APPENDIX 6-10

CONSERVATION OBJECTIVES OF EUROPEAN SITES

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

St. Gobnet's Wood SAC 000106

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

National Parks and Wildlife Service,
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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***

000106	St. Gobnet's Wood SAC
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 :	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 :	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 :	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 :	2002
Title :	Reversing the habitat fragmentation of British woodlands
Author :	Peterken, G.
Series :	WWF-UK, London
Year :	2010
Title :	The ancient and long-established woodlands of County Cork
Author :	Daly, O.; Perrin, P.
Series :	Unpublished report submitted to the Heritage Council, Kilkenny
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 :	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 2)

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 St. Gobnet's 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 St. Gobnet's Wood SAC. The SAC contains two discrete blocks of woodland, St Gobnet's Wood to the south and Cascade Wood to the north (NPWS internal files). As part of the National Survey of Native Woodlands (NSNW), St Gobnet's Wood (NSNW site code 1308) was surveyed by Perrin et al. (2008). St Gobnet's Wood (site number 236) was also included in a survey of ancient and long-established woodlands in County Cork (Daly and Perrin, 2010). Map 2 shows the surveyed area of old sessile oak woodland within the SAC. The area has been calculated as 28.8ha based on Perrin et al. (2008). It is important to note that Cascade Wood was not covered by the NSNW and further areas of old sessile oak woods may be present within the SAC
Habitat distribution	Occurrence	No decline, subject to natural processes. The surveyed woodland location is shown on map 2	Distribution based on Perrin et al. (2008). It is important to note that further areas of the Annex I habitat 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 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/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 habitat 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 (see Perrin and Daly, 2010), archaeological and geological features as well as red listed and other rare or localised species. At St Gobnet's Wood, a substantial area (15.5ha) was identified as Possible Ancient Woodland by Perrin and Daly (2010) and 16 Ancient Woodland Vascular Plant indicator species were recorded by Daly and Perrin (2010). Both St Gobnet's Wood and Cascade Wood contain elements typical of woods of the south-west, including Tunbridge filmy-fern (*Hymenophyllum tunbridgense*), Irish spurge (*Euphorbia hyberna*) and St Patrick's cabbage (*Saxifraga spathularis*). The site also supports Kerry slug (*Geomalacus maculosus*) and several species of bat (NPWS internal files)
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)
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. The non-native invasive species beech (*Fagus sylvatica*), sycamore (*Acer pseudoplatanus*), rhododendron (*Rhododendron ponticum*) and cherry laurel (*Prunus laurocerasus*) occur at both St Gobnet's Wood and Cascade Wood, but are more prevalent at the latter site (Daly and Perrin, 2010; NPWS internal files)

Baile Bhuirne

Cúil Na Coille

An Mhaigh

N22

Magh

CO. KERRY

CO. CORK

Baile Bhúirne

Ballyvourney

St. Gobnet's Wood SAC

Baile Mhic Íre

Garrane

Cúil Aodha

Legend

St. Gobnet's Wood SAC 000106

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

MAP 1:
ST. GOBNET'S WOOD SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

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

SITE CODE:
SAC 000106; version 3. CO. CORK

0 75 150 300 Metres

N

Date: October 2020

Legend

St. Gobnet's Wood SAC 000106

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

Ordnance Survey Ireland

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

MAP 2:
ST. GOBNET'S WOOD SAC
CONSERVATION OBJECTIVES
WOODLAND HABITATS

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

SITE CODE:
SAC 000106; version 3. CO. CORK

0 75 150 300 Metres

N

Date: October 2020

National Parks and Wildlife Service

Conservation Objectives

Castlemaine Harbour SAC 000343
Castlemaine Harbour SPA 004029

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

Introduction

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Qualifying Interests

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

000343 Castlemaine Harbour SAC

QI	Description
1095	Sea lamprey *Petromyzon marinus*
1099	River lamprey *Lampetra fluviatilis*
1106	Atlantic salmon (*Salmo salar*) (only in fresh water)
1130	Estuaries
1140	Mudflats and sandflats not covered by seawater at low tide
1210	Annual vegetation of drift lines
1220	Perennial vegetation of stony banks
1310	*Salicornia* and other annuals colonizing mud and sand
1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
1355	Otter *Lutra lutra*
1395	Petalwort *Petalophyllum ralfsii*
1410	Mediterranean salt meadows (*Juncetalia maritimi*)
2110	Embryonic shifting dunes
2120	Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")
2130	* Fixed coastal dunes with herbaceous vegetation ("grey dunes")
2170	Dunes with *Salix repens* ssp. *argentea* (*Salix arenariae*)
2190	Humid dune slacks
91E0	* Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)

004029 Castlemaine Harbour SPA

QI	Description	
A001	Red-throated Diver *Gavia stellata*	wintering
A017	Cormorant *Phalacrocorax carbo*	wintering
A046	Light-bellied Brent Goose *Branta bernicla hrota*	wintering
A050	Wigeon *Anas penelope*	wintering
A053	Mallard *Anas platyrhynchos*	wintering
A054	Pintail *Anas acuta*	wintering
A062	Scaup *Aythya marila*	wintering
A065	Common Scoter *Melanitta nigra*	wintering
A130	Oystercatcher *Haematopus ostralegus*	wintering
A137	Ringed Plover *Charadrius hiaticula*	wintering
A144	Sanderling *Calidris alba*	wintering
A157	Bar-tailed Godwit *Limosa lapponica*	wintering
A162	Redshank *Tringa totanus*	wintering
A164	Greenshank *Tringa nebularia*	wintering
A169	Turnstone *Arenaria interpres*	wintering
A346	Chough *Pyrrhocorax pyrrhocorax*	non-breeding
A999	Wetlands & Waterbirds	

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

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

Title: Castlemaine Harbour SAC (000343): Conservation objectives supporting document - woodland habitats [Version 2]

Year: 2011

Author: NPWS

Series: Unpublished Report to NPWS

Title: Castlemaine Harbour SPA (004029): Conservation Objectives Supporting Document [Version 2]

Year: 2011

Author: NPWS

Series: Unpublished Report to NPWS

Title: Castlemaine Harbour SAC (000343): Conservation objectives supporting document - marine habitats [Version 2]

Year: 2011

Author: NPWS

Series: Unpublished Report to NPWS

Title: Castlemaine Harbour SAC (000343): Conservation objectives supporting document - coastal habitats [Version 2]

Year: 2011

Author: NPWS

Series: Unpublished Report to NPWS

Title: Otter tracking study of Roaringwater Bay

Year: 2010

Author: De Jongh, A.; O'Neill, L.

Series: Unpublished Draft Report to NPWS

Title: MI benthic surveys of Natura 2000 sites: Area 1

Year: 2010

Author: ERM

Series: Unpublished Report to NPWS

Title: A provisional inventory of ancient and long-established woodland in Ireland

Year: 2010

Author: Perrin, P.M.; Daly, O.H.

Series: Irish Wildlife Manuals No. 46

Title: Report of the standing scientific committee to the DCENR. The status of Irish salmon stocks in 2010 and precautionary catch advice for 2011

Year: 2010

Author: SSC

Series: Unpublished Report to DCENR

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: A survey of mudflats and sandflats in Ireland. An intertidal soft sediment survey of Castlemaine Harbour

Year: 2008

Author: Aquatic Services Unit

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

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Title: National Survey of Native Woodlands 2003-2008

Year: 2008

Author: Perrin, P.; Martin, J.; Barron, S.; O'Neill, F.; McNutt, K.; Delaney, A.

Series: Unpublished Report to NPWS

Title: Saltmarsh Monitoring Report 2006

Year: 2007

Author: McCorry, M.

Series: Unpublished Report to NPWS

Title: Supporting documentation for the Habitats Directive Conservation Status Assessment - backing documents, Article 17 forms and supporting maps

Year: 2007

Author: NPWS

Series: Unpublished Report to NPWS

Title: A Survey of Juvenile Lamprey Populations in the Corrib and Suir Catchments

Year: 2007

Author: O'Connor, W.

Series: Irish Wildlife Manuals No. 26

Title: Otter Survey of Ireland 2004/2005

Year: 2006

Author: Bailey, M.; Rochford, J.

Series: Irish Wildlife Manuals No. 23

Title: Otters - ecology, behaviour and conservation

Year: 2006

Author: Kruuk, H.

Series: Oxford University Press

Title: Monitoring the river, sea and brook lamprey, *Lampetra fluviatilis*, *L. planeri* and *Petromyzon marinus*

Year: 2003

Author: Harvey, J.; Cowx, I.

Series: Conserving Natura 2000 Rivers Monitoring Series No. 5, English Nature, Peterborough

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Title: Quantification of the freshwater salmon habitat asset in Ireland using data interpreted in a GIS platform

Year: 2003

Author: McGinnity, P.; Gargan, P.; Roche, W.; Mills, P.; McGarrigle, M.

Series: Irish Freshwater Ecology & Management Series: No. 3, Central Fisheries Board

Title: Reversing the habitat fragmentation of British woodlands

Year: 2002

Author: Peterken, G.

Series: WWF-UK, London

Title: Diet of Otters *Lutra lutra* on Inishmore, Aran Islands, west coast of Ireland

Year: 1999

Author: Kingston, S.; O'Connell, M.; Fairley, J.S.

Series: Biol & Environ Proc R Ir Acad B 99B:173–182

Title: National Shingle Beach Survey of Ireland 1999

Year: 1999

Author: Moore, D.; Wilson, F.

Series: Unpublished Report to NPWS

Title: The spatial organization of otters (*Lutra lutra*) in Shetland

Year: 1991

Author: Kruuk, H.; Moorhouse, A.

Series: J. Zool, 224: 41-57

Title: Otter survey of Ireland

Year: 1982

Author: Chapman, P.J.; Chapman, L.L.

Series: Unpublished Report to Vincent Wildlife Trust

Spatial data sources

Year:	2010
Title:	EPA transitional waterbody data
GIS operations:	Clipped to SAC boundary
Used for:	1130 (map 2)

Year:	Interpolated 2011
Title:	Intertidal sediment survey 2008; subtidal sediment survey 2009
GIS operations:	Polygon feature classes from marine community types base data sub-divided based on interpolation of marine survey data
Used for:	Marine community types, 1140 (maps 3 & 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; Saltmarsh and Sand Dune CO datasets erased out
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:	1210, 1220, 2110, 2120, 2130, 2170, 2190 (map 5)

Year:	Revision 2010
Title:	Saltmarsh Monitoring Project 2007-2008. Version 1
GIS operations:	QIs selected; clipped to SAC boundary; overlapping regions with Sand Dune CO data investigated and resolved with expert opinion used
Used for:	1310, 1330, 1410 (map 6)

Year:	Revision 2010
Title:	National Survey of Native Woodlands 2003-2008. Version 1
GIS operations:	QIs selected; clipped to SAC boundary
Used for:	91E0 (map 7)

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; saltmarsh data for site combined to HWM and LWM polygon feature class; resulting polygon feature class unioned with SPA boundary; resulting polygon feature class clipped to SPA boundary; bird use zone attributes assigned to each polygon
Used for:	Bird use zones (map 8)

Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	Creation of an 80m buffer on the marine side of the high water mark (HWM); creation of a 10m buffer on the terrestrial side of the HWM; combination of 80m and 10m HWM buffer datasets; creation of a 10m buffer on the landward side of the river banks data; creation of a 20m buffer applied to river centerline and stream data; combination of 10m river banks and 20m river and stream centerline buffer datasets; combined river and stream buffer dataset clipped to HWM; combination of HWM buffer dataset with river and stream buffer dataset; overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary
Used for:	1355 (no map)

1095 Sea lamprey *Petromyzon marinus*

To maintain the favourable conservation condition of Sea lamprey in Castlemaine Harbour SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Extent of anadromy	% of river accessible	Greater than 75% of main stem length accessible from estuary	Artificial barriers can block or cause difficulties to lampreys' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas. Attribute and target based on Inland Fisheries Ireland survey work
Population structure of juveniles	Number of age/size groups	At least three age/size groups present	Attribute and target based on Harvey and Cowx (2003)
Juvenile density in fine sediment	Juveniles/m²	Mean catchment juvenile density at least 1/m²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on Harvey and Cowx (2003)
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds	Lampreys spawn in clean gravels. Artificial barriers can prevent lampreys from accessing suitable spawning habitat. Attribute and target based on spawning bed habitat mapping by IFI
Availability of juvenile habitat	Number of positive sites in 3rd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Artificial barriers can prevent juvenile lampreys from accessing the full extent of suitable habitat. Target based on O'Connor (2007)

1099 River lamprey *Lampetra fluviatilis*

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

Attribute	Measure	Target	Notes
Extent of anadromy	% of river accessible	Greater than 75% of main stem length accessible from estuary	Artificial barriers can block or cause difficulties to lampreys' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas. Target based on IFI survey work
Population structure of juveniles	Number of age/size groups	At least three age/size groups of river/brook lamprey present	Attribute and target based on data from Harvey and Cowx (2003). It is impossible to distinguish between brook and river lamprey juveniles in the field, hence they are considered together in this target
Juvenile density in fine sediment	Juveniles/m²	Mean catchment juvenile density of brook/river lamprey at least 2/m²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003) who state 10/m² in optimal conditions and more than 2/m² on a catchment basis
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds	Lampreys spawn in clean gravels. Artificial barriers can prevent lampreys from accessing suitable spawning habitat. Attribute and target based on spawning bed habitat mapping by IFI
Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Artificial barriers can prevent juvenile lampreys from accessing the full extent of suitable habitat. Target based on O'Connor (2007)

1106 Atlantic salmon (*Salmo salar*) (only in fresh water)

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

Attribute	Measure	Target	Notes
Extent of anadromy	% of river accessible	100% of channel down to second order accessible from estuary. Currently present in 88 - 100% of sites sampled	Artificial barriers can block salmons' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas. Target based on McGinnity et al. 2003
Adult spawning fish	Number	Conservation Limit (CL) for each system consistently exceeded	A conservation limit 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 of the National Salmon Commission's annual model output of CL attainment levels. See SSC (2010). Stock estimates are either 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 min sampling	Target is threshold value for rivers currently exceeding their conservation limit (CL) (SSC, 2010). For assessments of favourable conservation condition, this measure should be taken in conjunction with other direct means of stock assessment
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. Artificial barriers can prevent salmon from accessing suitable spawning habitat
Water quality	EPA Q values	At least Q4 at all sites sampled by EPA. 85% of relevant sites currently at least Q4 on Laune	Salmon spawn in clean gravels. Artificial barriers can prevent salmon from accessing suitable spawning habitat

1130 Estuaries

To maintain the favourable conservation condition of Estuaries in Castlemaine Harbour 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 no natural processes. See map 2	Habitat area was estimated as 5696ha using OSI data and the defined Transitional Water Body area under the Water Framework Directive. See marine supporting document for further information
Community distribution	Hectares	The following sediment communities should be maintained in a natural condition: Intertidal muddy fine sand community complex; Fine to muddy fine sand with polychaetes community complex; Intertidal sand with *Nephtys cirrosa* community; and Mixed sediment community complex. See map 4	The likely area of sediment communities was derived from a combination of intertidal and subtidal surveys undertaken in 2008 and 2009. See marine supporting document for further information

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 Castlemaine Harbour 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 4287ha using OSI data. See marine supporting document for further information
Community extent	Hectares	Maintain the extent of the *Zostera*-dominated community, subject to natural processes. See map 4	The likely area of this community is derived from an intertidal survey undertaken in 2008. See marine supporting document for further information
Community distribution	Hectares	The following sediment communities should be maintained in a natural condition: Intertidal muddy fine sand community complex; and Fine to muddy fine sand with polychaetes community complex. See map 4	The likely area of sediment communities was derived from a combination of intertidal and subtidal surveys undertaken in 2008 and 2009. See marine supporting document for further information

1210 Annual vegetation of drift lines

To maintain the favourable conservation condition of Annual vegetation of driftlines in Castlemaine Harbour 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, including erosion and succession. For sub-sites mapped: Inch - 1.17ha and Rosbehy - 0.73ha. See map 5	Current area unknown. Two sub-sites (Inch and Rosbehy) were mapped during the Coastal Monitoring Project (Ryle et al., 2009), giving a total estimated area of 1.90ha. NB further unsurveyed areas maybe present in the site. Habitat is very difficult to measure in view of its dynamic nature which means that it can appear and disappear within a site from year to year. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes	Current distribution unknown. Majority of habitat found at Inch and Rosbehy, although there may be additional patches distributed throughout the site. 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	Dunes are naturally dynamic systems that require continuous supply and circulation of sand. Accumulation of organic matter in tidal litter is essential for trapping sand and initiating dune formation. 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	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 number of monitoring stops	Maintain the presence of species-poor communities with typical species: *Cakile maritima*, *Honckenya peploides*, *Salsola kali* and *Atriplex* spp.	Based on data from 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	Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details

1220 Perennial vegetation of stony banks

To maintain the favourable conservation condition of Perennial vegetation of stony banks in Castlemaine Harbour 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, including erosion and succession	Current area unknown. It was recorded from Rosbehy and Cromane during the National Shingle Beach Survey (Moore and Wilson, 1999), but the extent was not mapped. The Coastal Monitoring Project mapped 0.5ha of this habitat at Rosbehy (Ryle et al., 2009). The extent is thought to be considerably greater than this figure, as substantial shingle deposits are known to have formed the spits of Inch, Rosbehy and Cromane, the first two of which are topped by extensive sand dune and saltmarsh systems. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes	Distribution unknown at present, although the habitat has been recorded at Cromane Point (Moore and Wilson, 1999) and Rosbehy (Moore and Wilson, 1999; Ryle et al., 2009). 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	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	Based on data from Moore and Wilson (1999) 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 the presence of species-poor communities with typical species: *Honckenya peploides*, *Beta vulgaris* ssp. *maritima*, *Crithmum maritimum*, *Tripleurospermum maritimum*, *Glaucium flavum* and *Silene uniflora*	Based on data from Moore and Wilson (1999) 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 Moore and Wilson (1999) and 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

1310 *Salicornia* and other annuals colonizing mud and sand

To maintain the favourable conservation condition of *Salicornia* and other annuals colonizing mud and sand in Castlemaine Harbour 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, including erosion and succession. For sub-sites mapped: Inch - 1.24ha and Rosbehy - 0.002ha. See map 6	Based on data from Saltmarsh Monitoring Project (McCorry and Ryle, 2009). Habitat recorded at two of the four sub-sites surveyed, giving a total estimated area of 1.24ha. NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 6 for known distribution	Based on data from McCorry and Ryle (2009). *Salicornia* is an annual species, so its distribution can vary significantly from year to year. See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain/restore natural circulation of sediments and organic matter, without any physical obstructions	Sediment supply is particularly important for this pioneer saltmarsh community, as the distribution of this habitat depends on accretion rates. See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession	Based on data from McCorry and Ryle (2009). Creeks deliver sediment throughout saltmarsh system. Creeks and pan structures well developed at Inch and Rosbehy. See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	This pioneer saltmarsh community requires regular tidal inundation. 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	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimeters	Maintain structural variation within sward	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details

1310 *Salicornia* and other annuals colonizing mud and sand

To maintain the favourable conservation condition of *Salicornia* and other annuals colonizing mud and sand in Castlemaine Harbour SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation composition: typical species & sub-communities	Percentage cover	Maintain the presence of species-poor communities with typical species including *Salicornia europaea*, *Puccinellia maritima*, *Aster tripolium*, *Suaeda maritima*	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: negative indicator species - *Spartina anglica*	Hectares	No significant expansion of *Spartina*. No new sites for this species and an annual spread of less than 1% where it is already known to occur	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details

1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

To maintain the favourable conservation condition of Atlantic salt meadows in Castlemaine Harbour 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, including erosion and succession. For sub-sites mapped: Inch - 9.48ha, Rosbehy - 7.29ha, Whitegate-Fybagh - 2.72ha, Cromane - 13.97ha. See map 6	Based on data from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009). Four sub-sites were mapped (29.21ha) and additional areas of potential saltmarsh (4.79ha) were identified from an examination of aerial photographs, giving a total estimated area of 34.0ha. NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 6 for known distribution	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain/restore natural circulation of sediments and organic matter, without any physical obstructions	See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession	Based on data from McCorry and Ryle (2009). The efficiency of sediment circulation throughout a saltmarsh depends on the creek pattern. Creeks and pans are well developed at both Inch and Rosbehy. See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	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	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details.
Vegetation structure: vegetation height	Centimeters	Maintain structural variation within sward	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% area outside creeks vegetated	Based on data from McCorry and Ryle (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 Saltmarsh Monitoring Project (McCorry & Ryle, 2009)	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details

1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

To maintain the favourable conservation condition of Atlantic salt meadows in Castlemaine Harbour SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation structure: negative indicator species - *Spartina anglica*	Hectares	No significant expansion of *Spartina*. No new sites for this species and an annual spread of less than 1% where it is already known to occur	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details

1355 Otter *Lutra lutra*

To restore the favourable conservation condition of Otter in Castlemaine Harbour 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. FCS target, based on 1980/81 survey findings, is 88% in SACs. Current range estimated at 75% (Bailey and Rochford, 2006; Rapid assessment results from Roaringwater Bay)
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 162ha above high water mark (HWM); 193ha along river banks	No field survey. Areas mapped to include 10m terrestrial buffer along shoreline (above 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 812ha	No field survey. Area mapped based on evicence that otters tend to forage within 80m of the shoreline (HWM) (NPWS, 2007; Kruuk, 2006)
Extent of freshwater (river) habitat	Kilometers	No significant decline. Length mapped and calculated as 104km	No field survey. River length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (Chapman and Chapman, 1982)
Couching sites and holts	Number	No significant decline	Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk, 2006; Kruuk and Moorhouse, 1991)
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	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

1395 Petalwort *Petalophyllum ralfsii*

To maintain the favourable conservation condition of *Petalophyllum ralfsii* in Castlemaine Harbour SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution of populations	Number and geographical spread	No decline. Maintain at least current number of populations- 3 at Inch; 1 at Rosbehy. See map 5	3 populations recorded from 3 dune slacks at Inch by Christina Campbell, 2009-2010. 1 population recorded at a dune slack at Rosbehy by David Holyoak, 2006
Population size	Number of individuals	No decline. Current known population at Inch estimated ca.72,000 thalli, counted in 2010. Rosbehy currently unknown	Counts of thalli made on 05.05.2010 (Christina Campbell). Southernmost dune slack: 14.7 thalli/m² (average of 3 quadrats) x 3,146 m² = 46,246 thalli; adjacent dune slack to north: 9 thalli/m² (1 quadrat) x 2,865 m² = 25,785 thalli
Area occupied by habitat	Hectares	No decline. At Inch area of suitable habitat at least 0.6011 ha. Rosbehy currently unknown	Main area of suitable habitat is in 2 dune slacks at Inch Spit, measured by Trimble = 0.6011 ha. *Petalophyllum ralfsii* also present in a 3rd dune slack at Inch Spit, but extent not yet measured. Area of suitable habitat at Rosbehy not yet measured, but known to be very small (ca.0.01 ha)

1410 Mediterranean salt meadows (*Juncetalia maritimi*)

To maintain the favourable conservation condition of Mediterranean salt meadows in Castlemaine Harbour 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, including erosion and succession. For sub-sites mapped: Inch - 29.11ha, Rosbehy - 16.10ha, Cromane - 29.31ha and Whitegate-Fybagh - 2.72ha. See map 6	Based on data from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009). Four sub-sites were mapped (74.73ha) and additional areas of potential saltmarsh (49.59ha) were identified from an examination of aerial photographs, giving a total estimated area of 124.32ha. NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 6 for known distribution	See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain/restore natural circulation of sediments and organic matter, without any physical obstructions	See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession	Based on data from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009). Creeks and pans are well developed at Inch and Rosbehy. See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	Mediterranean salt meadow is found high up in the saltmarsh but requires occasional tidal inundation. 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	Based on data from McCorry and Ryle (2009). Inch displays some of the best examples of transitional vegetation communities between saltmarsh and sand dunes anywhere in the country. See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation in the sward	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation composition: typical species	Percentage cover	Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009)	See coastal habitats supporting document for further details

1410 Mediterranean salt meadows (*Juncetalia maritimi*)

To maintain the favourable conservation condition of Mediterranean salt meadows in Castlemaine Harbour SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation structure: negative indicator species - *Spartina anglica*	Hectares	No significant expansion of *Spartina*. No new sites for this species and an annual spread of less than 1% where it is already known to occur	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details

2110 Embryonic shifting dunes

To maintain the favourable conservation condition of Embryonic shifting dunes in Castlemaine Harbour 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, including erosion and succession. For sub-sites mapped: Inch - 14.41ha and Rosbehy - 0.79ha. See map 5	Current area unknown. Two sub-sites (Inch and Rosbehy) were mapped during the Coastal Monitoring Project (Ryle et al., 2009), giving a total estimated area of 15.20ha. NB further unsurveyed areas maybe present in the site. Habitat is very difficult to measure in view of its dynamic nature. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map for known distribution	Inch is one of the few actively accreting dune systems on the west coast, with extensive foredunes. 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.	Dunes are naturally dynamic systems that require continuous supply and circulation of sand. 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	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	Maintain the presence of species-poor communities with typical species: *Elytrigia juncea* and/or *Leymus arenarius*	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: plant health of foredune grasses	Percentage cover	More than 95% of *Elytrigia* and/or *Leymus* should be healthy (i.e. green plant parts above ground and flowering heads present)	Based on data from 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. Sea-buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. See coastal habitats supporting document for further details

2120 Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")

To maintain the favourable conservation condition of Shifting dunes along the shoreline with *Ammophila arenaria* in Castlemaine Harbour SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat extent	Hectares	Area stable or increasing, subject to natural processes including erosion and succession. For sub-sites mapped: Inch - 25.80ha and Rosbehy - 10.42ha. See map 5	Current area unknown. Two sub-sites (Inch and Rosbehy) were mapped during the Coastal Monitoring Project (Ryle et al., 2009), giving a total estimated area of 36.22ha. NB further unsurveyed areas maybe present in the site. Habitat is very difficult to measure in view of its dynamic nature. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map for known distribution	Inch is one of the few actively accreting dune systems on the west coast, with extensive mobile dunes. 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	Dunes are naturally dynamic systems that require continuous supply and circulation of sand. *Ammophila* reproduces vegetatively and requires constant accretion of fresh sand to maintain active growth and thus encouraging further accretion. 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	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 number of monitoring stops	Maintain the presence of species-poor communities dominated by *Ammophila arenaria* and/or *Leymus arenarius*	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: plant health of dune grasses	Percentage cover	more than 95% of *Ammophila* and/or *Leymus* should be healthy (i.e. green plant parts above ground and flowering heads present)	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details

2120 Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")

To maintain the favourable conservation condition of Shifting dunes along the shoreline with *Ammophila arenaria* in Castlemaine Harbour 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. Sea-buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. 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 Castlemaine Harbour 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 including erosion and succession. For sub-sites mapped: Inch - 352.24ha and Rosbehy - 99.07ha. See map 5	Based on data from the Coastal Monitoring Project (Ryle et al., 2009). Two sub-sites (Inch and Rosbehy) were mapped, giving a total estimated area of 451.31ha. Figure for Inch based on examination of an aerial photograph from 2000. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 5 for known distribution	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	Based on data from Ryle et al. (2009). Inch in particular displays some of the best examples of transitional vegetation communities between saltmarsh and sand dunes anywhere in the country. 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). Inch is one of the most geomorphologically dynamic systems in the country. See coastal habitats supporting document for further details
Vegetation structure: sward height	Centimeters	Maintain structural variation within sward	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 (including *Hippophae rhamnoides*)	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. Sea-buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. 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

2170 Dunes with *Salix repens* ssp. *argentea* (*Salix arenariae*)

To maintain the favourable conservation condition of Dunes with *Salix repens* ssp. *argentea* (*Salix arenariae*) in Castlemaine Harbour 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, including erosion and succession. Habitat only found and mapped at one sub-site: Inch - 0.34ha. See map 5	Based on data from the Coastal Monitoring Project (Ryle et al., 2009). Figure of 0.34ha for Inch based on examination of an aerial photograph from 2000. Actual area likely to be greater. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 5 for known distribution	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	Based on data from Ryle et al. (2009). Inch in particular displays some of the best examples of transitional vegetation communities between saltmarsh and sand dunes anywhere in the country. See coastal habitats supporting document for further details
Vegetation structure: bare ground	Percentage cover	Bare ground should not exceed 10% cover, subject to natural processes	Based on data from 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 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)	See coastal habitats supporting document for further details
Vegetation composition: cover and height of *Salix repens*	Percentage cover; centimeters	Maintain more than 10% cover of *Salix*; vegetation height should be in the average range of 5-20cm	Cover of *Salix* is maintained through an appropriate grazing regime, which prevents the development of a coarse, rank vegetation cover. Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: negative indicator species (including *Hippophae rhamnoides*)	Percentage cover at a representative sample of monitoring stops	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. Sea-buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. See coastal habitats supporting document for further details

2170 Dunes with *Salix repens* ssp. *argentea* (*Salix arenariae*)

To maintain the favourable conservation condition of Dunes with *Salix repens* ssp. *argentea* (*Salix arenariae*) in Castlemaine Harbour 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). See coastal habitats supporting document for further details

2190 Humid dune slacks

To maintain the favourable conservation condition of Humid dune slacks in Castlemaine Harbour 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 including erosion and succession. For sub-sites mapped: Inch - 32.37ha and Rosbehy - 1.83ha. See map 5	Based on data from the Coastal Monitoring Project (Ryle et al., 2009). Two sub-sites (Inch and Rosbehy) were mapped, giving a total estimated area of 34.20ha. Figure for Inch based on examination of an aerial photograph from 2000. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 5 for known distribution	Slacks occur on Inch and Rosbehy spits. The dune slacks at Inch are extremely important in an Irish context, with some of the best examples of pioneer slack communities. They provide habitat for Petalwort (*Petalophyllum ralfsii)* and Natterjack toad (*Bufo calamita*). 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	Presence/absence of water abstraction or drainage	Maintain natural hydrological regime	Based on data from Gaynor (2008) and Ryle et al. (2009). 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	Based on data from Ryle et al. (2009). Inch in particular displays some of the best examples of transitional vegetation communities between saltmarsh and sand dunes anywhere in the country. 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

2190 Humid dune slacks

To maintain the favourable conservation condition of Humid dune slacks in Castlemaine Harbour SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation composition: cover of *Salix repens*	Percentage cover; centimeters	Maintain less than 40% cover of *Salix*	Cover of *Salix* is maintained through an appropriate grazing regime, which prevents the development of a coarse, rank vegetation cover. Based on data from 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. Sea-buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. 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

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* in Castlemaine Harbour 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, at least 17.68ha for sites surveyed: Whitefield (5.21ha), Ardagh wood (1.43ha), Brennan's Glen (0.19ha), Farrantooreen (6.70ha) and Ballymalis (4.15ha). See map 7	Minimum area, based on 5 sites surveyed by Perrin et al. (2008)- site codes 1755, 1759, 1760, 1791 and 1915. NB further unsurveyed areas maybe present within the SAC
Habitat distribution	Occurrence	No decline. Surveyed locations shown on map 7	Distribution based on Perrin et al. (2008). NB further unsurveyed areas maybe present within the site
Woodland size	Hectares	Where topographically possible, "large" woods at least 25ha in size and "small" woods at least 3ha in size	The sizes of at least some of the existing woodlands need to be increased in order to reduce habitat fragmentation and benefit those species requiring 'deep' woodland conditions (Peterken, 2002). Topographical constraints may restrict expansion
Woodland structure: cover and height	Percentage and metres	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi-mature trees and shrubs; and well-developed herb layer	Described in Perrin et al. (2008) and internal NPWS reports: Site 1791- dated March 2001; site 1759 - dated December 2000. See woodland habitats supporting document for further details
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	Described in Perrin et al. (2008) and internal NPWS reports: Site 1791- dated March 2001; site 1759 - dated December 2000. See woodland habitats supporting document for further details
Woodland structure: natural regeneration	Seedling:sapling:pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	Alder and oak regenerates poorly. Ash often regenerates in large numbers although few seedlings reach pole size
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 floodplains but not for woodland around springs/seepage areas
Woodland structure: dead wood	m^3 per hectare; number per hectare	At least 30m^3/ha of fallen timber greater than 10cm diameter; 30 snags/ha (standing dead wood); both categories should include stems greater than 40cm diameter (greater than 20cm diameter in the case of alder)	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem

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* in Castlemaine Harbour SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Woodland structure: veteran trees	Number per hectare	No decline	Mature and 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 disctinctiveness	Occurrence	No decline	Includes ancient or long-established (pre-1840s) woodlands, archaeological and geological features as well as red-listed and other rare or localised species. Perrin and Daly (2010) list two woodlands as potential ancient/long established woodlands within this site
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover not less than 95%	Described in Perrin et al. (2008) and internal NPWS reports: Site 1791- dated March 2001; site 1759 - dated December 2000
Vegetation composition: typical species	Occurrence	A variety of typical native species present, depending on woodland type, including ash (*Fraxinus excelsior*) alder (*Alnus glutinosa*) and willows (*Salix* spp)	Species reported in Perrin et al. (2008)
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control. These species include Japanese knotweed (*Fallopia japonica*), skunk cabbage (*Lysichiton americanus*)	Described in Perrin et al. (2008) and internal NPWS reports: Site 1791- dated March 2001
Presence of rubbish	Occurrence	No rubbish	Abundant dumping reported by Perrin et al. (2008) for site 1791, both from carpark to north and along edge with main road

A001 Red-throated Diver *Gavia stellata*

To maintain the favourable conservation condition of Red-throated Diver in Castlemaine Harbour 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	Population trend assessment using (Generalised Additive Modelling (GAM)) could not be undertaken for this species due to an incomplete dataset. Increased survey effort will allow more robust analysis in the future. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A017 Cormorant *Phalacrocorax carbo*

To maintain the favourable conservation condition of Cormorant in Castlemaine Harbour 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A046 Light-bellied Brent Goose *Branta bernicla hrota*

To maintain the favourable conservation condition of Light-bellied Brent Geese in Castlemaine Harbour 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A050 Wigeon *Anas penelope*

To maintain the favourable conservation condition of Wigeon in Castlemaine Harbour 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A053 Mallard *Anas platyrhynchos*

To maintain the favourable conservation condition of Mallard in Castlemaine Harbour 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A054 Pintail *Anas acuta*

To maintain the favourable conservation condition of Pintail in Castlemaine Harbour 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	Population trend assessment using (Generalised Additive Modelling (GAM)) could not be undertaken for this species due to an incomplete dataset. A measure of population change was calculated using the 'generic threshold' method (see Section 4 of the SPA conservation objectives supporting document for more details)
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A062 Scaup *Aythya marila*

To maintain the favourable conservation condition of Scaup in Castlemaine Harbour 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	Population trend assessment using (Generalised Additive Modelling (GAM)) could not be undertaken for this species due to an incomplete dataset. A measure of population change was calculated using the 'generic threshold' method (see Section 4 of the SPA conservation objectives supporting document for more details)
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A065 Common Scoter *Melanitta nigra*

To maintain the favourable conservation condition of Common Scoter in Castlemaine Harbour 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	Population trend assessment using (Generalised Additive Modelling (GAM)) could not be undertaken for this species due to an incomplete dataset. Increased survey effort will allow more robust analysis in the future. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A130 Oystercatcher *Haematopus ostralegus*

To maintain the favourable conservation condition of Oystercatcher in Castlemaine Harbour 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A137 Ringed Plover *Charadrius hiaticula*

To maintain the favourable conservation condition of Ringed Plover in Castlemaine Harbour 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A144 Sanderling *Calidris alba*

To maintain the favourable conservation condition of Sanderling in Castlemaine Harbour 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A157 Bar-tailed Godwit *Limosa lapponica*

To maintain the favourable conservation condition of Bar-tailed Godwit in Castlemaine Harbour 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A162 Redshank *Tringa totanus*

To maintain the favourable conservation condition of Redshank in Castlemaine Harbour 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A164 Greenshank *Tringa nebularia*

To maintain the favourable conservation condition of Greenshank in Castlemaine Harbour 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A169 Turnstone *Arenaria interpres*

To maintain the favourable conservation condition of Turnstone in Castlemaine Harbour 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A346 Chough *Pyrrhocorax pyrrhocorax*

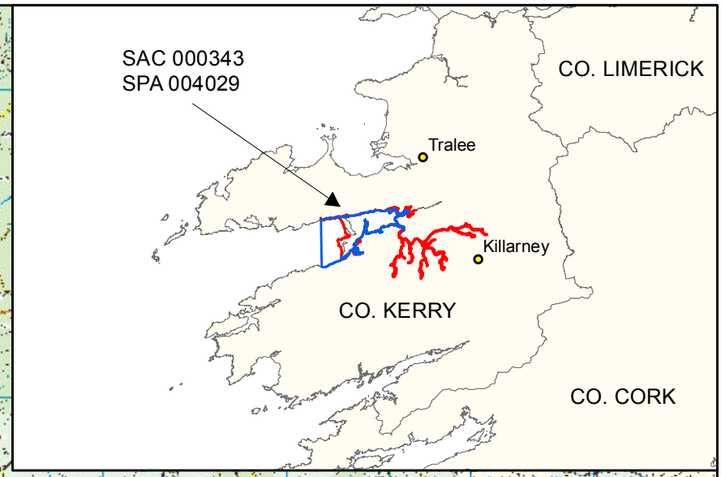
To maintain the favourable conservation condition of Chough in Castlemaine Harbour SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population	Numbers	Long term population stable or increasing	Chough have been recorded at this site in nationally important inumbers
Distribution	Numbers of birds and range of areas used	No significant decrease in the numbers or range of areas used	Chough use the sand dune systems of Inch and Rosbehy (See map 5) for foraging and socailising

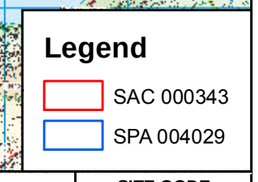
A999 Wetlands & Waterbirds

To maintain the favourable conservation condition of the wetland habitat in Castlemaine Harbour SAC as a resource for the regularly-occurring migratory waterbirds that utilise it. This is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent area occupied by the wetland habitat should be stable and not significantly less than the areas of 7472, 3983 and 322 hectares for subtidal, intertidal, and supratidal habitats respectively, other than that occurring from natural patterns of variation. See map 8	Wetland areas defined by SPA boundary to MLWM; MLWM to MHWM; and MHWM to SPA boundary (the last value is minus the sand dunes of Inch and Rosbehy)



DINGLE BAY
Bá an Daingin



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MAP 1:
CASTLEMAINE HARBOUR
CONSERVATION OBJECTIVES
SAC & SPA DESIGNATIONS

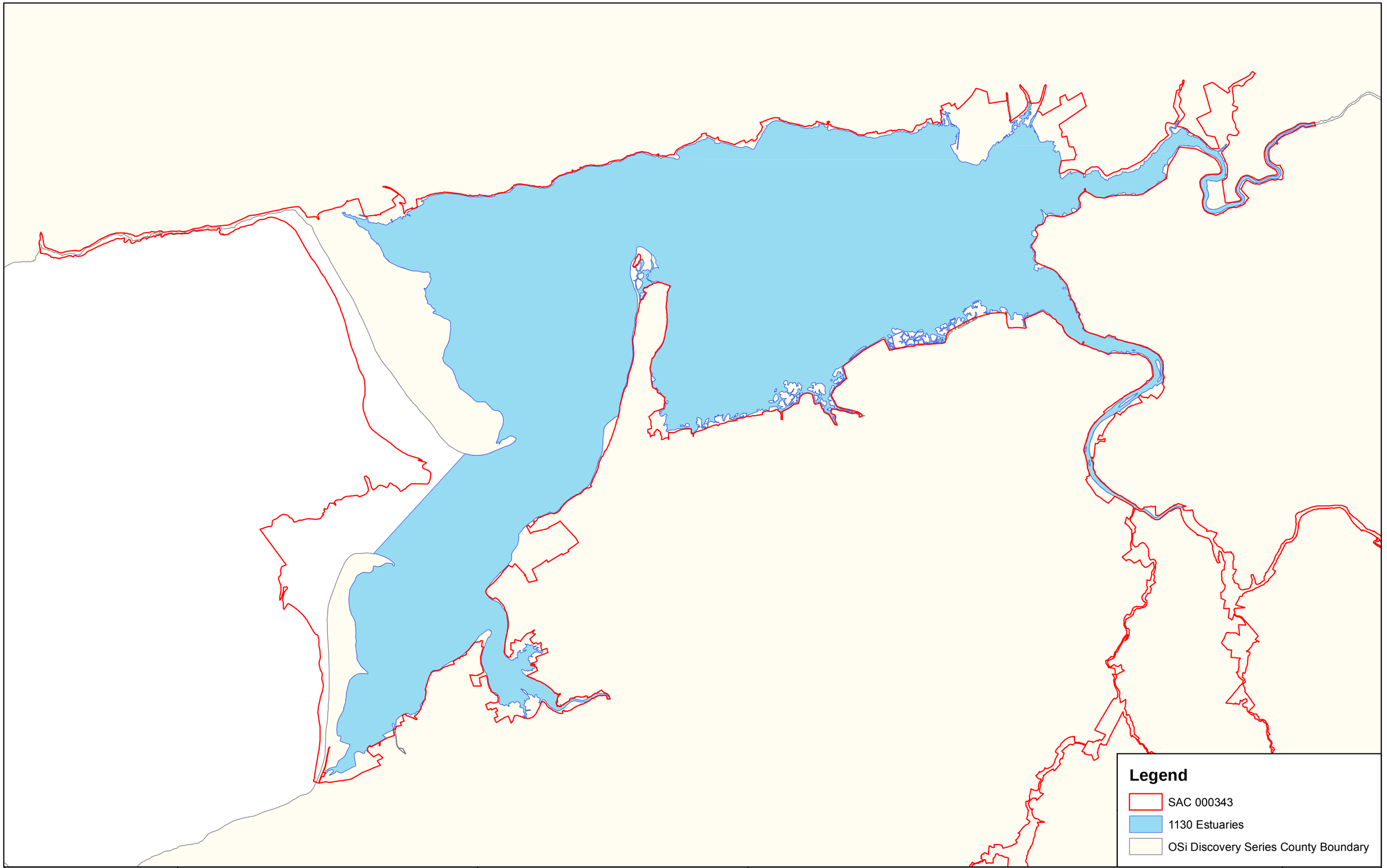
Map to be read in conjunction with the NPWS Conservation Objectives Document.

