10% of fixed dune habitat, subject to natural processes	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation structure: sward height	Centimeters	Maintain structural variation within sward	30-70% of sward should be maintained between 5 and 20cm. Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in Ryle et al. (2009)	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from Ryle et al. (2009). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. See coastal habitats supporting document for further details

2130 *Fixed coastal dunes with herbaceous vegetation ('grey dunes')

To restore the favourable conservation condition of Fixed coastal dunes with herbaceous vegetation (grey dunes) in Donegal Bay (Murvagh) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation composition: scrub/trees	Percentage cover	No more than 5% cover or under control	Based on data from Ryle et al. (2009). The spread of blackthorn (*Prunus spinosa*) scrub needs to be controlled at Mountcharles. See coastal habitats supporting document for further details

2190 Humid dune slacks

To restore the favourable conservation condition of Humid dune slacks in Donegal Bay (Murvagh) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area increasing, subject to natural processes including erosion and succession. For site mapped: Mullanasole - 0.12ha See map 5	Based on data from the Coastal Monitoring Project (Ryle et al., 2009). Habitat was mapped at Mullanasole, giving a total estimated area of 0.12ha. See coastal habitats supporting document for further details.
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 5 for known distribution	Based on data from the Coastal Monitoring Project (Ryle et al., 2009). Slacks known to occur at Mullanasole. They provide habitat for round-leaved wintergreen (*Pyrola rotundifolia* ssp. *maritima*). See coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation, resulting in increased rates of erosion. See coastal habitats supporting document for further details
Physical structure: hydrological and flooding regime	Water table levels: groundwater fluctuations (metres)	Maintain natural hydrological regime	Based on data from Ryle et al. (2009). Some slacks at Mullanasole are believed to have dried up due to afforestation. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	A range of coastal habitats form a dynamic mosaic at this site according to Ryle et al. (2009); McCorry and Ryle (2009) and Moore and Wilson (1999). See coastal habitats supporting document for further details
Vegetation structure: bare ground	Percentage cover	Bare ground should not exceed 5% of dune slack habitat, with the exception of pioneer slacks which can have up to 20% bare ground	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimeters	Maintain structural variation within sward	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in Ryle et al. (2009)	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: cover of Salix repens	% cover; centimeters	Maintain <40% cover of creeping willow (*Salix repens*)	Cover of creeping willow (*Salix repens*) needs to be controlled (e.g. through an appropriate grazing regime) to prevent the development of a coarse, rank vegetation cover. Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details

2190 Humid dune slacks

To restore the favourable conservation condition of Humid dune slacks in Donegal Bay (Murvagh) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from Ryle et al. (2009). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. See coastal habitats supporting document for further details
Vegetation composition: scrub/trees	Percentage cover	No more than 5% cover or under control	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details

Drumkeelan
Standing Stone
Glencoagh Lough
Glencoagh
St. Peter's Lough
Eddrim Glebe
Eddrim River
Drumkeegan
Drumstevlin
Dromore Upper
Dismantled
Ballydevitt
Gortlosky
Red Br.
Drumroosk
Railway
Doonan
N56
Drumark
Murlas Br.
Drumcliff Hill
Castle
Duncahs Br.
Scrawhill
Dromore Lower
Eddrim Br.
Drumgun
Rossylongan Strand
Donegal Friary
Ardeskin
Glebe
Raforker
Revlin Pt.
Main Channel
Drumgun Point
Glen Br.
Trim Hill
Formal Hill
Hall Demesne
Beefpark
Ballyboyle
Muckros Strand
Ballyboyle Island
Ardchicken
Rardoey Hill
Friary
Salthill Demesne
Jack's Quay
Summerhill
Ball Hill
Blind Channel
Castle
Cool Strand
Muckros Strand
Tawnalary
Harry's Loughan
St. Ernan's Island
Dungally Strand
Tullyearl
Pier
Hassan's
Rooney's Island
Bell's Isle
Rossmore
Legacurry
Rossyvolan
Inishpat
Murvagh Lower
Club House
Roughan
Passilly
Inishnevin
Tullyowen Point
Mullanasole
Inishnabo
Pier
Trummon
Drummanus Glebe
Murvagh Upper
Mullanacross
Loughtone Hill
Barrow
Ch
Lacklom
Drumlonghfield
Bunlin Bar
Irishfad
Dromhome
Drumoske
Drumoske
Buncrana
Letterkenny
CO. DONEGAL
Lifford
SAC 000133
Donegal
Ballyshannon
Bundoran

Legend

SAC 000133

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 1:
DONEGAL BAY (MURVAGH) SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000133 Version 1

0 0.5 1 km

N

Map Version 1
Date: Dec 2011

000163

000133

004151

Legend

- SAC 000133
- SAC 000163
- SPA 004151
- OSi Discovery Series County Boundary

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 2:
DONEGAL BAY (MURVAGH) SAC CONSERVATION OBJECTIVES ADJOINING / OVERLAPPING DESIGNATIONS

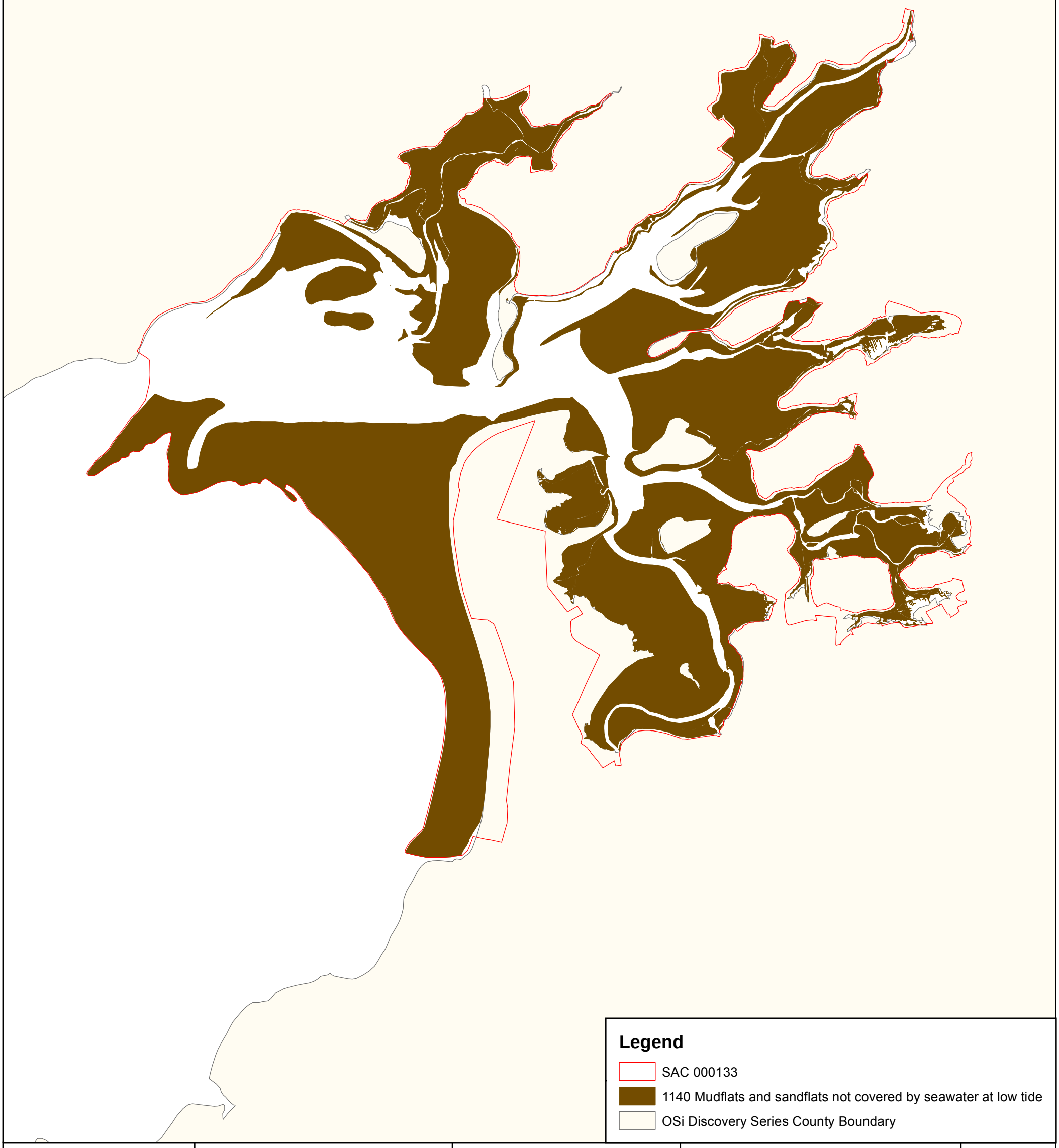
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000133 Version 1
SAC 000163 Version 1.02
SPA 004151 Version 2.01

0 1.5 3 km

N

Map Version 1
Date: Dec 2011



An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 3: DONEGAL BAY (MURVAGH) SAC CONSERVATION OBJECTIVES TIDAL MUDFLATS & SANDFLATS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

COUNTY DONEGAL

0 0.5 1 km

N

SITE CODE

SAC 000133
Version 1

Map Version 1
Date: Dec 2011

Legend

SAC 000133

OSi Discovery Series County Boundary

Marine Community Types

Estuarine fine sands dominated by polychaetes and oligochaetes community complex

Intertidal hard substrate

Intertidal muddy sand to sand dominated by polychaetes, bivalves and crustaceans community complex

Shingle beach

Subtidal fine sands with polychaetes and bivalves community complex

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 4:
DONEGAL BAY (MURVAGH) SAC
CONSERVATION OBJECTIVES
MARINE COMMUNITY TYPES

Map to be read in conjunction with the NPWS Conservation Objectives Document.

COUNTY DONEGAL

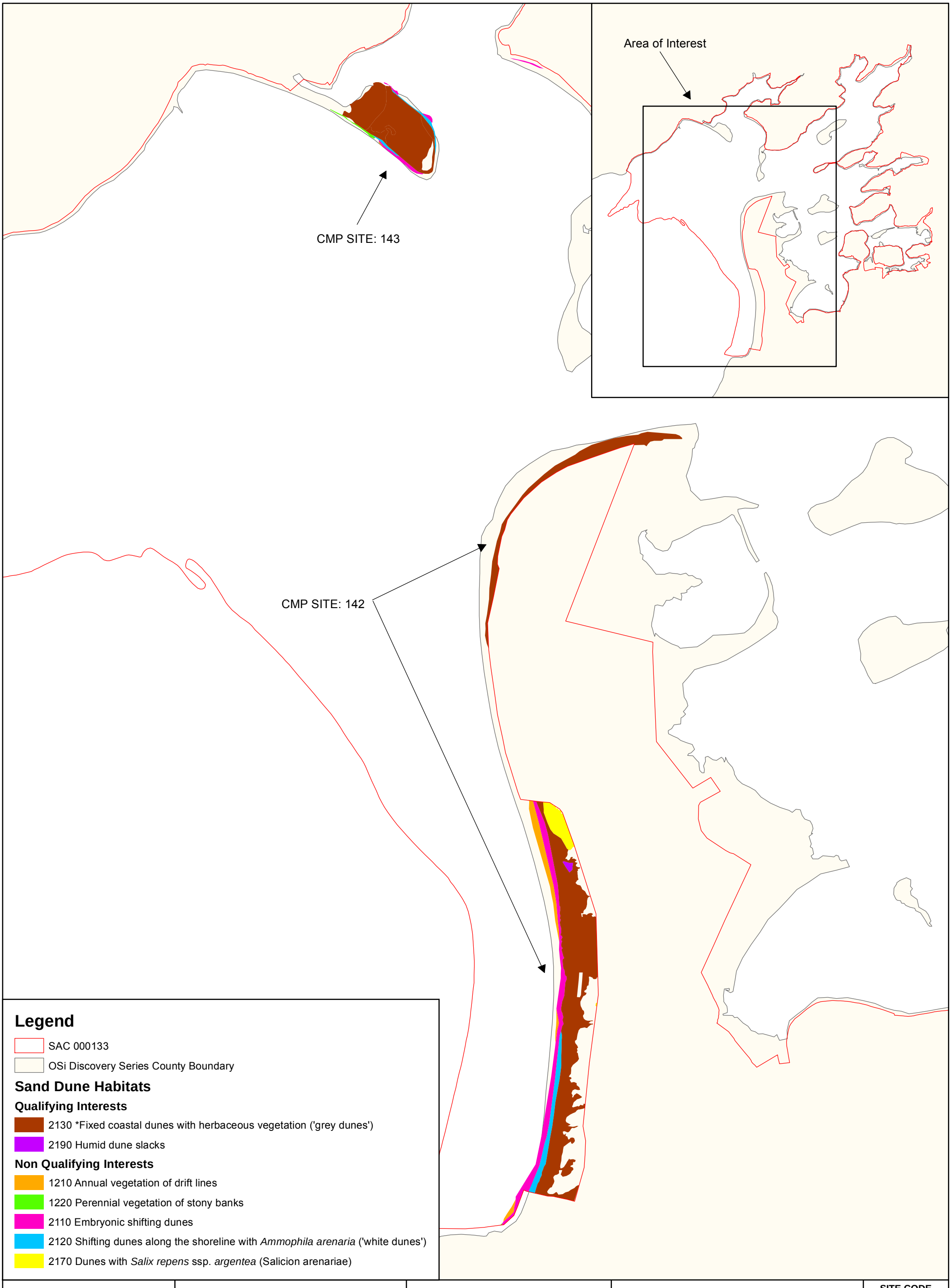
0 0.5 1 km

N

SITE CODE

SAC 000133
Version 1

Map Version 1
Date: Dec 2011



An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 5:
DONEGAL BAY (MURVAGH) SAC
CONSERVATION OBJECTIVES
SAND DUNE HABITATS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

COUNTY DONEGAL

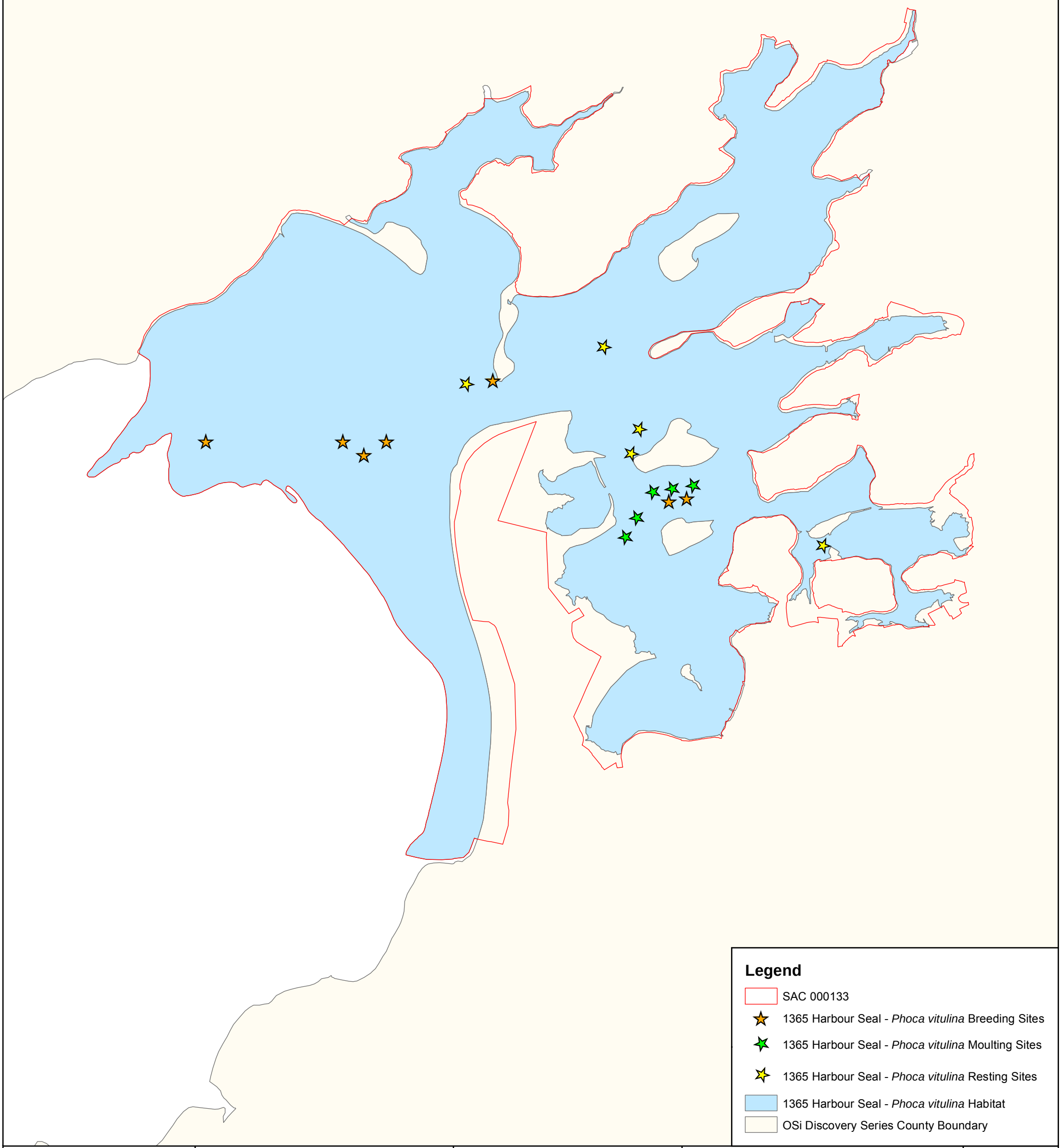
0 0.25 0.5 km

N

SITE CODE

SAC 000133
Version 1

Map Version 1
Date: Dec 2011



An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 6: DONEGAL BAY (MURVAGH) SAC CONSERVATION OBJECTIVES HARBOUR SEAL

Map to be read in conjunction with the NPWS Conservation Objectives Document.

COUNTY DONEGAL

0 0.5 1 km

N

SITE CODE

SAC 000133
Version 1

Map Version 1
Date: Dec 2011

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Donegal Bay SPA 004151

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht

National Parks and Wildlife Service,
Department of Arts, Heritage and the Gaeltacht,

7 Ely Place, Dublin 2, Ireland.

Web: www.npws.ie
E-mail: nature.conservation@ahg.gov.ie

Citation:
NPWS (2012) Conservation Objectives: Donegal Bay SPA 004151. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

Series Editors: Rebecca Jeffrey & Naomi Kingston
ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

004151 Donegal Bay SPA

A003	Great Northern Diver *Gavia immer*	wintering
A046	Light-bellied Brent Goose *Branta bernicla hrota*	wintering
A065	Common Scoter *Melanitta nigra*	wintering
A144	Sanderling *Calidris alba*	wintering
A999	Wetlands	

Please note that this SPA overlaps with Donegal Bay (Murvagh) SAC (000133), Durnesh Lough SAC (000138) and Lough Melvin SAC (000428) and is adjacent to Lough Eske and Ardnamona Wood SAC (000163). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping and adjacent sites as appropriate.

Supporting documents, relevant reports & publications (listed by date)

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

Title:	Donegal Bay SPA (004151). Conservation objectives supporting document [Version 1]
Year:	2012
Author:	NPWS
Series:	Unpublished Report to NPWS

A003 Great Northern Diver *Gavia immer*

To maintain the favourable conservation condition of Great Northern Diver in Donegal Bay SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by Great Northern Diver, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A046 Light-bellied Brent Goose *Branta bernicla hrota*

To maintain the favourable conservation condition of Light-bellied Brent Goose in Donegal Bay SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by Light-bellied Brent Goose, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A065 Common Scoter *Melanitta nigra*

To maintain the favourable conservation condition of Common Scoter in Donegal Bay SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by Common Scoter, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A144 Sanderling *Calidris alba*

To maintain the favourable conservation condition of Sanderling in Donegal Bay SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by Sanderling, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A999 Wetlands

To maintain the favourable conservation condition of the wetland habitat in Donegal Bay SPA as a resource for the regularly-occurring migratory waterbirds that utilise it. This is defined by the following attribute and target:

Attribute	Measure	Target	Notes
Wetland habitat area	Hectares	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 10,461ha, other than that occurring from natural patterns of variation	The wetland habitat area was estimated as 10,461ha using OSi data and relevant orthophotographs. For further information see part three of the conservation objectives supporting document

INVER BAY

Bá Inbhir

DONEGAL BAY

Bá Dhún na nGall

Mountcharles
Mór Searlas

Ballyboyle Island

Rooney's Island

Ballintra
Baile an tSratha

Bundoran

Donegal

Ballyshannon

Letterkenny

Buncrana

Lifford

CO. DONEGAL

SPA 004151

Legend

SPA 004151

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 1:
DONEGAL BAY SPA
CONSERVATION OBJECTIVES
SPA DESIGNATION

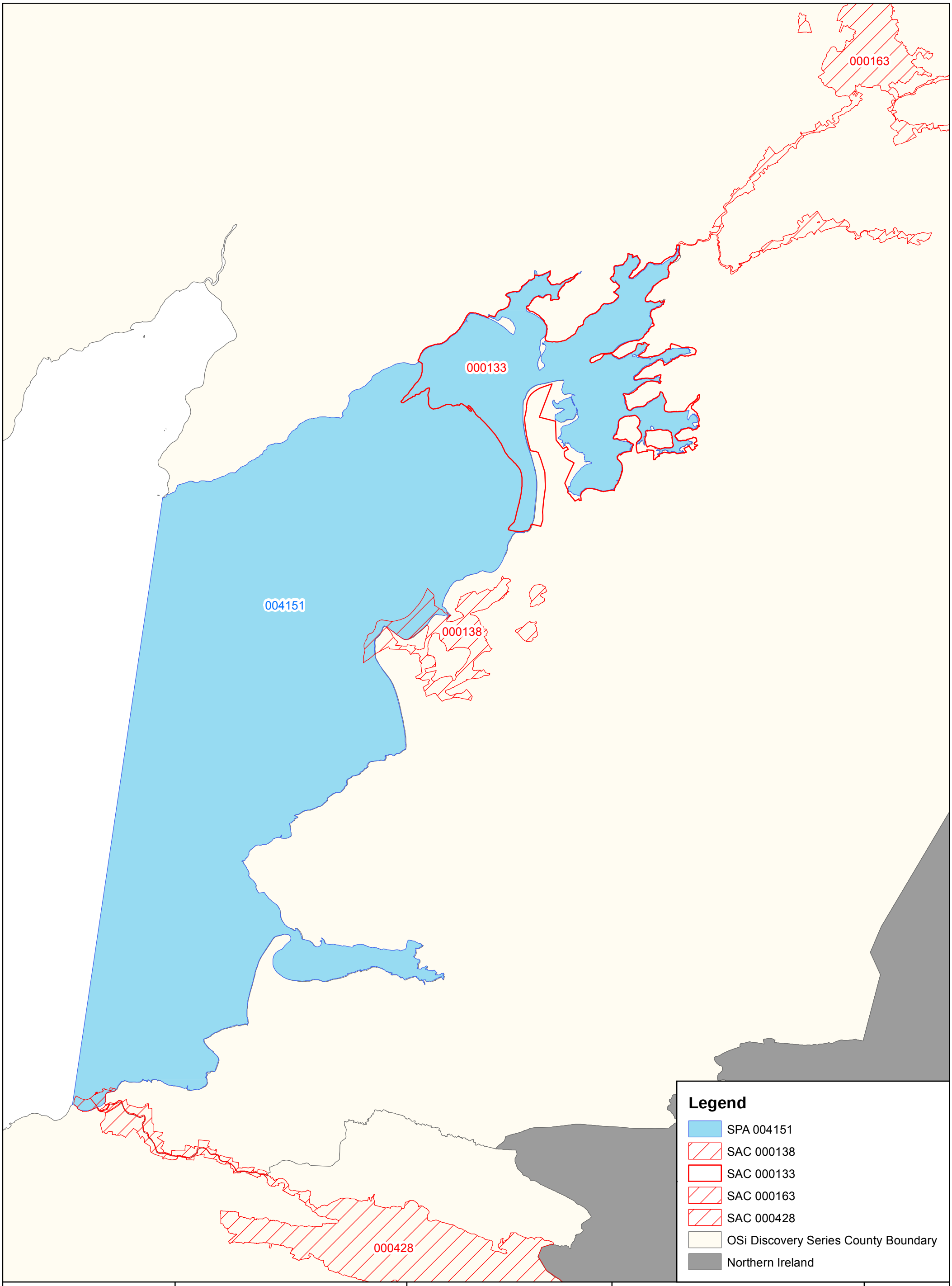
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SPA 004151 Version 2.01

0 1 2 3 km

N

Map Version 1
Date: Dec 2011



An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 2: DONEGAL BAY SPA CONSERVATION OBJECTIVES ADJOINING / OVERLAPPING DESIGNATIONS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SPA 004151 Version 2.01
SAC 000133 Version 1, SAC 000138 Version 1.02,
SAC 000163 Version 1.02, SAC 000428 Version 1.01

0 1.5 3 km

N

Map Version 1
Date: Dec 2011

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Dunmuckrum Turloughs SAC 002303

An Roinn Tithíochta,
Rialtais Áitiúil agus Oidhreachta
Department of Housing,
Local Government and Heritage

National Parks and Wildlife Service,
Department of Housing, Local Government and Heritage,

90 King Street North, Dublin 7, D07 N7CV, Ireland.

Web: www.npws.ie
E-mail: nature.conservation@chg.gov.ie

Citation:

NPWS (2021) Conservation Objectives: Dunmuckrum Turloughs SAC 002303. Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.

Series Editor: Rebecca Jeffrey
ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

002303	Dunmuckrum Turloughs SAC

3180	Turloughs*

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	2017
Title :	Conservation objectives supporting document: Turloughs* and Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation
Author :	O Connor, Á.
Series :	Conservation objectives supporting document

Other References

Year :	2005
Title :	Guidance on the Pressures and Impacts on Groundwater Dependent Terrestrial Ecosystems. Risk Assessment Sheet GWDTERA2a - Turloughs
Author :	Working Group on Groundwater (Turlough sub-committee)
Series :	Water Framework Directive Pressures and Impact Assessment Methodology - Guidance Document No. GW9
Year :	2009
Title :	Teagasc EPA soil and subsoils mapping project-final report. Volume II
Author :	Fealy, R. M.; Green, S.; Loftus, M.; Meehan, R.; Radford, T.; Cronin, C.; Bulfin, M.
Series :	Teagasc, Dublin
Year :	2014
Title :	Interim classification, harmonisation and generalisation of county soil maps of Ireland. Irish soil information system final technical report 1
Author :	Jones, R.J.A.; Hannam, J.A.; Palmer, R.C.; Truckell, I.G.; Creamer, R.E.; McDonald, E.
Series :	Report for the EPA prepared by Teagasc and Cranfield University
Year :	2017
Title :	The draft seven strategic towns local area plan 2018-2024 Natura Impact Statement
Author :	Donegal County Council
Series :	Unpublished report

Spatial data sources

Year :	2020
Title :	Internal NPWS data
GIS Operations :	Paper map scanned and georectified. Turlough as outlined on map digitised and clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	3180 (map 2)

Conservation Objectives for : Dunmuckrum Turloughs SAC [002303]

3180 Turloughs*

To maintain the favourable conservation condition of Dunmuckrum Turloughs SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	The turloughs in this SAC are the most northerly known in the country. The turlough area in the SAC has been calculated as 6.1ha, based on internal NPWS files. See map 2 for known extent. See O Connor (2017) for information on all attributes and targets
Habitat distribution	Occurrence	No decline, subject to natural processes	There are at least four small turloughs within the SAC. See map 2
Hydrological regime	Various	Maintain appropriate natural hydrological regime necessary to support the natural structure and functioning of the habitat	Hydrological regime is sub-divided into more detailed attributes (groundwater contribution, flood duration, frequency, area and depth, and permanently flooded/wet areas) and targets in O Connor (2017). NPWS internal files describe Dunmuckrum Turloughs as a series of four low-lying winter-flooded depressions set in an undulating landscape of limestone hills. Donegal County Council (2017) states that the area around Dunmuckrum Turloughs is an area of extreme groundwater vulnerability, in terms of both quality and quantity
Soil type	Hectares	Maintain variety, area and extent of soil types necessary to support turlough vegetation and other biota	The Teagasc/EPA soils map by Fealy et al. (2009) classified the soils in the most flooded part of the turloughs as acidic mineral soil over metamorphic tills, mostly deep and well-drained but with some areas poorly drained, whereas areas outside the main flood zone were predominantly shallow, well-drained, basic mineral soil over calcareous rock. Jones et al. (2014) classified the soils in the locality of the turloughs as poorly drained, coarse loamy drift with igneous and metamorphic stones
Soil nutrient status: nitrogen and phosphorus	N and P concentration in soil	Maintain nutrient status appropriate to soil types and vegetation communities	
Physical structure: bare ground	Presence	Maintain sufficient wet bare ground, as appropriate	NPWS internal files note an exposed mud community behind areas of wet vegetation at the lowest part of the basin, where *Rorippa palustris* and *Gnaphalium uliginosum* had established
Chemical processes: calcium carbonate deposition and concentration	Calcium carbonate deposition rate/soil concentration	Maintain appropriate calcium carbonate deposition rate and concentration in soil	
Active peat formation	Flood duration	Maintain active peat formation	
Water quality	Various	Maintain appropriate water quality to support the natural structure and functioning of the habitat	Water quality is sub-divided into more detailed attributes (nutrients, colour, phytoplankton and epiphyton biomass) and targets in O Connor (2017). See also The European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2019. According to the Working Group on Groundwater (Turlough sub-committee) (2005), the Dunmuckrum turloughs are currently oligotrophic, which is their natural trophic status. To remain in favourable condition they must meet targets of ≤20µg/l total phosphorus and should maintain trace/absent epiphyton as algal mats (<2% cover)

Vegetation composition: area of vegetation communities	Hectares	Maintain area of sensitive and high conservation value vegetation communities/units	NPWS internal files note the presence of a number of vegetation communities in the main (most westerly) basin: a scraw community at the lowest level, dominated by *Carex rostrata, Menyanthes trifoliata* and *Eleocharis palustris*; a wet, sedge-dominated community, with *Carex nigra, C. disticha* and a wide range of wetland herbs; an exposed mud community behind these wet areas, with *Rorippa palustris* and *Gnaphalium uliginosum*. At the upper levels of flooding the vegetation grades into limestone grassland, and *Crataegus monogyna-Prunus spinosa* scrub woodland. The small turlough basin further east supports permanent marsh, mostly dominated by sedges (*Carex nigra* and *C. rostrata*) and *Filipendula ulmaria*, surrounded by grazed grassland with *Agrostis stolonifera, Juncus articulatus* and *Leontodon autumnalis*
Vegetation composition: vegetation zonation	Distribution	Maintain vegetation zonation/mosaic characteristic of the turlough	NPWS internal files describe the zonation in the most westerly turlough: a permanently wet area at the lowest part of the basin with stoneworts (*Chara* sp.) and other aquatic species is surrounded by marsh, which then grades into a wet, sedge-dominated sward. A different community occupies the exposed muds behind these wet areas, with *Rorippa palustris* and *Gnaphalium uliginosum* present. At the upper levels the vegetation graded into limestone grassland and scrub woodland. The smaller turlough basin further east has a permanent marsh at the base, surrounded by shorter grazed grassland
Vegetation structure: sward height	Centimetres	Maintain sward heights appropriate to the vegetation unit, and a variety of sward heights across the turlough	NPWS internal files note grazing in the turlough grasslands
Typical species	Presence	Maintain typical species within the turlough	Typical species is sub-divided into more detailed attributes (terrestrial, wetland and aquatic plants, invertebrates and birds) and targets in O Connor (2017). The turlough was surveyed during a Botanical Society of Britain and Ireland (BSBI) field trip in August 2016 and species characteristic of very wet habitats, such as *Comarum palustre* and *Hydrocotyle vulgare*, and dry calcareous habitats, such as *Briza media* and *Galium verum*, were recorded (Oisin Duffy, pers. comm.). Internal NPWS files note *Ophioglossum vulgatum, Parnassia palustris* and an abundance of the moss *Cinclidotus fontinaloides* on all the inundated rocky surfaces
Fringing habitats: area	Hectares	Maintain marginal fringing habitats that support turlough vegetation, invertebrate, mammal and/or bird populations	
Vegetation structure: turlough woodland	Species diversity and woodland structure	Maintain appropriate turlough woodland diversity and structure	Scrub is present at the upper edges of the turlough basins. This is visible on recent aerial imagery of the site. NPWS internal files note that *Crataegus monogyna* and *Prunus spinosa* are present

West Port

CARRICKBOY

N15

Ballure

CO. DONEGAL

Ballyshannon

Dunmuckrum Turloughs SAC

Belleek

Bundoran

Tullaghan

CO. ANTRIM

Kinlough

CO. LEITRIM

Legend

Dunmuckrum Turloughs SAC 002303

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 1:
DUNMUCKRUM TURLOUGH SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

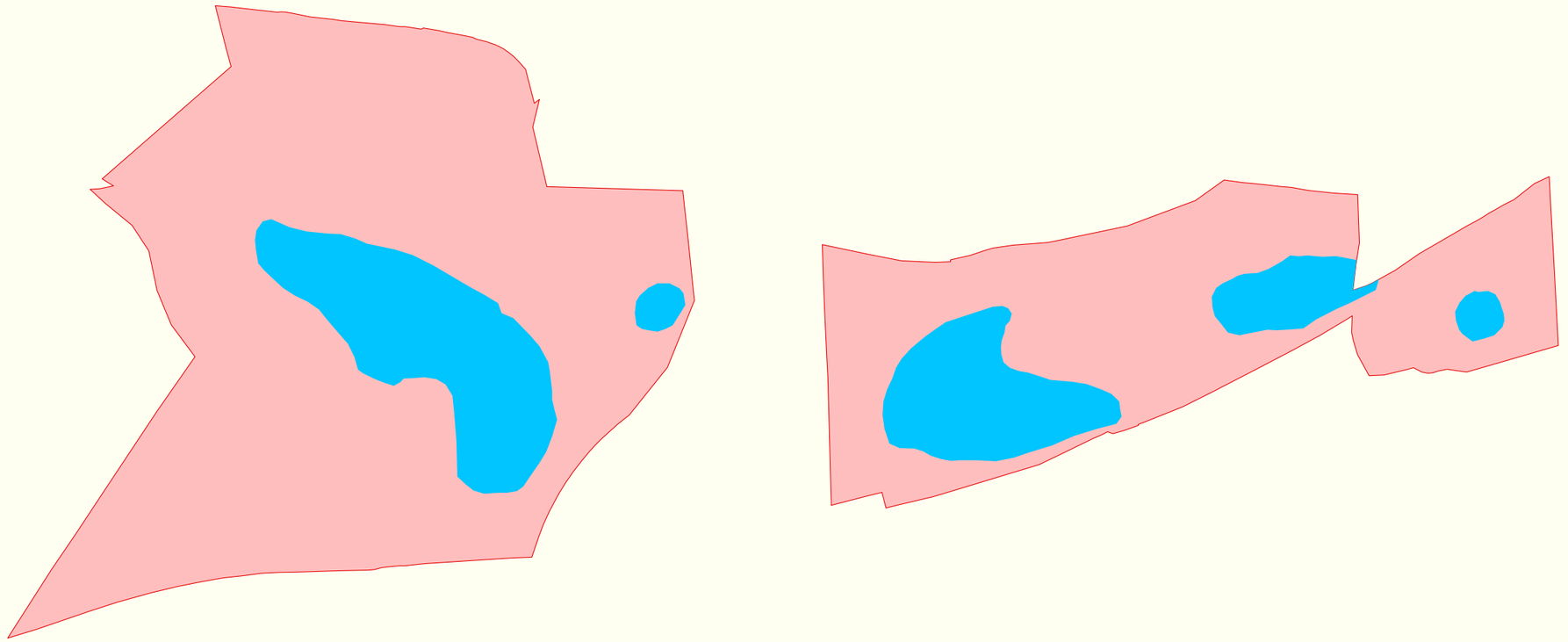
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002303; version 3. CO. DONEGAL

0 50 100 150 200 Metres

N

Map Version 1
Date: November 2020



Legend

- 3180 Turloughs*
- Dunmuckrum Turloughs SAC 002303

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 2
DUNMUCKRUM TURLOUGHS SAC
CONSERVATION OBJECTIVES
TURLOUGHS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002303; version 3. CO. DONEGAL

0 50 100 150 200 Metres

N

Map Version 1
Date: November 2020

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Dunragh Loughs/Pettigo Plateau SAC 001125

An Roinn Ealaíon, Oidhreachta,
Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta

Department of Arts, Heritage,
Regional, Rural and Gaeltacht Affairs

National Parks and Wildlife Service,
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs,

7 Ely Place, Dublin 2, Ireland.

Web: www.npws.ie
E-mail: nature.conservation@ahg.gov.ie

Citation:

NPWS (2017) Conservation Objectives: Dunragh Loughs/Pettigo Plateau SAC 001125. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

Series Editor: Rebecca Jeffrey
ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

001125	Dunragh Loughs/Pettigo Plateau SAC
4010	Northern Atlantic wet heaths with *Erica tetralix*
7130	Blanket bogs (* if active bog)

Please note that this SAC overlaps with Pettigo Plateau Nature Reserve SPA (004099) and is adjacent to River Finn SAC (002301) and Lough Derg (Donegal) SPA (004057). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping and adjacent sites as appropriate.

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	1990
Title :	A survey to locate lowland blanket bogs of scientific interest in county Donegal and upland blanket bogs in counties Cavan, Leitrim and Roscommon
Author :	Douglas, C.; Dunnells, D.; Scally, L.; Wyse Jackson, M.
Series :	Unpublished report to NPWS
Year :	2005
Title :	Conservation Plan for 2005-2010. Dunragh Loughs/Pettigo Plateau cSAC, SPA and NR Site Code 001125 and 004099 Co. Donegal
Author :	NPWS
Series :	Conservation Plan
Year :	2012
Title :	Ireland Red List No. 8: Bryophytes
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	Ireland Red List series, NPWS
Year :	2014
Title :	Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland, Version 2.0
Author :	Perrin, P.M.; Barron, S.J.; Roche, J.R.; O'Hanrahan, B.
Series :	Irish Wildlife Manual No. 79
Year :	2016
Title :	Ireland Red List No. 10: Vascular Plants
Author :	Wyse Jackson, M.; FitzPatrick, Ú.; Cole, E.; Jebb, M.; McFerran, D.; Sheehy Skeffington, M.; Wright, M.
Series :	Ireland Red Lists series, NPWS
Year :	2017
Title :	Dunragh Loughs/Pettigo Plateau SAC (site code: 1125) Conservation objectives supporting document- blanket bog and associated habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document

4010 Northern Atlantic wet heaths with Erica tetralix

To restore the favourable conservation condition of Northern Atlantic wet heaths with *Erica tetralix* in Dunragh Loughs/Pettigo Plateau SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Northern Atlantic wet heaths with *Erica tetralix* has not been mapped in detail for Dunragh Loughs/Pettigo Plateau SAC but from current available data the total area of the qualifying habitat is estimated to be approximately 401ha, covering 20% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Dunragh Loughs/Pettigo Plateau SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	Wet heath is documented to occur on hillsides throughout the SAC. It occurs in close association with blanket bog, wet grassland and flushes (NPWS, 2005). Further information can be found within NPWS (2005) and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	Douglas et al. (1990) recorded wet heath vegetation communities in this SAC, one of which corresponds to a community recorded in the National Survey of Upland Habitats and listed in the provisional list of vegetation communities described in Perrin et al. (2014). Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: cross-leaved heath	Occurrence within 20m of a representative number of monitoring stops	Cross-leaved heath (*Erica tetralix*) present within a 20m radius of each monitoring stop	Attribute and target based on Perrin et al. (2014)
Vegetation composition: positive indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of positive indicator species at least 50%	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: lichens and bryophytes	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of *Cladonia* and *Sphagnum* species, *Racomitrium lanuginosum* and pleurocarpous mosses at least 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: ericoid species and crowberry	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of ericoid species and crowberry (*Empetrum nigrum*) at least 15%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: dwarf shrub species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of dwarf shrubs less than 75%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). Rhododendron (*Rhododendron ponticum*) and the moss *Campylopus introflexus* have been recorded from the SAC (Douglas et al., 1990; NPWS internal files) but these non-native species cannot be attributed specifically to wet heath

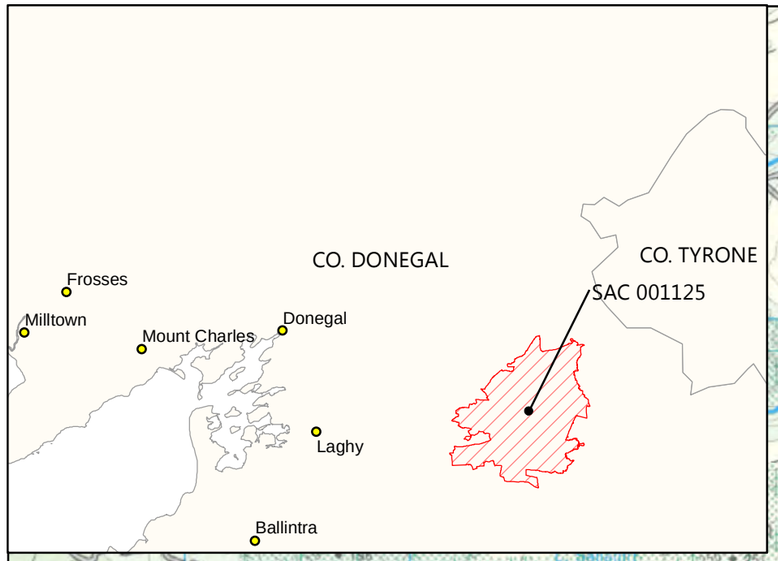
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 20%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: bracken	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of bracken (*Pteridium aquilinum*) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: soft rush	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of soft rush (*Juncus effusus*) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: *Sphagnum* condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up	Attribute and target based on Perrin et al. (2014)
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Less than 33% collectively of the last complete growing season's shoots of ericoids, crowberry (*Empetrum nigrum*) and bog-myrtle (*Myrica gale*) showing signs of browsing	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas for this habitat is also presented
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: drainage	Percentage area in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016)

7130 Blanket bogs (* if active bog)

To restore the favourable conservation condition of Blanket bogs (* if active bog) in Dunragh Loughs/Pettigo Plateau SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Blanket bog has not been mapped in detail for Dunragh Loughs/Pettigo Plateau SAC but from current available data the total area of the qualifying habitat is estimated to be approximately 540ha, covering 27% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Dunragh Loughs/Pettigo Plateau SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	Blanket bog is documented to occur throughout the SAC. It is particularly well-developed on the gentle undulating terrain that is present on the plateau in the southern section of the SAC. Further information can be found within Douglas et al. (1990), NPWS (2005), NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Ecosystem function: peat formation	Active blanket bog as a proportion of the total area of Annex I blanket bog habitat	At least 99% of the total Annex I blanket bog area is active	See the blanket bogs and associated habitats supporting document for further details
Ecosystem function: hydrology	Flow direction, water levels, occurrence of drains and erosion gullies	Natural hydrology unaffected by drains and erosion	Further details and a brief discussion of restoration potential is presented in the blanket bogs and associated habitats supporting document
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	A variety of blanket bog vegetation communities have been recorded in this SAC (Douglas et al., 1990; NPWS internal files), two of which correspond to communities recorded in the National Survey of Upland Habitats and listed in the provisional list of vegetation communities described in Perrin et al. (2014). Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: positive indicator species	Number of species at a representative number of 2m x 2m monitoring stops	Number of positive indicator species present at each monitoring stop is at least seven	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: lichens and bryophytes	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of bryophytes or lichens, excluding *Sphagnum fallax*, at least 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: potential dominant species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of each of the potential dominant species less than 75%	Attribute and target based on Perrin et al. (2014). See the blanket bogs and associated habitats supporting document for the list of potential dominant species
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). Rhododendron (*Rhododendron ponticum*) was recorded from blanket bog within the SAC (NPWS internal files). The non-native moss *Campylopus introflexus* has been recorded from the SAC (Douglas et al., 1990) but it cannot be attributed specifically to blanket bog

Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: *Sphagnum* condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up	Attribute and target based on Perrin et al. (2014)
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Last complete growing season's shoots of ericoids, crowberry (*Empetrum nigrum*) and bog-myrtle (*Myrica gale*) showing signs of browsing collectively less than 33%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas for this habitat is also presented
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: drainage	Percentage area in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: erosion	Percentage area in local vicinity of a representative number of monitoring stops	Less than 5% of the greater bog mosaic comprises erosion gullies and eroded areas	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016)



Legend

Dunragh Loughs/Pettigo Plateau SAC 001125

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 1:
DUNRAGH LOUGHS / PETTIGO PLATEAU SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 001125; version 3.
CO. DONEGAL

0 0.45 0.9 1.35 1.8 km

N

Map Version 1
Date: March 2017

SAC 002301

SAC 002301

SAC 001125

SPA 004099

SAC 002301

SPA 004057

Legend

- Dunragh Loughs/Pettigo Plateau SAC 001125
- River Finn SAC 002301
- Lough Derg (Donegal) SPA 004057
- Pettigo Plateau Nature Reserve SPA 004099
- OSi Discovery Series County Boundary

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 2:
DUNRAGH LOUGHS / PETTIGO PLATEAU SAC
CONSERVATION OBJECTIVES
ADJACENT AND OVERLAPPING DESIGNATIONS
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 001125; version 3. SAC 002301 version 3.01
SPA 004057; version 3 CO. DONEGAL

0 3 6 9 12 km

N

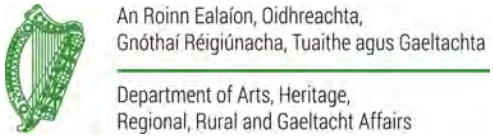
Map Version 1
Date: March 2017

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Durnesh Lough SAC 000138



National Parks and Wildlife Service,
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs,

7 Ely Place, Dublin 2, Ireland.

Web: www.npws.ie
E-mail: nature.conservation@ahg.gov.ie

Citation:

NPWS (2016) Conservation Objectives: Durnesh Lough SAC 000138. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

Series Editor: Rebecca Jeffrey
ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

000138	Durnesh Lough SAC
1150	Coastal lagoons*
6410	*Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)

Please note that this SAC overlaps Durnesh Lough SPA (004145) and Donegal Bay SPA (004151). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping sites as appropriate.

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	2007
Title :	Inventory of Irish coastal lagoons (version 2)
Author :	Oliver, G.
Series :	Unpublished report to NPWS
Year :	2013
Title :	Irish semi-natural grasslands survey 2007-2012
Author :	O'Neill, F.H.; Martin, J.R.; Devaney, F.M.; Perrin, P.M.
Series :	Irish Wildlife Manual No. 78
Year :	2016
Title :	Durnesh Lough SAC (site code: 138) Conservation objectives supporting document- coastal lagoons V1
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	2013
Title :	Monitoring and assessment of Irish lagoons for the purposes of the EU Water Framework Directive, 2009-2011. Parts 1 and 2
Author :	Roden, C.M; Oliver, G.A.
Series :	Unpublished report to the Environmental Protection Agency

Spatial data sources

Year :	Revision 2011
Title :	Inventory of Irish Coastal Lagoons. Version 3
GIS Operations :	Clipped to SAC boundary
Used For :	1150 (map 3)
Year :	2013
Title :	Irish Semi-Natural Grassland Survey
GIS Operations :	Dataset clipped to the SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	6410 (map 4)

1150 Coastal lagoons

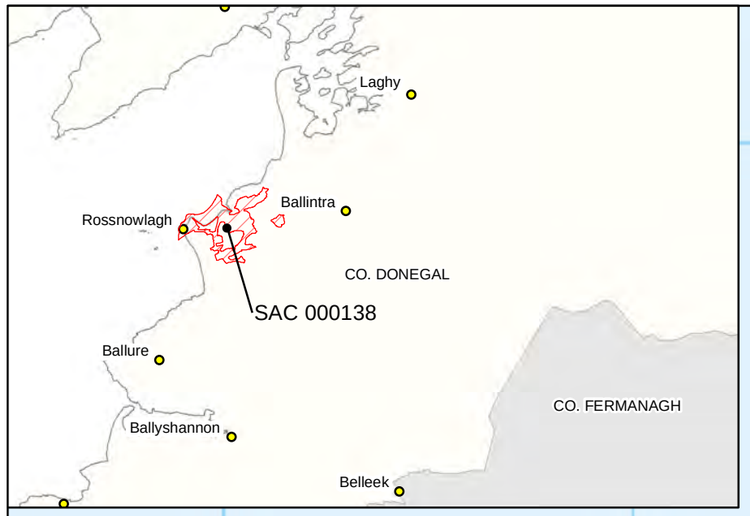
To restore the favourable conservation condition of Coastal lagoons in Durnesh Lough SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable, subject to slight natural variation. Favourable reference area 73.8ha. See map 3	Area calculated from spatial data derived from Oliver (2007). Site code IL079 (Durnesh Lough). See lagoons supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 3	Site IL079 in Oliver (2007). See lagoons supporting document for further details
Salinity regime	Practical salinity units (psu)	Median annual salinity and temporal variation within natural ranges	Durnesh Lough is recorded as an oligohaline lagoon. See lagoons supporting document for further details
Hydrological regime	Metres	Annual water level fluctuations and minima within natural ranges	Maximum depth of Durnesh Lough is recorded as less than 2m. See lagoons supporting document for further details
Barrier: connectivity between lagoon and sea	Permeability	Appropriate hydrological connections between lagoon and sea, including where necessary, appropriate management	Drongawn Lough is a natural sedimentary lagoon with a sand dune barrier and artificial outlet. See lagoons supporting document for further details
Water quality: Chlorophyll *a*	µg/L	Annual median chlorophyll *a* within natural range and less than 5µg/L	Target based on Roden and Oliver (2013). See lagoons supporting document for further details
Water quality: Molybdate Reactive Phosphorus (MRP)	mg/L	Annual median MRP within natural ranges 0.1mg/L	Target based on Roden and Oliver (2013). See lagoons supporting document for further details
Water quality: Dissolved Inorganic Nitrogen (DIN)	mg/L	Annual median DIN within natural ranges and less than 0.15mg/L.	Target based on Roden and Oliver (2013). See lagoons supporting document for further details
Depth of macrophyte colonisation	Metres	Macrophyte colonisation to full depth of lagoon	As the lagoon is less than 2m deep, it is expected that macrophyte colonisation would extend to its full depth. See lagoons supporting document for further details
Typical plant species	Number and m^2	Maintain number and extent of listed lagoonal specialists, subject to natural variation	Species listed in Oliver (2007). See lagoons supporting document for further details
Typical animal species	Number	Maintain listed lagoon specialists, subject to natural variation	Species listed in Oliver (2007). See lagoons supporting document for further details
Negative indicator species	Number and percentage cover	Negative indicator species absent or under control	Low salinity, shallow water and elevated nutrient levels increase the threat of unnatural encroachment by reedbeds. See lagoons supporting document for further details

6410 Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)

To restore the favourable conservation condition of *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) in Durnesh Lough SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	*Molinia* meadows occurs in close association with other grassland habitats as well as wetland habitats including swamp and fen. The Irish semi-natural grasslands survey (ISGS) (O'Neill et al., 2013) recorded 1.02ha of this Annex I habitat at site 1249 (see map 3). Other semi-natural grassland types occur in the SAC and there may be more, as yet unmapped, areas of the Annex I habitat type present
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 3 for mapped area	See note for area above
Vegetation composition: typical species	Number at a representative number of monitoring stops	At least seven positive indicator species present, including one "high quality" species as listed in O'Neill et al. (2013)	List of positive indicator species, including high quality species, identified by O'Neill et al. (2013). Note that purple moor-grass (*Molinia caerulea*) is a positive indicator species, but not necessarily an essential component of the habitat
Vegetation composition: negative indicator species	Percentage at a representative number of monitoring stops	Negative indicator species collectively not more than 20% cover, with cover by an individual species less than 10%	Attribute and target based on O'Neill et al. (2013)
Vegetation composition: non-native species	Percentage at a representative number of monitoring stops	Cover of non-native species not more than 1%	Attribute and target based on O'Neill et al. (2013)
Vegetation composition: moss species	Percentage at a representative number of monitoring stops	Hair mosses (*Polytrichum* spp.) not more than 25% cover	Attribute and target based on O'Neill et al. (2013)
Vegetation structure: woody species and bracken	Percentage at a representative number of monitoring stops	Cover of woody species and bracken (*Pteridium aquilinum*) not more than 5% cover	Attribute and target based on O'Neill et al. (2010)
Vegetation structure: broadleaf herb: grass ratio	Percentage at a representative number of monitoring stops	Broadleaf herb component of vegetation between 40 and 90%	Attribute and target based on O'Neill et al. (2013)
Vegetation structure: sward height	Percentage at a representative number of monitoring stops	At least 30% of sward between 10 and 80cm tall	Attribute and target based on O'Neill et al. (2013)
Physical structure: bare soil	Percentage at a representative number of monitoring stops	Not more than 10% bare soil	Attribute and target based on O'Neill et al. (2013)



Bunlin Bar
Barrow
Mound
Church
Drumlongfield
Inishfad
Drumhome
Drumoske
Dromoske
Abhainn Bh
Inishinny
Durnesh Lake
Drumhome Lough
Birra Hill
Dromore Hill
Birra L.
Dromore
Birra
Drum
Foyagh Hill
Foyagh
Dismantled Railway
R231
Rossnowlagh Lower
Durnesh Hill
Durnesh
Carrigfad
South Rock
Rathfragan
Crockahanny
Megalithic Tomb
Killinangel
Glasb Hill
Belall S
© Ordnance Survey Ireland

Legend

Durnesh Lough SAC 000138

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 1:
DURNESH LOUGH SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

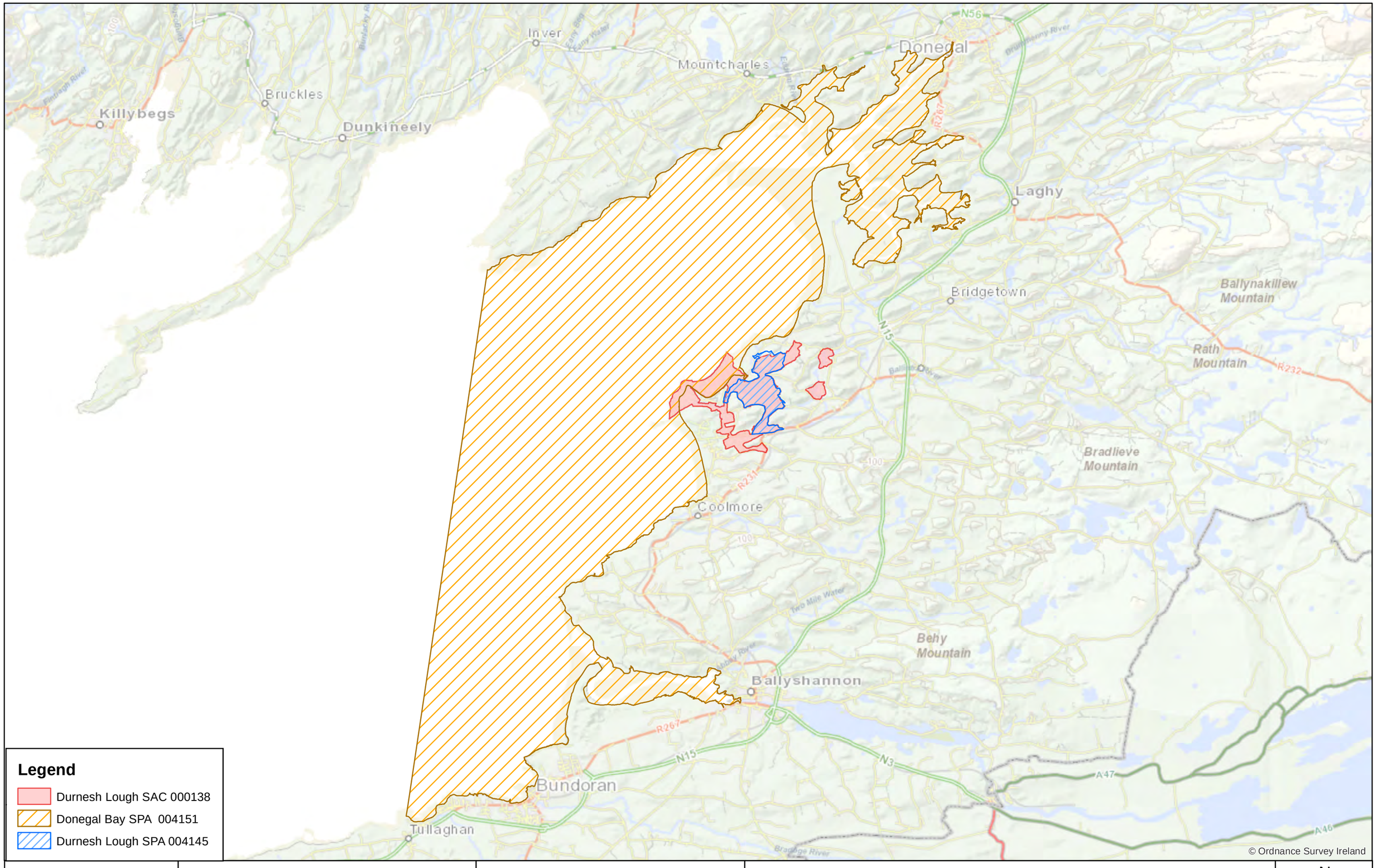
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000138; version 3.
CO. DONEGAL

0 0.15 0.3 0.45 0.6 0.75 km

N

Map Version 1
Date: Aug 2016



An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 2:
DURNESH LOUGH SAC
CONSERVATION OBJECTIVES
ADJACENT / ADJOINING AND
OVERLAPPING DESIGNATIONS
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000138; version 3. SPA 004145; version 3.
SAC 004151; version 3. CO. DONEGAL

0 1 2 3 4 5 km

N

Map Version 1
Date: Aug 2016

ICLS Site Number: IL079

Legend

- Durnesh Lough SAC 000138
- 1150 Coastal Lagoons
- OSi Discovery Series County Boundary

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 3:
DURNESH LOUGH SAC
CONSERVATION OBJECTIVES
COASTAL LAGOON HABITAT

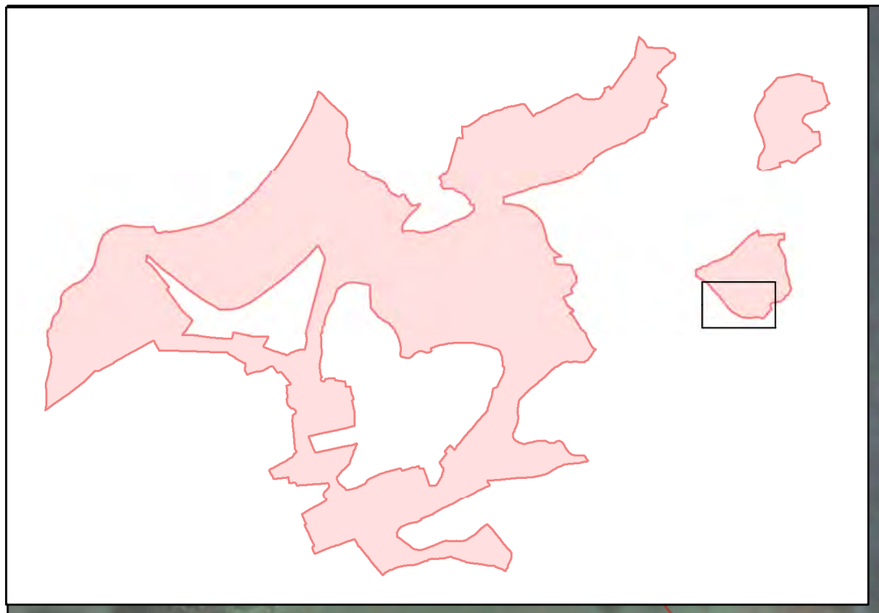
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000138; version 3.
CO. DONEGAL

0 0.15 0.3 0.45 0.6 0.75 km

N

Map Version 1
Date: Aug 2016



ISGS Site ID:1249

Legend

Durnesh Lough SAC 000138

Annex I Grassland Habitats

6410 6410 Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 4:
DURNESH LOUGH SAC
CONSERVATION OBJECTIVES
GRASSLAND HABITAT

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000138; version 3.
CO. DONEGAL

0 0.01 0.02 0.03 0.04 0.05 km

N

Map Version 1
Date: Aug 2016

Conservation objectives for Durnesh Lough SPA [004145]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Objective: To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:

Bird Code	Common Name	Scientific Name
A038	Whooper Swan	*Cygnus cygnus*
A395	Greenland White-fronted Goose	*Anser albifrons flavirostris*

Citation: *NPWS (2022) Conservation objectives for Durnesh Lough SPA [004145]. First Order Site-specific Conservation Objectives Version 1.0. Department of Housing, Local Government and Heritage.*

This First Order Site-specific Conservation Objectives Version 1.0 document replaces the Generic Conservation Objectives Version 9.0 document.

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Glenade Lough SAC 001919

An Roinn Tithíochta,
Rialtais Áitiúil agus Oidhreachta
Department of Housing,
Local Government and Heritage

National Parks and Wildlife Service,
Department of Housing, Local Government and Heritage,

90 King Street North, Dublin 7, D07 N7CV, Ireland.

Web: www.npws.ie
E-mail: natureconservation@housing.gov.ie

Citation:

NPWS (2021) Conservation Objectives: Glenade Lough SAC 001919. Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.

Series Editors: Rebecca Jeffrey and Christina Campbell
ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

001919	Glenade Lough SAC
1092	White-clawed Crayfish *Austropotamobius pallipes*
1833	Slender Naiad *Najas flexilis*
3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation

Please note that this SAC is adjacent to Ben Bulben, Gleniff and Glenade Complex SAC (000623), Lough Gill SAC (001976) and Sligo/Leitrim Uplands SPA (004187). See map 2. The conservation objectives for this site should be used in conjunction with those for the adjacent sites as appropriate.

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	1984
Title :	The vegetation of Irish lakes
Author :	Heuff, H.
Series :	Unpublished report to NPWS
Year :	2002
Title :	*Najas flexilis* in Donegal
Author :	Roden, C.M.
Series :	Unpublished report to NPWS
Year :	2004
Title :	The distribution of *Najas flexilis* in Ireland 2002-2004
Author :	Roden, C.M.
Series :	Unpublished report to NPWS
Year :	2007
Title :	Supporting documentation for the Habitats Directive Conservation Status Assessment - backing documents. Article 17 forms and supporting maps
Author :	NPWS
Series :	Unpublished report to NPWS
Year :	2009
Title :	Monitoring of white-clawed crayfish *Austropotamobius pallipes* in Irish lakes in 2007
Author :	O'Connor, W.; Hayes, G.; O'Keeffe, C.; Lynn, D.
Series :	Irish Wildlife Manuals, No. 37
Year :	2010
Title :	A technical manual for monitoring white-clawed crayfish (*Austropotamobius pallipes*) in Irish lakes
Author :	Reynolds, J.; O'Connor, W.; O'Keeffe, C.; Lynn, D.
Series :	Irish Wildlife Manuals, No.45
Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 2. Habitats assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2013
Title :	Article 17 assessment form and audit trail for *Najas flexilis*, the slender naiad (species code 1833). Backing document. April 2013
Author :	O Connor, Á.
Series :	Unpublished report by NPWS
Year :	2014
Title :	Targeted survey of *Najas flexilis*
Author :	Roden, C.; Murphy, P.
Series :	Unpublished report to NPWS
Year :	2015
Title :	Habitats Directive Annex I lake habitats: a working interpretation for the purposes of site-specific conservation objectives and Article 17 reporting
Author :	O Connor, Á.
Series :	Unpublished document by NPWS

Year :	2017
Title :	Ballyhoorisky Point to Fanad Head SAC (site code: 1975) Conservation objectives supporting document- *Najas flexilis* V1
Author :	NPWS
Series :	Conservation objectives supporting document
Year :	2017
Title :	Mweelrea/Sheeffry/Erriff Complex SAC (site code: 1932) Conservation objectives supporting document- *Najas flexilis* V1
Author :	NPWS
Series :	Conservation objectives supporting document
Year :	2017
Title :	Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC (site code: 365) Conservation objectives supporting document- *Najas flexilis* V1
Author :	NPWS
Series :	Conservation objectives supporting document
Year :	2019
Title :	The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2019
Title :	The Status of EU Protected Habitats and Species in Ireland. Volume 3: Species Assessments
Author :	NPWS
Series :	Conservation assessments
Year :	in prep.
Title :	A study of lakes with Slender Naiad (*Najas flexilis*)
Author :	Roden, C.; Murphy, P.; Ryan, J.B.
Series :	Irish Wildlife Manuals
Year :	in prep.
Title :	Survey of the status of white-clawed crayfish, *Austropotamobius pallipes*, in designated SACs in 2017
Author :	Gammell, M.; McFarlane, A.; Brady, D.; O'Brien, J.; Mirimin, L.; Graham, C.; Lally, H.; Minto, C.; O'Connor, I.
Series :	Irish Wildlife Manuals

Other References

Year :	2001
Title :	Aquatic plants in Britain and Ireland
Author :	Preston, C.D.; Croft, J.M.
Series :	Harley Books, Colchester
Year :	2004
Title :	The ecology of *Najas flexilis*
Author :	Wingfield, R.A.; Murphy, K.J.; Hollingsworth, P.; Gaywood, M.J.
Series :	Scottish Natural Heritage Commissioned Report No. 017 (ROAME No. F98PA02)
Year :	2006
Title :	A reference-based typology and ecological assessment system for Irish lakes. Preliminary investigations. Final report. Project 2000-FS-1-M1 Ecological assessment of lakes pilot study to establish monitoring methodologies EU (WFD)
Author :	Free, G.; Little, R.; Tierney, D.; Donnelly, K.; Coroni, R.
Series :	Environmental Protection Agency, Wexford

Year :	2016
Title :	A narrative for conserving freshwater and wetland habitats in England
Author :	Mainstone, C.; Hall, R.; Diack, I.
Series :	Natural England Research Reports Number 064
Year :	2020
Title :	Slender Naiad (*Najas flexilis*) habitat quality assessment
Author :	Gunn, I.D.M.; Carvalho, L.
Series :	CRW2018_27. Scotland's Centre of Expertise for Waters (CREW)

Spatial data sources

Year :	2008
Title :	OSi 1:5000 IG vector dataset
GIS Operations :	WaterPolygons feature class clipped to the SAC boundary. Expert opinion used to identify Annex I habitat and to resolve any issues arising
Used For :	3150 (map 3)
Year :	2021
Title :	NPWS rare and threatened species database
GIS Operations :	Dataset created from spatial references in database records. Expert opinion used as necessary to resolve any issues arising
Used For :	1092 (map 4)

3150 Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation

To restore the favourable conservation condition of Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation in Glenade Lough SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Lake habitat 3150 is no longer believed to occur in Glenade Lough, rather the lake is considered to be a *Najas*-type lake with high plant species and community diversity. As such, it is treated here as lake habitat 3130 in respect of the targets applied. Glenade Lough is an important lake. Its diversity may largely result from the mixed geology of its catchment, with base-poor springs and seepages likely to be a key driver. It is unusual in the co-occurrence of slender naiad (*Najas flexilis*) and white-clawed crayfish (*Austropotamobius pallipes*), although the former has not been seen since 1978 (see the conservation objective for slender naiad in this volume) and was considered extinct in Roden and Murphy (2014) and NPWS (2019). Lake surface area is the simplest measure of extent and should be stable or increasing. For further information on all attributes and an overview of slender naiad-type lakes see Roden et al. (in prep.). See also O Connor (2015)
Habitat distribution	Occurrence	No decline, subject to natural processes	As noted above, habitat 3130, and not 3150, is considered to occur in Glenade Lough. This is based on the reinterpretation of these lake habitats (O Connor, 2015) and the findings of Heuff (1984), Roden and Murphy (2014) and Roden et al. (in prep.). Roden and Murphy (2014) found that Glenade is suffering from eutrophication. Enrichment may already have begun when it was surveyed in 1978 by Heuff (1984). As a result, and owing to reclassification as 3130, the conservation objective is to restore the habitat to favourable conservation condition. Further data are also available from the Environmental Protection Agency (EPA) (Water Framework Directive (WFD) monitoring)
Vegetation species richness	Occurrence	Maintain/restore appropriate species richness	Roden and Murphy (2014) reported that 16 plant species were recorded in Glenade over time. See also Heuff (1984). There should be no decline in species richness (see Roden et al., in prep.). Roden et al. (in prep.) found that habitat 3130 has a varied and species-rich flora, with high conservation value examples having more than 30 species of aquatic macrophytes. Almost all lakes with more than 30 species had euphotic depth >3m (Roden et al., in prep.). The number of species recorded increases with sampling effort (Roden et al., in prep.)

Vegetation composition: typical species	Occurrence	Restore typical species, in good condition, and demonstrating typical abundances and distribution	Restore condition and extent of *Najas flexilis* (see 1833 conservation objective) and other typical species. Roden and Murphy (2014) recorded habitat 3130 typical species at Glenade including *Chara virgata, Callitriche hermaphroditica, Elatine hexandra, Isoetes lacustris, Potamogeton gramineus, P. lucens, P. perfoliatus, P. x zizii*. Many of these were recorded by Heuff (1984) but her 1978 survey also found a wider range of charophyte species: *Chara aspera, C. globularis, C. virgata, Nitella flexilis s.l., Tolypella glomerata*, as well as *P. praelongus* and *Najas flexilis*. Roden et al. (in prep.) described 3130 typical species and indicators of good condition. 3130 has a varied and species-rich flora with several rare species that can include *Baldellia ranunculoides* subsp. *repens, Hydrilla verticillata, Isoetes echinospora, Najas flexilis, Pilularia globulifera, Fissidens fontanus*. See also NPWS (2013, 2019) and O Connor (2015)
Vegetation composition: characteristic zonation	Occurrence	Restore characteristic deep-water vegetation	The vegetation of Glenade Lough was described by Heuff (1984). While Roden and Murphy (2014) said Glenade's vegetation resembled that of other species-rich *Najas* lakes, they also found significant changes from the 1978 survey, including loss of *Najas flexilis* and *Potamogeton praelongus* zone. The characteristic zonation (3 or more zones) is described in Roden et al. (in prep.). Shallow water has a *Lobelia-Littorella* zone (0-1.5m), then an *Isoetes lacustris* zone (0.5-3m), both also typical of oligotrophic lakes and habitat 3110. The characteristic deep-water community is the most sensitive element and consists of some or all of *Callitriche hermaphroditica, Hydrilla verticillata, Najas flexilis, Potamogeton berchtoldii, P. perfoliatus, P. pusillus, Nitella confervacea, Nitella flexilis, Nitella translucens* . Full development is when a distinct deep-water zone is present, with one or more of its typical species having >25% cover
Vegetation distribution: maximum (euphotic) depth	Metres	Restore maximum depth of vegetation, subject to natural processes	Heuff (1984) found vegetation to 3.5m in Glenade. Roden and Murphy (2014) found this had decreased to 2.8m. Euphotic depth ranged from 5.2m to 1.9m in lakes surveyed 2016-2018 and the target for maximum depth of vegetation colonisation (euphotic depth) in 3130 lakes was set as at least >3m (Roden et al., in prep.). Site-specific targets must be considered, however, as euphotic depths of >4m or >5m have been recorded in species-rich lakes in good condition. Maximum depth is considered to have declined in many lakes, owing to increased water colour. Lakes within undisturbed peatland are expected to have clear water and large maximum vegetation depth
Hydrological regime: water level fluctuations	Metres	Maintain appropriate hydrological regime necessary to support the habitat	The mixed geology of the basin and catchment leads to a complex hydrological regime at Glenade. Surface and groundwater discharges of base-poor water to Glenade from surrounding blanket bog and acid rocks exert significant influence over the vegetation, particularly obligate CO2 photosynthesisers such as slender naiad (Jim Ryan, pers. comm.). Calcareous springs and seepages also occur (Heuff, 1984). Roden et al. (in prep.) said exposure of >half of the typically submerged *Littorella* zone in summer is cause for concern and water level should never be lower than the top of the *Isoetes* zone. Natural fluctuations in lake water level can be amplified by activities such as abstraction, drainage and overgrazing, increasing wave action and turbidity, up-rooting vegetation, altering substratum and releasing nutrients from sediment. The hydrological regime must support maintenance of the area, distribution and depth of the habitat and its characteristic vegetation zones/species

Lake substratum quality	Various	Maintain/restore appropriate substratum type, extent and chemistry to support the vegetation	Heuff (1984) described the substratum of Glenade as sand and stone in the shallows, mud in deeper water. Roden et al. (in prep.) found that the habitat is generally dominated by bedrock, sand and loose stones, silt mud or hard peat, and stated that the appearance of large expanses of unconsolidated peat would indicate excessive sediment input. Groundwater inputs are likely to be important for the substratum of the characteristic deep-water zone and *Najas flexilis* (Gunn and Carvalho, 2020). Research is required to further characterise the chemical composition of the substratum
pH and Alkalinity	pH units, mg/l	Maintain/restore appropriate water and sediment pH, alkalinity and cation concentrations to support the habitat, subject to natural processes	Free et al. (2006) reported pH of 8.16 and alkalinity of 74mg/l for Glenade. EPA average alkalinity was 67-72mg/l in 2007-15. Seepages and springs appear to be important in the maintenance of appropriate sediment conditions for the vegetation of Glenade. Groundwater can contribute base-poor water to obligate CO2 photosynthesisers, such as *Najas flexilis*, in more calcareous lakes, and more base-rich water to highly oligotrophic lakes. The habitat is associated with intermediate alkalinity, largely between 20-80mg/l, but lower values may occur on Old Red Sandstone (Roden et al., in prep.). Surveyed lakes had average alkalinity of 25mg/l (range 5.5-73mg/l) (Roden et al., in prep.). In line with targets for *N. flexilis*, median pH values should >7 pH units. Acidification by organic acids released from degraded peatland and conifer plantations may impact on the habitat. See also The European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2019
Nutrients	µg/l P; mg/l N	Restore the concentration of nutrients in the water column to sufficiently low levels to support the habitat and its typical species	EPA average total phosphorus (TP) was 0.015, 0.016 and 0.012mg/l TP in the 2007-09, 2010-12 and 2013-15 reporting periods. Roden et al. (in prep.) found that the best quality lakes surveyed had average total phosphorus of <0.015mg/l TP. Lakes in good condition with high-frequency nutrient data had an overall average of 0.011mg/l TP (lake averages ranged 0.008-0.015mg/l TP). While Roden et al. (in prep.) suggested a target of <0.015mg/l TP, a precautionary target for good condition is set as ≤0.010mg/l or WFD High Status; however, vegetation attributes determine the overall conservation condition. See also The European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2019). WFD High Status targets for total ammonia (annual average ≤0.04mg/l N and annual 95th percentile ≤0.09mg/l N) may also be appropriate
Water colour	mg/l PtCo	Maintain/restore appropriate water colour to support the habitat	Heuff (1984) described Glenade as 'a clear water lake'. Free et al. (2006) reported colour of 28mg/l PtCo in Glenade Lough. The habitat is found in clear water, and water colour (dissolved light-absorbing compounds) is negatively correlated with maximum vegetation (euphotic) depth; lakes with euphotic depth >3m had colour <40mg/l PtCo, while those with euphotic depth >3.5m had <35mg/l PtCo (Roden et al., in prep.). Water colour directly controls light penetration and, therefore, euphotic depth and vegetation extent. Roden et al. (in prep.) set good condition at <40mg/l PtCo; however, this was considered to be an impacted state some distance from reference condition. The primary source of increased colour in Ireland is peatland disturbance, e.g. through turf-cutting, overgrazing, plantation forestry. Further work is necessary to determine water colour in intact peatland catchments and sustainable levels for the habitat, which may be <30 or even <20mg/l PtCo

Dissolved organic carbon (DOC)	mg/l	Maintain appropriate organic carbon levels to support the habitat	Dissolved organic carbon (DOC) in the water column is linked to water colour and acidification (organic acids). It can provide a substrate (food source) for heterotrophic organisms, which can impact directly (e.g. shading) and indirectly (e.g. nutrient release) on the characteristic lake communities. Damage and degradation of peatland, e.g. through afforestation or turf-cutting, leading to decomposition of peat is likely to be the predominant source of dissolved and particulate organic carbon in Ireland
Turbidity	Nephelometric turbidity units/ mg/l SS/ other appropriate units	Maintain appropriate turbidity to support the habitat	Turbidity can significantly affect the quantity and quality of light reaching rooted and attached vegetation and can, therefore, impact on lake habitats. The settlement of higher loads of inorganic or organic material on lake vegetation communities may also have impacts on sensitive, delicate species. Turbidity can increase as a result of re-suspension of material within the lake, higher loads entering the lake, or eutrophication. Particulate loads from peatlands are the most likely sources of increased turbidity in lakes with the habitat. Turbidity measurement and interpretation is challenging. As a result, it is likely to be difficult to set habitat-specific targets for turbidity in lakes
Transparency	Metres	Maintain/restore appropriate Secchi transparency. There should be no decline in Secchi depth/transparency	Heuff (1984) recorded Secchi transparency in Glenade of 2.2m in July and 2.3m in September 1978. Roden and Murphy (2014) recorded Secchi depth of 3m and described transparency as 'moderate'. Transparency relates to light penetration and, hence, to the depth of colonisation of vegetation. Roden et al. (in prep.) advised it is preferable to measure euphotic depth directly by observation, but noted that a decreasing trend in Secchi depth indicates declining water quality. Transparency can be affected by phytoplankton blooms, water colour and turbidity. Secchi depth in marl lakes in Good condition is generally >6m. The OECD fixed boundary system set transparency targets for oligotrophic lakes of ≥6m annual mean Secchi disk depth and ≥3m annual minimum Secchi disk depth
Attached algal biomass	Algal cover	Maintain/restore trace/absent attached algal biomass (<5% cover)	Roden and Murphy (2014) described *Cladophora* sp. as 'very common' in Glenade Lough. Nutrient enrichment can favour epiphytic and epipelic algae that can out-compete the submerged vegetation. Roden et al. (in prep.) noted that occasional blooms of filamentous algae occur in 3130 lakes in the absence of excess nutrients, especially species of the orders Zygnematales or Oedogoniales, but that drifting masses of *Cladophora* species may indicate a decline in water quality. In general, the cover abundance of attached algae in lakes with 3130 should be trace/absent (<5% cover)
Fringing habitat: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the natural structure and functioning of the habitat	In this SAC, a band of emergent vegetation occurs around much of the lake with *Phragmites australis* and *Schoenoplectus lacustris*, also *Typha latifolia, Equisetum fluviatile* and *Eleocharis palustris*. The fringing habitats include freshwater marsh, calcareous fens and flushes, cutaway peatland, wet grassland and wet woodland. Heterogeneous lake fringes with a range of natural and semi-natural habitats are preferable. Restoration or maintenance of open, species-rich fen, marsh and grassland can be particularly important. Fringing habitats along lakes intergrade with and support the structure and functions of the lake habitat. Equally, fringing wetland habitats are dependent on the lake, particularly its water levels, and support invertebrate and plant communities and species of high diversity and conservation concern. See also Mainstone et al. (2016)

1092 White-clawed Crayfish *Austropotamobius pallipes*

To maintain the favourable conservation condition of White-clawed Crayfish (*Austropotamobius pallipes*) in Glenade Lough SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Number of occupied 1km squares	No reduction from baseline. See map 4	White-clawed crayfish (*Austropotamobius pallipes*) has been known from Glenade Lough since 1998, though the lack of records before then is not necessarily an indication of recent colonisation. The species was recorded by both O'Connor et al. (2009) and Gammell et al. (in prep.). All the records have come from the accessible eastern shoreline in the 1km square G8345. There is no reason to assume that crayfish should not be present in other 1km squares that intersect the lake. However, this needs to be confirmed by appropriate survey
Population structure: recruitment	Percentage occurrence of juveniles and females with eggs	Juveniles and females with eggs in at least 50% of positive samples taken at appropriate time and methodology	See Reynolds et al. (2010) for further details. Gammell et al. (in prep.) found juveniles in Glenade Lough
Population size	Catch per unit effort	No reduction from baseline of 2.27	The population in Glenade Lough was assessed as having a Population abundance grade of Moderate to High (Gammell et al., in prep.). This is based on the CPUE (catch per unit effort) figures from that study. It is only applicable to the hand search methodology. CPUE figures have not been calculated for other methodologies
Negative indicator species	Occurrence	No non-indigenous crayfish species	Non-indigenous crayfish species (NICS) are identified as a major direct threat to the white-clawed crayfish and as a disease vector, in particular crayfish plague (*Aphanomyces astaci*), which is fatal to white-clawed crayfish. The possession, import and intentional release of five species of invasive alien crayfish is banned by Statutory Instrument No. 354/2018
Disease	Occurrence	No instances of disease	Crayfish plague, caused by the water-borne mould *Aphanomyces astaci*, is identified as a major threat to the species in Ireland. Instances of crayfish plague have occurred in Ireland since 2015 causing local extinctions. There have been no confirmed or suspected outbreaks in this SAC
Water quality	Water chemistry measures	Maintain appropriate water quality, particularly pH and nutrient levels, to support the natural structure and functioning of the habitat	Water quality status of Glenade Lough is poor and has declined. White-clawed crayfish are not considered very sensitive of water quality but are intolerant of low pH and poorest water quality, and lack of calcareous influence. There should be no decline in the water quality as defined by the targets for the 3130 lake habitat, as these are more stringent than white-clawed crayfish require. See also the conservation objective for the lake habitat (3150) in this volume; while the SAC was selected for lake habitat 3150, it is clear that the habitat naturally present in Glenade is lake habitat 3130, and targets appropriate to this latter habitat are used

Habitat quality: heterogeneity	Occurrence of positive habitat features	No decline from the baseline	White-clawed crayfish need high habitat heterogeneity. Larger crayfish must have stones to hide under, or an earthen bank in which to burrow. Hatchlings shelter in vegetation, gravel and among fine tree roots. Smaller crayfish are typically found among weed and debris in shallow water. Larger juveniles in particular may also be found among cobbles and detritus such as leaf litter. These conditions and habitat features must be available on the whole length of occupied habitat. Gammell et al. (in prep.) scored the habitat heterogeneity as between 0.32 and 0.48 in this SAC and there should be no decline from this baseline range

1833 Slender Naiad *Najas flexilis*

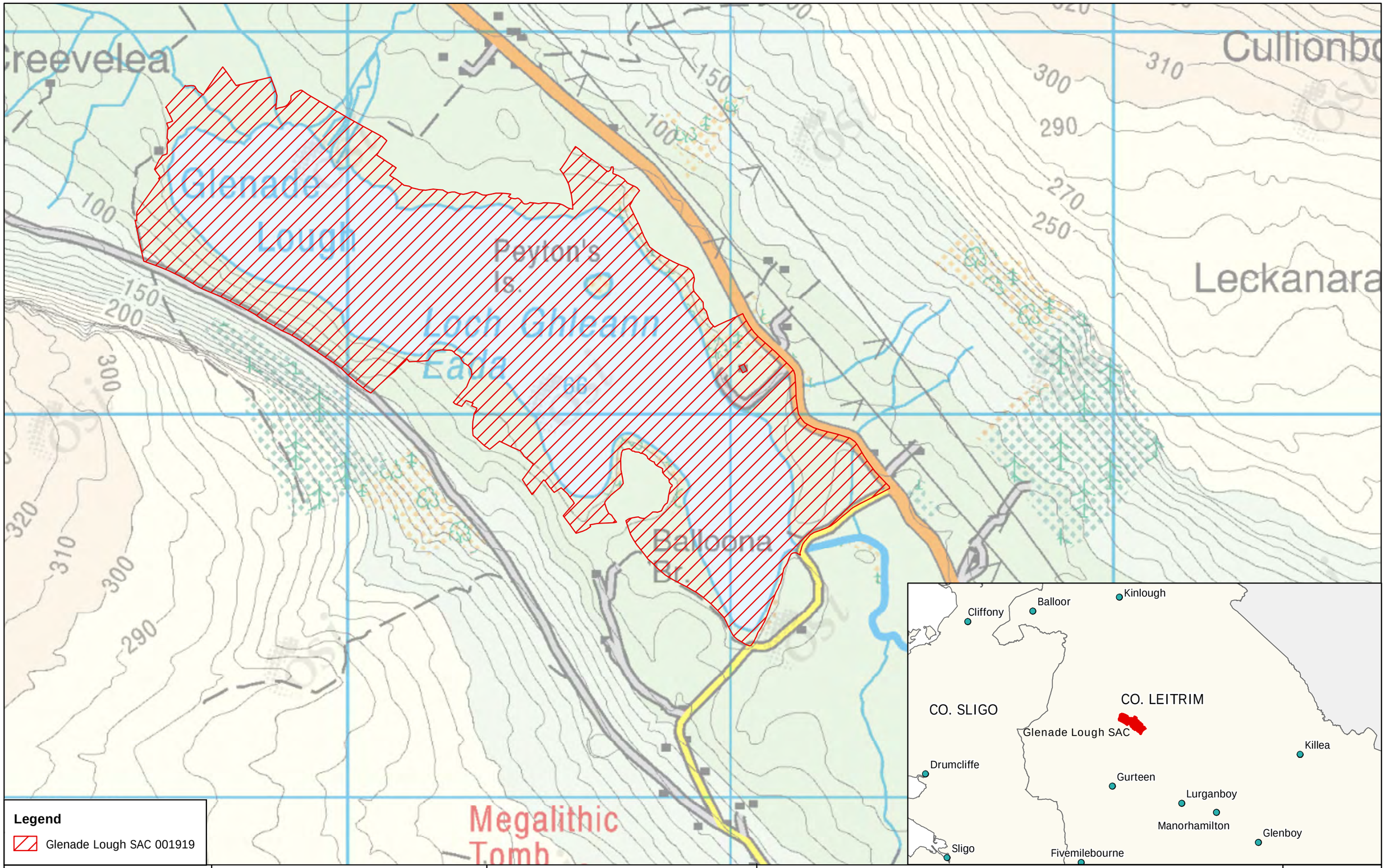
To restore the favourable conservation condition of Slender Naiad (*Najas flexilis*) in Glenade Lough SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population extent	Hectares; distribution	Restore the spatial extent of slender naiad (*Najas flexilis*) within the lake, subject to natural processes	*Najas flexilis* was discovered in Glenade Lough by Hester Heuff and Jim Ryan in 1978 (Heuff, 1984). The species was widespread, occurring from very shallow water amongst *Schoenoplectus lacustris* to depths of >3m. The species has not been seen at Glenade since, despite dedicated snorkel survey in 2004, 2005 and 2014, and is considered to now be extinct (Roden and Murphy, 2014; NPWS, 2019). Roden and Murphy (2014) stated that the vegetation of Glenade Lough resembled that of other species-rich *Najas flexilis* lakes, but showed significant changes since 1978 that indicate eutrophication. For further information on all attributes and targets, see Roden et al. (in prep.), O Connor (2013) and *Najas flexilis* conservation objective supporting documents for other SACs, for example SACs 001975 (NPWS, 2017), 001932 (NPWS, 2017) and 000365 (NPWS, 2017)
Population depth	Metres	Restore the depth range of *Najas flexilis* within the lake, subject to natural processes	In 1978, *Najas flexilis* was found 'throughout the reed bed zone down to the deepest vegetated areas' in Glenade (Heuff, 1984). It grew in very shallow water in the *Schoenoplectus* reedbed in July, but in September had gone from these shallow areas. Heuff (1984) also recorded *Najas flexilis* in relevés at 1.8m and 3m. As depth increased, *Najas flexilis* and *Sparganium emersum* became more frequent. *Najas flexilis* is part of the characteristic deep-water community of lake habitat 3130 (Roden et al., in prep.). *Najas flexilis* is frequently associated with the lower depths of macrophyte growth, where scattered plants gradually give way to bare mud or silt (Preston and Croft, 2001; Roden, 2002)
Population viability	Plant traits	Restore plant fitness, subject to natural processes	Wingfield et al. (2004) used certain traits (leaf area/shoot length x reproductive number/shoot length) to assess *Najas flexilis* plant fitness and indicated a score of less than one would give rise to concern. Roden et al. (in prep.) suggested size measurements and photographs of the largest plants encountered may be non-destructive indicators of plant health
Population abundance	Square metres	Restore the cover abundance of *Najas flexilis*, subject to natural processes	Heuff (1984) described *Najas flexilis* as thriving in Glenade, being found throughout the reedbed zone and within the littoral zone to depths of over 3m, reaching higher cover abundance in deeper water. Cover abundance is likely to vary within a lake, with depth, substratum and exposure. It may also vary inter-annually. Such variations may be even more marked in small, marginal populations. However, there should be no sustained decline in the extent, overall size, cover abundance or density of the population in the lake and the absence of the species from Glenade in 2004, 2005 and 2014 demonstrates a genuine decline
Species distribution	Occurrence	Restore distribution, subject to natural processes	In 1978, *Najas flexilis* was found in and adjacent to relevé 46, in a sheltered bay along the southern shore of Glenade Lough (see map in Volume 2 of Heuff, 1984). Her survey was concentrated on the central area of the lake, however, and did not map the species full extent of the species in the lake at that time. For further information on the species and its distribution in Ireland, see O Connor (2013), *Najas flexilis* conservation objective supporting documents for other SACs and NPWS (2019)

Habitat extent	Hectares	Restore habitat extent, subject to natural processes	Habitat for the species relates to the area and quality of the available habitat for the species. The quality of the habitat for *Najas flexilis* in Glenade Lough is impacted by eutrophication (Roden and Murphy, 2014). See also the conservation objective for the lake habitat (3150) in this volume. While the SAC was selected for lake habitat 3150, it is clear that the habitat naturally present in Glenade is 3130, and targets appropriate to this latter habitat are used. See Roden et al. (in prep.) for further information on the species and its habitat
Vegetation distribution: maximum (euphotic) depth	Metres	Maintain/restore maximum depth of vegetation, subject to natural processes	Heuff (1984) recorded a maximum vegetation depth of 3.8m in Glenade, and found *Najas flexilis* in the relevé at 3m. Roden and Murphy (2014) recorded a euphotic depth of 2.8m. Euphotic depth ranged from 5.2m to 1.9m and the most extensive populations were found in lakes with euphotic depths >2.5m; however, several lakes with *Najas flexilis* had lower euphotic depths (Roden et al., in prep.). The target for maximum depth of vegetation colonisation (euphotic depth) was set as at least >3m (Roden et al., in prep.). Site-specific targets must be considered, however, as euphotic depths of >4m or >5m have been recorded in lakes with *Najas flexilis* in good condition. See also the conservation objective for habitat 3150 in this volume and Roden et al. (in prep.)
Hydrological regime: water level fluctuations	Metres	Maintain appropriate natural hydrological regime necessary to support the habitat for the species	The hydrological regime of the lakes must be maintained so that the area, distribution and depth of the *Najas flexilis* habitats can be restored. Run-off, seepages, and perhaps springs, discharging base-poor water to Glenade from surrounding blanket bog and acid rocks exert significant influence over the vegetation, particularly obligate carbon dioxide photosynthesisers such as *Najas flexilis* (Jim Ryan pers. comm.). Groundwater inputs are likely to be important for the characteristic deep-water zone and *Najas flexilis* in many lakes (Gunn and Carvalho, 2020). See also the conservation objective for the lake habitat (3150) in this volume and Roden et al. (in prep.)
Lake substratum quality	Various	Maintain/restore appropriate substratum type, extent and chemistry to support a population of the species	Heuff (1984) described the substratum of Glenade as sand and stone in the shallows, mud in deeper water, with *Najas flexilis* occurring on mud. *Najas flexilis* is typically found on soft substrata of mud, silt or fine sand (Preston and Croft, 2001; Roden, 2002, 2004). The sediment chemistry of *Najas flexilis* lakes is described by Wingfield et al. (2004) and Gunn and Carvalho (2020). See also the conservation objective for the lake habitat (3150) in this volume and Roden et al. (in prep.)
Nutrients	mg/l P; mg/l N	Restore the concentration of nutrients in the water column to sufficiently low levels to support a population of the species	The EPA recorded average total phosphorus in Glenade of 0.015, 0.016 and 0.012mg/l TP in the 2007-09, 2010-12 and 2013-15 reporting periods, respectively. *Najas flexilis* is typically associated with high water quality. This is demonstrated by naturally low dissolved nutrients, clear water and low algal growth. The species' association with mixed geology, including some base-enrichment, is well-documented (Preston and Croft, 2001; Roden, 2004; Wingfield et al., 2004). While Roden et al. (in prep.) suggested a target of <0.015mg/l TP, a precautionary target for good condition is set as ≤0.010mg/l or Water Framework Directive High Status; however, population attributes determine the species' overall conservation condition. See also the conservation objective for habitat 3150 in this volume and Roden et al. (in prep.)

Water colour	mg/l PtCo	Maintain/restore appropriate water colour to support a population of *Najas flexilis*	Free et al. (2006) reported colour of 28mg/l PtCo in Glenade. The species is found in clear water (Roden et al., in prep.). Increased water colour (dissolved light-absorbing compounds) and turbidity decrease light penetration and can reduce the area of available *Najas flexilis* habitat, particularly at the lower euphotic depths. Roden et al. (in prep.) set good condition at <40mg/l PtCo; however, this was considered to be an impacted state some distance from reference condition. Further work is necessary to determine sustainable water colour levels for the species which may be <30 or even <20mg/l PtCo. The primary source of increased colour in Ireland is peatland disturbance, e.g. through turf-cutting, overgrazing, plantation forestry. See also the conservation objective for habitat 3150 in this volume and Roden et al. (in prep.)
Dissolved organic carbon (DOC)	mg/l	Maintain/restore appropriate organic carbon levels to support a population of *Najas flexilis*	Dissolved organic carbon (DOC) in the water column is linked to water colour and acidification (organic acids). It can provide a substrate (food source) for heterotrophic organisms, which can impact directly (e.g. shading) and indirectly (e.g. nutrient release) on the characteristic lake communities. Damage and degradation of peatland, e.g. through afforestation or turf-cutting, leading to decomposition of peat is likely to be the predominant source of dissolved and particulate organic carbon in Ireland
Acidification status	pH units; mg/l	Maintain appropriate water and sediment pH, alkalinity and cation concentrations to support a population of *Najas flexilis*, subject to natural processes	Free et al. (2006) reported pH of 8.16 and alkalinity of 74mg/l for Glenade. The EPA found average alkalinity of 67-72mg/l in 2007-15. Seepages and springs appear to be important in the maintenance of appropriate sediment conditions for *Najas flexilis* in Glenade. Groundwater may influence sediment and water chemistry and contribute base-poor water to *Najas flexilis*, an obligate carbon dioxide photosynthesiser, in more calcareous lakes, and more base-rich water in highly oligotrophic lakes. The species is associated with intermediate alkalinity, largely between 20-80mg/l, but also occurs in some lakes with lower values on Old Red Sandstone (Roden et al., in prep.). Acidification is a significant threat to the species (Preston and Croft, 2001; Roden, 2004; Wingfield et al., 2004; Gunn and Carvalho, 2020). Wingfield et al. (2004) considered that it has specific environmental requirements and occupies a relatively narrow realised niche. See also Roden et al. (in prep.)
Associated species	Species composition and abundance	Restore appropriate associated species and vegetation communities to support a population of *Najas flexilis*	In 1978 at Glenade, *Najas flexilis* occurred with *Chara virgata, Nitella flexilis s.l., Tolypella glomerata, Callitriche hermaphroditica* and *Potamogeton pusillus* in the *Schoenoplectus* reedbed (Heuff, 1984). At 1.8m, it grew with *Nitella flexilis s.l., T. glomerata, Fontinalis antipyretica, C. hermaphroditica* and *Elodea canadensis*, and at 3m with dominant *P. praelongus*. See also Roden and Murphy (2014) and the conservation objective for 3150. *Najas flexilis* is part of the characteristic and highly sensitive deep-water community of habitat 3130 that consists of some or all of *Callitriche hermaphroditica, Hydrilla verticillata, Najas flexilis, P. berchtoldii, P. perfoliatus, P. pusillus, Nitella confervacea, N. flexilis, N. translucens* (Roden et al., in prep.). See also Preston and Croft (2001); Roden (2004, 2007 in NPWS, 2007); Wingfield et al. (2004); O Connor (2013); NPWS (2019); Gunn and Carvalho (2020)

Fringing habitat: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support a population of *Najas flexilis*	In Glenade Lough, a band of emergent vegetation occurs around much of the lake with *Phragmites australis* and *Schoenoplectus lacustris*, also *Typha latifolia, Equisetum fluviatile* and *Eleocharis palustris*. Heuff (1984) found *Najas flexilis* within *Schoenoplectus* reedbeds, with a *Chara aspera* zone on the landward side. The fringing habitats of Glenade Lough include freshwater marsh, calcareous fens and flushes, cutaway peatland, wet grassland and wet woodland. Fringing habitats are an integral part of the structure and functioning of lake systems. Heterogeneous lake fringes with a range of natural and semi-natural habitats are preferable. Restoration or maintenance of open, species-rich fen, marsh and grassland can be particularly important. See also Mainstone et al. (2016)



Legend

Glenade Lough SAC 001919

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 1:
GLENADE LOUGH SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

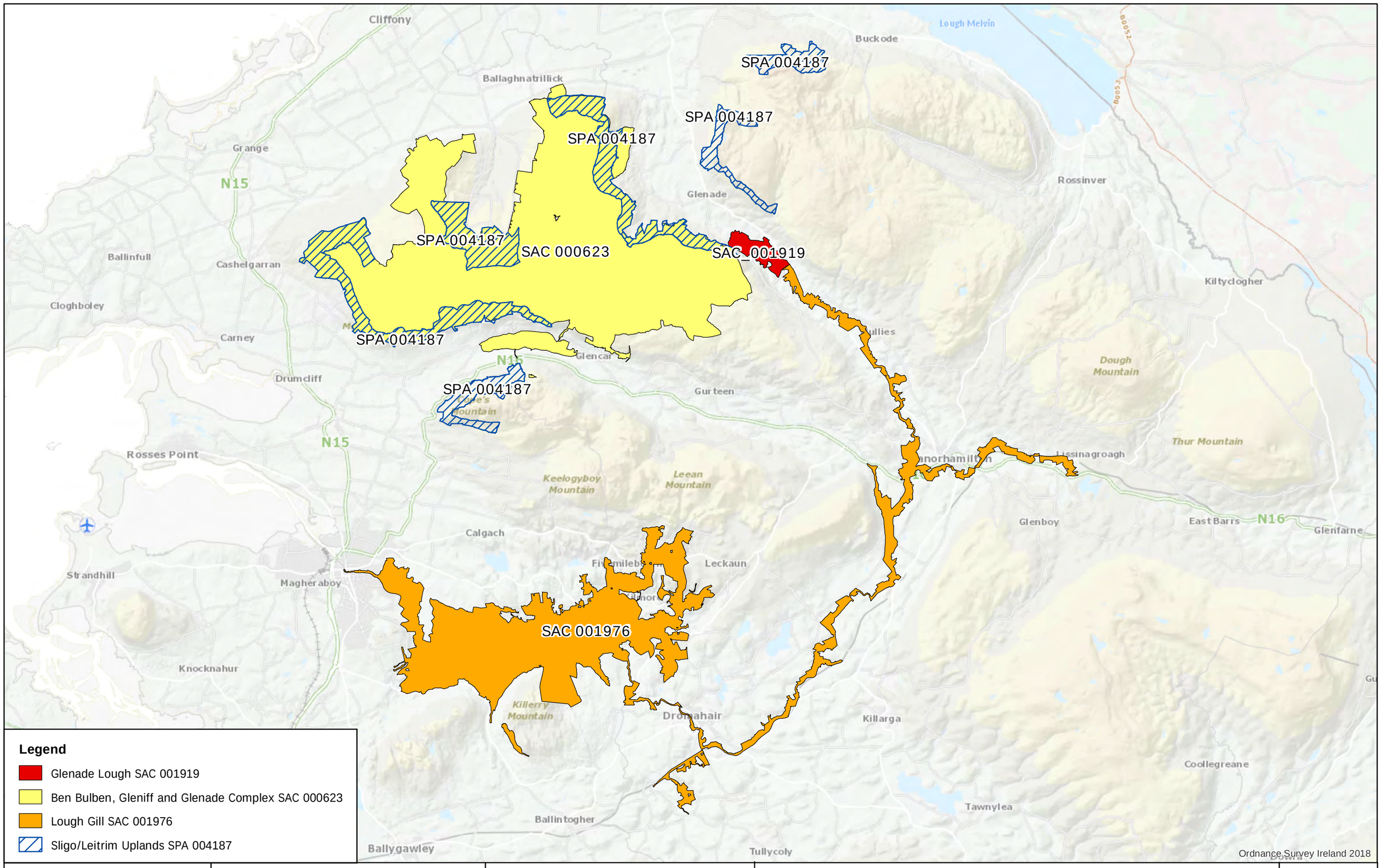
Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 001919; version 3.03.
CO. LEITRIM

0 100 200 400 Metres

N

Date: March 2021



Legend

- Glenade Lough SAC 001919
- Ben Bulben, Gleniff and Glenade Complex SAC 000623
- Lough Gill SAC 001976
- Sligo/Leitrim Uplands SPA 004187

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 2:
GLENADE LOUGH SAC
CONSERVATION OBJECTIVES
ADJACENT SITES

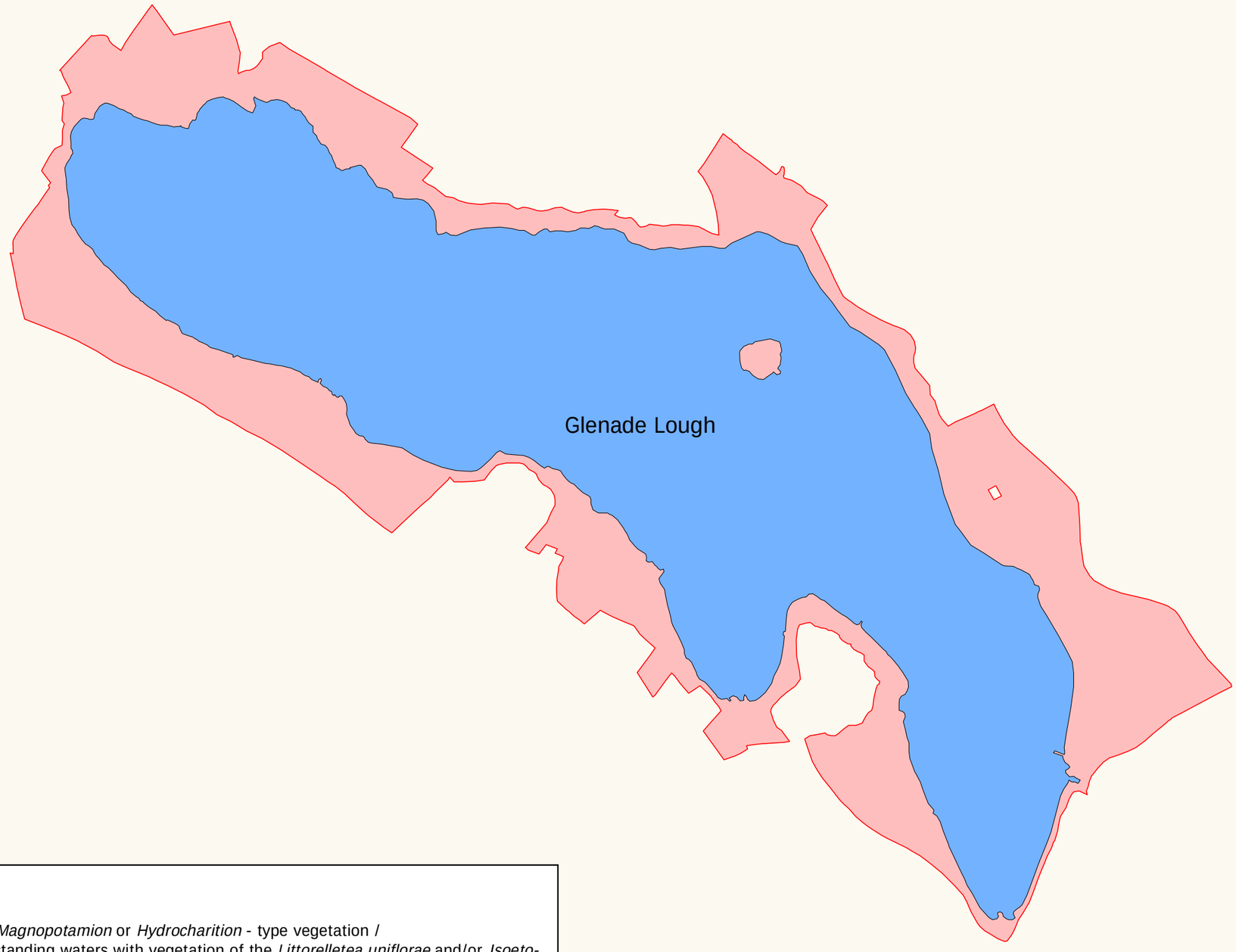
Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 001919; version 3.03.
CO. LEITRIM

0 1,250 2,500 5,000 Metres

N

Date: March 2021



Legend

- 3150 Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation / 3130 Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea*
- Glenade Lough SAC 001919
- OSi Discovery Series County Boundary

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 3:
GLENADE LOUGH SAC
CONSERVATION OBJECTIVES
INDICATIVE LAKE HABITATS

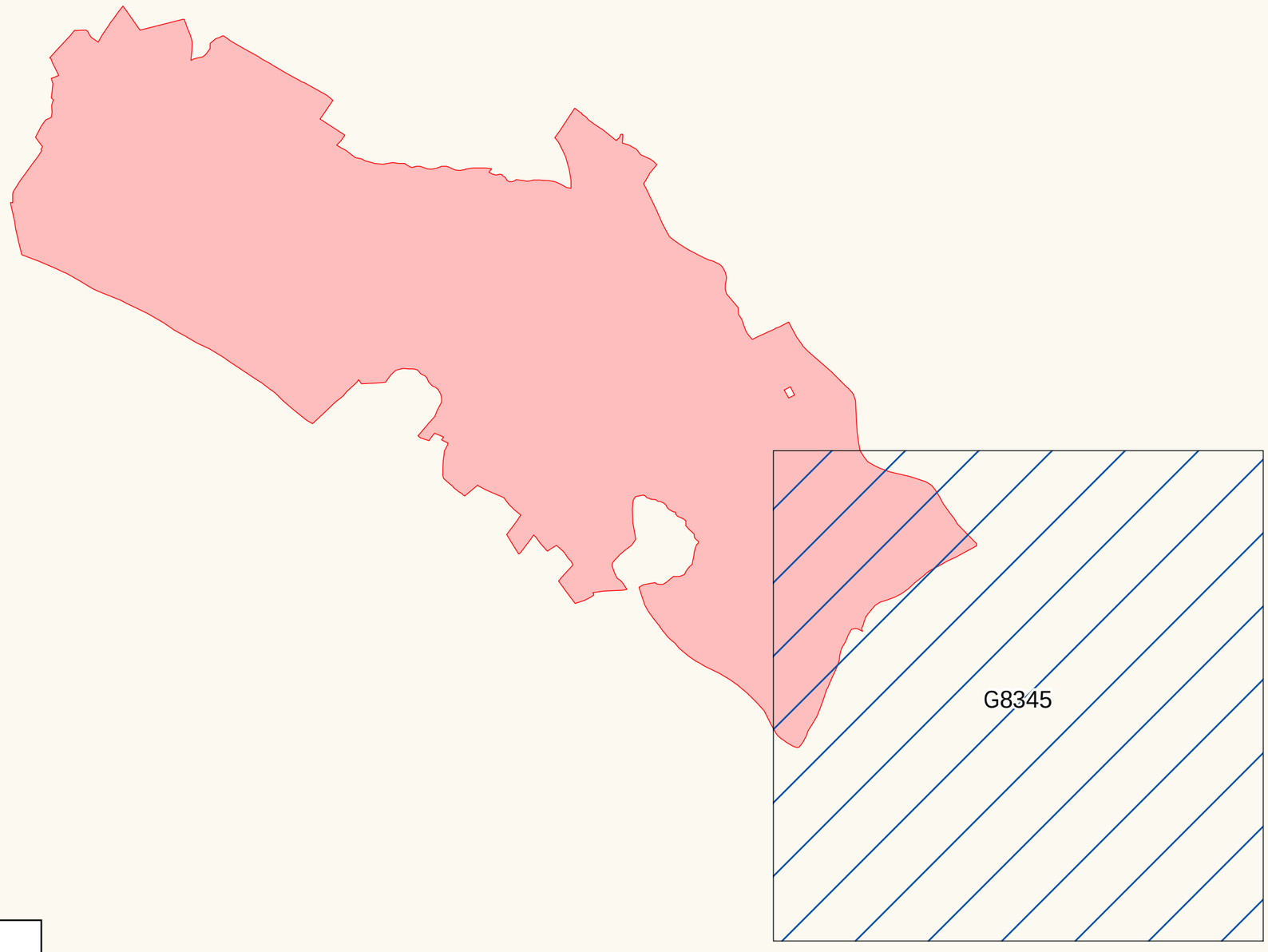
Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 001919; version 3.03.
CO. LEITRIM

0 75 150 300 Metres

N

Date: March 2021



Legend

- 1092 White-clawed crayfish Austropotamobius pallipes 1km grid square
- Glenade Lough SAC 001919
- OSi Discovery Series County Boundary

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 4:
GLENADE LOUGH SAC
CONSERVATION OBJECTIVES
WHITE-CLAWED CRAYFISH

Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 001919; version 3.03.
CO. LEITRIM

0 100 200 400 Metres

N

Date: March 2021

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Kilroosky Lough Cluster SAC 001786

An Roinn Tithíochta,
Rialtais Áitiúil agus Oidhreachta
Department of Housing,
Local Government and Heritage

National Parks and Wildlife Service,
Department of Housing, Local Government and Heritage,

90 King Street North, Dublin 7, D07 N7CV, Ireland.

Web: www.npws.ie
E-mail: natureconservation@housing.gov.ie

Citation:

NPWS (2021) Conservation Objectives: Kilroosky Lough Cluster SAC 001786. Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.