COUNTY KERRY

0 1 2 3 4 5 km

N

SITE CODE
SAC 000343
Version 1.11
SPA 004029
Version 1.08
Map Version 2
Date: April 2011



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MAP 2:
CASTLEMAINE HARBOUR
CONSERVATION OBJECTIVES
ESTUARIES

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

CO. KERRY

0 1 2 3 km

N

SITE CODE

SAC 000343
Version 1.11

Map Version 2
Date: March 2011

Legend

- SAC 000343
- 1140 Mudflats and sandflats not covered by sea water at low tide
- OSi Discovery Series County Boundary

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MAP 3:
CASTLEMAINE HARBOUR
CONSERVATION OBJECTIVES
TIDAL MUDFLATS AND SANDFLATS

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

CO. KERRY

0 1 2 3 km

N

SITE CODE

SAC 000343
Version 1.11

Map Version 2
Date: March 2011

Legend

- SAC 000343
- SPA 004029
- OSi Discovery Series County Boundary

Marine Community Types

- *Zostera* dominated community
- Fine sand with *Donax vittatus* and polychaetes community
- Fine to muddy fine sand with polychaetes community complex
- Intertidal muddy fine sand community complex
- Intertidal sand with *Nephtys cirrosa*
- Mixed sediment community complex
- River

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MAP 4:
CASTLEMAINE HARBOUR CONSERVATION OBJECTIVES MARINE COMMUNITY TYPES

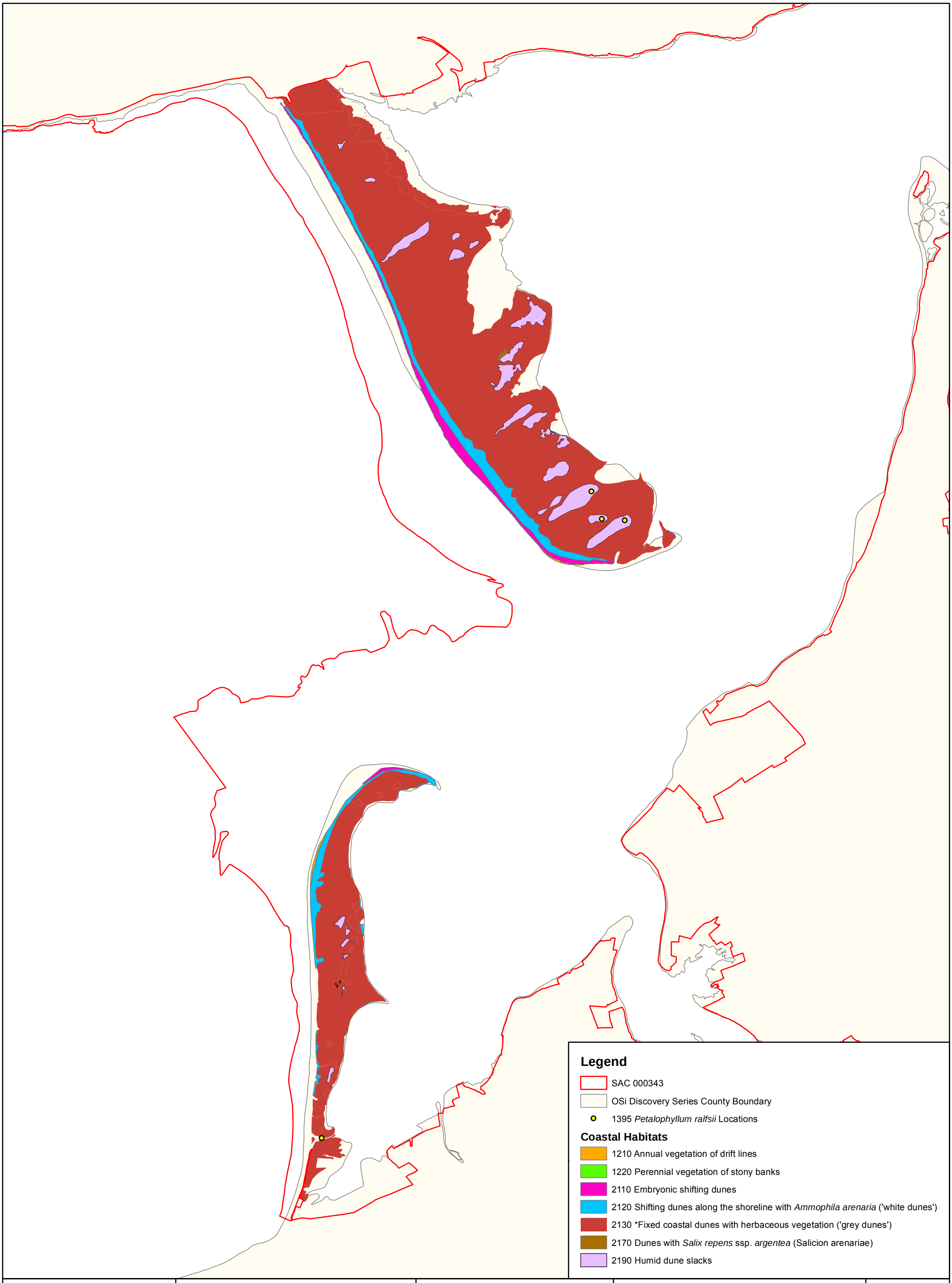
Map to be read in conjunction with the NPWS Conservation Objectives Document.

CO. KERRY

0 1 2 3 km

N

SITE CODE
SAC 000343
Version 1.11
SPA 004029
Version 1.08
Map Version 2
Date: April 2011



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MAP 5:
CASTLEMAINE HARBOUR
CONSERVATION OBJECTIVES
COASTAL HABITATS &
PETALOPHYLLUM RALFSII LOCATIONS

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

CO. KERRY

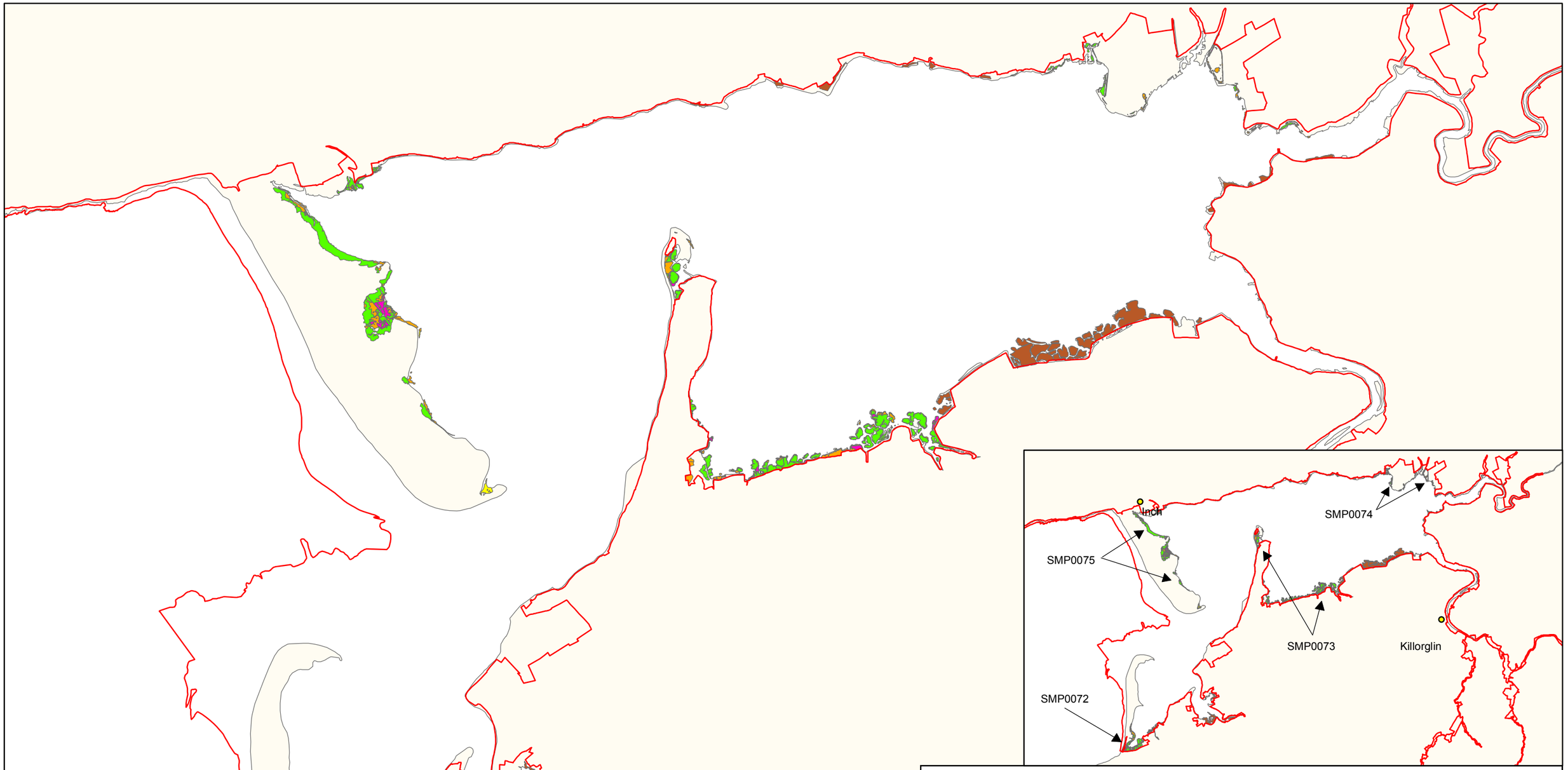
0 0.25 0.5 0.75 1 km

N

SITE CODE

SAC 000343
Version 1.11

Map Version 2
Date: March 2011



Legend

- SAC 000343
- OSi Discovery Series County Boundary

Saltmarsh Habitats

- 1310 *Salicornia* and other annuals colonising mud and sand
- 1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
- 1330 / 1410 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) / Mediterranean salt meadows (Juncetalia maritimi)
- 1410 Mediterranean salt meadows (Juncetalia maritimi)
- Potential Annex Habitat

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MAP 6: CASTLEMAINE HARBOUR CONSERVATION OBJECTIVES SALTMARSH HABITATS

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

CO. KERRY

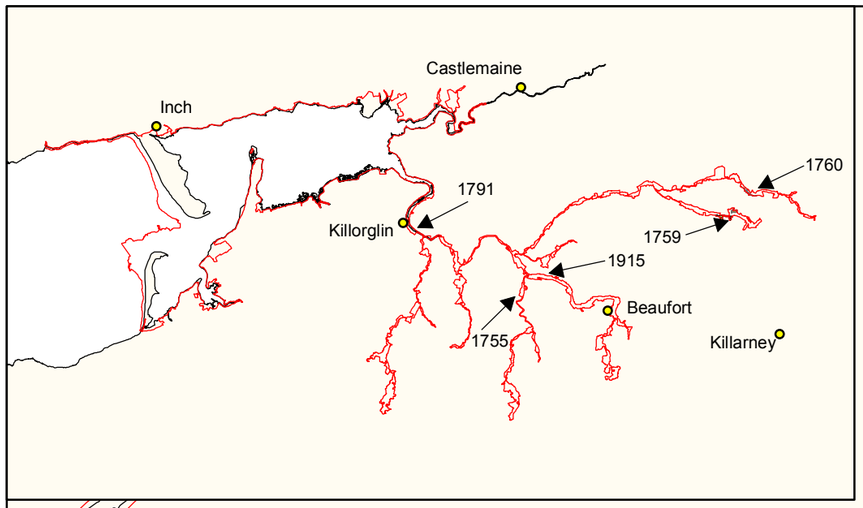
0 1 2 3 km

N

SITE CODE

SAC 000343
Version 1.11

Map Version 2
Date: March 2011



Legend

- SAC 000343
- OSi Discovery Series County Boundary
- 91E0 *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-padion, Alnion incanae, Salicion albae) Qualifying Interest
- 91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
- WD2 Mixed broadleaved / conifer woodland
- WN2 Oak-ash-hazel woodland

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MAP 7: CASTLEMAINE HARBOUR CONSERVATION OBJECTIVES ALLUVIAL FORESTS

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

CO. KERRY

0 0.5 1 1.5 2 km

N

SITE CODE

SAC 000343
Version 1.11

Map Version 2
Date: April 2011

Legend

- SPA 004029
- OSi Discovery Series County Boundary

Bird Use Zones

- Subtidal
- Intertidal
- Supratidal

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MAP 8:
CASTLEMAINE HARBOUR
CONSERVATION OBJECTIVES
BIRD USE ZONES

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

COUNTY KERRY

0 1 2 3 km

N

SITE CODE

SPA 004029
Version 1.08

Map Version 2
Date: March 2011

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Department of
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NPWS (2018) Conservation Objectives: Kilgarvan Ice House SAC 000364. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.

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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***

000364	Kilgarvan Ice House SAC

1303	Lesser Horseshoe Bat *Rhinolophus hipposideros*

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 :	Bat mitigation guidelines for Ireland
Author :	Kelleher, C.; Marnell, F.
Series :	Irish Wildlife Manuals, No. 25
Year :	2018
Title :	Conservation objectives supporting document – lesser horseshoe bat (*Rhinolophus hipposideros*)
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	2007
Title :	Protecting and managing underground sites for bats
Author :	Mitchell-Jones, A.J.; Bihari, Z.; Masing, M.; Rodrigues, L.
Series :	EUROBATS Publication Series No. 2
Year :	2008
Title :	The lesser horseshoe bat conservation handbook
Author :	Schofield, H.W.
Series :	The Vincent Wildlife Trust
Year :	2009
Title :	Importance of night roosts for bat conservation: roosting behaviour of the lesser horseshoe bat *Rhinolophus hipposideros*
Author :	Knight, T.; Jones, G.
Series :	Endangered Species Research, 8: 79-86

Spatial data sources

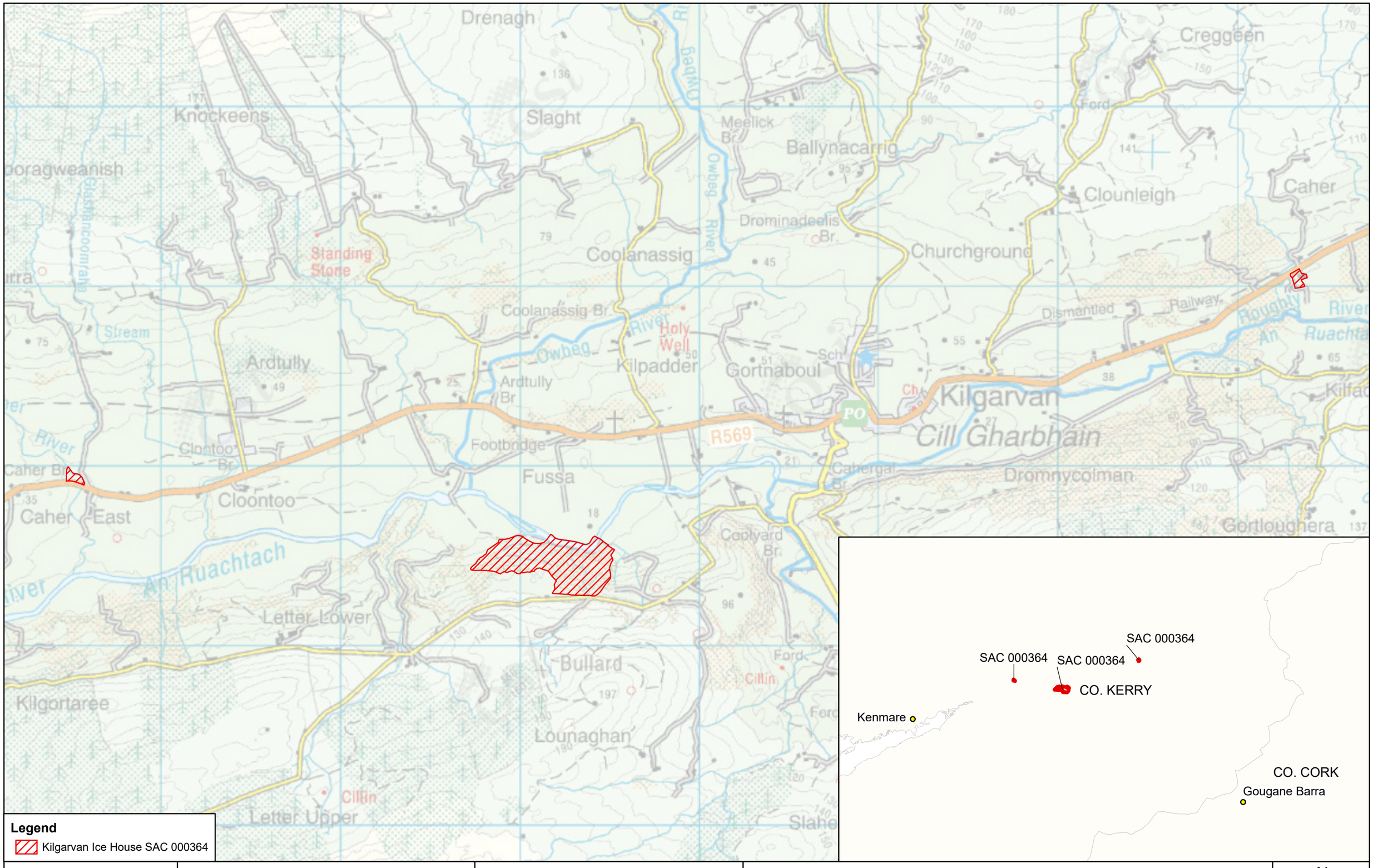
Year :	2018
Title :	NPWS lesser horseshoe bat database
GIS Operations :	Roosts identified, clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1303 (map 2)
Year :	2007
Title :	Forest Inventory and Planning System (FIPS)
GIS Operations :	Dataset clipped to 2.5km buffer centred on roost locations
Used For :	1303 (map 2)

1303 Lesser Horseshoe Bat *Rhinolophus hipposideros*

To maintain the favourable conservation condition of Lesser Horseshoe Bat in Kilgarvan Ice House SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population per roost	Number	Minimum number of 263 bats for the summer roost with roost id. 435 in NPWS database and 390 bats for the summer roost with id. 522; minimum number of 164 bats for the winter roost with id. 431, 56 bats for the winter roost with id. 435 and 81 bats for the winter roost with id. 522. See map 2	A figure of 100 bats for summer roosts and 50 bats for winter roosts was set as a minimum qualifying standard (MQS) when SACs were being selected for lesser horseshoe bat (*Rhinolophus hipposideros*). NPWS conduct regular counts at each qualifying roost. For each such roost, qualified means from the most recent five years of summer count and winter count data available (2011-2017) have been calculated whereby the year with the highest maximum count and the year with the lowest maximum count were removed and the mean of remaining years was calculated. This mean is set as the target figure for each roost in Kilgarvan Ice House SAC. See the conservation objectives supporting document for lesser horseshoe bat (NPWS, 2018) for further information on all attributes and targets
Winter roosts	Condition	No decline	Kilgarvan Ice House SAC has been selected for lesser horseshoe bat because of the presence of three internationally important winter roosts (roost ids 431, 435 and 522 in NPWS database). Damage or disturbance to the roosts or to the habitat immediately surrounding the roosts will lead to a decline in their condition (Mitchell-Jones et al., 2007)
Summer roosts	Condition	No decline	Kilgarvan Ice House SAC has been selected for lesser horseshoe bat because of the presence of two internationally important summer roosts (roost ids 435 and 522 in NPWS database). Damage or disturbance to the roosts or to the habitat immediately surrounding the roosts will lead to a decline in their condition (Kelleher and Marnell, 2006)
Auxiliary roosts	Number and condition	No decline	Lesser horseshoe bat populations will use a variety of roosts during the year besides the main summer maternity and winter hibernation roosts. Such additional roosts within the SAC may be important as night roosts, satellite roosts, etc. Night roosts are also considered an integral part of core foraging areas and require protection (Knight and Jones, 2009). In addition, in response to weather conditions for example, bats may use different seasonal roosts from year to year; this is particularly noticeable in winter. A database of all known lesser horseshoe bat roosts is available on the National Biodiversity Data Centre website. NB further unrecorded roosts may also be present within this SAC
Extent of potential foraging habitat	Hectares	No significant decline within 2.5km of qualifying roosts	Lesser horseshoe bats normally forage in woodlands/scrub within 2.5km of their roosts (Schofield, 2008). See map 2 which shows a 2.5km zone around the above roosts and identifies potential foraging grounds
Linear features	Kilometres	No significant loss within 2.5km of qualifying roosts. See map 2	This species follows commuting routes from its roost to its foraging grounds. Lesser horseshoe bats will not cross open ground. Consequently, linear features such as hedgerows, treelines and stone walls provide vital connectivity for this species within 2.5km around each roost (Schofield, 2008)

Light pollution	Lux	No significant increase in artificial light intensity adjacent to named roosts or along commuting routes within 2.5km of those roosts. See map 2	Lesser horseshoe bats are very sensitive to light pollution and will avoid brightly lit areas. Inappropriate lighting around roosts may cause abandonment; lighting along commuting routes may cause preferred foraging areas to be abandoned, thus increasing energetic costs for bats (Schofield, 2008)



Legend

Kilgarvan Ice House SAC 000364

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

MAP 1:
KILGARVAN ICE HOUSE SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

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

SITE CODE:
SAC 000364; version 3.0. CO. KERRY

0 240 480 720 960 Meters

N

Map Version 1
Date: Oct 2018

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

MAP 2:
KILGARVAN ICE HOUSE SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

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

SITE CODE:
SAC 000364; version 3.0. CO. KERRY

0 0.35 0.7 1.05 1.4 Kilometers

N

Map Version 1
Date: Oct 2018

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC 000365

An Roinn
Cultúir, Oidhreachta agus Gaeltachta

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Citation:

NPWS (2017) Conservation Objectives: Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC 000365. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.

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Qualifying Interests

** indicates a priority habitat under the Habitats Directive*

000365	Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC
1024	Kerry Slug *Geomalacus maculosus*
1029	Freshwater Pearl Mussel *Margaritifera margaritifera*
1065	Marsh Fritillary *Euphydryas aurinia*
1095	Sea Lamprey *Petromyzon marinus*
1096	Brook Lamprey *Lampetra planeri*
1099	River Lamprey *Lampetra fluviatilis*
1106	Salmon *Salmo salar*
1303	Lesser Horseshoe Bat *Rhinolophus hipposideros*
1355	Otter *Lutra lutra*
1421	Killarney Fern *Trichomanes speciosum*
1833	Slender Naiad *Najas flexilis*
3110	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)
3130	Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea
3260	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation
4010	Northern Atlantic wet heaths with *Erica tetralix*
4030	European dry heaths
4060	Alpine and Boreal heaths
5046	Killarney Shad *Alosa fallax killarnensis*
5130	*Juniperus communis* formations on heaths or calcareous grasslands
6130	Calaminarian grasslands of the Violetalia calaminariae
6410	*Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)
7130	Blanket bogs (* if active bog)
7150	Depressions on peat substrates of the Rhynchosporion
91A0	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
91E0	Alluvial forests with A*lnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)*
91J0	*Taxus baccata* woods of the British Isles*

Please note that this SAC overlaps with Killarney National Park SPA (004038) and Iveragh Peninsula SPA (004154) and is adjacent to Ballinskelligs Bay and Inny Estuary SAC (000335), Castlemaine Harbour SAC (000343), Castlemaine Harbour SPA (004029), Blackwater River (Cork/Waterford) SAC (002170) and Blackwater River (Kerry) SAC (002173). 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, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	1976
Title :	Abbreviated report of a botanical and malacological study performed in the southwestern part of Ireland
Author :	Visser, G; Zoer, J.A.
Series :	Unpublished report to NPWS
Year :	1984
Title :	The vegetation of Irish lakes
Author :	Heuff, H.
Series :	Unpublished report to NPWS
Year :	1987
Title :	The vegetation of Irish rivers
Author :	Heuff, H.
Series :	Unpublished report to NPWS
Year :	1989
Title :	A survey to locate blanket bogs of scientific interest in County Kerry and County Sligo
Author :	Douglas, C.; Garvey, L.; Kelly, L.; O'Sullivan, A.
Series :	Unpublished report to NPWS
Year :	1991
Title :	Survey to locate mountain blanket bogs of scientific interest in Ireland
Author :	Mooney, E.; Goodwillie, R.; Douglas, C.
Series :	Unpublished report to NPWS
Year :	1999
Title :	A survey of four rivers in the south-west of Ireland for the freshwater pearl mussel, *Margaritifera margaritifera* (L.)
Author :	Ross, E.
Series :	Unpublished report to Duchas, the Heritage Service
Year :	2002
Title :	*Najas flexilis* in Donegal
Author :	Roden, C.M.
Series :	Unpublished report to NPWS
Year :	2004
Title :	A pilot project to develop a monitoring protocol for the freshwater pearl mussel *Margaritifera margaritifera* (L.) in the River Caragh, County Kerry, Ireland
Author :	Ross, E.
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 :	2005
Title :	Management Plan for Killarney National Park 2005-2009
Author :	NPWS
Series :	Conservation Plan

Year :	2006
Title :	Otter survey of Ireland 2004/2005
Author :	Bailey, M.; Rochford, J.
Series :	Irish Wildlife Manual No. 23
Year :	2006
Title :	Bat mitigation guidelines for Ireland
Author :	Kelleher, C.; Marnell, F.
Series :	Irish Wildlife Manual No. 25
Year :	2006
Title :	Report on searches for juvenile *Margaritifera margaritifera* (L.) in the Caragh River, Co. Kerry
Author :	Ross, E.D.
Series :	Unpublished report to NPWS
Year :	2007
Title :	A survey of juvenile lamprey populations in the Corrib and Suir catchments
Author :	O'Connor, W.
Series :	Irish Wildlife Manual No. 26
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 :	2007
Title :	Report on juvenile searches for *Margaritifera margaritifera* (L.) in the Owenreagh River (Laune)
Author :	Ross, 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 :	2008
Title :	Rapid Assessment of *Margaritifera margaritifera* (L.) populations in Ireland: Rivers assessed in 2007
Author :	Ross, E.
Series :	Unpublished report to NPWS
Year :	2009
Title :	Bryophytes and metallophyte vegetation on metalliferous mine-waste in Ireland
Author :	Holyoak, D.T.
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: Report on biological monitoring of surface water quality in Caragh River Catchment
Author :	Conservation Services
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 Gearhameen River Catchment
Author :	Conservation Services
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 Caragh
Author :	Ross, E.
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 Currane
Author :	Ross, E.
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 Gearhameen
Author :	Ross, E.
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 Cappul (Currane) Catchment, Co. Kerry
Author :	Williams, L.
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 the Cummeragh (Currane) Catchment, Co. Kerry
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 Manual No. 46
Year :	2010
Title :	Irish semi-natural grasslands survey. Annual report No.3: Counties Donegal, Dublin, Kildare and Sligo
Author :	O'Neill, F.H.; Martin, J.R.; Devaney, F.M.; McNutt, K.E.; Perrin, P.M.; Delaney, A.
Series :	Unpublished report to NPWS
Year :	2010
Title :	Second draft Caragh 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 :	2010
Title :	Second draft Currane 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 :	2010
Title :	Second draft Gearhameen freshwater pearl mussel sub-basin management plan (2009-2015). March 2010
Author :	NPWS
Series :	Unpublilshed document to the Department of the Environment, Heritage and Local Government
Year :	2011
Title :	Distribution and population dynamics of the Kerry Slug, *Geomalacus maculosus* (Arionidae)
Author :	Mc Donnell, R.J.; Gormally, M.J.
Series :	Irish Wildlife Manual No. 54
Year :	2011
Title :	Ireland Red List No. 5: Amphibians, Reptiles and Freshwater Fish
Author :	King, J.; Marnell, F.; Kingston, N.; Rosell, R.; Boylan, P.; Caffrey, J.M.; Fitzpatrick, Ú.; Gargan, P.G.; Kelly, F.L.; O'Grady, M.F.; Poole, R.; Roche, W.K.; Cassidy, D.
Series :	Ireland Red List series, NPWS
Year :	2011
Title :	Production of a habitat map for Killarney National Park, Co. Kerry
Author :	Barron, S.; Perrin, P.
Series :	Unpublished report to NPWS
Year :	2011
Title :	Caragh River System 2011 *Margaritifera* monitoring results 2011
Author :	Ross, E.D.
Series :	Unpublished report to NPWS
Year :	2012
Title :	The conservation status of juniper formations in Ireland
Author :	Cooper, F.; Stone, R.E.; McEvoy, P.; Wilkins, T.; Reid, N.
Series :	Irish Wildlife Manual No. 63
Year :	2012
Title :	An assessment of the use of conifer plantations by the Kerry Slug *Geomalacus maculosus* with reference to the potential impacts of forestry operations
Author :	Reich, I.; O'Meara, K.; Mc Donnell, R.J.; Gormally, M.J.
Series :	Irish Wildlife Manual No. 64
Year :	2012
Title :	Ireland Red List No. 8: Bryophytes
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	Ireland Red List series, NPWS
Year :	2012
Title :	National Survey of Upland Habitats (Phase II, 2011-2012), site report No. 8: Killarney National Park, Co. Kerry
Author :	Roche, J.R.; Perrin, P.M.; Barron, S.J.; Daly, O.H.
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 Manual 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 Manual 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 Manual No. 71
Year :	2013
Title :	Results of a monitoring survey of yew woodland
Author :	Cross, J.; Lynn, D.
Series :	Irish Wildlife Manual No. 72
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 :	The status of EU protected habitats and species in Ireland. Volume 3. Species assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2013
Title :	Irish semi-natural grasslands survey annual report No. 4: Western seaboard counties (Clare, Galway, Kerry, Limerick, Mayo) and County Tipperary
Author :	Devaney, F.M.; Martin, J.R.; O'Neill, F.H.; Delaney, A.
Series :	Unpublished report to NPWS
Year :	2014
Title :	Species dossier, range and distribution data for the Hairy Wood Ant, *Formica lugubris*, in Ireland
Author :	Breen, J.
Series :	Irish Wildlife Manual No. 68
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 :	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 :	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 Manual No. 82
Year :	2015
Title :	KerryLIFE Project, 2014 surveys of the Kerry Blackwater and Caragh Rivers
Author :	Moorkens, E.A.
Series :	Unpublished report to NPWS

Year :	2015
Title :	Surveys of possible marsh fritillary sites and habitat in Cos. Clare (outside the Burren) and Kerry, final report
Author :	Barron, S.J.; Daly, O.H.
Series :	Unpublished report to 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 :	2016
Title :	KerryLIFE Project. Condition assessment of freshwater pearl mussel populations in the Kerry Blackwater and Caragh rivers in 2016
Author :	Moorkens, E.
Series :	Unpublished report to NPWS
Year :	2016
Title :	Freshwater pearl mussel survey of a section of the Gearhameen River extending downstream from the bridge at Lord Brandon's Cottage on August 15th, 2016
Author :	Ross, E.
Series :	Unpublished report to NPWS
Year :	2017
Title :	Cummeragh River, 2014 *Margaritifera* monitoring results
Author :	Ross, E.
Series :	Unpublished report to NPWS
Year :	2017
Title :	Owenreagh River (Laune System), 2015 *Margaritifera* monitoring results
Author :	Ross, E.
Series :	Unpublished report to NPWS
Year :	2017
Title :	Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC (site code: 365) Conservation objectives supporting document- blanket bogs and associated habitats 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

Other References

Year :	1916
Title :	Flora of County Kerry
Author :	Scully, R.W.
Series :	Hodges, Figgis & Company Ltd., Dublin
Year :	1972
Title :	Verslag van een botanisch/malacologische studiereis naar Z.W. Ierland
Author :	Visser, G.; Zoer, J.A.
Series :	Unpublished Report; Rijksinstituut voor Natuurbeheer, Leersum, Netherlands

Year :	1981
Title :	The native forest vegetation of Killarney, south-west Ireland: An ecological account
Author :	Kelly, D.L.
Series :	Journal of Ecology, 69: 437-472
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 :	1984
Title :	Ecology of European Rivers
Author :	Whitton, B.A. (ed.)
Series :	Blackwell Scientific Publishing
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 :	1996
Title :	The conservation of aquatic systems
Author :	Reynolds, J.D. (ed.)
Series :	Royal Irish Academy, Dublin
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 :	Appendix 2. Notes on the status and ecology of *Ditrichum cornubicum*
Author :	Holyoak, D.T.; Clements, R.; Colemen, M.R.J.; MacPherson, K.S.
Series :	English Nature Research Reports, No. 328: 40-50
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 :	Heavy metal concentrations in the soil substrates associated with rare bryophytes at former metalliferous mining sites in East Cornwell
Author :	Walsh, L.
Series :	Unpublished B.Sc. Thesis, University of Hertfordshire
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 :	2002
Title :	Habitat selection by larvae of a fluvial lamprey, *Lethenteron reissneri*, in a small stream and an experimental aquarium
Author :	Sugiyama H.; Goto A.
Series :	Ichthyological Research, 49(1): 62–68
Year :	2003
Title :	Monitoring the river, brook and sea lamprey, *Lampetra fluviatilis*, *L. planeri* and *Petromyzon marinus*
Author :	Harvey, J.; Cowx, I.
Series :	Conserving Natura 2000 Rivers Monitoring Series No. 5. English Nature, Peterborough
Year :	2003
Title :	Ecology of watercourses characterised by Ranunculion fluitantis and Callitricho-Batrachion vegetation
Author :	Hatton-Ellis, T.W.; Grieve, N.
Series :	Conserving Natura 2000 Rivers Ecology Series No. 11. English Nature, Peterborough
Year :	2003
Title :	Identifying lamprey. A field key for sea, river and brook lamprey
Author :	Gardiner, R.
Series :	Conserving Natura 2000 rivers, Conservation techniques No. 4. English Nature, Peterborough
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 :	2005
Title :	Common standards monitoring guidance for freshwater fauna
Author :	JNCC
Series :	Joint Nature Conservation Committee, Peterborough
Year :	2006
Title :	Otters - ecology, behaviour and conservation
Author :	Kruuk, H.
Series :	Oxford University Press
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 :	EPA, Wexford
Year :	2007
Title :	Evolutionary history of lamprey paired species *Lampetra fluviatilis* L. and *Lampetra planeri* Bloch as inferred from mitochondrial DNA variation
Author :	Espanhol, R.; Almeida, P.R.; Alves, M.J.
Series :	Molecular Ecology, 16: 1909-1924
Year :	2007
Title :	Protecting and managing underground sites for bats
Author :	Mitchell-Jones, A.J.; Bihari, Z.; Masing, M.; Rodrigues, L.
Series :	EUROBATS Publication Series No. 2
Year :	2008
Title :	Poor water quality constrains the distribution and movements of twaite shad (*Alosa fallax fallax*, Lacepede, 1803) in the watershed of river Scheldt
Author :	Maas, J.; Stevens, M.; Breine, J.
Series :	Hydrobiologia, 602: 129-143
Year :	2008
Title :	The lesser horseshoe bat conservation handbook
Author :	Schofield, H.W.
Series :	The Vincent Wildlife Trust
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 :	2008
Title :	Conservation of Ireland's biodiversity: A survey and assessment of the current status of three Irish endemic hawkweeds from Kerry, *Hieracium argentatum, H. scullyi* and *H. sparsifrons* (Asteraceae)
Author :	Rich, T.C.G.; Hodd, R.L.I.B.; McCosh, D.J.; Mhic Daeid, E.C.; McVeigh, A.; Sawtschuk, J.; Wyse Jackson, M.B.
Series :	Biology and Environment: Proceedings of the Royal Irish Academy, 108B(3): 143-155
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 :	Addressing the conservation and rehabilitation of *Margaritifera margaritifera* populations in the Republic of Ireland within the framework of the habitats and species directive
Author :	Moorkens, E.
Series :	Journal of Conchology, 40: 339

Year :	2010
Title :	Water quality in Ireland 2007-2009
Author :	McGarrigle, M.; Lucey, J.; Ó Cinnéide, M.
Series :	EPA, Wexford
Year :	2011
Title :	National Programme: Habitats Directive and Red Data Book fish species. Executive report 2011
Author :	Inland Fisheries Ireland (IFI)
Series :	IFI Report Number: IFI/2012/1-4103
Year :	2011
Title :	Long-term deer exclusion in yew-wood and oakwood habitats in southwest Ireland: Changes in ground flora and species diversity
Author :	Perrin, P.M.; Mitchell, F.J.G.; Kelly, D.L.
Series :	Forest Ecology and Management, 262: 2328-2337
Year :	2012
Title :	Rare and threatened bryophytes of Ireland
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	National Museums Northern Ireland
Year :	2012
Title :	Water Framework Directive fish stock survey of Lough Leane, September 2011
Author :	Kelly, F.L.; Connor, L.; Morrissey, E.; Wogerbauer, C.; Matson, R.; Feeney, R.; Rocks, K.
Series :	Inland Fisheries Ireland
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 :	2013
Title :	Conservation of selected legally protected and Red Listed bryophytes in Ireland
Author :	Campbell, C.
Series :	Unpublished Ph.D. Thesis, Trinity College Dublin
Year :	2013
Title :	Management strategies for the protection of high status water bodies
Author :	Ní Chatháin, B.; Moorkens, E.; Irvine, K.
Series :	Strive Report Series No. 99. EPA, Wexford
Year :	2013
Title :	Interpretation manual of European Union habitats- Eur 28
Author :	European Commission- DG Environment
Series :	European Commission
Year :	2013
Title :	Revised distribution and habitat associations for the protected slug, *Geomalacus maculosus* (Stylommatophora: Arionidae) in Ireland
Author :	Mc Donnell, R.J.; O'Meara, K.; Nelson, B.; Marnell, F.; Gormally, M.J.
Series :	Basteria, 77: 33-37
Year :	2013
Title :	A species-to-be? The genetic status and colonization history of the critically endangered Killarney shad
Author :	Coscia, I.; McDevitt, A.D.; King, J.J.; Roche, W.K.; McLoughlin, C.; Mariani, S.
Series :	Molecular Phylogenetics and Evolution, 69(3): 1190-1195

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 :	EPA, Wexford
Year :	2015
Title :	Common standards monitoring guidance for freshwater fauna. Version October 2015
Author :	JNCC
Series :	Joint Nature Conservation Committee, Peterborough
Year :	2015
Title :	Water Framework Directive fish stock survey of Lough Leane, September 2014
Author :	Kelly, F.L.; Connor, L.; Morrissey, E.; Coyne, J.; Feeney, R.; Matson, R.; Rocks, K.
Series :	Inland Fisheries Ireland
Year :	2015
Title :	A Catalogue and Atlas of the Caddisflies (Trichoptera) of Ireland
Author :	O'Connor, J.P.
Series :	Occasional Publication of the Irish Biogeographical Society, No. 11
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 :	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 habitats and to resolve any issues arising
Used For :	3110, 3130 (map 3)
Year :	2012
Title :	Bryophytes and Metallophyte Vegetation on Metalliferous Mine-waste in Ireland
GIS Operations :	Sites identified; clipped to SAC boundary
Used For :	6130 (map 4)
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 :	2011
Title :	Habitat map for Killarney National Park
GIS Operations :	QIs selected; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	91A0, 91E0, 91J0 (maps 5 and 6)
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, 91J0 (maps 5 and 6)
Year :	2017
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 :	1024, 1029, 1065 (maps 7, 8 and 9)
Year :	Revision 2012
Title :	Margaritifera Sensitive Areas data
GIS Operations :	Relevant catchment boundaries identified. Expert opinion used as necessary to resolve any issues arising
Used For :	1029 (map 8)
Year :	2012
Title :	NPWS lesser horseshoe bat database
GIS Operations :	Roosts identified, clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1303 (map 10)
Year :	2007
Title :	Forest Inventory and Planning System, (FIPS)
GIS Operations :	Dataset clipped to 2.5km buffer centred on roost locations
Used For :	1303 (map 10)

Year :	2005
Title :	OSi Discovery series vector data
GIS Operations :	Creation of 10m buffer on 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 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 11)
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. These datasets combined with 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 11)
Year :	2013
Title :	Najas flexilis data
GIS Operations :	Lake habitat for species clipped to SAC boundary
Used For :	1833 (map 12)

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 Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment 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 considered likely to occur in most lakes in the SAC, notably in upland corrie lakes (where it may co-occur with lake habitat 3160) and lowland lakes such as Currane, Muckross, Guitane and Derriana. It may also co-occur with lake habitat 3160 in lakes/ponds in blanket bog. It is likely to co-occur with lake habitat 3130 in Leane, Caragh, Muckross, the Upper Lake and Acoose. In line with Article 17 reporting (NPWS, 2013), all lakes larger than 1ha were mapped as potential 3110 (see map 3). It is likely, however, that the habitat also occurs in many of the smaller lakes and ponds in the SAC. 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, all lakes larger than 1ha have been mapped as potential 3110, but the habitat is likely to be even more widespread in the SAC (see map 3)
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 3110 (NPWS, 2013) and the lake habitats supporting document (O Connor, 2015). See Visser and Zoer (1972, 1976), Heuff (1984) and the 000365 conservation objectives supporting document for *Najas flexilis* for information on the specific lakes in the SAC. Lakes in the SAC are important for invertebrates, including water beetles, dragonflies, caddisflies and mayflies. Leane has an important fish community with its freshwater population of Killarney shad (*Alosa fallax killarnensis*) and Arctic charr (*Salvelinus alpinus*) (Maitland, 1996 in Reynolds, 1996). Killarney shad is a qualifying interest for the SAC. Leane, Muckross, the Upper Lake, Currane, Cloonaghlin, Namona, Derriana, Caragh, Acoose, Cummernamuck, Brin and Guitane are Water Framework Directive (WFD) monitoring lakes and regular macrophyte surveys are conducted 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 3110 (see O Connor, 2015). Lake-specific information on vegetation zonation may be available from Visser and Zoer (1972, 1976), Heuff (1984), 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. Further work is necessary to develop indicative targets for lake habitat 3110. Maximum depth should be large in lakes in the SAC within undisturbed peatland and uplands; however, pressures such as eutrophication, overgrazing, forestry and peat-cutting may have reduced vegetation depth in some lakes

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, 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
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. Free et al. (2009) found high isoetid abundance in lakes with Secchi depths of more than 3m. Secchi data for 2007-09 indicate that Acoose, Brin, Caragh, Currane, Leane and the Upper Lake failed both OECD targets, while Guitane and Muckross passed minimum, but failed mean, targets (McGarrigle et al., 2010)
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. Acoose, Caragh, Cummernamuck and Leane failed the target (having good nutrient status) in 2010-12 (Bradley et al., 2015). Brin, Currane, Cummernamuck (moderate status), Leane and Namona failed in 2007-09 (McGarrigle et al., 2010)
Water quality: phytoplankton biomass	µg/l Chlorophyll *a*	Maintain/restore 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. Acoose (moderate status), Cummernamuck and Currane failed to reach high status in 2007-2009 and in 2010 -2012; Brin also failed in 2010-2012 (McGarrigle et al., 2010; Bradley et al., 2015)

Water quality: 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. As for other water quality indicators, lake habitat 3110 requires WFD high status. Caragh and Leane had high phytoplankton composition status in 2010-12, but the Upper Lake had good (Bradley et al., 2015)
Water quality: attached algal biomass	Algal cover and EPA phytobenthos metric	Maintain/restore 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 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. Brin and the Upper Lake had high phytobenthos status in 2010-12, but Acoose, Caragh and Leane had good (Bradley et al., 2015)
Water quality: macrophyte status	EPA macrophyte metric (The Free Index)	Maintain/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. Of the monitored lakes, Leane failed the target in 2007-2009 and 2010-2012, Caragh in 2010-2012, and Brin in 2007-2009, all having good macrophyte status (McGarrigle et al., 2010; Bradley et al., 2015)
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. See McGarrigle et al. (2010) and Bradley et al. (2015) for WFD acidification status in the 2007-09 and 2010-12 periods
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. Free et al. (2006) reported colour of 23mg/l, 15mg/l, 17mg/l, 13mg/l, 15mg/l and 22mg/l PtCo in Caragh, Cloonaghlin, Currane, Guitane, Muckross and the Upper Lake, respectively

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 this SAC, lake shorelines are likely to have a wide variety of fringing habitats, from wet and dry native woodland, to grassland, swamp, poor fen, heath, blanket bog and rock communities. 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

3130 Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-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 Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment 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 3130 is considered likely to occur in Loughs Acoose, Caragh, Leane, The Long Range and the Upper Lake in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC (see map 3). It may also occur in Muckross Lake and other lakes in the SAC. It is likely to co-occur with lake habitat 3110 in these lakes. 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). See also the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC conservation objectives supporting document for *Najas flexilis*
Habitat distribution	Occurrence	No decline, subject to natural processes	The characteristics and distribution of lake habitat 3130 in Ireland are not yet fully understood. The Annex II macrophyte *Najas flexilis* (slender naiad) is considered to be characteristic of the habitat and occurs in Acoose, Caragh, Leane, The Long Range and the Upper Lake (see map 3). As noted above, the habitat may be more widespread in the SAC. See O Connor (2015) and the *Najas flexilis* conservation objectives supporting document for further information
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 3130 (NPWS, 2013), O Connor (2015) and the *Najas flexilis* conservation objectives supporting document. Regular macrophyte surveys are conducted by the Environmental Protection Agency (EPA) at Water Framework Directive (WFD) monitoring lakes. Lakes in the SAC are important for invertebrates, including water beetles, dragonflies, caddisflies and mayflies
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 3130 (see O Connor, 2015). Lake-specific information on vegetation zonation may be available from Visser and Zoer (1972, 1976), Heuff (1984), 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. Further work is necessary to develop indicative targets for lake habitat 3130. Maximum depth should be large in lakes in the SAC within undisturbed peatland and uplands; however, pressures such as eutrophication, overgrazing, forestry and peat-cutting may have reduced vegetation depth in some lakes

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, 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 3130 is associated with a range of substrate types that are more productive/base-rich relative to the substratum of lake habitat 3110. Substratum particle size is likely to vary with depth and along the shoreline within a single lake; however, it should be noted that *Najas flexilis* is typically found on soft substrata of mud, silt or fine sand (Preston and Croft, 2001; Roden, 2002, 2004). For further information see the lake habitats supporting document (O Connor, 2015) and the *Najas flexilis* supporting document
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 3130 (O Connor, 2015). Habitat 3130 is associated with clear water, as evidenced by the growth of the character species *Najas flexilis* at depths of up to 10m. There is likely to be some variation in Secchi depth across lakes with habitat 3130 and site-specific conditions should also be considered. 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. See Heuff (1984) and McGarrigle et al. (2010) for some data on Secchi depth
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	Lake habitat 3130 is associated with high water quality, with naturally low dissolved nutrients. It is naturally more productive than lake habitat 3110, probably reflecting higher concentrations of nutrients such as calcium, rather than P alone. Lake habitat 3130 may reach favourable condition slightly above the oligotrophic boundary for nutrients, but in the absence of habitat-specific targets, the targets are WFD 'High Status' or oligotrophic (OECD, 1982). The "good-moderate" boundary is too enriched to support the habitat. 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. Acoose, Caragh and Leane failed the target (having good nutrient status) in 2010-12 (Bradley et al., 2015). Leane failed in 2007-09 (McGarrigle et al., 2010)

Water quality: phytoplankton biomass	µg/l Chlorophyll *a*	Maintain/restore appropriate water quality to support the habitat, including high chlorophyll *a* status	Lake habitat 3130 is associated with high water quality and naturally low algal growth. As for nutrients, the targets are WFD 'High Status' or oligotrophic (OECD, 1982). The "good-moderate" boundary is too enriched to support the habitat. 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 The European Communities Environmental Objectives (Surface Waters) Regulations 2009. Acoose (moderate status) failed to reach high status in 2007-2009 and 2010-2012 (McGarrigle et al., 2010; Bradley et al., 2015)
Water quality: 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. As for other water quality indicators, lake habitat 3130 requires WFD high status. Caragh and Leane had high phytoplankton composition status in 2010-12, but the Upper Lake had good (Bradley et al., 2015)
Water quality: attached algal biomass	Algal cover and EPA phytobenthos metric	Maintain/restore 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 3130 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, habitat 3130 requires high phytobenthos status. The Upper Lake had high phytobenthos status in 2010-12, but Acoose, Caragh and Leane had good (Bradley et al., 2015)
Water quality: macrophyte status	EPA macrophyte metric (The Free Index)	Maintain/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 3130 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. Of the monitored lakes, Leane failed the target in 2007-2009 and 2010-2012, and Caragh in 2010-2012, having good macrophyte status (McGarrigle et al., 2010; Bradley et al., 2015)
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 lake habitat 3130. Acidification reduces the abundance and reproductive capacity of *Najas flexilis* (Wingfield et al., 2004). The specific requirements of habitat 3130, in terms of water and sediment pH, alkalinity and cation concentration, have not been determined. In line with targets for *Najas flexilis*, median pH values should be greater than 7 pH units. Water and sediment alkalinity and concentrations of cations (notably calcium) should be appropriate to the habitat. The target for WFD Acidification/Alkalisation status is high. Maximum pH should be <9.0 pH units, in line with the surface water standards. See Schedule Five of the European Communities Environmental Objectives (Surface Waters) Regulations 2009. See McGarrigle et al. (2010) and Bradley et al. (2015) for WFD acidification status in the 2007-09 and 2010-12 periods

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 is generally <30mg/l PtCo or, more naturally, <20mg/l PtCo in lakes with habitat 3130 where the peatland in the lake's catchment is intact. Free et al. (2006) reported colour of 23mg/l and 22mg/l PtCo in Caragh and the Upper Lake, respectively
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 3130	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 this SAC, lake shorelines are likely to have a wide variety of fringing habitats, from wet and dry native woodland, to grassland, swamp, poor fen, heath, blanket bog and rock communities. 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

3260 Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation

To maintain the favourable conservation condition of Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Kilometres	Area stable or increasing, subject to natural processes	Conservation objectives concentrate on the high conservation value sub-types of the habitat. Selection of the SAC for 3260 used a broad interpretation and the habitat's distribution and sub-types in the numerous rivers and streams have not been documented. Records for rare/threatened lotic plant and invertebrate species in the SAC indicate high conservation value. Note: rooted macrophytes should be trace/absent (<5% cover) in freshwater pearl mussel (*Margaritifera margaritifera*) habitat. The SAC overlaps with four freshwater pearl mussel SAC catchments: Caragh, Kerry Blackwater, Currane and Gearhameen (the first three are priority catchments). The freshwater pearl mussel (1029) conservation objective for this SAC and that for SAC 002173 take precedence because the mussel requires environmental conditions close to natural background levels
Habitat distribution	Occurrence	No decline, subject to natural processes	Further study is needed of Irish rivers to interpret the broad description of 3260 which covers from upland bryophyte/macroalgal dominated to lowland depositing rivers with pondweeds and starworts (European Commission, 2013). The rivers in the SAC are very variable in terms of hydrology and morphology, but all are naturally very nutrient-poor. High conservation value rivers include: those associated with waterfalls/cascades and important bryophyte and fern communities (including Killarney fern); those with rare and endemic hawkweed species, e.g. *Hieracium argentatum* in the Caragh (Rich et al., 2008); those fringed with acid grassland and *Wahlenbergia hederacea*; those flowing into/out of lakes with lentic-type communities, e.g. *Pilularia globulifera*. Useful sources of information on plants and invertebrates include Scully (1916), Heuff and Horkan (1984) in Whitton (1984), Heuff (1987), Lockhart et al. (2012), Ni Chathain et al. (2013) and O'Connor (2015)
Hydrological regime: river flow	Metres per second	Maintain/restore appropriate hydrological regimes	High conservation value sub-types are associated with natural hydrology. A natural flow regime is required for both plant communities and channel geomorphology to be in favourable condition, exhibiting typical dynamics for the river type (Hatton-Ellis and Grieve, 2003). For many sub-types, high flows are required to maintain the substratum necessary for the characteristic species. Flow variation can be particularly important, with high and flood flows being critical to the hydromorphology. As noted above, the rivers in the SAC vary considerably in terms of their hydrology
Hydrological regime: groundwater discharge	Metres per second	Maintain appropriate hydrological regime	Even small groundwater contributions can significantly alter hydrochemistry, particularly where there is basic bedrock and/or subsoils

Substratum composition: particle size range	Millimetres	Maintain/restore appropriate substratum particle size range, quantity and quality, subject to natural process	Although many of the high conservation value sub-types are dominated by coarse substrata and bedrock, certain sub-types, notably those associated with lake inflows/outflows and peatlands, are dominated by fine substrata. The size and distribution of particles is largely determined by the river flow and geology. The chemical composition (particularly minerals and nutrients) of the substratum is also important. The quality of finer sediment particles is a notable driver for rooted plant communities
Water quality	Various	Maintain/restore appropriate water quality to support the natural structure and functioning of the habitat	The specific targets may vary among sub-types. The rivers within the SAC are considered to be naturally very nutrient-poor and, therefore, to typically require Water Framework Directive (WFD) high status, in terms of nutrient and oxygenation standards, and EQRs (Ecological Quality Ratios) for macroinvertebrates and phytobenthos. Rivers dominated by bryophytes and macroalgae, in particular, typically require WFD high status. High status targets apply to freshwater pearl mussel (*Margaritifera margaritifera*) habitat in the Caragh, Kerry Blackwater, Currane and Gearhameen (see The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009). See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009, Environmental Protection Agency (EPA) river water quality reports (e.g. Bradley et al., 2015) and Ní Chatháin et al. (2013)
Typical species	Occurrence	Typical species of the relevant habitat sub-type should be present and in good condition	The sub-types of this habitat are poorly understood and their typical species have not yet been fully defined. The typical species may include higher plants, bryophytes, macroalgae and microalgae, and invertebrates. As noted above, a number or rare and/or protected species are associated with the rivers in the SAC, including Killarney fern (*Trichomanes speciosum*), silver hawkweed (*Hieracium argentatum*), ivy-leaved bellflower (*Wahlenbergia hederacea*), pillwort (*Pilularia globulifera*) and the caddisflies *Hydroptila tigurina* and *Lepidostoma basale*. See also the conservation objective for Killarney fern (*Trichomanes speciosum*) in this volume
Floodplain connectivity: area	Hectares	The area of active floodplain at and upstream of the habitat should be maintained	River connectivity with the floodplain is important for the functioning of this habitat. Channels with a naturally functioning floodplain are better able to maintain habitat and water quality (Hatton-Ellis and Grieve, 2003). Floodplain connectivity is particularly important in terms of sediment sorting and nutrient deposition. High conservation value rivers are intimately connected to floodplain habitats and function as important wildlife corridors, connecting otherwise isolated or fragmented habitats in the wider countryside (Hatton-Ellis and Grieve, 2003; Mainstone et al., 2016)

Riparian habitat: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the habitat and its sub-types	Riparian habitats (including those along lake shores), particularly natural/semi-natural woodlands and wetlands, are an integral part of the structure and functioning of river systems, even where they do not form part of a natural floodplain. Fringing habitats can contribute to the aquatic food web (e.g. allochthonous matter such as leaf fall), provide habitat (refuge and resources) for certain life-stages of fish, birds and aquatic invertebrates, assist in the settlement of fine suspended material, protect banks from erosion and contribute to nutrient cycling. Shade may also be important in suppressing algal growth in enriched rivers and moderating temperatures. Equally, fringing habitats are dependent on rivers/lakes, particularly their water levels, and support wetland communities and species of conservation concern. See Mainstone et al. (2016). Alluvial and riparian woodland, semi-natural grassland and peatland are important for the rivers in this SAC

4010 Northern Atlantic wet heaths with Erica tetralix

To restore the favourable conservation condition of Northern Atlantic wet heaths with *Erica tetralix* in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment 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 Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 12,846ha, covering 17% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment 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 hillsides throughout the SAC where it often occurs in a mosaic with blanket bog habitat (Barron and Perrin, 2011; NPWS internal files). Further information can be found within Barron and Perrin (2011), 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 (Roche et al., 2012; NPWS internal files), six 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). Rhododendron (*Rhododendron ponticum*) has been recorded in this habitat in the SAC (Roche et al., 2012; NPWS internal files)
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 and no decline in status of hepatic mats associated with this 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). Hepatic mats occur within this habitat in the SAC (R. Hodd, pers. comm.)

4030 European dry heaths

To restore the favourable conservation condition of European dry heaths in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment 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	European dry heaths has not been mapped in detail for Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 6,894ha, covering 9% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	The habitat is best represented in the eastern part of the SAC, including much of The Paps, Tomies Mountain, Shehy Mountain, Purple Mountain and the southern slopes of the Owenreagh valley (Barron and Perrin, 2011; NPWS internal files). It also dominates some of the hills at the western edge of the SAC near the coast (NPWS internal files). Further information can be found within Barron and Perrin (2011), 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	Roche et al. (2012) recorded a variety of dry heath vegetation communities in this SAC, 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: lichens and bryophytes	Number of species at a representative number of 2m x 2m monitoring stops	Number of bryophyte or non-crustose lichen species present at each monitoring stop is at least three, excluding *Campylopus* and *Polytrichum* mosses	Attribute and target based on Perrin et al. (2014)
Vegetation composition: number of 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 two	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat, which is composed of dwarf shrubs, is also presented
Vegetation composition: cover of positive indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of positive indicator species at least 50% for siliceous dry heath and 50-75% for calcareous dry heath	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat, which is composed of dwarf shrubs, is also presented
Vegetation composition: dwarf shrub composition	Percentage cover at a representative number of 2m x 2m monitoring stops	Proportion of dwarf shrub cover composed collectively of bog-myrtle (*Myrica gale*), creeping willow (*Salix repens*) and western gorse (*Ulex gallii*) is less than 50%	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*) has been recorded in this habitat in the SAC (Barron and Perrin, 2011)
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: senescent ling	Percentage cover at a representative number of 2m x 2m monitoring stops	Senescent proportion of ling (*Calluna vulgaris*) cover less than 50%.	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 and crowberry (*Empetrum nigrum*) 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	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas for this habitat is also presented
Vegetation structure: growth phases of ling	Percentage cover in local vicinity of a representative number of monitoring stops	Outside sensitive areas, all growth phases of ling (*Calluna vulgaris*) should occur throughout, with at least 10% of cover in the mature phase	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)
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). The FPO listed and Near Threatened Kerry lily (*Simethis mattiazzii*) (Wyse Jackson et al., 2016) has been recorded from dry heath within the SAC (NPWS internal files)

4060 Alpine and Boreal heaths

To restore the favourable conservation condition of Alpine and Boreal heaths in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment 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	Alpine and Boreal heaths has not been mapped in detail for Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 1,258ha, covering 2% of this SAC (NPWS internal files). Further details on this and the following attributes can be found in the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment 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 most of the higher mountains and ridges within the SAC. Good examples are present on Mangerton Mountain, Purple Mountain and parts of the Macgillycuddy's Reeks (Barron and Perrin, 2011; NPWS internal files). Further information can be found within Barron and Perrin (2011), 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	Roche et al. (2012) recorded Alpine and Boreal 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: lichens and bryophytes	Number of species at a representative number of 2m x 2m monitoring stops	Number of bryophyte or non-crustose lichen species present at each monitoring stop is at least three	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 66%	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: dwarf shrub species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of dwarf shrub species 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 10%	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 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: signs of grazing	Percentage of leaves grazed at a representative number of 2m x 2m monitoring stops	Less than 10% collectively of the live leaves of specific graminoids showing signs of grazing	Attribute and target based on Perrin et al. (2014). See the blanket bogs and associated habitats supporting document for the list of specific graminoids

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 and crowberry (*Empetrum nigrum*) 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 within the habitat	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)
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 and no decline in status of hepatic mats associated with this 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). Hepatic mats occur within this habitat in the SAC (R. Hodd, pers. comm.)

5130 Juniperus communis formations on heaths or calcareous grasslands

To maintain the favourable conservation condition of *Juniperus communis* formations on heaths or calcareous grasslands in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment 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 area of *Juniperus communis* formations on heaths or calcareous grasslands within Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC is currently unknown. The habitat is documented to occur on islands in the Upper Lake and on headlands of the Muckross peninsula within the SAC (NPWS internal files). Cooper et al. (2012) identified nine locations of juniper (*Juniperus communis*) vegetation (KY03-KY11) during a national juniper survey, although none were classified as formations (see below). Barron and Perrin (2011) also recorded juniper plants within the National Park. NB unsurveyed areas may be present within the SAC
Habitat distribution	Occurrence	No decline, subject to natural processes	See note for habitat area above. It is important to note that unsurveyed areas may be present within the SAC
Juniper population size	Number per formation	At least 50 plants per formation	To classify as a juniper (*Juniperus communis*) formation, at least 50 plants should be present (Cooper et al., 2012)
Vegetation composition: typical species	Number per formation	At least 50% of the listed positive indicator species for the relevant vegetation group present	Attribute and target based on Cooper et al. (2012), where positive indicator species for five vegetation groups are listed
Vegetation composition: negative indicator species	Occurrence per formation	Negative indicator species, particularly non-native invasive species, absent or under control	Attribute and target based on Cooper et al. (2012), where the list of negative indicator species is presented
Vegetation structure: cone-bearing plants	Percentage per formation	At least 10% of plants are bearing cones	Attribute and target based on Cooper et al. (2012)
Vegetation structure: seedling recruitment	Percentage per formation	At least 10% of juniper plants are seedlings	Attribute and target based on Cooper et al. (2012)
Vegetation structure: dead juniper	Percentage per formation	Mean percentage of each juniper plant dead less than 10%	Attribute and target based on Cooper et al. (2012)

6130 Calaminarian grasslands of the Violetalia calaminariae

To maintain the favourable conservation condition of Calaminarian grasslands of the Violetalia calaminariae in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	No decline, subject to natural processes	Calaminarian grasslands of the Violetalia calaminariae habitat has been recorded at two locations within Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC: at Muckross Lake, where the area of the habitat is estimated to be 0.16ha, and at Ross Island, where the area of the habitat is estimated to be 0.15ha (Holyoak, 2009). NB further unsurveyed areas may be present within the SAC
Distribution	Location	No decline, subject to natural processes. See map 4 for recorded locations	Calaminarian grassland occurs at the disused copper mine on the north shore of Muckross Lake and at Ross Island, at a former copper and lead mine (Holyoak, 2009). NB further unsurveyed areas may be present within the SAC
Physical structure: bare ground	Percentage cover	Maintain adequate open ground	At Muckross Lake, calaminarian grassland is well-developed over most of the open spoil area. The extent of bare soil and rock within four (50cm x 50cm) quadrats (in 2008) ranged between 0% and 50% (Holyoak, 2009). At Ross Island, calaminarian grassland is well-developed in small open areas above regular wave-washing of Lough Leane and below the woodland edge. The extent of bare soil and rock within two (50cm x 50cm) quadrats (in 2008) ranged between 4% and 50% (Holyoak, 2009)
Soil toxicity: copper content	µg Cu/g dry weight soil	Maintain high copper (Cu) levels in soil	Total copper content in a sample of mine spoil taken from Ross Island in 2009 was 3,815µg/g dry weight (Campbell, 2013). Mine spoil with similar vegetation from Cornwall had available copper of 151–3,220µg/g dry weight (Holyoak et al., 2000; Walsh, 2001)
Vegetation structure: height and cover	Centimetres; percentage cover	Maintain low and open vegetation	At Muckross Lake, within four (50cm x 50cm) quadrats, herbaceous vegetation height was relatively short (4-8cm) and vegetation cover was 34 -75%. Bryophyte cover was relatively high (0-80%). Within two (50cm x 50cm) quadrats at Ross Island, herbaceous vegetation height was 4-10cm, vegetation cover was relatively low (26-50%) and bryophyte cover was 11-25%
Vegetation composition: metallophyte bryophytes	Number	Maintain diversity and populations of metallophyte bryophytes	*Cephaloziella massalongi*, a liverwort listed on the Flora (Protection) Order, 2015 and classified as Vulnerable (Lockhart et al., 2012) occurs at both Muckross Lake and Ross Island (Holyoak, 2009). The Near Threatened liverwort *Cephaloziella stellulifera* (Lockhart et al., 2012) also occurs at Muckross Lake (Holyoak, 2009)

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 Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment 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, with a minimum area of 9.02ha. See map 4	The full extent of *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caerulae) within Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC is unknown. *Molinia* meadows habitat was recorded as part of the Irish Semi-natural Grassland Survey (ISGS) within the sub-site Bunrower (ISGS site code 2403) (Devaney et al., 2013; O'Neill et al., 2013) with an area of 8.03ha. In the production of a habitat map for Killarney National Park, Barron and Perrin (2011) mapped a further 0.98ha of the habitat at Ross Island to give a total minimum area of 9.02ha of *Molinia* meadows in the SAC. Map 4 shows surveyed grasslands, including the areas classified as 6410 (9.02ha). NB further unsurveyed areas may be present within the SAC
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 4	Distribution based on Barron and Perrin (2011) and O'Neill et al. (2013). It is important to note that further unsurveyed areas may be present within the SAC
Vegetation composition: positive indicator 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)	Based on O'Neill et al. (2013), where the list of positive indicator species, including high quality species, is also presented. Note that purple moor-grass (*Molinia caerulea*) is a positive indicator species, but not necessarily an essential component of the habitat. See Devaney et al. (2013) and O'Neill et al. (2013) for further details
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 not more than 10%	Attribute and target based on O'Neill et al. (2013), where the list of negative indicator species is also presented
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 composition: 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. (2013)
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 10cm and 80cm tall	Attribute and target based on O'Neill et al. (2013)
Vegetation structure: litter	Percentage at a representative number of monitoring stops	Litter cover not more than 25%	Attribute and target based on O'Neill et al. (2013)
Physical structure: bare ground	Percentage	Not more than 10% bare ground	Attribute and target based on O'Neill et al. (2010)

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)
Physical structure: disturbance	Square metres	Area showing signs of serious grazing or other disturbance less than 20m^2	Attribute and target based on O'Neill et al. (2013)

7130 Blanket bogs (* if active bog)

To restore the favourable conservation condition of Blanket bogs (* if active bog) in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment 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 Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 6,445ha, covering 8% of this SAC (NPWS internal files). Further details on this and the following attributes can be found in the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	This habitat is documented to occur in both lowland and upland situations within the SAC. Examples of lowland blanket bogs include Cummeragh River Bog, Ballygisheen Bog, Eirk Bog, Dinis Bog, Newfoundland Bog, Meelagh River Bog and Cores Bog. Examples of upland blanket bogs include Coomacheo Bog, Caherbarnagh Bog, Carrig East Bog, Tooreenbreanla Bog, Tooreenealagh Bog, Mangerton Bog, Lough Nambrackdarrig Bog and Oolagh East Bog. Further information can be found within Douglas et al. (1989), Mooney et al. (1991), Barron and Perrin (2011), 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. (1989), Mooney et al. (1991) and Roche et al. (2012) recorded a variety of blanket bog vegetation communities in this SAC, seven 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 non-native moss *Campylopus introflexus* have been recorded in this habitat in the SAC (Roche et al., 2012)
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). The Near Threatened brown beak-sedge (*Rhynchospora fusca*) (Wyse Jackson et al., 2016) was recorded in blanket bog in the SAC (Roche et al., 2012). The FPO listed and Near Threatened slender cottongrass (*Eriophorum gracile*) (Wyse Jackson et al., 2016) has been recorded within the SAC (NPWS internal files), but this species cannot be assigned specifically to blanket bog

7150 Depressions on peat substrates of the Rhynchosporion

To restore the favourable conservation condition of Depressions on peat substrates of the Rhynchosporion in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment 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 Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC and thus the total area of the qualifying habitat in the SAC is unknown. Further details on this and the following attributes can be found in the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	This habitat typically occurs in the wetter areas of lowland blanket bog in the SAC. Good examples are present at Ballygisheen Bog, Cores Bog, Oak Island Bog, Dinis Bog, Cummeragh River Bog, Meelagh River Bog, Looscaunagh Bog and Kealduff River Bog. Further information can be found within Douglas et al. (1989), Mooney et al. (1991), Barron and Perrin (2011), Roche et al. (2012) 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)
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). The Near Threatened brown beak-sedge (*Rhynchospora fusca*) (Wyse Jackson et al., 2016) was recorded in this habitat in the SAC (Roche et al., 2012)

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 Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment 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, with a minimum area of 1,254.4ha. See maps 5 and 6	Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC holds the most extensive areas of old oak woodland in Ireland. Several sites within the SAC were surveyed by Perrin et al. (2008) as part of the National Survey of Native Woodlands (NSNW) - NSNW site codes 1270, 1277, 1289, 1290, 1292, 1495, 1715, 1734, 1736, 1737, 1793 and 2013, with a combined mapped area of 461.6ha. NSNW sites 1277, 1290 and 1737 were included in a national monitoring survey (O'Neill and Barron, 2013). In the production of a habitat map for Killarney National Park, Barron and Perrin (2011) mapped a further 792.8ha of the habitat within the National Park to give a total minimum area of 1,254.4ha of old sessile oak woods within the SAC. Map 5 (the west of the SAC) and map 6 (east) show the mapped woodlands in the SAC, including the areas classified as 91A0 (1,254.4ha). 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 mapped woodland locations are shown on maps 5 and 6	Distribution based on Perrin et al. (2008) and Barron and Perrin (2011). 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 and metres	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi-mature trees and shrubs; and well-developed herb layer	Described in Perrin et al. (2008) and NPWS internal files
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	Described in Perrin et al. (2008) and NPWS internal files. See also Kelly (1981)
Woodland structure: natural regeneration	Seedling:sapling:pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	Oak (*Quercus petraea*) generally regenerates poorly. In suitable sites, ash (*Fraxinus excelsior*) can regenerate in large numbers although few seedlings reach pole size
Woodland structure: dead wood	m^3 per hectare; number per hectare	At least $30m^3$/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem
Woodland structure: veteran trees	Number per hectare	No decline	Mature and veteran trees are important habitats for bryophytes, lichens, saproxylic organisms, Kerry slug (*Geomalacus maculosus*) and some bird species. Their retention is important to ensure continuity of habitats/niches and propagule sources

Woodland structure: indicators of local disctinctiveness	Occurrence	No decline	Includes ancient or long-established woodlands, archaeological and geological features as well as red data and other rare or localised species. Perrin and Daly (2010) identify 3 sub-sites, Tomies Wood (NSNW site code 1289), Derrycunihy Wood (1290) and Camillan Wood (1495), as ancient woodland and Drom East (1734) as possible ancient woodland. Atlantic and Lusitanian flora is well-developed in the habitat in the SAC with species such as strawberry tree (*Arbutus unedo*), Irish spurge (*Euphorbia hyberna*), kidney saxifrage (*Saxifraga hirsuta*) and St. Patrick's cabbage (*S. spathularis*). Many rare and protected bryophytes occur, e.g. the Endangered *Cephalozia crassifola*, the Vulnerable *Lejeunea flava* subsp. *moorei* and the Near Threatened *Radula carringtonii* (Lockhart et al., 2012), all of which are listed on the Flora (Protection) Order, 2015. See also Breen (2014) and the conservation objective for Kerry slug (1024)
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover not less than 95%	Species reported in Perrin et al. (2008) and NPWS internal files
Vegetation composition: typical species	Occurrence	A variety of typical native species present, depending on woodland type, including oak (*Quercus petraea*) and birch (*Betula pubescens*)	Species reported in Perrin et al. (2008) and NPWS internal files
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control	The following are the most common non-native invasive species in this woodland type: beech (*Fagus sylvatica*), sycamore (*Acer pseudoplatanus*) and rhododendron (*Rhododendron ponticum*). Rhododendron infestation is a problem within this habitat in the SAC, but a programme of removal is on-going, particularly within the boundaries of Killarney National Park (Barron and Perrin, 2011; NPWS internal files). Beech has been reported from Rossacroonalo (NSNW site code 1270), Tomies Wood (1289) and Camillan Wood (1495) (Perrin et al., 2008). A small amount of Japanese knotweed (*Fallopia japonica*) was noted from Oolagh East (NSNW site code 1736) (Perrin et al., 2008)

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 Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment 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, with a minimum area of 170.84ha. See map 6	Alluvial woods* in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC are found on the low-lying limestone areas within the floodplain of Lough Leane and also in association with streams or calcareous springs such as at Cloghereen Pool Wood, the woodland behind Muckross Abbey, Carrigafreaghane Wood and Bellview Wood (Barron and Perrin, 2011). This habitat was surveyed by Perrin et al. (2008) as part of the National Survey of Native Woodlands (NSNW) at Game Wood (NSNW site code 1288) and mapped as 32.24ha. Game Wood was also included in a national monitoring survey (O'Neill and Barron, 2013). In the production of a habitat map for Killarney National Park, Barron and Perrin (2011) mapped a further 138.6ha of the habitat within the National Park to give a total minimum area of 170.84ha of alluvial woods within the SAC. Map 6 shows mapped woodlands, including the area classified as 91E0* (170.84ha). NB further unsurveyed areas may be present within the SAC
Habitat distribution	Occurrence	No decline. The mapped woodland locations are shown on map 6	Distribution based on Perrin et al. (2008) and Barron and Perrin (2011). NB 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 and metres	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi-mature trees and shrubs; and well-developed herb layer	Described in Perrin et al. (2008) and NPWS internal files. See also Kelly and Iremonger (1997)
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	Described in Perrin et al. (2008) and NPWS internal files. See also Kelly and Iremonger (1997)
Woodland structure: natural regeneration	Seedling:sapling:pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	Alder (*Alnus glutinosa*) and oak (*Quercus* spp.) tend to regenerate poorly. Ash (*Fraxinus excelsior*) often regenerates in large numbers although few seedlings reach pole size
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

Woodland structure: dead wood	m^3 per hectare; number per hectare	At least $30m^3$/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter (greater than 20cm diameter in the case of alder (*Alnus glutinosa*))	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem
Woodland structure: veteran trees	Number per hectare	No decline	Mature and 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 disctinctiveness	Occurrence	No decline	Includes ancient or long-established woodlands (see Perrin and Daly, 2010), archaeological and geological features as well as red data and other rare or localised species
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover not less than 95%	Species reported in Perrin et al. (2008) and NPWS internal files. See also Kelly and Iremonger (1997)
Vegetation composition: typical species	Occurrence	A variety of typical native species present, depending on woodland type, including alder (*Alnus glutinosa*), willows (*Salix* spp.), oak (*Quercus* spp.), ash (*Fraxinus excelsior*) and birch (*Betula pubescens*)	Species reported in Perrin et al. (2008) and NPWS internal files. See also Kelly and Iremonger (1997)
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control	Sycamore (*Acer pseudoplatanus*) has been reported from Bellview Wood (NPWS internal files) and Game Wood (NSNW site code 1288), where beech (*Fagus sylvatica*) also occurs (Perrin et al., 2008). Rhododendron (*Rhododendron ponticum*) also occurs in the habitat in the SAC, but is being controlled (NPWS internal files). Rhododendron forms clumps in parts of Game Wood (NSNW site code 1288), but its spread is somewhat curtailed by the wet substrate (Perrin et al., 2008)