Series Editors: Rebecca Jeffrey and Christina Campbell
ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

001786	Kilroosky Lough Cluster SAC
1092	White-clawed Crayfish *Austropotamobius pallipes*
3140	Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.
7210	Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae*
7230	Alkaline fens

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	1983
Title :	Pre-drainage survey, Finn/Lacky River catchment, Cos Monaghan and Cavan
Author :	Douglas, C.; Lockhart, N.
Series :	Unpublished report
Year :	1984
Title :	Revisions to the lists of areas of scientific interest in County Monaghan
Author :	Ni Lamhna, E.
Series :	Unpublished Report
Year :	2007
Title :	Monaghan Fen Survey 2007 Volume I: Main Report
Author :	Foss, P.; Crushell, P.
Series :	Unpublished report to NPWS and Monaghan County Council
Year :	2009
Title :	Monitoring of white-clawed crayfish *Austropotamobius pallipes* in Irish lakes in 2007
Author :	O'Connor, W.; Hayes, G.; O'Keeffe, C.; Lynn, D.
Series :	Irish Wildlife Manuals, No. 37
Year :	2009
Title :	Ireland Red List No. 2: Non-marine molluscs
Author :	Byrne, A.; Moorkens, E.A.; Anderson, R.; Killeen, I.J.; Regan, E.C.
Series :	Ireland Red List series, NPWS
Year :	2010
Title :	Ireland Red List No. 4: Butterflies
Author :	Regan, E.C.; Nelson, B.; Aldwell, B.; Bertrand, C.; Bond, K.; Harding, J.; Nash, D.; Nixon, D.; Wilson, C.J.
Series :	Ireland Red List series, NPWS
Year :	2010
Title :	A technical manual for monitoring white-clawed crayfish (*Austropotamobius pallipes*) in Irish lakes
Author :	Reynolds, J.; O'Connor, W.; O'Keeffe, C.; Lynn, D.
Series :	Irish Wildlife Manuals, No.45
Year :	2012
Title :	Ireland Red List No. 8: Bryophytes
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	Ireland Red List series, NPWS
Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 2. Habitats assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2015
Title :	Habitats Directive Annex I lake habitats: a working interpretation for the purposes of site-specific conservation objectives and Article 17 reporting
Author :	O Connor, Á.
Series :	Unpublished document by NPWS

Year :	2016
Title :	Ireland Red List No. 10: Vascular Plants
Author :	Wyse Jackson, M.; FitzPatrick, Ú.; Cole, E.; Jebb, M.; McFerran, D.; Sheehy Skeffington, M.; Wright, M.
Series :	Ireland Red Lists series, NPWS
Year :	2019
Title :	The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2019
Title :	Checklists Protected and Threatened Species in Ireland 2019
Author :	Nelson, B.; Cummins, S.; Fay, L.; Jeffrey, R.; Kelly, S.; Kingston, N.; Lockhart, N.; Marnell, F.; Tierney, D.; Wyse Jackson, M.
Series :	Irish Wildlife Manuals, No. 116
Year :	2020
Title :	Marl Lake (Habitat 3140) Survey and Assessment Methods Manual
Author :	Roden, C.; Murphy, P.; Ryan, J.; Doddy, P.
Series :	Irish Wildlife Manuals, No. 125
Year :	2020
Title :	Benthic vegetation in Irish marl lakes: monitoring habitat 3140 condition 2011 to 2018
Author :	Roden, C.; Murphy, P.; Ryan, J.
Series :	Irish Wildlife Manuals, No. 124
Year :	2020
Title :	Benthic vegetation in Irish marl lakes: monitoring habitat 3140 condition 2011 to 2018. Appendix III, Site Reports
Author :	Roden, C.; Murphy, P.; Ryan, J.
Series :	Irish Wildlife Manuals, No. 124
Year :	2021
Title :	Checklists Protected and Threatened Species in Ireland. Version 2.1. 3 December 2021
Author :	Nelson, B.; Cummins, S.; Fay, L.; Jeffrey, R.; Kelly, S.; Kingston, N.; Lockhart, N.; Marnell, F.; Tierney, D.; Wyse Jackson, M.
Series :	Irish Wildlife Manuals, No. 116
Year :	2021
Title :	White-clawed Crayfish *Austropotamobius pallipes* survey in designated SACs in 2017
Author :	Gammell, M.; McFarlane, A.; Brady, D.; O'Brien, J.; Mirimin, L.; Graham, C.; Lally, H.; Minto, C.; O'Connor, I.
Series :	Irish Wildlife Manuals, No. 131
Year :	in prep.
Title :	Scoping study and pilot survey of fens
Author :	O'Neill, F.H.; Perrin, P.M.; Denyer, J.; Martin, J.R.; Daly, O.H.; Brophy, J.T.
Series :	Irish Wildlife Manuals

Other References

Year :	1982
Title :	Eutrophication of waters. Monitoring assessment and control
Author :	OECD
Series :	OECD, Paris

Year :	1987
Title :	A method for evaluating wetlands - a case study on the Finn river catchment, County Monaghan, Ireland
Author :	Lockhart, N.D.
Series :	Irish Geography, 20: 75-81
Year :	1992
Title :	The Northern Ireland Lakes Survey
Author :	Wolfe-Murphy, S.A.; Lawrie, E.W.; Smith, S.J.; Gibson, C.E.
Series :	Report to Countryside and Wildlife Branch, Department of the Environment for Northern Ireland
Year :	2009
Title :	The marl lakes of the British Isles
Author :	Pentecost, A.
Series :	Freshwater Reviews, 2(1): 167-197
Year :	2011
Title :	Review and revision of empirical critical loads and dose-response relationships. Proceedings of an expert workshop, Noordwijkerhout, 23-25 June 2010
Author :	Bobbink, R.; Hettelingh, J.P.
Series :	RIVM report 680359002, Coordination Centre for Effects, National Institute for Public Health and the Environment (RIVM)
Year :	2011
Title :	The Fen Management Handbook
Author :	McBride, A.; Diack, I.; Droy, N.; Hamill, B.; Jones, P.; Schutten, J.; Skinner, A.; Street, M. (eds.)
Series :	Scottish Natural Heritage, Perth
Year :	2014
Title :	Tellus Investigation of Wetland Ecology and Geochemistry (TIWEG) Final Report
Author :	Flynn, R.; McKernan, R.; O'Leary, Á.; Rolston, A.; McCarthy, V.
Series :	Tellus Border report
Year :	2014
Title :	Tellus Border Wetland Project: an ecohydrological investigation of wetlands in the border region of Ireland
Author :	McCarthy, V.; Rolston, A.
Series :	Tellus Border report
Year :	2015
Title :	Magheraveely Marl Loughs SAC Conservation Objectives. V2
Author :	McKeown, R.
Series :	Department of Agriculture, Environment and Rural Affairs, Northern Ireland
Year :	2016
Title :	A narrative for conserving freshwater and wetland habitats in England
Author :	Mainstone, C.; Hall, R.; Diack, I.
Series :	Natural England Research Reports Number 064
Year :	2018
Title :	Irish Vegetation Classification: Technical Progress Report No. 4
Author :	Perrin, P.
Series :	Report submitted to National Biodiversity Data Centre
Year :	2019
Title :	Crayfish (*Austropotamobius pallipes*) surveys in the Magheraveely/Kilroosky Lake Custer SAC 2019
Author :	CANN (Collaborative Action for the Natura Network)
Series :	Unpublished report for EU INTERREG project CANN

Year :	2020
Title :	Magheraveely Marl Lakes - Kilroosky Lough Cluster. Macrophytes and Water Chemistry Trends. Confidential draft
Author :	Stewart, N.F.; McElarney, Y.R
Series :	Internal CANN project report
Year :	2020
Title :	White-clawed crayfish (*Austropotamobius pallipes*) stock assessment on the 'Horseshoe lake' (Kilroosky Lough ASSI)
Author :	CANN (Collaborative Action for the Natura Network)
Series :	Unpublished report for EU INTERREG project CANN
Year :	2021
Title :	White-clawed crayfish (*Austropotamobius pallipes*) stock assessment on the 'Horseshoe lake' (Kilroosky Lough ASSI). June 2021
Author :	CANN (Collaborative Action for the Natura Network)
Series :	Unpublished report for EU INTERREG project CANN
Year :	2021
Title :	White-clawed crayfish (*Austropotamobius pallipes*) stock assessment on the 'Horseshoe Lake' (Kilroosky Lough ASSI). August 2021
Author :	CANN (Collaborative Action for the Natura Network)
Series :	Unpublished report for EU INTERREG project CANN
Year :	2021
Title :	White-clawed crayfish (*Austropotamobius pallipes*) stock assessment on the 'Dummy's Lough' (Kilroosky Lough Cluster SAC). August/September 2021
Author :	CANN (Collaborative Action for the Natura Network)
Series :	Unpublished report for EU INTERREG project CANN
Year :	2021
Title :	Kilroosky Lough Cluster SAC CANN Habitat Mapping Report
Author :	AFBI (Agri-Food and BioSciences Institute)
Series :	Unpublished report for EU INTERREG project CANN

Spatial data sources

Year :	2021
Title :	OSi Prime 2 water polygon file
GIS Operations :	WaterPolygons feature class clipped to the SAC boundary. Expert opinion used to identify Annex I habitat and to resolve any issues arising
Used For :	3140 (map 2)
Year :	2021
Title :	Kilroosky Lough Cluster SAC CANN Habitat Mapping Report
GIS Operations :	Dataset clipped to SAC boundary; QIs selected; Expert opinion used as necessary to resolve any issues arising
Used For :	7210, 7230 (map 3)
Year :	2021
Title :	NPWS rare and threatened species database
GIS Operations :	Dataset created from spatial references in database records. Expert opinion used as necessary to resolve any issues arising
Used For :	1092 (map 4)

3140 Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.

To restore the favourable conservation condition of Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. in Kilroosky Lough Cluster SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Habitat 3140 occurs in a series of small marl lakes, Summerhill, Burdautien, Kilroosky and Dummy's Loughs. All are cross-border and most are protected in Northern Ireland in Magheraveely Marl Loughs SAC. The lakes in the SAC were assessed as in bad conservation condition and habitat 3140 was in bad, deteriorating conservation status across Ireland in the two reporting periods, 2007-2018 (NPWS, 2013, 2019). CANN project survey work showed charophyte abundance had significantly declined in the four lakes in 2018, with plants restricted to areas adjacent to calcareous fen or open patches in swamp (Stewart and McElarney, 2020). The lake surface area is the simplest measure of extent and should be stable or increasing. It may also be possible to estimate the area of the vegetation zones that typify the habitat. For further information on all attributes see Roden et al. (2020) and O Connor (2015). See Pentecost (2009) and Roden et al. (2020) for an overview of Irish and British marl lakes
Habitat distribution	Occurrence	No decline, subject to natural processes	In the SAC, habitat 3140 is found in Summerhill, Burdautien, Kilroosky and Dummy's Loughs, a series of small, cross-border, inter-drumlin, kettle-hole, marl lakes, on predominantly limestone substrate, fed by lime-rich water. See map 2. It may have formerly occurred in Ramages Lough, which was altered by drainage and some infilling. The lakes are protected in Kilroosky Lough Cluster SAC in Ireland and in Magheraveely Marl Loughs SAC (UK0016621) (and as ASSIs) in Northern Ireland; however, the boundaries of the SACs in the two jurisdictions do not match exactly. Habitat 3140 was surveyed in Summerhill in 2012 (Roden et al., 2020) and in all four lakes in 2018 for the CANN project. Other surveys have included (Wolfe-Murphy et al., 1992; McCarthy and Rolston, 2014; Lockhart, 1987; Ní Lamhna, 1984; Douglas and Lockhart, 1983). Further data may also be available from NIEA (condition monitoring) and, for Summerhill Lough, from the EPA (Water Framework Directive monitoring)
Vegetation composition: typical species	Occurrence	Typical species present, in good condition, and demonstrating typical abundances and distribution; restore condition and extent of typical charophyte species	While charophyte diversity had not decreased in 2018, charophytes were restricted in distribution and had low abundance, and higher plants dominated the flora (Stewart and McElarney, 2020). Roden et al. (2020) found no charophytes on the 2012 Summerhill transect. The following typical charophytes have been recorded: Summerhill: *Chara aculeolata, C. contraria* var. *contraria, C. globularis, C. hispida, C. rudis, C. vulgaris*; Burdautien: *C. aculeolata, C. curta, C. hispida, C. virgata, C. vulgaris*; Kilroosky: *C. aculeolata, C. contraria* var. *contraria, C. globularis, C. hispida, C. rudis, C. virgata, C. vulgaris, Nitella flexilis* agg.; Dummy's: *C. aculeolata, C. contraria* vars *contraria* and *hispidula, C. hispida*. Habitat 3140 typical species include cyanobacteria, algae, higher plants and water beetles (see NPWS, 2013, 2019 and O Connor, 2015). Roden et al. (2020) list species present in marl lakes in good condition

Vegetation composition: characteristic zonation	Occurrence	Restore characteristic charophyte and crust zones	Charophytes had declined significantly in all four lakes in 2018 and were confined to areas protected from the main water body, adjacent to calcareous fen, frequently in open patches within swamp (Stewart and McElarney, 2020). The 2012 Summerhill transect had no characteristic zones (Roden et al., 2020). Charophyte zones were extensive in Kilroosky until at least 2006, but declined significantly by 2014 and were restricted to the north-eastern shore in 2018. Higher plants dominated the lakes in 2018, particularly bands of floating-leaved species *Nuphar lutea, Nymphaea alba, Potamogeton natans*, and a variety of submerged species had expanded (e.g. *Utricularia vulgaris* agg. at Kilroosky). Marl lakes in good condition have four or more characteristic zones, see Roden et al. (2020). Small kettle-hole lakes may show some natural variation from this zonation, including more frequent, but not dominant, submerged vascular plants
Vegetation distribution: maximum depth	Metres	Restore maximum depth of vegetation (euphotic depth), subject to natural processes	Maximum depth of vegetation was 1.5m in Summerhill in 2012; however, no charophytes occurred on the transect (Roden et al., 2020). Charophytes appeared to be restricted to shallow water in 2018 (Stewart and McElarney, 2020). The target for maximum depth of vegetation colonisation (euphotic depth) in marl lakes is >7m (Roden et al., 2020). Euphotic depth is considered to be a key measure of the structure and functions of marl lake vegetation and has been found to exceed 10m in some Irish marl lakes (Roden et al., 2020)
Hydrological regime: water level fluctuations	Metres	Restore appropriate hydrological regime necessary to support the habitat	The lakes in the SAC are largely fed by springs (McCarthy and Rolston, 2014). At Kilroosky, a sluice installed following unauthorised deepening of the outflow to lower the water level was subsequently by-passed (McKeown, 2015). Excavation of the outflow from Burdautien lowered the lake water level in 2018. Fluctuations in lake water level can be amplified by activities such as abstraction and drainage. In undisturbed marl lakes, fluctuations follow predictable seasonal trends and relationships exist with the vegetation zones (Roden et al., 2020). In summer, >90% of the crust zone should be covered and water level should never be lower than the top of the *Chara curta* zone; in winter, all zones should be submerged (Roden et al., 2020). Groundwater normally exerts a strong influence on the hydrology of marl lakes. Increased water level fluctuations can increase wave action, up-root vegetation, increase turbidity, alter the substratum and lead to nutrient release from sediment
Lake substratum quality	Various	Maintain/restore appropriate substratum type, extent and chemistry to support the vegetation	Highly variable surface sediment composition was recorded at Kilroosky (McCarthy and Rolston, 2014). Increased accumulation of nutrients and organic matter in the lake sediments in the SAC may contribute to eutrophication and the observed bad condition of the habitat. In general, marl lakes are dominated by limestone bedrock, calcareous silt and sand, and loose stones (Roden et al., 2020). Deposited peat may indicate excessive sediment inputs and sediment can accumulate phosphorus and release it into the water column (Roden et al., 2020). Further research into acceptable sediment phosphorus concentrations and other aspects of substratum quality in marl lakes would be beneficial

pH and Alkalinity	pH units, mg/l	Maintain appropriate water and sediment pH, alkalinity and cation concentrations to support the habitat, subject to natural processes	Average alkalinity was 130mg/l at Kilroosky (McCarthy and Rolston, 2014). The Environmental Protection Agency (EPA) reported alkalinity of 201 and 196mg/l in Summerhill in 2010-12 and 2013-15, respectively. The lower alkalinity boundary for the habitat may lie between 80 and 100mg/l; however, alkalinity is far higher in most Irish marl lakes, exceeding 200mg/l in some cases (Roden et al., 2020). Acidification is not considered a threat to habitat 3140, but eutrophication can lead to at least temporary increases in pH to toxic levels (>9/9.5 pH units). Maximum pH should be <9.0 pH units, in line with the surface water standards (The European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2019). Further study of the sediment pH, alkalinity and cation concentration may assist in understanding of nutrient cycling
Nutrients	mg/l P; mg/l N	Restore the concentration of nutrients in the water column to sufficiently low levels to support the habitat and its typical species	The EPA reported moderate total phosphorus (TP) status and average concentration of 0.030mg/l in Summerhill in 2010-12, but high TP status in 2013-15. Episodes of elevated TP concentrations have also been reported at Kilroosky since 2012 (Flynn et al., 2014; McCarthy and Rolston, 2014; NIEA/DAERA data). Maxima of 0.04mg/l and 0.08mg/l TP were recorded in Kilroosky and Burdautien respectively (Stewart and McElarney, 2020). Roden et al. (2020) found that most marl lakes in good condition have TP ≤0.01mg/l; this is the target for good condition although vegetation attributes determine the overall conservation condition (Roden et al., 2020). ≤0.01mg/l TP is equivalent to oligotrophic (OECD, 1982) and WFD High Status (The European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2019). WFD high status targets for total ammonia (annual average ≤0.04mg/l N and annual 95th percentile ≤0.09mg/l N) may also be appropriate. Summerhill had high ammonia status 2012-2015
Water colour	mg/l PtCo	Restore appropriate water colour to support the habitat	Water colour in Summerhill was 46mg/l PtCo in 2012 (Roden et al., 2020). Roden et al. (2020) found that water colour (dissolved light-absorbing compounds) is negatively correlated with euphotic depth, charophyte species richness and cover, and positively correlated with vascular plant cover in marl lakes. Roden et al. (2020) set good condition at <15mg/l PtCo; however, the highest conservation value marl lakes in Ireland have very clear waters with colour of <5mg/l PtCo. Roden et al. (2020) also set a TP×Colour Index with a target of <0.1 for good. Increased colour decreases light penetration and reduces the area of macrophyte habitat, particularly at the lower euphotic depths. The primary source of increased colour in Ireland is peatland disturbance, e.g. through overgrazing, afforestation
Dissolved organic carbon (DOC)	mg/l	Maintain/restore appropriate organic carbon levels to support the habitat	Dissolved organic carbon (DOC) in the water column is linked to water colour. It can provide a substrate (food source) for heterotrophic organisms, which can impact directly (e.g. shading) and indirectly (e.g. nutrient release) on the characteristic lake communities. Damage and degradation of peatland, e.g. through afforestation or turf-cutting, leading to decomposition of peat is likely to be the predominant source of dissolved and particulate organic carbon in Ireland. The very high colour recorded in Summerhill Lough in 2012 may have indicated high DOC from catchment sources

Turbidity	Nephelometric turbidity units/ mg/l SS/ other appropriate unit	Maintain/restore appropriate turbidity to support the habitat	Turbidity can significantly affect the quantity and quality of light reaching rooted and attached vegetation and can, therefore, impact on lake habitats. The settlement of higher loads of inorganic or organic material on lake vegetation communities may also have impacts on sensitive, delicate species. Turbidity can increase as a result of re-suspension of material within the lake, higher loads entering the lake, or eutrophication. Turbidity measurement and interpretation is challenging. As a result, it is likely to be difficult to set habitat-specific targets for turbidity in lakes
Transparency	Metres	Restore appropriate Secchi transparency. There should be no decline in Secchi depth/transparency	High colour was recorded in Summerhill in 2012 (Roden et al., 2020) and high chlorophyll concentration in Kilroosky in 2012-2013 (McCarthy and Rolston, 2014), both frequently associated with reduced transparency. Transparency relates to light penetration and, hence, to the depth of colonisation of vegetation. Roden et al. (2020) advised it is preferable to measure euphotic depth directly by observation, but noted that a decreasing trend in Secchi depth indicates declining water quality. Transparency can be affected by phytoplankton blooms, water colour and turbidity. Secchi depth in marl lakes in good condition is generally >6m. The OECD fixed boundary system set transparency targets for oligotrophic lakes of ≥6m annual mean Secchi disk depth and ≥3m annual minimum Secchi disk depth
Attached algal biomass	Algal cover	Maintain/restore trace/absent attached algal biomass (<5% cover)	Locally frequent filamentous algae were recorded at Dummy's Lough in 2018 (Stewart and McElarney, 2020). Filamentous algae have increased at Kilroosky. Nutrient enrichment can favour epiphytic and epipelic algae that can out-compete the submerged vegetation. Roden et al. (2020) noted that occasional blooms of filamentous algae occur in marl lakes in the absence of excess nutrients, especially species of the orders Zygnematales or Oedogoniales, but that drifting masses of *Cladophora* species may indicate a decline in water quality. In general, the cover abundance of attached algae in marl lakes (3140) should be trace/absent (<5% cover)
Fringing habitat: area and condition	Hectares	Restore the area and condition of fringing habitats necessary to support the natural structure and functioning of habitat 3140	*Cladium* and alkaline fens fringe lakes in the SAC (see the conservation objectives for habitats 7210* and 7230 in this volume). Grazing to maintain open, species-rich fen and prevent further encroachment and dominance by dense swamp and woodland is essential for the survival of charophytes in the SAC. Wet woodland and scrub, swamp, species-rich marsh and wet grassland also occur around the lakes. The Near Threatened (Wyse Jackson et al., 2016) *Pyrola rotundifolia* subsp. *rotundifolia* occurs at Kilroosky, as does *Epipactis palustris*, and *Prunus padus* in woodland at Summerhill (Lockhart, 1987; NPWS internal files). Fringing habitats along lakes intergrade with and support the structure and functions of the lake habitat. Equally, fringing wetland habitats are dependent on the lake, particularly its water levels, and support invertebrate and plant communities and species of high diversity and conservation concern. See also Mainstone et al. (2016)

7210 Calcareous fens with Cladium mariscus and species of the Caricion davallianae*

To restore the favourable conservation condition of Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae* in Kilroosky Lough Cluster SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	As part of the CANN (Collaborative Action for the Natura Network) cross-border environment project, Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae* within Kilroosky Lough Cluster SAC was mapped with an area of 0.47ha (AFBI, 2021). See map 3. The habitat in the SAC had previously been surveyed by Foss and Crushell (2007) as part of the Monaghan Fen Survey 2007. See also the conservation objective for Alkaline fens (Annex I habitat code 7230) in this volume
Habitat distribution	Occurrence	No decline, subject to natural processes	Distribution based on mapping from the CANN project (AFBI, 2021). See map 3. *Cladium* fen occurs in an area on the south-east shore of Kilroosky Lough and on the north/north-east side of Summerhill Lough in the SAC
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil pH and nutrient status within natural ranges	Relevant nutrients and their natural ranges are yet to be defined for fen habitats. Increased nutrients can lead to changes in plant and invertebrate species through competition and subsequent structural changes to micro-habitats. These nutrients favour growth of grasses rather than forbs and mosses and leads to a higher and denser sward
Ecosystem function: peat formation	Percentage cover of peat-forming vegetation and water table levels	Maintain active peat formation, where appropriate	In order for peat to form, water levels need to be slightly below or above the soil surface for c.90% of the time
Ecosystem function: hydrology - groundwater levels	Water levels (centimetres); duration of levels; hydraulic gradients; water supply	Maintain, or where necessary restore, appropriate natural hydrological regimes necessary to support the natural structure and functioning of the habitat	Fen habitats require high groundwater levels (i.e. water levels at or above the ground surface) for a large proportion of the calendar year (i.e. duration of mean groundwater level). Fen groundwater levels are controlled by regional groundwater levels in the contributing catchment area (which sustain the hydraulic gradients of the fen groundwater table). Regional abstraction of groundwater may affect fen groundwater levels
Ecosystem function: hydrology - surface water flow	Drain density and form	Maintain, or where necessary restore, as close as possible to natural or semi-natural, drainage conditions	Drainage, either within or surrounding the fen habitat, can result in the drawdown of the groundwater table. The depth, geometry and density of drainage (hydromorphology) will indicate the scale and impact on fen hydrology. Drainage can result in loss of characteristic species and transition to drier habitats. Drying out of the habitat at Kilroosky Lough has been noted (AFBI, 2021)
Ecosystem function: water quality	Various	Maintain, or where necessary restore, appropriate water quality, particularly pH and nutrient levels, to support the natural structure and functioning of the habitat	Fens receive natural levels of nutrients (e.g. iron, magnesium and calcium) from water sources. However, they are generally poor in nitrogen and phosphorus, with the latter tending to be the limiting nutrient under natural conditions. Water supply should be also relatively calcium-rich. See Foss and Crushell (2007) for details of hydrochemical analysis undertaken in the SAC
Vegetation composition: cover of *Cladium mariscus*	Percentage cover at a representative number monitoring stops	Cover of *Cladium mariscus* at least 25%	Attribute and target based on O'Neill et al. (in prep.)
Vegetation composition: typical vascular plants	Percentage cover at a representative number of monitoring stops	Maintain adequate cover of typical vascular plant species	For lists of typical vascular plant species, including high quality indicators, see O'Neill et al. (in prep.)

Vegetation composition: native negative indicator species	Percentage cover at a representative number of monitoring stops	Cover of native negative indicator species at insignificant levels	Negative indicators include species not characteristic of the habitat and species indicative of undesirable activities such as overgrazing, undergrazing, nutrient enrichment, agricultural improvement or impacts on hydrology. Native negative indicators may include *Anthoxanthum odoratum, Epilobium hirsutum, Holcus lanatus, Juncus effusus, Phragmites australis, Ranunculus repens* and *Typha latifolia*. See O'Neill et al. (in prep.)
Vegetation composition: non-native species	Percentage cover at a representative number of monitoring stops	Cover of non-native species less than 1%	Attribute and target based on O'Neill et al. (in prep.). Non-native species can be invasive and have deleterious effects on native vegetation. A low target is set as non-native species can spread rapidly and are most easily dealt with when still at lower abundances
Vegetation composition: trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 10%	Attribute and target based on O'Neill et al. (in prep.). Scrub and trees will tend to invade if fen conditions become drier. Scattered alder (*Alnus glutinosa*) has been noted in the habitat around Summerhill Lough (AFBI, 2021)
Vegetation composition: algal cover	Percentage cover at, and in local vicinity of, a representative number of monitoring stops	Cover of algae less than 2%	Attribute and target based on O'Neill et al. (in prep.). Algal cover is indicative of nutrient enrichment from multiple sources (McBride et al., 2011)
Vegetation structure: vegetation height	Percentage cover at a representative number of monitoring stops	At least 10% of live shoots more than 1m high	Attribute and target based on O'Neill et al. (in prep.)
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of monitoring stops	Cover of disturbed bare ground not more than 10%	Attribute and target based on O'Neill et al. (in prep.). Disturbed bare ground and the loss of characteristic species may result from excessive grazing. Disturbance can include hoof marks, wallows, vehicle and machinery tracks. Excessive disturbance can result in loss of characteristic species and presage erosion for peatlands. At Summerhill Lough, trampling causing worn paths through fen areas to fishing platforms, where further trampling occurs, has been reported (Foss and Crushell, 2007)
Physical structure: tufa formations	Percentage cover in local vicinity of a representative number of monitoring stops	Disturbed proportion of vegetation cover where tufa is present is less than 1%	Attribute and target based on O'Neill et al. (in prep.)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat; maintain features of local distinctiveness, subject to natural processes	This includes species on the Flora (Protection) Order, 2015 and/or Red Lists (Byrne et al., 2009; Regan et al., 2010; Lockhart et al., 2012; Wyse Jackson et al., 2016, etc.; see Nelson et al., 2019, 2021)
Transitional areas between fen and adjacent habitats	Hectares; distribution	Maintain/restore adequate transitional areas to support/protect the *Cladium* fen habitat and the services it provides	In many cases, fens transition to other wetland habitats. It is important that the transitional areas between *Cladium* fen and other habitats are maintained in as natural condition as possible in order to protect the functioning of the fen

7230 Alkaline fens

To restore the favourable conservation condition of Alkaline fens in Kilroosky Lough Cluster SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	As part of the CANN (Collaborative Action for the Natura Network) cross-border environment project, Alkaline fens within Kilroosky Lough Cluster SAC was mapped with an area of 0.22ha (AFBI, 2021). See map 3. The habitat in the SAC had previously been surveyed by Foss and Crushell (2007) as part of the Monaghan Fen Survey 2007. See also the conservation objective for *Cladium* fens (priority Annex I habitat code 7210) in this volume
Habitat distribution	Occurrence	No decline, subject to natural processes	Distribution based on mapping from the CANN project (AFBI, 2021). See map 3. Alkaline fen occurs on the eastern side of Kilroosky Lough and south-west of Dummy's Lough
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil pH and nutrient status within natural ranges	Relevant nutrients and their natural ranges are yet to be defined. However, nitrogen deposition is noted as being relevant to this habitat in NPWS (2013). See also Bobbink and Hettelingh (2011). Increased nutrients can lead to changes in plant and invertebrate species through competition and subsequent structural changes to micro-habitats. These nutrients favour growth of grasses rather than forbs and mosses and leads to a higher and denser sward
Ecosystem function: peat formation	Percentage cover of peat-forming vegetation and water table levels	Maintain active peat formation, where appropriate	In order for peat to form, water levels need to be slightly below or above the soil surface for c.90% of the time
Ecosystem function: hydrology - groundwater levels	Water levels (centimetres); duration of levels; hydraulic gradients; water supply	Maintain, or where necessary restore, appropriate natural hydrological regimes necessary to support the natural structure and functioning of the habitat	Fen habitats require high groundwater levels (i.e. water levels at or above the ground surface) for a large proportion of the calendar year (i.e. duration of mean groundwater level). Fen groundwater levels are controlled by regional groundwater levels in the contributing catchment area (which sustain the hydraulic gradients of the fen groundwater table). Regional abstraction of groundwater may affect fen groundwater levels
Ecosystem function: hydrology - surface water flow	Drain density and form	Maintain, or where necessary restore, as close as possible to natural or semi-natural, drainage conditions	Drainage, either within or surrounding the fen habitat, can result in the drawdown of the groundwater table. The depth, geometry and density of drainage (hydromorphology) will indicate the scale and impact on fen hydrology. Drainage can result in loss of characteristic species and transition to drier habitats
Ecosystem function: water quality	Various	Maintain, or where necessary restore, appropriate water quality, particularly pH and nutrient levels, to support the natural structure and functioning of the habitat	Fens receive natural levels of nutrients (e.g. iron, magnesium and calcium) from water sources. However, they are generally poor in nitrogen and phosphorus, with the latter tending to be the limiting nutrient under natural conditions. Water supply should be also relatively calcium-rich. See Foss and Crushell (2007) for details of hydrochemistry analysis undertaken in the SAC. Some enrichment has been noted in the habitat at Dummy's Lough (AFBI, 2021)
Vegetation composition: community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	The entire diversity of alkaline fen vegetation communities present in the SAC is currently unknown. Information on the vegetation communities associated with alkaline fens is provided in O'Neill et al. (in prep.). See also the Irish Vegetation Classification (Perrin, 2018; www.biodiversityireland.ie/projects/ivc-classification-explorer/)

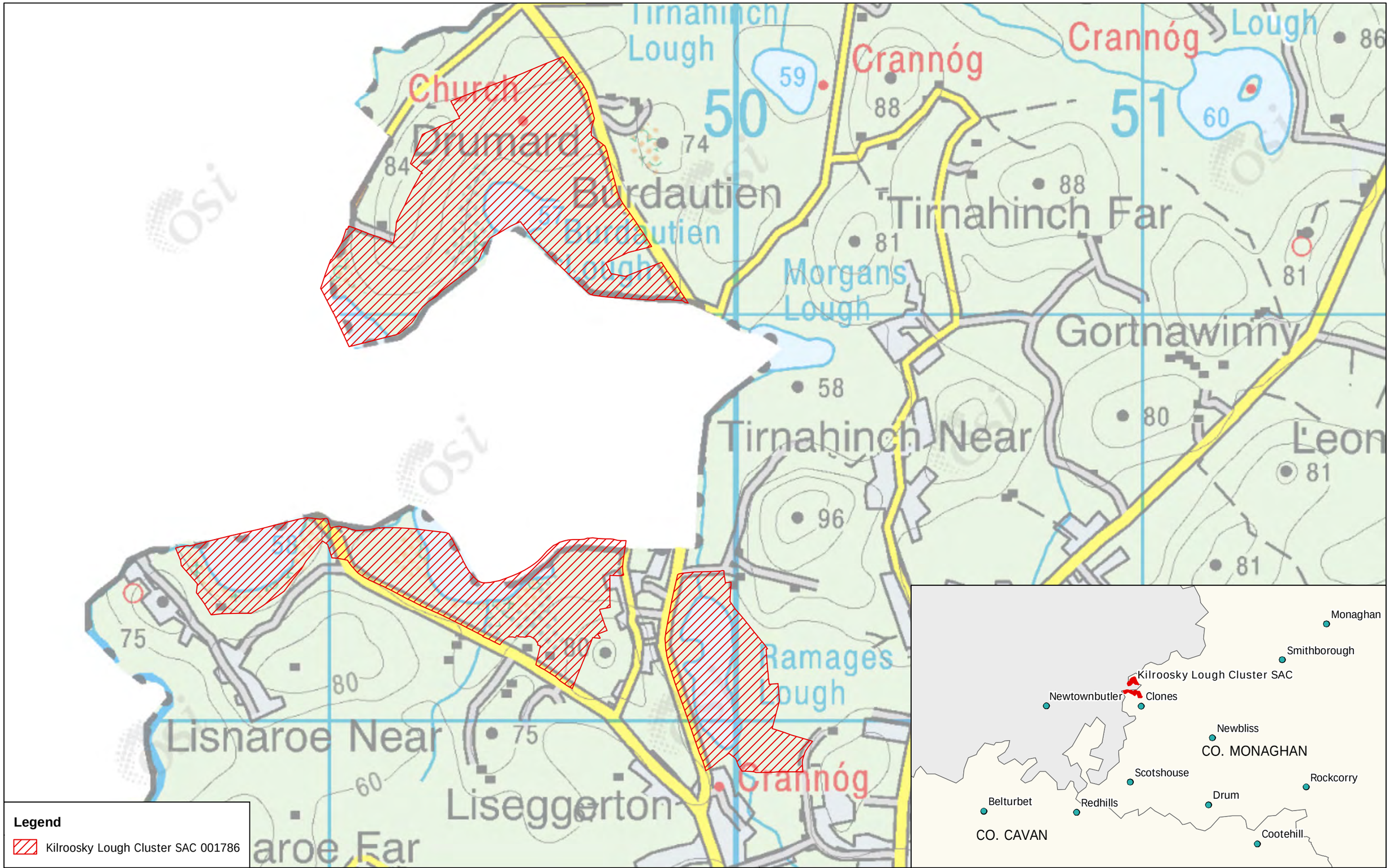
Vegetation composition: typical brown mosses	Percentage cover at a representative number of monitoring stops	Maintain adequate cover of typical brown moss species	For lists of typical bryophyte species for alkaline fen, including high quality indicator species, see O'Neill et al. (in prep.)
Vegetation composition: typical vascular plants	Percentage cover at a representative number of monitoring stops	Maintain adequate cover of typical vascular plant species	For lists of typical vascular plant species for the different vegetation communities, including high quality indicators. see O'Neill et al. (in prep.)
Vegetation composition: native negative indicator species	Percentage cover at a representative number of monitoring stops	Cover of native negative indicator species at insignificant levels	Negative indicators include species not characteristic of the habitat and species indicative of undesirable activities such as overgrazing, undergrazing, nutrient enrichment, agricultural improvement or impacts on hydrology. Native negative indicators may include *Anthoxanthum odoratum, Epilobium hirsutum, Holcus lanatus, Juncus effusus, Phragmites australis* and *Ranunculus repens*. See O'Neill et al. (in prep.)
Vegetation composition: non-native species	Percentage cover at a representative number of monitoring stops	Cover of non-native species less than 1%	Attribute and target based on O'Neill et al. (in prep.). Non-native species can be invasive and have deleterious effects on native vegetation. A low target is set as non-native species can spread rapidly and are most easily dealt with when still at lower abundances
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 10%	Attribute and target based on O'Neill et al. (in prep.). Scrub and trees will tend to invade if fen conditions become drier
Vegetation composition: algal cover	Percentage cover at, and in local vicinity of, a representative number of monitoring stops	Cover of algae less than 2%	Attribute and target based on O'Neill et al. (in prep.). Algal cover is indicative of nutrient enrichment from multiple sources (McBride et al., 2011)
Vegetation structure: vegetation height	Percentage cover at a representative number of monitoring stops	At least 50% of the live leaves/flowering shoots are more than either 5cm or 15cm above ground surface depending on community type	Attribute and target based on O'Neill et al. (in prep.). While grazing may be appropriate in this habitat, excessive grazing can reduce the ability of plant species to regenerate reproductively and maintain species diversity, especially if flowering shoots are cropped during the growing season
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of monitoring stops	Cover of disturbed bare ground not more than 10%	Attribute and target based on O'Neill et al. (in prep.). While grazing may be appropriate in this habitat, excessive areas of disturbed bare ground may develop due to unsuitable grazing regimes. Disturbance can include hoof marks, wallows, human footprints, vehicle and machinery tracks. Excessive disturbance can result in loss of characteristic species and presage erosion for peatlands. In this SAC, heavy grazing by cattle has been reported in the habitat at Kilroosky Lough (AFBI, 2021)
Physical structure: tufa formations	Percentage cover in local vicinity of a representative number of monitoring stops	Disturbed proportion of vegetation cover where tufa is present is less than 1%	Attribute and target based on O'Neill et al. (in prep.)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat; maintain features of local distinctiveness, subject to natural processes	This includes species on the Flora (Protection) Order, 2015 and/or Red Lists (Byrne et al., 2009; Regan et al., 2010; Lockhart et al., 2012; Wyse Jackson et al., 2016, etc.; see Nelson et al., 2019, 2021). The Near Threatened round-leaved wintergreen (*Pyrola rotundifolia* subsp. *rotundifolia*) (Wyse Jackson et al., 2016) has been recorded from the wetland habitats around the shore of Kilroosky Lough in the SAC (NPWS internal files), but cannot be specifically assigned to this habitat in the SAC
Transitional areas between fen and adjacent habitats	Hectares; distribution	Maintain/restore adequate transitional areas to support/protect the alkaline fen habitat and the services it provides	In many cases, fens transition to other wetland habitats. It is important that the transitional areas between fens and other habitats are maintained in as natural condition as possible in order to protect the functioning of the fen

1092 White-clawed Crayfish *Austropotamobius pallipes*

To maintain the favourable conservation condition of White-clawed Crayfish (*Austropotamobius pallipes*) in Kilroosky Lough Cluster SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Number of occupied 1km squares	No reduction from baseline. See map 4	White-clawed crayfish (*Austropotamobius pallipes*) has been reported from the four lakes in the SAC within the 1km grid squares H4827, H4927 and H4928. Most of the records come from Kilroosky Lough, but it is also been reported in each of the other three lakes in the SAC - Burdautien, Dummy's and Summerhill. The species is well-recorded from Kilroosky and it supports the largest population. Dummy's Lough also appears to have a resident population. In 2017, the species was found in Kilroosky Lough, but not Summerhill (Gammell et al., 2021); Dummy's and Burdautien were not surveyed. All four lakes were surveyed by the CANN (Collaborative Action for the Natura Network) project during 2019-2021 and many were found in both Kilroosky and Dummy's Lough, but only a single individual in Burdautien Lough and none in Summerhill Lough (CANN, 2019, 2020, 2021). The status of white-clawed crayfish in these two lakes remains unclear, but would appear not to be significant
Population structure: recruitment	Percentage occurrence of juveniles and females with eggs	Juveniles and females with eggs in at least 50% of positive samples taken at appropriate time and methodology	See Reynolds et al. (2010) for further details. Gammell et al. (2021) found high numbers of juveniles in Kilroosky Lough in 2017
Population size	Catch per unit effort (CPUE)	No reduction from baseline of 1.0 for Kilroosky Lough; no reduction in baseline of 0.5 for Dummy's Lough	Various catch per unit effort (CPUE) figures for Kilroosky Lough are given in O'Connor et al. (2009), Gammell et al. (2021) and CANN (2019, 2020, 2021). The figures vary according to the methodology used, but a CPUE figure of 1 is taken as an appropriate baseline for Kilroosky Lough. The CANN project (CANN 2019, 2021) sampled the white-clawed crayfish population in Dummy's Lough and calculated CPUE figures. Based on this, a CPUE of 0.5 is considered the baseline for Dummy's Lough. These figures may be refined with more detailed assessment of the stocks in both lakes. Each baseline CPUE figure applies to sampling using crayfish traps, sweep netting or night time searches. Hand searching at each site is considered ineffective due to the nature of the shoreline
Negative indicator species	Occurrence	No non-indigenous crayfish species	Non-indigenous crayfish species (NICS) are identified as a major direct threat to the white-clawed crayfish and as a disease vector, in particular crayfish plague (*Aphanomyces astaci*), which is fatal to white-clawed crayfish. The possession, import and intentional release of five species of invasive alien crayfish is banned by Statutory Instrument No. 354/2018
Disease	Occurrence	No instances of disease	Crayfish plague, caused by the water-borne mould *Aphanomyces astaci*, is identified as major threat to the species in Ireland. Instances of crayfish plague have occurred in Ireland since 2015 causing local extinctions. There have been no confirmed or suspected outbreaks in this SAC

Water quality	Water chemistry measures	Maintain appropriate water quality, particularly pH and nutrient levels, to support the natural structure and functioning of the habitat	Water quality status of Summerhill Lough is monitored by the Environmental Protection Agency (EPA) and has been consistently assessed as moderate. There is no regular monitoring of Dummy's, Burdautien or Kilroosky Loughs. White-clawed crayfish is not considered very sensitive of water quality but the species is intolerant of low pH and poorest water quality, and lack of calcareous influence. There should be no decline in the water quality as defined by the targets for the Annex I lake habitat Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. (habitat code 3140), as these are more stringent than white-clawed crayfish requires. See the conservation objective for 3140 in this volume for further details
Habitat quality: heterogeneity	Occurrence of positive habitat features	No decline from the baseline	White-clawed crayfish need high habitat heterogeneity. Larger crayfish must have stones to hide under, or an earthen bank in which to burrow. Hatchlings shelter in vegetation, gravel and among fine tree roots. Smaller crayfish are typically found among weed and debris in shallow water. Larger juveniles in particular may also be found among cobbles and detritus such as leaf litter. These conditions and habitat features must be available on the whole length of occupied habitat. Gammell et al. (2021) scored the habitat heterogeneity and, following this methodology, a baseline score of 0.5 is set



An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 1:
KILROOSKY LOUGH CLUSTER SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

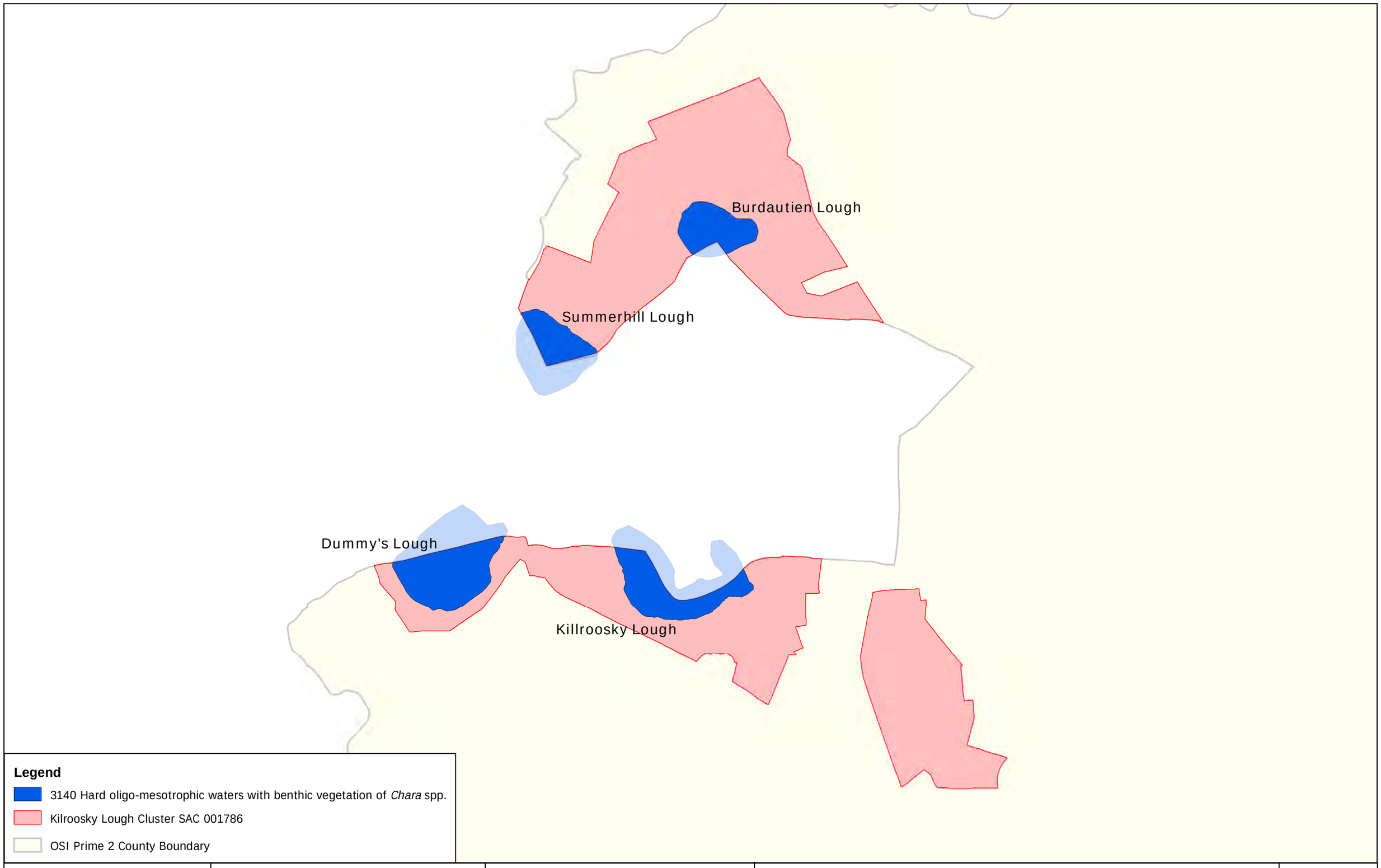
Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 001786; version 3.02.
CO. MONAGHAN

0 0.1 0.2 0.4 Kilometres

N

Date: October 2021



An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 2:
KILROOSKY LOUGH CLUSTER SAC
CONSERVATION OBJECTIVES
INDICATIVE LAKE HABITATS

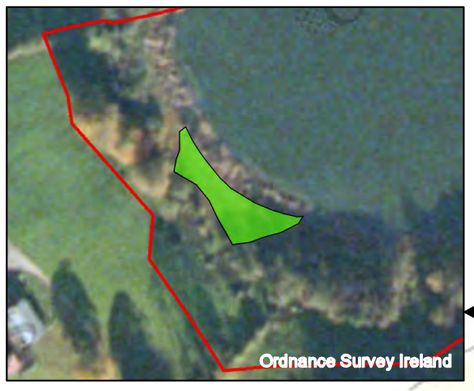
Map to be read in conjunction with the NPWS Conservation Objectives Document

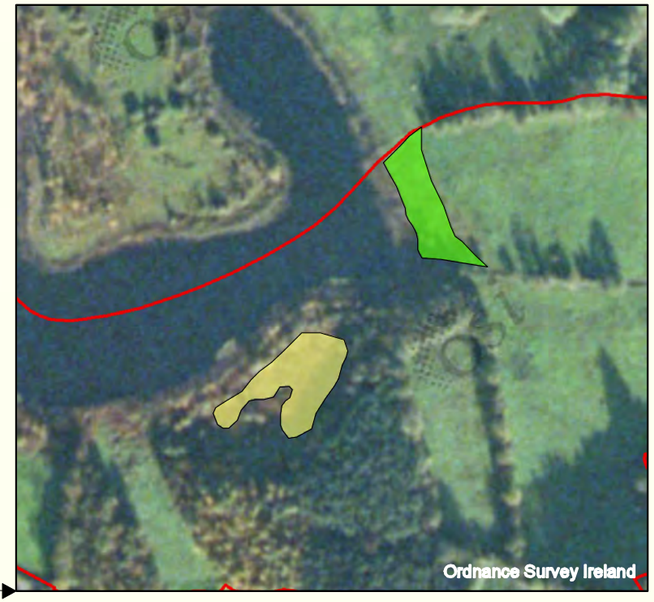
SITE CODE:
SAC 001786; version 3.02.
CO. MONAGHAN

0 0.1 0.2 0.4 Kilometres

N

Date: October 2021





Legend

- 7210 *Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*
- 7230 Alkaline fens
- Kilroosky Lough Cluster SAC 001786
- OSI Prime 2 County Boundary

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 3:
KILROOSKY LOUGH CLUSTER SAC
CONSERVATION OBJECTIVES
FEN HABITATS

Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 001786; version 3.02.
CO. MONAGHAN

0 0.1 0.2 0.4 Kilometres

N

Date: October 2021

H4928

H4827

H4927

Legend

1092 White-clawed crayfish *Austropotamobius pallipes* 1km grid squares

Kilroosky Lough Cluster SAC 001786

Ordnance Survey Ireland

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 4:
KILROOSKY LOUGH CLUSTER SAC
CONSERVATION OBJECTIVES
WHITE-CLAWED CRAYFISH

Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 001786; version 3.02.
CO. MONAGHAN

0 0.125 0.25 0.5 Kilometres

N

Date: October 2021

Conservation objectives for Lough Derg (Donegal) SPA [004057]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Objective: To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:

Bird Code	Common Name	Scientific Name
A183	Lesser Black-backed Gull	*Larus fuscus*
A184	Herring Gull	*Larus argentatus*

Citation: *NPWS (2022) Conservation objectives for Lough Derg (Donegal) SPA [004057]. First Order Site-specific Conservation Objectives Version 1.0. Department of Housing, Local Government and Heritage.*

This First Order Site-specific Conservation Objectives Version 1.0 document replaces the Generic Conservation Objectives Version 9.0 document.

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Lough Eske and Ardnamona Wood SAC 000163

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

National Parks and Wildlife Service,
Department of Culture, Heritage and the Gaeltacht,

90 King Street North, Dublin 7, D07 N7CV, Ireland.

Web: www.npws.ie
E-mail: nature.conservation@chg.gov.ie

Citation:

NPWS (2019) Conservation Objectives: Lough Eske and Ardnamona Wood SAC 000163. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.