91J0 Taxus baccata woods of the British Isles

To restore the favourable conservation condition of *Taxus baccata* woods of the British Isles* in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment 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, with a minimum area of 73.46ha. See map 6	*Taxus baccata* woods of the British Isles* in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC occur on the limestone areas of Muckross Peninsula and comprise the only sizeable stands of yew (*Taxus baccata*) in Ireland. The main area is at Reenadinna, with smaller significant stands at Monk's Wood and Dundag Point. Yew woodland was surveyed in the SAC by Perrin et al. (2008) as part of the National Survey of Native Woodlands (NSNW) at Reenadinna Wood (NSNW site code 1291) and mapped as 38.63ha. Reenadinna was also included in a national monitoring survey (Cross and Lynn, 2013). In the production of a habitat map for Killarney National Park, Barron and Perrin (2011) mapped a further 34.83ha of the habitat within the National Park to give a total minimum area of 73.46ha of yew woods within the SAC. Map 6 shows the mapped woodlands, including the areas classified as 91J0* (73.46ha). NB further unsurveyed areas may be present within the SAC
Habitat distribution	Occurrence	No decline. The mapped woodland locations are shown on maps 6	Distribution based on Perrin et al. (2008), Barron and Perrin (2011) and Cross and Lynn (2013). NB further unsurveyed areas may be present within the SAC
Woodland size	Hectares	Area stable or increasing	The yew woods of the Muckross peninsula are unlikely to spread due to the limited extent of the limestone (NPWS internal files)
Woodland structure: cover and height	Percentage and metres	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi-mature trees and shrubs; and herb and bryophyte layer	Described in Perrin et al. (2008), Cross and Lynn (2013) and NPWS internal files. At Reenadinna, the shrub and herbaceous layers are poorly developed. Where exclosures were put in place in 2001 to exclude grazing, regeneration of ivy (*Hedera helix*), bramble (*Rubus fruticosus* agg.) and holly (*Ilex aquifolium*) is taking place (Perrin et al., 2011; Cross and Lynn, 2013)
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	Described in Perrin et al., (2008), Cross and Lynn (2013) and NPWS internal files. See also Kelly (1981)
Woodland structure: natural regeneration	Seedling: sapling: pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	Yew (*Taxus baccata*) regenerates poorly under its own canopy, but can regenerate under a canopy of other species or in the open if the competition from the field layer is not too strong. Overgrazing, mostly by the non-native sika deer (*Cervus nippon*), but also by native red deer (*C. elaphus*), is a factor in the lack of regeneration at Reenadinna (Perrin et al., 2011; Cross and Lynn, 2013)
Woodland structure: dead wood	m^3 per hectare; number per hectare	At least $30m^3$/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem
Woodland structure: veteran trees	Number per hectare	No decline	Mature and 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 disctinctiveness	Occurrence	No decline	Includes ancient or long-established woodlands (Perrin and Daly, 2010), archaeological and geological features as well as red data and other rare or localised species. Reenadinna Wood (NSNW code 1291) has been classified as ancient woodland by Perrin and Daly (2010)
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover not less than 95%	Species reported in Perrin et al. (2008), Cross and Lynn (2013) and NPWS internal files. See also Perrin et al. (2011)
Vegetation composition: typical species	Occurrence	A variety of typical native species present, including yew (*Taxus baccata*) and ash (*Fraxinus excelsior*)	Species reported in Perrin et al. (2008), Cross and Lynn (2013) and NPWS internal files. See also Perrin et al. (2011)
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control	The most common invasive species in this woodland type is beech (*Fagus sylvatica*), although there is evidence to suggest that it actually facilitates regeneration of yew (*Taxus baccata*). At Reenadinna, rhododendron (*Rhododendron ponticum*) is scarce; it has been removed from areas of infestation in past years (Perrin et al., 2008). Cotoneaster (*Cotoneaster* spp.) and wild clematis (*Clematis vitalba*) occur throughout Reenadinna Wood (Cross and Lynn, 2013)

1024 Kerry Slug *Geomalacus maculosus*

To maintain the favourable conservation condition of Kerry Slug in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: occupied 1km grid squares	Number	Number of occupied 1km grid squares at least stable, subject to natural processes. See map 7	The recorded distribution of Kerry slug (*Geomalacus maculosus*) is extensive within Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC. There have been records from 37 1km grid squares which overlap with the SAC. Most of these come from the area around Killarney National Park, and around Caragh Lake and Glencar. The Kerry slug is primarily associated with old red sandstone geology and, as this rock type underlies most of the SAC, it should be expected to occur more widely, but this has not been confirmed by positive records. See Mc Donnell and Gormally (2011) and Mc Donnell et al. (2013) for further details
Habitat extent: area of heath/bog with sandstone outcrops	Hectares	Stable or increasing, subject to natural processes	Within the SAC, Kerry slug (*Geomalacus maculosus*) occupies woodland and also wet heath/blanket bog. In the open heath/bog habitat, the species is found on the outcropping boulders of old red sandstone where the slug finds its preferred species of lichens and mosses. It is thought to retreat during dry periods to refuges around the interface between rock and soil, and crevices and holes in trees. Movement presumably does occur between rocks, but the conditions needed to facilitate this are not known
Habitat extent: woodland area	Hectares	Stable or increasing, subject to natural processes	Kerry slug (*Geomalacus maculosus*) is found in areas of woodland supporting its preferred foodplants which are species of epiphytic lichens and mosses, especially *Platismatia glauca*, *Usnea cornuta*, *Cladonia uncialis*, *Parmotrema perlatum* and *Lepraria incana* (Reich et al., 2012). The preferred trees are those with rough bark, such as oak (*Quercus petraea*), but also conifers (Reich et al., 2012)
Habitat quality: woodland	Proportion of oak trees	Proportion of sessile oak (*Quercus petraea*) in canopy at least stable	Oak is the preferred tree for this species within native broadleaved woodland. See also the conservation objective for Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles (91A0) in this volume
Habitat quality: non-native invasive species	Occurrence	Rhododendron (*Rhododendron ponticum*) in woodland and wet heath/blanket bog absent or under control	Kerry slug (*Geomalacus maculosus*) is negatively impacted by the presence of rhododendron (*Rhododendron ponticum*), which creates excessive shade and reduces cover of its epiphytic foodplants (Mc Donnell and Gormally, 2011). This is primarily, but not exclusively, a problem in woodland, and rhododendron may also impact open heath and bog. See also the conservation objectives for Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles (91A0), Northern Atlantic wet heaths with *Erica tetralix* (4010) and Blanket bogs (* if active bog) (7130) in this volume

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

To restore the favourable conservation condition of Freshwater Pearl Mussel in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Kilometres	See targets below and map 8. Note that the distribution target lengths include the perimeters of lakes in each catchment	The conservation objective applies to the Caragh, Currane and Gearhameen freshwater pearl mussel populations, which are listed on the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 (Statutory Instrument No. 296 of 2009). The target is for the species to be sufficiently widespread to maintain itself on a long-term basis as a viable component of the Caragh, Currane and Gearhameen systems (see further information below). The Caragh and Currane are amongst eight Irish populations prioritised for conservation action (Moorkens, 2010). Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC covers most of the Caragh, Currane and Gearhameen catchments. The SAC also covers upper parts of the Kerry Blackwater population and catchment (Blackwater River (Kerry) SAC (002173)), which is also selected for freshwater pearl mussel
Distribution: Caragh	Kilometres	Maintain Caragh distribution at 35.06km	The widespread distribution of the freshwater pearl mussel in the Caragh catchment was mapped by Ross (1999). The distribution was re-examined as part of baseline monitoring in 2004 (Ross, 2004). The distribution extends through the Owenroe, Caragh, Glashawee, Caraghbeg and Meelagh Rivers, and Loughs Cloon and Acoose. The target is for the species to be sufficiently widespread to maintain itself on a long-term basis as a viable component of the Caragh system. See NPWS (2010) for further information
Distribution: Currane	Kilometres	Maintain Currane distribution at 14.90km	The known distribution of the freshwater pearl mussel extends through the Cummeragh, Cappal and Isknagahiny Lough Rivers of the Currane catchment. This may be an underestimate, however, as the system has not been fully surveyed. The target is for the species to be sufficiently widespread to maintain itself on a long-term basis as a viable component of the Currane system. See NPWS (2010) for further information
Distribution: Gearhameen	Kilometres	Maintain Gearhameen distribution at 4.45km	The known distribution of the freshwater pearl mussel is from the base of a section of falls in the Owenreagh River at Looscaunagh to the Bridge on the Gearhameen River at Lord Brandon's Cottage (Ross, 2007). Ross (2016) found small numbers of mussels in 800m surveyed downstream of the Bridge. The species may also extend further upstream in the Owenreagh and a 1994 record for Knocksallagh bog requires further investigation. The target is for the species to be sufficiently widespread to maintain itself on a long-term basis as a viable component of the Gearhameen system. See NPWS (2010) for further information

Population size	Number of adult mussels	Restore populations to at least: 2.8 million adult mussels in the Caragh, 100,000 in the Currane and 100,000 in the Gearhameen	The estimated Caragh population was 2,805,071 (Ross, 1999). Mussel density was variable and maximum abundance was 268/m² (Ross, 1999). E. Ross found a large population in the Cummeragh River, Currane with mussels abundant (>1,500/100m) in parts (Ross, 2008, 2009, 2017). NPWS (2010) estimated the Currane population as c.100,000. NPWS staff counted over 20,000 adult mussels in an 800m stretch of the Owenreagh, Gearhameen in 2005. Ross (2007) recorded a very large population in the Owenreagh, with high mussel density in places (up to 272/m²). Ross (2017) estimated the Owenreagh population is well in excess of 100,000 mussels. NPWS (2013) assumed the Caragh and Currane populations had declined at a rate of 1%/year and the Owenreagh at 3%/year. The improved 2014 estimate for the Caragh was 2.1 million. The target is for the species to be sufficiently abundant to maintain itself on a long-term basis as a viable component of the Caragh, Currane and Gearhameen systems
Population structure: recruitment	Percentage per size class	Restore to at least 20% of each population no more than 65mm in length; and at least 5% of each population no more than 30mm in length	Mussels of no more than 65mm are considered 'young mussels' and are found buried in the substratum and/or beneath adult mussels. Mussels of no more than 30mm are 'juvenile mussels' and are always buried in the substratum. See the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. The Sub-basin Management Plans (NPWS, 2010) summarise demographic work up to 2010. The Caragh failed both targets in 2011, 2014 and 2016 (Ross, 2011; Moorkens, 2015, 2016). The Currane failed both in 2014 (Ross, 2017). The Gearhameen failed the targets in 2015 (Ross, 2017). The Caragh, Currane and Gearhameen populations are unsustainable owing to lack of survival of juvenile mussels. NPWS (2010) predicted that, based on current rates of decline, all three populations would be extinct by 2100. 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 Caragh, Currane and Gearhameen systems
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% of dead shells is considered to be indicative of natural losses. The Caragh failed the live adult target in 2011, with declines of 100% and 74% at 2 transects (Ross, 2011). The average decline 2004-2014 was 24% of live adults across 6 transects (Moorkens, 2015). The Currane failed the dead shells target in 2014, with 18%, 3% and 5% dead shells in 3 transects (Ross, 2017). The Gearhameen passed both targets in 2009 and 2015 (Ross, 2009, 2017; NPWS, 2010). 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 Caragh, Currane and Gearhameen systems

Suitable habitat: extent	Kilometres	See targets below and map 8. Note that the suitable habitat target lengths include the perimeters of lakes in each catchment	The habitat is a combination of the area of 1) habitat adult and juvenile mussels can occupy; 2) spawning and nursery habitats host fish can occupy. Fish nursery and mussel habitat typically overlap. Fish spawning habitat is generally adjacent to mussel habitat, but may lie upstream of the generalised mussel distribution. Only spawning areas that regularly contribute juvenile fish to adult mussel habitat should be considered. Availability of mussel and fish habitat is determined by flow and substratum conditions. It is highly sensitive to hydromorphological changes, sedimentation and nutrient enrichment. Pressures throughout the catchment add to such impacts. Habitat in the Caragh, Currane and Gearhameen is unsuitable for juvenile recruitment (Moorkens, 2015, 2016; Ross, 2011, 2017). 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 Caragh, Currane and Gearhameen systems. See below
Suitable habitat: extent - Caragh	Kilometres	Restore suitable habitat in more than 33.18km in the Caragh and any additional stretches necessary for salmonid spawning	The extent of the mussel habitat in the Caragh system is well-documented; it was first mapped in 1999 (Ross, 1999) and full baseline monitoring took place in 2004 (Ross, 2004). Most of the available habitat in the Caragh system is occupied by adult mussels; however, it is unsuitable for juvenile recruitment (NPWS, 2010; Ross, 2011; Moorkens, 2015, 2016). There is evidence for localised loss of habitat as a result of land drainage and bank erosion (Ross, 2011; Moorkens, 2015). 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 Caragh system
Suitable habitat: extent - Currane	Kilometres	Restore suitable habitat in more than 6.86km in the Currane and any additional stretches necessary for salmonid spawning	Further survey is required to accurately map the extent of mussel habitat in the Currane system. The habitat polyline is likely to underestimate habitat extent, particularly in the Cummeragh River. Suitable habitat appears to be widespread in the Cummeragh River from Lough Derriana to Lough Currane, but the river hasn't been comprehensively surveyed (Ross, 2008, 2009, 2017; NPWS, 2010). Ross (2008) recorded suitable habitat throughout the Cappal River, but found only four mussels. There has been no dedicated survey of the Isknagahiny Lough Stream, other tributaries or lakes. 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 Currane system
Suitable habitat: extent - Gearhameen	Kilometres	Restore suitable habitat in more than 4.45km in the Gearhameen and any additional stretches necessary for salmonid spawning	Further survey is required to accurately map the extent of mussel habitat in the Gearhameen system. The habitat polyline is likely to underestimate habitat extent in the Owenreagh River, and more survey is required upstream of the falls at Looscaunagh. The Gearhameen River appears to have limited mussel habitat, being dominated by torrential flow and unstable, mobile cobble and gravel substrate; however, further investigation is recommended (Ross, 2009, 2017; NPWS, 2010). 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 Gearhameen 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). In 2009, the habitat in the Caragh, Currane and Gearhameen systems failed the macroinvertebrate target (Conservation Services, 2009; Williams, 2009; NPWS, 2010). The Currane and Gearhameen also failed the phytobenthos target (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 Caragh, Currane and Gearhameen systems
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%)	The Caragh failed the targets in 2009, 2011, 2014 and 2016 (Ross, 2009, 2011; Moorkens, 2015, 2016). Extensive algae have been recorded since monitoring began; macrophytes appear to have increased over time (Ross, 2004, 2006, 2009, 2011). The Currane failed the targets in 2009 and 2014 (NPWS, 2010; Ross, 2017). Significant crowfoot abundance has been recorded, but algal abundance tends to be relatively low (Ross, 2009, 2017). The Gearhameen failed the algal target in 2009; excessive algae have been recorded since 1996 (NPWS, 2010) and the Gearhameen failed both targets in 2015 (Ross, 2017). Excessive fungal/bacterial production is also a concern in the Caragh and Gearhameen. Sufficient recruitment 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 Caragh, Currane and Gearhameen systems
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 Caragh failed the target in 2009, 2011 and 2014, and sedimentation has increased throughout the system since monitoring began (Ross, 2004, 2006, 2009, 2011; Moorkens, 2015). The Currane failed the target in 2009 and 2014 (NPWS, 2010; Ross, 2009, 2017). The abundance of crowfoot suggests sedimentation has been a feature of the Currane for some time. The Gearhameen passed the target in 2009 and sedimentation appeared to be localised (NPWS, 2010). It failed in 2014/15, with some silt plumes (Ross, 2017). Sufficient recruitment 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 Caragh, Currane and Gearhameen systems
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. The Caragh failed the redox target in 2009, with an average decline of 23.8% (NPWS, 2010). It failed with an overall decline of 22% in 2014 (Moorkens, 2015). The Currane failed with 24% in 2015 (Ross, 2017). The Owenreagh failed with 23% in 2015 (Ross, 2017). 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 Caragh, Currane and Gearhameen systems

Hydrological regime: flow variability	Metres per second	Restore appropriate hydrological regime	The availability of suitable freshwater pearl mussel habitat is largely determined by flow (catchment geology being the other important factor). In order 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 sediment or growth of algae/macrophytes and 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). Groundwater inflow to the substratum also contributes to water-cycling and favourable habitat condition. 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 Caragh, Currane and Gearhameen systems
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 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 host fish density and biomass 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 2009, glochidia were found on salmon, but not trout, in the Caragh and Currane, but on neither salmonid in the Gearhameen (Johnston, 2009; NPWS, 2010)
Fringing habitat: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the population	Riparian habitats, including those along lake fringes, particularly natural/semi-natural woodlands and wetlands, even where they do not form part of a natural floodplain, are an integral part of the structure and functioning of river systems. 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 such as leaf fall) and provide habitat for certain life-stages of fish, birds and aquatic invertebrates. Shade may also be important in suppressing algal and macrophyte growth in enriched rivers and moderating temperatures. 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 Caragh, Currane and Gearhameen systems

1065 Marsh Fritillary *Euphydryas aurinia*

To restore the favourable conservation condition of Marsh Fritillary in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: occupied 1km grid squares	Number	No decline, subject to natural processes	Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC has not been comprehensively surveyed for marsh fritillary (*Euphydryas aurinia*) and so the current distribution of the species in the SAC is unknown. One colony was recorded in grid square V9586 in 2006. See map 9
Proof of breeding: larval webs	Number at a representative number of sub-sites	Proof of breeding, confirmed by detection of webs	There are currently no survey data for sub-sites within the SAC
Potential habitat: area	Hectares	Area of potential habitat stable or increasing, subject to natural processes	Potential suitable habitat for marsh fritillary (*Euphydryas aurinia*) is defined as areas of vegetation where devil's-bit scabious (*Succisa pratensis*) is present, with mean height less than 50cm and with less than 10% cover of scrub more than 1m tall. There is no figure available for the total area of suitable habitat in the SAC. A survey in 2014 mapped potential habitat covering 5.4ha (Barron and Daly, 2015). This should be considered a minimum target for the SAC

1095 Sea Lamprey *Petromyzon marinus*

To maintain the favourable conservation condition of Sea Lamprey in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment 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 cause difficulties to lampreys' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas. No barriers to passage have been found in float-over surveys in the Laune catchment (rivers Laune, Flesk and Gearhameen) (Inland Fisheries Ireland, 2011), and adult spawning occurs at the top of the catchment (NPWS, pers. comm.; IFI unpublished data, 2017)
Population structure of juveniles	Number of age/size groups	At least three age/size groups present	Attribute and target based on data from Harvey and Cowx (2003) and O'Connor (2007)
Juvenile density in fine sediment	Juveniles/m²	Juvenile density at least 1/m²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003)
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds	Attribute and target based on spawning bed mapping by Inland Fisheries Ireland (IFI). Lampreys spawn in clean gravels
Availability of juvenile habitat	Number of positive sites in 3rd order channels (and greater), downstream of spawning areas	More than 10% of sample sites positive	The target is based on experience of catchment-wide sampling within IFI in the period 2009-2016 and is in line with proposed targets in JNCC (2015)

1096 Brook Lamprey *Lampetra planeri*

To maintain the favourable conservation condition of Brook Lamprey in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment 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 cause difficulties to brook lampreys' migration, both up- and downstream, thereby possibly limiting species to specific stretches, restricting access to spawning areas and creating genetically isolated populations (Espanhol et al., 2007)
Population structure of juveniles	Number of age/size groups	At least three age/size groups of brook/river lamprey present	Attribute and target based on data from Harvey and Cowx (2003). It is impossible to distinguish between brook lamprey (*Lampetra planeri*) and river lamprey (*L. fluviatilis*) juveniles in the field (Gardiner, 2003), hence they are considered together in this target
Juvenile density in fine sediment	Juveniles/m²	Mean catchment juvenile density of brook/river lamprey at least 5/m²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from (a) Harvey and Cowx (2003) who state 10/m² in optimal conditions and more than 2/m² on a catchment basis and (b) JNCC (2015) who propose >5/m² for suitable habitat
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds	Attribute and target based on spawning bed mapping by Inland Fisheries Ireland (IFI). Lampreys spawn in clean gravels (Rooney et al., 2013)
Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Many sites with suitable larval attributes, i.e. fine sediment in low velocity habitat, are found not to contain larval lamprey. This may be a function of chance or probability, or may be a consequence of insufficient recruitment to fill all spatial niches. JNCC (2005) recommended 66% positive sites at catchment level. Occupancy in excess of 50% of sites would be 'reasonable' for the Irish catchments examined to date. Target based on IFI (unpublished data) and Sugiyama and Goto (2002)

1099 River Lamprey *Lampetra fluviatilis*

To maintain the favourable conservation condition of River Lamprey in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment 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 cause difficulties to river lampreys' migration, both up- and downstream, thereby possibly limiting species to specific stretches, restricting access to spawning areas and creating genetically isolated populations (Espanhol et al., 2007)
Population structure of juveniles	Number of age/size groups	At least three age/size groups of river/brook lamprey present	Attribute and target based on data from Harvey and Cowx (2003). It is impossible to distinguish between river lamprey (*Lampetra fluviatilis*) and brook lamprey (*L. planeri*) juveniles in the field, hence they are considered together in this target
Juvenile density in fine sediment	Juveniles/m²	Mean catchment juvenile density of river/brook lamprey at least 5/m²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from (a) Harvey and Cowx (2003) who state 10/m² in optimal conditions and more than 2/m² on a catchment basis and (b) JNCC (2015) who propose >5/m² for suitable habitat
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds	Attribute and target based on spawning bed mapping by Inland Fisheries Ireland (IFI). Lampreys spawn in clean gravels (Rooney et al., 2013)
Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Many sites with suitable larval attributes, i.e. fine sediment in low velocity habitat, are found not to contain larval lamprey. This may be a function of chance or probability, or may be a consequence of insufficient recruitment to fill all spatial niches. JNCC (2005) recommended 66% positive sites at catchment level. Occupancy in excess of 50% of sites would be 'reasonable' for the Irish catchments examined to date. Target based on IFI (unpublished data) and Sugiyama and Goto (2002)

1106 Salmon *Salmo salar*

To maintain the favourable conservation condition of Atlantic Salmon in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment 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. There are no artificial barriers on the Cummeragh/Finglas, Caragh, Ferta and Flesk/Laune systems; there are a number of natural waterfall barriers
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. The Ferta is currently exceeding its CL and the Cummeragh, Caragh, and Flesk/Laune are currently exceeding both the 1 sea winter and multi sea winter 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	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*). Marine salmon farming takes place in Kenmare Bay into which the Cummeragh discharges. There are no marine salmon farms in the Caragh, Ferta and Flesk/Laune estuaries
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. Artificial barriers are not preventing salmon from accessing suitable spawning habitat in the Cummeragh/Finglas, Caragh, Ferta and Flesk/Laune systems
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)

1303 Lesser Horseshoe Bat *Rhinolophus hipposideros*

To maintain the favourable conservation condition of Lesser Horseshoe Bat in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population per roost	Number	Minimum number of 182 bats in winter for Roost ID 623; minimum number of 127 in winter and 358 in summer for Roost ID 505; minimum number of 176 in winter and 315 in summer for Roost ID 296; minimum number of 218 in summer for Roost ID 615. See map 10	Figures of 100 bats for summer roosts and 50 bats for winter roosts were set as the minimum qualifying standards (MQS) when SACs were being selected for lesser horseshoe bat (*Rhinolophus hipposideros*). NPWS conduct annual counts at each qualifying roost. Qualified means from the 2010-2016 data have been calculated whereby the year with the highest maximum count and the year with the lowest maximum count over that period were removed, and the mean of the remaining years was calculated. This mean is set as the target figure for the roost except where the figure falls below the MQS, then the MQS (100 or 50 as appropriate) is used as the target. Some structures may host qualifying winter roosts AND qualifying summer roosts, in which case separate targets have been set for each season using the summer and winter count data
Winter roosts	Condition	No decline	Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC has been selected for lesser horseshoe bats because of the presence of a number of internationally important winter roosts. Damage or disturbance to a roost or to the habitat immediately surrounding a roost will lead to a decline in its condition (Mitchell-Jones et al., 2007)
Summer roosts	Condition	No decline	Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC has been selected for lesser horseshoe bats because of the presence of a number of internationally important summer roosts. Damage or disturbance to a roost or to the habitat immediately surrounding a roost will lead to a decline in its condition (Kelleher and Marnell, 2006)
Number of auxillary roosts	Number and condition	No decline	Lesser horseshoe bat populations will use a variety of roosts during the year besides the main summer maternity and winter hibernation roosts. Such additional roosts within the SAC may be important as night roosts, satellite roosts, etc. In addition, in response to weather conditions for example, bats may use different seasonal roosts from year to year; this is particularly noticeable in winter. Several other winter and summer roosts that support lesser horseshoe bats, but at numbers below the MQS figures, are known from this SAC. A database of all known lesser horseshoe roosts is available on the National Biodiversity Data Centre website. NB further unrecorded roosts may also be present within this SAC
Extent of potential foraging habitat	Hectares	No significant decline	Lesser horseshoe bats normally forage in woodlands/scrub within 2.5km of their roosts (Schofield, 2008). See map 10 which shows a 2.5km zone around the above named roosts and identifies potential foraging grounds
Linear features	Kilometres	No significant loss, within 2.5km of qualifying roosts. See map 10	This species follows commuting routes from its roost to its foraging grounds. Lesser horseshoe bats will not cross open ground. Consequently, linear features such as hedgerows, treelines and stone walls provide vital connectivity for this species, most importantly within 2.5km around each roost (Schofield, 2008)

Light pollution	Lux	No significant increase in artificial light intensity adjacent to named roosts or along commuting routes within 2.5km of those roosts. See map 10	Lesser horseshoes are very sensitive to light pollution and will avoid brightly lit areas. Inappropriate lighting around roosts may cause abandonment; lighting along commuting routes may cause preferred foraging areas to be abandoned, thus increasing the energetic cost for bats (Schofield, 2008)

1355 Otter *Lutra lutra*

To maintain the favourable conservation condition of Otter in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment 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 1,936.8ha along river banks/lake shoreline/ around ponds	No field survey. Areas mapped to include 10m terrestrial buffer along shorelines and river banks identified as critical for otters (NPWS, 2007)
Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 1,246.2km	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 2,710.3ha	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 11	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

1421 Killarney Fern *Trichomanes speciosum*

To maintain the favourable conservation condition of Killarney Fern in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment 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	As its common name indicates, the Killarney area of Co. Kerry is an important location for this species, which formerly occurred at several sites here and elsewhere to the south-west in such abundance as to form a local tourist attraction. However, it became a favourite of Victorian-era fern enthusiasts and consequently plants were removed from many sites, resulting in considerable losses. The species was not entirely eradicated, however, and persisted at many locations within the SAC, particularly in remoter areas and more inaccessible situations. Since 1960 there have been confirmed records from sites within the SAC in eight hectads: V56, V66, V67, V68, V77, V88, V97 and V98; a record from a further hectad, V58, requires confirmation. The species has not been recorded from V78 since 1844. Exact locations are not mapped here on account of the threat posed by illegal collecting. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Number of populations	Number	No decline, subject to natural processes	20 confirmed populations of the species have been recorded in the SAC since 1960. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Number of colonies	Number	No decline, subject to natural processes	52 colonies of the species have been identified in the 20 confirmed populations recorded in the SAC since 1960. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Population: life-cycle stage	Type (sporophyte or gametophyte)	Maintain life-cycle stage composition of populations, subject to natural processes	31 of the 52 colonies recorded since 1960 are composed of sporophytes (frond stage), of which 12 have co-existing gametophytes (filamentous stage), and 21 are of gametophytes only. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Population size: area of occupancy	Square metres	No decline, subject to natural processes	Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Population size: living sporophyte fronds	Number	No decline, subject to natural processes	Based on Ní Dhúill et al. (2015), NPWS (2013) 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 populations in the SAC. Based on Ní Dhúill et al. (2015), NPWS (2013) 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 been recorded from populations in the SAC. Based on Ní Dhúill et al. (2015), NPWS (2013) 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 been recorded from populations in the SAC. Based on Ní Dhúill et al. (2015), NPWS (2013) 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 (filamentous) stage can grow in drier areas that do not suit the sporophyte. Based on Ní Dhúill et al. (2015), NPWS (2013) 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), NPWS (2013) 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), NPWS (2013) 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), NPWS (2013) 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 the SAC in both woodland and open upland sites. Based on Ní Dhúill et al. (2015), NPWS (2013) 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, in particular, with regard to maintenance of sufficient canopy cover. The species occurs in the SAC in both woodland and open upland sites. Based on Ní Dhúill et al. (2015), NPWS (2013) 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 *T. speciosum*	In order to avoid negative impacts on *Trichomanes speciosum*, 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), NPWS (2013) and NPWS internal files

1833 Slender Naiad *Najas flexilis*

To maintain the favourable conservation condition of Slender Naiad in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC, which is defined by the following list of attributes and targets:

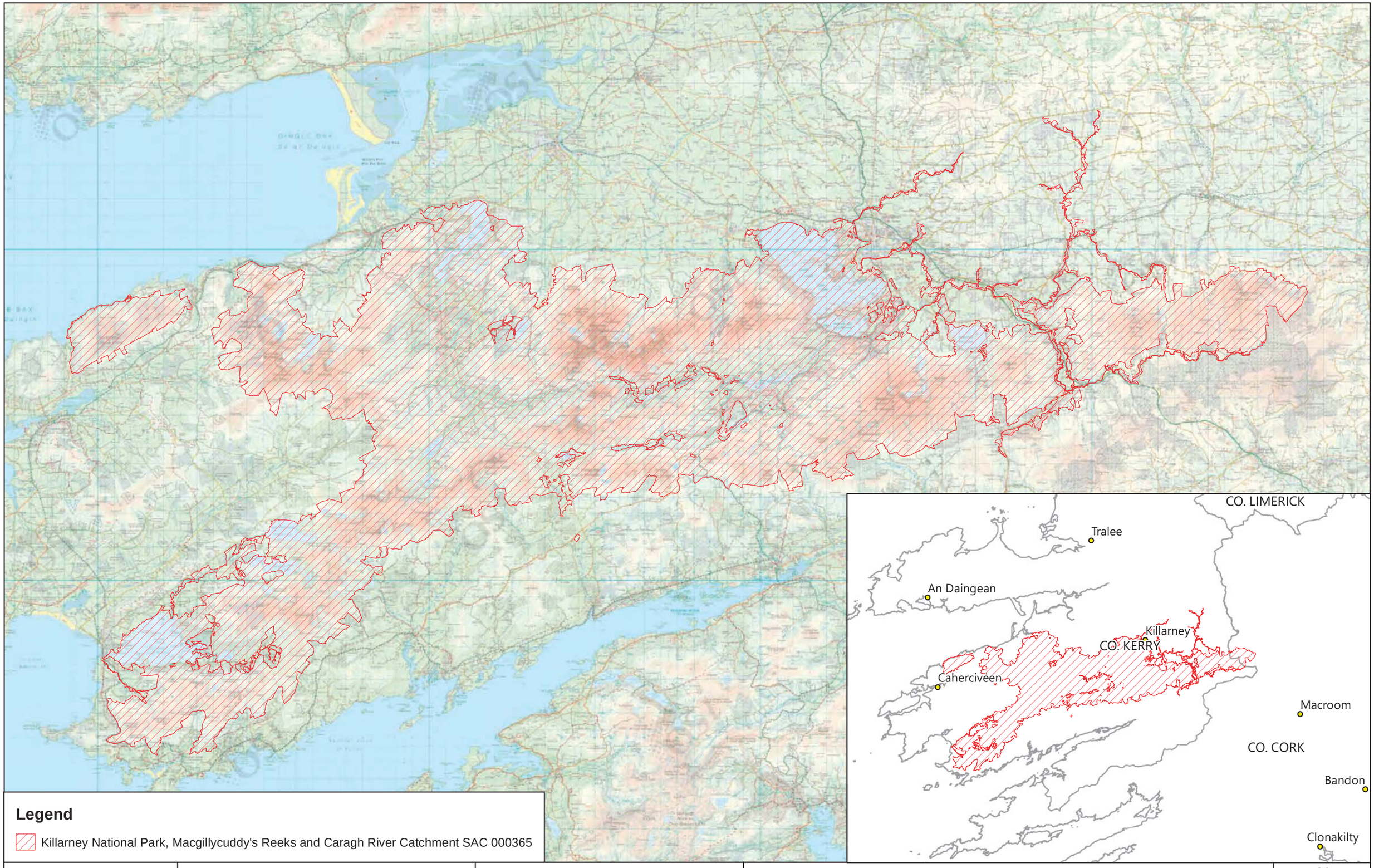
Attribute	Measure	Target	Notes
Population extent	Hectares; distribution	No change to the spatial extent of *Najas flexilis* within the lakes, subject to natural processes. See map 12 for known locations	The selection of Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC for *Najas flexilis* (slender naiad) was based on its presence in Loughs Acoose, Caragh, Leane, the Upper Lake and The Long Range. Records for *Najas flexilis* in Lough Adoolig and Muckross Lake have been rejected (Roden and Murphy, 2014). See the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC conservation objectives supporting document for *Najas flexilis* for further details
Population depth	Metres	No change to the depth range of *Najas flexilis* within the lakes, subject to natural processes	See the *Najas flexilis* supporting document for further details
Population viability	Plant traits	No decline in plant fitness, subject to natural processes	See the *Najas flexilis* supporting document for further details
Population abundance	Square metres	No change to the cover abundance of *Najas flexilis*, subject to natural processes	See the *Najas flexilis* supporting document for further details
Species distribution	Occurrence	No decline, subject to natural processes	See the *Najas flexilis* supporting document for further details
Habitat extent	Hectares	No decline, subject to natural processes	See the *Najas flexilis* supporting document for further details
Hydrological regime: water level fluctuations	Metres	Maintain appropriate natural hydrological regime necessary to support the habitat for the species	See the *Najas flexilis* supporting document for further details
Lake substratum quality	Various	Maintain appropriate substratum type, extent and chemistry to support the populations of the species	See the *Najas flexilis* supporting document for further details
Water quality	Various	Maintain/restore appropriate water quality to support the populations of the species	See the *Najas flexilis* supporting document for further details
Acidification status	pH units; mg/l	Maintain appropriate water and sediment pH, alkalinity and cation concentrations to support the populations of *Najas flexilis*, subject to natural processes	See the *Najas flexilis* supporting document for further details
Water colour	mg/l PtCo	Maintain appropriate water colour to support the populations of *Najas flexilis*	See the *Najas flexilis* supporting document for further details
Associated species	Species composition and abundance	Maintain appropriate associated species and vegetation communities to support the populations of *Najas flexilis*	See the *Najas flexilis* supporting document for further details

Fringing habitat: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the populations of *Najas flexilis*	See the *Najas flexilis* supporting document for further details

5046 Killarney Shad *Alosa fallax killarnensis*

To restore the favourable conservation condition of Killarney shad in Killarney National Park, Macgillacuddy's Reeks and Caragh River Catchment SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Occurrence	Widespread recording during appropriate fish sampling operations (e.g. netting, hydroacoustics); access into inflowing and outflowing rivers for potential spawning migrations	Killarney shad (*Alosa fallax killarnensis*) is unique to Lough Leane (Coscia et al., 2013), which lies within Killarney National Park. Macgillacuddy's Reeks and Caragh River Catchment SAC. The species is listed as Vulnerable (D2) in the Irish red list (King et al., 2011), based on the species' restricted distibution and area of occupancy
Population structure: age classes	Number of age classes	Full range of age classes present	Inland Fisheries Ireland (IFI) surveys for Water Framework Directive (WFD) purposes (Kelly et al., 2012, 2015) indicate on-going occurrence of this species, as well as recruitment to adult size. Trials with pelagic netting indicated a range of age classes when sampled in May 2014, including fish spawned in May 2013 (IFI, unpublished data)
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning habitats	Anecdotal reports indicate that spawning occurs on gravelled shores of the islands at and west of Ross Bay, as well as along the eastern shoreline of Castle Bay
Water quality: oxygen levels	Milligrammes per litre	No lower than 5mg/l	Attribute and target based on Maas et al. (2008). IFI surveys of 2008, 2011 and 2014 all allocated a WFD 'good' status in the context of the fish Ecological Quality Ratio (EQR) (Kelly et al., 2015). Note that the conservation objectives for the lake habitats 3110 and 3130 require WFD 'high' status targets to be met
Spawning habitat quality: filamentous algae; macrophytes; sediment	Occurrence	Maintain stable gravel substrate with very little fine material, free of filamentous algal (macroalgae) growth and macrophyte (rooted higher plants) growth	Habitat quality not assessed. Considered satisfactory in terms of any algal accumulations, given the overall 'good' status for WFD is allocated to the lake. Considered satisfactory in terms of gravel composition and low levels of fine sediment accumulations in gravel bed areas due to the exposed nature of the site to wave action. However, note that the conservation objectives for the lake habitats 3110 and 3130 require WFD 'high' status targets to be met



Legend

Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC 000365

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MAP 1:
KILLARNEY NATIONAL PARK, MACGILLYCUDDY'S REEKS AND CARAGH REEKS RIVER CATCHMENT SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

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

SITE CODE:
SAC 000365; version 3. CO. KERRY / CO. CORK.

0 3 6 9 12 km

N

Map Version 1
Date: Aug 2017

SAC 002170

SAC 002170

SAC 002170

SAC 002170

SPA 000343

SPA 004029

SAC 000365

SPA 004038

SAC 002173

SPA 004154

SAC 000335

Legend

- Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC 000365
- Blackwater River (Kerry) SAC 002173
- Blackwater River (Cork/Waterford) SAC 002170
- Castlemaine Harbour SAC 000343
- Ballinskelligs Bay and Inny Estuary SAC 000335
- Killarney National Park SPA 004038
- Castlemaine Harbour SPA 004029
- Iveragh Peninsula SPA 004154

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MAP 2:
KILLARNEY NATIONAL PARK, MACGILLYCUDDY'S REEKS AND CARAGH REEKS RIVER CATCHMENT SAC
CONSERVATION OBJECTIVES
ADJACENT / ADJOINING AND OVERLAPPING DESIGNATIONS

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

SITE CODE: SAC 000365; version 3. SAC 000335; version 3. SAC 000343; version 3.01. SAC 002170; version 3.01. SAC 002173; version 3. SPA 004029; version 3. SPA 004038; version 3. SPA 004154; version 3
CO. KERRY / CO. CORK / CO. WATERFORD.

0 8 16 24 32 km

N

Map Version 1
Date: Aug 2017

Lough Caragh
Lough Leane
Lough Acoose
Muckross Lake
Lough Guitane
Upper Lake
Cloon Lough
Loch Dhoire Ianna
Lough Currane

Legend

Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC 000365

OSi Discovery Series County Boundary

Indicative Lake Habitats

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

3110 / 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

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MAP 3:
KILLARNEY NATIONAL PARK, MACGILLYCUDDY'S REEKS AND CARAGH REEKS RIVER CATCHMENT SAC
CONSERVATION OBJECTIVES
INDICATIVE LAKE HABITATS

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

SITE CODE:
SAC 000365; version 3. CO. KERRY / CO. CORK.

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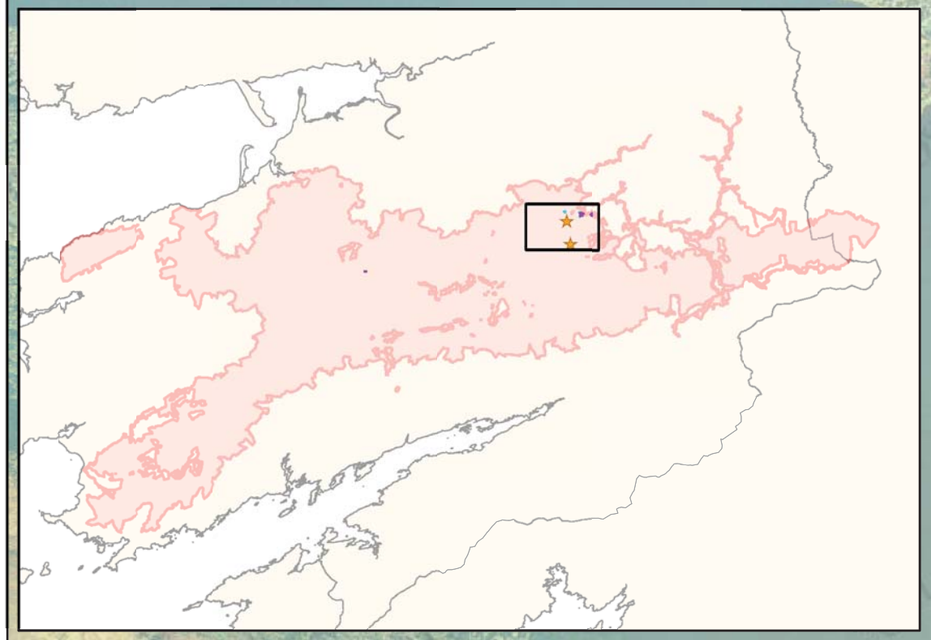
N

Map Version 1
Date: Aug 2017



KNP Habitat Survey

ISGS Site ID: 2403

ISGS Site ID: 2403

ISGS Site ID: 2403

ISGS Site ID: 2403

Legend

- 6130 Calaminarian grasslands of the *Violetalia calaminariae*
- 6410 Molinia meadows on calcareous, peaty or clayey-silt-laden soils *Molinion caeruleae*
- Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC 000365
- ISGS Survey Site Boundaries

Ordnance Survey Ireland

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MAP 4:
KILLARNEY NATIONAL PARK, MACGILLYCUDDY'S REEKS AND CARAGH REEKS RIVER CATCHMENT SAC
CONSERVATION OBJECTIVES
GRASSLAND HABITATS

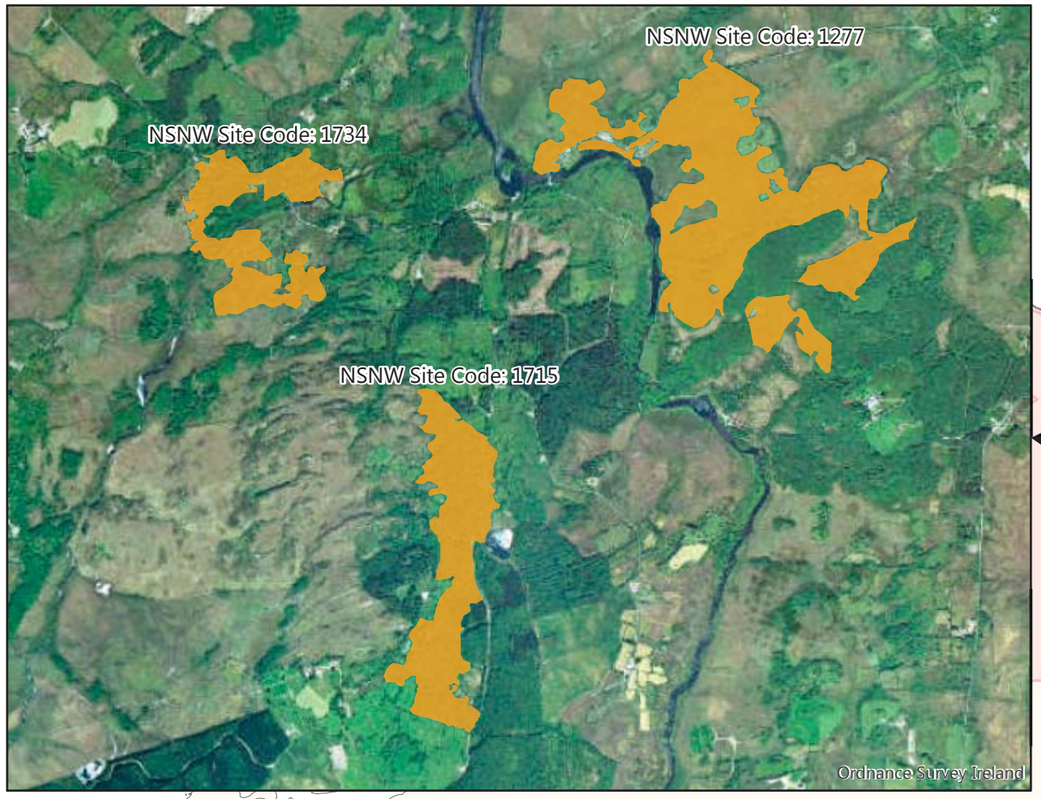
Map to be read in conjunction with the NPWS Conservation Objectives Document.

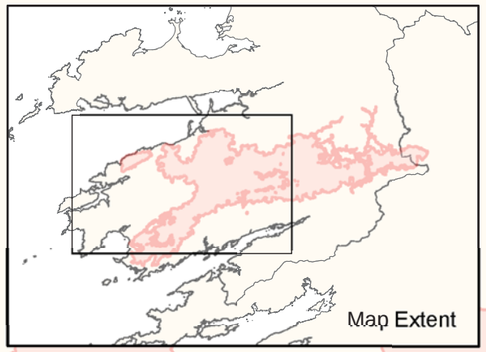
SITE CODE:
SAC 000365; version 3. CO. KERRY / CO. CORK.

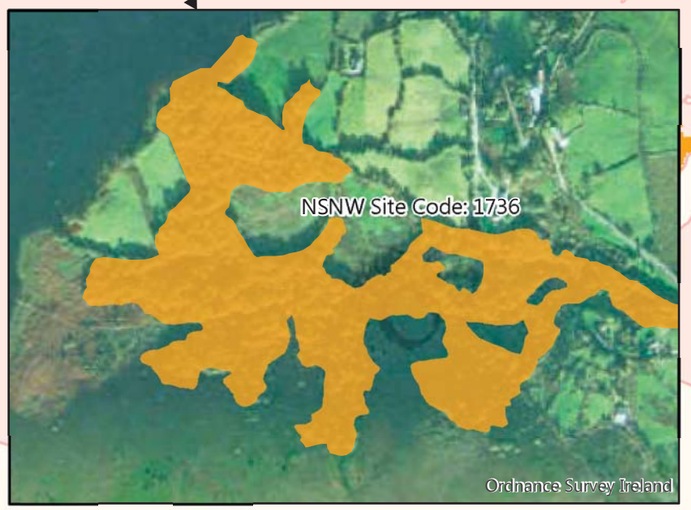
0 0.2 0.4 0.6 0.8 1 km

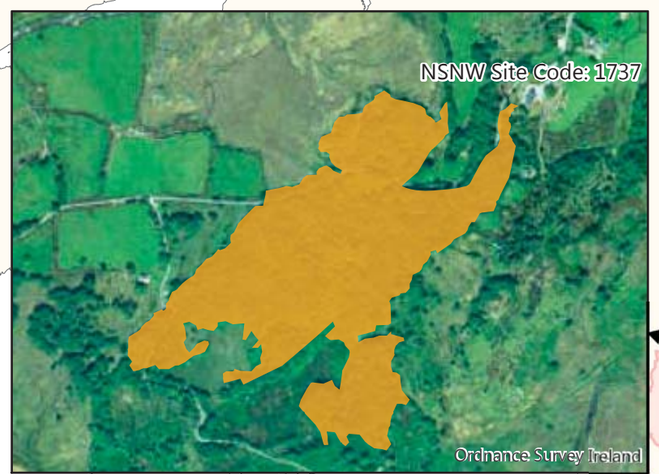
N

Map Version 1
Date: Aug 2017









Legend

- Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC 000365
- OSi Discovery Series County Boundary

Qualifying Interests

- 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*)
- 91J0 *Taxus baccata* woods of the British Isles

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

MAP 5:
KILLARNEY NATIONAL PARK, MACGILLYCUDDY'S REEKS AND CARAGH REEKS RIVER CATCHMENT SAC
CONSERVATION OBJECTIVES
WOODLAND HABITATS - WEST

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

SITE CODE:
SAC 000365; version 3. CO. KERRY / CO. CORK.

0 2 4 6 8 km

N

Map Version 1
Date: Aug 2017

Legend

- Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC 000365
- OSi Discovery Series County Boundary
- National Survey of Nativel Woodlands Survey Site Boundaries

Qualifying Interests

- 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*)
- 91J0 *Taxus baccata* woods of the British Isles

NSNW Site Code: 1288

NSNW Site Code: 1289

NSNW Site Code: 1291

NSNW Site Code: 1495

NSNW Site Code: 1495

NSNW Site Code: 1292

NSNW Site Code: 1290

NSNW Site Code: 2013

Map Extent

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Department of Culture, Heritage and the Gaeltacht

MAP 6:
KILLARNEY NATIONAL PARK, MACGILLYCUDDY'S REEKS AND CARAGH REEKS RIVER CATCHMENT SAC
CONSERVATION OBJECTIVES
WOODLAND HABITATS - EAST

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

SITE CODE:
SAC 000365; version 3. CO. KERRY / CO. CORK.

0 0.5 1 1.5 2 km

N

Map Version 1
Date: Aug 2017

Legend

- 1024 Kerry Slug *Geomalacus maculosus* 1 km Grid Squares
- Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC 000365
- OSi Discovery Series County Boundary

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Department of Culture, Heritage and the Gaeltacht

MAP 7:
KILLARNEY NATIONAL PARK, MACGILLYCUDDY'S REEKS AND CARAGH REEKS RIVER CATCHMENT SAC
CONSERVATION OBJECTIVES
KERRY SLUG

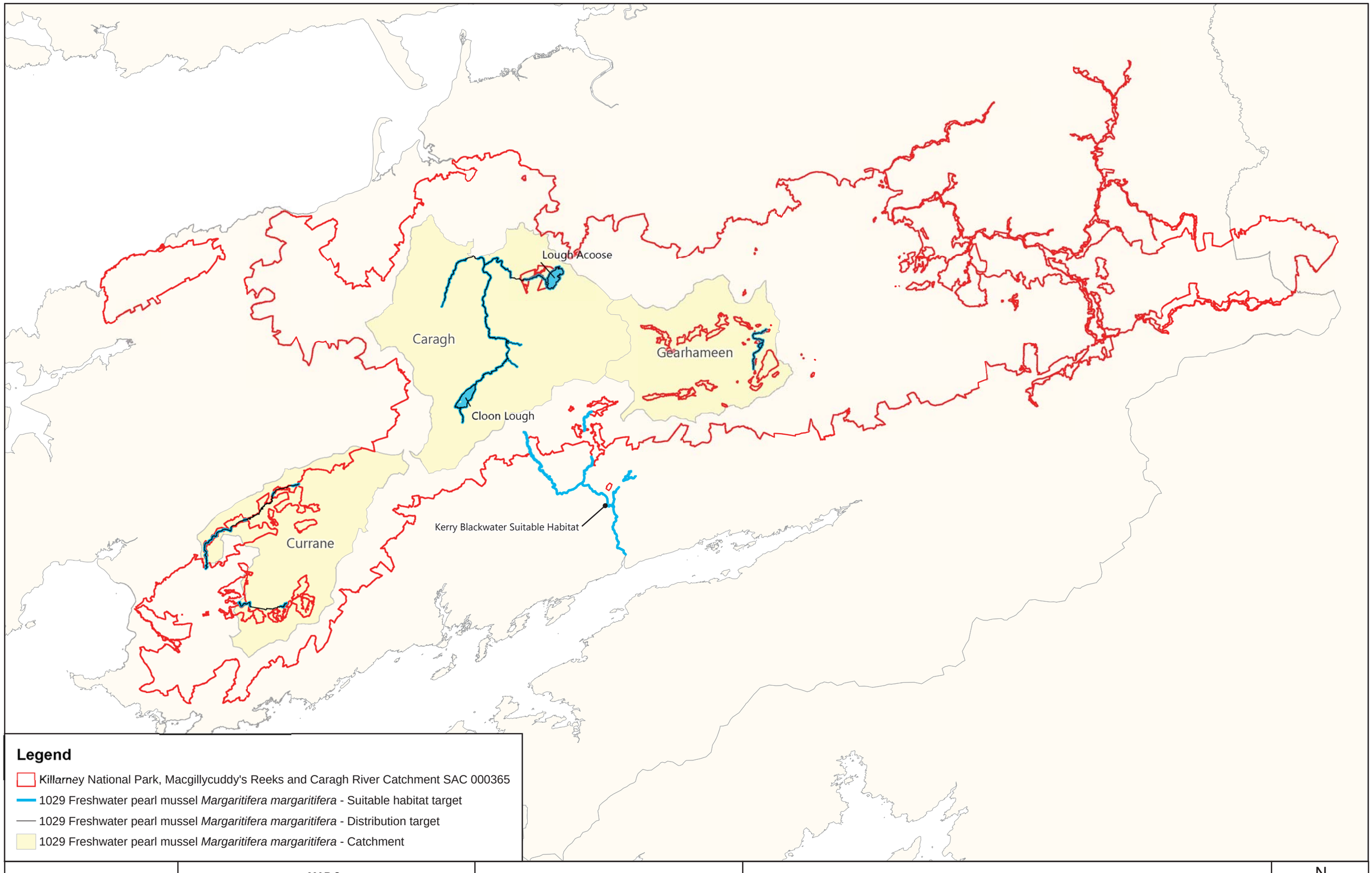
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000365; version 3. CO. KERRY / CO. CORK.

0 3 6 9 12 km

N

Map Version 1
Date: Aug 2017



Legend

- Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC 000365
- 1029 Freshwater pearl mussel *Margaritifera margaritifera* - Suitable habitat target
- 1029 Freshwater pearl mussel *Margaritifera margaritifera* - Distribution target
- 1029 Freshwater pearl mussel *Margaritifera margaritifera* - Catchment

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Department of Culture, Heritage and the Gaeltacht

MAP 8:
KILLARNEY NATIONAL PARK, MACGILLYCUDDY'S REEKS AND CARAGH REEKS RIVER CATCHMENT SAC CONSERVATION OBJECTIVES FRESHWATER PEARL MUSSEL

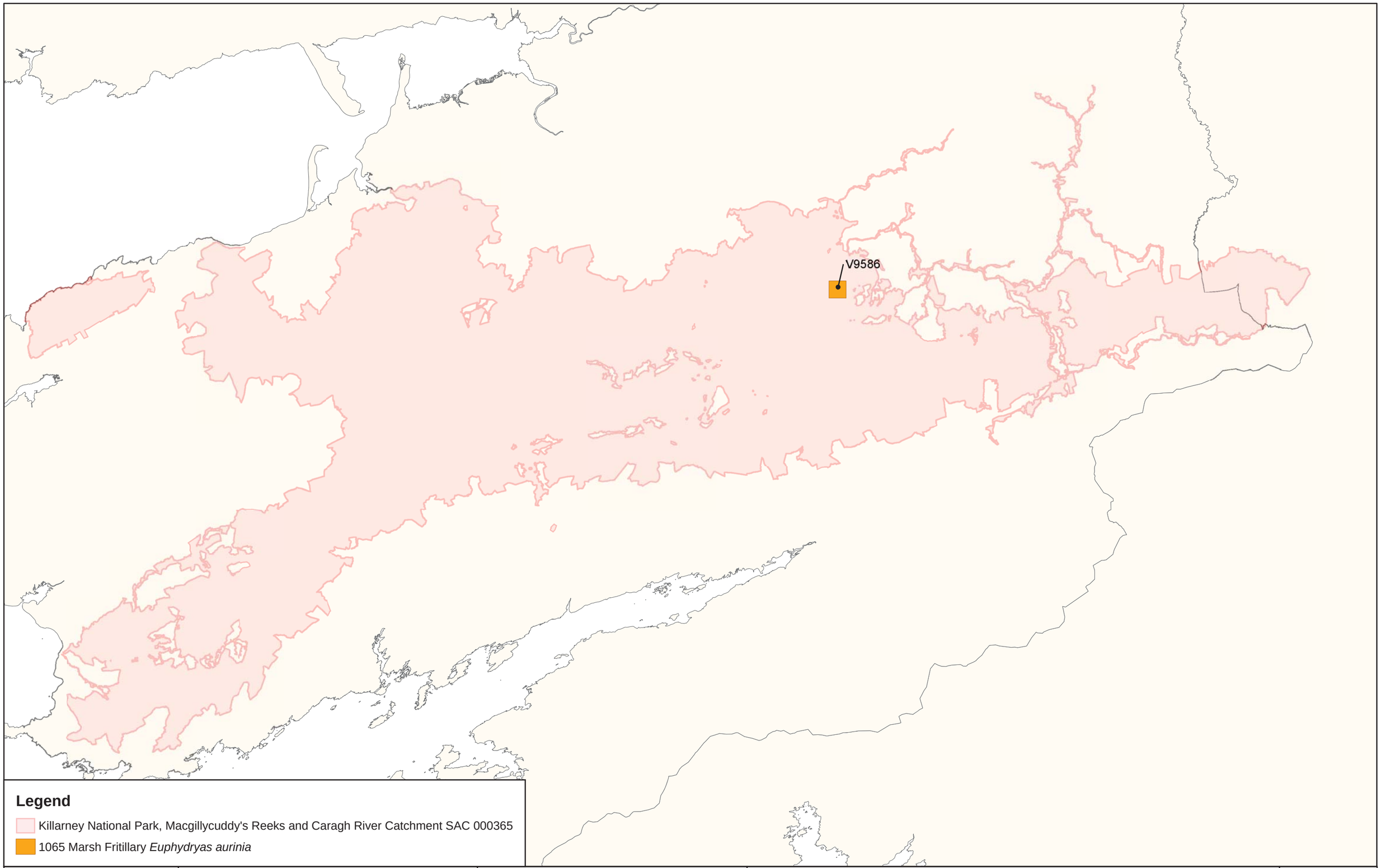
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000365; version 3. CO. KERRY / CO. CORK.

0 3 6 9 12 km

N

Map Version 1
Date: Aug 2017



Legend

Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC 000365

1065 Marsh Fritillary *Euphydryas aurinia*

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Department of Culture, Heritage and the Gaeltacht

MAP 9:
KILLARNEY NATIONAL PARK, MACGILLYCUDDY'S REEKS AND CARAGH REEKS RIVER CATCHMENT SAC
CONSERVATION OBJECTIVES
MARSH FRITILLARY

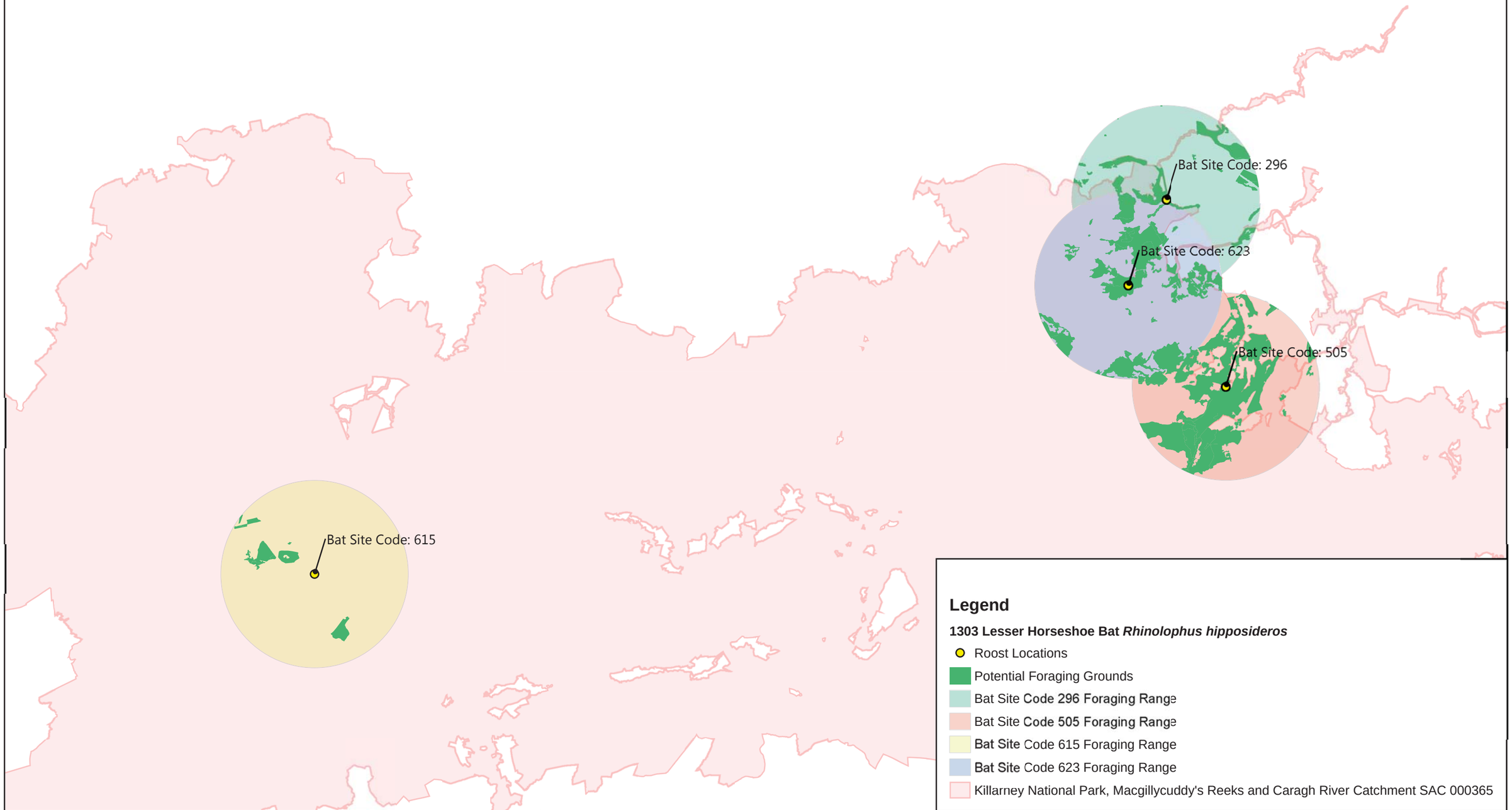
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000365; version 3. CO. KERRY / CO. CORK.

0 2 4 6 8 10 km

N

Map Version 1
Date: Aug 2017



Legend

1303 Lesser Horseshoe Bat *Rhinolophus hipposideros*

- Roost Locations
- Potential Foraging Grounds
- Bat Site Code 296 Foraging Range
- Bat Site Code 505 Foraging Range
- Bat Site Code 615 Foraging Range
- Bat Site Code 623 Foraging Range
- Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC 000365

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

MAP 10:
KILLARNEY NATIONAL PARK, MACGILLYCUDDY'S REEKS AND CARAGH REEKS RIVER CATCHMENT SAC
CONSERVATION OBJECTIVES
LESSER HORSESHOE BAT

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

SITE CODE:
SAC 000365; version 3. CO. KERRY / CO. CORK.

0 1 2 3 4 5 km

N

Map Version 1
Date: Aug 2017

Legend

Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC 000365

1355 Otter *Lutra lutra* Commuting 250m Buffer

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Department of Culture, Heritage and the Gaeltacht

MAP 11:
KILLARNEY NATIONAL PARK, MACGILLYCUDDY'S REEKS AND CARAGH REEKS RIVER CATCHMENT SAC
CONSERVATION OBJECTIVES
OTTER

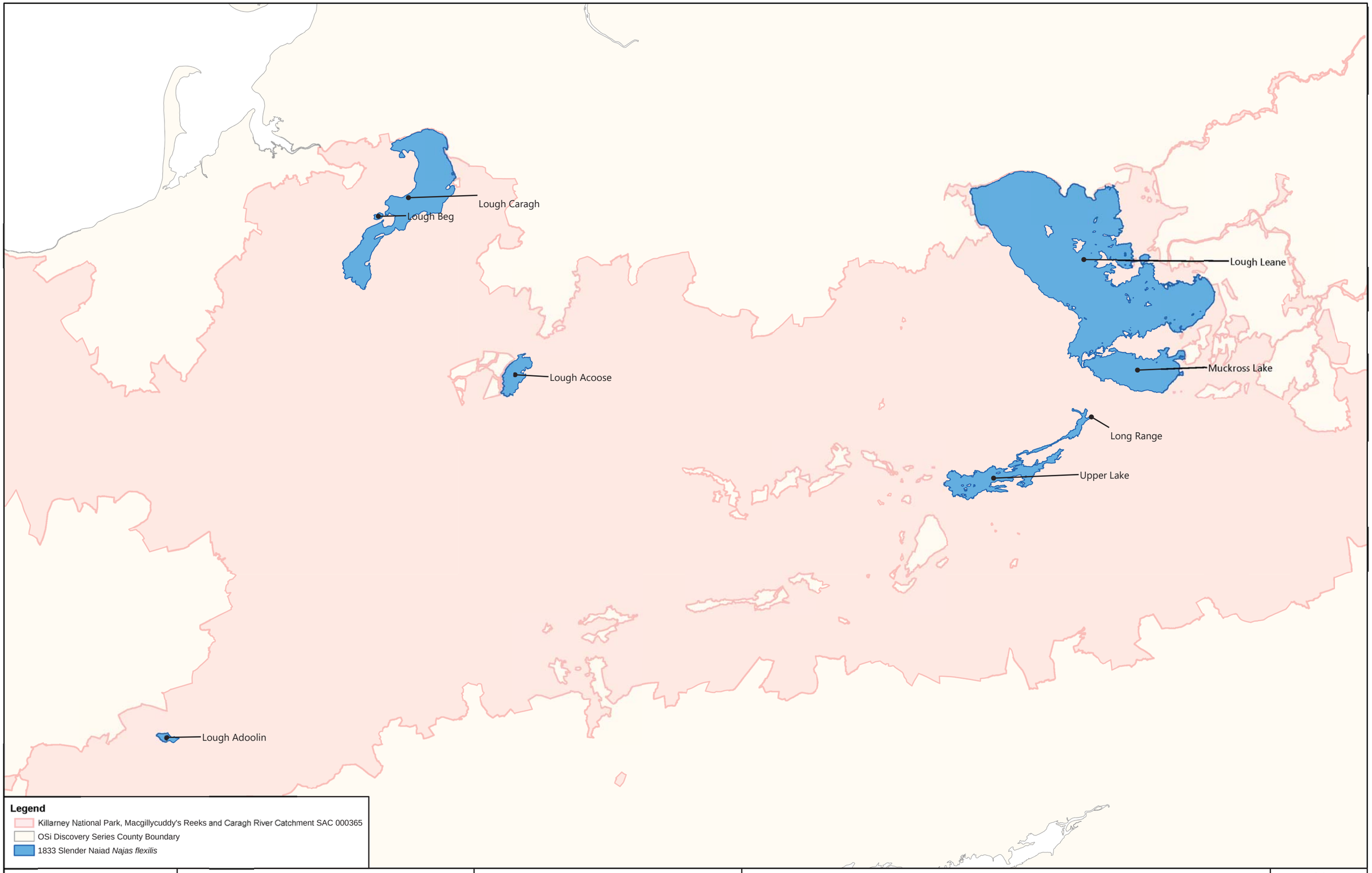
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000365; version 3. CO. KERRY / CO. CORK.

0 3 6 9 12 km

N

Map Version 1
Date: Aug 2017



Legend

- Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC 000365
- OSi Discovery Series County Boundary
- 1833 Slender Naiad *Najas flexilis*

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Department of Culture, Heritage and the Gaeltacht

MAP 12:
KILLARNEY NATIONAL PARK, MACGILLYCUDDY'S REEKS AND CARAGH REEKS RIVER CATCHMENT SAC
CONSERVATION OBJECTIVES
SLENDER NAIAD

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

SITE CODE:
SAC 000365; version 3. CO. KERRY / CO. CORK.

0 3 6 9 12 km

N

Map Version 1
Date: Aug 2017

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Sheheree (Ardagh) Bog SAC 000382

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,

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Citation:

NPWS (201p) Conservation Objectives: Sheheree (Ardagh) Bog SAC 000382. Version 1. National Parks and Wildlife Service, Department of Arts, 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***

000382	Sheheree (Ardagh) Bog SAC
7110	Active raised bogs*
7120	Degraded raised bogs still capable of natural regeneration

Supporting documents, relevant reports & publications

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

NPWS Documents

Year :	2014
Title :	Raised Bog Monitoring and Assessment Survey 2013
Author :	Fernandez, F.; Connolly K.; Crowley W.; Denyer J.; Duff K.; Smith G.
Series :	Irish Wildlife Manual No. 81
Year :	2014
Title :	Sheheree Bog (SAC 000382), Co. Kerry, Site Report
Author :	Fernandez, F.; Connolly, K.; Crowley, W.; Denyer J.; Duff K.; Smith G.
Series :	Raised bog monitoring and assessment survey 2013
Year :	2014
Title :	National raised bog SAC management plan
Author :	Department of Arts, Heritage and the Gaeltacht
Series :	Draft for consultation. 15 January 2014
Year :	2015
Title :	Sheheree (Ardagh) Bog SAC (site code 382) Conservation objectives supporting document-raised bog habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

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 :	2014
Title :	Nitrogen deposition and exceedance of critical loads for nutrient nitrogen in Irish grasslands
Author :	Henry, J.; Aherne, J.
Series :	Science of the Total Environment 470–471: 216–223

Spatial data sources

Year :	2014
Title :	Scientific Basis for Raised Bog Conservation in Ireland
GIS Operations :	RBSB13_SACs_ARB_DRB dataset, RBSB13_SACs_2012_HB dataset, RBSB13_SACs_DrainagePatterns_5k dataset and RBSB13_SAC_LIDAR_DTMs dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	potential 7110; digital elevation model; drainage patterns (maps 2 and 4)
Year :	2013
Title :	Raised Bog Monitoring and Assessment Survey 2013
GIS Operations :	RBMA13_ecotope_map dataset clipped to SAC boundary. Appropriate ecotopes selected and exported to new dataset. Expert opinion used as necessary to resolve any issues arising
Used For :	7110 ecotopes (map 3)

7110 Active raised bogs

To restore the favourable conservation condition of Active raised bogs in Sheheree (Ardagh) Bog SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Restore area of active raised bog to 4.9ha, subject to natural processes	Active Raised Bog (ARB) habitat was mapped at 4.1ha by Fernandez et al. (2014). Area of Degraded Raised Bog (DRB) on the High Bog (HB) has been modelled as 0.8ha. See map 2. It is estimated that this area is potentially restorable to ARB. The total potential ARB on the HB is therefore estimated to be 4.9ha. See raised bog supporting document for further details on this and following attributes
Habitat distribution	Occurrence	Restore the distribution and variability of active raised bog across the SAC. See map 3 for distribution in 2011	ARB habitat at Sheheree Bog is sub-central ecotope, active flush and bog woodland. DRB occurs in the southern part of the bog
High bog area	Hectares	No decline in extent of high bog necessary to support the development and maintenance of active raised bog. See map 2	The area of high bog within Sheheree Bog SAC in 2012 (latest figure available) was 6.4ha (DAHG 2014)
Hydrological regime: water levels	Centimetres	Restore appropriate water levels throughout the site	For ARB, mean water level needs to be near or above the surface of the bog lawns for most of the year. Seasonal fluctuations should not exceed 20cm, and should only be 10cm below the surface, except for very short periods of time
Hydrological regime: flow patterns	Flow direction; slope	Restore, where possible, appropriate high bog topography, flow directions and slopes. See map 4 for current situation	ARB depends on mean water levels being near or above the surface of bog lawns for most of the year. Long and gentle slopes are the most favourable to achieve these conditions. Changes to flow directions due to subsidence of bogs can radically change water regimes and cause drying out of high quality ARB
Transitional areas between high bog and adjacent mineral soils (including cutover areas)	Hectares; distribution	Restore adequate transitional areas to support/protect active raised bog and the services it provides	There is an interesting lagg zone around the entire margin of Sheheree Bog
Vegetation quality: central ecotope, active flush, soaks, bog woodland	Hectares	Restore 2.5ha of central ecotope/active flush/soaks/bog woodland as appropriate	At least 50% of ARB habitat should be high quality (i.e. central ecotope, active flush, soaks, bog woodland). Target area of active raised bog for the site has been set at 4.9ha (see area target above)
Vegetation quality: microtopograph-ical features	Hectares	Restore adequate cover of high quality microtopographical features	Low hummock and hollow, lawn and pool microtopography, and abundant Molinia caerulea tussocks, are well developed on Sheheree Bog
Vegetation quality: bog moss (*Sphagnum*) species	Percentage cover	Restore adequate cover of bog moss (*Sphagnum*) species to ensure peat-forming capacity	*Sphagnum* cover varies naturally across Ireland with relatively high cover in the east to lower cover in the west. Hummock forming species such as *Sphagnum austinii* are particularly good peat formers. *Sphagnum* cover and distribution also varies naturally across a site
Typical ARB species: flora	Occurrence	Restore, where appropriate, typical active raised bog flora	Typical flora species include widespread species, as well as those with more restricted distributions but typical of the habitat's subtypes or geographical range
Typical ARB species: fauna	Occurrence	Restore, where appropriate, typical active raised bog fauna	Typical fauna species include widespread species, as well as those with more restricted distributions but typical of the habitat's subtypes or geographical range

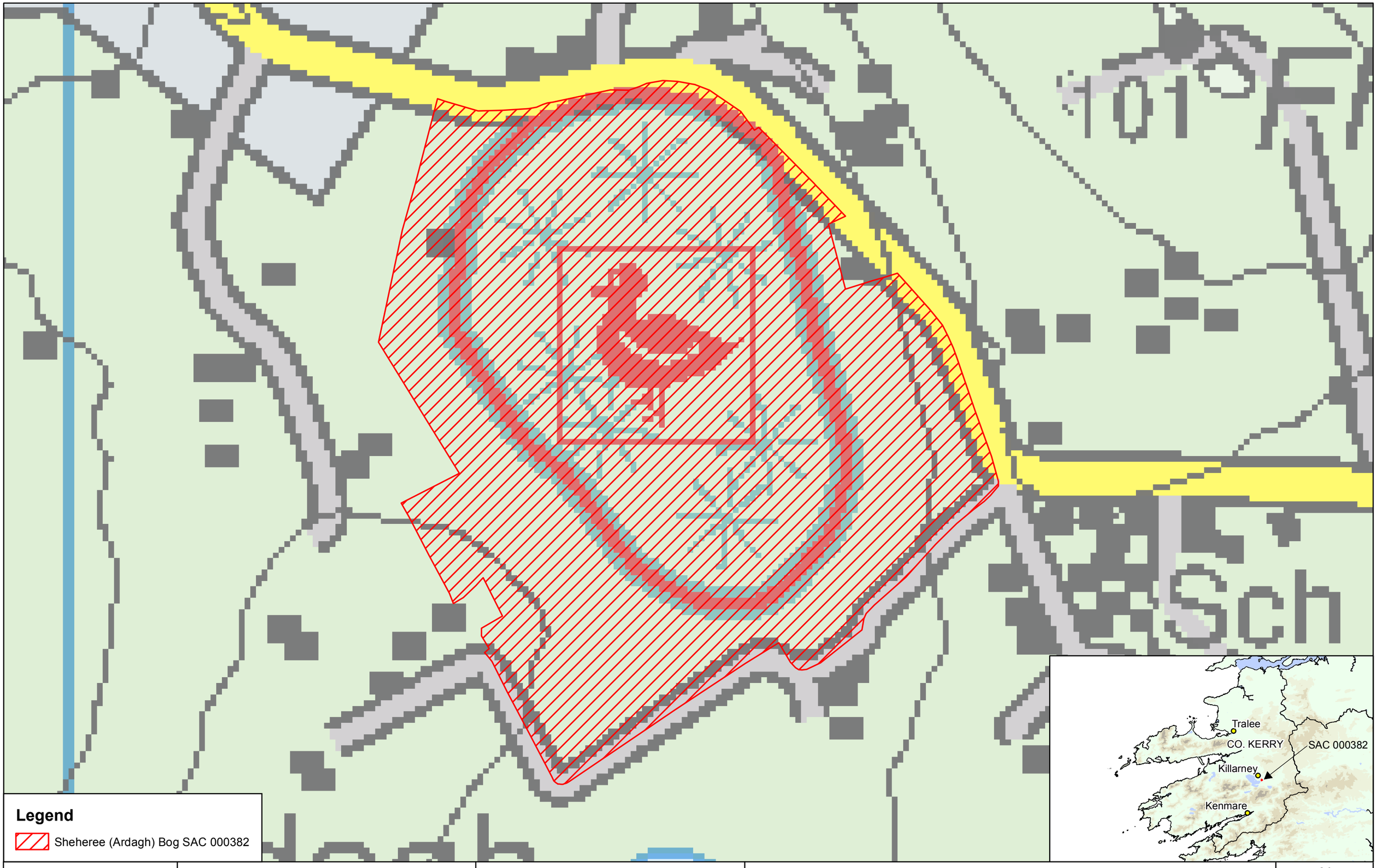
Elements of local distinctiveness	Occurrence	Maintain features of local distinctiveness, subject to natural processes	The lagg zone is the main feature of local distinctiveness in Sheheree Bog SAC. Areas of wet lagg vegetation such as this are very rare and the lagg system at Sheheree Bog is the best remaining example in the country
Negative physical indicators	Percentage cover	Negative physical features absent or insignificant	Negative physical indicators include: bare peat, algae dominated pools and hollows, marginal cracks, tear patterns, subsidence features such as dry mineral mounds /ridges emerging or expanding, and burning evidence
Vegetation composition: native negative indicator species	Percentage cover	Native negative indicator species at insignificant levels	Native negative indicator species that suggest drying out include abundant bog asphodel (*Narthecium ossifragum*), deergrass (*Trichophorum germanicum*) and harestail cotton-grass (*Eriophorum vaginatum*) forming tussocks; abundant magellanic bog-moss (*Sphagnum magellanicum*) in pools previously dominated by *Sphagnum* species typical of very wet conditions (e.g. feathery bog-moss (*S. cuspidatum*)). Indicators of frequent burning events include abundant *Cladonia floerkeana* and high cover of carnation sedge (*Carex panicea*) (particularly in true midlands raised bogs)
Vegetation composition: non-native invasive species	Percentage cover	Non-native invasive species at insignificant levels and not more than 1% cover	Most common non-native invasive species on raised bogs include lodgepole pine (*Pinus contorta*), rhododendron (*Rhododendron ponticum*), and pitcherplant (*Sarracenia purpurea*). Rhododendron has been identified as an issue on this bog
Air quality: nitrogen deposition	kg N/ha/year	Air quality surrounding bog close to natural reference conditions. The total N deposition should not exceed 5kg N/ha/yr	Change in air quality can result from fertiliser drift; adjacent quarry activities; or other atmospheric inputs. The critical load range for ombrotrophic bogs has been set as between 5 and 10kg N/ha/yr (Bobbink and Hettelingh, 2011). The latest N deposition figures for the area around Sheheree Bog suggests that the current level is approximately 11.4kg N/ha/yr (Henry and Aherne, 2014)
Water quality	Hydrochemical measure	Water quality on the high bog and transitional areas close to natural reference conditions	Water chemistry within raised bogs is influenced by atmospheric inputs (rainwater). However, within soak systems, water chemistry is influenced by other inputs such as focused flow or interaction with underlying substrates. Water chemistry in marginal areas and lagg zone surrounding the high bog varies due to influences of different water types (bog water, regional groundwater, and run-off from surrounding mineral lands)