Series Editor: Rebecca Jeffrey
ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

000163	Lough Eske and Ardnamona Wood SAC
1029	Freshwater Pearl Mussel *Margaritifera margaritifera*
1106	Salmon *Salmo salar*
3110	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)
7220	Petrifying springs with tufa formation (Cratoneurion)*
6985	Killarney Fern *Vandenboschia speciosa*
91A0	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	1973
Title :	A Report on Areas of Biological and Geological Interest in County Donegal
Author :	Young, R.
Series :	Unpublished report
Year :	2007
Title :	Monitoring Populations of the Freshwater Pearl Mussel, *Margaritifera margaritifera*. 2006 Baseline Survey of the River Eske, County Donegal
Author :	Moorkens, E.
Series :	Unpublished report to NPWS
Year :	2008
Title :	National survey of native woodlands 2003-2008
Author :	Perrin, P.M.; Martin, J.; Barron, S.; O'Neill, F.H.; McNutt, K.E.; Delaney, A.
Series :	Unpublished report to NPWS
Year :	2009
Title :	NS II Freshwater pearl mussel sub-basin management plans: fisheries survey. Stage 1 report
Author :	Paul Johnston Associates
Series :	Unpublished report to NPWS
Year :	2009
Title :	NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Eske
Author :	Moorkens, E.A.
Series :	Unpublished report to NPWS
Year :	2009
Title :	NS2 Freshwater Pearl Mussel Sub-Basin Management Plans. Phytobenthos monitoring of the Eske Catchment, Co. Donegal. (NWIRBD). June 2009
Author :	Ní Chatháin, B.
Series :	Unpublished report to NPWS
Year :	2009
Title :	NS II Freshwater Pearl Mussel Sub-basin Management Plans: Report on Biological Monitoring of Surface Water Quality in Eske Catchment, Co. Donegal
Author :	Williams, L.
Series :	Unpublished report to NPWS
Year :	2010
Title :	A provisional inventory of ancient and long-established woodland in Ireland
Author :	Perrin, P.M.; Daly, O.H.
Series :	Irish Wildlife Manuals, No. 46
Year :	2010
Title :	Second Draft Eske Freshwater Pearl Mussel Sub-basin Management Plan (2009-2015). March 2010
Author :	NPWS
Series :	Unpublished document to the Department of the Environment, Heritage and Local Government
Year :	2013
Title :	Conservation status assessment for petrifying springs
Author :	Lyons, M.D.; Kelly, D.L.
Series :	Unpublished report to NPWS

Year :	2013
Title :	Results of a monitoring survey of old sessile oak woods and alluvial forests
Author :	O'Neill, F.H.; Barron, S.J.
Series :	Irish Wildlife Manuals, No. 71
Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 2. Habitats assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2015
Title :	Habitats Directive Annex I lake habitats: a working interpretation for the purposes of site-specific conservation objectives and Article 17 reporting
Author :	O Connor, Á.
Series :	Unpublished document by NPWS
Year :	2015
Title :	Monitoring methods for the Killarney fern (*Trichomanes speciosum* Willd.) in Ireland
Author :	Ní Dhúill, E.; Smyth, N.; Waldren, S.; Lynn, D.
Series :	Irish Wildlife Manuals, No. 82
Year :	2016
Title :	Monitoring guidelines for the assessment of petrifying springs in Ireland
Author :	Lyons, M.D.; Kelly, D.L.
Series :	Irish Wildlife Manuals, No. 94
Year :	2016
Title :	Ireland Red List No. 10: Vascular Plants
Author :	Wyse Jackson, M.; FitzPatrick, Ú.; Cole, E.; Jebb, M.; McFerran, D.; Sheehy Skeffington, M.; Wright, M.
Series :	Ireland Red List Series, NPWS
Year :	2017
Title :	Survey and Condition Assessment of the population of the freshwater mussel *Margaritifera margaritifera* in the River Eske, County Donegal. 2014-2016
Author :	Moorkens, E.
Series :	Unpublished report to NPWS
Year :	2019
Title :	The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2019
Title :	The Status of EU Protected Habitats and Species in Ireland. Volume 3: Species Assessments
Author :	NPWS
Series :	Conservation assessments
Year :	in prep.
Title :	The monitoring and assessment of four EU Habitats Directive Annex I woodland habitats
Author :	Daly, O.H.; O'Neill, F.H.; Barron, S.J.
Series :	Irish Wildlife Manuals
Year :	in prep.
Title :	A study of the mixed *Najas flexilis* lake habitat (3130), 2015-2018
Author :	Roden, C.; Murphy, P.; Ryan, J.
Series :	Unpublished report to NPWS

Year :	in prep.
Title :	Monitoring and assessment of Killarney Fern (*Vandenboschia speciosa* (Willd.) Kunkel) in Ireland, 2015-2018
Author :	Ní Dhúill, E.; O'Neill, F.H.; Hodd, R.
Series :	Irish Wildlife Manuals

Other References

Year :	1898
Title :	The Flora of the County Donegal
Author :	Hart, H.C.
Series :	Sealy Bryers and Walker, Dublin. David Nutt, 270 & 271 Strand W.C., London
Year :	1982
Title :	Eutrophication of waters. Monitoring assessment and control
Author :	OECD
Series :	OECD, Paris
Year :	1996
Title :	The distribution and ecology of the freshwater pearl mussel, *Margaritifera margaritifera* L. 1758, in County Donegal, Ireland and implications for its conservation
Author :	Beasley, C.R.
Series :	Unpublished Ph.D. thesis, The Queen's University of Belfast
Year :	2000
Title :	Colour in Irish lakes
Author :	Free, G.; Allott, N.; Mills, P.; Kennelly, C.; Day, S.
Series :	Verhandlungen Internationale Vereinigung für theoretische und angewandte Limnologie, 27: 2620-2623
Year :	2001
Title :	Aquatic plants in Britain and Ireland
Author :	Preston, C.D.; Croft, J.M.
Series :	Harley Books, Colchester
Year :	2002
Title :	Reversing the habitat fragmentation of British woodlands
Author :	Peterken, G.
Series :	WWF-UK, London
Year :	2002
Title :	Deterioration of Atlantic soft water macrophyte communities by acidification, eutrophication and alkalinisation
Author :	Arts, G.H.P.
Series :	Aquatic Botany, 73: 373-393
Year :	2006
Title :	The status of host fish populations and fish species richness in European freshwater pearl mussel (*Margaritifera margaritifera*) streams
Author :	Geist, J.; Porkka, M.; Kuehn, R.
Series :	Aquatic Conservation: Marine and Freshwater Ecosystems, 16: 251-266
Year :	2006
Title :	A reference-based typology and ecological assessment system for Irish lakes. Preliminary investigations. Final report. Project 2000-FS-1-M1 Ecological assessment of lakes pilot study to establish monitoring methodologies EU (WFD)
Author :	Free, G.; Little, R.; Tierney, D.; Donnelly, K.; Coroni, R.
Series :	Environmental Protection Agency, Wexford

Year :	2009
Title :	The identification, characterization and conservation value of isoetid lakes in Ireland
Author :	Free, G.; Bowman, J.; McGarrigle, M.; Little, R.; Coroni, R.; Donnelly, K.; Tierney, D.; Trodd, W.
Series :	Aquatic Conservation: Marine and Freshwater Ecosystems, 19(3): 264-273
Year :	2009
Title :	A survey of the *Margaritifera margaritifera* (L.) population in a section of the Eske River at Clardrumnaghan Bridge (Thrushbank), County Donegal
Author :	Ross, E.
Series :	Unpublished report for Donegal County Council
Year :	2010
Title :	Water Quality in Ireland 2007-2009
Author :	McGarrigle, M.; Lucey, J.; Ó Cinnéide, M.
Series :	Environmental Protection Agency, Wexford
Year :	2014
Title :	Assessing near-bed velocity in a recruiting population of the endangered freshwater pearl mussel (*Margaritifera margaritifera*) in Ireland
Author :	Moorkens, E.; Killeen, I.
Series :	Aquatic Conservation: Marine and Freshwater Ecosystems, 24(6): 853-862
Year :	2015
Title :	Water Quality in Ireland 2010-2012
Author :	Bradley, C.; Byrne, C.; Craig, M.; Free, G.; Gallagher, T.; Kennedy, B.; Little, R.; Lucey, J.; Mannix, A.; McCreesh, P.; McDermott, G.; McGarrigle, M.; Ní Longphuirt, S.; O'Boyle, S.; Plant, C.; Tierney, D.; Trodd, W.; Webster, P.; Wilkes, R.; Wynne, C.
Series :	Environmental Protection Agency, Wexford
Year :	2015
Title :	The flora and conservation status of petrifying springs in Ireland
Author :	Lyons, M.D.
Series :	Unpublished Ph.D. thesis, Trinity College Dublin
Year :	2016
Title :	Irish Vegetation Classification: Technical Progress Report No. 2
Author :	Perrin, P.
Series :	Report submitted to National Biodiversity Data Centre
Year :	2017
Title :	Water Quality in Ireland 2010-2015
Author :	Fanning, A.; Craig, M.; Webster, P.; Bradley, C.; Tierney, D.; Wilkes, R.; Mannix, A.; Treacy, P.; Kelly, F.; Geoghegan, R.; Kent, T.; Mageean, M.
Series :	Environmental Protection Agency, Wexford
Year :	2019
Title :	The Status of Irish Salmon Stocks in 2018 with Catch Advice for 2019
Author :	Technical Expert Group on Salmon (TEGOS)
Series :	Report of the Technical Expert Group on Salmon (TEGOS) to Inland Fisheries Ireland (IFI)

Spatial data sources

Year :	2008
Title :	OSi 1:5000 IG vector dataset
GIS Operations :	WaterPolygons feature class clipped to the SAC boundary. Expert opinion used to identify Annex I habitat and to resolve any issues arising
Used For :	3110 (map 2)
Year :	Derived 2019
Title :	Internal NPWS files
GIS Operations :	Dataset created from spatial reference contained in files
Used For :	7220 (map 3)
Year :	Revision 2010
Title :	National Survey of Native Woodlands 2003-2008. Version 1
GIS Operations :	QI selected; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	91A0 (map 4)
Year :	2019
Title :	NPWS rare and threatened species database
GIS Operations :	Dataset created from spatial references in database records. Expert opinion used as necessary to resolve any issues arising
Used For :	1029 (map 5)
Year :	Revision 2012
Title :	Margaritifera Sensitive Areas data
GIS Operations :	Relevant catchment boundary identified. Expert opinion used as necessary to resolve any issues arising
Used For :	1029 (map 5)

3110 Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)

To restore the favourable conservation condition of Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) in Lough Eske and Ardnamona Wood SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Lake habitat 3110 occurs in Lough Eske (see map 2) in Lough Eske and Ardnamona Wood SAC. Habitat 3130 is also considered to occur in the lake. Sources for aquatic plant records for the lakes in the SAC include NPWS internal files and N.F. Stewart and C.D. Preston records made for Preston and Croft (2001). It was briefly surveyed as part of an on-going study of slender naiad (*Najas flexilis*) lakes (Roden et al., in prep.). Lough Eske is on the Water Framework Directive (WFD) monitoring programme and regular macrophyte surveys are conducted by the Environmental Protection Agency (EPA). Two measures of extent should be used: 1. the area of the lake itself and 2. the extent of the vegetation communities/zones that typify the habitat. Further information relating to all attributes is provided in the lake habitats supporting document for the purposes of site-specific conservation objectives and Article 17 reporting (O Connor, 2015)
Habitat distribution	Occurrence	No decline, subject to natural processes	As noted above, lake habitat 3110 occurs in Lough Eske in the SAC. See map 2
Vegetation composition: typical species	Occurrence	Typical species present, in good condition, and demonstrating typical abundances and distribution	See NPWS (2013, 2019) and O Connor (2015) for lists of typical plant species. In 1990 N.F. Stewart and C.D. Preston recorded: SW Bay- *Equisetum fluviatile, Isoetes* sp., *Juncus bulbosus, Littorella uniflora, Lobelia dortmanna, Mentha aquatica, Myriophyllum alterniflorum, Nymphaea alba, Phalaris arundinacea, Potamogeton berchtoldii, P. natans, P.* x *nitens, Ranunculus flammula, Chara virgata, Nitella flexilis*; Harvey's Point- *Osmunda regalis, Alisma plantago-aquatica, Baldellia ranunculoides, Caltha palustris, Carex rostrata, Cladium mariscus, Comarum palustre, Eleocharis multicaulis, Eleogiton fluitans, Juncus bulbosus, Littorella uniflora, Lobelia dortmanna, Lythrum salicaria, Mentha aquatica, Myriophyllum alterniflorum, Nymphaea alba, Phragmites australis, Potamogeton natans, Utricularia intermedia* agg., *Chara virgata, Nitella flexilis*. Roden et al. (in prep.) recorded 28 species such as *I. echinospora, P. praelongus, P. perfoliatus*
Vegetation composition: characteristic zonation	Occurrence	All characteristic zones should be present, correctly distributed and in good condition	Further work is necessary to describe the characteristic zonation and other spatial patterns in lake habitat 3110 (see O Connor, 2015). Roden et al. (in prep.) noted simple vegetation structure in Lough Eske: a *Littorella-Lobelia* shore zone with patches of *Phragmites, Schoenoplectus* and *Equisetum fluviatile* in sheltered bays; below 1m to the base of the euphotic zone, *Isoetes lacustris* is dominant; occasional plants of *Potamogeton berchtoldii* and *Nitella translucens* occur down to 3m. The absence of a *Nitella*-dominated zone below the *Isoetes* band may indicate declining conservation condition (Roden et al., in prep.) and habitat 3130 was categorised as Poor in Lough Eske for 2013-2018 (NPWS, 2019). Additional information on vegetation zonation in the SAC may be available from EPA surveys and other sources

Vegetation distribution: maximum depth	Metres	Maintain maximum depth of vegetation, subject to natural processes	The maximum depth of vegetation is likely to be specific to the lake shoreline in question. Roden et al. (in prep.) recorded a maximum vegetation depth of 3m. Further work is necessary to develop indicative targets for lake habitat 3110. Maximum depth should be large in 3110 lakes; however, pressures such as eutrophication, overgrazing, forestry and peat-cutting can lead to reduced vegetation depth
Hydrological regime: water level fluctuations	Metres	Maintain appropriate hydrological regime necessary to support the habitat	Fluctuations in lake water level are typical in Ireland, but can be amplified by activities such as abstraction, drainage and overgrazing. Increased water level fluctuations can increase wave action, up-root vegetation, increase turbidity, alter the substratum and lead to release of nutrients from the sediment. The hydrological regime of the lakes must be maintained so that the area, distribution and depth of the lake habitat and its constituent/characteristic vegetation zones and communities are not reduced
Lake substratum quality	Various	Maintain appropriate substratum type, extent and chemistry to support the vegetation	Research is required to further characterise the substratum types (particle size and origin) and substratum quality (notably pH, calcium, iron and nutrient concentrations) favoured by each of the five Annex I lake habitats in Ireland. It is likely that lake habitat 3110 is associated with a range of nutrient-poor substrates, from stones, cobble and gravel, through sands, silt, clay and peat. Substratum particle size is likely to vary with depth and along the shoreline within a single lake. Roden et al. (in prep.) recorded sand, cobbles, silt and rock in Lough Eske. Additional data on lake substrata in the SAC may be available from EPA surveys and other sources
Water quality: transparency	Metres	Maintain/restore appropriate Secchi transparency. There should be no decline in Secchi depth/transparency	Transparency relates to light penetration and, hence, to the depth of colonisation of vegetation. It can be affected by phytoplankton blooms, water colour and turbidity. Specific targets have yet to be established for lake habitat 3110 (O Connor, 2015). Habitat 3110 is associated with very clear water. The OECD fixed boundary system set transparency targets for oligotrophic lakes of ≥6m annual mean Secchi disk depth, and ≥3m annual minimum Secchi disk depth (OECD, 1982). Free et al. (2009) found high isoetid abundance in lakes with Secchi depths of more than 3m. In this SAC, Free et al. (2006) recorded a Secchi depth of 3.7m in Lough Eske. Roden et al. (in prep.) recorded a Secchi depth of 2.7m
Water quality: nutrients	µg/l P; mg/l N	Maintain/restore the concentration of nutrients in the water column to sufficiently low levels to support the habitat and its typical species	As a nutrient-poor habitat, oligotrophic and WFD 'high' status targets apply. Where a lake has nutrient concentrations that are lower than these targets, there should be no decline within class, i.e. no upward trend in nutrient concentrations. For lake habitat 3110, annual average total phosphorus (TP) concentration should be ≤10µg/l TP, average annual total ammonia concentration should be ≤0.040mg/l N and annual 95th percentile for total ammonia should be ≤0.090mg/l N. See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009. Lough Eske passed the TP target in 2010-12 and 2012-15 (high status) (Bradley et al., 2015; Fanning et al., 2017), but failed in 2007-09 (good status) (McGarrigle et al., 2010)

Water quality: phytoplankton biomass	µg/l chlorophyll *a*	Maintain appropriate water quality to support the habitat, including high chlorophyll *a* status	Oligotrophic and WFD 'high' status targets apply to lake habitat 3110. Where a lake has a chlorophyll *a* concentration that is lower than this target, there should be no decline within class, i.e. no upward trend in phytoplankton biomass. The average growing season (March-October) chlorophyll *a* concentration must be <5.8µg/l. The annual average chlorophyll *a* concentration should be <2.5µg/l and the annual peak chlorophyll *a* concentration should be ≤8.0µg/l. See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009. Lough Eske passed the target (high status) in 2007-09, 2010-12 and 2013-15 (McGarrigle et al., 2010; Bradley et al., 2015; Fanning et al., 2017)
Water quality: phytoplankton composition	EPA phytoplankton composition metric	Maintain appropriate water quality to support the habitat, including high phytoplankton composition status	The EPA has developed a phytoplankton composition metric for nutrient enrichment of Irish lakes. As for other water quality indicators, lake habitat 3110 requires WFD high status
Water quality: attached algal biomass	Algal cover	Maintain trace/absent attached algal biomass (<5% cover)	Nutrient enrichment can favour epiphytic and epipelic algae that can out-compete the submerged vegetation. The cover abundance of attached algae in lake habitat 3110 should, therefore, be trace/absent (<5% cover)
Water quality: macrophyte status	EPA macrophyte metric (The Free Index)	Restore high macrophyte status	Nutrient enrichment can favour more competitive submerged macrophyte species that out-compete the typical and characteristic species for the lake habitat. The EPA monitors macrophyte status for WFD purposes using the 'Free Index'. The target for lake habitat 3110 is high status or an Ecological Quality Ratio (EQR) for lake macrophytes of ≥0.90, as defined in Schedule Five of the European Communities Environmental Objectives (Surface Waters) Regulations 2009. Lough Eske failed the target, having good macrophyte status in 2007-09 and 2010-12 (McGarrigle et al., 2010; Bradley et al., 2015) and moderate status in 2013-15 (Fanning et al., 2017)
Acidification status	pH units; mg/l	Maintain appropriate water and sediment pH, alkalinity and cation concentrations to support the habitat, subject to natural processes	Acidification can impact on species abundance and composition in soft water lake habitats. In Europe, acidification of isoetid lakes can lead to loss of isoetids and dominance by submerged bog mosses (*Sphagnum* spp.) and bulbous rush (*Juncus bulbosus*) (Arts, 2002). The specific requirements of lake habitat 3110, in terms of water and sediment pH, alkalinity and cation concentration, have not been determined. For lakes with habitat 3110, and adopting a precautionary approach based on Arts (2002), minimum pH should not be <5.5 pH units. Maximum pH should be <9.0 pH units, in line with the surface water standards established for soft waters (where water hardness is ≤100mg/l calcium carbonate). See Schedule Five of the European Communities Environmental Objectives (Surface Waters) Regulations 2009. Lough Eske passed the WFD metric in 2007-09, 2010-12 and 2013-15 (McGarrigle et al., 2010; Bradley et al., 2015; Fanning et al., 2017)

Water colour	mg/l PtCo	Maintain/restore appropriate water colour to support the habitat	Increased water colour and turbidity decrease light penetration and can reduce the area of available habitat for lake macrophytes, particularly at the lower euphotic depths. The primary source of increased water colour in Ireland is disturbance to peatland. No habitat-specific or national standards for water colour currently exist. Studies have shown median colour concentrations in Irish lakes of 38mg/l PtCo (Free et al., 2000) and 33mg/l PtCo (Free et al., 2006). It is likely that the water colour in all Irish lake habitats would naturally be <50mg/l PtCo. Water colour can be very low (<20mg/l PtCo or even <10mg/l PtCo) in lakes with habitat 3110, where the peatland in the lake's catchment is intact. In this SAC, Free et al. (2006) reported colour of 27mg/l PtCo in Lough Eske
Dissolved organic carbon (DOC)	mg/l	Maintain appropriate organic carbon levels to support the habitat	Dissolved (and particulate) organic carbon (OC) in the water column is linked to water colour and acidification (organic acids). Increasing DOC in water has been documented across the Northern Hemisphere, including afforested peatland catchments in Ireland. Damage and degradation of peatland, leading to decomposition of peat is likely to be the predominant source of OC in Ireland. OC in water promotes decomposition by fungi and bacteria that, in turn, releases dissolved nutrients. The increased biomass of decomposers can also impact directly on the characteristic lake communities through shading, competition, etc.
Turbidity	Nephelometric turbidity units/ mg/l SS/ other appropriate unit	Maintain appropriate turbidity to support the habitat	Turbidity can significantly affect the quantity and quality of light reaching rooted and attached vegetation and can, therefore, impact on lake habitats. The settlement of higher loads of inorganic or organic material on lake vegetation communities may also have impacts on sensitive, delicate species. Turbidity can increase as a result of re-suspension of material within the lake, higher loads entering the lake, or eutrophication. Turbidity measurement and interpretation is challenging. As a result, it is likely to be difficult to set habitat-specific targets for turbidity in lakes
Fringing habitat: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the natural structure and functioning of lake habitat 3110	Most lake shorelines have fringing habitats of reedswamp, other swamp, fen, marsh or wet woodland that intergrade with and support the structure and functions of the lake habitat. In Lough Eske and Ardnamona Wood SAC, fringing habitats may include freshwater marsh, poor fen, flush, blanket bog, wet and dry heath, and a variety of native woodland and grassland types. Fringing habitats are dependent on the lake, particularly its water levels, and support wetland communities and species of conservation concern. Many of the fringing wetland habitats support higher invertebrate and plant species richness than the lake habitats themselves. Whorled caraway (*Carum verticillatum*) is known from the margins of Lough Eske (Hart, 1898; Young, 1973). There is also a record for six-stamened waterwort (*Elatine hexandra*) in Hart (1898). Both species are Near Threatened in Ireland (Wyse Jackson et al., 2016)

7220 Petrifying springs with tufa formation (Cratoneurion)

To maintain the favourable conservation condition of Petrifying springs with tufa formation (Cratoneurion)* in Lough Eske and Ardnamona Wood SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Square metres	Area stable or increasing, subject to natural processes	The habitat Petrifying springs with tufa formation (Cratoneurion)* has not been surveyed in detail in Lough Eske and Ardnamona Wood SAC and thus the exact total area of the qualifying priority habitat in the SAC is currently unknown. The habitat is known to occur along the north side of the valley of the Lowerymore River in the SAC, notably at White Goat's Island, where it occurs in semi-open terrain within woodland in an area of the river where waterfalls occur. A second area of petrifying springs with tufa formation was also recorded a short distance further downstream on the same river (NPWS internal files). It is important to note that further areas of the habitat may be present within the SAC
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 3 for point location at White Goat's Island	Point distribution (see map 3) is based on NPWS internal files. Note that further areas of the habitat may be present within the SAC. Lyons and Kelly (2016) describe eight plant communities of Irish petrifying springs based on relevé data. It is not currently known which communities occur in the habitat in Lough Eske and Ardnamona Wood SAC. Further information on the vegetation communities associated with this habitat is presented in Lyons and Kelly (2016)
Hydrological regime: height of water table; water flow	Metres; metres per second	Maintain appropriate hydrological regimes	Petrifying springs rely on permanent irrigation, usually from upwelling groundwater sources or seepage sources (Lyons and Kelly, 2013). Water flow should not be altered anthropogenically. See Lyons and Kelly (2016) for further details on this attribute
Water quality - nitrate level	mg/l	No increase from baseline nitrate level and less than 10mg/l	Target based on data from McGarrigle et al. (2010). See Lyons and Kelly (2016) for further details on this attribute
Water quality - phosphate level	µg/l	No increase from baseline phosphate level and less than 15µg/l	Based on data from Lyons (2015). See Lyons and Kelly (2016) for further details on this attribute
Vegetation composition: positive indicator species	Number per spring	At least three positive/high quality indicator species as listed in Lyons and Kelly (2016) and no loss from baseline number	Based on Lyons and Kelly (2016), where the lists of positive and high quality indicator species are presented. A good diversity of bryophytes have been recorded in the habitat at White Goat's Island, including the positive indicator bryophyte species *Palustriella commutata, Eucladium verticillatum* and *Pellia endiviifolia*. Other species recorded include remote sedge (*Carex remota*), herb-robert (*Geranium robertianum*), yellow pimpernel (*Lysimachia nemorum*) and the bryophytes *Conocephalum conicum, Eurhynchium striatum* and *Plagiomnium undulatum* (NPWS internal files)
Vegetation composition: negative indicator species	Cover (DAFOR scale)	Potentially negative indicator species should not be Dominant or Abundant; potentially negative woody species should be absent in unwooded springs; invasive species should be absent	Based on Lyons and Kelly (2016), where the lists of potentially negative herbaceous, bryophyte, algal and woody species are presented. See Lyons and Kelly (2016) also for details on potentially invasive species. If two or more potentially negative bryophyte/alga species are present, and if at least two are Frequent, or at least one is Abundant, then the habitat fails for this attribute. See Lyons and Kelly (2016) for further details. The potentially negative bryophyte species *Cratoneuron filicinum* has been recorded in the habitat in the SAC (NPWS internal files), but at an unknown level of cover

Vegetation structure: sward height	Centimetres	Field layer height between 10cm and 50cm (except for bryophyte-dominated ground <10cm)	Attribute and target based on Lyons and Kelly (2016)
Physical structure: trampling/dung	Cover (DAFOR scale)	Cover should not be Dominant or Abundant	Attribute and target based on Lyons and Kelly (2016)

91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

To maintain the favourable conservation condition of Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles in Lough Eske and Ardnamona Wood SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles is present at Ardnamona Wood in Lough Eske and Ardnamona Wood SAC. Ardnamona Wood is state-owned and protected as a Nature Reserve. As part of the National Survey of Native Woodlands (NSNW), the sub-site Ardnamona Wood (NSNW site code 1427) was surveyed by Perrin et al. (2008). Map 4 shows the surveyed woodland (52.9ha) within the SAC. The surveyed area contains a mosaic of woodland habitats, comprising c.80% 91A0 woodland habitat. Ardnamona Wood (site code 1427) was also included in national monitoring surveys (O'Neill and Barron, 2013; Daly et al., in prep.) and is considered to contain an excellent example of the extreme oceanic variant of 91A0 woodland habitat. It is important to note that further unsurveyed areas may be present within the SAC
Habitat distribution	Occurrence	No decline, subject to natural processes. The surveyed woodland area is shown on map 4	Distribution based on Perrin et al. (2008) and Daly et al. (in prep.). It is important to note that further unsurveyed areas may be present within the SAC
Woodland size	Hectares	Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and "small" woods at least 3ha in size	The target areas for individual woodlands aim to reduce habitat fragmentation and benefit those species requiring 'deep' woodland conditions (Peterken, 2002). In some cases, topographical constraints may restrict expansion
Woodland structure: cover and height	Percentage; metres; centimetres	Total canopy cover at least 30%; median canopy height at least 11m; native shrub layer cover 10-75%; native herb/dwarf shrub layer cover at least 20% and height at least 20cm; bryophyte cover at least 4%	The target aims for a diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi-mature trees and shrubs; and well-developed herb layer and ground layer. Assessment criteria are described in Daly et al. (in prep.) and O'Neill and Barron (2013)
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	Described in Perrin et al. (2008). See also the Irish Vegetation Classification (Perrin, 2016; www.biodiversityireland.ie/projects/national-vegetation-database/irish-vegetation-classification)
Woodland structure: natural regeneration	Seedling: sapling: pole ratio	Seedlings, saplings and pole age-classes of target species for 91A0 woodlands and other native tree species occur in adequate proportions to ensure survival of woodland canopy	The target species for 91A0 are sessile oak (*Quercus petraea*) and the hybrid oak *Quercus* x *rosacea*. Assessment criteria are described in Daly et al. (in prep.) and O'Neill and Barron (2013)
Woodland structure: dead wood	Number per hectare	At least 19 stems/ha of dead wood of at least 20cm diameter	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem. Dead wood comprises old senescent trees, standing dead trees, fallen dead wood (including large branches) and rotten stumps of any species. Assessment criteria are described in Daly et al. (in prep.) and O'Neill and Barron (2013)
Woodland structure: veteran trees	Number per hectare	No decline	Veteran trees are important habitats for bryophytes, lichens, saproxylic organisms and some bird species. Their retention is important to ensure continuity of habitats/niches and propagule sources

Woodland structure: indicators of local distinctiveness	Occurrence	No decline	Includes ancient or long-established woodlands (Perrin and Daly, 2010), archaeological and geological features as well as red listed and other rare or localised species. Perrin and Daly (2010) list Ardnamona Wood (NSNW site code 1427) as 'possible ancient woodland'. Ardnamona Wood has been noted as being particularly species-rich. Notably, the rare lichen tree lungwort (*Lobaria pulmonaria*) has been recorded in the old oak woodland in the SAC (NPWS internal files). The Flora (Protection) Order, 2015 (FPO) listed and Vulnerable narrow-leaved helleborine (*Cephalanthera longifolia*) (Wyse Jackson et al., 2016) has also been recorded (NPWS internal files). The Annex II and FPO listed species Killarney fern (*Vandenboschia speciosa*) also occurs in the habitat in the SAC. See the conservation objective for Killarney fern (species code 6985) in this volume
Woodland structure: indicators of overgrazing	Occurrence	All four indicators of overgrazing absent	There are four indicators of overgrazing within 91A0: topiary effect on shrubs and young trees; browse line on mature trees; abundant dung; and severe recent bark stripping (Daly et al., in prep.; O'Neill and Barron, 2013)
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover at least 90% of canopy; target species cover at least 50% of canopy	The target species for 91A0 are sessile oak (*Quercus petraea*) and the hybrid oak *Quercus* x *rosacea* (Daly et al., in prep.; O'Neill and Barron, 2013). Species present reported in Perrin et al. (2008)
Vegetation composition: typical species	Occurrence	At least 1 target species for 91A0 woodlands present; at least 6 positive indicator species for 91A0 woodlands present	A variety of typical native species should be present, depending on woodland type. The target species for 91A0 are sessile oak (*Quercus petraea*) and the hybrid oak *Quercus* x *rosacea*. Positive indicator species for 91A0 are listed in Daly et al. (in prep.) and O'Neill and Barron (2013). Species present reported in Perrin et al. (2008). See also Young (1973)
Vegetation composition: negative indicator species	Occurrence	Negative indicator species cover not greater than 10%; regeneration of negative indicator species absent	Negative indicator species (i.e. any non-native species, including herbaceous species such as montbretia (*Crocosmia* x *crocosmiiflora*)) should be absent or under control. In general, the following are the most common non-native invasive species in 91A0 woodlands: beech (*Fagus sylvatica*), sycamore (*Acer pseudoplatanus*) and rhododendron (*Rhododendron ponticum*). Rhododendron has previously been removed from parts of the woodland (Perrin et al., 2008; NPWS internal files)

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

To restore the favourable conservation condition of Freshwater Pearl Mussel (*Margaritifera margaritifera*) in Lough Eske and Ardnamona Wood SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Kilometres	Maintain/restore distribution at 6.08km. See map 5	The conservation objective applies to the Eske freshwater pearl mussel (*Margaritifera margaritifera*) population. The distribution and abundance of the species in the Eske was mapped in 2006 as part of full, baseline monitoring (Moorkens, 2007). Mussels are distributed throughout the River Eske from Lough Eske to the estuary. Mussels also occurred in Lough Eske in 1994 (Moorkens, 2007). Mussels are abundant in two stretches: from Drumnacarry to the Limestone Brook confluence, and from below the N56 to the Drummenny confluence. Significant mussel kills were recorded in the abundant stretch downstream of the N56 in 2014 and 2016 (Moorkens, 2017). The target is for the species to be sufficiently widespread to maintain itself on a long-term basis as a viable component of the Eske system. See NPWS (2010) for further information
Population size	Number of adult mussels	Restore population to at least 200,000 adult mussels	Moorkens (2007) estimated the Eske population as at least 200,000. Beasley (1996) counted 10,962 mussels at 5 sites along the Eske, with significant within-site variation in mussel density. In 2006, mussel density of up to 240/m² was recorded, while maximum density in transects was 77/m² (Moorkens, 2007). Moorkens (2017) found 24% of quadrats were occupied, average density was 1.8/m² and highest density was 19/m². Habitat is below carrying capacity throughout. Pearl fishing was documented in the past (Beasley, 1996). Moorkens (2007) recorded a significant decline in population between 1994 and 2006. Further losses were noted in 2009 (Moorkens, 2009). Further significant declines were recorded in 2014-2016 (Moorkens, 2017). NPWS (2019) estimated that the population may have declined to as little as 45,000. The target is for the species to be sufficiently abundant to maintain itself on a long-term basis as a viable component of the Eske system
Population structure: recruitment	Percentage per size class	Restore to at least 20% of population no more than 65mm in length; and at least 5% of population no more than 30mm in length	Mussels ≤65mm are 'young mussels' and found buried in the substratum or beneath adult mussels. Mussels ≤30mm are 'juvenile mussels' and always buried in the substratum. See the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 and I.S. EN 16859:2017. The Eske is an ageing population. Beasley (1996) found some mussels of 25-30mm. The smallest mussel was 7mm in 1994, but 67mm in 2006 when the Eske failed both targets (Moorkens, 2007). It failed both targets again in 2009 (no mussels under 75mm) (Moorkens, 2009; NPWS, 2010). Ross (2009) found 4 young mussels: 0% and 0.17% ≤30mm and 1.5% and 0.5% ≤65mm in quadrats and translocation, respectively. No young/juvenile mussels were observed in 2014-16 (Moorkens, 2017). The Eske population is unsustainable owing to lack of survival of juvenile mussels. The target is for sufficient juvenile recruitment to allow the species to maintain itself on a long-term basis as a viable component of the Eske system

Population structure: adult mortality	Percentage	No more than 5% decline from previous number of live adults counted; dead shells less than 1% of the adult population and scattered in distribution	5% is considered the cut-off between the combined errors associated with natural fluctuations and sampling methods and evidence of true population decline. 1% dead shells is indicative of natural losses. The Eske failed both targets in 2014-16 with recent severe decline in live adults and many dead and moribund mussels; 200m estimated in 2006 to have 50,000-75,000 had declined to <6,000 in 2016 (Moorkens, 2017). The Eske also failed both targets in 2009, with some decline in adult numbers since 2006 and excessive dead shells (Moorkens, 2009; NPWS, 2010). The baseline survey also reported a decline in adult numbers between 1994 and 2006 (Moorkens, 2007). The Eske population is unsustainable owing to lack of survival of juvenile mussels and elevated adult mortality. The target is for sufficient survival of adults to allow the species to maintain itself on a long-term basis as a viable component of the Eske system
Suitable habitat: extent	Kilometres	Restore suitable habitat in more than 6.08km in the Eske system (see map 5) and any additional stretches necessary for salmonid spawning	The extent of the freshwater pearl mussel habitat in the Eske River is from Lough Eske to the estuary (Moorkens, 2007, 2009, 2017; NPWS, 2010). The species was also known to occur in Lough Eske near the river's outflow (Moorkens, 2007). The mussel habitat is severely impacted by nutrient-enrichment and sedimentation. Disturbance to the natural hydrological regime, morphological changes and toxic pollution also appear to be significant factors. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Eske system
Suitable habitat: condition	Kilometres	Restore condition of suitable habitat	The species' habitat is a combination of 1) the area of habitat adult and juvenile mussels can occupy; 2) the area of spawning and nursery habitats host fish can occupy. Fish nursery habitat typically overlaps with mussel habitat. Fish spawning habitat is generally adjacent to mussel habitat, but may lie upstream of the generalised mussel distribution. Only spawning areas that can regularly contribute juvenile fish to areas occupied by adult mussels should be considered. Mussel and fish spawning/nursery habitat availability is determined by flow and substratum conditions, and is highly sensitive to hydromorphological, sedimentation and nutrient enrichment pressures from throughout the catchment (map 5). See I.S. EN 16859:2017. Mussel habitat is widespread in the Eske but cannot support sufficient juvenile survival. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Eske system
Water quality: macroinvertebrate and phytobenthos (diatoms)	Ecological quality ratio (EQR)	Restore water quality - macroinvertebrates: EQR greater than 0.90 (Q4-5 or Q5); phytobenthos: EQR greater than 0.93	The EQR targets correspond to high ecological status for these two Water Framework Directive biological quality elements.They represent high water quality with very low nutrient concentrations (oligotrophic conditions). Reaching these targets does not however guarantee achieving the targets for the other attributes. In 2009, the habitat in the Eske system failed the macroinvertebrate target, but passed the diatom target; however, confidence in the diatom result was low owing to early sampling (Ní Chatháin, 2009; Williams, 2009; NPWS, 2010). See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Eske system

Substratum quality: filamentous algae (macroalgae); macrophytes (rooted higher plants)	Percentage	Restore substratum quality- filamentous algae: absent or trace (less than 5%); macrophytes: absent or trace (less than 5%)	Macroalgae and, particularly, macrophytes have increased in the Eske since the 1990s (Moorkens, 2007). In 2014-16, it passed the algal target and failed the macrophyte target, having dense *Ranunculus* growths (Moorkens, 2017). Both targets failed in 2009, macrophyte cover was up to 100% in unshaded mussel habitat and filamentous algae widespread (Moorkens, 2009; Ní Chatháin, 2009; Williams, 2009; NPWS, 2010). Both were also widespread and abundant in 2006, obscuring mussels (Moorkens, 2007). Abundant decaying organic matter/floc has been noted in mussel habitat, with death of in-stream macroalgae/macrophytes the most likely source. Sufficient recruitment of juvenile mussels is being prevented by the poor condition of the river substratum. Algal/macrophyte growths may also be contributing to elevated adult mortality. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Eske system
Substratum quality: sediment	Occurrence	Restore substratum quality- stable cobble and gravel substrate with very little fine material; no artificially elevated levels of fine sediment	The Eske failed the target in 2014-16 and for the Sub-basin Management Plan (NPWS, 2010; Moorkens, 2017). In 2014, Moorkens (pers. comm.) noted very high turbidity throughout the river, downstream of Thrushbank Bridge. Silt infiltration was recorded in 70% of quadrats (Moorkens, 2017). Heavy sedimentation was noted in some mussel habitat in 2009 (Moorkens, 2009; NPWS, 2010). Williams (2009) noted sedimentation in glides and a significant silt plume during kicks at 2 sites on the Eske. Sedimentation of the mussel habitat has provided a rooting medium for macrophytes in the Eske. Sufficient survival of juvenile mussels is being prevented by the poor condition of the river substratum. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Eske system
Substratum quality: oxygen availability	Redox potential	Restore to no more than 20% decline from water column to 5cm depth in substrate	Differences in redox potential between the water column and the substrate correlate with differences in oxygen levels. Juvenile mussels require full oxygenation while buried in gravel. In suitable habitat, there should be very little loss of redox potential between the water column and underlying gravels. See I.S. EN 16859:2017. The Eske failed the redox target in 2014-16 and 2009. In 2014-16, average redox potential was 22% and only 41% of measurements had redox of 20% or less (Moorkens, 2017). In 2009, the average loss was 30.7%, indicating a severe decline of oxygen in the substratum (Moorkens, 2009; NPWS, 2010). Severe redox declines were also measured in 2006 (Moorkens, 2007). The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Eske system

Hydrological regime: flow variability	Metres per second	Restore appropriate hydrological regime	The availability of suitable mussel habitat is largely determined by flow (also catchment geology). To restore the habitat for the species, flow variability over the annual cycle must be such that: 1) high flows can wash fine sediments from the substratum; 2) high flows are not artificially increased so as to cause excessive scour of mussel habitat; 3) low flows do not exacerbate the deposition of fine sediments or growth of algae/macrophytes; 4) low flows do not cause stress to mussels in terms of exposure, water temperatures, food availability or aspects of the reproductive cycle; see Moorkens and Killeen (2014) and I.S. EN 16859:2017. Groundwater inflow to the substratum contributes to water-cycling. Catchment drainage, resulting in hydrological regime change, may be contributing to the decline of the species in the Eske. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Eske system
Host fish	Number	Maintain sufficient juvenile salmonids to host glochidial larvae	Salmonid fish are host to the larval stage of the freshwater pearl mussel and, thus, are essential to completion of the life cycle. 0+ and 1+ fish are typically used, both because of habitat overlaps and the development of immunity with age in fish. Fish presence is sufficient, as higher fish density and biomass is indicative of enriched conditions in mussel rivers. Geist et al. (2006) found that higher densities of host fish coincided with eutrophication, poor substrate quality for mussels and a lack of mussel recruitment, while significantly lower densities and biomass of host fish were associated with high juvenile mussel numbers. Fish movements must be such that 0+ fish remain in the mussel habitat until their 1+ summer. No fish stocking should occur within the mussel habitat, nor any works that may change the salmonid balance or residency time. In May 2009, glochidia were found on salmon but not on trout in the Eske (Johnston, 2009; NPWS, 2010)
Fringing habitat: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the population	Semi-natural and natural riparian habitats, including those along lake fringes, even where they do not form part of a natural floodplain, are an integral part of the structure and functioning of river systems. Open wetlands, e.g. wet heath and blanket bog, are particularly critical to the hydrological regime of mussel rivers. Fringing habitats aid in the settlement of fine suspended material, protect banks from erosion, contribute to nutrient cycling, and to the aquatic food web (e.g. allochthonous matter from poor fens/flushes), and provide habitat (refuge and resources) for life-stages of fish, birds and aquatic invertebrates. Equally, fringing habitats are dependent on rivers/lakes, particularly their water levels, and support wetland communities and species of conservation concern. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Eske system. See the conservation objective for 3110

1106 Salmon *Salmo salar*

To restore the favourable conservation condition of Atlantic Salmon (*Salmo salar*) in Lough Eske and Ardnamona Wood SAC, which is defined by the following list of attributes and targets:

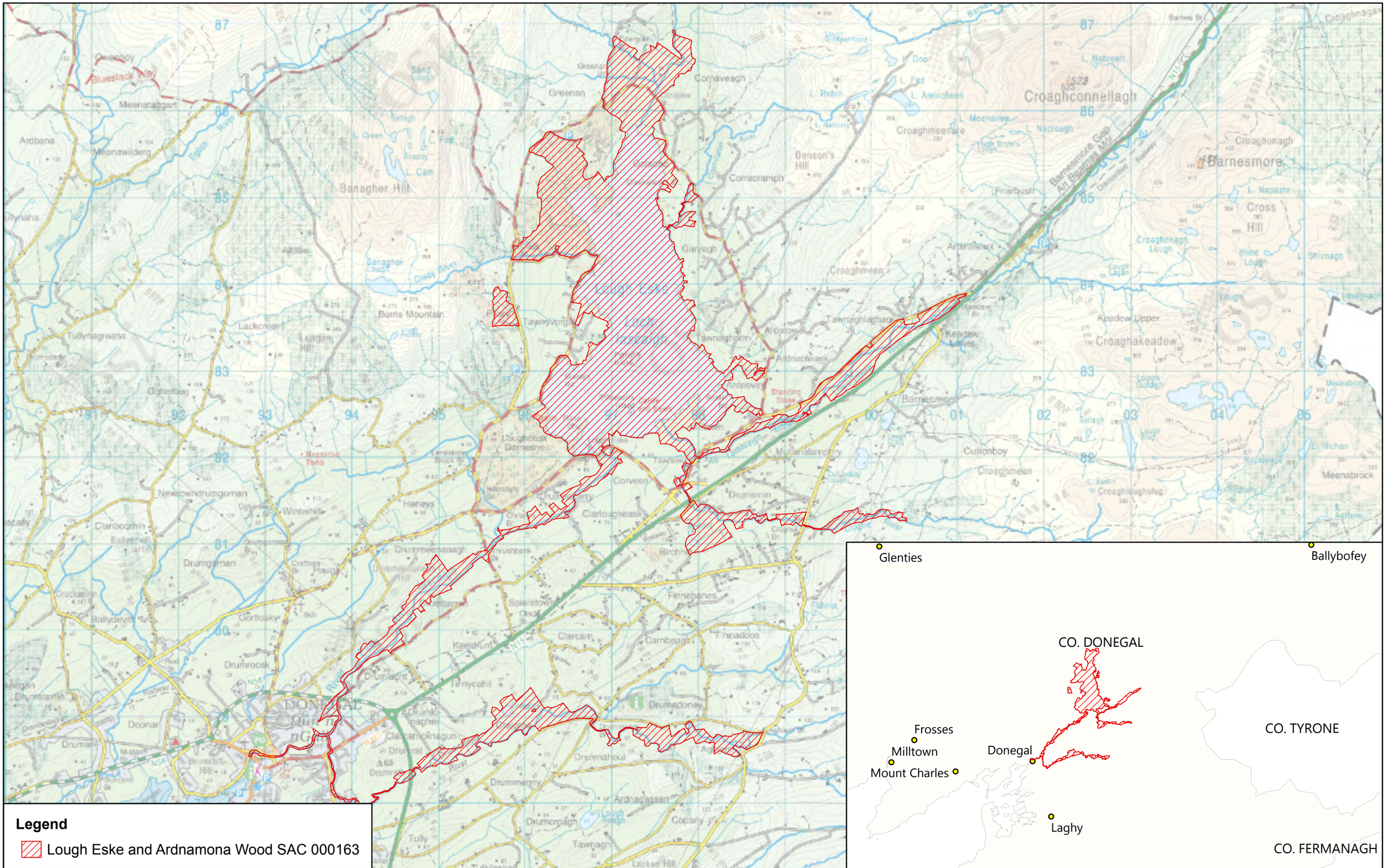
Attribute	Measure	Target	Notes
Distribution: extent of anadromy	Percentage of river accessible	100% of river channels down to second order accessible from estuary	Artificial barriers block salmons' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas
Adult spawning fish	Number	Conservation limit (CL) for each system consistently exceeded	A conservation limit (CL) is defined by the North Atlantic Salmon Conservation Organisation (NASCO) as "the spawning stock level that produces long-term average maximum sustainable yield as derived from the adult to adult stock and recruitment relationship". The target is based on the Technical Expert Group on Salmon's (TEGOS) annual model output of CL attainment levels. See Technical Expert Group on Salmon (2019) for further details. Stock estimates are either derived from direct counts of adults (rod catch, fish counter) or indirectly by fry abundance counts. The fish counter on the River Eske is used as the source of adult salmon run estimates. The Eske is currently below CL, meeting 56% of CL
Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 minutes sampling	Target is threshold value for rivers currently exceeding their conservation limit (CL)
Out-migrating smolt abundance	Number	No significant decline	Smolt abundance can be negatively affected by a number of impacts such as estuarine pollution, predation and sea lice (*Lepeophtheirus salmonis*)
Number and distribution of redds	Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes	Salmon spawn in clean gravels
Water quality	EPA Q value	At least Q4 at all sites sampled by EPA	Q values based on triennial water quality surveys carried out by the Environmental Protection Agency (EPA)

6985 Killarney Fern *Vandenboschia speciosa*

To maintain the favourable conservation condition of Killarney Fern (*Vandenboschia speciosa*) in Lough Eske and Ardnamona Wood SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Occurrence	No loss in geographical spread of populations, subject to natural processes	The population of Killarney fern (*Vandenboschia speciosa* [formerly *Trichomanes speciosum*; species code 1421]) is currently known from locations in Lough Eske and Ardnamona Wood SAC within hectad G98. Exact locations are not mapped here on account of the threat posed by illegal collecting. Based on Ní Dhúill et al. (2015, in prep.), NPWS (2019) and NPWS internal files
Number of populations	Number	No decline, subject to natural processes	One population of the species has been recorded in the SAC since 1960. Based on Ní Dhúill et al. (2015, in prep.), NPWS (2019) and NPWS internal files
Number of colonies	Number	No decline, subject to natural processes	Six colonies of the species have been recorded in the population in the SAC since 1960, five in 2016 and one in 1993. Based on Ní Dhúill et al. (2015, in prep.), NPWS (2019) and NPWS internal files
Population: life-cycle stage	Type (sporophyte or gametophyte)	Maintain life-cycle stage composition of populations, subject to natural processes	One of the six colonies recorded since 1960 is composed of sporophytes (frond stage) with co-existing gametophytes (filamentous stage) and five are composed of gametophytes only. Based on Ní Dhúill et al. (2015, in prep.), NPWS (2019) and NPWS internal files
Population size: area of occupancy	Square metres	No decline, subject to natural processes	Based on Ní Dhúill et al. (2015, in prep.), NPWS (2019) and NPWS internal files
Population size: living sporophyte fronds	Number	No decline, subject to natural processes	Based on Ní Dhúill et al. (2015, in prep.), NPWS (2019) and NPWS internal files
Population structure: young and unfurling fronds	Occurrence	Young (not fully expanded) and/or unfurling (crozier) fronds present in populations previously observed to have these, subject to natural processes	Young and/or unfurling fronds have been recorded from Lough Eske and Ardnamona Wood SAC. Based on Ní Dhúill et al. (2015, in prep.), NPWS (2019) and NPWS internal files
Population structure: fertile fronds	Occurrence	Fertile fronds present in populations previously observed to have these, subject to natural processes	Fertile fronds have not been recorded from the SAC. Based on Ní Dhúill et al. (2015, in prep.), NPWS (2019) and NPWS internal files
Population structure: juvenile sporophyte fronds emerging from gametophytes	Number	No decline, subject to natural processes	Juvenile sporophyte fronds emerging from gametophytes have not been recorded from the SAC. Based on Ní Dhúill et al. (2015, in prep.), NPWS (2019) and NPWS internal files
Habitat extent	Hectares	No loss of suitable habitat, subject to natural processes	The species grows in deeply shaded, humid situations - dripping caves, overhangs and crevices on cliffs, rocky slopes, by waterfalls, in stream ravines and gullies, on rock or soil banks in woodlands and, occasionally, under fallen trees and on the floor of damp woodlands. Whilst also occurring in these habitats, the gametophyte stage can grow in drier areas that do not suit the sporophyte. Based on Ní Dhúill et al. (2015, in prep.), NPWS (2019) and NPWS internal files

Hydrological conditions: wet/damp microhabitats	Occurrence	Maintain hydrological conditions at the locations of known populations - visible water source, with dripping or seeping water present and/or substrate wet/damp to touch, subject to natural processes	Based on Ní Dhúill et al. (2015, in prep.), NPWS (2019) and NPWS internal files
Hydrological conditions: relative humidity	Percentage	Maintain relative humidity levels at known colonies at not less than 80%, subject to natural processes	Based on Ní Dhúill et al. (2015, in prep.), NPWS (2019) and NPWS internal files
Hydrological conditions: desiccated fronds	Number	No increase, subject to natural processes	Presence of desiccated sporophyte fronds and gametophyte mats is indicative of unsuitable conditions. Based on Ní Dhúill et al. (2015, in prep.), NPWS (2019) and NPWS internal files
Light levels: shading	Shade index score	At least 4 for woodland sporophyte-only and mixed colonies; at least 5 for open upland sporophyte-only and mixed colonies; at least 6 for gametophyte-only colonies, subject to natural processes	Shade Index: 4. Moderate shade, e.g. light-medium deciduous canopy with sun flecks. 5. Permanently shaded from direct sunlight but otherwise open to sky. 6. Deep woodland (e.g. coniferous or in ravine) shade, no sun flecks. 7. Perpetual deep shade, e.g. cave entrance, beneath boulder. The species occurs in moderate to deep shade in woodland in Lough Eske and Ardnamona Wood SAC. Based on Ní Dhúill et al. (2015, in prep.), NPWS (2019) and NPWS internal files
Woodland canopy cover	Percentage	No loss of woodland canopy at, or in the vicinity of, the locations of known populations and canopy cover here maintained at more than 33%, subject to natural processes	Woodland management at or near to locations of known populations of the species must take account of its habitat requirements, particularly with regard to maintenance of sufficient canopy cover. The species occurs in woodland in Lough Eske and Ardnamona Wood SAC. Based on Ní Dhúill et al. (2015, in prep.), NPWS (2019) and NPWS internal files
Invasive species	Occurrence	Maintain absence of invasive non-native and vigorous native plant species at the locations of known populations or, if present, maintain vegetation cover of these at less than 10%, taking into account the habitat requirements of *V. speciosa*	In order to avoid negative impacts on the Killarney fern (*Vandenboschia speciosa*), its habitat requirements (site hydrology, relative humidity, canopy cover, shading levels, etc.) must be taken into account in locations that are subject to or proposed for management actions to control invasive non-native and/or vigorous native plant species. Based on Ní Dhúill et al. (2015, in prep.), NPWS (2019) and NPWS internal files



Legend

Lough Eske and Ardnamona Wood SAC 000163

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

MAP 1:
LOUGH ESKE AND ARDNAMONA WOODSAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000163; version 3.01. CO. DONEGAL

0 0.5 1 1.5 2 Kilometers

N

Map Version 1
Date: May 2019

Legend

- 3110 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)
- OSi Discovery Series County Boundary
- Lough Eske and Ardnamona Wood SAC 000163

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

MAP 2:
LOUGH ESKE AND ARDNAMONA WOOD SAC
CONSERVATION OBJECTIVES
INDICATIVE LAKE HABITATS

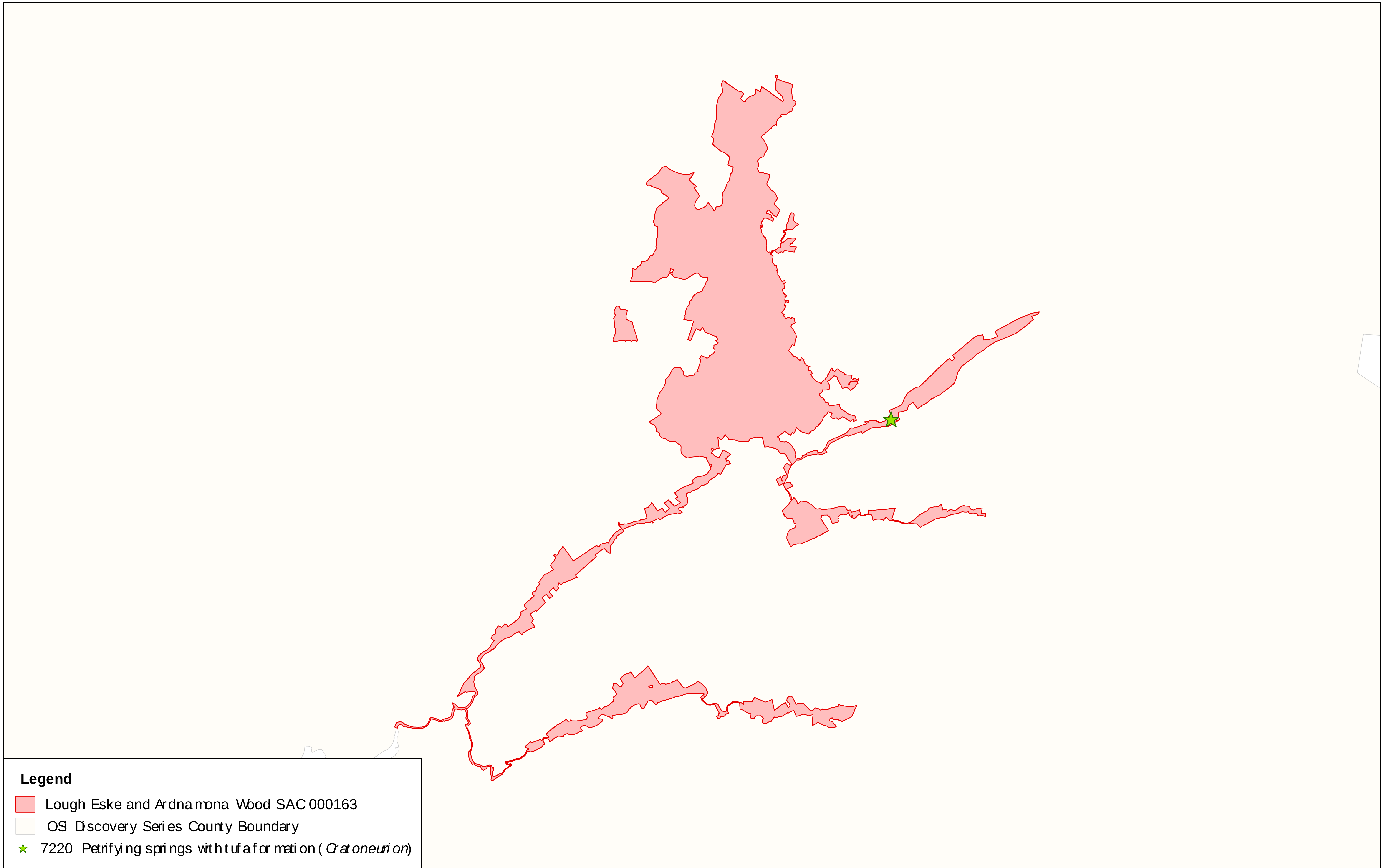
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000163; version 3.01. CO. DONEGAL