Conservation Objectives for : Sheheree (Ardagh) Bog SAC [000382]

7120 Degraded raised bogs still capable of natural regeneration

The long-term aim for Degraded raised bogs still capable of natural regeneration is that its peat-forming capability is re-established; therefore, the conservation objective for this habitat is inherently linked to that of Active raised bogs (7110) and a separate conservation objective has not been set in Sheheree (Ardagh) Bog SAC

Attribute	Measure	Target	Notes



Legend

Sheheree (Ardagh) Bog SAC 000382

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

MAP 1:
SHEHEREE (ARDAGH) BOG SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

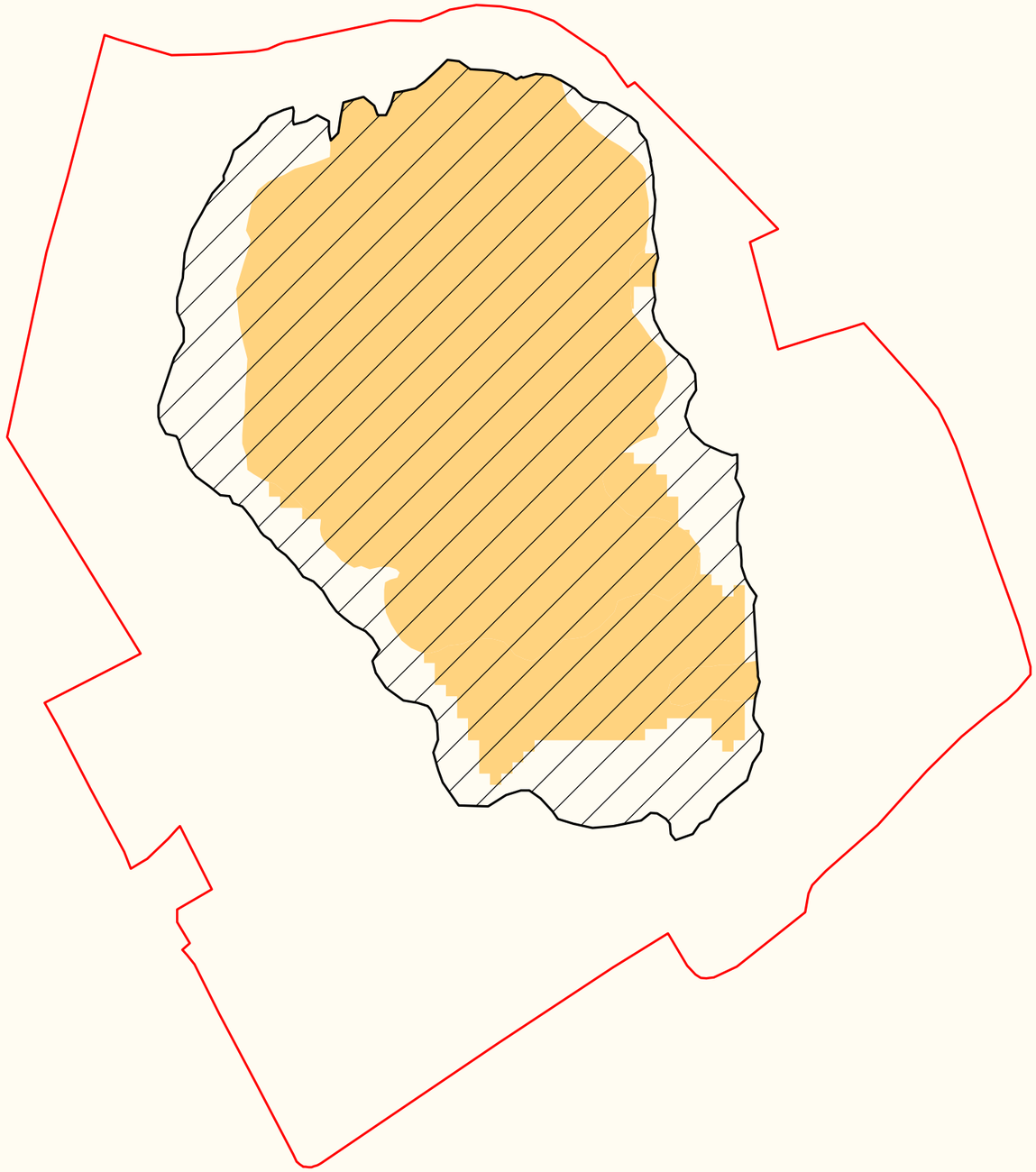
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000382; version 3.01. Co. Kerry

0 25 50 75 100 m

N

Map Version 1
Date: Nov 2015



Legend

- Sheheree (Ardagh) Bog SAC 000382
- High Bog Boundary
- Potential 7110 *Active Raised Bogs

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

MAP 2:
SHEHEREE (ARDAGH) BOG SAC
CONSERVATION OBJECTIVES
EXTENT OF POTENTIAL
ACTIVE RAISED BOGS

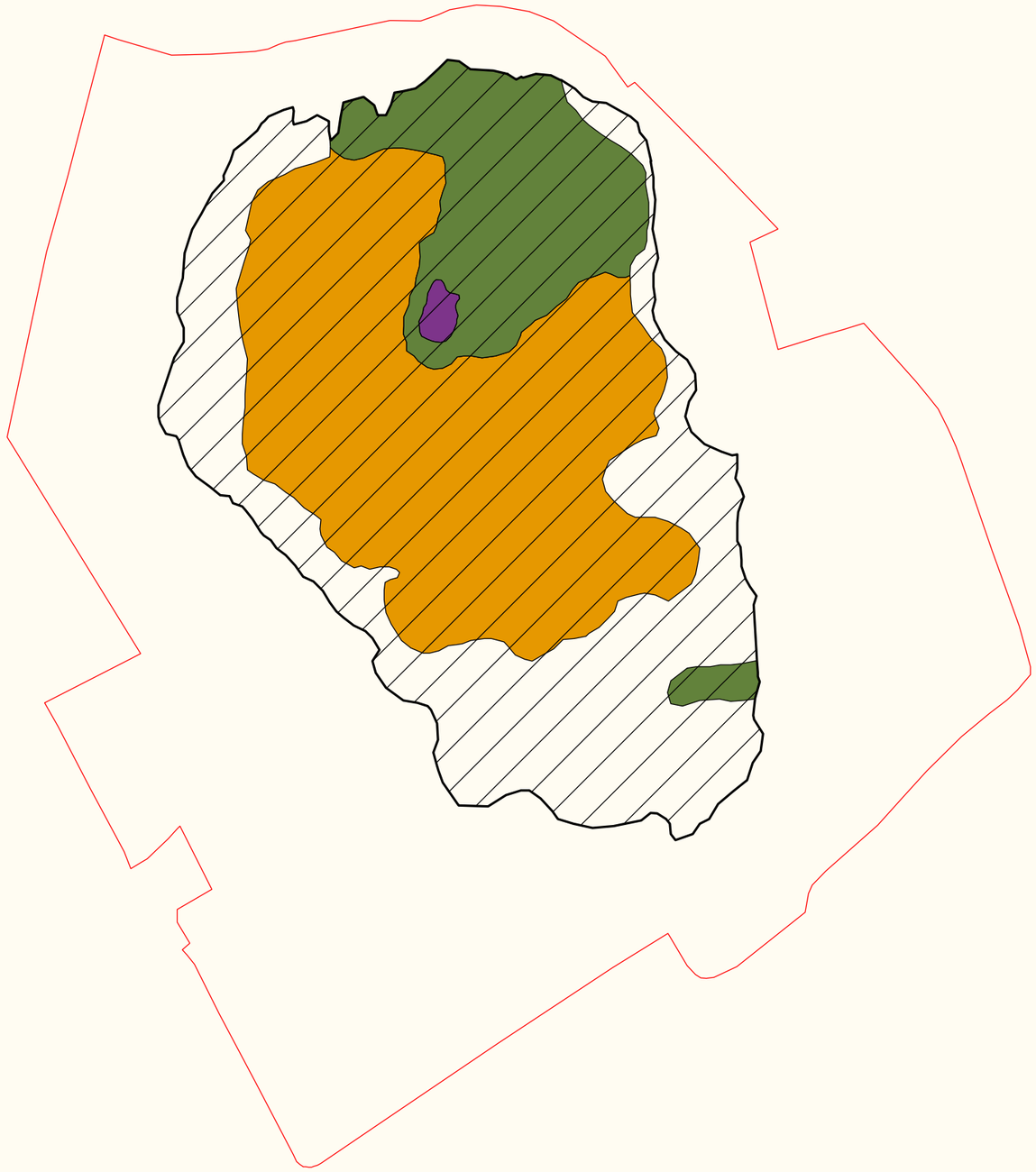
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000382; version 3.01. Co. Kerry

0 25 50 75 100 m

N

Map Version 1
Date: Nov 2015



Legend

- Sheheree (Ardagh) Bog SAC 000382
- High Bog Boundary

Active Raised Bog Ecotopes

- Bog Woodland
- Soaks / active flush
- Sub-central ecotope

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

MAP 3:
SHEHEREE (ARDAGH) BOG SAC
CONSERVATION OBJECTIVES
ACTIVE RAISED BOGS
ECOTOPES

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

SITE CODE:
SAC 000382; version 3.01. Co. Kerry

0 25 50 75 100 m

N

Map Version 1
Date: Nov 2015

Legend

- Sheheree (Ardagh) Bog SAC 000382
- High Bog Boundary
- Drainage Patterns
- Contours

Elevation

78.07 m

60.04 m

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Department of Arts, Heritage and the Gaeltacht

MAP 4:
SHEHEREE (ARDAGH) BOG SAC
CONSERVATION OBJECTIVES
RAISED BOG
DIGITAL ELEVATION MODEL
& DRAINAGE PATTERNS

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

SITE CODE:
SAC 000382; version 3.01. Co. Kerry

0 25 50 75 100 m

N

Map Version 1
Date: Nov 2015

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Derryclogher (Knockboy) Bog SAC 001873

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.

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E-mail: nature.conservation@ahg.gov.ie

Citation:

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Series Editor: Rebecca Jeffrey
ISSN 2009-4086

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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***

001873	Derryclogher (Knockboy) Bog 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

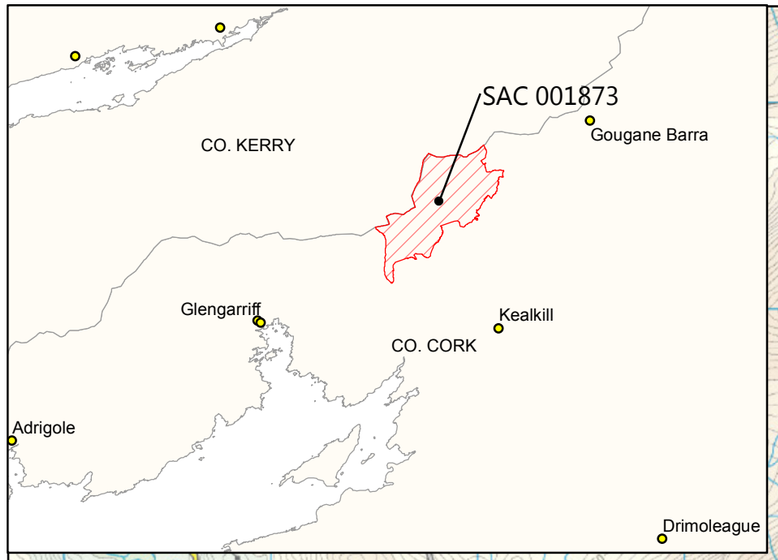
Year :	1991
Title :	Survey to locate mountain blanket bogs of scientific interest in Ireland
Author :	Mooney, E.; Goodwillie, R.; Douglas, C.
Series :	Unpublished report to NPWS
Year :	2006
Title :	Conservation Plan for 2006-2011. Derryclogher (Knockboy) Bog cSAC Site Code 001873 Co. Cork
Author :	NPWS
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 :	Derryclogher (Knockboy) Bog SAC (site code: 1873) Conservation objectives supporting document- blanket bog 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 Derryclogher (Knockboy) 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 Derryclogher (Knockboy) Bog SAC but from current available data the total area of the qualifying habitat is estimated to be approximately 185ha, covering 11% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Derryclogher (Knockboy) Bog 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 on a series of shelves within the SAC. Larger expanses occur in the Borlin Valley, to the north-east of the Knockboy summit and to the south of Curramore Lough (NPWS, 2006). Further information can be found within Mooney et al. (1991), NPWS (2006) 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	Mooney et al. (1991) recorded a variety of blanket bog vegetation communities in this SAC, 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: 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 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 and no decline in status of hepatic mats associated with this 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 and Near Threatened bog orchid (*Hammarbya paludosa*) (Wyse Jackson et al., 2016) from the Knockboy area (NPWS internal files). However, this species cannot be assigned specifically to the SAC or blanket bog habitat. Hepatic mats were recorded from blanket bog in the SAC by Mooney et al. (1991)



Legend

Derryclogher (Knockboy) Bog SAC 001873

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

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

MAP 1:
DERRYCLOGHER (KNOCKBOY) BOG SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

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

SITE CODE:
SAC 001873; version 3.02
CO. CORK

0 0.5 1 1.5 2 km

N

Map Version 1
Date: March 2017

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Mullaghanish Bog SAC 001890

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: Mullaghanish Bog SAC 001890. 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***

001890	Mullaghanish Bog 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

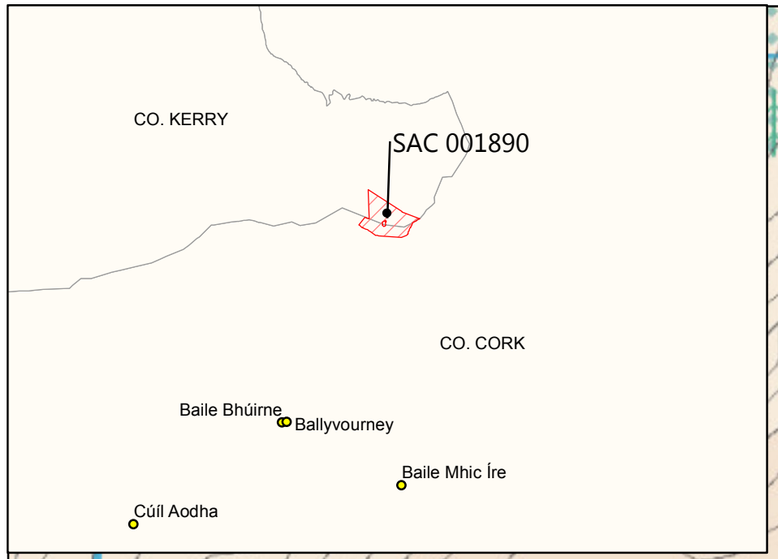
Year :	1991
Title :	Survey to locate mountain blanket bogs of scientific interest in Ireland
Author :	Mooney, E.; Goodwillie, R.; Douglas, C.
Series :	Unpublished report to NPWS
Year :	2012
Title :	Ireland Red List No. 8: Bryophytes
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	Ireland Red 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 :	Mullaghanish Bog SAC (site code: 1890) Conservation objectives supporting document-blanket bog 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 Mullaghanish 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 Mullaghanish Bog SAC but from current available data the total area of the qualifying habitat is estimated to be approximately 34ha, covering 49% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Mullaghanish 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 throughout the SAC but is best developed close to the summit (Mooney et al., 1991). Further information can be found within Mooney et al. (1991) 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	Blanket bog vegetation communities have been recorded in this SAC (Mooney et al., 1991; 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)
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)



Mullaghanish

Mullach an Ois

530 550 570 586 490 520 530 550 570 510 640 649 630 610 590 570 550 510 549

Cárrigrathduff

© Ordnance Survey Ireland

Legend

Mullaghanish Bog SAC 001890

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

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

MAP 1:
MULLAGHANISH BOG SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

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

SITE CODE:
SAC 001890; version 3.
CO.CORK, CO.KERRY

0 0.1 0.2 0.3 0.4 km

N

Map Version 1
Date: March 2017

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Old Domestic Building, Curraglass Wood SAC 002041

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

National Parks and Wildlife Service,
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90 King Street North, Dublin 7, D07 N7CV, Ireland.

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

Citation:

NPWS (2018) Conservation Objectives: Old Domestic Building, Curraglass Wood SAC 002041. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.

Series Editor: Rebecca Jeffrey
ISSN 2009-4086

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- 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***

002041	Old Domestic Building, Curraglass Wood SAC

1303	Lesser Horseshoe Bat *Rhinolophus hipposideros*

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 :	Bat mitigation guidelines for Ireland
Author :	Kelleher, C.; Marnell, F.
Series :	Irish Wildlife Manual No. 25
Year :	2018
Title :	Conservation objectives supporting document – lesser horseshoe bat (*Rhinolophus hipposideros*)
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	2008
Title :	The lesser horseshoe bat conservation handbook
Author :	Schofield, H.W.
Series :	The Vincent Wildlife Trust
Year :	2009
Title :	Importance of night roosts for bat conservation: roosting behaviour of the lesser horseshoe bat *Rhinolophus hipposideros*
Author :	Knight, T.; Jones, G.
Series :	Endangered Species Research, 8: 79-86

Spatial data sources

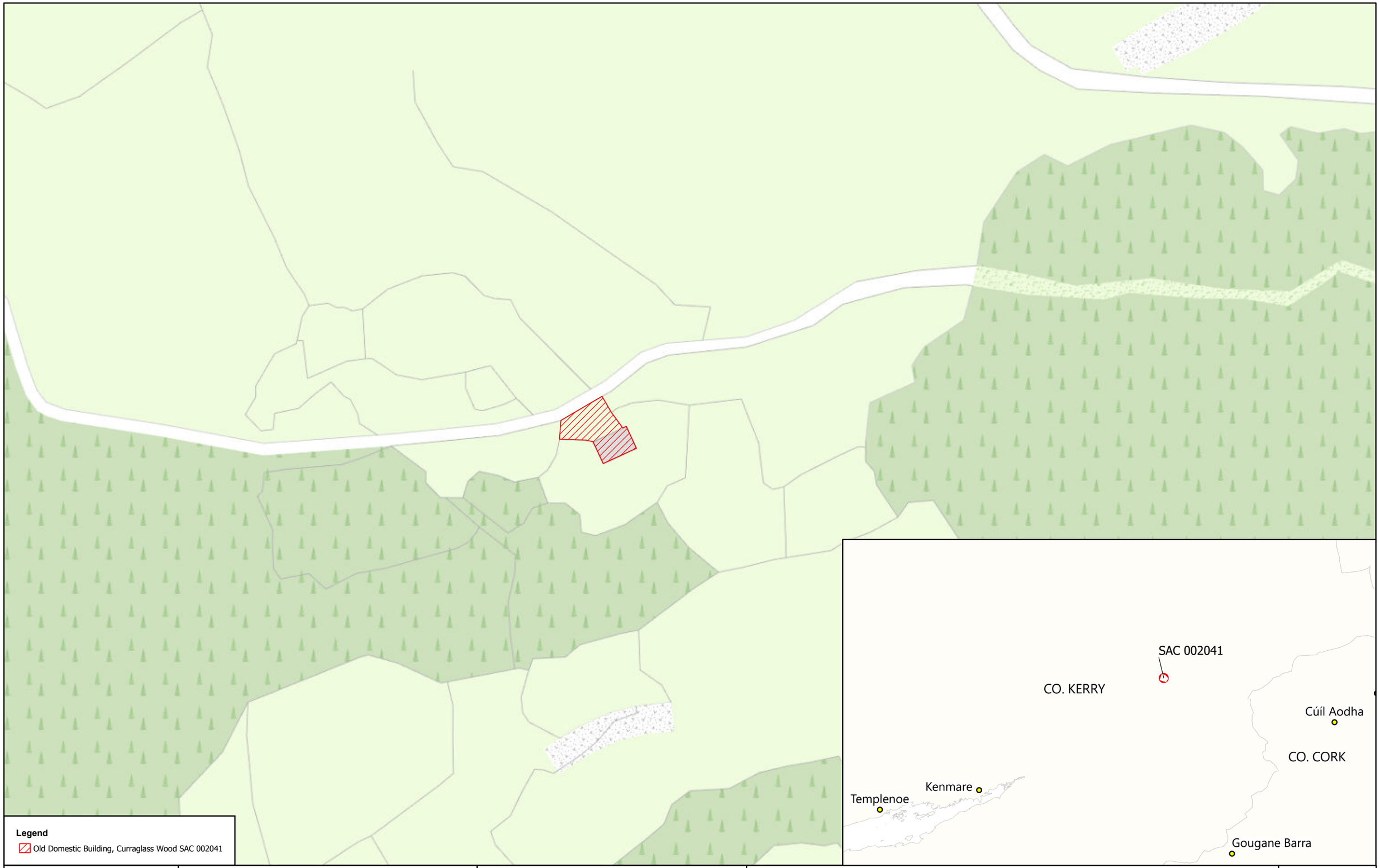
Year :	2018
Title :	NPWS lesser horseshoe bat database
GIS Operations :	Roost identified, clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1303 (map 2)
Year :	2007
Title :	Forest Inventory and Planning System (FIPS)
GIS Operations :	Dataset clipped to 2.5km buffer centred on roost location
Used For :	1303 (map 2)

Conservation Objectives for : Old Domestic Building, Curraglass Wood SAC [002041]

1303 Lesser Horseshoe Bat *Rhinolophus hipposideros*

To restore the favourable conservation condition of Lesser Horseshoe Bat in Old Domestic Building, Curraglass Wood SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population per roost	Number	Minimum number of 100 bats for the summer roost (roost id. 482 in NPWS database). See map 2	A figure of 100 bats for summer roosts and 50 bats for winter roosts was set as a minimum qualifying standard (MQS) when SACs were being selected for lesser horseshoe bat (*Rhinolophus hipposideros*). NPWS conduct annual counts at each qualifying roost. Qualified means from the most recent available five years of summer data (collected between 2011-2016) have been calculated whereby the year with the highest maximum count and the year with the lowest maximum count were removed and the mean of the remaining years was calculated. This mean is usually set as the target figure for the roost. However, in the case of the summer roost (roost id. 482 in NPWS database) in Old Domestic Building, Curraglass Wood SAC, where a mean of 67 bats was recorded (2011-2016), the target is instead set at the MQS of 100 bats. See the conservation objectives supporting document for lesser horseshoe bat (NPWS, 2018) for further information on all attributes and targets
Summer roosts	Condition	No decline	Old Domestic Building, Curraglass Wood SAC has been selected for lesser horseshoe bat because of the presence of one internationally important summer roost (roost id. 482 in NPWS database). Damage or disturbance to the roost or to the habitat immediately surrounding it will lead to a decline in its condition (Kelleher and Marnell, 2006)
Auxiliary roosts	Number and condition	No decline	Lesser horseshoe bat populations will use a variety of roosts during the year besides the main summer maternity and winter hibernation roosts. Such additional roosts within the SAC may be important as night roosts, satellite roosts, etc. Night roosts are also considered an integral part of core foraging areas and require protection (Knight and Jones, 2009). In addition, in response to weather conditions for example, bats may use different seasonal roosts from year to year; this is particularly noticeable in winter. A database of all known lesser horseshoe bat roosts is available on the National Biodiversity Data Centre website. NB further unrecorded roosts may also be present within this SAC
Extent of potential foraging habitat	Hectares	No significant decline within 2.5km of qualifying roost	Lesser horseshoe bats normally forage in woodlands/scrub within 2.5km of their roosts (Schofield, 2008). See map 2 which shows a 2.5km zone around the above roost and identifies potential foraging grounds
Linear features	Kilometres	No significant loss within 2.5km of qualifying roost. See map 2	This species follows commuting routes from its roost to its foraging grounds. Lesser horseshoe bats will not cross open ground. Consequently, linear features such as hedgerows, treelines and stone walls provide vital connectivity for this species within 2.5km around each roost (Schofield, 2008)
Light pollution	Lux	No significant increase in artificial light intensity adjacent to named roost or along commuting routes within 2.5km of the roost. See map 2	Lesser horseshoe bats are very sensitive to light pollution and will avoid brightly lit areas. Inappropriate lighting around roosts may cause abandonment; lighting along commuting routes may cause preferred foraging areas to be abandoned, thus increasing energetic costs for bats (Schofield, 2008)



Legend

Old Domestic Building, Curraglass Wood SAC 002041

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

MAP 1:
OLD DOMESTIC BUILDING, CURRAGLASS WOOD SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

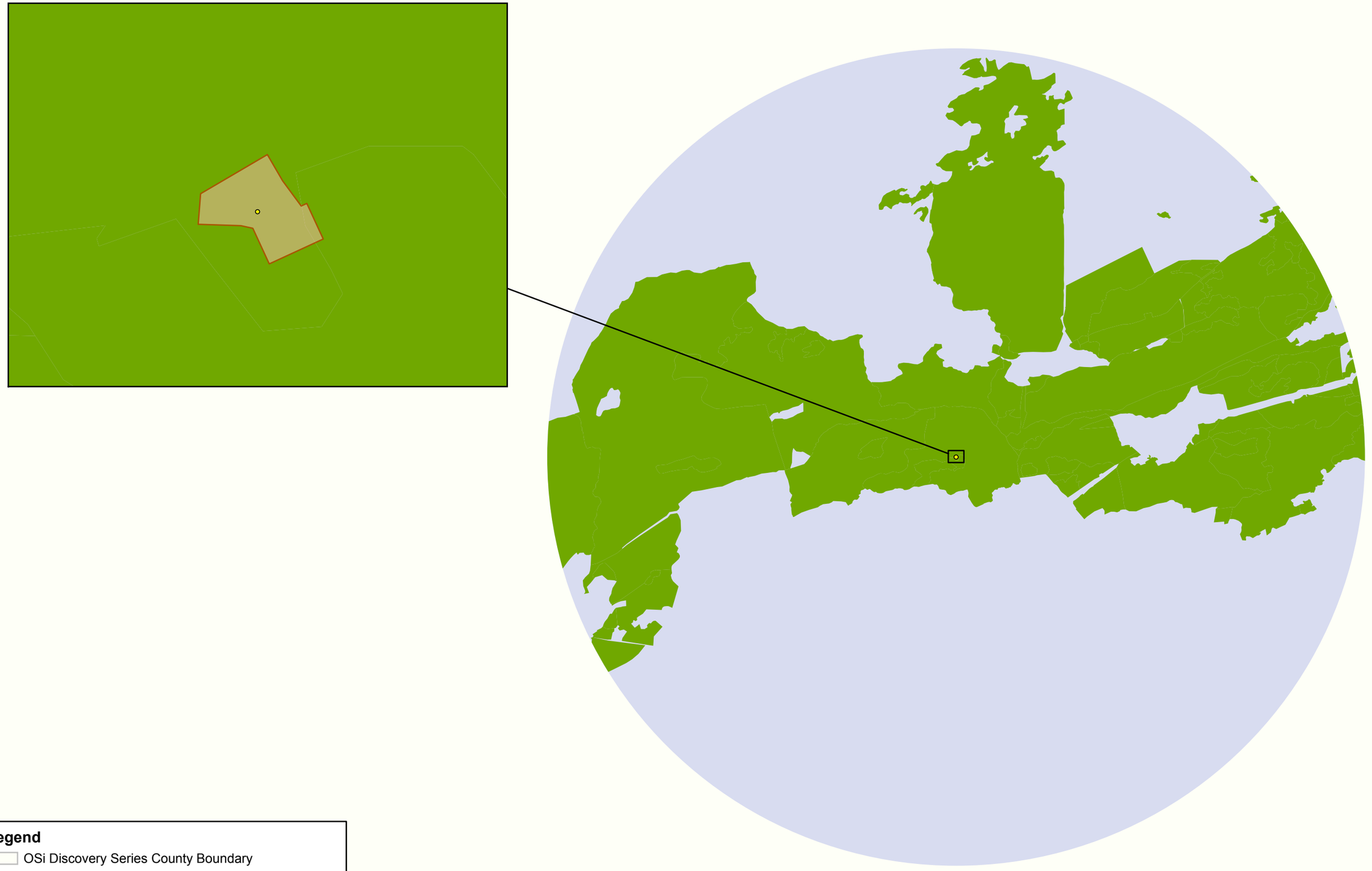
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002041; version 3.0. CO. KERRY

0 10 20 30 40 50 Meters

N

Map Version 1
Date: June 2018



Legend

- OSi Discovery Series County Boundary
- Old Domestic Building, Curraglass Wood SAC 002041

1303 Lesser Horseshoe Bat *Rhinolophus hipposideros*

- Roost Location
- Roost ID 482 Foraging Range
- Potential Foraging Grounds

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

MAP 2:
OLD DOMESTIC BUILDING, CURRAGLASS WOOD SAC
CONSERVATION OBJECTIVES
LESSER HORSESHOE BAT

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

SITE CODE:
SAC 002041; version 3.0. CO. KERRY

0 0.25 0.5 0.75 1 Kilometers

N

Map Version 1
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Conservation Objectives Series

Kenmare River SAC 002158

An Roinn
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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***

002158	Kenmare River SAC
1014	Marsh Snail *Vertigo angustior*
1160	Large shallow inlets and bays
1170	Reefs
1220	Perennial vegetation of stony banks
1230	Vegetated sea cliffs of the Atlantic and Baltic coasts
1303	Lesser Horseshoe Bat *Rhinolophus hipposideros*
1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
1355	Otter *Lutra lutra*
1365	Harbour seal *Phoca vitulina*
1410	Mediterranean salt meadows (Juncetalia maritimi)
2120	Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)
2130	*Fixed coastal dunes with herbaceous vegetation (grey dunes)
4030	European dry heaths
6130	Calaminarian grasslands of the Violetalia calaminariae
8330	Submerged or partially submerged sea caves

Please note that this SAC overlaps with Iveragh Peninsula SPA (004154), Beara Peninsula SPA (004155) and Deenish Island and Scariff Island SPA (004175). It also adjoins Old Domestic Building, Dromore Wood SAC (000353), Cleanderry Wood SAC (001043), Cloonee and Inchiquin Loughs, Uragh Wood SAC (001342), Mucksna Wood SAC (001371), Glanmore Bog SAC (001879) and Drongawn Lough SAC (002187). See map 2. These conservation objectives should be used in conjunction with those for 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

Year :	1980
Title :	An assessment of the status of the common seal *Phoca vitulina vitulina* in Ireland
Author :	Summers, C.F.; Warner, P.J.; Nairn, R.G.W.; Curry, M.G.; Flynn, J.
Series :	Biological Conservation 17: 115-123
Year :	1982
Title :	Otter survey of Ireland
Author :	Chapman, P.J.; Chapman, L.L.
Series :	Unpublished Report to Vincent Wildlife Trust
Year :	1983
Title :	An assessment of the breeding populations of common seals (*Phoca vitulina vitulina* L.) in the Republic of Ireland during 1979
Author :	Warner, P.J.
Series :	Irish Naturalists' Journal 21: 24-26
Year :	1991
Title :	The spatial organization of otters (*Lutra lutra*) in Shetland
Author :	Kruuk, H.; Moorhouse, A.
Series :	J. Zool, 224: 41-57
Year :	1997
Title :	The BioMar biotope viewer: a guide to marine habitats, fauna and flora in Britain and Ireland
Author :	Picton, B.E.; Costello, M.J.
Series :	Environmental Science Unit, Trinity College Dublin
Year :	2000
Title :	Appendix 2. Notes on the status and ecology of *Ditrichum cornubicum*
Author :	Holyoak, D.T.; Clements, R.; Colemen, M.R.J.; MacPherson, K.S.
Series :	English Nature Research Reports No. 328: 40 - 50
Year :	2001
Title :	Heavy metal concentrations in the soil substrates associated with rare bryophytes at former metalliferous mining sites in East Cornwell
Author :	Walsh, L.
Series :	Unpublished BSc. thesis, University of Hertfordshire
Year :	2003
Title :	Broadscale mapping of candidate marine Special Area of Conservation. Kenmare River, Co. Cork and Co. Kerry cSAC
Author :	Aquafact
Series :	Unpublished report to NPWS
Year :	2006
Title :	Otters - ecology, behaviour and conservation
Author :	Kruuk, H.
Series :	Oxford University Press
Year :	2006
Title :	The status of the harbour seal *Phoca vitulina L.* in inner Bantry Bay, Co. Cork and inner Kenmare River, Co. Kerry, 1964 - 2004
Author :	Heardman, C.; O'Donnell, D.; McMahon, D.
Series :	Irish Naturalist's Journal 28(5): 181-191

Year :	2006
Title :	Risk assessment for marine mammal and seabird populations in south-western Irish waters (R.A.M.S.S.I.)
Author :	Roycroft, D.; Cronin, M.; Mackey, M.; Ingram, S.N.; O Cadhla, O.
Series :	Coastal & Marine Resource Centre, University College Cork
Year :	2007
Title :	The abundance, habitat use and haul-out behaviour of harbour seals (*Phoca vitulina vitulina*) in southwest Ireland
Author :	Cronin, M.A.
Series :	Unpublished PhD thesis, University College Cork
Year :	2007
Title :	An assessment of harbour seal population size and distribution in the Republic of Ireland during the 2003 moult season
Author :	Cronin, M.; Duck, C.; O Cadhla, O.; Nairn, R.; Strong, D.; O'Keeffe, C.
Series :	Journal of Zoology, London, 273(2); 131-139
Year :	2007
Title :	Protecting and managing underground sites for bats
Author :	Mitchell-Jones, A.J.; Bihari, Z.; Masing, M.; Rodrigues, L.
Series :	EUROBATS Publication Series No. 2
Year :	2008
Title :	The phytosociology and conservation value of Irish sand dunes
Author :	Gaynor, K.
Series :	Unpublished PhD thesis, National University of Ireland, Dublin
Year :	2008
Title :	The foraging ecology of the harbour seal (*Phoca vitulina vitulina*) in Ireland
Author :	Cronin, M.A.; Kavanagh, A.; Rogan, E.
Series :	Report to the Marine Institute
Year :	2008
Title :	The Lesser horseshoe bat conservation handbook
Author :	Schofield, H.W.
Series :	The Vincent Wildlife Trust
Year :	2009
Title :	Using mobile phone telemetry to investigate the haul-out behaviour of harbour seals (*Phoca vitulina vitulina*).
Author :	Cronin, M.; Zuur, A.F.; Rogan, E.
Series :	Endangered Species Research, 10: 255-267
Year :	2009
Title :	Natura 2000 sub-tidal benthic surveys: area 1
Author :	ERM
Series :	Unpublished report on behalf of the Marine Institute
Year :	2009
Title :	Surveys of sensitive sublittoral benthic communities in Kenmare River SAC site code 002158, Tralee Bay & Magharee Islands West to Cloghane SAC site code 002070
Author :	MERC
Series :	Unpublished report for Marine Institute and NPWS
Year :	2009
Title :	Notes on some rare and newly recorded bryophytes of metalliferous mine sites in Ireland
Author :	Holyoak, D.T.; Lockhart, N.
Series :	Journal of Bryology 31: 267 - 282

Year :	2009
Title :	Assessing the Conservation Status of the Kerry Lily (*Simethis planifolia* Gren. and Godr.) in Ireland
Author :	Lupton, D.
Series :	Heritage Council
Year :	2010
Title :	Otter tracking study of Roaringwater Bay
Author :	De Jongh, A.; O'Neill, L.
Series :	Unpublished Draft Report to NPWS
Year :	2011
Title :	A survey of bryophytes and metallophyte vegetation of metalliferous mine spoil in Ireland
Author :	Holyoak, D.T.; Lockhart, N.
Series :	Journal of the Mining Heritage Trust of Ireland 11: 3 - 16
Year :	2013
Title :	Conservation of selected legally protected and Red Listed bryophytes in Ireland
Author :	Campbell, C.
Series :	Unpublished Ph.D. Thesis, Trinity College Dublin
Year :	1988
Title :	The Irish Red Data Book - 1 Vascular Plants
Author :	Curtis, T.G.F.; McGough, H.N.
Series :	Red List, Stationery Office, Dublin
Year :	1990
Title :	1989 survey of breeding herds of common seal *Phoca vitulina* with reference to previous surveys
Author :	Harrington, R.
Series :	Unpublished report to Wildlife Service
Year :	1999
Title :	National Shingle Beach Survey of Ireland 1999
Author :	Moore, D.; Wilson, F.
Series :	Unpublished Report to NPWS
Year :	2004
Title :	Harbour seal population assessment in the Republic of Ireland: August 2003
Author :	Cronin, M.; Duck, C.; O'Cadhla, O.; Nairn, R.; Strong, D.; O'Keeffe, C.
Series :	Irish Wildlife Manual No. 11
Year :	2004
Title :	Summary of National Parks & Wildlife Service surveys for common (harbour) seals (*Phoca vitulina*) and grey seals (*Halichoerus grypus*), 1978 to 2003
Author :	Lyons, D.O.
Series :	Irish Wildlife Manual No.13
Year :	2006
Title :	Otter Survey of Ireland 2004/2005
Author :	Bailey, M.; Rochford, J.
Series :	Irish Wildlife Manual No. 23
Year :	2006
Title :	Bat mitigation guidelines for Ireland
Author :	Kelleher, C.; Marnell, F.
Series :	Irish Wildlife Manual No. 25

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 :	2007
Title :	Interpretation Manual of European Union Habitats- EUR 27
Author :	DG Environment- European Commission
Series :	European Commission
Year :	2009
Title :	Bryophytes and metallophyte vegetation on metalliferous mine-waste in Ireland
Author :	Holyoak, D. T
Series :	Unpublished report to NPWS
Year :	2009
Title :	Saltmarsh Monitoring Project 2007 - 2008
Author :	McCorry, M.; Ryle, T.
Series :	Unpublished report to NPWS
Year :	2009
Title :	Coastal Monitoring Project 2004-2006
Author :	Ryle, T.; Murray, A.; Connolly, C.; Swann, M.
Series :	Unpublished Report to NPWS
Year :	2010
Title :	Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland. Version 1.0.
Author :	Perrin, P.M.; Barron, S.J.; Roche, J.R.; O'Hanrahan, B.
Series :	Irish Wildlife Manual No. 48
Year :	2010
Title :	Harbour seal population monitoring 2009-2012: Report no. 1. Report on a pilot monitoring study carried out in southern and western Ireland, 2009
Author :	NPWS
Series :	Unpublished Report to NPWS
Year :	2011
Title :	National survey and assessment of the conservation status of Irish sea cliffs
Author :	Barron, S.J.; Delaney, A.; Perrin, P.M.; Martin, J.; O'Neill, F.
Series :	Irish Wildlife Manual No. 53
Year :	2011
Title :	Monitoring and condition assessment of populations of *Vertigo geyeri*, *Vertigo angustior* and *Vertigo moulinsiana* in Ireland
Author :	Moorkens, E.A.; Killeen, I.J.
Series :	Irish Wildlife Manual No. 55
Year :	2011
Title :	Harbour seal pilot monitoring project, 2010
Author :	NPWS
Series :	Unpublished Report to NPWS
Year :	2012
Title :	The Conservation Status of Juniper Formations in Ireland
Author :	Cooper, F.; Stone, R.E.; McEvoy, P.; Wilkins, T.; Reid, N.
Series :	Irish Wildlife Manual No. 63

Year :	2012
Title :	Harbour seal pilot monitoring project, 2011
Author :	NPWS
Series :	Unpublished Report to NPWS
Year :	2013
Title :	Kenmare River SAC (site code 2158) Conservation objectives supporting document- coastal habitats V1
Author :	NPWS
Series :	Unpublished report to NPWS
Year :	2013
Title :	Kenmare River SAC (site code 2158) Conservation objectives supporting document- marine habitats and species V1
Author :	NPWS
Series :	Unpublished report to NPWS

Spatial data sources

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. EPA WFD transitional waterbody data erased from extent. Expert opinion used as necessary to resolve any issues arising
Used For :	1160 (map 3)
Year :	Interpolated 2012
Title :	BioMar survey, 1995; acoustic mapping survey, 2002; intertidal and subtidal surveys, 2009
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 :	1170, Marine community types (maps 4 and 6)
Year :	Revision 2012
Title :	National Shingle Beach Survey
GIS Operations :	Clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1220 (map 5)
Year :	2011
Title :	National Survey and assessment of the conservation status of Irish sea cliffs
GIS Operations :	Clipped to SAC boundary
Used For :	1230 (map 5)
Year :	2012
Title :	Bryophytes and Metallophyte Vegetation on Metalliferous Mine-waste in Ireland
GIS Operations :	Site(s) identified; clipped to SAC boundary
Used For :	6130 (map 5)
Year :	Derived 2012
Title :	Coast of Ireland Oblique Imagery Survey 2003
GIS Operations :	Point dataset created from visual inspection of survey
Used For :	8330 (map 5)
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 6)
Year :	Revision 2010
Title :	Saltmarsh Monitoring Project 2007-2008. Version 1
GIS Operations :	QIs selected; clipped to SAC boundary; overlapping regions with Coastal CO data investigated and resolved with expert opinion used
Used For :	1330, 1410 (map 7)
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 :	2120, 2130 (map 8)
Year :	2013
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 :	1014, 1365 (maps 8 and 11)

Year :	2012
Title :	NPWS lesser horseshoe bat database
GIS Operations :	Roosts identified
Used For :	1303 (map 9)
Year :	2007
Title :	Forest Inventory and Planning System (FIPS)
GIS Operations :	Dataset clipped to 2.5km buffer centred on roost location
Used For :	1303 (map 9)
Year :	2005
Title :	OSi Discovery series vector data
GIS Operations :	Creation of an 80m buffer on the marine side of the high water mark (HWM); creation of a 10m buffer on the terrestrial side of the HWM; combination of 80m and 10m HWM buffer datasets; creation of a 10m buffer on the terrestrial side of the river banks data; creation of 20m buffer applied to canal centreline data. These datasets are combined with the derived EPA WFD Waterbodies data and Coastal Lagoon data for the 1355 CO. 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 10)
Year :	2010
Title :	EPA WFD Waterbodies data
GIS Operations :	Creation of a 20m buffer applied to river and stream centreline data; creation of 80m buffer on the aquatic side of lake data; creation of 10m buffer on the terrestrial side of lake data. These datasets are combined with the derived OSi data and Coastal Lagoon data for the 1355 CO. Overlapping regions investigated and resloved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1355 (no map)
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 11)

1160 Large shallow inlets and bays

To maintain the favourable conservation condition of Large shallow inlets and bays in Kenmare River 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 39322ha using OSi data and the Transitional Water Body area as defined under the Water Framework Directive
Community extent	Hectares	Maintain the extent of the *Zostera*- and Maërl-dominated communities and the *Pachycerianthus multiplicatus* community subject to natural processes. See map 6	Based on the BioMar survey in 1995 (Picton and Costello, 1997), broadscale mapping survey in 2002 (Aquafact, 2003) and a dive survey undertaken in 2009 (MERC, 2009). See marine supporting document for further details
Community structure: *Zostera* density	Shoots per m²	Conserve the high quality of the *Zostera*-dominated community, subject to natural processes	Described from 2009 diver observation and underwater viewer (MERC, 2009). See marine supporting document for further details
Community structure	Biological composition	Conserve the high quality of the *Pachycerianthus multiplicatus* community, subject to natural processes	Estimated from a dive survey undertaken in 2009 (MERC, 2009). See marine supporting document for further details
Community structure	Biological composition	Conserve the high quality of the Maërl-dominated community, subject to natural processes	Based on broadscale mapping survey in 2002 (Aquafact, 2003) and 2009 diver observation and underwater viewer (MERC, 2009). See marine supporting document for further details
Community distribution	Hectares	Conserve the following communities in a natural condition: Intertidal mobile sand community complex; Muddy fine sands dominated by polychaetes and *Amphiura filiformis* community complex; Fine to medium sand with crustaceans and polychaetes community complex; Coarse sediment dominated by polychaetes community complex; Shingle; Intertidal reef community complex; Subtidal reef with echinoderms and faunal turf community complex and *Laminaria*-dominated community complex. See map 6	Based on the BioMar survey in 1995 (Picton and Costello, 1997), broadscale mapping survey in 2002 (Aquafact, 2003) and intertidal and subtidal surveys in 2009 (ERM, 2009). See marine supporting document for further information

1170 Reefs

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

Attribute	Measure	Target	Notes
Distribution	Occurrence	The distribution of reefs remains stable, subject to natural processes. See map 4	Likely distribution was established by the 1995 BioMar survey (Picton and Costello, 1997); broadscale mapping survey in 2002 (Aquafact, 2003) and 2009 subtidal reef survey and intertidal survey (ERM, 2009)
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 4	Habitat area estimated as 9196ha from the 1995 BioMar survey (Picton and Costello, 1997); 2002 broadscale mapping survey (Aquafact, 2003) and 2009 subtidal reef survey and intertidal survey (ERM, 2009)
Community structure	Biological composition	Conserve the following community types in a natural condition: Intertidal reef community complex; Subtidal reef with echinoderms and faunal turf community complex; and *Laminaria*-dominated community complex. See map 6	The likely area of reef communities was derived from the 1995 BioMar survey (Picton and Costello, 1997); 2002 broadscale mapping survey (Aquafact, 2003) and 2009 subtidal reef survey and intertidal survey (ERM, 2009). See marine supporting document for further details

1220 Perennial vegetation of stony banks

To maintain the favourable conservation condition of Perennial vegetation of stony banks in Kenmare River 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, including erosion and succession	Current area unknown. It was recorded as being present but extent was not mapped from two sub-sites during the National Shingle Beach Survey (Moore and Wilson, 1999): Rossdohan Island and Pallas Harbour. NB further unsurveyed areas maybe present within the site. 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 mapped locations	Full distribution unmapped at present, although the habitat has been recorded at Rossdohan Island and Pallas Harbour by Moore and Wilson (1999). Habitat likely to be more widespread. 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	The shingle beaches within this SAC appear to be funtioning naturally, with no artificial restrictions to beach dynamics (Moore and Wilson, 1999). Shingle features are relatively stable in the long term. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Moore and Wilson (1999). At the Rossdohan Island sub-site the vegetated shingle is associated with intertidal shingle and rocky shore as well as saltmarsh. The vegetated shingle at the Pallas Harbour sub-site is also associated with intertidal shingle and rocky shore. Lichens are present at both sub-sites, indicating a degree of stability. 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 the typical vegetated shingle flora including the range of sub-communities within the different zones	Both Rossdohan Island and Pallas Harbour support good quality vegetated shingle flora. Based on data from Moore and Wilson (1999). 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 Moore and Wilson (1999). Negative indicators include non-native species indicative of changes in nutrient status and species not considered characteristic of the habitat. See coastal habitats supporting document for further details

1230 Vegetated sea cliffs of the Atlantic and Baltic coasts

To maintain the favourable conservation condition of Vegetated sea cliffs of the Atlantic and Baltic coasts in Kenmare River SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat length	Kilometres	Area stable, subject to natural processes, including erosion. For sub-sites mapped: Lamb's Head - 4.4km; Coomatloukane East - 0.5km; Coomatloukane West - 0.5km; Reenearagh - 0.5km; Dog's Bay to Kilcatherine Point - 17.3km; Cod's Head - 25.1km; Garnish Point and Crow Head - 13.4km; Dursey Island - 10.5km. See map 5	Based on data from the Irish Sea Cliff Survey (ISCS) (Barron et al., 2011). Eight sub-sites were identified using a combination of aerial photos and the DCENR helicopter viewer. The length of each cliff was measured (in some cases the cliff was measured in sections) to give a total estimated area of 72.2km within the SAC. An additional 3.8km of 'undocumented sites' were also identified. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 5	Cliffs are known to occur along the coastline from Lambs Head in Co. Kerry to Dursey Island in Co. Cork. Both hard and soft cliffs have been noted in this SAC (Browne, 2005; Barron et al., 2011). However, it is estimated that over 90% of the cliffs are of the hard type. See coastal habitats supporting document for further details
Physical structure: functionality and hydrological regime	Occurrence of artificial barriers	No alteration to natural functioning of geomorphological and hydrological processes due to artificial structures	Based on data from ISCS (Barron et al., 2011). Maintaining natural geomorphological processes including natural erosion is important for the health of a vegetated sea cliff. Hydrological processes maintain flushes and in some cases tufa formations that can be associated with sea cliffs. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of sea cliff habitat zonations including transitional zones, subject to natural processes including erosion and succession	Based on data from ISCS (Barron et al., 2011). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from ISCS (Bannon et al., 2011). 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 the Irish Sea Cliff Survey (Barron et al., 2011)	See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from the ISCS (Barron et al., 2011). See coastal habitats supporting document for further details
Vegetation composition: bracken and woody species	Percentage	Cover of bracken (*Pteridium aquilinum*) on grassland and/or heath less than 10%. Cover of woody species on grassland and/or heath less than 20%	Based on data from the ISCS (Barron et al., 2011). See coastal habitats supporting document for further details

1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)

To maintain the favourable conservation condition of Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) in Kenmare River 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, including erosion and succession. For sub-sites Dereen House - 0.26ha; Dinish - 0.07ha; Tahilla - 0.01ha; West Cove - 0.08ha. See map 7	Based on data from Saltmarsh monitoring Project (SMP) (McCorry and Ryle, 2009). Four sub-sites that supported Atlantic salt meadow were mapped (0.42ha) and additional areas of potential saltmarsh (2.23ha) were identified from an examination of aerial photographs, giving a total estimated area of 2.65ha. NB Further unsurveyed areas may be present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 7 for known distribution	Based on data from SMP (McCorry and Ryle, 2009). See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/ absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions	Based on data from SMP (McCorry and Ryle, 2009). See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession	Based on data from SMP (McCorry and Ryle, 2009). See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from SMP (McCorry and Ryle, 2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from SMP (McCorry and Ryle, 2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% area outside creeks vegetated	Based on data from SMP (McCorry and Ryle, 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 SMP (McCorry and Ryle, 2009)	See coastal habitats supporting document for further details
Vegetation structure: negative indicator species - *Spartina anglica*	Hectares	There is currently no common cordgrass (*Spartina anglica*) in this SAC. Prevent establishment of cordgrass	Based on data from SMP (McCorry and Ryle, 2009). As common cordgrass (*Spartina anglica*) has never been recorded from this area, the target is to ensure that the site remains free of this highly invasive species. See coastal habitats supporting document for further details

1410 Mediterranean salt meadows (Juncetalia maritimi)

To maintain the favourable conservation condition of Mediterranean salt meadows (*Juncetalia maritimi*) in Kenmare River 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, including erosion and succession. For sub-sites mapped: Dereen House - 8.93ha; Dinish - 0.04ha; Tahilla - 0.27ha; West Cove - 1.54ha. See map 7	Based on data from the Saltmarsh Monitoring Project (SMP) (McCorry and Ryle, 2009). Four sub-sites that supported Mediterranean salt meadow were mapped (10.77ha) and additional areas of potential saltmarsh (7.13ha) were identified from an examination of aerial photographs, giving a total estimated area of 17.90ha. NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 7 for known distribution	Based on data from SMP (McCorry and Ryle, 2009). See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions	Based on data from SMP (McCorry and Ryle, 2009). See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession	Based on data from the SMP (McCorry and Ryle, 2009). See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	Mediterranean salt meadows is found high up in the saltmarsh but requires occasional tidal inundation. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of saltmarsh habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from SMP (McCorry and Ryle, 2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation in the sward	Based on data from SMP (McCorry and Ryle, 2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated	Based on data from SMP (McCorry and Ryle (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 characteristic species listed in SMP (McCorry and Ryle, 2009)	See coastal habitats supporting document for further details
Vegetation structure: negative indicator species - *Spartina anglica*	Hectares	There is currently no common cordgrass (*Spartina anglica*) in this SAC. Prevent establishment of cordgrass	Based on data from SMP (McCorry and Ryle, 2009). As common cordgrass (*Spartina anglica*) has never been recorded from this area, the target is to ensure that the site remains free of this highly invasive species. See coastal habitats supporting document for further details

2120 Shifting dunes along the shoreline with Ammophila arenaria (white dunes)

To maintain the favourable conservation condition of Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes') in Kenmare River 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 including erosion and succession. Total area mapped: Derrynane-1.67ha. See map 8	Habitat was mapped from a single site (Derrynane) during the Coastal Monitoring Project (Ryle et al., 2009). Habitat is very difficult to measure in view of its dynamic nature. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 8 for known distribution	Based on CMP (Ryle et al. 2009). 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	Dunes are naturally dynamic systems that require continuous supply and circulation of sand. Marram grass (*Ammophila arenaria)* reproduces vegetatively and requires constant accretion of fresh sand to maintain active growth thus encouraging further accretion. 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	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: plant health of dune grasses	Percentage cover	95% of marram grass (*Ammophila arenaria*) and/or lyme-grass *(Leymus arenarius*) should be healthy (i.e. green plant parts above ground and flowering heads present)	Based on data from CMP (Ryle et al. 2009). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain the presence of species-poor communities dominated by marram grass (*Ammophila arenaria*) and/or lyme-grass (*Leymus arenarius*)	Based on data from CMP (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 CMP (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. Sea-buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. See coastal habitats supporting document for further details

2130 Fixed coastal dunes with herbaceous vegetation (grey dunes)

To maintain the favourable conservation condition of Fixed coastal dunes with herbaceous vegetation ('grey dunes') in Kenmare River 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 including erosion and succession. Total area mapped: Derrynane-20.41ha. See map 8	Habitat was mapped from a single site (Derrynane) during the Coastal Monitoring Project (Ryle et al. 2009). See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 8 for known distribution	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	Based on data from CMP (Ryle et al., 2009). 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	Centimetres	Maintain structural variation within sward	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. Habitat supports a population of the Annex II species *Vertigo angustior* (code 1014)-see also conservation objective for this species
Vegetation composition: negative indicator species (including *Hippophae rhamnoides*)	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from CMP (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. Sea-buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. 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 CMP (Ryle et al., 2009). Ash (*Fraxinus excelsior*) and gorse (*Ulex europaeus*) have been recorded at Derrynane. See coastal habitats supporting document for further details

4030 European dry heaths

To maintain the favourable conservation condition of European dry heaths in Kenmare River 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 there has been no comprehensive mapping, the area is estimated only. It is thought to cover c. 200ha in the Derrynane locality with another 100ha or more elsewhere, often in association with other habitats such as coastal grassland, wet heath and bog and exposed rock including sea cliffs. Based on internal NPWS files and on the supporting document for coastal habitats (NPWS, 2013). See also the conservation objective for vegetated sea cliffs (code: 1230)
Habitat distribution	Occurrence	No decline from current habitat distribution, subject to natural processes	Dry heath occurs on shallow peat from sea level to the upland fringes of Kenmare Bay on both the Iveragh and Beara peninsulas. Much of the dry heath in this SAC corresponds to Annex I sub-type - heaths rich in gorse (*Ulex gallii*) of the Atlantic margins (EC, 2007). Its localities include Derrynane, Lamb's Head, Abbey Island, Garnish Point and Crow Head, Castlecove to Sneem area, Ross Island, Ardgroom, Kilcatherine, Cod's Head, Dursey Island and many other locations around Kenmare Bay
Physical structure: free-draining, acid, low nutrient soil; rock outcrops	Occurrence	No significant change in soil nutrient status, subject to natural processes. No increase or decrease in area of natural rock outcrop	Changes to soil nutrient status can result from fertilisation, high stock densities or supplementary feeding. Outwintering of cattle may also impact on physical structure and vegetation. Quarrying would impact through removal of rock structures. Based on internal NPWS files and on Commonage Framework Plans (KE10, KE19, KE23) for 2000 and 2007
Vegetation structure: dwarf shrub indicator species	Pecentage cover	Cover of characteristic dwarf shrub indicator species, typically heather (*Calluna vulgaris*), bell heather (*Erica cinerea*) and Western gorse (*Ulex gallii*) at least 25%	Attribute and target based on Perrin et al. (2010). Site data based on internal NPWS files. Other sub-shrubs present are gorse (*Ulex europaeus*), bilberry (*Vaccinium myrtillus*), cross-leaved heath (*Erica tetralix*), creeping willow (*Salix repens*) while juniper (*Juniperus communis*) and burnet rose (*Rosa pimpinellifolia*) occur locally
Vegetation structure: senescent *Calluna vulgaris*	Percentage cover	Cover of senescent heather (*Calluna vulgaris*), less than 50%	Attribute and target based on dry heath habitat condition assessment methodology outlined in Perrin et al. (2010)
Vegetation structure: browsing	Percentage cover	Long shoots of bilberry (*Vaccinium myrtillus*) with signs of browsing collectively less than 33%	Attribute and target based on dry heath habitat condition assessment methodology outlined in Perrin et al. (2010)
Vegetation structure: native trees and shrubs	Pecentage cover	Cover of scattered native trees and shrubs less than 20%	Attribute and target based on dry heath habitat condition assessment methodology outlined in Perrin et al. (2010). Encroaching willow (*Salix* spp.) and bramble (*Rubus fruticosus*) are recorded in this site (internal NPWS files)
Vegetation composition: positive indicator species	Number	At least 2 positive indicator species e.g. bell heather (*Erica cinerea*) and Western gorse (*Ulex gallii*), with combined cover of at least 60%	Dry heath is characterised by a mosaic of dwarf shrubs, chiefly heather, bell heather and Western gorse and open areas with a characteristic composition of grasses, herbs, bryophytes and lichens. Attribute and target based on dry heath habitat condition assessment methodology outlined in Perrin et al. (2010)
Vegetation composition: bryophyte and non-crustose lichen species	Number	At least 2 bryophyte or non-crustose lichen species present	Attribute and target based on dry heath habitat condition assessment methodology outlined in Perrin et al. (2010)

Vegetation composition: bracken (*Pteridium aquilinum*)	Percentage cover	Cover of bracken (*Pteridium aquilinum*) less than 10%	Attribute and target based on dry heath habitat condition assessment methodology of Perrin et al. (2010). Inadequate grazing is reported as damaging the condition of dry heath at some locations in this site
Vegetation composition: weedy negative indicator species	Pecentage cover	Cover of agricultural weed species (negative indicator species) less than 1%	Attribute and target based and dry heath habitat condition assessment methodology outlined in Perrin et al. (2010)
Vegetation composition: non-native species	Percentage cover	Cover of non-native species less than 1%	Attribute and target based on dry heath habitat condition assessment methodology of Perrin et al. (2010). Rhododendron (*Rhododendron ponticum*) is recorded in this site (internal NPWS files)
Vegetation composition: rare/scarce heath species	Location, area and number	No decline in distribution or population sizes of rare/scarce species, including protected species Kerry lily (*Simethis planifolia*) and betony (*Stachys officinalis*) and uncommon species juniper (*Juniperus communis*)	Excessive grazing and competition from invasive species are listed as the principal threats to the status of these species. Based on survey data in internal NPWS files, Lupton (2009) and Cooper et al. (2012)
Vegetation structure: disturbed bare ground	Percentage cover	Cover of disturbed bare peat less than 5%	Attribute and target based on Perrin et al. (2010). Excessive grazing and/or trampling by domestic stock is reported to be impacting on the condition of dry heath at some localities in this SAC
Vegetation structure: burning	Occurrence	No signs of burning within sensitive areas	Perrin et al. (2010) define sensitive areas. Excessive burning is reported as impacting on vegetation compostion and structure of dry heath at some localities in this SAC

6130 Calaminarian grasslands of the Violetalia calaminariae

To maintain the favourable conservation condition of Calaminarian grasslands of the *Violetalia calaminariae* in Kenmare River SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	No decline, subject to natural processes	The area of this habitat at Allihies is estimated to be 3.1ha (Holyoak, 2009; Holyoak and Lockhart, 2011). NB Further unsurveyed areas may be present within this SAC
Distribution	Occurrence	No decline, subject to natural processes. See map 5 for recorded location	Calaminarian grassland occurs at the disused copper mine at Mountain Mine, Allihies (in Cloan Townland) (Holyoak, 2009; Holyoak and Lockhart, 2011). NB Further unsurveyed areas may be present within this SAC
Physical structure: bare ground	Percentage cover	Maintain adequate open ground	Calaminarian grassland is well developed and varied, but mainly as patches of small extent scattered among rocky heathland and less toxic spoil. The extent of bare soil and rock within eight (50 x 20cm) quadrats (in 2008) (Holyoak, 2009) ranged between 20% and 80%
Soil toxicity: copper content	µg Cu/g dry weight soil	Maintain high copper levels in soil	Total copper content in soils from four measurements at Allihies in 2009 ranged from 1585 µg/g to 9877 µg/g dry weight (Campbell, 2013). Mine spoil with similar vegetation from Cornwall had available copper of 151–3220 µg/g dry weight (Holyoak et al., 2000; Walsh, 2001)
Vegetation structure: height and cover	Centimetres; percentage cover	Maintain low and open cover	Herbaceous vegetation height is short (0-3cm) and cover is low (30-40%). Bryophyte cover is high (40%-80%)
Vegetation composition: metallophyte bryophytes	Number	Maintain diversity and populations of metallophyte bryophytes	Allihies is the most important known site in Ireland for metallophyte bryophytes, with populations of rare species including *Cephaloziella integerrima*, *C. massalongi*, *C. nicholsonii*, *Ditrichum lineare*, *D. cornubicum*, *Pohlia andalusica* and *Scopelophila cataractae*. One of only three sites globally with extant *Ditrichum cornubicum* (Holyoak and Lockhart, 2009)

8330 Submerged or partially submerged sea caves

To maintain the favourable conservation condition of Submerged or partially submerged sea caves in Kenmare River SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Occurrence	The distribution of sea caves is stable, subject to natural processes. See map 5 for known caves	Sea cave distribution at this site was derived from the 1995 BioMar survey (Picton and Costello, 1997) and from an oblique aerial survey. The aerial survey only detects the presence of sea caves visible intertidally in the flight path. See marine supporting document for further details
Community structure	Biological composition	Human activities should occur at levels that do not adversely affect the ecology of sea caves at this site	See marine supporting document for further details

1014 Marsh Snail *Vertigo angustior*

To maintain the favourable conservation condition of Narrow-mouthed Whorl Snail in Kenmare River SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: occupied sites	Number	No decline. There is one known site for this species in this SAC. See map 8	From Moorkens and Killeen (2011)
Presence	Occurrence	Adult or sub-adult snails are present in at least 3 places on the transect where optimal or sub-optimal habitat occurs (minimum 5 samples)	Transect established as part of condition assessment monitoring at this site (Moorkens and Killeen, 2011). See habitat extent note below for definition of optimal and sub-optimal habitat
Abundance	Number per sample	At least 2 samples on the transect have more than 10 *V. angustior* individuals (minimum 5 samples)	From Moorkens and Killeen (2011)
Transect habitat quality	Metres	At least 20m of habitat along the transect is classed as optimal or sub-optimal	From Moorkens and Killeen (2011). See habitat extent note below for definition of optimal and sub-optimal habitat
Transect optimal wetness	Metres	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for at least 20m along the transect	From Moorkens and Killeen (2011)
Habitat extent	Hectares	1.5ha of sub-optimal with optimal areas	Optimal habitat is defined as fixed dune, species-rich grassland dominated by red fescue (*Festuca rubra*) with sparse marram (*Ammophila arenaria*), lady's bedstraw (*Galium verum*), eyebright (*Euphrasia* sp.), bird's-foot-trefoil (*Lotus corniculatus*) and other low growing herbs. Vegetation height 10-30cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch. Sub-optimal is defined as for optimal habitat, but either vegetation height is less than 10cm or between 30 and 50cm; or the soil is dry and sandy, or the thatch is wetter with a denser structure. From Moorkens and Killeen (2011). See also the conservation objective for fixed coastal dunes (code: 2130)

1303 Lesser Horseshoe Bat *Rhinolophus hipposideros*

To maintain the favourable conservation condition of Lesser Horseshoe Bat in Kenmare River SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population per roost	Number	Minimum number for the winter roost at Dunkerron souterrain is 138; Minimum of 100 for summer roost (Foley's cottage, Killaha). See map 9	A figure of 100 bats for summer roosts and 50 for winter roosts was set as a minimum qualifying standard (MQS) when SACs were being selected for lesser horseshoe bats. Qualified means have been calculated from 2006-2012 roost count data, whereby the year with the highest maximum count and the year with the lowest maximum count were removed and the mean of the remaining years was calculated. This mean is set as the target except where it falls below the MQS, then the MQS is used
Winter roosts	Condition	No decline	This SAC has been selected for lesser horseshoe bats because of the presence of one internationally important winter roost: Dunkerron souterrain. Damage or disturbance to the roost or to the habitat immediately surrounding the roost will lead to a decline in its condition (Mitchell Jones et al., 2007)
Summer roosts	Condition	No decline	This SAC has been selected for lesser horseshoe bats because of the presence of one internationally important summer roost: Foley's cottage, Killaha. Damage or disturbance to the roost or to the habitat immediately surrounding the roost will lead to a decline in its condition (Kelleher and Marnell, 2006)
Number of auxillary roosts	Number and condition	No decline	Lesser horseshoe bat populations will use a variety of roosts besides the main summer maternity roost and winter hibernation roost. Such additional roosts within the SAC may be important as night/satellite roosts. A database of all known lesser horseshoe roosts is available on the National Biodiversity Data Centre website. NB Further unrecorded roosts may also be present within this SAC
Extent of potential foraging habitat	Hectares	No significant decline	Lesser horseshoe bats normally forage in woodlands/scrub within 2.5km of their roosts (Schofield, 2008). See map 9 which shows 2.5km zone around the above named roosts and identifies potential foraging grounds
Linear features: length	Metres	No significant loss, within 2.5km of qualifying roosts. See map 9	This species follows commuting routes from its roost to its foraging grounds. Lesser horseshoe bats will not cross open ground. Consequently, linear features such as hedgerows, treelines and stone walls provide vital connectivity for this species within 2.5km around each roost (Schofield, 2008)
Light pollution	Lux	No significant increase in artificial light intensity adjacent to named roosts or along commuting routes within 2.5km of those roosts. See map 9	Lesser horseshoe bats are very sensitive to light pollution and will avoid brightly lit areas. Inappropriate lighting around roosts may cause abandonment; lighting along commuting routes may cause preferred foraging areas to be abandoned increasing energetic cost for bats (Schofield, 2008)

1355 Otter *Lutra lutra*

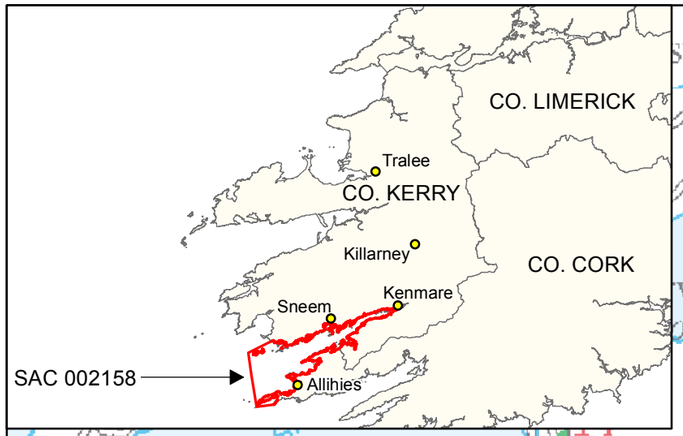
To restore the favourable conservation condition of Otter in Kenmare River SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Percentage positive survey sites	No significant decline	Measure based on standard otter survey technique. FCS target, based on 1980/81 survey findings, is 88% in SACs. Current range in south-west estimated at 74.5% (Bailey and Rochford, 2006)
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 268ha above high water mark (HWM); 40ha along river banks/ around ponds	No field survey. Areas mapped to include 10m terrestrial buffer along shoreline (above 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 2748ha	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 18.9km	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/lagoon) habitat	Hectares	No significant decline. Area mapped and calculated as 25.1ha	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, 2006; Kruuk and Moorhouse, 1991)
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 10	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

1365 Harbour seal *Phoca vitulina*

To maintain the favourable conservation condition of Harbour Seal in Kenmare River 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 is not restricted by artificial barriers to site use. See map 11	See marine supporting document for further details
Breeding behaviour	Breeding sites	Conserve the breeding sites in a natural condition. See map 11	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); Heardman et al. (2006); Roycroft et al. (2006); Cronin (2007) and unpublished National Parks and Wildlife Service records. See marine supporting document for further details
Moulting behaviour	Moult haul-out sites	Conserve the moult haul-out sites in a natural condition. See map 11	Attribute and target based on background knowledge of Irish populations, review of data from Lyons (2004); Cronin et al. (2004); Heardman et al. (2006); Roycroft et al. (2006); Cronin (2007); Cronin et al. (2007) and unpublished National Parks and Wildlife Service records. See marine supporting document for further details
Resting behaviour	Resting haul-out sites	Conserve the resting haul-out sites in a natural condition. See map 11	Attribute and target based on background knowledge of Irish populations, review of data from Lyons (2004); Heardman et al. (2006); Roycroft et al. (2006); Cronin (2007); Cronin et al. (2008) and unpublished National Parks and 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



MAP 1: KENMARE RIVER SAC CONSERVATION OBJECTIVES SAC DESIGNATION

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

SITE CODE: SAC 002158
CO. CORK; version 1.05
CO. KERRY; version 1.1

0 2 4 6 8 10 km

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Map Version 1
Date: October 2012

SPA 004154

SAC 000353

SAC 002187

SAC 001371

SAC 001342

SPA 004175

SAC 002158

SAC 001879

SAC 001043

SPA 004155

Legend

- SAC 002158 Kenmare River
- SAC 000353 Old Domestic Building, Dromore Wood
- SAC 001043 Cleanderry Wood
- SAC 001342 Cloonee And Inchiquin Loughs, Uragh Wood
- SAC 001371 Mucksna Wood
- SAC 001879 Glanmore Bog
- SAC 002187 Drongawn Lough
- 004154 Iveragh Peninsula SPA
- 004155 Beara Peninsula SPA
- 004175 Deenish Island and Scariff Island SPA
- OSi Discovery Series County Boundaries

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MAP 2:
KENMARE RIVER SAC
CONSERVATION OBJECTIVES
ADJOINING / OVERLAPPING DESIGNATIONS

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

SITE CODE: SAC 000353 CO. KERRY; v 1, SAC 001043 CO.CORK; v 1.03, SAC 001342 CO. KERRY; v 1.02, SAC 001371 CO. KERRY; v 1.01, SAC 001879 CO. CORK; v 1.03, CO. KERRY; v 1, SAC 002158 CO. CORK; v 1.05, CO. KERRY; v 1.1, SAC 002187 CO. KERRY; v 1 SPA 004154 CO. KERRY; v 2.02, SPA 004155 CO. CORK; v 2.01, SPA 004175 CO. KERRY; v 2

0 5 10 15 km

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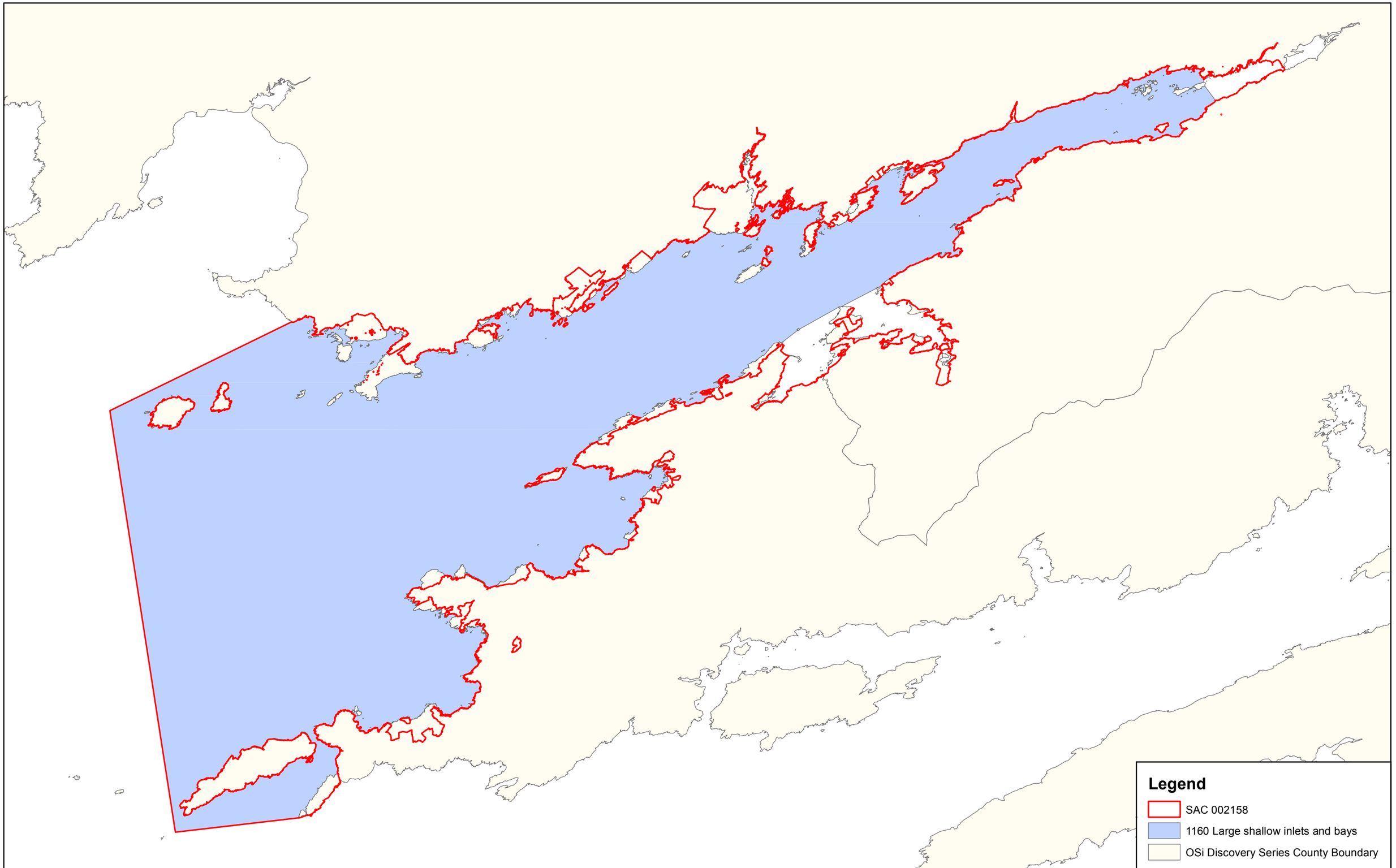
Map Version 1
Date: October 2012



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MAP 3:
KENMARE RIVER SAC
CONSERVATION OBJECTIVES
LARGE SHALLOW INLETS AND BAYS

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

SITE CODE: SAC 002158
CO. CORK; version 1.05
CO. KERRY; version 1.1

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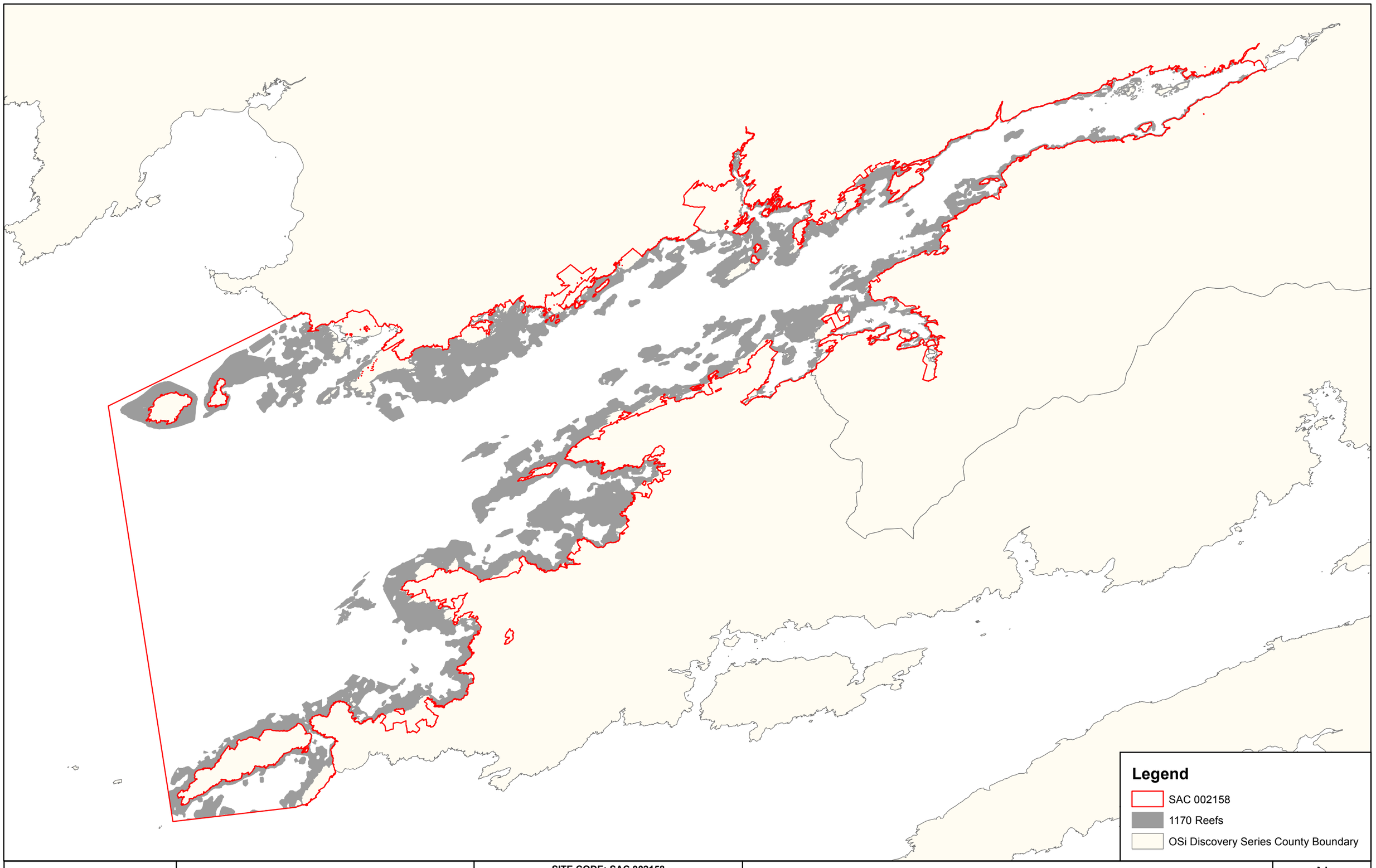
N