0 0.6 1.2 1.8 2.4 Kilometers

N

Map Version 1
Date: May 2019



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

MAP 3:
LOUGH ESKE AND ARDNAMONA WOOD SAC
CONSERVATION OBJECTIVES
PETRIFYING SPRINGS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000163; version 3.01. CO. DONEGAL

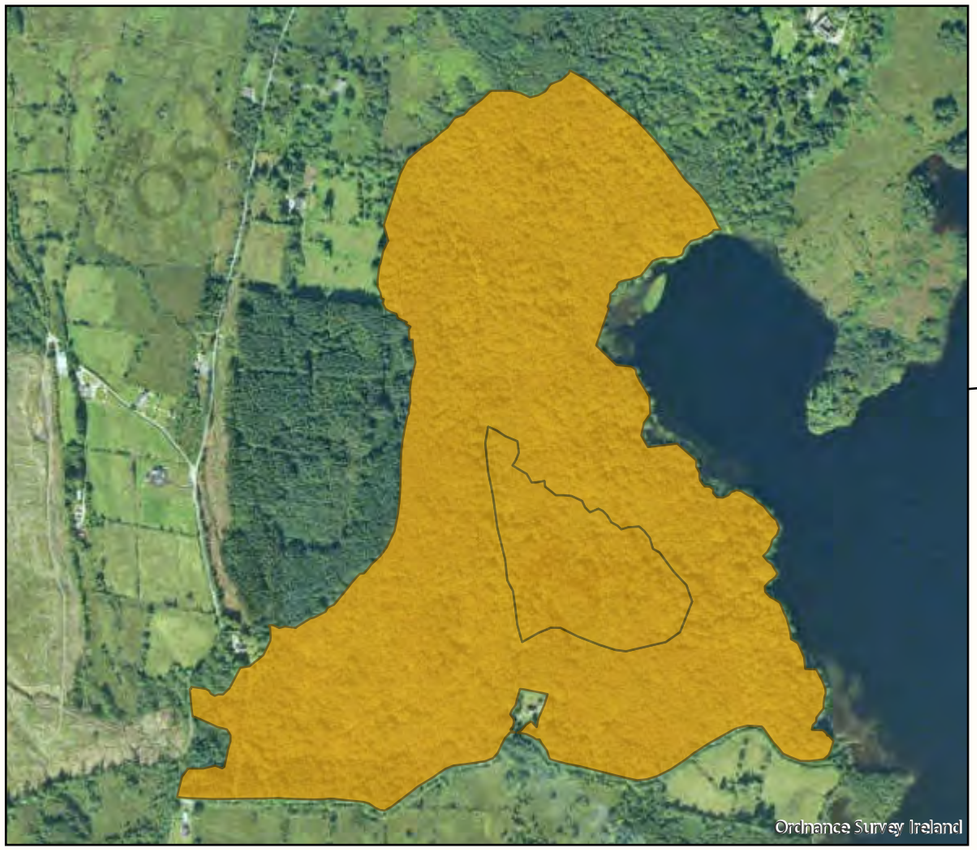
0 0.7 1.4 2.1 2.8 Km

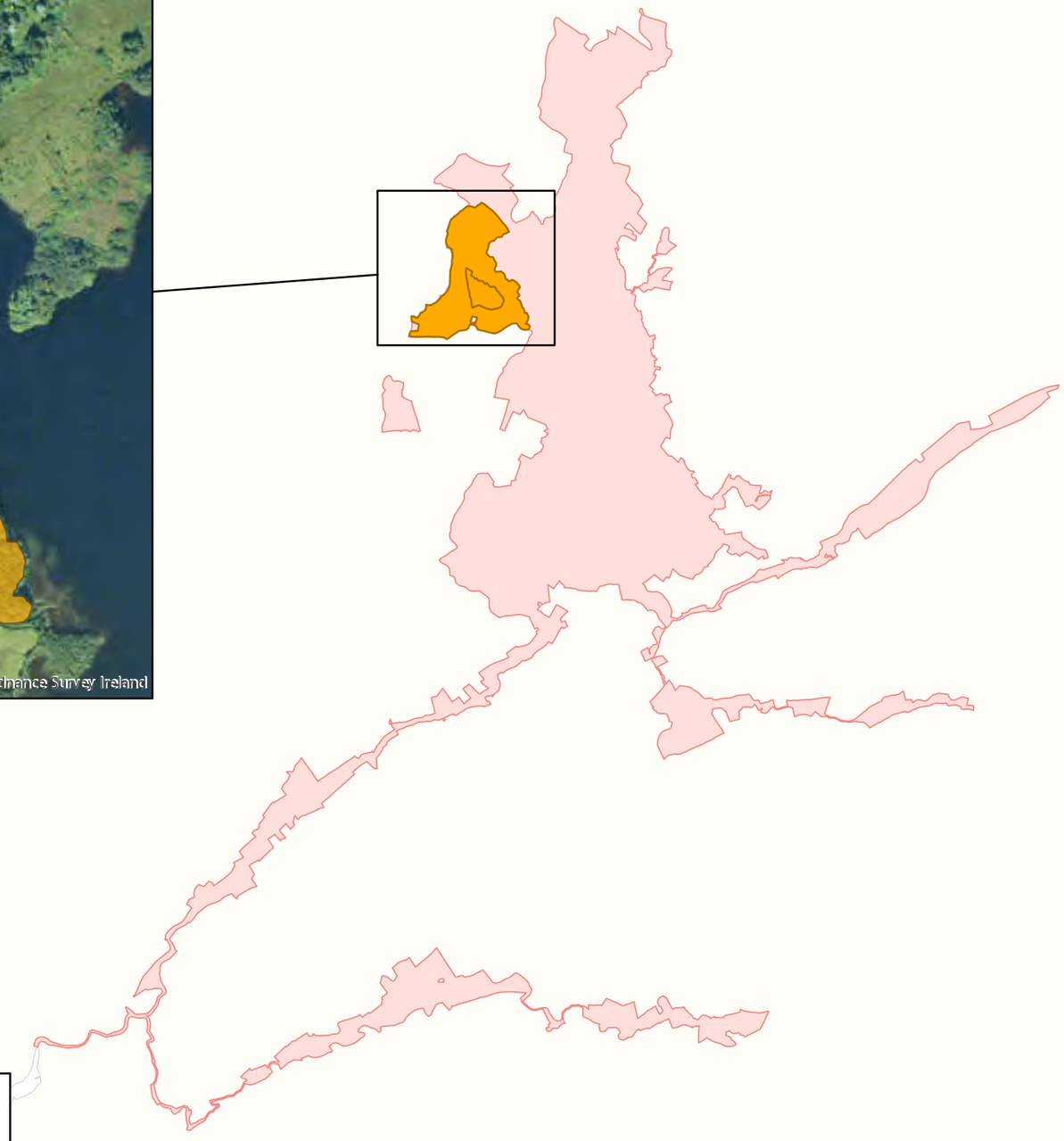
The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision.
Ordnance Survey of Ireland Licence No EN 0059216. © Ordnance Survey of Ireland Government of Ireland

Ní sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Suirbhéarachta Ordanáis na hÉireann Ceadúnas Uimh EN 0059216. © Suirbhéarachta Ordanáis na hÉireann Rialtas na hÉireann

N

Map Version 1
Date: May 2019





Legend

- Lough Eske and Ardnamona Wood SAC 000163
- OSi Discovery Series County Boundary
- 91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

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

MAP 4:
LOUGH ESKE AND ARDNAMONA WOOD SAC
CONSERVATION OBJECTIVES
WOODLAND HABITATS

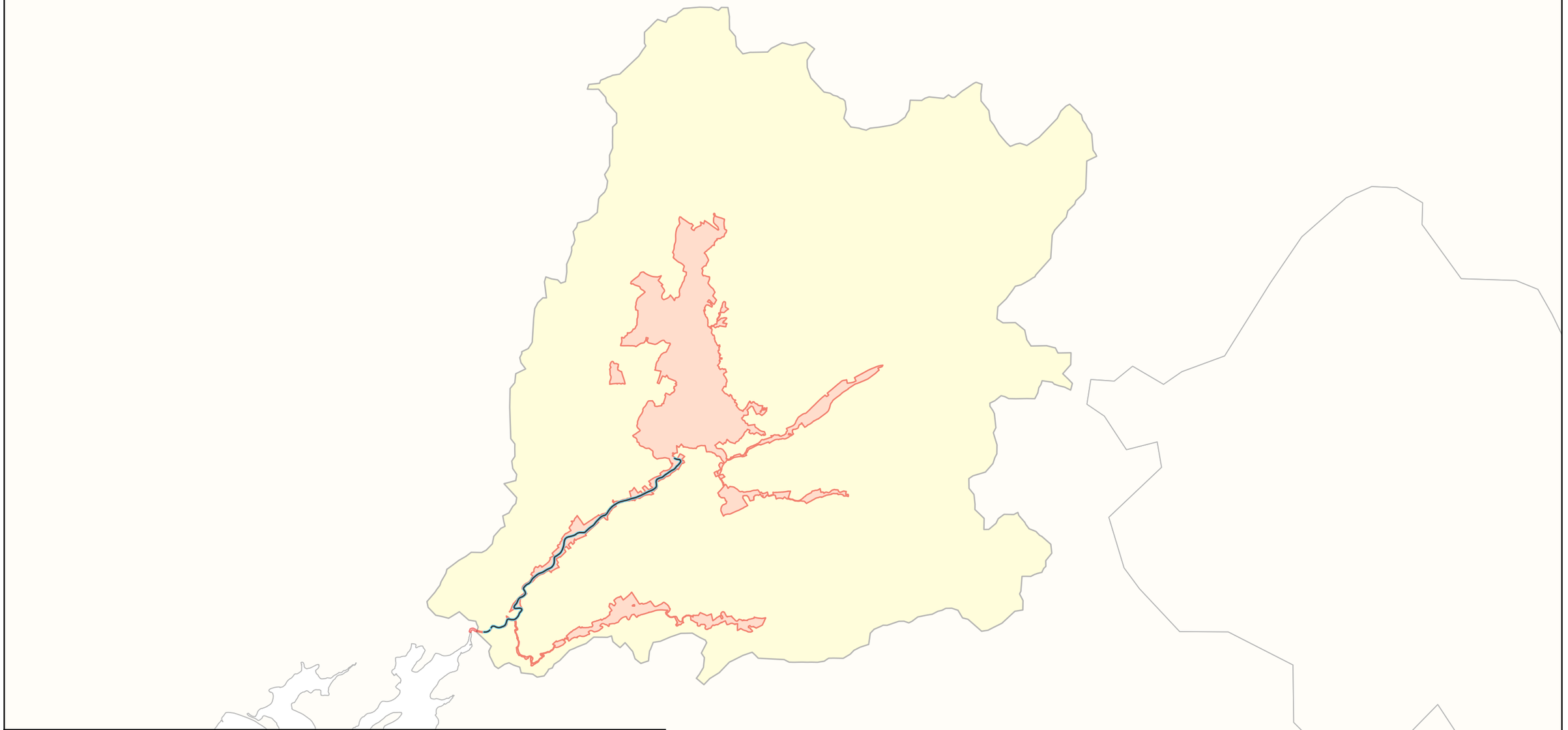
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000163; version 3.01. CO. DONEGAL

0 0.5 1 1.5 2 2.5 Kilometers

N

Map Version 1
Date: May 2019



Legend

- Lough Eske and Ardnamona Wood SAC 000163
- 1029 Freshwater Pearl Mussel - *Margaritifera margaritifera* Suitable habitat target
- 1029 Freshwater Pearl Mussel - *Margaritifera margaritifera* Distribution target
- 1029 Freshwater Pearl Mussel - *Margaritifera margaritifera* Catchment
- OSi Discovery Series County Boundaries

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

MAP 5:
LOUGH ESKE AND ARDNAMONA WOOD SAC
CONSERVATION OBJECTIVES
FRESHWATER PEARL MUSSEL

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000163; version 3.01. CO. DONEGAL

0 0.85 1.7 2.55 3.4 4.25 km

N

Map Version 1
Date: May 2019

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Lough Gill SAC 001976

An Roinn Tithíochta,
Rialtais Áitiúil agus Oidhreachta
Department of Housing,
Local Government and Heritage

National Parks and Wildlife Service,
Department of Housing, Local Government and Heritage,

90 King Street North, Dublin 7, D07 N7CV, Ireland.

Web: www.npws.ie
E-mail: natureconservation@housing.gov.ie

Citation:

NPWS (2021) Conservation Objectives: Lough Gill SAC 001976. Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.

Series Editors: Rebecca Jeffrey and Christina Campbell
ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

001976	Lough Gill SAC
1092	White-clawed Crayfish *Austropotamobius pallipes*
1095	Sea Lamprey *Petromyzon marinus*
1096	Brook Lamprey *Lampetra planeri*
1099	River Lamprey *Lampetra fluviatilis*
1106	Salmon *Salmo salar*
1355	Otter *Lutra lutra*
3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)
91A0	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
91E0	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)*

Please note that this SAC is adjacent to Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC (000627) and Glenade Lough SAC (001919). See map 2. The conservation objectives for this site should be used in conjunction with those for the adjacent sites as appropriate.

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	1972
Title :	A Preliminary Report on Areas of Scientific Interest in County Sligo
Author :	Goodwillie, R.N.
Series :	Unpublished Report
Year :	2006
Title :	Otter survey of Ireland 2004/2005
Author :	Bailey, M.; Rochford, J.
Series :	Irish Wildlife Manuals, No. 23
Year :	2007
Title :	Supporting documentation for the Habitats Directive Conservation Status Assessment - backing documents. Article 17 forms and supporting maps
Author :	NPWS
Series :	Unpublished report to NPWS
Year :	2008
Title :	National survey of native woodlands 2003-2008
Author :	Perrin, P.M.; Martin, J.; Barron, S.; O'Neill, F.H.; McNutt, K.E.; Delaney, A.
Series :	Unpublished report to NPWS
Year :	2009
Title :	Monitoring of white-clawed crayfish *Austropotamobius pallipes* in Irish lakes in 2007
Author :	O'Connor, W.; Hayes, G.; O'Keeffe, C.; Lynn, D.
Series :	Irish Wildlife Manuals, No. 37
Year :	2010
Title :	A provisional inventory of ancient and long-established woodland in Ireland
Author :	Perrin, P.M.; Daly, O.H.
Series :	Irish Wildlife Manuals, No. 46
Year :	2010
Title :	A technical manual for monitoring white-clawed crayfish (*Austropotamobius pallipes*) in Irish lakes
Author :	Reynolds, J.; O'Connor, W.; O'Keeffe, C.; Lynn, D.
Series :	Irish Wildlife Manuals, No.45
Year :	2012
Title :	The beetles of decaying wood in Ireland. A provisional annotated checklist of saproxylic Coleoptera
Author :	Alexander, K.N.A.; Anderson, R.
Series :	Irish Wildlife Manuals, No. 65
Year :	2013
Title :	National otter survey of Ireland 2010/12
Author :	Reid, N.; Hayden, B.; Lundy, M.G.; Pietravalle, S.; McDonald, R.A.; Montgomery, W.I.
Series :	Irish Wildlife Manuals, No. 76
Year :	2013
Title :	Irish semi-natural grasslands survey 2007-2012
Author :	O'Neill, F.H.; Martin, J.R.; Devaney, F.M.; Perrin, P.M.
Series :	Irish Wildlife Manuals, No. 78

Year :	2013
Title :	Results of a monitoring survey of old sessile oak woods and alluvial forests
Author :	O'Neill, F.H.; Barron, S.J.
Series :	Irish Wildlife Manuals, No. 71
Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 2. Habitats assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2015
Title :	Habitats Directive Annex I lake habitats: a working interpretation for the purposes of site-specific conservation objectives and Article 17 reporting
Author :	O Connor, Á.
Series :	Unpublished document by NPWS
Year :	2016
Title :	Ireland Red List No. 10: Vascular Plants
Author :	Wyse Jackson, M.; FitzPatrick, Ú.; Cole, E.; Jebb, M.; McFerran, D.; Sheehy Skeffington, M.; Wright, M.
Series :	Ireland Red Lists series, NPWS
Year :	2018
Title :	The monitoring and assessment of three EU Habitats Directive Annex I grassland habitats
Author :	Martin, J.R.; O'Neill, F.H.; Daly, O.H.
Series :	Irish Wildlife Manuals, No. 102
Year :	2019
Title :	The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2021
Title :	Conservation Objectives: Lough Carra/Mask Complex SAC 001774. Version 1
Author :	NPWS
Series :	Conservation Objectives
Year :	2021
Title :	White-clawed Crayfish *Austropotamobius pallipes* survey in designated SACs in 2017
Author :	Gammell, M.; McFarlane, A.; Brady, D.; O'Brien, J.; Mirimin, L.; Graham, C.; Lally, H.; Minto, C.; O'Connor, I.
Series :	Irish Wildlife Manuals, No. 131
Year :	in prep.
Title :	The monitoring and assessment of four EU Habitats Directive Annex I woodland habitats
Author :	Daly, O.H.; O'Neill, F.H.; Barron, S.J.
Series :	Irish Wildlife Manuals
Year :	in prep.
Title :	A study of lakes with Slender Naiad (*Najas flexilis*)
Author :	Roden, C.; Murphy, P.; Ryan, J.B.
Series :	Irish Wildlife Manuals

Other References

Year :	1950
Title :	*Arbutus unedo* L.
Author :	Sealy, J.R.; Webb, D.A.
Series :	Journal of Ecology, 38: 223-36
Year :	1975
Title :	A preliminary survey of Irish lakes
Author :	Flanagan, P.J.; Toner P.F.
Series :	An Foras Forbartha
Year :	1982
Title :	Otter survey of Ireland
Author :	Chapman, P.J.; Chapman, L.L.
Series :	Unpublished report to Vincent Wildlife Trust
Year :	1982
Title :	Eutrophication of waters. Monitoring assessment and control
Author :	OECD
Series :	OECD, Paris
Year :	1989
Title :	Moor Balls from the Shore of Lough Gill, Co Sligo
Author :	Campbell, J.; Scannell, M.J.P.
Series :	Irish Naturalists' Journal, 23(2): 75-76
Year :	1991
Title :	The spatial organization of otters (*Lutra lutra*) in Shetland
Author :	Kruuk, H.; Moorhouse, A.
Series :	Journal of Zoology, 224: 41-57
Year :	1993
Title :	Ecological Study of Lough Gill - to Predict the Effects of the Sligo and Environs Water Supply Scheme on the Flora and Fauna with Suggestions for Future Management
Author :	Cotton, D.C.F.
Series :	Report prepared in conjunction with Jennings O'Donovan and Partners for Sligo County Council
Year :	1997
Title :	Irish wetland woods: the plant communities and their ecology
Author :	Kelly, D.L; Iremonger, S.F.
Series :	Biology and Environment: Proceedings of the Royal Irish Academy, 97B: 1-32
Year :	2000
Title :	Colour in Irish lakes
Author :	Free, G.; Allott, N.; Mills, P.; Kennelly, C.; Day, S.
Series :	Verhandlungen Internationale Vereinigung für theoretische und angewandte Limnologie, 27: 2620-2623
Year :	2002
Title :	Reversing the habitat fragmentation of British woodlands
Author :	Peterken, G.
Series :	WWF-UK, London
Year :	2002
Title :	A survey of the white-clawed crayfish, *Austropotamobius pallipes* (Lereboullet), and of water quality in two catchments of eastern Ireland
Author :	Demers, A.; Reynolds, J.D.
Series :	Bulletin Francais de la Peche et de la Pisciculture, 367: 729-740

Year :	2006
Title :	Otters - ecology, behaviour and conservation
Author :	Kruuk, H.
Series :	Oxford University Press
Year :	2006
Title :	A reference-based typology and ecological assessment system for Irish lakes. Preliminary investigations. Final report. Project 2000-FS-1-M1 Ecological assessment of lakes pilot study to establish monitoring methodologies EU (WFD)
Author :	Free, G.; Little, R.; Tierney, D.; Donnelly, K.; Coroni, R.
Series :	Environmental Protection Agency, Wexford
Year :	2010
Title :	Otter tracking study of Roaringwater Bay
Author :	De Jongh, A.; O'Neill, L.
Series :	Unpublished draft report to NPWS
Year :	2010
Title :	Water Quality in Ireland 2007-2009
Author :	McGarrigle, M.; Lucey, J.; Ó Cinnéide, M.
Series :	Environmental Protection Agency, Wexford
Year :	2010
Title :	National Programme: Habitats Directive and Red Data Book Species Executive Report 2009
Author :	Inland Fisheries Ireland (IFI)
Series :	IFI/2010/1-0480. Inland Fisheries Ireland
Year :	2011
Title :	Comparison of field- and GIS-based assessments of barriers to Atlantic salmon migration: a case study in the Nore Catchment, Republic of Ireland
Author :	Gargan, P.G.; Roche, W.K.; Keane, S.; King, J.J.; Cullagh, A.; Mills, P.; O'Keeffe, J.
Series :	Journal of Applied Ichthyology, 27 (Suppl. 3): 66-72
Year :	2013
Title :	Aspects of brook lamprey (*Lampetra planeri* Bloch) spawning in Irish waters
Author :	Rooney, S.M.; O'Gorman, N.M.; Green, F.; King, J.J.
Series :	Biology and Environment: Proceedings of the Royal Irish Academy, 113B(1): 13-25
Year :	2015
Title :	Water Quality in Ireland 2010-2012
Author :	Bradley, C.; Byrne, C.; Craig, M.; Free, G.; Gallagher, T.; Kennedy, B.; Little, R.; Lucey, J.; Mannix, A.; McCreesh, P.; McDermott, G.; McGarrigle, M.; Ní Longphuirt, S.; O'Boyle, S.; Plant, C.; Tierney, D.; Trodd, W.; Webster, P.; Wilkes, R.; Wynne, C.
Series :	Environmental Protection Agency, Wexford
Year :	2015
Title :	Behaviour of sea lamprey (*Petromyzon marinus* L.) at man-made obstacles during upriver spawning migration: use of telemetry to access efficacy of weir modifications for improved passage
Author :	Rooney, S.M.; Wightman, G.D.; O Conchuir, R.; King, J.J.
Series :	Biology and Environment: Proceedings of the Royal Irish Academy, 115B: 1-12
Year :	2015
Title :	Common standards monitoring guidance for freshwater fauna. Version October 2015
Author :	JNCC
Series :	Joint Nature Conservation Committee, Peterborough

Year :	2016
Title :	A narrative for conserving freshwater and wetland habitats in England
Author :	Mainstone, C.; Hall, R.; Diack, I.
Series :	Natural England Research Reports Number 064
Year :	2016
Title :	Irish Vegetation Classification: Technical Progress Report No. 2
Author :	Perrin, P.
Series :	Report submitted to National Biodiversity Data Centre
Year :	2017
Title :	Water Quality in Ireland 2010-2015
Author :	Fanning, A.; Craig, M.; Webster, P.; Bradley, C.; Tierney, D.; Wilkes, R.; Mannix, A.; Treacy, P.; Kelly, F.; Geoghegan, R.; Kent, T.; Mageean, M.
Series :	Environmental Protection Agency, Wexford
Year :	2017
Title :	National Programme: Habitats Directive and Red Data Book Species Summary Report 2016
Author :	Gallagher, T.; O'Gorman, N.M.; Rooney, S.M.; Coghlan, B.; King, J.J.
Series :	IFI/2017/1-4383. Inland Fisheries Ireland
Year :	2018
Title :	Initial observations on feeding juvenile sea lamprey (*Petromyzon marinus*) L. in Irish Lakes
Author :	King, J.J.; O'Gorman, N.
Series :	Biology and Environment: Proceedings of the Royal Irish Academy, 118B(2): 113-120
Year :	2019
Title :	Resurvey of long-term ecological monitoring transects at the People's Millennium Forests
Author :	Daly, O.H.; O'Neill, F.H.; Perrin, P.M.
Series :	Unpublished report to Woodlands of Ireland, Coillte and The Forest Service
Year :	2021
Title :	The Status of Irish Salmon Stocks in 2020 with Catch Advice for 2021
Author :	Gargan, P.; Fitzgerald, C.; Kennedy, R.; Maxwell, H.; McLean, S.;Millane, M.
Series :	Report of the Technical Expert Group on Salmon (TEGOS) to the North-South Standing Scientific Committee for Inland Fisheries

Spatial data sources

Year :	2021
Title :	OSi Prime 2 water polygon file
GIS Operations :	WaterPolygons feature class clipped to the SAC boundary. Expert opinion used to identify Annex I habitat and to resolve any issues arising
Used For :	3150 (map 3)
Year :	2018
Title :	Grasslands Monitoring Survey 2015-2017
GIS Operations :	Dataset clipped to the SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	6210 (map 4)
Year :	Revision 2010
Title :	National Survey of Native Woodlands 2003-2008. Version 1
GIS Operations :	QIs selected; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	91A0, 91E0 (map 5)
Year :	2018
Title :	Woodland Monitoring Survey 2017-2018
GIS Operations :	QIs selected; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	91E0 (map 5)
Year :	2021
Title :	NPWS rare and threatened species database
GIS Operations :	Dataset created from spatial references in database records. Expert opinion used as necessary to resolve any issues arisin
Used For :	1092 (map 6)
Year :	2010
Title :	OSi 1:5000 IG vector dataset
GIS Operations :	Creation of 80m buffer on aquatic side of lake data; creation of 10m buffer on terrestrial side of lake data. Datasets combined with derived OSi Prime 2 water dataset. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising. Creation of 250m buffer on aquatic side of the lake boundary to highlight potential commuting points
Used For :	1355 (map 7)
Year :	2021
Title :	OSi Prime 2 water polygon file
GIS Operations :	Creation of 10m buffer on terrestrial side of river banks data. Dataset combined with derived OSi 1:5000 vector lake buffer data. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1355 (map 7)

3150 Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation

To restore the favourable conservation condition of Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation in Lough Gill SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	It is uncertain whether the lake habitat in Lough Gill is 3150, or more closely aligned with the *Najas*-type lake habitat 3130 as is the upstream Glenade Lough. The mixed geology of the catchment suggests that habitat 3130 may be more appropriate. This distinction has important implications for the targets used as Water Framework Directive good ecological status/mesotrophic is considered sufficient for habitat 3150, while habitat 3130 broadly requires high status/oligotrophic status and has habitat-specific attributes and targets (see Roden et al., in prep.; see also 3130 in NPWS, 2021). Lough Gill has steeply sloping littoral zones and large areas of deep water. Despite this, a wide variety of pondweed species has been recorded. Further study of its aquatic vegetation is needed. Further information relating to all attributes is provided in the lake habitats supporting document for the purposes of site-specific conservation objectives and Article 17 reporting (O Connor, 2015)
Habitat distribution	Occurrence	No decline, subject to natural processes	As noted above, it is unclear whether the vegetation of Lough Gill is that of habitat 3150 or 3130
Vegetation composition: typical species	Occurrence	Typical species present, in good condition, and demonstrating typical abundances and distribution	A number of accounts indicate that the flora of Lough Gill is limited, most likely owing to its steeply sloping shorelines (Cotton, 1993). Nevertheless, a range of submerged aquatics have been recorded in Lough Gill, including charophytes: *Chara aspera, C. contraria, C. curta, C. hispida, C. virgata* and *Tolypella glomerata; Callitriche hermaphroditica, Hippuris vulgaris, Littorella uniflora, Myriophyllum alterniflorum, M. spicatum, Potamogeton alpinus, P. berchtoldii, P. coloratus, P. filiformis, P. gramineus, P. lucens, P. natans, P. perfoliatus, P.* x *angustifolius* and *P.* x *nitens. Lemna minor* and *L. trisulca* also occur. See Roden et al. (in prep.) for habitat 3130 typical species. For lists of typical plant species of both habitats 3150 and 3130, see the Article 17 habitat assessments (NPWS, 2013, 2019) and the lake habitats supporting document (O Connor, 2015)
Vegetation composition: characteristic zonation	Occurrence	All characteristic zones should be present, correctly distributed and in good condition	The vegetation zones/communities of Lough Gill have not been fully described. Further survey using snorkel/scuba is required. The characteristic zonation of habitat 3150 has not yet been described. Roden et al. (in prep.) describe the characteristic zonation and other spatial patterns of lake habitat 3130
Vegetation distribution: maximum depth	Metres	Maintain maximum depth of vegetation, subject to natural processes	Information on the maximum depth of vegetation growth in Lough Gill may be available from the Environmental Protection Agency (EPA). Roden et al. (in prep.) describe the maximum vegetation depth of habitat 3130 in Ireland. Further work is necessary to develop indicative targets for lake habitat 3150. The maximum depth of vegetation may be specific to the lake shoreline in question. It should be large in lakes within undisturbed peatland and uplands; however, pressures on peatland such as overgrazing, as well as eutrophication, may have reduced vegetation depth

Hydrological regime: water level fluctuations	Metres	Maintain appropriate hydrological regime necessary to support the habitat	The mixed geology of the lake's basin and catchment influences Lough Gill's hydrological regime, and it is likely that seepages and springs discharge to the lake. The inflowing Bonet River was arterially drained 1982-1992. Fluctuations in lake water level are typical in Ireland, but can be amplified by activities such as abstraction, drainage and overgrazing. Increased water level fluctuations can increase wave action, up-root vegetation, increase turbidity, alter the substratum and lead to release of nutrients from the sediment. The hydrological regime of the lakes must be maintained so that the area, distribution and depth of the lake habitat and its constituent/characteristic vegetation zones and communities are not reduced
Lake substratum quality	Various	Maintain appropriate substratum type, extent and chemistry to support the vegetation	Roden et al. (in prep.) provide information on the substratum types of lake habitat 3130 in Ireland. Research is required to further characterise the substratum types (particle size and origin) of habitat 3150 and substratum quality (notably pH, calcium, iron and nutrient concentrations) favoured by each of the five Annex I lake habitats in Ireland. It is likely that soft muddy substrata dominate habitat 3150. Substratum varies with catchment geology, and with depth and along shorelines in an individual lake
Transparency	Metres	Maintain/restore appropriate Secchi transparency. There should be no decline in Secchi depth/transparency	McGarrigle et al. (2010) report average Secchi transparency of 2m in Lough Gill in 2008. The OECD fixed boundary system set transparency targets for mesotrophic lakes of 6-3m annual mean Secchi disk depth, and 3-1.5m annual minimum Secchi disk depth and for oligotrophic lakes of ≥6m annual mean Secchi disk depth, and ≥3m annual minimum Secchi disk depth. Transparency relates to light penetration and, hence, to the depth of colonisation of vegetation. It can be affected by phytoplankton blooms, water colour and turbidity. Specific targets have yet to be established for lake habitats (O Connor, 2015); however, Roden et al. (in prep.) discuss Secchi depths in habitat 3130 in Ireland. Habitat 3130 is associated with clear water, as evidenced by the growth of the character species *Najas flexilis* (slender naiad) at depths of up to 10m
Nutrients	µg/l P; mg/l N	Maintain/restore the concentration of nutrients in the water column to sufficiently low levels to support the habitat and its typical species	Depending on which habitat occurs naturally in Lough Gill, the target is Water Framework Directive (WFD) good status and mesotrophic or better for 3150, or high status and oligotrophic for 3130. The 'good-moderate' boundary is too enriched to support habitat 3130. Lough Gill had good nutrient status from 2007-2015 (McGarrigle et al., 2010; Bradley et al., 2015; Fanning et al., 2017). Good status/mesotrophic has annual average TP concentration ≤20µg/l TP, average annual total ammonia concentration ≤0.065mg/l N and annual 95th percentile for total ammonia ≤0.140mg/l N. High status/oligotrophic has annual average TP concentration ≤10µg/l TP, average annual total ammonia concentration ≤0.040mg/l N and annual 95th percentile for total ammonia ≤0.090mg/l N. See also O Connor (2015), OECD (1982) and The European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2019

Phytoplankton biomass	µg/l chlorophyll *a*	Maintain appropriate water quality to support the habitat, including high chlorophyll *a* status	Lough Gill had high chlorophyll status from 2007-2015 (McGarrigle et al., 2010; Bradley et al., 2015; Fanning et al., 2017); therefore, the target for Lough Gill is set as high status and oligotrophic. The average growing season (March-October) chlorophyll *a* concentration must be <5.8µg/l. The annual average chlorophyll *a* concentration should be <2.5µg/l and the annual peak chlorophyll *a* concentration should be ≤8.0µg/l. Where a lake has a chlorophyll *a* concentration that is lower than this target, there should be no decline within class, i.e. no upward trend in phytoplankton biomass. See also OECD (1982) and The European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2019
Phytoplankton composition	EPA phytoplankton composition metric	Maintain/restore appropriate water quality to support the habitat, including high phytoplankton composition status	The EPA has developed a phytoplankton composition metric for nutrient enrichment of Irish lakes. Phytoplankton composition status at Lough Gill was high in 2007-2009, but declined to good in 2010-12 and 2013-15 (McGarrigle et al., 2010; Bradley et al., 2015; Fanning et al., 2017)
Attached algal biomass	Algal cover	Maintain/restore trace/absent attached algal biomass (<5% cover)	Cotton (1993) noted that *Cladophora* balls, first observed in Lough Gill by Campbell and Scannell (1989), are a regular occurrence. Nutrient enrichment can favour epiphytic and epipelic algae that can out-compete the submerged vegetation. The cover abundance of attached algae in habitats 3130 and 3150 should, ideally therefore, be trace/absent (<5% cover)
Macrophyte status	EPA macrophyte metric (The Free Index)	Restore high/good macrophyte status	If habitat 3150 is present, the target for Lough Gill is WFD good status, or better. It failed to reach this, having moderate macrophyte status 2007-2009 and 2010-12, and poor in 2013-15 (McGarrigle et al., 2010; Bradley et al., 2015; Fanning et al., 2017). Specific vegetation targets are set for habitat 3130 (Roden et al., in prep.). Nutrient enrichment can favour more competitive submerged macrophyte species that out-compete the typical and characteristic species for the lake habitat. The EPA monitors macrophyte status for Water Framework Directive purposes using the 'Free Index'. See also The European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2019
Acidification status	pH units, mg/l	Maintain appropriate water and sediment pH, alkalinity and cation concentrations to support the habitat, subject to natural processes	Habitat 3130 is associated with intermediate alkalinity, largely between 20-80mg/l (Roden et al., in prep.), and in line with targets for *Najas flexilis*, median pH values should be>7 pH units. The specific requirements of habitats 3150, in terms of water and sediment pH, alkalinity and cation concentration, have not been determined, but it is also expected to have median pH values above 7 pH units. Acidification can impact on species abundance and composition in lake habitats. Maximum pH should be <9.0 pH units, in line with the surface water standards. See also The European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2019. Lough Gill passed this target from 2007-15 (McGarrigle et al., 2010; Bradley et al., 2015; Fanning et al., 2017)

Water colour	mg/l PtCo	Maintain/restore appropriate water colour to support the habitat	Flanagan and Toner (1975) noted that the water of Lough Gill was markedly coloured. Free et al. (2006) reported colour of 44mg/l PtCo in Lough Gill. Roden et al. (in prep.) showed that habitat 3130 is found in clear water, and water colour is negatively correlated with maximum vegetation (euphotic) depth. They set good condition at <40mg/l PtCo; however, further work is necessary to determine sustainable water colour levels for the habitat, which may be <30 or even <20mg/l PtCo. Studies have shown median colour concentrations in Irish lakes of 38mg/l PtCo (Free et al., 2000) and 33mg/l PtCo (Free et al., 2006). Increased water colour and turbidity decrease light penetration and can reduce the area of available habitat for lake macrophytes, particularly at the lower euphotic depths. The primary source of increased water colour in Ireland is disturbance to peatland
Dissolved organic carbon (DOC)	mg/l	Maintain/restore appropriate organic carbon levels to support the habitat	Dissolved (and particulate) organic carbon (OC) in the water column is linked to water colour and acidification (organic acids). Increasing DOC in water has been documented across the Northern Hemisphere, including afforested peatland catchments in Ireland. Damage and degradation of peatland, leading to decomposition of peat is likely to be the predominant source of OC in Ireland. OC in water promotes decomposition by fungi and bacteria that, in turn, releases dissolved nutrients. The increased biomass of decomposers can also impact directly on the characteristic lake communities through shading, competition, etc.
Turbidity	Nephelometric turbidity units/ mg/l SS/ other appropriate units	Maintain/restore appropriate turbidity to support the habitat	Lough Gill should, naturally, have clear water with low levels of turbidity. Cotton (1993) noted high turbidity in Lough Gill as a result of the Bonet drainage scheme. Jim Ryan (pers. comm.) has also noted high turbidity in the lake. Turbidity can significantly affect the quantity and quality of light reaching rooted and attached vegetation and can, therefore, impact on lake habitats. The settlement of higher loads of inorganic or organic material on lake vegetation communities may also have impacts on sensitive, delicate species. Turbidity can increase as a result of re-suspension of material within the lake, higher loads entering the lake, or eutrophication. Turbidity measurement and interpretation is challenging. As a result, it is likely to be difficult to set habitat-specific targets for turbidity in lakes
Fringing habitat: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the natural structure and functioning of the habitat	Most lake shorelines have fringing habitats that intergrade with and support the structure and functions of the lake habitat. Lough Gill has a variety of important fringing habitats including alluvial woodland, other woodland, marsh, heath, wet grassland and orchid-rich calcareous grassland (see conservation objectives for 91E0, 91A0 and 6210). A number of rare and threatened plant species (see Wyse Jackson et al., 2016) are found in the fringing habitats including *Arbutus unedo, Taxus baccata, Prunus padus, Sorbus rupicola, Hieracium basalticola, Leucojum aestivum, Scutellaria minor, Sagittaria sagittifolia, Tamus communis, Neottia nidus-avis* and *Hypopitys monotropa*. Fringing habitats are dependent on the lake, particularly its water levels, and support wetland communities and species of conservation concern. Many of the fringing wetland habitats support higher invertebrate and plant species richness than the lake habitats themselves. See also Mainstone et al. (2016)

6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)

To restore the favourable conservation condition of Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) in Lough Gill SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	The Irish Semi-natural Grasslands Survey (ISGS; O'Neill et al., 2013) surveyed a number of areas of semi-natural grasslands within Lough Gill SAC, and found species-rich calcareous grassland habitat in one of those areas. The area of the habitat recorded within the SAC is located approximately midway along the northern shore of Lough Gill, in an area called Clogher Beg (survey site code 1556). This site (1556) was again visited as part of the Grasslands Monitoring Survey (GMS; Martin et al., 2018). The GMS (Martin et al., 2018) mapped 6.9ha of the habitat in Lough Gill SAC. See map 4. It is important to note that further unsurveyed areas of the habitat may be present within the SAC
Habitat distribution	Occurrence	No decline, subject to natural processes	Distribution based on GMS (Martin et al., 2018). See map 4. Note that further unsurveyed areas of the habitat may be present within the SAC
Vegetation composition: positive indicator species	Number at a representative number of 2m x 2m monitoring stops; within 20m surrounding area of monitoring stops	At least 7 positive indicator species present in monitoring stop or, if 5–6 present in stop, additional species within 20m of stop; this includes at least two 'high quality' positive indicator species present in stop or within 20m of stop	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018), where the lists of positive indicator species, including high quality indicators, are also presented. These documents should be consulted for further details
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Negative indicator species collectively not more than 20% cover, with cover of an individual species not more than 10%	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018), where the list of negative indicator species is presented. The GMS (Martin et al., 2018) noted relatively high cover of the negative indicator species white clover (*Trifolium repens*) throughout the Clogher Beg site (site code 1556)
Vegetation composition: non-native species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of non-native species not more than 1%	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018)
Vegetation composition: woody species and bracken	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of woody species (except certain listed species) and bracken (*Pteridium aquilinum*) not more than 5%	Woody species that can occur above 5% cover are juniper (*Juniperus communis*), burnet rose (*Rosa spinosissima*), mountain avens (*Dryas octopetala*) and hoary rock-rose (*Helianthemum oelandicum*). However, cover of these species above 25% may indicate transition to another Annex I habitat such as Alpine and Boreal heaths (4060) or *Juniperus communis* formations (5130). Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018)
Vegetation structure: broadleaf herb:grass ratio	Percentage at a representative number of 2m x 2m monitoring stops	Broadleaf herb component of vegetation between 40% and 90%	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018). Broadleaf herb component of vegetation between 30% and 40% may be allowed to pass on expert judgement (Martin et al., 2018)
Vegetation structure: sward height	Percentage at a representative number of 2m x 2m monitoring stops	At least 30% of sward between 5cm and 40cm tall	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018). The GMS (Martin et al., 2018) recorded both tall rank vegetation and very short vegetation (3cm) at separate monitoring stops at the Clogher Beg site (site code 1556) in 2017
Vegetation structure: litter	Percentage cover at a representative number of 2m x 2m monitoring stops	Litter cover not more than 25%	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018)

Physical structure: bare soil	Percentage cover at a representative number of 2m x 2m monitoring stops	Not more than 10% bare soil	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018)
Physical structure: grazing or disturbance	Area in local vicinity of a representative number of monitoring stops	Area of the habitat showing signs of serious grazing or disturbance less than 20m²	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018)

91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles

To restore the favourable conservation condition of Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles in Lough Gill SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes. See map 5	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles is present at Lough Gill SAC. As part of the National Survey of Native Woodlands (NSNW), the sub-sites Stonepark (NSNW site code 333), Cullentra (1400) and Slishwood (1411) were surveyed by Perrin et al. (2008). The conservation assessment score of Cullentra was ranked as joint first in Co. Sligo. National monitoring surveys have included Slishwood (1411) (Daly et al., in prep.) and Stonepark (333) (O'Neill and Barron, 2013). Oak woodland was formerly much more extensive at Slishwood, but much of the site was planted with conifers c. the 1950s (Goodwillie, 1972). Map 5 shows the minimum area of old sessile oak woods in the SAC which is estimated to be 41.42ha: 16.85ha at Stonepark, 6.07ha at Slishwood, and 18.50ha at Cullentra where the habitat occurs in association with other native woodland types (Perrin et al., 2008). It is important to note that further unsurveyed areas are present within the SAC
Habitat distribution	Occurrence	No decline, subject to natural processes. The surveyed woodland locations are shown on map 5	Distribution based on Perrin et al. (2008). It is important to note that further unsurveyed areas are present within the SAC
Woodland size	Hectares	Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and “small” woods at least 3ha in size	The target areas for individual woodlands aim to reduce habitat fragmentation and benefit those species requiring ‘deep’ woodland conditions (Peterken, 2002). In some cases, topographical constraints may restrict expansion
Woodland structure: cover and height	Percentage; metres; centimetres	Total canopy cover at least 30%; median canopy height at least 11m; native shrub layer cover 10-75%; native herb/dwarf shrub layer cover at least 20% and height at least 20 cm; bryophyte cover at least 4%	The target aims for a diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi-mature trees and shrubs; and well-developed herb layer and ground layer. Assessment criteria are described in Daly et al. (in prep.) and O'Neill and Barron (2013)
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	Described in Perrin et al. (2008). See also the Irish Vegetation Classification (Perrin, 2016; www.biodiversityireland.ie/projects/ivc-classification-explorer)
Woodland structure: natural regeneration	Seedling:sapling:pole ratio	Seedlings, saplings and pole age-classes of target species for 91A0 woodlands and other native tree species occur in adequate proportions to ensure survival of woodland canopy	The target species for 91A0 are sessile oak (*Quercus petraea*) and the hybrid oak *Quercus* x *rosacea*. Assessment criteria are described in Daly et al. (in prep.) and O'Neill and Barron (2013)
Woodland structure: dead wood	Number per hectare	At least 19 stems/ha of dead wood of at least 20cm diameter	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem. Dead wood comprises old senescent trees, standing dead trees, fallen dead wood (including large branches) and rotten stumps of any species. Assessment criteria are described in Daly et al. (in prep.) and O'Neill and Barron (2013)

Woodland structure: veteran trees	Number per hectare	No decline	Veteran trees are important habitats for bryophytes, lichens, saproxylic organisms, and some bird species. Their retention is important to ensure continuity of habitats/niches and propagule sources
Woodland structure: indicators of local distinctiveness	Occurrence; population size	No decline in distribution and, in the case of red listed and other rare or localised species, population size	Includes ancient or long-established woodlands (see Perrin and Daly, 2010), archaeological and geological features as well as red listed and other rare or localised species. The eastern half of Cullentra (site code 1400) and the majority of Slishwood (1411) have been classified as Possible Ancient Woodland. Stonepark (333) contains an area of Long-established Woodland (I) (Perrin and Daly, 2010). Rare and red listed plant species have been recorded within the SAC, including the Near Threatened yellow bird's-nest (*Hypopitys monotropa*) and the Vulnerable rock whitebeam (*Sorbus rupicola*) (NPWS internal files; Wyse Jackson et al., 2016). Strawberry tree (*Arbutus unedo*) is present, Lough Gill being its most northerly site globally (Sealy and Webb, 1950). Rare old growth species of saproxylic beetle have been recorded at Slishwood, one of only two sites in Ireland for the fire-winged beetle *Pyropterus nigroruber* (Alexander and Anderson, 2012)
Woodland structure: indicators of overgrazing	Occurrence	All four indicators of overgrazing absent	There are four indicators of overgrazing within 91A0: topiary effect on shrubs and young trees, browse line on mature trees, abundant dung, and severe recent bark stripping (Daly et al., in prep.; O'Neill and Barron, 2013). A large herd of fallow deer is present within the SAC (NPWS internal files). Excessive levels of grazing by deer have been recorded at Slishwood (Daly et al., in prep.) and Cullentra (Perrin et al., 2008). As part of the People's Millennium Forests Project, conifer clear felling was undertaken adjacent to Cullentra with the aim of allowing natural regeneration of native woodland. The area remains largely open, mainly due to heavy grazing by deer (Daly et al., 2019)
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover at least 90% of canopy; target species cover at least 50% of canopy	The target species for 91A0 are sessile oak (*Quercus petraea*) and the hybrid oak *Quercus* x *rosacea* (Daly et al., in prep.; O'Neill and Barron, 2013)
Vegetation composition: typical species	Occurrence	At least 1 target species for 91A0 woodlands present; at least 6 positive indicator species for 91A0 woodlands present	A variety of typical native species should be present, depending on woodland type. The target species for 91A0 are sessile oak (*Quercus petraea*) and the hybrid oak *Quercus* x *rosacea*. Positive indicator species for 91A0 are listed in Daly et al. (in prep.) and O'Neill and Barron (2013)
Vegetation composition: negative indicator species	Occurrence	Negative indicator species cover not greater than 10%; regeneration of negative indicator species absent	Negative indicator species (i.e. any non-native species, including herbaceous species such as montbretia (*Crocosmia* x *crocosmiiflora*) should be absent or under control. Rhododendron (*Rhododendron ponticum*) is problematic at Slishwood (Perrin et al., 2008; Daly et al., in prep.)

91E0 Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)*

To restore the favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)* in Lough Gill SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes. See map 5	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)* is present within Lough Gill SAC. Significant areas of the habitat occur along the Garvoge River and at the mouth of the River Bonet (NPWS internal files). As part of the National Survey of Native Woodlands (NSNW), the sub-sites Conaghil (NSNW site code 371), Cleaveragh Demesne (1408) and Hazelwood Demesne (1409) were surveyed by Perrin et al. (2008). The conservation assessment scores of Hazelwood Demesne and Cleaveragh Demesne were ranked as joint first and joint second respectively in Co. Sligo. Hazelwood Demesne (site code 1409) was also included in a national monitoring survey (O'Neill and Barron, 2013; Daly et al., in prep.). Map 5 shows the minimum area of alluvial forests within the SAC, which is estimated to be 55.3ha. It is important to note that further unsurveyed areas may be present within the SAC
Habitat distribution	Occurrence	No decline, subject to natural processes. The surveyed woodland locations are shown on map 5	Distribution based on Perrin et al. (2008), with modifications to the boundary of the monitoring site at Hazelwood Demesne (NSNW site code 1409) by Daly et al. (in prep.). It is important to note that further unsurveyed areas may be present within the SAC
Woodland size	Hectares	Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and "small" woods at least 3ha in size	The target areas for individual woodlands aim to reduce habitat fragmentation and benefit those species requiring 'deep' woodland conditions (Peterken, 2002). In some cases, topographical constraints may restrict expansion
Woodland structure: cover and height	Percentage; metres; centimetres	Total canopy cover at least 30%; median canopy height at least 7m; native shrub layer cover 10-75%; native herb/dwarf shrub layer cover at least 20% and height at least 20cm; bryophyte cover at least 4%	The target aims for a diverse structure with a canopy containing mature trees, shrub layer with semi-mature trees and shrubs, and well-developed field layer (herbs, graminoids and dwarf shrubs) and ground layer (bryophytes). Assessment criteria are described in Daly et al. (in prep.) and O'Neill and Barron (2013)
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	Described in Perrin et al. (2008). See also the Irish Vegetation Classification (Perrin, 2016; www.biodiversityireland.ie/projects/ivc-classification-explorer). Kelly and Iremonger (1997) classified plots from Hazelwood as the Osmundo-Salicetum atrocinereae vegetation type and one plot from the mouth of the Bonet River as the Carici remotae-Fraxinetum vegetation type
Woodland structure: natural regeneration	Seedling:sapling:pole ratio	Seedlings, saplings and pole age-classes of target species for 91E0* woodlands and other native tree species occur in adequate proportions to ensure survival of woodland canopy	The target species for 91E0* are alder (*Alnus glutinosa*), ash (*Fraxinus excelsior*) and willows (*Salix* spp.). Assessment criteria are described in Daly et al. (in prep.) and O'Neill and Barron (2013)

Hydrological regime: flooding depth/height of water table	Metres	Appropriate hydrological regime necessary for maintenance of alluvial vegetation	Periodic flooding is essential to maintain alluvial woodlands along river and lake floodplains, but not for woodland around springs/seepage areas. Drain blocking has been undertaken to reinstate natural hydrological functions at Hazelwood as part of a LIFE Project (LIFE05 NAT/IRL/000182) (Coillte: www.woodlandrestoration.ie/demonstration-sites-hazelwood.php)
Woodland structure: dead wood	Number per hectare	At least 19 stems/ha of dead wood of at least 20cm diameter	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem. Dead wood comprises old senescent trees, standing dead trees, fallen dead wood (including large branches) and rotten stumps of any tree species. Assessment criteria are described in Daly et al. (in prep.) and O'Neill and Barron (2013)
Woodland structure: veteran trees	Number per hectare	No decline	Veteran trees are important habitats for bryophytes, lichens, saproxylic organisms and some bird species. Their retention is important to ensure continuity of habitats/niches and propagule sources
Woodland structure: indicators of local distinctiveness	Occurrence; population size	No decline in distribution and, in the case of red listed and other rare or localised species, population size	Includes ancient or long-established woodlands (see Perrin and Daly, 2010), archaeological and geological features as well as red listed and other rare or localised species. Parts of the alluvial forest habitat at Cleaveragh Demesne (NSNW site code 1408) and Hazelwood Demesne (1409) have been categorised as Long-established Woodland (I) i.e. they appear on the 1830s 1st edition Ordnance Survey maps but no further evidence of antiquity could be found in older documentation (Perrin and Daly, 2010). The notable species bird cherry (*Prunus padus*) is abundant at Hazelwood Demesne (Perrin et al., 2008). See also the conservation objective for otter (*Lutra lutra*; Annex II species code 1355) in this volume
Woodland structure: indicators of overgrazing	Occurrence	All five indicators of overgrazing absent	There are five indicators of overgrazing within 91E0*: topiary effect on shrubs and young trees, browse line on mature trees, abundant dung, severe recent bark stripping, and trampling (Daly et al., in prep.)
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover at least 90% of canopy; target species cover at least 50% of canopy	The target species for 91E0* are alder (*Alnus glutinosa*), ash (*Fraxinus excelsior*) and willows (*Salix* spp.) (Daly et al., in prep.; O'Neill and Barron, 2013)
Vegetation composition: typical species	Occurrence	At least 1 target species for 91E0* woodlands present; at least 6 positive indicator species for 91E0* woodlands present	A variety of typical native species should be present, depending on woodland type. The target species for 91E0* are alder (*Alnus glutinosa*), ash (*Fraxinus excelsior*) and willows (*Salix* spp.). Positive indicator species for 91E0* are listed in Daly et al. (in prep.) and O'Neill and Barron (2013)
Vegetation composition: negative indicator species	Occurrence	Negative indicator species cover not greater than 10%; regeneration of negative indicator species absent	Negative indicator species (i.e. any non-native species, including herbaceous species) should be absent or under control. At Cleaveragh Demesne (1408), the non-native red-osier dogwood (*Cornus sericea*) forms thickets in the northern part of the site, and Rhododendron (*Rhododendron ponticum*) forms dense stands in western parts of the site. At Hazelwood Demesne (1409), Rhododendron and cherry laurel (*Prunus laurocerasus*) are dominant in a central part of the site and scattered elsewhere. Red-osier dogwood is frequent in wetter areas (Perrin et al., 2008). Horse-chestnut (*Aesculus hippocastanum*) is present and regenerating (Daly et al., in prep.). Substantial invasive species control work was undertaken to restore 24ha of alluvial forest at Hazelwood as part of a LIFE Project (LIFE05 NAT/IRL/000182) (Coillte: www.woodlandrestoration.ie/demonstration-sites-hazelwood.php) and further work is being undertaken by Coillte Nature on an additional 30ha

Vegetation composition: problematic native species	Percentage	Cover of common nettle (*Urtica dioica*) less than 75%	Common nettle (*Urtica dioica*) is a positive indicator species for 91E0* but, in some cases, it may become excessively dominant. Increased light and nutrient enrichment are factors which favour proliferation of common nettle (Daly et al., in prep.)

1092 White-clawed Crayfish *Austropotamobius pallipes*

To maintain the favourable conservation condition of White-clawed Crayfish (*Austropotamobius pallipes*) in Lough Gill SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Number of occupied 1km squares	No reduction from baseline. See map 6	Within Lough Gill SAC, the main population of white-clawed crayfish (*Austropotamobius pallipes*) is found in the Bonet River. Records indicate it is present on the main channel of the Bonet from Dromahair upstream to Glenade Lough (which is in an adjoining SAC). It is also found on the Shanvaus and Owenmore rivers and in Doon Lough, and in the stream that connects this lake to Lough Gill. There are likely to be crayfish populations in all 1km squares that overlap the designated sections of all these rivers; however, this would need to be proven by appropriate surveys. White-clawed crayfish are, however, not known to be present in Lough Gill itself (O'Connor et al., 2009)
Population structure: recruitment	Percentage occurrence of juveniles and females with eggs	Juveniles and females with eggs in at least 50% of positive samples taken at appropriate time and methodology	See Reynolds et al. (2010) for further details. Gammell et al. (2021) found juveniles at sites at sites along the River Bonet
Population size	Catch per unit effort	No reduction from baseline of 0.25	The population abundance grade at most sites sampled in Gammell et al. (2021) was low except in the upper reaches of the Bonet River. The catch per unit effort (CPUE) figure is based on the figures and methodologies in Gammell et al. (2021) and in O'Connor et al. (2009). This may be refined with further more detailed assessment of the stocks within this SAC and in the different habitats
Negative indicator species	Occurrence	No non-indigenous crayfish species present	Non-indigenous crayfish species (NICS) are identified as a major direct threat to the white-clawed crayfish and as a disease vector, in particular crayfish plague (*Aphanomyces astaci*), which is fatal to white-clawed crayfish. The possession, import and intentional release of five species of invasive alien crayfish is banned by Statutory Instrument No. 354/2018
Disease	Occurrence	No instances of disease	Crayfish plague, caused by the water-borne mould *Aphanomyces astaci*, is identified as major threat to the species in Ireland. Instances of crayfish plague have occurred in Ireland since 2015 causing local extinctions. There have been no confirmed or suspected outbreaks in this SAC
River water quality	EPA Q value	At least Q3-4 at all sites sampled by EPA	The Bonet system is monitored by the Environmental Protection Agency (EPA) and in the latest assessment the river is High in the upper reaches downstream of Glenade Lough to H8641. Below this, it changes progressively through Good and Moderate to Poor in the section downstream of Dromahair. The Shanavaus and Owenmore are both classified as High. The subcatchment that includes Doon Lough is classified as Poor. The target level is based on Demers and Reynolds (2002). Q values are based on triennial water quality surveys carried out by the EPA
Lake water quality	Water chemistry measures	Maintain appropriate water quality, particularly pH and nutrient levels, to support the natural structure and functioning of the habitat	White-clawed crayfish are not considered very sensitive of water quality but are intolerant of low pH and poorest water quality, and lack of calcareous influence. There should be no decline in the water quality as defined by the targets for the 3150 lake habitat, as these are more stringent than white-clawed crayfish requires. See the conservation objective for the lake habitat in this volume for further details

Habitat quality: heterogeneity	Occurrence of positive habitat features	No decline from the baseline	White-clawed crayfish need high habitat heterogeneity. Larger crayfish must have stones to hide under, or an earthen bank in which to burrow. Hatchlings shelter in vegetation, gravel and among fine tree roots. Smaller crayfish are typically found among weed and debris in shallow water. Larger juveniles in particular may also be found among cobbles and detritus such as leaf litter. These conditions and habitat features must be available on the whole length of occupied habitat. Gammell et al. (2021) scored the habitat heterogeneity and following this methodology a baseline score of of 0.37, based on the mean score, is set

1095 Sea Lamprey *Petromyzon marinus*

To restore the favourable conservation condition of Sea Lamprey (*Petromyzon marinus*) in Lough Gill SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	Percentage of river accessible	Greater than 75% of main stem length of rivers accessible from estuary	Artificial barriers can block or impede the passage of upstream migrating lamprey, thereby restricting access to spawning areas (Gargan et al., 2011; Rooney et al., 2015). The weir on the Garavogue River in Sligo town is currently not considered an issue for sea lamprey. However, there is a significant natural barrier, consisting of a sequence of waterfalls, at the village of Dromahair in the lower reaches of the River Bonet. Only a small number of records exist for sea lamprey (*Petromyzon marinus*) in Lough Gill SAC. An individual lamprey was observed immediately downstream of the weir in Sligo in 2015 and there have been anecdotal records of sea lamprey nests in the Garavogue in Sligo town. Significantly, two juvenile lake-feeding sea lampreys were recorded from Lough Gill in 2018 attached to pike (King and O'Gorman, 2018)
Annual run size	Number of sea lamprey nests	Annual run size should reflect that expected under near-natural conditions	This target is based on guidance from JNCC (2015) and requires assessment of adult sea lamprey spawning activity in the form of annual nest counts. Sea lamprey do not exhibit complete fidelity to natal rivers and monitoring needs to occur over several years to build up a picture of inter-annual variation in spawning occurrence. Suitable spawning habitat for sea lamprey in Lough Gill SAC is limited to sections of the Garavogue River in Sligo town and downstream of Dromahair on the River Bonet. As stated above, few records exist for adult sea lampreys in this catchment and the sequence of waterfalls on the Bonet River at Dromahair represents a potential natural barrier to upstream migration
Larval lamprey in fine sediment	Larval lamprey/m²	Larval lamprey present in SAC catchment	It is currently not possible to set a target mean density for this attribute. Sea lamprey larvae are rarely encountered in catchment-wide electro-fishing surveys and more information is required on larval habitat utilisation by this species. Targeted surveys may be required to establish presence/absence of sea lamprey larvae in Lough Gill SAC and new sampling techniques may need to be explored. An electro-fishing survey for larval lamprey was carried out on the Garavogue-Bonet catchment by Inland Fisheries Ireland (IFI) in 2009 (Inland Fisheries Ireland, 2010), with a repeat survey in 2016 (Gallagher et al., 2017). No sea lamprey larvae were recorded from these surveys

Extent and distribution of spawning and nursery habitat	m^2 and occurrence	No decline in extent and distribution of spawning and nursery beds	Sea lampreys spawn in well-oxygenated gravels where they excavate large nests. Suitable spawning habitat for sea lamprey in this SAC is limited to sections of the Garavogue River in Sligo town and downstream of Dromahair on the River Bonet, as stated above. The target for nursery beds is based on habitat mapping during targeted larval lamprey monitoring surveys. Of the 23 sites surveyed in the 2016 survey (Gallagher et al., 2017), 35% had no nursery habitat for larval lamprey. A high proportion of sites with no suitable nursery habitat reflects the fluvial geomorphology of this catchment which is predominantly a mid to high energy system. Some of the low-lying arterially drained sections were too deep for sampling using the electro-fishing technique. Approximately 30% of the catchment's water bodies were subjected to arterial drainage in the 1980s. Drainage maintenance has the potential to alter instream sediment dynamics which in turn affects larval lamprey populations

1096 Brook Lamprey *Lampetra planeri*

To restore the favourable conservation condition of Brook Lamprey (*Lampetra planeri*) in Lough Gill SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Percentage of river accessible	Access to all water courses down to first order streams	Artificial barriers can block or impede the passage of upstream migrating lamprey, thereby limiting their distribution to lower stretches and restricting access to spawning areas (Gargan et al., 2011; Rooney et al., 2015). Artificial barriers are not considered an issue for brook lamprey (*Lampetra planeri*) in Lough Gill SAC
Distribution in suitable habitat	Percentage of positive sites in 2nd order channels (and greater), downstream of spawning areas	Not less than 50% of sample sites with suitable habitat positive for larval brook/river lamprey	Larval lamprey live in fine sediments for up to six years. It is not possible to distinguish between larval brook lamprey (*Lampetra planeri*) and river lamprey (*L. fluviatilis*) in the field and they are therefore considered together in this and other attribute targets. A survey for larval lamprey was carried out on the Garavogue-Bonet catchment in 2009 (Inland Fisheries Ireland, 2010), with a repeat survey in 2016 (Gallagher et al., 2017). Results were broadly similar for both years. To achieve favourable condition, *Lampetra* spp. should, as a minimum, be present in not less than 50% of all sampling sites surveyed with suitable habitat present within the natural range (JNCC, 2015). Of the 23 sites sampled in 2016 (Gallagher et al., 2017), *Lampetra* spp. larvae were present in 47% of sites with suitable nursery habitat, indicating this catchment does not achieve favourable condition for this attribute
Population structure of larvae	Number of age/size classes	At least three age/size classes of larval brook/river lamprey present	The target of at least three age/size classes is based on guidance from JNCC (2015). Larvae typically range from 10-150mm in length and this corresponds to up to six age classes. A broad range of size classes (21-104mm) was recorded from the Garavogue-Bonet catchment-wide survey in 2016 (Gallagher et al., 2017) indicating favourable condition for this attribute
Larval lamprey density in fine sediment	Larval lamprey/m²	Mean density of brook/river larval lamprey in sites with suitable habitat at least 5/m²	A target mean density of at least 5/m² larvae in sites with suitable habitat is required to achieve favourable condition (JNCC, 2015). A mean density of 1.5/m² *Lampetra* spp. larvae was obtained in the 2009 electro-fishing survey of the Garavogue-Bonet catchment (Inland Fisheries Ireland, 2010), with no improvement (1.7/m²) recorded in 2016 (Gallagher et al., 2017). Brook lamprey, therefore, do not achieve favourable condition for this attribute in Lough Gill SAC
Extent and distribution of spawning and nursery habitat	m² and occurrence	No decline in extent and distribution of spawning and nursery beds	This target is based on habitat mapping during targeted larval lamprey monitoring surveys. Brook lamprey spawn in clean gravels where they excavate shallow nests (Rooney et al., 2013). While coarse substrate is required for spawning, the close proximity of nursery areas comprising mainly sand/silt are necessary for the development of larvae. Of the 23 sites surveyed in 2016 (Gallagher et al., 2017), 35% had no nursery habitat, with 43% of sites having no nearby spawning habitat. A high proportion of sites with no suitable nursery habitat reflects the fluvial geomorphology of this catchment which is predominantly a mid to high energy system. Some of the low-lying arterially drained sections were too deep for sampling using the electro-fishing technique. Approximately 30% of the catchment's water bodies were subjected to arterial drainage in the 1980s. Drainage maintenance has the potential to alter instream sediment dynamics which in turn affects larval lamprey populations

1099 River Lamprey *Lampetra fluviatilis*

To restore the favourable conservation condition of River Lamprey (*Lampetra fluviatilis*) in Lough Gill SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Percentage of river accessible	Access to all water courses down to first order streams	Artificial barriers can block or impede the passage of upstream migrating lamprey, thereby restricting access to spawning areas (Gargan et al., 2011; Rooney et al., 2015). There is a substantial weir on the Garavogue River in Sligo town, but this is currently not considered an issue for river lamprey (*Lampetra fluviatilis*) migration as there is a working fish pass and, failing that, one of the weir arches is open to enable fish passage. Of more significance is a possible natural barrier in the form of a substantial bedrock outcrop at the village of Dromahair in the lower reaches of the River Bonet. At this point, the river falls approximately 9m in a short distance over a series of bedrock outcroppings, creating a sequence of waterfalls. This feature poses a significant barrier to anadromous and catadromous fish species. At present, there are no records for adult river lamprey in the Garavogue-Bonet system
Distribution in suitable habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	Not less than 50% of sample sites with suitable habitat positive for larval brook/river lamprey	It is not possible to distinguish between larval brook lamprey (*Lampetra planeri*) and river lamprey (*L. fluviatilis*) in the field and they are therefore considered together in this and other targets. That said, it is likely that the majority, if not all, records are for brook lamprey, particularly those recorded above barriers to river lamprey upstream passage. A survey for larval lamprey was carried out on the Garavogue-Bonet catchment in 2009 (IFI, 2010), with a repeat survey in 2016 (Gallagher et al., 2017). Results were broadly similar for both years. To achieve favourable condition, *Lampetra* spp. should, as a minimum, be present in not less than 50% of all sampling sites surveyed with suitable habitat present within the natural range (JNCC, 2015). Of the 23 sites sampled in 2016, *Lampetra* spp. larvae were present in 47% of sites with suitable nursery habitat, indicating this catchment does not achieve favourable condition for this attribute
Population structure of larvae	Number of age/size classes	At least three age/size classes of larval brook/river lamprey present	The target of at least 3 age/size classes is based on guidance from JNCC (2015). Larvae typically range from 10-150mm in length and this corresponds to up to six age classes. A broad range of size classes (21-104mm) for *Lampetra* spp. was recorded from the Garavogue-Bonet catchment-wide survey in 2016 (Gallagher et al., 2017) indicating favourable condition for this atttribute in Lough Gill SAC
Larval lamprey density in fine sediment	Larval lamprey/m²	Mean density of brook/river larval lamprey in sites with suitable habitat at least 5/m²	A target mean density of at least 5/m² larvae in sites with suitable habitat is required to achieve favourable condition (JNCC, 2015). A mean density of 1.5/m² *Lampetra* spp. larvae was obtained in the 2009 electro-fishing survey (Inland Fisheries Ireland, 2010), with no improvement (1.7/m²) recorded in 2016 (Gallagher et al., 2017), indicating that the Garavogue-Bonet catchment does not achieve favourable condition for this attribute

Extent and distribution of spawning and nursery habitat	m^2 and occurrence	No decline in extent and distribution of spawning and nursery beds	This target is based on habitat mapping during targeted larval lamprey monitoring surveys. River lamprey spawn in clean gravels in flowing water where they excavate shallow nests. While coarse substrate is required for spawning, the close proximity of nursery areas comprising mainly sand/silt are necessary for the development of larvae. Of the 23 sites surveyed in 2016 (Gallagher et al., 2017), 35% had no nursery habitat, with 43% of sites having no nearby spawning habitat. A high proportion of sites with no suitable nursery habitat reflects the fluvial geomorphology of this catchment which is predominantly a mid to high energy system. Some of the low-lying arterially drained sections were too deep for sampling using the electro-fishing technique. Approximately 30% of the catchment's water bodies were subjected to arterial drainage in the 1980s. Drainage maintenance has the potential to alter instream sediment dynamics which in turn affects larval lamprey populations

1106 Salmon *Salmo salar*

To restore the favourable conservation condition of Atlantic Salmon (*Salmo salar*) in Lough Gill SAC, which is defined by the following list of attributes and targets:

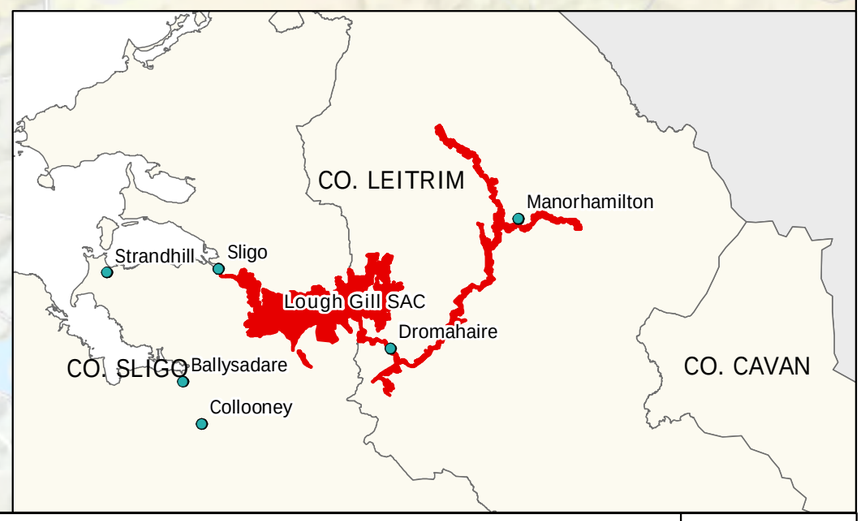
Attribute	Measure	Target	Notes
Distribution: extent of anadromy	Percentage of river accessible	100% of river channels down to second order accessible from estuary	Artificial barriers block salmons' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas
Adult spawning fish	Number	Conservation limit (CL) for each system consistently exceeded	A conservation limit (CL) is defined by the North Atlantic Salmon Conservation Organisation (NASCO) as "the spawning stock level that produces long-term average maximum sustainable yield as derived from the adult to adult stock and recruitment relationship". The target is based on the Technical Expert Group on Salmon's (TEGOS) annual model output of CL attainment levels. See Gargan et al. (2021) for further details. Stock estimates are either derived from direct counts of adults (rod catch, fish counter) or indirectly by fry abundance counts. Lough Gill SAC is just below its CL for one-sea-winter (1SW) and just above its CL for multi-sea-winter (MSW) salmon
Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 minutes sampling	Target is threshold value for rivers currently exceeding their conservation limit (CL)
Out-migrating smolt abundance	Number	No significant decline	Smolt abundance can be negatively affected by a number of impacts such as estuarine pollution, predation and sea lice (*Lepeophtheirus salmonis*)
Number and distribution of redds	Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes	Salmon spawn in clean gravels. There is restricted habitat for salmon in the system in this SAC
Water quality	EPA Q value	At least Q4 at all sites sampled by EPA	Q values based on triennial water quality surveys carried out by the Environmental Protection Agency (EPA)

1355 Otter *Lutra lutra*

To maintain the favourable conservation condition of Otter (*Lutra lutra*) in Lough Gill SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Percentage positive survey sites	No significant decline	Measure based on standard otter survey technique. Favourable Conservation Status (FCS) target, based on 1980/81 survey findings, is 88% in SACs. Current range is estimated at 93.6% (Reid et al., 2013)
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 193.91ha along river banks/ lake shoreline/around ponds	No field survey. Areas mapped to include 10m terrestrial buffer, identified as critical for otters (NPWS, 2007), along rivers and around water bodies
Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 80.38km	No field survey. River length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (Chapman and Chapman, 1982)
Extent of freshwater (lake) habitat	Hectares	No significant decline. Area mapped and calculated as 353.39ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (NPWS, 2007)
Couching sites and holts	Number	No significant decline	Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk and Moorhouse, 1991: Kruuk, 2006)
Fish biomass available	Kilograms	No significant decline	Broad diet that varies locally and seasonally, but dominated by fish, in particular salmonids, eels and sticklebacks in freshwater (Bailey and Rochford, 2006; Reid et al., 2013)
Barriers to connectivity	Number	No significant increase. For guidance, see map 7	Otters will regularly commute across stretches of open water up to 500m. e.g. between the mainland and an island; between two islands; across an estuary (De Jongh and O'Neill, 2010). It is important that such commuting routes are not obstructed

Kings Mountain
Glencar Lough
Glencar
N16
Cope's Mountain
N15
Gurteen
Keelogyboy Mountain
Leean Mountain
Calgach
Fivemilebourne
Leckaun
Kilmore
Killerry Mountain
Dromahair
Killarga
Ballintogher
Tullycoly
Cullies
Kiltyclogher
Dough Mountain
Thur Mountain
Manorhamilton
Lissinagroagh
Glenboy
East Barrs
N16



Legend

Lough Gill SAC 001976

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 1:
LOUGH GILL SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 001976; version 3.
CO. SLIGO / LEITRIM

0 1 2 4 Kilometres

N

Date: November 2021

Glenade Lough SAC 001919

Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC 000627

Lough Gill SAC 001976

Legend

- Lough Gill SAC 001976
- Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC 000627
- Glenade Lough SAC 001919

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 2:
LOUGH GILL SAC
CONSERVATION OBJECTIVES
ADJACENT SITES

Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 001976; version 3.
CO. SLIGO / LEITRIM

0 1 2 4 Kilometres

N

Date: November 2021

Lough Gill

Legend

- 3150 Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation / 3130 Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea*
- Lough Gill SAC 001976
- OSI Discovery Series County Boundary

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 3:
LOUGH GILL SAC
CONSERVATION OBJECTIVES
INDICATIVE LAKE HABITATS

Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 001976; version 3.
CO. SLIGO / LEITRIM

0 1 2 4 Kilometres

N

Date: November 2021

Legend

- Lough Gill SAC 001976
- 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates(*Festuco-Brometalia*) (* important orchid sites)
- OSI Discovery Series County Boundary

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 4:
LOUGH GILL SAC
CONSERVATION OBJECTIVES
GRASSLAND HABITATS

Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 001976; version 3.
CO. SLIGO / LEITRIM

0 1 2 4 Kilometres

N

Date: November 2021

NSNW/WM sitecode: 1409

NSNW/WM sitecode: 1408

NSNW sitecode: 1400

NSNW sitecode: 333

NSNW sitecode: 371

NSNW sitecode: 1411

Ordnance Survey Ireland

Legend

Annex woodland habitats

- 91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
- 91E0 *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior Alno-padion, Alnion incanae, Salicion albae*)

Non-Annex woodland habitats

- WD1 (Mixed) broadleaved woodland
- WN1 Oak-birch-holly woodland

- Lough Gill SAC 001976

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 5:
LOUGH GILL SAC
CONSERVATION OBJECTIVES
WOODLAND HABITATS

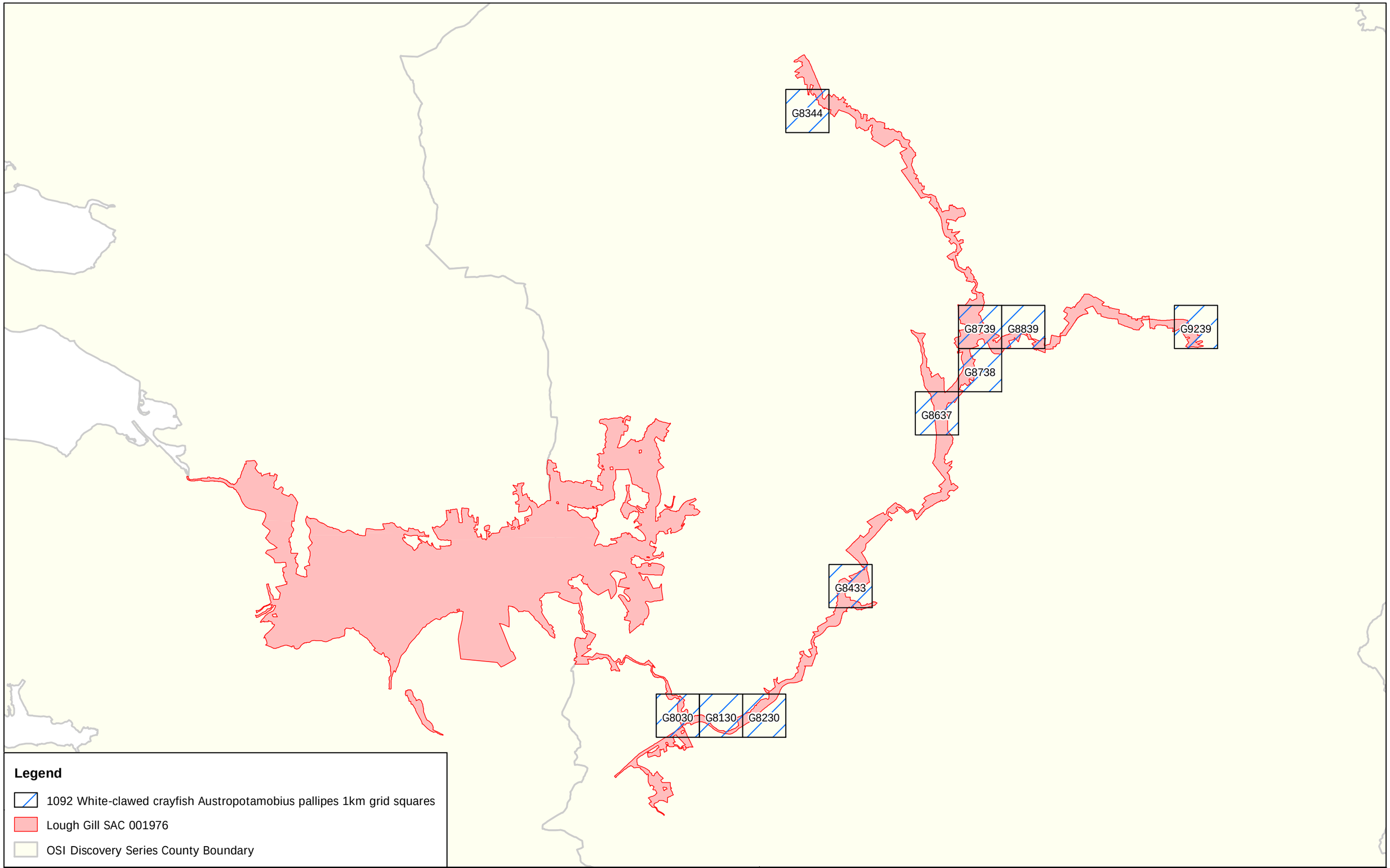
Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 001976; version 3.
CO. SLIGO / LEITRIM

0 0.45 0.9 1.8 Kilometres

N

Date: November 2021



Legend

- 1092 White-clawed crayfish Austropotamobius pallipes 1km grid squares
- Lough Gill SAC 001976
- OSI Discovery Series County Boundary

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 6:
LOUGH GILL SAC
CONSERVATION OBJECTIVES
WHITE-CLAWED CRAYFISH

Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 001976; version 3.
CO. SLIGO / LEITRIM

0 1 2 4 Kilometres

N

Date: November 2021

Legend

- 1355 Otter - *Lutra lutra* commuting 250m buffer
- Lough Gill SAC 001976
- OSI Discovery Series County Boundary

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 7:
LOUGH GILL SAC
CONSERVATION OBJECTIVES
OTTER COMMUTING

Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 001976; version 3.
CO. SLIGO / LEITRIM

0 1 2 4 Kilometres

N

Date: November 2021

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Lough Golagh and Breesy Hill SAC 002164

An Roinn Ealaíon, Oidhreachta,
Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta

Department of Arts, Heritage,
Regional, Rural and Gaeltacht Affairs

National Parks and Wildlife Service,
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs,

7 Ely Place, Dublin 2, Ireland.

Web: www.npws.ie
E-mail: nature.conservation@ahg.gov.ie

Citation:

NPWS (2017) Conservation Objectives: Lough Golagh and Breesy Hill SAC 002164. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

Series Editor: Rebecca Jeffrey
ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

002164	Lough Golagh and Breesy Hill SAC

7130	Blanket bogs (* if active bog)

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

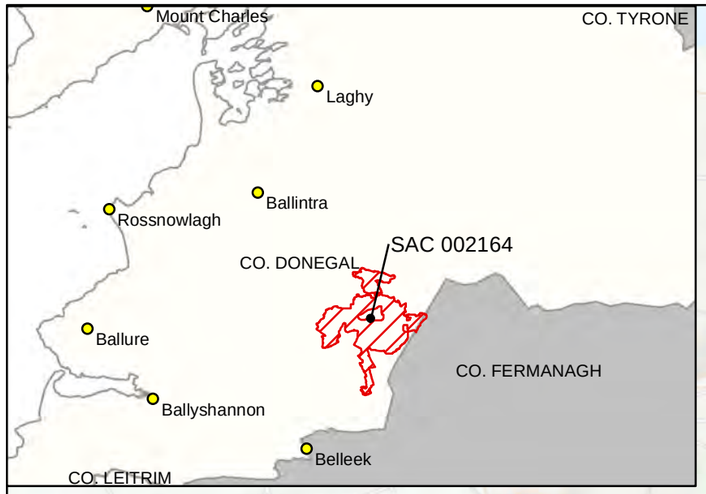
Year :	2005
Title :	Conservation Plan for 2005-2010. Lough Golagh and Breesy Hill cSAC Site Code 002164 Co. Donegal
Author :	NPWS
Series :	Conservation Plan
Year :	2012
Title :	Ireland Red List No. 8: Bryophytes
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	Ireland Red List series, NPWS
Year :	2014
Title :	Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland, Version 2.0
Author :	Perrin, P.M.; Barron, S.J.; Roche, J.R.; O'Hanrahan, B.
Series :	Irish Wildlife Manual No. 79
Year :	2016
Title :	Ireland Red List No. 10: Vascular Plants
Author :	Wyse Jackson, M.; FitzPatrick, Ú.; Cole, E.; Jebb, M.; McFerran, D.; Sheehy Skeffington, M.; Wright, M.
Series :	Ireland Red Lists series, NPWS
Year :	2017
Title :	Lough Golagh and Breesy Hill SAC (site code: 2164) Conservation objectives supporting document- blanket bogs and associated habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document

7130 Blanket bogs (* if active bog)

To restore the favourable conservation condition of Blanket bogs (* if active bog) in Lough Golagh and Breesy Hill SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Blanket bog has not been mapped in detail for Lough Golagh and Breesy Hill SAC but from current available data the total area of the qualifying habitat is estimated to be approximately 246ha, covering 31% of the SAC. Further details on this and the following attributes can be found in the Lough Golagh and Breesy Hill SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	Blanket bog is documented to occur throughout Lough Golagh and Breesy Hill SAC, mostly in a mosaic with heath and flush. The most extensive area of blanket bog within the SAC is found on the open landscape west of Breesy Hill (NPWS, 2005). Further information can be found within NPWS (2005) and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Ecosystem function: peat formation	Active blanket bog as a proportion of the total area of Annex I blanket bog habitat	At least 99% of the total Annex I blanket bog area is active	See the blanket bogs and associated habitats supporting document for further details
Ecosystem function: hydrology	Flow direction, water levels, occurrence of drains and erosion gullies	Natural hydrology unaffected by drains and erosion	Further details and a brief discussion of restoration potential is presented in the blanket bogs and associated habitats supporting document
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	A variety of blanket bog vegetation communities have been recorded in this SAC (NPWS, 2005; NPWS internal files), one of which corresponds to a community recorded in the National Survey of Upland Habitats and listed in the provisional list of vegetation communities described in Perrin et al. (2014). Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: positive indicator species	Number of species at a representative number of 2m x 2m monitoring stops	Number of positive indicator species present at each monitoring stop is at least seven	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: lichens and bryophytes	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of bryophytes or lichens, excluding *Sphagnum fallax*, at least 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). Rhododendron (*Rhododendron ponticum*) was recorded from blanket bog within the SAC (NPWS, 2005)
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 10%	Attribute and target based on Perrin et al. (2014)

Vegetation composition: potential dominant species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of each of the potential dominant species less than 75%	Attribute and target based on Perrin et al. (2014). See the blanket bogs and associated habitats supporting document for the list of potential dominant species
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Last complete growing season's shoots of ericoids, crowberry (*Empetrum nigrum*) and bog-myrtle (*Myrica gale*) showing signs of browsing collectively less than 33%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas for this habitat is also presented
Vegetation structure: *Sphagnum* condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up	Attribute and target based on Perrin et al. (2014)
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: drainage	Percentage area in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: erosion	Percentage area in local vicinity of a representative number of monitoring stops	Less than 5% of the greater bog mosaic comprises erosion gullies and eroded areas	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016)



Legend

Lough Golagh and Breesy Hill SAC 002164

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 1:
LOUGH GOLAGH AND BREESY HILL SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002164; version 3.02
CO. DONEGAL

0 0.25 0.5 0.75 1 km

N

Map Version 1
Date: April 2017

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Lough Melvin SAC 000428

An Roinn Tithíochta,
Rialtais Áitiúil agus Oidhreachta
Department of Housing,
Local Government and Heritage

National Parks and Wildlife Service,
Department of Housing, Local Government and Heritage,

90 King Street North, Dublin 7, D07 N7CV, Ireland.

Web: www.npws.ie
E-mail: natureconservation@housing.gov.ie

Citation:

NPWS (2021) Conservation Objectives: Lough Melvin SAC 000428. Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.

Series Editors: Rebecca Jeffrey and Christina Campbell
ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

000428	Lough Melvin SAC
1106	Salmon *Salmo salar*
1355	Otter *Lutra lutra*
3130	Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoëto-Nanojuncetea
6410	*Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)

Please note that this SAC overlaps with Donegal Bay SPA (004151). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping site as appropriate.

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	2006
Title :	Otter survey of Ireland 2004/2005
Author :	Bailey, M.; Rochford, J.
Series :	Irish Wildlife Manuals, No. 23
Year :	2007
Title :	Supporting documentation for the Habitats Directive Conservation Status Assessment - backing documents. Article 17 forms and supporting maps
Author :	NPWS
Series :	Unpublished report to NPWS
Year :	2013
Title :	National otter survey of Ireland 2010/12
Author :	Reid, N.; Hayden, B.; Lundy, M.G.; Pietravalle, S.; McDonald, R.A.; Montgomery, W.I.
Series :	Irish Wildlife Manuals, No. 76
Year :	2013
Title :	Irish semi-natural grasslands survey 2007-2012
Author :	O'Neill, F.H.; Martin, J.R.; Devaney, F.M.; Perrin, P.M.
Series :	Irish Wildlife Manuals, No. 78
Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 2. Habitats assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2015
Title :	Habitats Directive Annex I lake habitats: a working interpretation for the purposes of site-specific conservation objectives and Article 17 reporting
Author :	O Connor, Á.
Series :	Unpublished document by NPWS
Year :	2016
Title :	Ireland Red List No. 10: Vascular Plants
Author :	Wyse Jackson, M.; FitzPatrick, Ú.; Cole, E.; Jebb, M.; McFerran, D.; Sheehy Skeffington, M.; Wright, M.
Series :	Ireland Red Lists series, NPWS
Year :	2018
Title :	The monitoring and assessment of three EU Habitats Directive Annex I grassland habitats
Author :	Martin, J.R.; O'Neill, F.H.; Daly, O.H.
Series :	Irish Wildlife Manuals, No. 102
Year :	2019
Title :	The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments
Author :	NPWS
Series :	Conservation assessments
Year :	in prep.
Title :	A study of lakes with Slender Naiad (*Najas flexilis*)
Author :	Roden, C.; Murphy, P.; Ryan, J.B.
Series :	Irish Wildlife Manuals

Other References

Year :	1982
Title :	Otter survey of Ireland
Author :	Chapman, P.J.; Chapman, L.L.
Series :	Unpublished report to Vincent Wildlife Trust
Year :	1991
Title :	The spatial organization of otters (*Lutra lutra*) in Shetland
Author :	Kruuk, H.; Moorhouse, A.
Series :	Journal of Zoology, 224: 41-57
Year :	1992
Title :	The Northern Ireland Lakes Survey
Author :	Wolfe-Murphy, S.A.; Lawrie, E.W.; Smith, S.J.; Gibson, C.E.
Series :	Report to Countryside and Wildlife Branch, Department of the Environment for Northern Ireland
Year :	1997
Title :	Lough Melvin ASSI Citation and Views about Management
Author :	Environment and Heritage Services (EHS)
Series :	EHS, Department of the Environment for Northern Ireland
Year :	1999
Title :	Diet of otters (*Lutra lutra*) on Inishmore, Aran Islands, west coast of Ireland
Author :	Kingston, S.; O'Connell, M.; Fairley, J.S.
Series :	Biology and Environment: Proceedings of the Royal Irish Academy, 99B: 173-182
Year :	2006
Title :	Otters - ecology, behaviour and conservation
Author :	Kruuk, H.
Series :	Oxford University Press
Year :	2006
Title :	A reference-based typology and ecological assessment system for Irish lakes. Preliminary investigations. Final report. Project 2000-FS-1-M1 Ecological assessment of lakes pilot study to establish monitoring methodologies EU (WFD)
Author :	Free, G.; Little, R.; Tierney, D.; Donnelly, K.; Coroni, R.
Series :	Environmental Protection Agency, Wexford
Year :	2010
Title :	Otter tracking study of Roaringwater Bay
Author :	De Jongh, A.; O'Neill, L.
Series :	Unpublished draft report to NPWS
Year :	2016
Title :	A narrative for conserving freshwater and wetland habitats in England
Author :	Mainstone, C.; Hall, R.; Diack, I.
Series :	Natural England Research Reports Number 064
Year :	2021
Title :	The Status of Irish Salmon Stocks in 2020 with Catch Advice for 2021
Author :	Gargan, P.; Fitzgerald, C.; Kennedy, R.; Maxwell, H.; McLean, S.;Millane, M.
Series :	Report of the Technical Expert Group on Salmon (TEGOS) to the North-South Standing Scientific Committee for Inland Fisheries

Spatial data sources

Year :	2008
Title :	OSi 1:5000 IG vector dataset
GIS Operations :	WaterPolygons feature class clipped to the SAC boundary. Expert opinion used to identify Annex I habitat and to resolve any issues arising
Used For :	3130 (map 3)
Year :	2013
Title :	Irish Semi-Natural Grassland Survey
GIS Operations :	Dataset clipped to the SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	6410 (map 4)
Year :	2018
Title :	Grasslands Monitoring Survey 2015-2017
GIS Operations :	Dataset clipped to the SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	6410 (map 4)
Year :	2010
Title :	OSi 1:5000 IG vector dataset
GIS Operations :	Creation of 80m buffer on aquatic side of lake data; creation of 10m buffer on terrestrial side of lake data. Datasets combined with derived OSi Prime 2 water dataset. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising. Creation of 250m buffer on aquatic side of the lake boundary to highlight potential commuting points
Used For :	1355 (map 5)
Year :	2021
Title :	OSi Prime 2 water polygon file
GIS Operations :	Creation of 10m buffer on terrestrial side of river banks data. Dataset combined with derived OSi 1:5000 vector lake buffer data and OSi Discovery series vector marine buffer data. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1355 (map 5)
Year :	2005
Title :	OSi Discovery series vector data
GIS Operations :	Creation of 80m buffer on marine side of high water mark (HWM); creation of 10m buffer on terrestrial side of HWM; combination of 80m and 10m HWM buffer datasets; Datasets combined with the derived OSi Prime 2 water dataset. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising. Creation of 250m buffer on marine side of HWM to highlight potential commuting points
Used For :	1355 (map 5)

3130 Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoëto-Nanojuncetea

To restore the favourable conservation condition of Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea in Lough Melvin SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Habitat 3130 is found in Lough Melvin. The habitat occurs in clear-water lakes of intermediate alkalinity where *Isoetes lacustris* and *Potamogeton perfoliatus/praelongus* co-occur and is characterised by high species richness and a deep-water flora that can include *Najas flexilis* (slender naiad) (Roden et al., in prep.). Lough Melvin was considered significantly altered in 2017 (Roden et al., in prep.). The lake was assessed as in bad conservation condition, while overall habitat 3130 was in poor deteriorating conservation status across Ireland in 2013-2018 (NPWS, 2019). The majority of lakes with 3130 appear to be damaged and high conservation value 3130 lakes in good condition are extremely rare (Roden et al., in prep.). The lake surface area is the simplest measure of extent and should be stable or increasing. See map 3. For further information on all attributes and an overview of slender naiad-type lakes see Roden et al. (in prep.). See also O Connor (2015)
Habitat distribution	Occurrence	No decline, subject to natural processes	Lough Melvin occupies a basin partly on Carboniferous sandstone, shale and limestone. Roden et al. (in prep.), during a brief survey in 2017 from the southern shore, found a depauperate flora in Lough Melvin and considered it had changed significantly since the survey by Wolfe-Murphy et al. (1992). Further data are also available from the Environmental Protection Agency (EPA) and Northern Ireland Environment Agency (NIEA) (Water Framework Directive (WFD) monitoring). Lough Melvin is also an SAC in Northern Ireland (UK0030047)
Vegetation species richness	Occurrence	Restore appropriate species richness	Lough Melvin had a depauperate flora (10 species) and low euphotic depth for a large lake when examined in 2017 (Roden et al., in prep.), apparently significantly changed since the Northern Ireland Lakes Survey (Wolfe-Murphy et al., 1992). There should be no decline in species richness (see Roden et al., in prep.). Roden et al. (in prep.) found that habitat 3130 has a varied and species-rich flora, with high conservation value examples having more than 30 species of aquatic macrophytes. Almost all lakes with more than 30 species had euphotic depth >3m (Roden et al., in prep.). The number of species recorded increases with sampling effort (Roden et al., in prep.)
Vegetation composition: typical species	Occurrence	Restore typical species, in good condition, and demonstrating typical abundances and distribution	Restore condition and extent of typical plant species of habitat 3130. The post-glacial fish community of Lough Melvin is considered to be important and unique. Roden et al. (in prep.) described the typical species of habitat 3130 and those present in lakes in good condition. Habitat 3130 has a varied and species-rich flora with several rare species that can include *Baldellia ranunculoides* subsp. *repens, Hydrilla verticillata, Isoetes echinospora, Najas flexilis, Pilularia globulifera, Fissidens fontanus*, and also two uncertain charophyte taxa: *Chara muscosa; Nitella spanioclema*. See also NPWS (2013, 2019) and O Connor (2015)

Vegetation composition: characteristic zonation	Occurrence	Restore characteristic deep-water vegetation	Roden et al. (in prep.) did not record either *Isoetes* or deep-water vegetation zones in Lough Melvin. The characteristic zonation (3 or more zones) is described in Roden et al. (in prep.). Shallow water has a *Lobelia-Littorella* zone (0-1.5m), then an *Isoetes lacustris* zone (0.5-3m), both also typical of oligotrophic lakes and habitat 3110. The characteristic deep-water community is the most sensitive element and consists of some or all of *Callitriche hermaphroditica, Hydrilla verticillata, Najas flexilis, Potamogeton berchtoldii, P. perfoliatus, P. pusillus, Nitella confervacea, Nitella flexilis, Nitella translucens*. Full development is when a distinct deep-water zone is present, with one or more of its typical species having >25% cover
Vegetation distribution: maximum (euphotic) depth	Metres	Restore maximum depth of vegetation, subject to natural processes	Maximum depth of vegetation was 2.5m in Lough Melvin in 2017 (Roden et al., in prep.). Euphotic depth ranged from 5.2m to 1.9m in lakes surveyed 2016-2018 and the target for maximum depth of vegetation colonisation (euphotic depth) in 3130 lakes was set as at least >3m (Roden et al., in prep.). Site-specific targets must be considered, however, as euphotic depths of >4m or >5m have been recorded in species-rich lakes in good condition. Maximum depth is considered to have declined in many lakes, owing to increased water colour. Lakes within undisturbed peatland are expected to have clear water and large maximum vegetation depth
Hydrological regime: water level fluctuations	Metres	Maintain appropriate hydrological regime necessary to support the habitat	Roden et al. (in prep.) found that, in summer, the *Littorella* zone is typically submerged and stated that if more than half is exposed it is a matter of concern and water level should never be lower than the top of the *Isoetes* zone. Fluctuations in lake water level are typical in Ireland, but can be amplified by activities such as abstraction, drainage and overgrazing. Increased water level fluctuations can increase wave action, up-root vegetation, increase turbidity, alter the substratum and lead to release of nutrients from the sediment. Groundwater inputs are likely to be important for the characteristic deep-water zone. Groundwater inflow was noted at the southern shore of Lough Melvin in 2017 (Roden, pers. comm.). The hydrological regime of the lake must be maintained so that the area, distribution and depth of the lake habitat and its constituent/characteristic vegetation zones and communities are not reduced
Lake substratum quality	Various	Maintain/restore appropriate substratum type, extent and chemistry to support the vegetation	The southern shore of Lough Melvin examined in 2017 had sandy substratum. Roden et al. (in prep.) found that the habitat is generally dominated by bedrock, sand and loose stones, silt mud or hard peat, and stated that the appearance of large expanses of unconsolidated peat would indicate excessive sediment input. Groundwater inputs are likely to be important for the substratum of the characteristic deep-water zone. Research is required to further characterise the chemical composition of the substratum

pH and Alkalinity	pH units, mg/l	Maintain/restore appropriate water and sediment pH, alkalinity and cation concentrations to support the habitat, subject to natural processes	EPA data show average alkalinity of 58-64mg/l at Lough Melvin and pH of 7.3-8.3 The habitat is associated with intermediate alkalinity, largely between 20-80mg/l, but lower values may occur on Old Red Sandstone (Roden et al., in prep.). Surveyed lakes had average alkalinity of 25mg/l (range 5.5-73mg/l) (Roden et al., in prep.). In line with targets for *Najas flexilis*, median pH values should be greater than 7 pH units. Groundwater may influence sediment and water chemistry and be important for characteristic flora, contributing base-poor water to obligate carbon dioxide photosynthesisers in more calcareous lakes and more base-rich water to highly oligotrophic lakes (ORS). Acidification by organic acids released from degraded peatland and conifer plantations may impact on the habitat. See also The European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2019
Nutrients	mg/l P; mg/l N	Restore the concentration of nutrients in the water column to sufficiently low levels to support the habitat and its typical species	EPA average total phosphorus (TP) for Lough Melvin was 0.020mg/l for 2013-15. Roden et al. (in prep.) found that the best quality 3130 lakes surveyed had average total phosphorus of <0.015mg/l TP. Lakes in good condition with high-frequency nutrient data had an overall average of 0.011mg/l TP (lake averages ranged 0.008-0.015mg/l TP). While Roden et al. (in prep.) suggests a target of <0.015mg/l TP, a precautionary target for good condition is set as ≤0.010mg/l or WFD High Status; however, vegetation attributes determine the overall conservation condition. See also The European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2019). WFD High Status targets for total ammonia (annual average ≤0.04mg/l N and annual 95th percentile ≤0.09mg/l N) may also be appropriate
Water colour	mg/l PtCo	Restore appropriate water colour to support the habitat	Water colour in Lough Melvin was 73mg/l PtCo in 2001/2 (Free et al., 2006). The habitat is found in clear water, and water colour (dissolved light-absorbing compounds) is negatively correlated with maximum vegetation (euphotic) depth; lakes with euphotic depth >3m had colour <40mg/l PtCo, while those with euphotic depth >3.5m had <35mg/l PtCo (Roden et al., in prep.). Water colour directly controls light penetration and, therefore, euphotic depth and vegetation extent. Roden et al. (in prep.) set good condition at <40mg/l PtCo; however, this was considered to be an impacted state some distance from reference condition. The primary source of increased colour in Ireland is peatland disturbance, e.g. through turf-cutting, overgrazing, plantation forestry. Further work is necessary to determine water colour in intact peatland catchments and sustainable levels for the habitat, which may be <30 or even <20mg/l PtCo
Dissolved organic carbon (DOC)	mg/l	Maintain/restore appropriate organic carbon levels to support the habitat	Dissolved organic carbon (DOC) in the water column is linked to water colour and acidification (organic acids). It can provide a substrate (food source) for heterotrophic organisms, which can impact directly (e.g. shading) and indirectly (e.g. nutrient release) on the characteristic lake communities. Damage and degradation of peatland, e.g. through afforestation or turf-cutting, leading to decomposition of peat is likely to be the predominant source of dissolved and particulate organic carbon in Ireland

Turbidity	Nephelometric turbidity units/ mg/l SS/ other appropriate unit	Maintain/restore appropriate turbidity to support the habitat	Turbidity can significantly affect the quantity and quality of light reaching rooted and attached vegetation and can, therefore, impact on lake habitats. The settlement of higher loads of inorganic or organic material on lake vegetation communities may also have impacts on sensitive, delicate species. Turbidity can increase as a result of re-suspension of material within the lake, higher loads entering the lake, or eutrophication. Particulate loads from peatlands are the most likely sources of increased turbidity in lakes with the habitat. Turbidity measurement and interpretation is challenging. As a result, it is likely to be difficult to set habitat-specific targets for turbidity in lakes
Transparency	Metres	Restore appropriate Secchi transparency. There should be no decline in Secchi depth/transparency	Secchi depth in Lough Melvin was 1.5m in 2001/2 (Free et al., 2006). Transparency relates to light penetration and, hence, to the depth of colonisation of vegetation. Roden et al. (in prep.) advised it is preferable to measure euphotic depth directly by observation, but noted that a decreasing trend in Secchi depth indicates declining water quality. Transparency can be affected by phytoplankton blooms, water colour and turbidity. Secchi depth in marl lakes in Good condition is generally >6m. The OECD fixed boundary system set transparency targets for oligotrophic lakes of ≥6m annual mean Secchi disk depth and ≥3m annual minimum Secchi disk depth
Attached algal biomass	Algal cover	Maintain trace/absent attached algal biomass (<5% cover)	Nutrient enrichment can favour epiphytic and epipelic algae that can out-compete the submerged vegetation. Roden et al. (in prep.) noted that occasional blooms of filamentous algae occur in 3130 lakes in the absence of excess nutrients, especially species of the orders Zygnematales or Oedogoniales, but that drifting masses of *Cladophora* species may indicate a decline in water quality. In general, the cover abundance of attached algae in lakes with 3130 should be trace/absent (<5% cover)
Fringing habitat: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the natural structure and functioning of habitat 3130	Lough Melvin's shoreline has sparse swamp communities often backed by fen, wet grassland, alder and willow-dominated wet woodland and dry woodland (EHS, 1997). Its wooded islands are an Irish stronghold for the Flora (Protection) Order, 2015 listed and Near Threatened (Wyse Jackson et al., 2016) globeflower (*Trollius europaeus*). Marsh helleborine (*Epipactis palustris*) and blue-eyed-grass (*Sisyrinchium bermudiana*) also occur. Heterogeneous lake fringes with a range of natural and semi-natural habitats are preferable. Restoration or maintenance of open, species-rich fen, marsh and grassland can be particularly important. Fringing habitats along lakes intergrade with and support the structure and functions of the lake habitat. Equally, fringing wetland habitats are dependent on the lake, particularly its water levels, and support invertebrate and plant communities and species of high diversity and conservation concern. See also Mainstone et al. (2016)

6410 Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)

To restore the favourable conservation condition of *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caerulae) in Lough Melvin SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Two areas supporting *Molinia* meadows within Lough Melvin SAC were surveyed as part of the Irish Semi-natural Grassland Survey (ISGS; O'Neill et al., 2013) and the Grassland Monitoring Survey (GMS; Martin et al., 2018). These were grassland survey site Gubalaun (site code 804), on Ross Point at the southern end, and grassland survey site Gubacreeny (site code 802), along the Drowes River at the northern end of the SAC. An area of 1.35ha of the habitat was mapped within the SAC in the most recent survey, the GMS (Martin et al., 2018), at Gubacreeny (site code 802) and an area of 0.57ha was mapped by the ISGS (O'Neill et al., 2008) at Gubalaun (site code 804). See map 4 for the recorded extent. It is important to note that further unsurveyed areas may be present within this large SAC
Habitat distribution	Occurrence	No decline, subject to natural processes	Distribution is based on the ISGS (O'Neill et al., 2013) and the GMS (Martin et al., 2018). See map 4. Note that further unsurveyed areas of the habitat may be present within this large SAC
Vegetation composition: positive indicator species	Number at a representative number of 2m x 2m monitoring stops; within 20m surrounding area of monitoring stops	At least 7 positive indicator species present in monitoring stop or, if 5–6 present in stop, additional species within 20m of stop; this includes at least one 'high quality' positive indicator species present in the stop or within 20m of stop	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018), where lists of positive indicator species, including high quality positive indicator species, are also presented. These documents should be consulted for further details. Note that purple moor-grass (*Molinia caerulea*) is a positive indicator species and should be present in at least one monitoring stop, or within 20m of a monitoring stop, for the attribute to pass (Martin et al., 2018). Note that Martin et al. (2018) mention two additional species which may be considered, should stops fail marginally on presence of indicators. The following positive indicators were dominant at the ISGS site Gubalaun: devil's-bit scabious (*Succisa pratensis*), sharp-flowered rush (*Juncus acutiflorus*), tormentil (*Potentilla erecta*) and purple moor-grass. The GMS reports that compact rush (*Juncus conglomeratus*) and flea sedge (*Carex pulicaris*) were occasional at Gubalaun
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Negative indicator species collectively not more than 20% cover, with cover by an individual species not more than 10%	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018), where the list of negative indicator species is presented
Vegetation composition: non-native species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of non-native species not more than 1%	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018)
Vegetation composition: moss species	Percentage cover at a representative number of 2m x 2m monitoring stops	Hair mosses (*Polytrichum* spp.) not more than 25% cover	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018)

Vegetation composition: woody species and bracken	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of woody species and bracken (*Pteridium aquilinum*) not more than 5% cover	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018). Significant scrub encroachment was noted throughout the Gubalaun site (804), and in some areas in Gubacreeny (802) by the ISGS (O'Neill et al., 2013). The GMS (Martin et al., 2018) report that the area of 6410 which falls within the SAC at Gubacreeny is managed adequately by extensive horse-grazing, and scrub encroachment was not an issue there
Vegetation structure: broadleaf herb:grass ratio	Percentage at a representative number of 2m x 2m monitoring stops	Broadleaf herb component of vegetation between 40% and 90%	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018). Broadleaf herb component of vegetation between 30% and 40% may be allowed to pass on expert judgement (Martin et al., 2018)
Vegetation structure: sward height	Percentage at a representative number of 2m x 2m monitoring stops	At least 30% of sward between 10cm and 80cm tall	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018)
Vegetation structure: litter	Percentage cover at a representative number of 2m x 2m monitoring stops	Litter cover not more than 25%	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018). The sward was noted as being quite rank due to lack of mowing at Gubalaun (O'Neill et al., 2013)
Physical structure: bare ground	Percentage cover at a representative number of 2m x 2m monitoring stops	Not more than 10% bare ground	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018)
Physical structure: grazing or disturbance	Area in local vicinity of a representative number of monitoring stops	Area of the habitat showing signs of serious grazing or disturbance less than $20m^2$	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018)

1106 Salmon *Salmo salar*

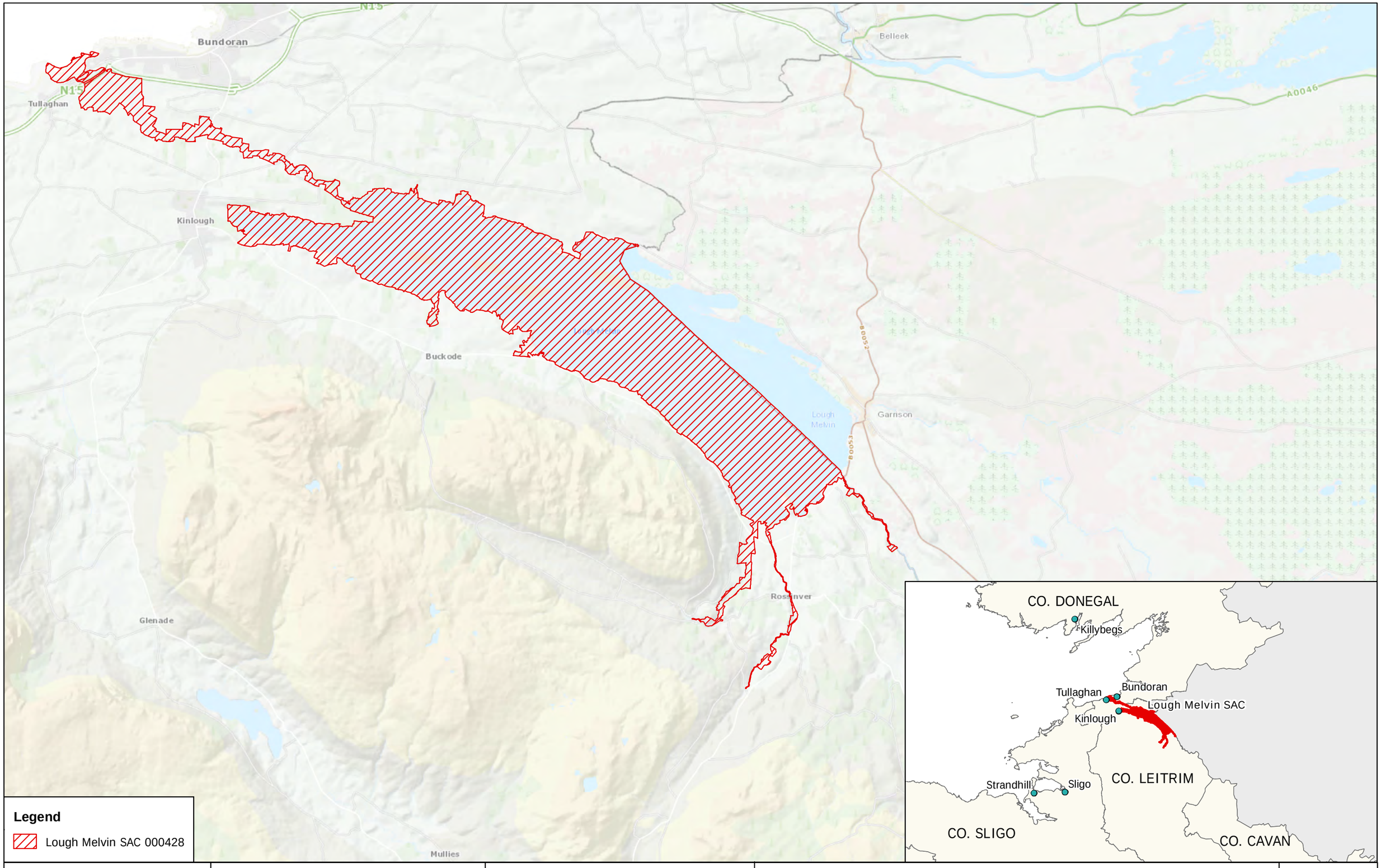
To maintain the favourable conservation condition of Atlantic Salmon (*Salmo salar*) in Lough Melvin SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	Percentage of river accessible	100% of river channels down to second order accessible from estuary	Artificial barriers block salmons' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas
Adult spawning fish	Number	Conservation limit (CL) for each system consistently exceeded	A conservation limit (CL) is defined by the North Atlantic Salmon Conservation Organisation (NASCO) as "the spawning stock level that produces long-term average maximum sustainable yield as derived from the adult to adult stock and recruitment relationship". The target is based on the Technical Expert Group on Salmon's (TEGOS) annual model output of CL attainment levels. See Gargan et al. (2021) for further details. Stock estimates are either derived from direct counts of adults (rod catch, fish counter) or indirectly by fry abundance counts. Lough Melvin and the Drowes river are currently above CL for both one-sea-winter (1SW) and multi-sea-winter (MSW) salmon
Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 minutes sampling	Target is threshold value for rivers currently exceeding their conservation limit (CL)
Out-migrating smolt abundance	Number	No significant decline	Smolt abundance can be negatively affected by a number of impacts such as estuarine pollution, predation and sea lice (*Lepeophtheirus salmonis*)
Number and distribution of redds	Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes	Salmon spawn in clean gravels
Water quality	EPA Q value	At least Q4 at all sites sampled by EPA	Q values based on triennial water quality surveys carried out by the Environmental Protection Agency (EPA)

1355 Otter *Lutra lutra*

To maintain the favourable conservation condition of Otter (*Lutra lutra*) in Lough Melvin SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Percentage positive survey sites	No significant decline	Measure based on standard otter survey technique. Favourable Conservation Status (FCS) target, based on 1980/81 survey findings, is 88% in SACs. Current range is estimated at 93.6% (Reid et al., 2013)
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 75.64ha	No field survey. Areas mapped to include 10m terrestrial buffer along shoreline (above high water mark (HWM) and along river banks) identified as critical for otters (NPWS, 2007)
Extent of marine habitat	Hectares	No significant decline. Area mapped and calculated as 5.87ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (HWM) (NPWS, 2007; Kruuk, 2006)
Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 20.89km	No field survey. River length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (Chapman and Chapman, 1982)
Extent of freshwater (lake) habitat	Hectares	No significant decline. Area mapped and calculated as 317.55ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (NPWS, 2007)
Couching sites and holts	Number	No significant decline	Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk and Moorhouse, 1991: Kruuk, 2006)
Fish biomass available	Kilograms	No significant decline	Broad diet that varies locally and seasonally, but dominated by fish, in particular salmonids, eels and sticklebacks in freshwater (Bailey and Rochford, 2006) and wrasse and rockling in coastal waters (Kingston et al., 1999)
Barriers to connectivity	Number	No significant increase. For guidance, see map 5	Otters will regularly commute across stretches of open water up to 500m. e.g. between the mainland and an island; between two islands; across an estuary (De Jongh and O'Neill, 2010). It is important that such commuting routes are not obstructed



Legend

Lough Melvin SAC 000428

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 1:
LOUGH MELVIN SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 000428; version 3.03.
CO. LEITRIM / DONEGAL

0 0.5 1 2 Kilometres

N

Date: September 2021

Donegal Bay SPA 004151

Lough Melvin SAC 000428

Legend

- Lough Melvin SAC 000428
- Donegal Bay SPA 004151

Ordnance Survey Ireland 2018

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 2:
LOUGH MELVIN SAC
CONSERVATION OBJECTIVES
OVERLAPPING SITE

Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 000428; version 3.03.
CO. LEITRIM / DONEGAL

0 1.25 2.5 5 Kilometres

N

Date: September 2021

Legend

- 3130 Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto- Nanojuncetea*
- Lough Melvin SAC 000428
- OSI Discovery Series County Boundary

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 3:
LOUGH MELVIN SAC
CONSERVATION OBJECTIVES
INDICATIVE LAKE HABITATS

Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 000428; version 3.03.
CO. LEITRIM / DONEGAL

0 0.5 1 2 Kilometres

N

Date: September 2021

Legend

- *Lough Melvin SAC 000428*
- *Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)*
- *OSI Discovery Series County Boundary*

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 4:
LOUGH MELVIN SAC
CONSERVATION OBJECTIVES
GRASSLAND HABITATS

Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 000428; version 3.03.
CO. LEITRIM / DONEGAL

0 0.5 1 2 Kilometres

N

Date: September 2021

Legend

- 1355 Otter - *Lutra lutra* commuting 250m buffer
- Lough Melvin SAC 000428
- OSI Discovery Series County Boundary

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 5:
LOUGH MELVIN SAC
CONSERVATION OBJECTIVES
OTTER COMMUTING

Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 000428; version 3.03.
CO. LEITRIM / DONEGAL

0 0.5 1 2 Kilometres

N

Date: November 2021

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Lough Nageage SAC 002135

An Roinn Tithíochta,
Rialtais Áitiúil agus Oidhreachta
Department of Housing,
Local Government and Heritage

National Parks and Wildlife Service,
Department of Housing, Local Government and Heritage,

90 King Street North, Dublin 7, D07 N7CV, Ireland.

Web: www.npws.ie
E-mail: nature.conservation@chg.gov.ie

Citation:

NPWS (2021) Conservation Objectives: Lough Nageage SAC 002135. Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.

Series Editor: Rebecca Jeffrey
ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

002135	Lough Nageage SAC

1092	White-clawed Crayfish *Austropotamobius pallipes*

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	2009
Title :	Monitoring of white-clawed crayfish *Austropotamobius pallipes* in Irish lakes in 2007
Author :	O'Connor, W.; Hayes, G.; O'Keeffe, C.; Lynn, D.
Series :	Irish Wildlife Manuals, No. 37
Year :	2010
Title :	A technical manual for monitoring white-clawed crayfish (*Austropotamobius pallipes*) in Irish lakes
Author :	Reynolds, J.; O'Connor, W.; O'Keeffe, C.; Lynn, D.
Series :	Irish Wildlife Manuals, No.45
Year :	in prep.
Title :	Survey of the status of white-clawed crayfish, *Austropotamobius pallipes*, in designated SACs in 2017
Author :	Gammell, M.; McFarlane, A.; Brady, D.; O'Brien, J.; Mirimin, L.; Graham, C.; Lally, H.; Minto, C.; O'Connor, I.
Series :	Irish Wildlife Manuals

Other References

Year :	1992
Title :	Crayfish in Co. Donegal (H34)
Author :	Ffrench Mullen, P.; Lucey, J.
Series :	The Irish Naturalists' Journal, 24, 133-133

Spatial data sources

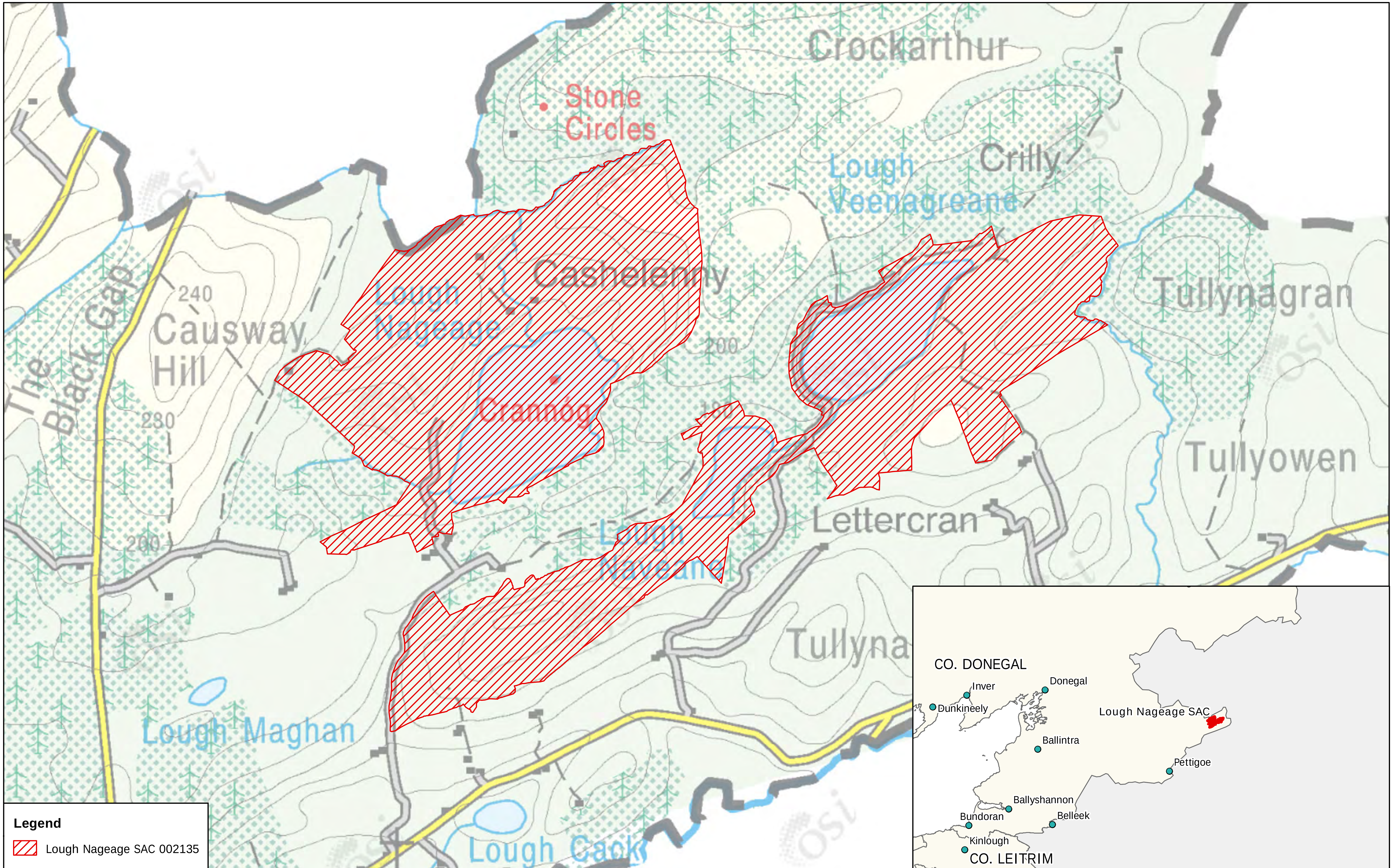
Year :	2021
Title :	NPWS rare and threatened species database
GIS Operations :	Dataset created from spatial references in database records. Expert opinion used as necessary to resolve any issues arising
Used For :	1092 (map 2)

1092 White-clawed Crayfish *Austropotamobius pallipes*

To maintain the favourable conservation condition of White-clawed Crayfish in Lough Nageage SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Number of occupied 1km squares	No reduction from baseline. See map 2	White-clawed crayfish was first found in Lough Nageage in 1991 (Ffrench Mullen and Lucey, 1991). The species was subsequently found in Lough Veenagreane (O'Connor et al., 2009). There have been no records from Lough Naveane and the peaty nature of this lake suggests that it is not suitable for the species. O'Connor et al. (2009) reported crayfish in both Nageage and Veenagreane. Gammell et al. (in prep.) also found the species in Veenagreane but reported none in Nageage. However, this absence may be related to the timing of the survey (August). A similar negative result from a summer survey was reported by O'Connor et al. (2009); however, the species was found in a repeat survey of Lough Nageage later in the year also by O'Connor et al. (2009). In 2020 crayfish were reported from both Nageage and Veenagreane. The species is recorded from the following 1km squares H1673, H1772, H1774 and H1874
Population structure: recruitment	Percentage occurrence of juveniles and females with eggs	Juveniles and females with eggs in at least 50% of positive samples taken at appropriate time and methodology	See Reynolds et al. (2010) for further details. Gammell et al. (in prep.) found juveniles in Lough Veenagreane
Population size	Catch per unit effort	No reduction from baseline of 0.1	The CPUE figures are based on the figures in O'Connor et al. (2009) and Gammell et al. (in prep.) calculated for Lough Veenagreane. A CPUE for Lough Nageage was not calculated due to low numbers or absence in samples. This may be refined further with more detailed assessment of the stocks in both lakes. Gammell et al. (in prep.) assessed the population in Lough Veenagreane as having Low Population abundance grade
Negative indicator species	Occurrence	No non-indigenous crayfish species	Non-indigenous crayfish species (NICS) are identified as a major direct threat to the white-clawed crayfish (*Austropotamobius pallipes*) and as a disease vector, in particular crayfish plague (*Aphanomyces astaci*), which is fatal to white-clawed crayfish. Legislation has banned the import of the five most common NICS to Ireland (S.I. No. 354/2018)
Disease	Occurrence	No instances of disease	Crayfish plague, caused by the water-borne mould *Aphanomyces astaci*, is identified as major threat to the species in Ireland. Instances of crayfish plague have occurred in Ireland since 2015 causing local extinctions. There have been no confirmed or suspected outbreaks in this SAC
Water quality	Water chemistry measures	No decline	White-clawed crayfish is not considered very sensitive of water quality but the species is intolerant of low pH and poorest water quality and lack of calcareous influence. Baseline levels need to be determined for both lakes as neither is monitored for water quality. The visual assessment by O'Connor et al. (2009) was that Lough Nageage appeared slightly polluted and the substrate was covered with filamentous algae

Habitat quality: heterogeneity	Occurrence of positive habitat features	No decline from the baseline	White-clawed crayfish need high habitat heterogeneity. Larger crayfish must have stones to hide under, or an earthen bank in which to burrow. Hatchlings shelter in vegetation, gravel and among fine tree-roots. Smaller crayfish are typically found among weed and debris in shallow water. Larger juveniles in particular may also be found among cobbles and detritus such as leaf litter. These conditions and habitat features must be available on the whole length of occupied habitat. Gammell et al. (in prep.) scored the habitat heterogeneity and following this methodology the baseline score of 0.5 is set



An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 1:
LOUGH NAGEAGE SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 002135; version 3.03.
CO. DONEGAL

0 125 250 500 Metres

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision.

Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe.

N

Date: February 2021

H1774

H1874

H1673

H1773

Legend

1092 White-clawed crayfish *Austropotamobius pallipes* 1km grid squares

Lough Nageage SAC 002135

OSi Discovery Series County Boundary

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 2:
LOUGH NAGEAGE SAC
CONSERVATION OBJECTIVES
WHITE-CLAWED CRAYFISH

Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 002135; version 3.03.
CO. DONEGAL

0 125 250 500 Metres

N

Date: March 2021

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Lough Oughter and Associated Loughs SAC 000007

An Roinn Tithíochta,
Rialtais Áitiúil agus Oidhreachta
Department of Housing,
Local Government and Heritage

National Parks and Wildlife Service,
Department of Housing, Local Government and Heritage,

90 King Street North, Dublin 7, D07 N7CV, Ireland.

Web: www.npws.ie
E-mail: natureconservation@housing.gov.ie

Citation:

NPWS (2021) Conservation Objectives: Lough Oughter and Associated Loughs SAC 000007. Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.

Series Editors: Rebecca Jeffrey and Christina Campbell
ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

000007	Lough Oughter and Associated Loughs SAC
1355	Otter *Lutra lutra*
3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation
91D0	Bog woodland*

Please note that this SAC overlaps with Lough Oughter SPA (004049). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping site as appropriate.

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	1984
Title :	The vegetation of Irish lakes
Author :	Heuff, H.
Series :	Unpublished report to NPWS
Year :	2006
Title :	Otter survey of Ireland 2004/2005
Author :	Bailey, M.; Rochford, J.
Series :	Irish Wildlife Manuals, No. 23
Year :	2007
Title :	Supporting documentation for the Habitats Directive Conservation Status Assessment - backing documents. Article 17 forms and supporting maps
Author :	NPWS
Series :	Unpublished report to NPWS
Year :	2008
Title :	National survey of native woodlands 2003-2008
Author :	Perrin, P.M.; Martin, J.; Barron, S.; O'Neill, F.H.; McNutt, K.E.; Delaney, A.
Series :	Unpublished report to NPWS
Year :	2010
Title :	A provisional inventory of ancient and long-established woodland in Ireland
Author :	Perrin, P.M.; Daly, O.H.
Series :	Irish Wildlife Manuals, No. 46
Year :	2013
Title :	National otter survey of Ireland 2010/12
Author :	Reid, N.; Hayden, B.; Lundy, M.G.; Pietravalle, S.; McDonald, R.A.; Montgomery, W.I.
Series :	Irish Wildlife Manuals, No. 76
Year :	2013
Title :	Results of a monitoring survey of bog woodland
Author :	Cross, J.; Lynn, D.
Series :	Irish Wildlife Manuals, No. 69
Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 2. Habitats assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2015
Title :	Habitats Directive Annex I lake habitats: a working interpretation for the purposes of site-specific conservation objectives and Article 17 reporting
Author :	O Connor, Á.
Series :	Unpublished document by NPWS
Year :	2019
Title :	The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments
Author :	NPWS
Series :	Conservation assessments

Year :	in prep.
Title :	The monitoring and assessment of four EU Habitats Directive Annex I woodland habitats
Author :	Daly, O.H.; O'Neill, F.H.; Barron, S.J.
Series :	Irish Wildlife Manuals

Other References

Year :	1975
Title :	A preliminary survey of Irish lakes
Author :	Flanagan, P.J.; Toner P.F.
Series :	An Foras Forbartha
Year :	1982
Title :	Otter survey of Ireland
Author :	Chapman, P.J.; Chapman, L.L.
Series :	Unpublished report to Vincent Wildlife Trust
Year :	1982
Title :	Eutrophication of waters. Monitoring assessment and control
Author :	OECD
Series :	OECD, Paris
Year :	1991
Title :	The spatial organization of otters (*Lutra lutra*) in Shetland
Author :	Kruuk, H.; Moorhouse, A.
Series :	Journal of Zoology, 224: 41-57
Year :	1999
Title :	Bog Woodland Survey in the Lough Oughter Proposed Special Area of Conservation
Author :	Nairn, R.; Duff, K.
Series :	Unpublished report submitted to Cavan County Council
Year :	2000
Title :	Colour in Irish lakes
Author :	Free, G.; Allott, N.; Mills, P.; Kennelly, C.; Day, S.
Series :	Verhandlungen Internationale Vereinigung für theoretische und angewandte Limnologie, 27: 2620-2623
Year :	2002
Title :	Reversing the habitat fragmentation of British woodlands
Author :	Peterken, G.
Series :	WWF-UK, London
Year :	2006
Title :	Otters - ecology, behaviour and conservation
Author :	Kruuk, H.
Series :	Oxford University Press
Year :	2006
Title :	A reference-based typology and ecological assessment system for Irish lakes. Preliminary investigations. Final report. Project 2000-FS-1-M1 Ecological assessment of lakes pilot study to establish monitoring methodologies EU (WFD)
Author :	Free, G.; Little, R.; Tierney, D.; Donnelly, K.; Coroni, R.
Series :	Environmental Protection Agency, Wexford

Year :	2009
Title :	Water Quality in Ireland 2007-2008. Key Indicators of the Aquatic Environment
Author :	Lucey, J.
Series :	Environmental Protection Agency, Wexford
Year :	2010
Title :	Otter tracking study of Roaringwater Bay
Author :	De Jongh, A.; O'Neill, L.
Series :	Unpublished draft report to NPWS
Year :	2010
Title :	Water Quality in Ireland 2007-2009
Author :	McGarrigle, M.; Lucey, J.; Ó Cinnéide, M.
Series :	Environmental Protection Agency, Wexford
Year :	2015
Title :	Water Quality in Ireland 2010-2012
Author :	Bradley, C.; Byrne, C.; Craig, M.; Free, G.; Gallagher, T.; Kennedy, B.; Little, R.; Lucey, J.; Mannix, A.; McCreesh, P.; McDermott, G.; McGarrigle, M.; Ní Longphuirt, S.; O'Boyle, S.; Plant, C.; Tierney, D.; Trodd, W.; Webster, P.; Wilkes, R.; Wynne, C.
Series :	Environmental Protection Agency, Wexford
Year :	2016
Title :	Irish Vegetation Classification: Technical Progress Report No. 2
Author :	Perrin, P.
Series :	Report submitted to National Biodiversity Data Centre

Spatial data sources

Year :	2008
Title :	OSi 1:5000 IG vector dataset
GIS Operations :	WaterPolygons feature class clipped to the SAC boundary. Expert opinion used to identify Annex I habitat and to resolve any issues arising
Used For :	3150 (map 3)
Year :	Revision 2010
Title :	National Survey of Native Woodlands 2003-2008. Version 1
GIS Operations :	QIs selected; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	91D0 (map 4)
Year :	2018
Title :	Woodland Monitoring Survey 2017-2018
GIS Operations :	QIs selected; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	91D0 (map 4)

3150 Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation

To restore the favourable conservation condition of Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation in Lough Oughter and Associated Loughs SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Little is known about the characteristics or ecology of lake habitat 3150 in Ireland. It is associated with base-rich lakes, with circumneutral or higher pH, in low-lying, large, naturally more productive catchments, and is characterised by high abundance and diversity of pondweeds (*Potamogeton* spp.) and mesotrophic values for total phosphorus and chlorophyll. It is considered likely to occur in Lough Oughter and the *circa* 90 other inter-drumlin lakes in Lough Oughter and Associated Loughs SAC (see map 3). Two measures of extent can be used: 1. the area of the lake itself and; 2. the extent of the vegetation communities/zones that typify the habitat. Further information relating to all attributes is provided in the lake habitats supporting document for the purposes of site-specific conservation objectives and Article 17 reporting (O Connor, 2015)
Habitat distribution	Occurrence	Restore, subject to natural processes	As noted above, habitat 3150 is considered to occur in many or all of the lakes in this SAC (see map 3). Eutrophication has increased the trophic status of these lakes, however. Lough Oughter is known to be impacted by nutrients/organic matter since the 1970s (Flanagan and Toner, 1975; Lucey, 2009; McGarrigle et al., 2010; Bradley et al., 2015). It is likely, therefore, that the habitat is in unfavourable condition, or has been lost, in impacted lakes. Furthermore, it is possible that at least some of the lakes naturally contained a less productive habitat, such as Annex I habitats 3140 (Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.) or 3130 (Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea)
Vegetation composition: typical species	Occurrence	Typical species present, in good condition, and demonstrating typical abundances and distribution	For lists of typical plant species, see the Article 17 habitat assessments for 3150 (NPWS, 2013, 2019) and O Connor (2015). The aquatic flora of the SAC is varied with several pondweeds such as *Potamogeton obtusifolius, P. lucens, P. natans, P. alpinus* and *P. gramineus. Nuphar lutea, Hippuris vulgaris, Myriophyllum spicatum, Veronica beccabunga* and *Callitriche* sp. are common. Duckweed species also occur. Heuff (1984) reports on a 1977 survey of Round Lough, which was fringed with *Phragmites australis* and *Schoenoplectus lacustris* and had abundant *Lemna trisulca, Elodea canadensis* and *Stratiotes aloides. Chara rudis, Nuphar lutea, Littorella uniflora* and *Cladophora* also occurred. The macrophytes in some of the lakes in the SAC, including Annagh, Ardan, Bawn, Corglass, Cullinaghan, Derrybrick, Farnharn, Mill and Oughter, are monitored on a three-year cycle by the Environmental Protection Agency (EPA)
Vegetation composition: characteristic zonation	Occurrence	All characteristic zones should be present, correctly distributed and in good condition	Further work is necessary to describe the characteristic zonation and other spatial patterns in lake habitat 3150 (see O Connor, 2015)

Vegetation distribution: maximum depth	Metres	Maintain maximum depth of vegetation, subject to natural processes	The maximum depth of vegetation is likely to be specific to the lake shoreline in question. Further work is necessary to develop indicative targets for lake habitat 3150. The maximum depth of vegetation in Round Lough was 5m in 1977 (Heuff, 1984). Maximum vegetation depth is likely to have declined in lakes in the SAC as a result of eutrophication
Hydrological regime: water level fluctuations	Metres	Maintain appropriate hydrological regime necessary to support the habitat	Fluctuations in lake water level are typical in Ireland, but can be amplified by activities such as abstraction and drainage. Increased water level fluctuations can increase wave action, up-root vegetation, increase turbidity, alter the substratum and lead to release of nutrients from the sediment. The hydrological regime must be maintained so that the area, distribution and depth of the lake habitat and its constituent/characteristic vegetation zones and communities are not reduced
Lake substratum quality	Various	Maintain appropriate substratum type, extent and chemistry to support the vegetation	Research is required to further characterise the substratum types (particle size and origin) and substratum quality (notably pH, calcium, iron and nutrient concentrations) favoured by each of the five Annex I lake habitats in Ireland. It is likely that soft muddy substrata dominate habitat 3150. Substratum particle size is likely to vary with depth and along the shoreline within a single lake. Heuff (1984) noted a substratum of soft, black mud at Round Lough
Transparency	Metres	Maintain/restore appropriate Secchi transparency. There should be no decline in Secchi depth/transparency	Transparency relates to light penetration and, hence, to the depth of colonisation of vegetation. It can be affected by phytoplankton blooms, water colour and turbidity. Specific targets have yet to be established for lake habitat 3150 (O Connor, 2015). Habitat 3150 is associated with lower transparency than the other lake habitats. The OECD fixed boundary system set transparency targets for mesotrophic lakes of 6-3m annual mean Secchi disk depth, and 3-1.5m annual minimum Secchi disk depth. Heuff (1984) noted transparency of 4m at Round Lough in 1977. Eutrophication is likely to have led to reduced transparency in lakes in the SAC
Nutrients	µg/l P; mg/l N	Restore the concentration of nutrients in the water column to sufficiently low levels to support the habitat and its typical species	As a relatively productive habitat, mesotrophic and Water Framework Directive (WFD) 'good' status targets apply. Where a lake has nutrient concentrations that are lower than these targets, there should be no decline within class, i.e. no upward trend in nutrient concentrations. For lake habitat 3150, annual average total phosphorus (TP) concentration should be ≤25µg/l TP, average annual total ammonia concentration should be ≤0.065mg/l N and annual 95th percentile for total ammonia should be ≤0.140mg/l N. See also The European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2019. The WFD monitoring lakes in the SAC include Annagh, Ardan, Bawn, Corglass, Cullinaghan, Derrybrick, Farnharn, Mill and Oughter
Phytoplankton biomass	µg/l chlorophyll *a*	Restore appropriate water quality to support the habitat, including good chlorophyll *a* status	Mesotrophic and WFD 'good' status targets apply to habitat 3150. Where a lake has a chlorophyll *a* concentration that is lower than this target, there should be no decline within class, i.e. no upward trend in phytoplankton biomass. The average growing season (March-October) chlorophyll *a* concentration should be <10µg/l. The annual average chlorophyll *a* concentration should be 2.5-8.0µg/l and the annual peak chlorophyll *a* concentration should be 8.0-25.0µg/l (OECD, 1982). See also The European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2019

Phytoplankton composition	EPA phytoplankton composition metric	Restore appropriate water quality to support the habitat, including good phytoplankton composition status	The EPA has developed a phytoplankton composition metric for nutrient enrichment of Irish lakes. As for other water quality indicators, habitat 3150 requires WFD good status
Attached algal biomass	Algal cover	Maintain/restore trace/absent attached algal biomass (<5% cover)	Nutrient enrichment can favour epiphytic and epipelic algae that can out-compete the submerged vegetation. The cover abundance of attached algae in habitat 3150 should, ideally therefore, be trace/absent (<5% cover). Heuff (1984) noted *Cladophora* and other filamentous algae at Round Lake in 1977
Water quality: macrophyte status	EPA macrophyte metric (The Free Index)	Restore good macrophyte status	Nutrient enrichment can favour more competitive submerged macrophyte species that out-compete the typical and characteristic species for the lake habitat. The EPA monitors macrophyte status for Water Framework Directive purposes using the 'Free Index'. The target for lake habitat 3150 is good status or an Ecological Quality Ratio (EQR) for lake macrophytes of ≥0.68, as defined in Schedule Five of The European Communities Environmental Objectives (Surface Waters) Regulations 2009 and the amendment Regulations (Statutory Instrument 77 of 2019). Most lakes monitored in the SAC have less than good macrophyte status
Acidification status	pH units, mg/l	Maintain appropriate water and sediment pH, alkalinity and cation concentrations to support the habitat, subject to natural processes	The specific requirements of habitat 3150, in terms of water and sediment pH, alkalinity and cation concentration, have not been fully determined. Acidification is not considered a threat to habitat 3150; however, eutrophication can lead to at least temporary increases in pH to toxic levels (>9/9.5 pH units). Maximum pH should be <9.0 pH units. See The European Communities Environmental Objectives (Surface Water Objectives) Regulations 2009 and The European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2019
Water colour	mg/l PtCo	Maintain/restore appropriate water colour to support the habitat	Increased water colour and turbidity decrease light penetration and can reduce the area of available habitat for lake macrophytes, particularly at the lower euphotic depths. The primary source of increased water colour in Ireland is disturbance to peatland. No habitat-specific or national standards for water colour currently exist. Studies have shown median colour concentrations in Irish lakes of 38mg/l PtCo (Free et al., 2000) and 33mg/l PtCo (Free et al., 2006). It is likely that the water colour in all Irish lake habitats would naturally be <50mg/l PtCo
Dissolved organic carbon (DOC)	mg/l	Maintain/restore appropriate organic carbon levels to support the habitat	Dissolved (and particulate) organic carbon (OC) in the water column is linked to water colour and acidification (organic acids). Increasing DOC in water has been documented across the Northern Hemisphere, including afforested peatland catchments in Ireland. Damage and degradation of peatland, leading to decomposition of peat is likely to be the predominant source of OC in Ireland. OC in water promotes decomposition by fungi and bacteria that, in turn, releases dissolved nutrients. The increased biomass of decomposers can also impact directly on the characteristic lake communities through shading, competition, etc.

Turbidity	Nephelometric turbidity units/ mg/l SS/ other appropriate units	Maintain/restore appropriate turbidity to support the habitat	Turbidity can significantly affect the quantity and quality of light reaching rooted and attached vegetation and can, therefore, impact on lake habitats. The settlement of higher loads of inorganic or organic material on lake vegetation communities may also have impacts on sensitive, delicate species. Turbidity can increase as a result of re-suspension of material within the lake, higher loads entering the lake, or eutrophication. Turbidity measurement and interpretation is challenging. As a result, it is likely to be difficult to set habitat-specific targets for turbidity in lakes
Fringing habitat: area and condition	Hectares	Maintain/restore the area and condition of fringing habitats necessary to support the natural structure and functioning of lake habitat 3150	3150 lakes typically have well-developed reedswamp, fen and/or marsh communities along their shoreline and would, historically have been surrounded by woodland. These fringing habitats intergrade with and support the structure and functions of the lake. Equally, fringing habitats depend on the lake, particularly its water levels, and support wetland communities and species of conservation concern. Many fringing wetland habitats support higher invertebrate and plant species richness than the lake habitats themselves. See Mainstone et al. (2016). Many lakes in the SAC have well-developed swamp, marsh and wet grassland, which include less widespread species such as *Eleocharis acicularis, Epipactis palustris, Rumex hydrolapathum, Sium latifolium, Cicuta virosa, Carex elata, Stratiotes aloides, Sagittaria sagittifolia, Butomus umbellatus* and *Ranunculus lingua*. Wet and dry deciduous woodland has re-established behind the reedbeds, with willows, alder and downy birch common

91D0 Bog woodland*

To maintain the favourable conservation condition of Bog woodland* in Lough Oughter and Associated Loughs SAC, which is defined by the following list of attributes and targets:

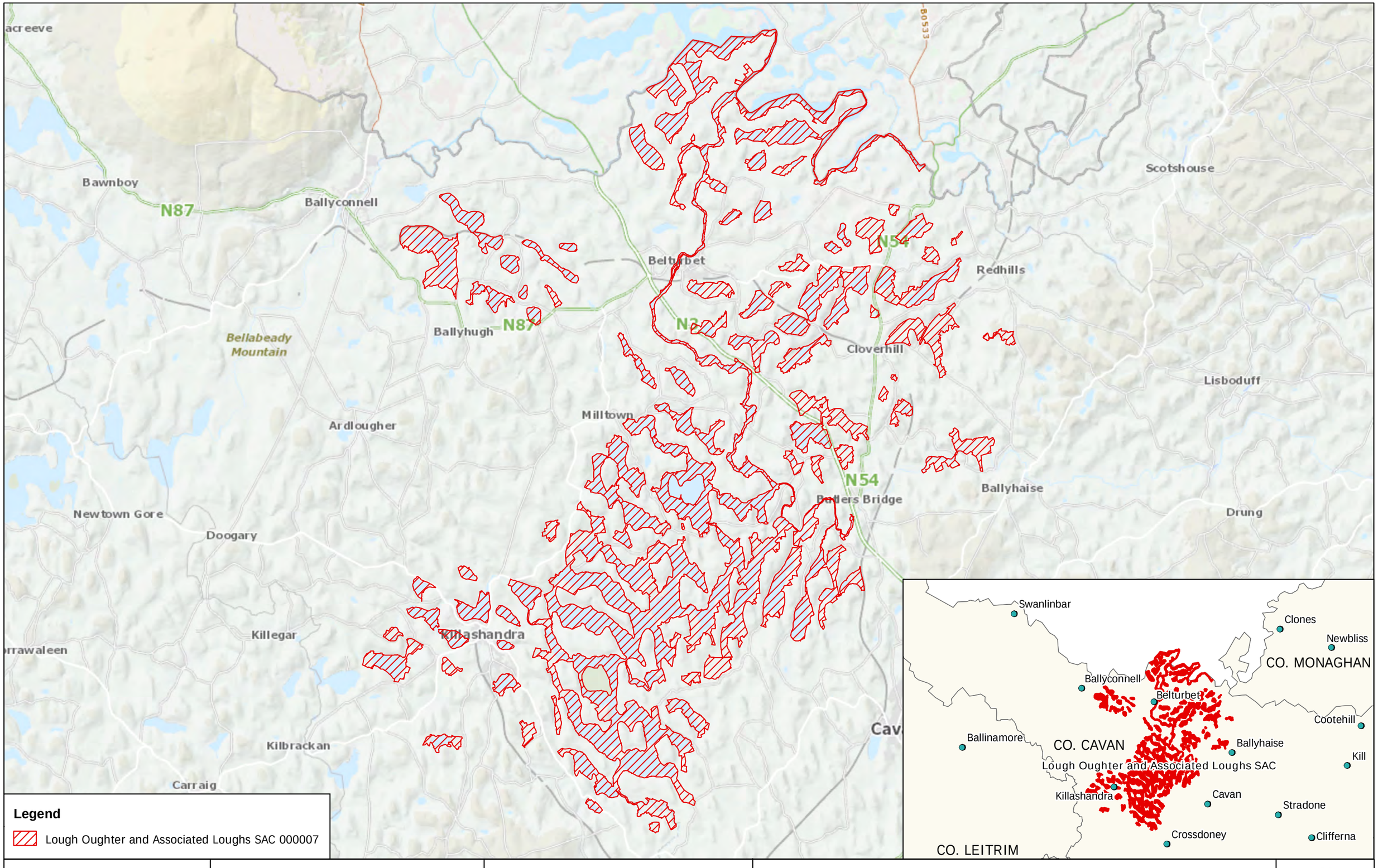
Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Bog woodland is present within Lough Oughter and Associated Loughs SAC. As part of the National Survey of Native Woodlands (NSNW), the sub-site Annagh Wood West (NSNW site code 465) was surveyed by Perrin et al. (2008). Annagh (code 465) was also included in a national monitoring survey (Cross and Lynn, 2013; Daly et al., in prep.). Map 4 shows the minimum area of bog woodland within the SAC, which is estimated to be 2.77ha (Daly et al., in prep.). However, Nairn and Duff (1999) recorded 108ha of birch woodland on peat within the SAC, terming this "potential bog woodland", which suggests that further areas of 91D0 habitat are likely to be present within the SAC
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 4 for the habitat extent recorded by Daly et al. (in prep.)	Distribution based on Daly et al. (in prep.). It is important to note that further areas of the habitat are likely to be present within the SAC
Woodland size	Hectares	Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and "small" woods at least 3ha in size	The target areas for individual woodlands aim to reduce habitat fragmentation and benefit those species requiring 'deep' woodland conditions (Peterken, 2002). The artificial expansion of new bog woodland is likely to be difficult, although creation of the right hydrological conditions may shift vegetation in the direction of bog woodland. As part of a LIFE Project (LIFE05 NAT/IRL/000182), felling of adjacent conifers at Annagh has resulted in bog woodland developing in the former plantation (Cross and Lynn, 2013)
Woodland structure: canopy cover and height	Percentage cover; metres	Total canopy cover at least 30%; downy birch (*Betula pubescens*) comprises at least 50% of canopy cover; median canopy height at least 4m	Attribute and target based on Daly et al. (in prep.) and Cross and Lynn (2013)
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	Described in Perrin et al. (2008). See also the Irish Vegetation Classification (Perrin, 2016; www.biodiversityireland.ie/projects/ivc-classification-explorer)
Woodland structure: tree size classes	Occurrence	Downy birch (*Betula pubescens*) present in each tree size class	Attribute and target based on Daly et al. (in prep.) and Cross and Lynn (2013). The presence of all size classes indicates that a woodland has good structural diversity with trees of varying ages
Woodland structure: regeneration	Occurrence	At least one downy birch (*Betula pubescens*) sapling of at least 1m tall present within each monitoring stop	Attribute and target based on Daly et al. (in prep.) and Cross and Lynn (2013)
Woodland structure: senescent and dead wood	Occurrence	Senescent or dead wood present	Mature and veteran trees and dead wood are important for bryophytes, lichens, saproxylic organisms and some bird species. Their retention within a woodland is important to ensure continuity of habitats/niches and propagule sources. However, as downy birch trees seldom exceed 30cm in diameter in this habitat and fallen dead wood rots quickly and is engulfed by bog mosses, dead wood may be less frequent in bog woodland than in other woodland types (Cross and Lynn, 2013)

Woodland structure: indicators of local distinctiveness	Occurrence; population size	No decline in distribution and, in the case of red listed and other rare or localised species, poulation size	Includes ancient or long-established woodlands (see Perrin and Daly, 2010), archaeological and geological features as well as red listed and other rare or localised species
Woodland structure: indicators of overgrazing	Occurrence	All four indicators of overgrazing absent	There are four indicators of overgrazing within 91D0*: topiary effect on shrubs and young trees, browse line on mature trees, abundant dung, and severe recent bark stripping (Daly et al., in prep.)
Woodland structure: dwarf shrub cover	Percentage cover at a representative number of monitoring stops	Native dwarf shrub layer cover less than 50%; ling (*Calluna vulgaris*) cover less than 40%	Attribute and target based on Daly et al. (in prep.) and Cross and Lynn (2013)
Woodland structure: bryophyte cover	Percentage cover at a representative number of monitoring stops	Bryophyte cover at least 50%; bog moss (*Sphagnum* spp.) cover at least 25%	Attribute and target based on Daly et al. (in prep.) and Cross and Lynn (2013)
Vegetation composition: positive indicator species	Occurrence within monitoring stops	Downy birch (*Betula pubescens*), bog moss (*Sphagnum* spp.) and at least five other positive indicator species present	Bog woodland is typically species-poor but with a characteristic and distinctive flora. Positive indicator species for 91D0* are listed in Daly et al. (in prep.) and Cross and Lynn (2013)
Vegetation composition: negative indicator species	Percentage cover within monitoring stops	Both native and non-native invasive species absent or under control. Total cover should be less than 10%	Negative indicator species include bracken (*Pteridium aquilinum*), bramble (*Rubus fruticosus* agg.) and any non-native species, including herbaceous species. In general, Rhododendron (*Rhododendron ponticum*) and non-native conifers are the most common non-native species in bog woodland (Daly et al., in prep.). As part of a LIFE Project (LIFE05 NAT/IRL/000182), clearance of adjacent non-native conifers at Annagh c. 2008 had a positive impact on the 91D0* habitat by increasing light levels and providing potential for expansion (Cross and Lynn, 2013)

1355 Otter *Lutra lutra*

To maintain the favourable conservation condition of Otter (*Lutra lutra*) in Lough Oughter and Associated Loughs SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Percentage positive survey sites	No significant decline	Measure based on standard otter survey technique. Favourable Conservation Status (FCS) target, based on 1980/81 survey findings, is 88% in SACs. Current range is estimated at 93.6% (Reid et al., 2013)
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 364.4ha along river banks/ lake shoreline/around ponds	No field survey. Areas mapped to include 10m terrestrial buffer, identified as critical for otters (NPWS, 2007), along rivers and around water bodies
Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 71.3km	No field survey. River length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (Chapman and Chapman, 1982)
Extent of freshwater (lake) habitat	Hectares	No significant decline. Area mapped and calculated as 1,730.6ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (NPWS, 2007)
Couching sites and holts	Number	No significant decline	Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk and Moorhouse, 1991; Kruuk, 2006)
Fish biomass available	Kilograms	No significant decline	Broad diet that varies locally and seasonally, but dominated by fish, in particular salmonids, eels and sticklebacks in freshwater (Bailey and Rochford, 2006; Reid et al., 2013)
Barriers to connectivity	Number	No significant increase	Otters will regularly commute across stretches of open water up to 500m e.g. between the mainland and an island; between two islands; across an estuary (De Jongh and O'Neill, 2010). It is important that such commuting routes are not obstructed



Legend

Lough Oughter and Associated Loughs SAC 000007

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 1:
LOUGH OUGHTER AND ASSOCIATED LOUGHS SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

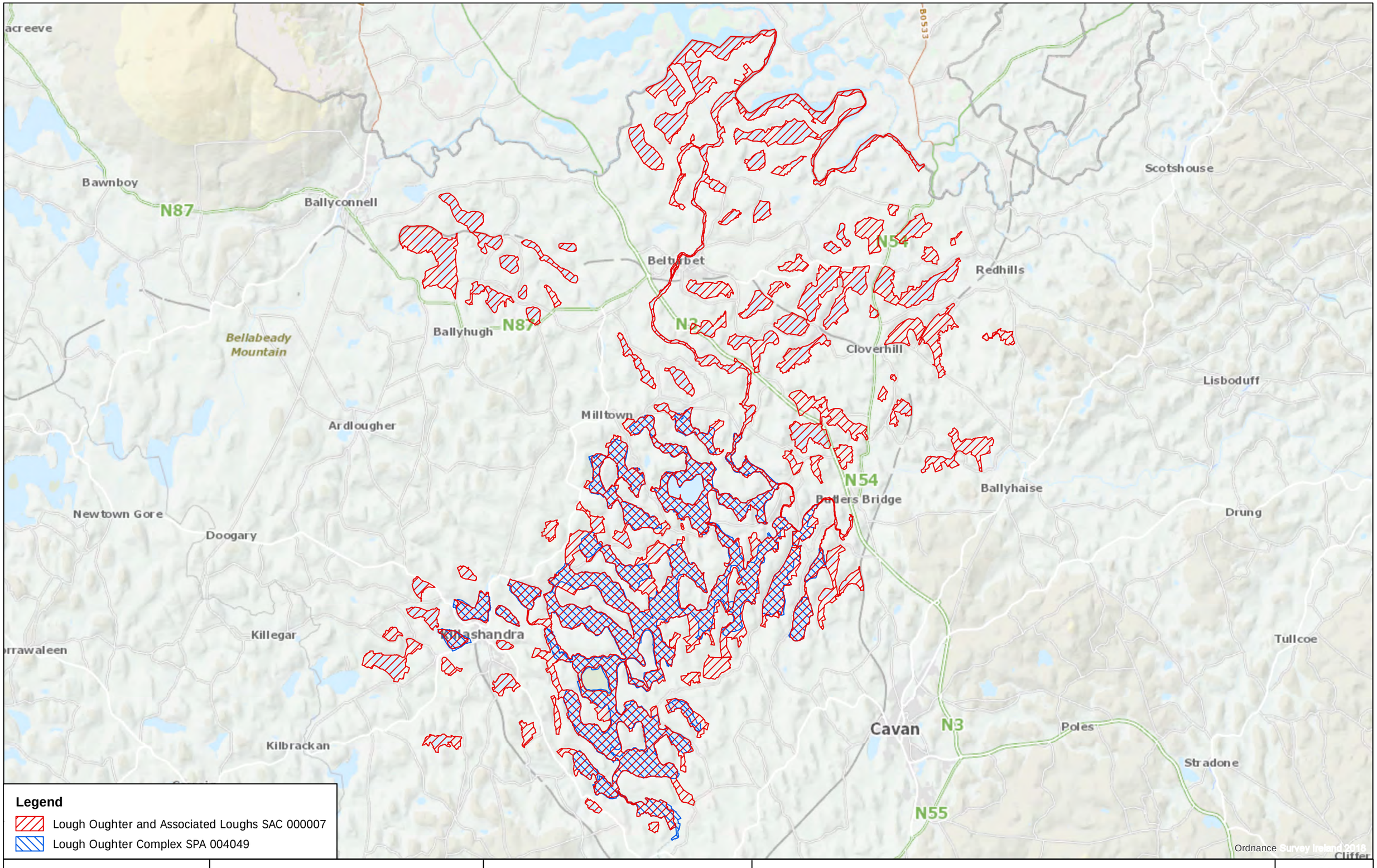
Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 000007; version 3.01. CO. CAVAN

0 1 2 4 Kilometres

N

Date: December 2020



Legend

- Lough Oughter and Associated Loughs SAC 000007
- Lough Oughter Complex SPA 004049

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 2:
LOUGH OUGHTER AND ASSOCIATED LOUGHS SAC
CONSERVATION OBJECTIVES
OVERLAPPING SITE

Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 000007; version 3.01. CO. CAVAN

0 1 2 4 Kilometres

N

Date: December 2020

Legend

- 3150 Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation
- Lough Oughter and Associated Loughs SAC 000007
- OSi Discovery Series County Boundary

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 3:
LOUGH OUGHTER AND ASSOCIATED LOUGHS SAC
CONSERVATION OBJECTIVES
INDICATIVE LAKE HABITATS

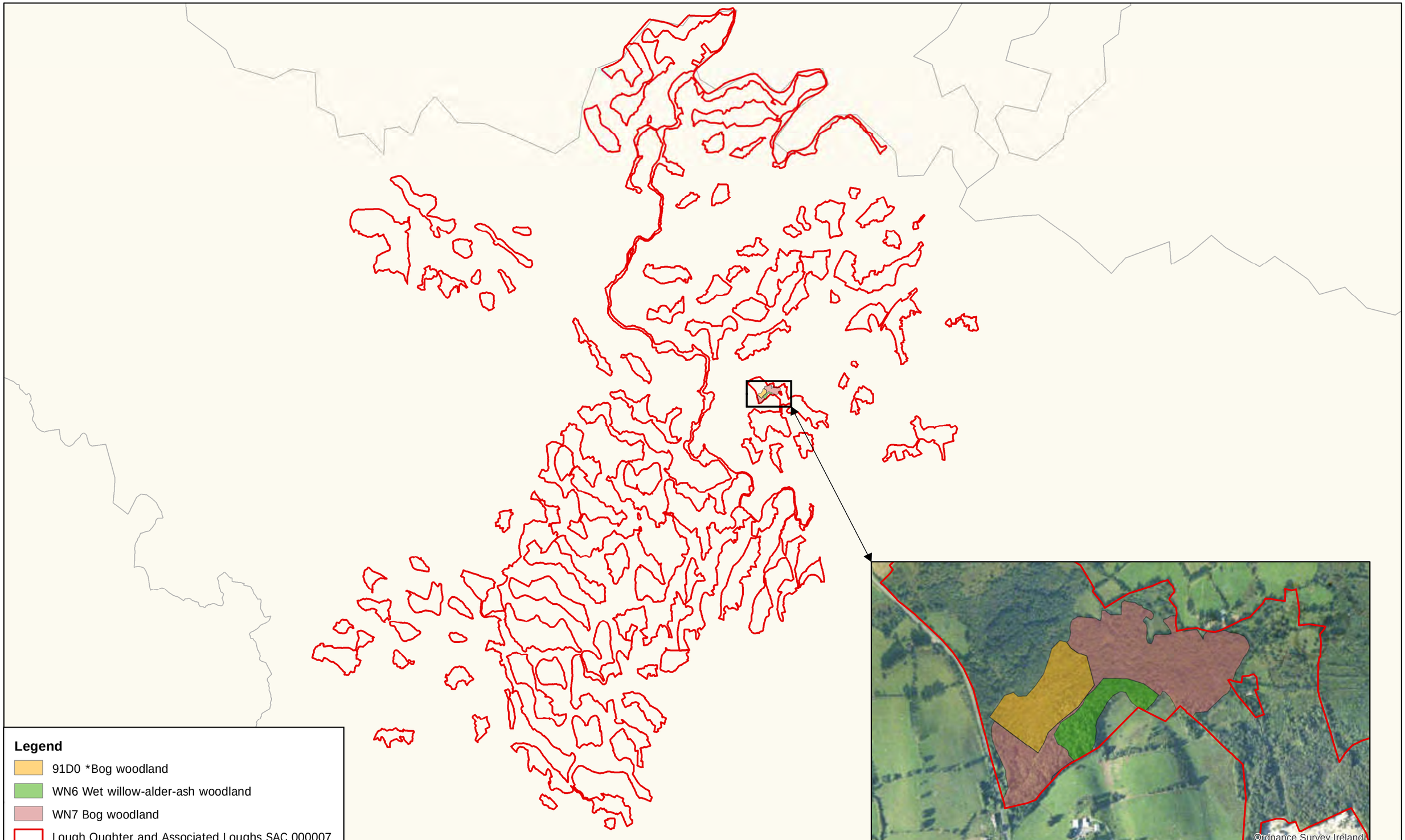
Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 000007; version 3.01. CO. CAVAN

0 1 2 4 Kilometres

N

Date: January 2021



Legend

- 91D0 *Bog woodland
- WN6 Wet willow-alder-ash woodland
- WN7 Bog woodland
- Lough Oughter and Associated Loughs SAC 000007
- OSi Discovery Series County Boundary

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 4:
LOUGH OUGHTER AND ASSOCIATED LOUGHS SAC
CONSERVATION OBJECTIVES
WOODLAND HABITATS

Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SAC 000007; version 3.01. CO. CAVAN

0 1 2 4 Kilometres

N

Date: January 2021

Conservation objectives for Lough Oughter Complex SPA [004049]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Objective: To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:

Bird Code	Common Name	Scientific Name
A005	Great Crested Grebe	*Podiceps cristatus*
A038	Whooper Swan	*Cygnus cygnus*
A050	Wigeon	*Anas penelope*

To acknowledge the importance of Ireland's wetlands to wintering waterbirds, â€œWetland and Waterbirdsâ€ may be included as a Special Conservation Interest for some SPAs that have been designated for wintering waterbirds and that contain a wetland site of significant importance to one

or more of the species of Special Conservation Interest. Thus, a second objective is included as follows:

Objective: To maintain or restore the favourable conservation condition of the wetland habitat at Lough Oughter Complex SPA as a resource for the regularly-occurring migratory waterbirds that utilise it.

Citation: *NPWS (2022) Conservation objectives for Lough Oughter Complex SPA [004049]. First Order Site-specific Conservation Objectives Version 1.0. Department of Housing, Local Government and Heritage.*

This First Order Site-specific Conservation Objectives Version 1.0 document replaces the Generic Conservation Objectives Version 9.0 document.

Conservation objectives for Pettigo Plateau Nature Reserve SPA [004099]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Objective: To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:

Bird Code	Common Name	Scientific Name
A395	Greenland White-fronted Goose	*Anser albifrons flavirostris*

Citation: *NPWS (2022) Conservation objectives for Pettigo Plateau Nature Reserve SPA [004099]. First Order Site-specific Conservation Objectives Version 1.0. Department of Housing, Local Government and Heritage.*

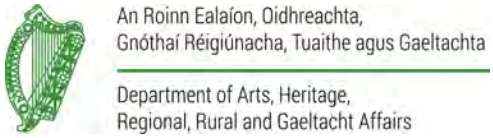
This First Order Site-specific Conservation Objectives Version 1.0 document replaces the Generic Conservation Objectives Version 9.0 document.

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

River Finn SAC 002301



National Parks and Wildlife Service,
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs,

7 Ely Place, Dublin 2, Ireland.

Web: www.npws.ie
E-mail: nature.conservation@ahg.gov.ie

Citation:

NPWS (2017) Conservation Objectives: River Finn SAC 002301. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

Series Editor: Rebecca Jeffrey
ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

002301	River Finn SAC
1106	Salmon *Salmo salar*
1355	Otter *Lutra lutra*
3110	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)
4010	Northern Atlantic wet heaths with *Erica tetralix*
7130	Blanket bogs (* if active bog)
7140	Transition mires and quaking bogs

Please note that this SAC overlaps with Derryveagh and Glendowan Mountains SPA (004039) and Lough Derg (Donegal) SPA (004057) and adjoins Meentygrannagh Bog SAC (000173), Dunragh Loughs/Pettigo Plateau SAC (001125) and Cloghernagore Bog and Glenveagh National Park SAC (002047). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping and adjoining sites as appropriate.

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	1990
Title :	A survey to locate lowland blanket bogs of scientific interest in county Donegal and upland blanket bogs in counties Cavan, Leitrim and Roscommon
Author :	Douglas, C.; Dunnells, D.; Scally, L.; Wyse Jackson, M.
Series :	Unpublished report to NPWS
Year :	2006
Title :	Otter survey of Ireland 2004/2005
Author :	Bailey, M.; Rochford, J.
Series :	Irish Wildlife Manual No. 23
Year :	2007
Title :	Supporting documentation for the Habitats Directive Conservation Status Assessment - backing documents. Article 17 forms and supporting maps
Author :	NPWS
Series :	Unpublished report to NPWS
Year :	2012
Title :	Ireland Red List No. 8: Bryophytes
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	Ireland Red List series, NPWS
Year :	2013
Title :	National otter survey of Ireland 2010/12
Author :	Reid, N.; Hayden, B.; Lundy, M.G.; Pietravalle, S.; McDonald, R.A.; Montgomery, W.I.
Series :	Irish Wildlife Manual No. 76
Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 2. Habitats assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2014
Title :	Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland, Version 2.0
Author :	Perrin, P.M.; Barron, S.J.; Roche, J.R.; O'Hanrahan, B.
Series :	Irish Wildlife Manual No. 79
Year :	2015
Title :	Habitats Directive Annex I lake habitats: a working interpretation for the purposes of site-specific conservation objectives and Article 17 reporting
Author :	O Connor, Á.
Series :	Unpublished document by NPWS
Year :	2016
Title :	Ireland Red List No. 10: Vascular Plants
Author :	Wyse Jackson, M.; FitzPatrick, Ú.; Cole, E.; Jebb, M.; McFerran, D.; Sheehy Skeffington, M.; Wright, M.
Series :	Ireland Red Lists series, NPWS
Year :	2017
Title :	River Finn SAC (site code: 2301) Conservation objectives supporting document- blanket bog and associated habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	1934
Title :	The Botanist in Ireland
Author :	Praeger, R.L.
Series :	Hodges, Figgis and Co., Dublin
Year :	1982
Title :	Otter survey of Ireland
Author :	Chapman, P.J.; Chapman, L.L.
Series :	Unpublished report to Vincent Wildlife Trust
Year :	1982
Title :	Eutrophication of waters. Monitoring assessment and control
Author :	OECD
Series :	OECD, Paris
Year :	1991
Title :	The spatial organization of otters (*Lutra lutra*) in Shetland
Author :	Kruuk, H.; Moorhouse, A.
Series :	Journal of Zoology, 224: 41-57
Year :	2000
Title :	Colour in Irish lakes
Author :	Free, G.; Allott, N.; Mills, P.; Kennelly, C.; Day, S.
Series :	Verhandlungen Internationale Vereinigung für theoretische und angewandte Limnologie, 27: 2620-2623
Year :	2002
Title :	Deterioration of Atlantic soft water macrophyte communities by acidification, eutrophication and alkalinisation
Author :	Arts, G.H.P.
Series :	Aquatic Botany, 73: 373-393
Year :	2006
Title :	Otters - ecology, behaviour and conservation
Author :	Kruuk, H.
Series :	Oxford University Press
Year :	2006
Title :	A reference-based typology and ecological assessment system for Irish lakes. Preliminary investigations. Final report. Project 2000-FS-1-M1 Ecological assessment of lakes pilot study to establish monitoring methodologies EU (WFD)
Author :	Free, G.; Little, R.; Tierney, D.; Donnelly, K.; Coroni, R.
Series :	EPA, Wexford
Year :	2008
Title :	Water Quality in Ireland 2004-2006
Author :	Clabby, K.J.; Bradley, C.; Craig, M.; Daly, D.; Lucey, J.; McGarrigle, M.; O'Boyle, S.; Tierney, D.; Bowman, J.
Series :	EPA, Wexford
Year :	2009
Title :	The identification, characterization and conservation value of isoetid lakes in Ireland
Author :	Free, G.; Bowman, J.; McGarrigle, M.; Little, R.; Coroni, R.; Donnelly, K.; Tierney, D.; Trodd, W.
Series :	Aquatic Conservation: Marine and Freshwater Ecosystems, 19 (3): 264–273

Year :	2010
Title :	Otter tracking study of Roaringwater Bay
Author :	De Jongh, A.; O'Neill, L.
Series :	Unpublished draft report to NPWS
Year :	2010
Title :	Water quality in Ireland 2007-2009
Author :	McGarrigle, M.; Lucey, J.; Ó Cinnéide, M.
Series :	EPA, Wexford
Year :	2015
Title :	Water quality in Ireland 2010-2012
Author :	Bradley, C.; Byrne, C.; Craig, M.; Free, G.; Gallagher, T.; Kennedy, B.; Little, R.; Lucey, J.; Mannix, A.; McCreesh, P.; McDermott, G.; McGarrigle, M.; Ní Longphuirt, S.; O'Boyle, S.; Plant, C.; Tierney, D.; Trodd, W.; Webster, P.; Wilkes, R.; Wynne, C.
Series :	EPA, Wexford
Year :	2016
Title :	The Status of Irish Salmon Stocks in 2015 with Precautionary Catch Advice for 2016
Author :	SSCS (Standing Scientific Committee on Salmon)
Series :	Independent Scientific Report to Inland Fisheries Ireland

Spatial data sources

Year :	2008
Title :	OSi 1:5000 IG vector dataset
GIS Operations :	WaterPolygons feature class clipped to the SAC boundary. Expert opinion used to identify Annex I habitat and to resolve any issues arising
Used For :	3110 (map 3)
Year :	2010
Title :	OSi 1:5000 IG vector dataset
GIS Operations :	Creation of 80m buffer on the aquatic side of lake data; creation of 10m buffer on the terrestrial side of lake data. These datasets combined with the derived OSi Discovery Series river and canal datasets. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising. Creation of 250m buffer on aquatic side of the lake boundary to highlight potential commuting points
Used For :	1355 (map 4)
Year :	2005
Title :	OSi Discovery series vector data
GIS Operations :	Creation of a 10m buffer on the terrestrial side of river banks data; creation of 20m buffer applied to canal centreline data. Creation of 20m buffer applied to river and stream centreline data; These datasets combined with the derived OSI 1:5000 vector lake buffer data. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1355 (no map)

3110 Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)

To restore the favourable conservation condition of Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) in River Finn SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Lake habitat 3110 is likely to occur in the larger lakes in River Finn SAC, such as Loughs Derg, Finn and Belshade. Lake habitat 3130 may also occur in Loughs Derg and Finn. The exact distribution of lake habitat 3110 in the SAC is unknown however, as little specific information on the lake vegetation is currently available. Lake habitat 3110 may co-occur with lake habitat 3160 in small and upland lakes. In line with Article 17 reporting (NPWS, 2013), all lakes larger than 1ha have been mapped as 'potential 3110' (see map 3). Two measures of extent should be used: 1. the area of the lake itself and; 2. the extent of the vegetation communities/zones that typify the habitat. Further information relating to all attributes is provided in the lake habitats supporting document for the purposes of site-specific conservation objectives and Article 17 reporting (O Connor, 2015)
Habitat distribution	Occurrence	No decline, subject to natural processes	As noted above, the exact distribution of lake habitat 3110 in River Finn SAC is not known. In map 3, all lakes larger than 1ha (based on 1:5,000 data) have been mapped as potential 3110
Typical species	Occurrence	Typical species present, in good condition, and demonstrating typical abundances and distribution	For lists of typical plant species, see the Article 17 habitat assessment for lake habitat 3110 (NPWS, 2013) and the lake habitats supporting document (O Connor, 2015). The moss *Fontinalis antipyretica*, quillwort (*Isoetes lacustris*), bulbous rush (*Juncus bulbosus*), shoreweed (*Littorella uniflora*), water lobelia (*Lobelia dortmanna*), broad-leaved pondweed (*Potamogeton natans*) and floating bur-reed (*Sparganium angustifolium*) have been recorded in Lough Derg (Praeger, 1934; internal NPWS and EPA files). Environmental Protection Agency (EPA) biologists have also recorded slender naiad (*Najas flexilis*) in Lough Derg, suggesting lake habitat 3130 may occur. EPA records for stonewort (*Chara* sp.), intermediate water starwort (*Callitriche hamulata*) and pondweeds (*Potamogeton berchtoldii, P. gramineus* and *P. perfoliatus*) in Lough Finn are also indicative of lake habitat 3130
Vegetation composition: characteristic zonation	Occurrence	All characteristic zones should be present, correctly distributed and in good condition	Further work is necessary to describe the characteristic zonation and other spatial patterns in lake habitat 3110 (see O Connor, 2015)
Vegetation distribution: maximum depth	Metres	Maintain maximum depth of vegetation, subject to natural processes	The maximum depth of vegetation is likely to be specific to the lake shoreline in question. Further work is necessary to develop indicative targets for lake habitat 3110. Water clarity is expected to be high in upland 3110 lakes, resulting in a large maximum depth of vegetation
Hydrological regime: water level fluctuations	Metres	Maintain appropriate natural hydrological regime necessary to support the habitat	Fluctuations in lake water level are typical in Ireland, but can be amplified by activities such as abstraction and drainage. Increased water level fluctuations can increase wave action, up-root vegetation, increase turbidity, alter the substratum and lead to release of nutrients from the sediment. The hydrological regime of the lakes must be maintained so that the area, distribution and depth of the lake habitat and its constituent/characteristic vegetation zones and communities are not reduced

Lake substratum quality	Various	Maintain appropriate substratum type, extent and chemistry to support the vegetation	Research is required to further characterise the substratum types (particle size and origin) and substratum quality (notably pH, calcium, iron and nutrient concentrations) favoured by each of the five Annex I lake habitats in Ireland. It is likely that lake habitat 3110 is associated with a range of nutrient-poor substrates, from stones, cobble and gravel, through sands, silt, clay and peat. Substratum particle size is likely to vary with depth and along the shoreline within a single lake
Water quality: transparency	Metres	Maintain appropriate Secchi transparency. There should be no decline in Secchi depth/transparency	Transparency relates to light penetration and, hence, to the depth of colonisation of vegetation. It can be affected by phytoplankton blooms, water colour and turbidity. Specific targets have yet to be established for lake habitat 3110 (O Connor, 2015). Habitat 3110 is associated with very clear water, particularly upland examples. The OECD fixed boundary system set transparency targets for oligotrophic lakes of ≥6m annual mean Secchi disk depth, and ≥3m annual minimum Secchi disk depth. Free et al. (2009) found high isoetid abundance in lakes with Secchi depths of more than 3m
Water quality: nutrients	µg/l P; mg/l N	Maintain the concentration of nutrients in the water column at sufficiently low levels to support the habitat and its typical species	As a nutrient-poor habitat, oligotrophic and Water Framework Directive (WFD) 'high' status targets apply. Where a lake has nutrient concentrations that are lower than these targets, there should be no decline within class, i.e. no upward trend in nutrient concentrations. For lake habitat 3110, annual average total phosphorus (TP) concentration should be ≤10µg/l TP, average annual total ammonia concentration should be ≤0.040mg/l N and annual 95th percentile for total ammonia should be ≤0.090mg/l N. See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009
Water quality: phytoplankton biomass	µg/l Chlorophyll *a*	Maintain appropriate water quality to support the habitat, including high chlorophyll *a* status	Oligotrophic and WFD 'high' status targets apply to lake habitat 3110. Where a lake has a chlorophyll *a* concentration that is lower than this target, there should be no decline within class, i.e. no upward trend in phytoplankton biomass. The average growing season (March-October) chlorophyll *a* concentration must be <5.8µg/l. The annual average chlorophyll *a* concentration should be <2.5µg/l and the annual peak chlorophyll *a* concentration should be ≤8.0µg/l. See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009
Water quality: phytoplankton composition	EPA phytoplankton composition metric	Maintain appropriate water quality to support the habitat, including high phytoplankton composition status	The EPA has developed a phytoplankton composition metric for nutrient enrichment of Irish lakes. As for other water quality indicators, lake habitat 3110 requires WFD high status
Water quality: attached algal biomass	Algal cover and EPA phytobenthos metric	Maintain trace/absent attached algal biomass (<5% cover) and high phytobenthos status	Nutrient enrichment can favour epiphytic and epipelic algae that can out-compete the submerged vegetation. The cover abundance of attached algae in lake habitat 3110 should, therefore, be trace/absent (<5% cover). EPA phytobenthos can be used as an indicator of changes in attached algal biomass. As for other water quality indicators, lake habitat 3110 requires high phytobenthos status
Water quality: macrophyte status	EPA macrophyte metric (The Free Index)	Maintain high macrophyte status	Nutrient enrichment can favour more competitive submerged macrophyte species that out-compete the typical and characteristic species for the lake habitat. The EPA monitors macrophyte status for WFD purposes using the 'Free Index'. The target for lake habitat 3110 is high status or an Ecological Quality Ratio (EQR) for lake macrophytes of ≥0.90, as defined in Schedule Five of the European Communities Environmental Objectives (Surface Waters) Regulations 2009

Acidification status	pH units; mg/l	Maintain appropriate water and sediment pH, alkalinity and cation concentrations to support the habitat, subject to natural processes	Acidification can impact on species abundance and composition in soft water lake habitats. In Europe, acidification of isoetid lakes can lead to loss of isoetids and dominance by submerged *Sphagnum* mosses and *Juncus bulbosus* (Arts, 2002). The specific requirements of lake habitat 3110, in terms of water and sediment pH, alkalinity and cation concentration, have not been determined. For lake habitat 3110, and adopting a precautionary approach based on Arts (2002), minimum pH should not be <5.5 pH units. Maximum pH should be <9.0 pH units, in line with the surface water standards established for soft waters (where water hardness is ≤100mg/l calcium carbonate). See Schedule Five of the European Communities Environmental Objectives (Surface Waters) Regulations 2009
Water colour	mg/l PtCo	Maintain appropriate water colour to support the habitat	Increased water colour and turbidity decrease light penetration and can reduce the area of available habitat for lake macrophytes, particularly at the lower euphotic depths. The primary source of increased water colour in Ireland is disturbance to peatland. No habitat-specific or national standards for water colour currently exist. Studies have shown median colour concentrations in Irish lakes of 38mg/l PtCo (Free et al., 2000) and 33mg/l PtCo (Free et al., 2006). It is likely that the water colour in all Irish lake habitats would naturally be <50mg/l PtCo. Water colour can be very low (<20mg/l PtCo or even <10mg/l PtCo) in lake habitat 3110, where the peatland in the lake's catchment is intact
Dissolved organic carbon (DOC)	mg/l	Maintain appropriate organic carbon levels to support the habitat	Dissolved (and particulate) organic carbon (OC) in the water column is linked to water colour and acidification (organic acids). Increasing DOC in water has been documented across the Northern Hemisphere, including afforested peatland catchments in Ireland. Damage and degradation of peatland, leading to decomposition of peat is likely to be the predominant source of OC in Ireland. OC in water promotes decomposition by fungi and bacteria that, in turn, releases dissolved nutrients. The increased biomass of decomposers can also impact directly on the characteristic lake communities through shading, competition, etc.
Turbidity	Nephelometric turbidity units/ mg/l SS/ other appropriate units	Maintain appropriate turbidity to support the habitat	Turbidity can significantly affect the quantity and quality of light reaching rooted and attached vegetation and can, therefore, impact on lake habitats. The settlement of higher loads of inorganic or organic material on lake vegetation communities may also have impacts on sensitive, delicate species. Turbidity can increase as a result of re-suspension of material within the lake, higher loads entering the lake, or eutrophication. Turbidity measurement and interpretation is challenging. As a result, it is likely to be difficult to set habitat-specific targets for turbidity in lakes
Fringing habitat: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the natural structure and functioning of habitat 3110	Most lake shorelines have fringing habitats of reedswamp, other swamp, fen, marsh or wet woodland that intergrade with and support the structure and functions of the lake habitat. In River Finn SAC, active blanket bog and heath, transition mire, fen, flush or grassland could also occur. Equally, fringing habitats are dependent on the lake, particularly its water levels, and support wetland communities and species of conservation concern. Many of the fringing wetland habitats support higher invertebrate and plant species richness than the lake habitats themselves

4010 Northern Atlantic wet heaths with Erica tetralix

To restore the favourable conservation condition of Northern Atlantic wet heaths with *Erica tetralix* in River Finn SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Northern Atlantic wet heaths with *Erica tetralix* has not been mapped in detail for River Finn SAC but from current available data the total area of the qualifying habitat is estimated to be approximately 187ha, covering 3% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the River Finn SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	Wet heath occurs in association with blanket bog, upland grassland and exposed rock within the SAC. It occupies shallower peats and better drained slopes. It occurs quite widely at Owendoo/ Cloghervaddy (Douglas et al., 1990; NPWS internal files). Further information can be found within Douglas et al. (1990), NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	A variety of wet heath vegetation communities have been recorded in this SAC (Douglas et al., 1990; NPWS internal files), three of which correspond to communities recorded in the National Survey of Upland Habitats and listed in the provisional list of vegetation communities described in Perrin et al. (2014). Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: cross-leaved heath	Occurrence within 20m of a representative number of monitoring stops	Cross-leaved heath (*Erica tetralix*) present within a 20m radius of each monitoring stop	Attribute and target based on Perrin et al. (2014)
Vegetation composition: positive indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of positive indicator species at least 50%	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: lichens and bryophytes	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of *Cladonia* and *Sphagnum* species, *Racomitrium lanuginosum* and pleurocarpous mosses at least 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: ericoid species and crowberry	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of ericoid species and crowberry (*Empetrum nigrum*) at least 15%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: dwarf shrub species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of dwarf shrubs less than 75%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented

Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). The non-native moss *Campylopus introflexus* has been recorded from the SAC (Douglas et al., 1990), but this species cannot be assigned specifically to wet heath
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 20%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: bracken	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of bracken (*Pteridium aquilinum*) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: soft rush	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of soft rush (*Juncus effusus*) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: *Sphagnum* condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up	Attribute and target based on Perrin et al. (2014)
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Less than 33% collectively of the last complete growing season's shoots of ericoids, crowberry (*Empetrum nigrum*) and bog-myrtle (*Myrica gale*) showing signs of browsing	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Attribute and target based on Perrin et al. (2014)
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: drainage	Percentage area in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 (FPO) and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016). There is a historic record for the FPO listed and Vulnerable marsh clubmoss (*Lycopodiella inundata*) (Wyse Jackson et al., 2016) from Lough Belshade in the SAC (NPWS internal files), but this species cannot be assigned specifically to wet heath

7130 Blanket bogs (* if active bog)

To restore the favourable conservation condition of Blanket bogs (*if active bog) in River Finn SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Blanket bog has not been mapped in detail for River Finn SAC but from current available data the total area of the qualifying habitat is estimated to be approximately 519ha, covering 9% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the River Finn SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	Blanket bog is documented to occur throughout much of the upland areas of the SAC and along the edges of the river. The most extensive examples are found at Tullytresna and Owendoo/Cloghervaddy. A valley bog is present to the north-east of Lough Finn (Douglas et al., 1990; NPWS internal files). Further information can be found within Douglas et al. (1990), NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Ecosystem function: peat formation	Active blanket bog as a proportion of the total area of Annex I blanket bog habitat	At least 99% of the total Annex I blanket bog area is active	See the blanket bogs and associated habitats supporting document for further details
Ecosystem function: hydrology	Flow direction, water levels, occurrence of drains and erosion gullies	Natural hydrology unaffected by drains and erosion	Further details and a brief discussion of restoration potential is presented in the blanket bogs and associated habitats supporting document
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	A variety of blanket bog vegetation communities have been recorded in this SAC (Douglas et al., 1990; NPWS internal files), four of which correspond to communities recorded in the National Survey of Upland Habitats and listed in the provisional list of vegetation communities described in Perrin et al. (2014). Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: positive indicator species	Number of species at a representative number of 2m x 2m monitoring stops	Number of positive indicator species present at each monitoring stop is at least seven	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: lichens and bryophytes	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of bryophytes or lichens, excluding *Sphagnum fallax*, at least 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: potential dominant species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of each of the potential dominant species less than 75%	Attribute and target based on Perrin et al. (2014). See the blanket bogs and associated habitats supporting document for the list of potential dominant species
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). The non-native moss *Campylopus introflexus* has been recorded from the SAC (Douglas et al., 1990), but this species cannot be assigned specifically to blanket bog

Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: *Sphagnum* condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up	Attribute and target based on Perrin et al. (2014)
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Last complete growing season's shoots of ericoids, crowberry (*Empetrum nigrum*) and bog-myrtle (*Myrica gale*) showing signs of browsing collectively less than 33%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas for this habitat is also presented
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: drainage	Percentage area in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: erosion	Percentage area in local vicinity of a representative number of monitoring stops	Less than 5% of the greater bog mosaic comprises erosion gullies and eroded areas	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 (FPO) and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016). There is a historic record for the FPO listed and Vulnerable marsh clubmoss (*Lycopodiella inundata*) (Wyse Jackson et al., 2016) from Lough Belshade in the SAC (NPWS internal files), but this species cannot be assigned specifically to blanket bog

7140 Transition mires and quaking bogs

To restore the favourable conservation condition of Transition mires and quaking bogs in River Finn SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Transition mires and quaking bogs have not been mapped in detail for River Finn SAC and thus total area of the qualifying habitat is unknown. Further details on this and the following attributes can be found in the River Finn SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	The habitat occurs at the interface between bog and waterbodies. An extensive area of this habitat is found at Owendoo/Cloghervaddy to the west of the Owendoo River. It is also though to occur in quaking areas associated with Cronakerny and Cronamuck. Other locations that support this habitat include Tullytresna and the lake edges of Lough Fad, Lough Finn, Lough Gulladuff and the small lakes south of Lough Belshade (Douglas et al., 1990; NPWS internal files). Further information can be found within Douglas et al. (1990), NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	A variety of transition mire vegetation communities have been recorded in this SAC (NPWS internal files), two of which correspond to communities recorded in the National Survey of Upland Habitats and listed in the provisional list of vegetation communities described in Perrin et al. (2014). Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: number of positive indicator species	Vegetation composition: number of positive indicator species	Number of positive indicator species at each monitoring stop is at least three for infilling pools and flushes and at least six for fens	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: number of core positive indicator species	Number of species at a representative number of 2m x 2m monitoring stops	At least one core positive indicator species present	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: cover of positive indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of positive indicator species is at least 25%	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014)

Vegetation structure: height	Percentage of leaves/shoots at a representative number of 2m x 2m monitoring stops	Proportion of live leaves and/or flowering shoots of vascular plants that are more than 15cm above the ground surface should be at least 50%	Attribute and target based on Perrin et al. (2014). This attribute is only applicable to fen and flush examples of the habitat, not to infilling pool examples
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: drainage	Percentage area in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016)

1106 Salmon *Salmo salar*

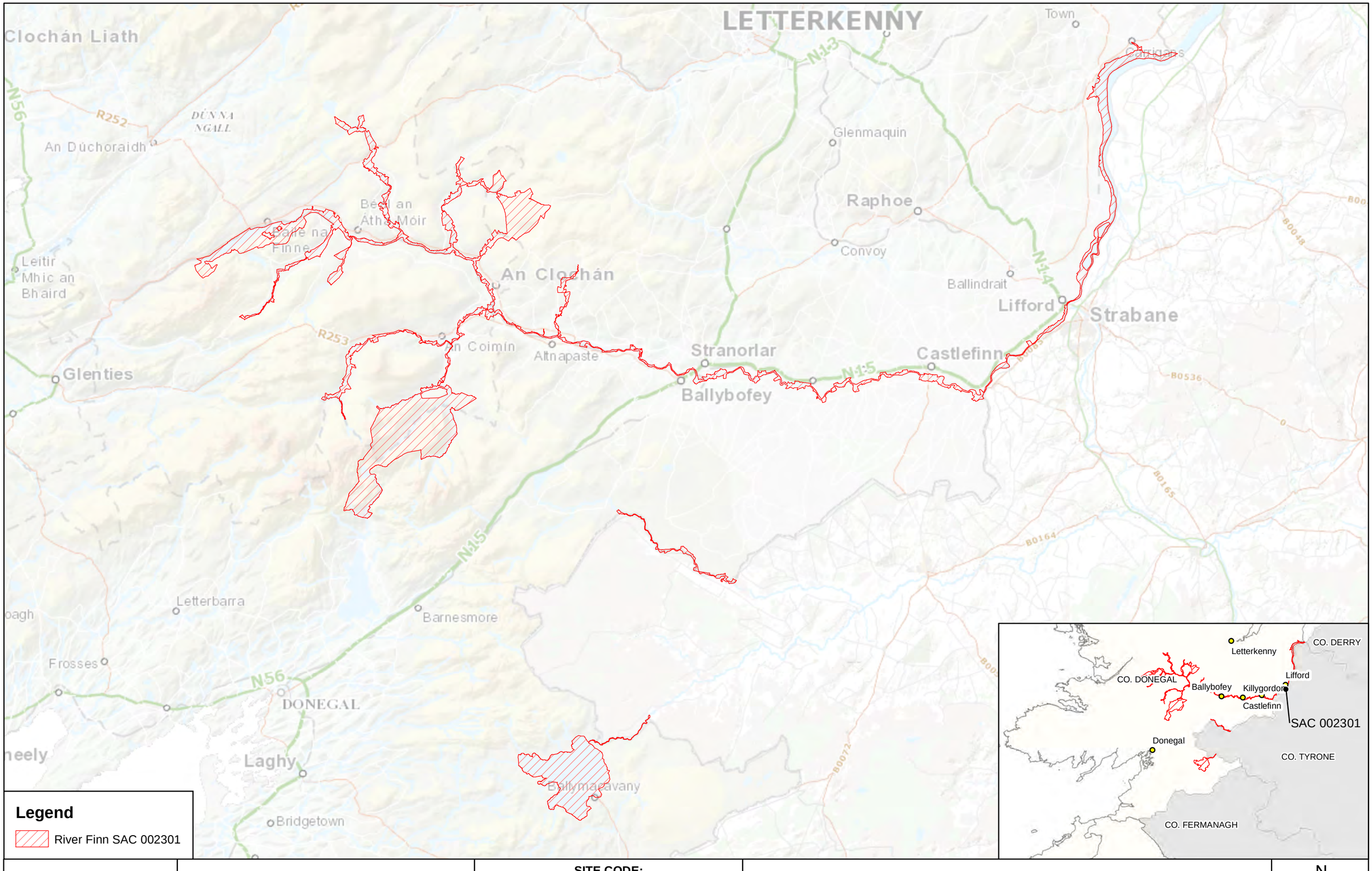
To maintain the favourable conservation condition of Atlantic Salmon in River Finn SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	Percentage of river accessible	100% of river channels down to second order accessible from estuary	Artificial barriers block salmons' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas
Adult spawning fish	Number	Conservation limit (CL) for each system consistently exceeded	A conservation limit (CL) is defined by the North Atlantic Salmon Conservation Organisation (NASCO) as "the spawning stock level that produces long-term average maximum sustainable yield as derived from the adult to adult stock and recruitment relationship". The target is based on the Standing Scientific Committee on Salmon (SSCS) annual model output of CL attainment levels. See SSCS (2016). Attainment of CL estimates are derived from direct counts of adults (rod catch, fish counter) or indirectly by fry abundance counts
Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 minutes sampling	The target is the threshold value for rivers currently exceeding their conservation limit (CL)
Out-migrating smolt abundance	Number	No significant decline	Smolt abundance can be negatively affected by a number of impacts such as estuarine pollution, predation and sea lice (*Lepeophtheirus salmonis*)
Number and distribution of redds	Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes	Salmon spawn in clean gravels
Water quality	EPA Q value	At least Q4 at all sites sampled by EPA	Q values based on triennial water quality surveys carried out by the Environmental Protection Agency (EPA)

1355 Otter *Lutra lutra*

To maintain the favourable conservation condition of Otter in River Finn SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Percentage positive survey sites	No significant decline	Measure based on standard otter survey technique. Favourable Conservation Status (FCS) target, based on 1980/81 survey findings, is 88% in SACs. Current range is estimated at 93.6% (Reid et al., 2013)
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 390ha along river banks/lake shoreline/ around ponds	No field survey. Areas mapped to include 10m terrestrial buffer along river banks and around water bodies identified as critical for otters (NPWS, 2007)
Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 182.2km	No field survey. River length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (Chapman and Chapman, 1982)
Extent of freshwater (lake) habitat	Hectares	No significant decline. Area mapped and calculated as 354ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (NPWS, 2007)
Couching sites and holts	Number	No significant decline	Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk and Moorhouse, 1991; Kruuk, 2006)
Fish biomass available	Kilograms	No significant decline	Broad diet that varies locally and seasonally, but dominated by fish, in particular salmonids, eels and sticklebacks in freshwater (Bailey and Rochford, 2006; Reid et al., 2013)
Barriers to connectivity	Number	No significant increase. For guidance, see map 4	Otters will regularly commute across stretches of open water up to 500m e.g. between the mainland and an island; between two islands; across an estuary (De Jongh and O'Neill, 2010). It is important that such commuting routes are not obstructed



An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta

Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 1:
RIVER FINN SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

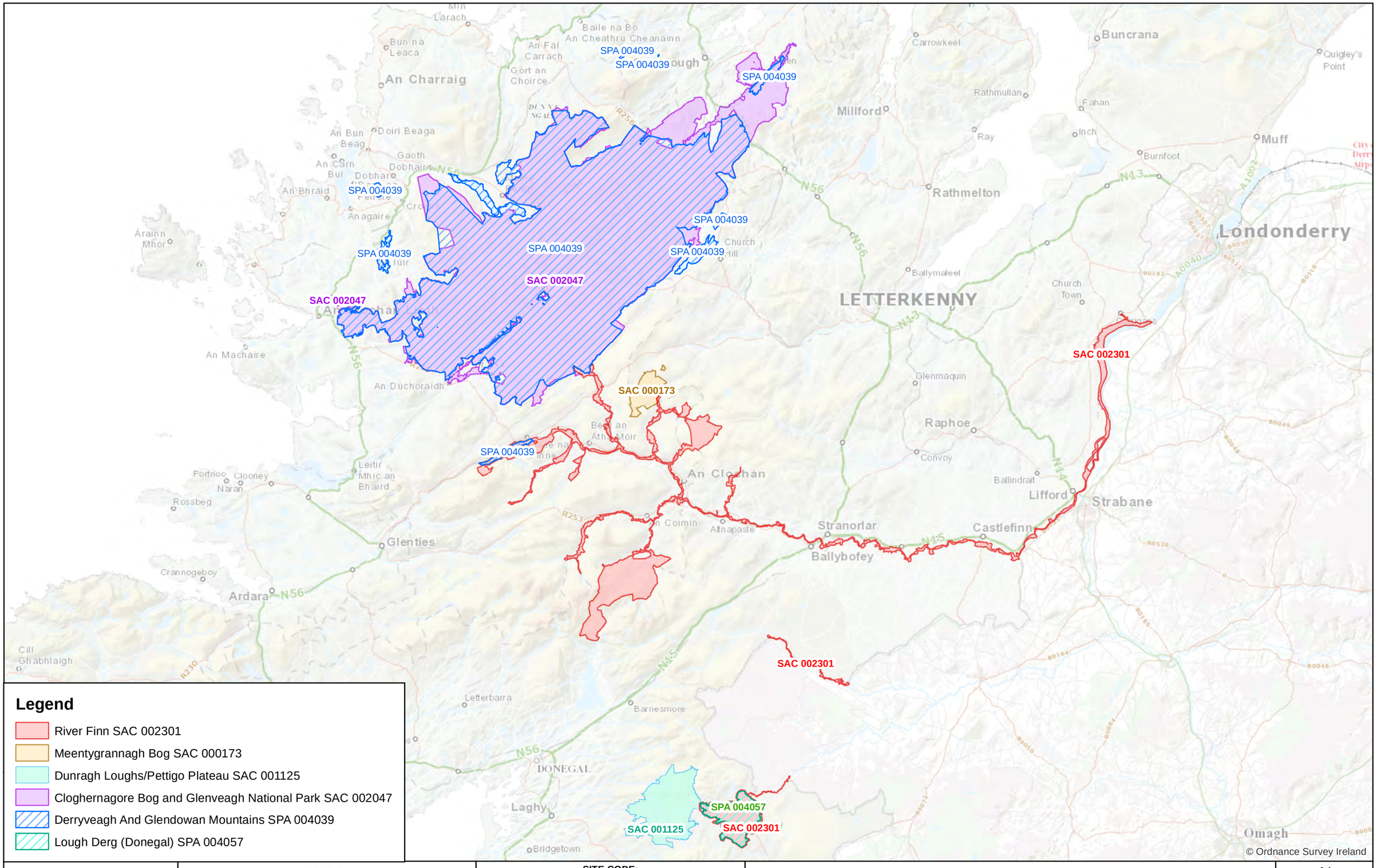
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002301; version 3.01
CO. DONEGAL

0 2 4 6 8 km

N

Map Version 1
Date: May 2017



Legend

- River Finn SAC 002301
- Meentygrannagh Bog SAC 000173
- Dunragh Loughs/Pettigo Plateau SAC 001125
- Cloghernagore Bog and Glenveagh National Park SAC 002047
- Derryveagh And Glendowan Mountains SPA 004039
- Lough Derg (Donegal) SPA 004057

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 2:
RIVER FINN SAC
CONSERVATION OBJECTIVES
ADJACENT / ADJOINING AND OVERLAPPING DESIGNATIONS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002301; version 3.01. SAC 000173; version 3.01.
SAC 002047; version 3. SAC 001125; version 3.
SPA 004039; version 3. SAC 004057; version 3.
CO. DONEGAL

0 3 6 9 12 15 km

N

Map Version 1
Date: May 2017

An Loch Sifneach

Lough Finn

Lough Belshade

Loughinisland

Lough Gulladuff

Lough Derg

Legend

- River Finn SAC 002301
- Potential 3110 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)
- Potential 3110 / Potential 3130 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) / Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 3:
RIVER FINN SAC
CONSERVATION OBJECTIVES
INDICATIVE LAKE HABITATS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002301; version 3.01.
CO. DONEGAL

0 2 4 6 8 10 km

N

Map Version 1
Date: May 2017

Legend

- 1355 Otter *Lutra lutra* Commuting
- River Finn SAC 002301
- OSi Discovery Series County Boundary
- Northern Ireland

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 4:
RIVER FINN SAC
CONSERVATION OBJECTIVES
OTTER COMMUTING

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002301; version 3.01
CO. DONEGAL

0 1.5 3 4.5 6 7.5 km

N

Map Version 1
Date: May 2017

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Slieve Beagh SPA 004167

An Roinn Tithíochta,
Rialtais Áitiúil agus Oidhreachta
Department of Housing,
Local Government and Heritage

National Parks and Wildlife Service,
Department of Housing, Local Government and Heritage,

90 King Street North, Dublin 7, D07 N7CV, Ireland.

Web: www.npws.ie
E-mail: natureconservation@housing.gov.ie

Citation:

NPWS (2022) Conservation Objectives: Slieve Beagh SPA 004167. Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.

Series Editors: Rebecca Jeffrey and Colin Heaslip
ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

004167	Slieve Beagh SPA

A082	Hen Harrier *Circus cyaneus*

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	2015
Title :	Hen harrier special protection area (SPA) habitat mapping project 2014
Author :	Moran, P.; Wilson-Parr, R.
Series :	Irish Wildlife Manual No. 83
Year :	2015
Title :	Hen harrier conservation and the forestry sector in Ireland - forestry - V3.2
Author :	NPWS
Series :	Unpublished Report
Year :	2016
Title :	The 2015 national survey of breeding hen harrier in Ireland
Author :	Ruddock, M.; Mee, A.; Lusby, J.; Nagle, A.; O'Neill, S.; O'Toole, L.
Series :	Irish Wildlife Manual No. 93
Year :	2022
Title :	Conservation objectives supporting document: breeding hen harrier
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

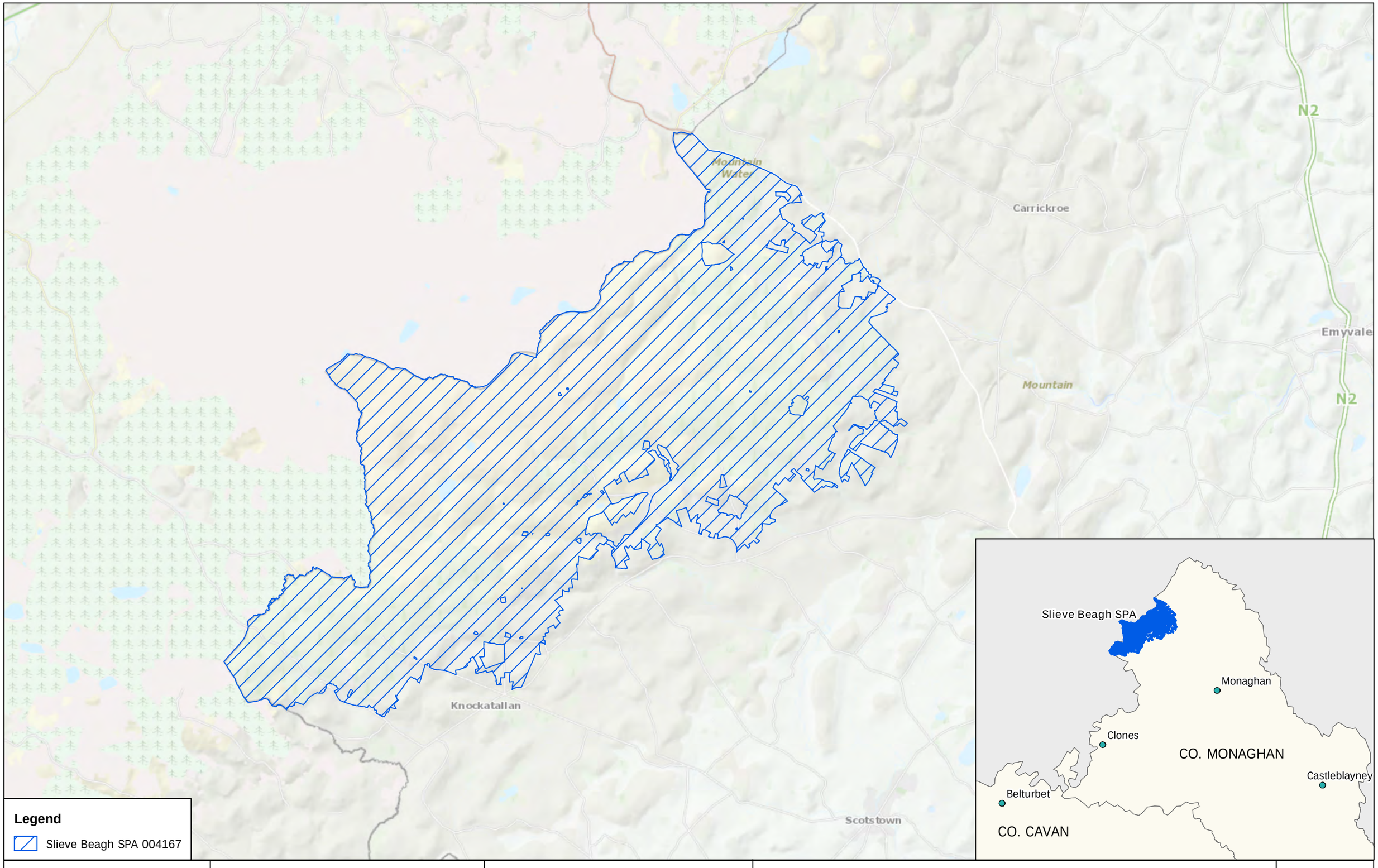
Year :	2002
Title :	A national survey of breeding hen harriers (*circus cyaneus*) in Ireland 1998-2000
Author :	Norriss, D.W., Marsh, J., McMahon, D. & Oliver, G.A.
Series :	Irish Birds, 7, 1-10
Year :	2006
Title :	The second national survey of breeding hen harriers *circus cyaneus* in Ireland
Author :	Barton, C., Pollock, C., Norriss, D.W., Nagle, T., Oliver, G.A. & Newton, S.
Series :	Irish Birds, 8, 1–20
Year :	2006
Title :	The distribution of hen harriers in Ireland in relation to land use cover, particularly forest cover
Author :	Wilson, M.; Gittings, T.; O'Halloran, J.; Kelly, T.; Pithon, J.
Series :	Environment No. 6. COFORD, Dublin
Year :	2012
Title :	Optimum scenarios for hen harrier conservation in Ireland; final report 2012
Author :	Irwin, S.; Wilson, W.; O'Donoghue, B.; O'Mahony, B.; Kelly, T.; O'Halloran, J.
Series :	Prepared for the Department of Agriculture, Food and the Marine by the School of Biological, Earth and Environmental Sciences, University College Cork
Year :	2014
Title :	Ranging behaviour of hen harriers breeding in special protection areas in Scotland
Author :	Arroyo, B.; Leckie, F.; Amar, A.; Cluskie, A; Redpath, S.
Series :	Bird Study, 61:1, 48-55

A082 Hen Harrier *Circus cyaneus*

To restore the favourable conservation condition of hen harrier in Slieve Beagh SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population size	Number of confirmed breeding pairs	Maintain numbers at or above 3–4 confirmed breeding pairs	The attribute 'confirmed breeding pairs' is based on standard survey methods (see Ruddock et al., 2016). The target for this SPA is informed by the first two national surveys of 1998–2001 (Norriss et al., 2002) and 2005 (Barton et al., 2006). For further information on this and all other attributes, please refer to the conservation objectives supporting document for breeding hen harrier (NPWS, 2022) for further details
Productivity rate	Number of fledged young per confirmed pair	Maintain at least 1.0–1.4 fledged young per confirmed pair	At the SPA level, the productivity rate can be highly variable in any given year. Generally, the setting of a minimum level of productivity to ensure a stable and/or increasing population at a given site ought to be informed by robust estimates of: post-fledging survival; adult survival; and immigration and emigration rates. Setting a single precise and robust rate is constrained by a lack of comprehensive Irish data. In order to frame this uncertainty, a threshold of 1.0–1.4 fledged young per confirmed breeding pair is set for this attribute. If population size of the SPA is not favourable, then the upper end of this productivity rate range is to be met. In order for estimates to be sufficiently representative of the SPA, they need to be of sufficient sample size and ideally over multiple years in order to account for inter-annual variability
Spatial utilisation by breeding pairs	Percentage	Maintain the spatial utilisation of the SPA by breeding pairs at 100%	Optimal resilience depends on breeding pairs utilising the SPA to the maximum extent possible. The spatial distribution of breeding pairs is expressed by the proportion of the SPA being used by them. Breeding pairs predominantly use the area within 5km of their nest site or centre of territory, though they can travel further (e.g. Irwin et al., 2012; Arroyo et al., 2014). Thus, the core area used by confirmed pairs can be broadly and generically estimated by calculating the portion that lies within 5km of all recorded nest sites. Ideally, the breeding population should be well dispersed around the SPA. The target range for this attribute for this SPA is informed by the first two national surveys of 1998–2001 and 2005
Extent and condition of heath and bog and associated habitats	Hectares; condition assessment	Maintain the extent and quality of this resource to support the targets relating to population size, productivity rate and spatial utilisation	Open heath and bog occur in mosaics and often with other semi-natural habitats (e.g. scrub). These habitats can provide important nesting and foraging resources for the breeding population providing they are in suitable condition. Based on the habitat mapping of Moran and Wilson-Parr (2015), the estimated total extent of these habitats in this SPA is 1,380ha. Qualitative aspects were not assessed by Moran and Wilson-Parr (2015), but some important aspects to consider are the habitats' structure, soil integrity and overall open habitat coherence
Extent and condition of low intensity managed grasslands and associated habitats	Hectares; condition assessment	Maintain extent and quality of this resource to support the targets relating to population size, productivity rate and spatial utilisation	Low intensity managed grasslands occur in mosaics and often with other semi-natural habitats (e.g. scrub). These habitats can provide important foraging resources for the breeding population providing they are in suitable condition. Based on the habitat mapping of Moran and Wilson-Parr (2015), the estimated total extent of these habitats in this SPA is 106ha. Qualitative aspects were not assessed by Moran and Wilson-Parr (2015), but some important aspects to consider are the habitats' structure and overall open habitat coherence

Extent and condition of hedgerows	Kilometres; condition assessment	Maintain the length and quality of this resource to support the targets relating to population size, productivity rate and spatial utilisation	Hedgerows can be an important foraging resource for hen harrier throughout the year by providing food and refuge for prey animals i.e. small mammals and birds. Moran and Wilson-Parr (2015) quantified the hedgerow resource in this SPA with an estimated total linear extent of 64.3km, with two structural hedgerow types namely 'intact and dense' and 'boxed and moderate' accounting for 27.7km of that total. These combined types account for 43% of the total hedgerow resource of the SPA
Age structure of forest estate	Percentage	Maintain an even and consistent distribution of age-classes across the forest estate	This attribute aims to define optimal forest age-class composition required to reduce the forest demographic bottleneck, as set out in NPWS (2015) and Wilson et al. (2006)
Disturbance to breeding sites	Level of impact	Disturbance occurs at levels that does not significantly impact upon breeding hen harrier	The impact of any significant disturbance on the SPA's breeding population will ultimately be manifested in the targets which relate to population demographics (i.e. population size, productivity rate) and the spatial utilisation of the SPA by breeding pairs. Factors such as intensity, frequency, timing and duration of a potentially disturbing activity need to be taken into account to determine its significance on breeding hen harrier in the SPA



Legend

Slieve Beagh SPA 004167

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

MAP 1:
SLIEVE BEAGH SPA
CONSERVATION OBJECTIVES
SPA DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document

SITE CODE:
SPA 004167; version 3
CO. MONAGHAN

0 0.5 1 2 Kilometres

N

Date: July 2022

Conservation objectives for Sligo/Leitrim Uplands SPA [004187]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Objective: To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:

Bird Code	Common Name	Scientific Name
A103	Peregrine	*Falco peregrinus*
A346	Chough	*Pyrrhocorax pyrrhocorax*

Citation: *NPWS (2022) Conservation objectives for Sligo/Leitrim Uplands SPA [004187]. First Order Site-specific Conservation Objectives Version 1.0. Department of Housing, Local Government and Heritage.*

This First Order Site-specific Conservation Objectives Version 1.0 document replaces the Generic Conservation Objectives Version 9.0 document.

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Tamur Bog SAC 001992

An Roinn Ealaíon, Oidhreachta,
Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta

Department of Arts, Heritage,
Regional, Rural and Gaeltacht Affairs

National Parks and Wildlife Service,
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs,

7 Ely Place, Dublin 2, Ireland.

Web: www.npws.ie
E-mail: nature.conservation@ahg.gov.ie

Citation:

NPWS (2017) Conservation Objectives: Tamur Bog SAC 001992. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

Series Editor: Rebecca Jeffrey
ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

001992	Tamur Bog SAC
4010	Northern Atlantic wet heaths with *Erica tetralix*
7130	Blanket bogs (* if active bog)
7150	Depressions on peat substrates of the Rhynchosporion

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	1990
Title :	A survey to locate lowland blanket bogs of scientific interest in county Donegal and upland blanket bogs in counties Cavan, Leitrim and Roscommon
Author :	Douglas, C.; Dunnells, D.; Scally, L.; Wyse Jackson, M.
Series :	Unpublished report to NPWS
Year :	2012
Title :	Ireland Red List No. 8: Bryophytes
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	Ireland Red List series, NPWS
Year :	2014
Title :	Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland, Version 2.0
Author :	Perrin, P.M.; Barron, S.J.; Roche, J.R.; O'Hanrahan, B.
Series :	Irish Wildlife Manual No. 79
Year :	2016
Title :	Ireland Red List No. 10: Vascular Plants
Author :	Wyse Jackson, M.; FitzPatrick, Ú.; Cole, E.; Jebb, M.; McFerran, D.; Sheehy Skeffington, M.; Wright, M.
Series :	Ireland Red Lists series, NPWS
Year :	2017
Title :	Tamur Bog SAC (site code: 1992) Conservation objectives supporting document- blanket bog and associated habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document

4010 Northern Atlantic wet heaths with Erica tetralix

To restore the favourable conservation condition of Northern Atlantic wet heaths with *Erica tetralix* in Tamur Bog SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Northern Atlantic wet heaths with *Erica tetralix* has not been mapped in detail for Tamur Bog SAC but from current available data the total area of the qualifying habitat is estimated to be approximately 230ha, covering 18% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Tamur Bog SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	The habitat is documented to occur on sloping ground and hillsides within the SAC. It is present on Mallygreen hill, Carnbeg hill, Tullynahushoge hill, the hillsides flanking the southern shores of Glaskeeragh Lough, and on hillsides to the north and north-west of Lough Avehy. Wet heath also occurs in patches throughout the blanket bog (NPWS internal files). Further information can be found within NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	The diversity of wet heath communities within this SAC is unknown. Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: cross-leaved heath	Occurrence within 20m of a representative number of monitoring stops	Cross-leaved heath (*Erica tetralix*) present within a 20m radius of each monitoring stop	Attribute and target based on Perrin et al. (2014)
Vegetation composition: positive indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of positive indicator species at least 50%	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: lichens and bryophytes	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of *Cladonia* and *Sphagnum* species, *Racomitrium lanuginosum* and pleurocarpous mosses at least 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: ericoid species and crowberry	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of ericoid species and crowberry (*Empetrum nigrum*) at least 15%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: dwarf shrub species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of dwarf shrubs less than 75%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). Rhododendron (*Rhododendron ponticum*) and the moss *Campylopus introflexus* were recorded within the SAC at Glaskeeragh by Douglas et al. (1990), however, these non-native species cannot be assigned specifically to wet heath

Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 20%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: bracken	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of bracken (*Pteridium aquilinum*) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: soft rush	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of soft rush (*Juncus effusus*) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: *Sphagnum* condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up	Attribute and target based on Perrin et al. (2014)
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Less than 33% collectively of the last complete growing season's shoots of ericoids, crowberry (*Empetrum nigrum*) and bog-myrtle (*Myrica gale*) showing signs of browsing	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas for this habitat is also presented
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: drainage	Percentage area in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016)

7130 Blanket bogs (* if active bog)

To restore the favourable conservation condition of Blanket bogs (*if active bog) in Tamur Bog SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Blanket bog has not been mapped in detail for Tamur Bog SAC but from current available data the total area of the qualifying habitat is estimated to be approximately 613ha, covering 48% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Tamur Bog SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	The habitat occurs throughout the SAC on flat, undulating and gently sloping terrain (NPWS internal files). Further information can be found within Douglas et al. (1990), NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Ecosystem function: peat formation	Active blanket bog as a proportion of the total area of Annex I blanket bog habitat	At least 99% of the total Annex I blanket bog area is active	See the blanket bogs and associated habitats supporting document for further details
Ecosystem function: hydrology	Flow direction, water levels, occurrence of drains and erosion gullies	Natural hydrology unaffected by drains and erosion	Further details and a brief discussion of restoration potential is presented in the blanket bogs and associated habitats supporting document
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	Douglas et al. (1990) recorded a variety of blanket bog vegetation communities in this SAC, four of which correspond to communities recorded in the National Survey of Upland Habitats and listed in the provisional list of vegetation communities described in Perrin et al. (2014). Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: positive indicator species	Number of species at a representative number of 2m x 2m monitoring stops	Number of positive indicator species present at each monitoring stop is at least seven	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: lichens and bryophytes	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of bryophytes or lichens, excluding *Sphagnum fallax*, at least 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: potential dominant species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of each of the potential dominant species less than 75%	Attribute and target based on Perrin et al. (2014). See the blanket bogs and associated habitats supporting document for the list of potential dominant species
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). Rhododendron (*Rhododendron ponticum*) and the moss *Campylopus introflexus* were recorded within the SAC at Glaskeeragh by Douglas et al. (1990), however, these non-native species cannot be assigned specifically to blanket bog
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 10%	Attribute and target based on Perrin et al. (2014)

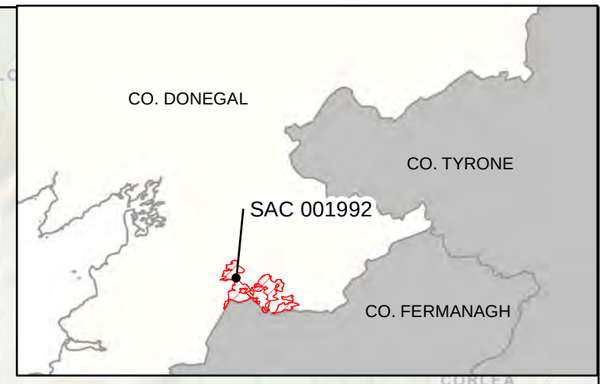
Vegetation structure: *Sphagnum* condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up	Attribute and target based on Perrin et al. (2014)
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Last complete growing season's shoots of ericoids, crowberry (*Empetrum nigrum*) and bog-myrtle (*Myrica gale*) showing signs of browsing collectively less than 33%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas for this habitat is also presented
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: drainage	Percentage area in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: erosion	Percentage area in local vicinity of a representative number of monitoring stops	Less than 5% of the greater bog mosaic comprises erosion gullies and eroded areas	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016)

7150 Depressions on peat substrates of the Rhynchosporion

To restore the favourable conservation condition of Depressions on peat substrates of the Rhynchosporion in Tamur Bog SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Depressions on peat substrates of the Rhynchosporion has not been mapped in detail for Tamur Bog SAC and thus the total area of the qualifying habitat is unknown. Further details on this and the following attributes can be found in the Tamur Bog SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	The habitat is associated with blanket bog particularly in wetter parts of the SAC, including those areas that support quaking lawns and pools/lakes. It is best represented close to the large lakes of Lough Vearty and Lough Awaddy in the south of the SAC, where deep, quaking peat basins have developed (NPWS internal files). Flats dominated by white beak-sedge (*Rhynchospora alba*) were reported west of Lough Garlagh Beg in the north-west of the SAC by Douglas et al. (1990). Further information can be found within Douglas et al. (1990), NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Vegetation composition: positive indicator species	Number of species at a representative number of 2m x 2m monitoring stops	Number of positive indicator species at each monitoring stop is at least five	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: *Rhynchospora* spp.	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of white beaked sedge (*Rhynchospora alba*) and brown beaked sedge (*R. fusca*) at least 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: potential dominant species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of each of the potential dominant species individually less than 35%	Attribute and target based on Perrin et al. (2014). See the blanket bogs and associated habitats supporting document for the list of potential dominant species
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). Rhododendron (*Rhododendron ponticum*) and the moss *Campylopus introflexus* were recorded within the SAC at Glaskeeragh by Douglas et al. (1990), however, these non-native species cannot be assigned specifically to this habitat
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: *Sphagnum*	Condition at a representative number of 2m x 2m monitoring stops condition	Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up	Attribute and target based on Perrin et al. (2014)

Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Last complete growing season's shoots of ericoids, crowberry (*Empetrum nigrum*) and bog-myrtle (*Myrica gale*) showing signs of browsing collectively less than 33%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas for this habitat is also presented
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: drainage	Percentage area in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: erosion	Percentage area in local vicinity of a representative number of monitoring stops	Less than 5% of the greater bog mosaic comprises erosion gullies and eroded areas	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016)



Legend

Tamur Bog SAC 001992

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 1:
TAMUR BOG SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 001992; version 3.01
CO. DONEGAL

0 0.45 0.9 1.35 1.8 km

N

Map Version 1
Date: April 2017