Map Version 1
Date: October 2012



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MAP 4:
KENMARE RIVER SAC
CONSERVATION OBJECTIVES
REEFS

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

SITE CODE: SAC 002158
CO. CORK; version 1.05
CO. KERRY; version 1.1

0 2 4 6 8 10 km

N

Map Version 1
Date: October 2012

Rossdohan Island
Coomatloukane West
Coomatloukane East
Reenearagh
Dogs Bay to Kilcatherine Point
Pallas Harbour
Lamb's Head
Cod's Head
Allihies (Mountain Mine)
Dursey Island
Garnish Pt. & Crow Head

Legend

- SAC 002158
- 1220 Perennial vegetation of stony banks
- 1230 Vegetated sea cliffs of the Atlantic and Baltic coasts
- 6130 Calaminarian grasslands of the Violetalia calaminariae
- 8330 Submerged or partially submerged sea caves
- OSi Discovery Series County Boundary

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MAP 5:
KENMARE RIVER SAC
CONSERVATION OBJECTIVES
PERENNIAL VETGETATION OF STONY BANKS, VEGETATED SEA CLIFFS, CALAMINARIAN GRASSLAND & SEA CAVES
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002158
CO. CORK; version 1.05
CO. KERRY; version 1.1

0 2 4 6 8 10 km

N

Map Version 1
Date: October 2012

Legend

SAC 002158

OSi Discovery Series County Boundary

Marine Community Types

- Coarse sediment dominated by polychaetes community complex
- Estuarine mud community
- Fine to medium sand with crustaceans and polychaetes community complex
- Intertidal mobile sand community complex
- Intertidal reef community complex
- *Laminaria*-dominated community complex
- Maërl-dominated community
- Muddy fine sands dominated by polychaetes and *Amphiura filiformis* community complex
- *Pachycerianthus multiplicatus* community complex
- River
- Shingle
- Subtidal reef with echinoderms and faunal turf community complex
- *Zostera*-dominated community

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MAP 6:
KENMARE RIVER SAC
CONSERVATION OBJECTIVES
MARINE COMMUNITY TYPES

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

SITE CODE: SAC 002158
CO. CORK; version 1.05
CO. KERRY; version 1.1

0 2 4 6 8 10 km

N

Map Version 1
Date: October 2012

SMP 0070

Potential Saltmarsh Habitat

Potential Saltmarsh Habitat

SMP 0071

SMP 0069

Potential Saltmarsh Habitat

Potential Saltmarsh Habitat

Potential Saltmarsh Habitat

SMP 0068

Potential Saltmarsh Habitat

Legend

SAC 002158

OSi Discovery Series County Boundaries

SMP 0068 Saltmarsh Monitoring Project Site Codes

Saltmarsh Habitats

Qualifying Interests

1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)

1410 Mediterranean salt meadows (Juncetalia maritimi)

1330 / 1410 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) / Mediterranean salt meadows (Juncetalia maritimi)

Potential 1330 / 1410 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) / Mediterranean salt meadows (Juncetalia maritimi)

Potential 1410 Mediterranean salt meadows (Juncetalia maritimi)

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MAP 7: KENMARE RIVER SAC CONSERVATION OBJECTIVES SALTMARSH HABITATS

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

SITE CODE: SAC 002158
CO. CORK; version 1.05,
CO. KERRY; version 1.1

0 1 2 3 4 5 km

N

Map Version 1
Date: October 2012

CMP: 066

Area of Interest

Legend

- SAC 002158
- 1014 Narrow-Mouthed Whorl Snail - *Vertigo angustior*
- OSi Discovery Series County Boundary
- CMP: 066 Coastal Monitoring Project Site Codes

Sand Dune habitats

Qualifying Interests

- 2120 Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes')
- 2130 *Fixed coastal dunes with herbaceous vegetation ('grey dunes')

Non-Qualifying Interests

- 2110 Embryonic shifting dunes
- 2190 Humid dune slacks

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MAP 8:
KENMARE RIVER SAC
CONSERVATION OBJECTIVES
SAND DUNE HABITATS &
NARROW-MOUTHED WHORL SNAIL

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

SITE CODE: SAC 002158
CO. CORK; version 1.05
CO. KERRY; version 1.1

0 250 500 m

N

Map Version 1
Date: October 2012

Dunkerron souterrain

Foley's cottage Killaha

Legend

- SAC 002158
- OSi Discovery Series County Boundary

1303 Lesser Horseshoe Bat - *Rhinolophus hipposideros*

- 2.5km buffer around Dunkerron souterrain roost
- 2.5km buffer around Foley's cottage Killaha roost
- Potential Foraging Grounds

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MAP 9:
KENMARE RIVER SAC
CONSERVATION OBJECTIVES
LESSER HORSESHOE BAT

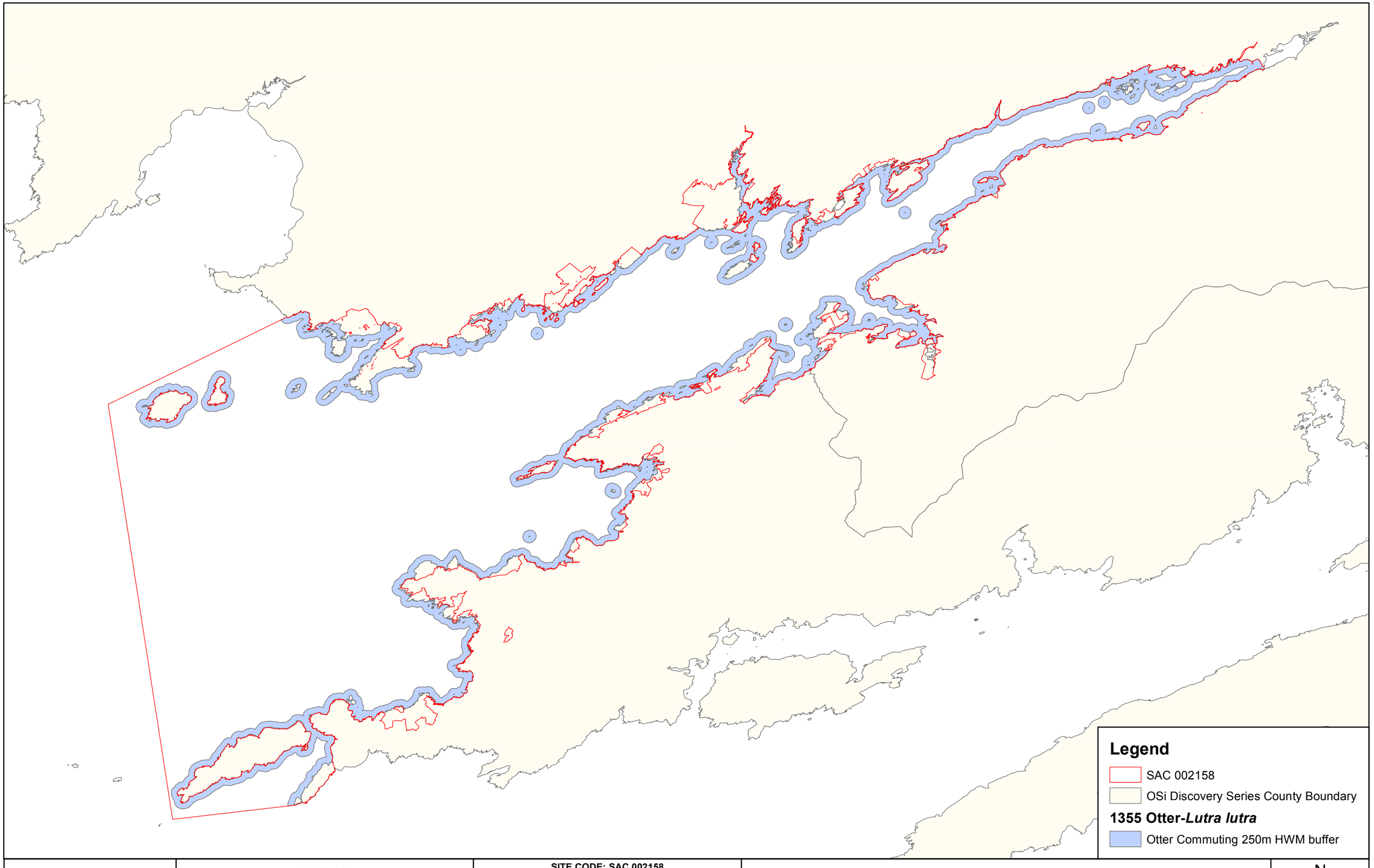
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002158
CO. CORK; version 1.05
CO. KERRY; version 1.1

0 0.5 1 1.5 2 km

N

Map Version 1
Date: October 2012



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MAP 10:
KENMARE RIVER SAC
CONSERVATION OBJECTIVES
OTTER

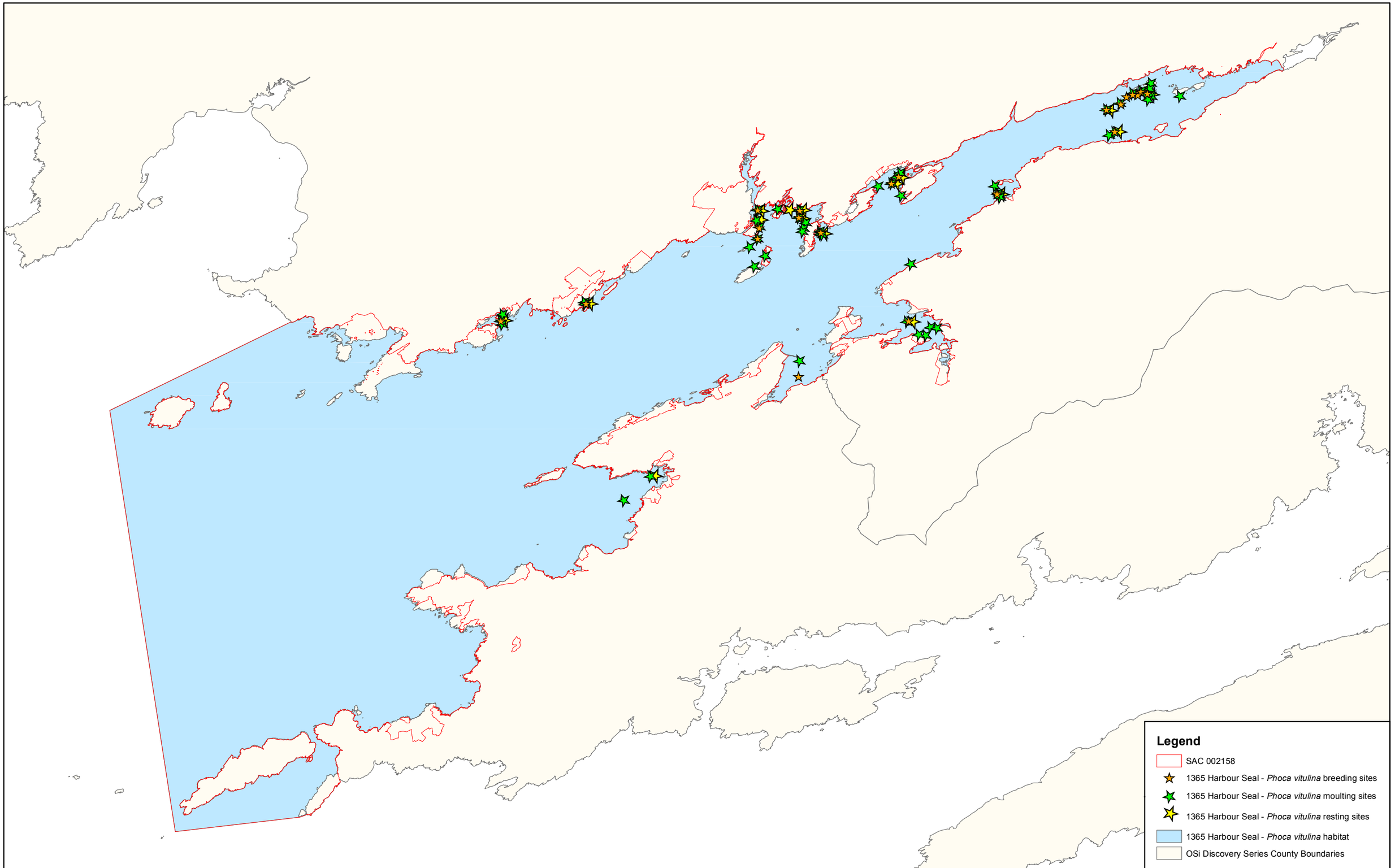
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002158
CO. CORK; version 1.05
CO. KERRY; version 1.1

0 2 4 6 8 10 km

N

Map Version 1
Date: October 2012



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MAP 11:
KENMARE RIVER SAC
CONSERVATION OBJECTIVES
HARBOUR SEAL

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

SITE CODE: SAC 002158
CO. CORK; version 1.05,
CO. KERRY; version 1.1

0 2 4 6 8 10 km

N

Map Version 1
Date: October 2012

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Blackwater River (Cork/Waterford) SAC 002170

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: Blackwater River (Cork/Waterford) SAC 002170. 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***

002170	Blackwater River (Cork/Waterford) SAC
1029	Freshwater Pearl Mussel *Margaritifera margaritifera*
1092	White-clawed Crayfish *Austropotamobius pallipes*
1095	Sea Lamprey *Petromyzon marinus*
1096	Brook Lamprey *Lampetra planeri*
1099	River Lamprey *Lampetra fluviatilis*
1103	Twaite Shad *Alosa fallax*
1106	Atlantic Salmon *Salmo salar* (only in fresh water)
1130	Estuaries
1140	Mudflats and sandflats not covered by seawater at low tide
1220	Perennial vegetation of stony banks
1310	*Salicornia* and other annuals colonizing mud and sand
1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
1355	Otter *Lutra lutra*
1410	Mediterranean salt meadows (*Juncetalia maritimi*)
1421	Killarney Fern *Trichomanes speciosum*
3260	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
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*)
91J0	**Taxus baccata* woods of the British Isles

Please note that this SAC overlaps with Blackwater Estuary SPA (004028), Blackwater Callows SPA (004094) and Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161). It is also adjacent to Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC (000365). 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: Aspects of brook lamprey (*Lampetra planeri* Bloch) spawning in Irish waters

Year: in press

Author: Rooney, S.M.; O'Gorman, N.M.; Green, F.; King, J.J.

Series: Biology and Environment

Title: River Blackwater (Cork/Waterford) SAC (0002170). Conservation objectives supporting document - coastal habitats [Version 1]

Year: 2012

Author: NPWS

Series: Unpublished Report to NPWS

Title: River Blackwater (Cork/Waterford) SAC (0002170). Conservation objectives supporting document - marine habitats [Version 1]

Year: 2012

Author: NPWS

Series: Unpublished Report to NPWS

Title: River Blackwater (Cork/Waterford) SAC (0002170). Conservation objectives supporting document - woodland habitats [Version 1]

Year: 2012

Author: NPWS

Series: Unpublished Report to NPWS

Title: Comparison of field- and GIS-based assessments of barriers to Atlantic salmon migration: a case study in the Nore Catchment, Republic of Ireland

Year: 2011

Author: Gargan, P. G.; Roche, W. K.; Keane, S.; King, J.J.; Cullagh, A.; Mills, P.; O'Keeffe, J.

Series: J. Appl. Ichthyol. 27 (Suppl. 3), 66–72

Title: Second Draft Licky Freshwater Pearl Mussel Sub-basin Management Plan (2009-2015)

Year: 2010c

Author: DEHLG

Series: Unpublished Report to NPWS

Title: Second Draft Allow Freshwater Pearl Mussel Sub-basin Management Plan (2009-2015)

Year: 2010b

Author: DEHLG

Series: Unpublished Report to NPWS

Title: Second Draft Munster Blackwater Freshwater Pearl Mussel Sub-basin Management Plan (2009-2015)

Year: 2010a

Author: DEHLG

Series: Unpublished Report to NPWS

Title: Subtidal benthic investigations in Blackwater River cSAC (Site Code:IE002170) and Blackwater Estuary SPA (IE004028), Co. Cork/Waterford

Year: 2010

Author: Aquafact

Series: Unpublished Report to NPWS & MI

Title: A survey of mudflats and sandflats in Ireland. An intertidal soft sediment survey of the lower Blackwater Estuary

Year: 2010

Author: ASU

Series: Unpublished Report to NPWS & MI

Title: Otter tracking study of Roaringwater Bay

Year: 2010

Author: De Jongh, A.; O'Neill, L.

Series: Unpublished Draft Report to NPWS

Title: A provisional inventory of ancient and long-established woodland in Ireland

Year: 2010

Author: Perrin, P.M.; Daly, O.H.

Series: Irish Wildlife Manuals No. 46

Title: A technical manual for monitoring white-clawed crayfish *Austropotamobius pallipes* in Irish lakes

Year: 2010

Author: Reynolds, J.D.; O'Connor, W.; O'Keeffe, C.; Lynn, D.

Series: Irish Wildlife Manuals No. 45

Title: Report of the standing scientific committee to the DCENR. The status of Irish salmon stocks in 2010 and precautionary catch advice for 2011

Year: 2010

Author: SSC

Series: Unpublished Report to DCENR

Title: The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. [S.I. 296 of 2009]

Year: 2009b

Author: Government of Ireland

Series: Irish Statute Book

Title: The European Communities Environmental Objectives (Surface Water) Regulations 2009. [S.I. 272 of 2009]

Year: 2009a

Author: Government of Ireland

Series: Irish Statute Book

Title: Saltmarsh Monitoring Report 2007-2008

Year: 2009

Author: McCorry, M.; Ryle, T.

Series: Unpublished Report to NPWS

Title: Wildflowers of Cork City and County

Year: 2009

Author: O'Mahony, T.

Series: The Collins Press, Cork

Title: Mitigation of arterial drainage maintenance works on the Awbeg River, Co Cork in relation to conservation of white-clawed crayfsh, *Austropotamobius pallipes*, within the River Blackwater SAC

Year: 2009

Author: Williams, L.

Series: Unpublished Report to NPWS

Title: Flora of County Waterford

Year: 2008

Author: Green, P.

Series: The National Botanic Gardens of Ireland, Dublin

Title: Aspects of anadromous Allis shad (*Alosa alosa* Linnaeus) and Twaite shad (*Alosa fallax* Lacépède) biology in four Irish Special Areas of Conservation (SACs): status, spawning indications and implications for consŜ℠Ø·ΰ2ϒŘŜă¹∃γ1·ΰ2ϒ

Year: 2008

Author: King, J.J.; Roche, W.K.

Series: Hydrobiologia 602, 145–154

Title: Poor water quality constrains the distribution and movements of Twaite shad *Alosa fallax fallax* (Lacepede, 1803) in the watershed of river Scheldt

Year: 2008

Author: Maas, J.; Stevens, M. ; Breine, J.

Series: Hydrobiologia 602, 129 - 143

Title: All Ireland Species Action Plan - Killarney fern

Year: 2008

Author: NPWS ; EHS-NI

Series: Unpublished Report to NPWS & EHS-NI

Title: National Survey of Native Woodlands 2003-2008

Year: 2008

Author: Perrin, P.; Martin, J.; Barron, S.; O'Neill, F.; McNutt, K.; Delaney, A.

Series: Unpublished Report to NPWS

Title: Evolutionary history of lamprey paired species *Lampetra fluviatilis* (L.) and *Lampetra planeri* (Bloch) as inferred from mitochondrial DNA variation

Year: 2007

Author: Espanhol, R.; Almeida, P.R.; Alves, M.J.

Series: Molecular Ecology 16, 1909-1924

Title: Interpretation manual of European Union habitats- EUR 27

Year: 2007

Author: European Commission

Series: DG Environment, Brussels

Title: Supporting documentation for the Habitats Directive Conservation Status Assessment - backing documents, Article 17 forms and supporting maps

Year: 2007

Author: NPWS

Series: Unpublished Report to NPWS

Title: A Survey of Juvenile Lamprey Populations in the Corrib and Suir Catchments

Year: 2007

Author: O'Connor, W.

Series: Irish Wildlife Manuals No. 26

Title: Otter Survey of Ireland 2004/2005

Year: 2006

Author: Bailey, M.; Rochford, J.

Series: Irish Wildlife Manuals No. 23

Title: The status of host fish populations and fish species richness in European freshwater pearl mussel (*Margaritifera margaritifera*) streams

Year: 2006

Author: Geist, J.; Porkka, M.; Kuehn, R.

Series: Aquatic Conservation: Marine and Freshwater Ecosystems 16, 251–266

Title: The distribution of Lamprey in the River Barrow SAC

Year: 2006

Author: King, J.J.

Series: Irish Wildlife Manuals No. 21

Title: Otters - ecology, behaviour and conservation

Year: 2006

Author: Kruuk, H.

Series: Oxford University Press

Title: Conservation Plan for River Blackwater (Cork/Waterford) SAC. Draft 0 – descriptive section

Year: 2006

Author: NPWS

Series: Unpublished Draft Report to NPWS

Title: The ecology and conservation of the gametophyte generation of the Killarney Fern (*Trichomanes speciosum* Willd.) in Ireland

Year: 2005

Author: Kingston, N. ; Hayes, C.

Series: Biology and Environment: Proceedings of the Royal Irish Academy 105B(2): 71-79

Title: Initiation of a monitoring program for the freshwater pearl mussel, *Margaritifera margaritifera* (L.) in the Licky River

Year: 2005

Author: Ross, E.D.

Series: Unpublished Report to NPWS

Title: The status and distribution of lamprey and shad in the Slaney and Munster Blackwater SACs
Year: 2004
Author: King, J.J.; Linnane, S.M.
Series: Irish Wildlife Manuals No. 14

Title: Identifying lamprey. A field key for sea, river and brook lamprey
Year: 2003
Author: Gardiner, R.
Series: Conserving Natura 2000 rivers, Conservation techniques No. 4. English Nature, Peterborough

Title: Monitoring the river, sea and brook lamprey, *Lampetra fluviatilis*, *L. planeri* and *Petromyzon marinus*
Year: 2003
Author: Harvey, J.; Cowx, I.
Series: Conserving Natura 2000 Rivers Monitoring Series No. 5. English Nature, Peterborough

Title: Ecology of Watercourses Characterised by *Ranunculion fluitantis* and *Callitricho-Batrachion* Vegetation
Year: 2003
Author: Hatton-Ellis, T.W.; Grieve, N.
Series: Conserving Natura 2000 Rivers Ecology Series No. 11. English Nature, Peterborough

Title: Ecology of the Allis and Twaite shad
Year: 2003
Author: Maitland, P.S.; Hatton-Ellis, T.W.
Series: Conserving Natura 2000 Rivers Ecology Series No. 3. English Nature, Peterborough

Title: Pondweeds of Great Britain and Ireland
Year: 2003
Author: Preston, C.D.
Series: BSBI Handbook, No. 8, London

Title: A survey of the white-clawed crayfish, *Austropotamobius pallipes* (Lereboullet) and of water quality in two catchments of Eastern Ireland
Year: 2002
Author: Demers, A.; Reynolds, J. D.
Series: Bulletin Français de la Pêche et de la Pisciculture, 367: 729-740

Title: Reversing the habitat fragmentation of British woodlands
Year: 2002
Author: Peterken, G.
Series: WWF-UK, London

Title: Aquatic Plants in Britain and Ireland
Year: 2001
Author: Preston, C.D.
Series: Harley Books, Colchester

Title: National Shingle Beach Survey of Ireland 1999

Year: 1999

Author: Moore, D.; Wilson, F.

Series: Unpublished Report to NPWS

Title: The saltmarshes of Ireland: an inventory and account of their geographical variation

Year: 1998

Author: Curtis, T.G.F.; Sheehy-Skeffington, M.J.

Series: Biology and Environment, Proceedings of the Royal Irish Academy 98B: 87-104

Title: The spatial organization of otters (*Lutra lutra*) in Shetland

Year: 1991

Author: Kruuk, H.; Moorhouse, A.

Series: J. Zool, 224: 41-57

Title: Otter survey of Ireland

Year: 1982

Author: Chapman, P.J.; Chapman, L.L.

Series: Unpublished Report to Vincent Wildlife Trust

Spatial data sources

Year:	2010
Title:	EPA WFD transitional waterbody data
GIS operations:	Clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	1130 (map 3)
Year:	Interpolated 2012
Title:	Mudflat and sandflat survey 2010; subtidal survey 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 4 and 5)
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 5)
Year:	Revision 2010
Title:	Saltmarsh Monitoring Project 2007-2008. Version 1
GIS operations:	QIs selected; clipped to SAC boundary; overlapping regions with Coastal CO data investigated and resolved with expert opinion used
Used for:	1310, 1330, 1410 (map 6)
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 7)
Year:	2012
Title:	Coillte hardcopy map
GIS operations:	Polygon digitised; clipped to SAC boundary
Used for:	91J0 (map 7)
Year:	Revision 2012
Title:	NPWS conservation plan spatial data 2006
GIS operations:	WN, WD1 and WD2 polygons merged; clipped to SAC boundary
Used for:	semi-natural woodland (map 7)
Year:	Revision 2012
Title:	Margaritifera Sensitive Areas data
GIS operations:	Relevant catchment boundaries identified. Expert opinion used as necessary to resolve any issues arising
Used for:	1029 (map 8)

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:	1029, 1092, 1095, 1096, 1099, 1421 (maps 8, 9 and 10)
Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	Creation of an 80m buffer on the marine side of the high water mark (HWM); creation of a 10m buffer on the terrestrial side of the HWM; combination of 80m and 10m HWM buffer datasets; creation of a 10m buffer on the terrestrial side of the river banks data; creation of 20m buffer applied to canal centreline data. These datasets are combined with the derived EPA WFD Waterbodies data for the 1355 CO. 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)
Year:	2010
Title:	EPA WFD Waterbodies data
GIS operations:	Creation of a 20m buffer applied to river and stream centreline data; creation of 80m buffer on the aquatic side of lake data; creation of 10m buffer on the terrestrial side of lake data. These datasets are combined with the derived OSi data and Coastal Lagoon data for the 1355 CO. Overlapping regions investigated and resloved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	1355 (no map)

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

To restore the favourable conservation condition of the Freshwater Pearl Mussel in the Blackwater River (Cork/Waterford) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Kilometres	Maintain at 161km. See map 8	The freshwater pearl mussel is known from the main Blackwater River, two tributaries (Owentaraglin and Allow) and the Licky River, which discharges to the Upper Blackwater Estuary. 168km encompasses the length of channel from the most upstream records of the freshwater pearl mussel to the most downstream records of live mussels, and contained within the freshwater pearl mussel catchment boundaries displayed on map 8
Population size	Number of adult mussels	Restore to 35,000 adult mussels	The SAC has three populations listed on the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations of 2009 (Government of Ireland, 2009b): Munster Blackwater, Allow (Munster Blackwater) and Licky. The separation of the main channel Blackwater and Allow into two populations is artificial and no longer considered appropriate. The Licky, however, is a distinct population, being separated from the Blackwater by brackish water and a hydrological distance of approx. 30km, making genetic exchange very unlikely. Information on the size of the population in the Blackwater and its tributaries is poor, but estimated at less than 10,000 for the Blackwater main channel (target set at 10,000); and between 10,000 and 20,000 for the Allow tributary (target set at 15,000) (DEHLG, 2010a, 2010b). The Licky population was estimated as just greater than 10,000 in 2005, but was estimated to have declined to approx. 4,700 by 2009 (target set at 10,000) (Ross, 2005; DEHLG, 2010c)

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

To restore the favourable conservation condition of the Freshwater Pearl Mussel in the Blackwater River (Cork/Waterford) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population structure: recruitment	Percentage per size class	Restore to least 20% of population no more than 65mm in length; and at least 5% of population no more than 30mm in length	Mussels of no more than 65mm are considered 'young mussels' and may be found buried in the substratum and/or beneath adult mussels. Mussels of no more than 30mm are 'juvenile mussels' and are always buried in the substratum. The Blackwater population is believed to be composed entirely of aged adults, with no evidence of recruitment for at least 20 years (DEHLG, 2010a). No juvenile mussels were found in the Allow and 8.3% of the population was no more than 65mm in length in 2009 (DEHLG, 2010b). No young or juvenile mussels were recorded in the Licky during monitoring in 2005 or 2009 and there was no evidence that recruitment had occurred in at least 12 years, with the smallest mussel in 2009 measuring 85.3mm (Ross, 2005; DEHLG 2010c)
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% of dead shells is considered to be indicative of natural losses. The Allow passed the target for live adults, but failed that for dead shells in 2009 (DEHLG, 2010b). The Blackwater and Licky failed both targets in 2009 (DEHLG, 2010a, 2010c)

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

To restore the favourable conservation condition of the Freshwater Pearl Mussel in the Blackwater River (Cork/Waterford) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat extent	Kilometres	Restore suitable habitat in more than 35km (see map 8) and any additional stretches necessary for salmonid spawning	The species' habitat covers stretches of very large, high energy, lowland rivers (Blackwater) and a short coastal river (Licky); and is a combination of 1) the area of habitat adult and juvenile mussels can occupy and 2) the area of spawning and nursery habitats the 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 those salmonid spawning areas that could regularly contribute juvenile fish to the areas occupied by adult mussels should be considered. The availability of mussel habitat and fish spawning and nursery habitats are determined by flow and substratum conditions. The habitat for the species is currently unsuitable for the survival of adult mussels or the recruitment of juveniles. The target is based on the stretches of river identified, from a combination of dedicated survey and incidental records, as having suitable habitat for the species. As there has been no full baseline survey, the quality of the data from the Blackwater and its tributaries is poor
Water quality: macroinvertebrate and phytobenthos (diatoms)	ecological quality ratio (EQR)	Restore water quality-macroinvertebrates: EQR greater than 0.90; phytobenthos: EQR greater than 0.93	These EQRs 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). The habitat in the Blackwater and Licky failed both standards during 2009 sampling for the Sub-basin Management Plans, while the Allow failed the macorinvertebrate target (DEHLG, 2010a, 2010b, 2010c). See also The European Communities Environmental Objectives (Surface Water Objectives) Regulations 2009 (Government of Ireland, 2009a)

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

To restore the favourable conservation condition of the Freshwater Pearl Mussel in the Blackwater River (Cork/Waterford) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Substratum quality: filamentous algae (macroalgae), macrophytes (rooted higher plants)	Percentage	Restore substratum quality- filamentous algae: absent or trace (<5%); macrophytes: absent or trace (<5%)	Significant growth of macrophytes was found at some sites in all three populations sampled during 2009 for the Sub-basin Management Plans (DEHLG, 2010a, 2010b, 2010c). Filamentous algae were below the target at all sites sampled in the Allow, however significant growths were detected at some sampling sites in the Blackwater and Licky (DEHLG, 2010a, 2010b, 2010c). Recruitment of juvenile mussels is being prevented by the poor quality of the river substrate
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 habitat for the species is currently unsuitable for the recruitment of juveniles owing to sedimentation of the substratum. In some locations, it is also unsuitable for the survival of adult mussels, notably stretches of the Licky (DEHLG, 2010c). Significant sedimentation has been recorded during all recent mussel monitoring surveys, particularly in the Licky and Allow (DEHLG, 2010a, 2010b, 2010c). Recruitment of juvenile mussels is being prevented by the poor quality of the river substrate
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. Redox potential data are currently only available from the Allow, where loss in 2009 was 31.5 - 44.1% at 5cm depth (DEHLG, 2010b)
Hydrological regime: flow variability	Metres per second	Restore appropriate hydrological regimes	The availability of suitable freshwater pearl mussel habitat is largely determined by flow (catchment geology being the other important factor). In order 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) low flows do not exacerbate the deposition of fines and 3) low flows do not cause stress to mussels in terms of exposure, water temperatures, food availability or aspects of the reproductive cycle

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

To restore the favourable conservation condition of the Freshwater Pearl Mussel in the Blackwater River (Cork/Waterford) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Host fish	Number	Maintain sufficient juvenile salmonids to host glochidial larvae	Salmonid fish are host to the larval form of the freshwater pearl mussel and, thus, they are essential to the completion of the life cycle. 0+ and 1+ fish are typically used, both because of the habitat overlaps and the development of immunity with age in the fish. Fish presence is considered sufficient, as higher densities and biomass of fish are 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 pearl mussels and a lack of pearl mussel recruitment, while significantly lower densities and biomass of host fish were associated with high numbers of juvenile mussels. Fish movement patterns must be such that 0+ fish in the vicinity of the mussel habitat 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. The Allow and Licky freshwater pearl mussel populations appear to favour native brown trout (*Salmo trutta*), therefore, it is particularly important that these are not out-competed by stocked fish (DEHLG, 2010b, 2010c). No data on fish preferences are available for the Blackwater

1092 White-clawed Crayfish *Austropotamobius pallipes*

To maintain the favourable conservation condition of White-clawed Crayfish in the Blackwater River (Cork/Waterford) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Occurrence	No reduction from baseline. See map 9	Within the Blackwater River system, white-clawed crayfish is present only on the Awbeg River. The Awbeg flows through limestone geology. There are other tributaries of the Blackwater with limestone geology but are not known to contain the species. The main Blackwater is considered chemically unsuitable for the crayfish. However, there have been two recent records from other parts of the river system. One was downstream of the confluence of the Awbeg and Blackwater and may simply represent a specimen moving out of the Awbeg. The second was upstream of Mallow and this may represent a new population or an introduction. More information is needed on these. On the Awbeg, the crayfish is found along the whole length of the designated part of the river. The Environmental Protection Agency (EPA) river quality monitoring on the Awbeg did not detect any crayfish in 2009. However, large numbers were found during river maintenance work in 2009 upstream of Buttevant and these were translocated to undisturbed habitat (Williams, 2009)
Population structure: recruitment	Percentage occurrence of juveniles and females with eggs	Juveniles and/or females with eggs in at least 50% of positive samples	See Reynolds et al. (2010) for further details
Negative indicator species	Occurrence	No alien crayfish species	Alien crayfish species are identified as major direct threat to this species and as disease vector. See Reynolds (1998) for further details
Disease	Occurrence	No instances of disease	Disease is identified as major threat and has occurred in Ireland even in the absence of alien vectors. See Reynolds et al. (2010) for further details
Water quality	EPA Q value	At least Q3-4 at all sites sampled by EPA	Target taken from Demers and Reynolds (2002). Q values based on triennial water quality surveys carried out by the EPA

1092 White-clawed Crayfish *Austropotamobius pallipes*

To maintain the favourable conservation condition of White-clawed Crayfish in the Blackwater River (Cork/Waterford) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat quality: heterogeneity	Occurrence of positive habitat features	No decline in heterogeneity or habitat quality	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 must be available on the whole length of occupied habitat

1095 Sea Lamprey *Petromyzon marinus*

To restore the favourable conservation condition of Sea Lamprey in the Blackwater River (Cork/Waterford) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	% of river accessible	Greater than 75% of main stem length of rivers accessible from estuary. See map 10 for recorded distribution	Artificial barriers can block or cause difficulties to lampreys' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas. See Gargan et al. (2011)
Population structure of juveniles	Number of age/size groups	At least three age/size groups present	Attribute and target based on data from Harvey and Cowx (2003) and O'Connor (2007)
Juvenile density in fine sediment	Juveniles/m²	Juvenile density at least 1/m²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003)
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds. See map 10 for recorded locations	Attribute and target based on spawning bed mapping by Inland Fisheries Ireland (IFI). Lampreys spawn in clean gravels. Survey in 2010 indicated accumulations of redds downstream of major weirs. (See also Gargan et al., 2011)
Availability of juvenile habitat	Number of positive sites in 3rd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive. See map 10 for recorded locations	Despite observed spawning activity, sampling for ammocoetes consistently fails to find these in many sampling stations and never in any great numbers. See King and Linnane (2004)

1096 Brook Lamprey *Lampetra planeri*

To maintain the favourable conservation condition of Brook Lamprey in the Blackwater River (Cork/Waterford) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	% of river accessible	Access to all water courses down to first order streams	Artificial barriers can block or cause difficulties to brook lampreys migration, both up- and downstream, thereby possibly limiting species to specific stretches and creating genetically isolated populations (Espanhol et al., 2007)
Population structure of juveniles	Number of age/size groups	At least three age/size groups of brook/river lamprey present	Attribute and target based on data from Harvey & Cowx (2003). It is impossible to distinguish between brook and river lamprey juveniles in the field (Gardiner 2003), hence they are considered together in this target
Juvenile density in fine sediment	Juveniles/m²	Mean catchment juvenile density of brook/river lamprey at least 2/m²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey & Cowx (2003) who state 10/m² in optimal conditions and more than 2/m² on a catchment basis
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds	Spawning site and redd attributes established by IFI (Rooney et al., in press)
Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive. See map 10 for recorded locations	Many sites with suitable larval attributes i.e. fine sediment in low velocity habitat, are found not to contain larval lamprey. This may be a function of chance or probability, or may be a consequence of insufficient recruitment to fill all spatial niches. Occupancy in excess of 50% of sites would be 'reasonable' for the Irish catchments examined to date (King and Linnane, 2004; King et al., unpublished data)

1099 River Lamprey *Lampetra fluviatilis*

To maintain the favourable conservation condition of River Lamprey in the Blackwater River (Cork/Waterford) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	% of river accessible	Access to all water courses down to first order streams	Artificial barriers can block or cause difficulties to river lampreys' migration, both up- and downstream, thereby possibly limiting species to specific stretches and creating genetically isolated populations (Espanhol et al., 2007)
Population structure of juveniles	Number of age/size groups	At least three age/size groups of river/brook lamprey present	Attribute and target based on data from Harvey & Cowx (2003). It is impossible to distinguish between river and brook lamprey juveniles in the field (Gardiner 2003), hence they are considered together in this target
Juvenile density in fine sediment	Juveniles/m²	Mean catchment juvenile density of brook/river lamprey at least 2/m²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey & Cowx (2003) who state 10/m² in optimal conditions and more than 2/m² on a catchment basis
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds	Spawning site and redd attributes established by IFI (Rooney et al., in press)
Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive. See map 10 for recorded locations of brook/river lamprey juveniles	Many sites with suitable larval attributes i.e. fine sediment in low velocity habitat, are found not to contain larval lamprey. This may be a function of chance or probability, or may be a consequence of insufficient recruitment to fill all spatial niches. Occupancy in excess of 50% of sites would be reasonable for the Irish catchments examined to date (King and Linnane, 2004; King et al., unpublished data)

1103 Twaite Shad *Alosa fallax*

To restore the favourable conservation condition of Twaite Shad in the Blackwater River (Cork/Waterford) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	% of river accessible	Greater than 75% of main stem length of rivers accessible from estuary	In some catchments, artificial barriers block twaite shads' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas. Major weirs on the Blackwater prevent potential exploitation of adult spawning grounds
Population structure: age classes	Number of age classes	More than one age class present	Regular breeding has been confirmed in the River Blackwater in recent years (King and Linnane, 2004; King and Roche, 2008)
Extent and distribution of spawning habitat	m^2 and occurrence	No decline in extent and distribution of spawning habitats	
Water quality: oxygen levels	Milligrammes per litre	No lower than 5mg/l	Attribute and target based on Maas, Stevens and Briene (2008)
Spawning habitat quality: Filamentous algae; macrophytes; sediment	Occurrence	Maintain stable gravel substrate with very little fine material, free of filamentous algal (macroalgae) growth and macrophyte (rooted higher plant) growth	

1106 Atlantic Salmon *Salmo salar* (only in fresh water)

To maintain the favourable conservation condition of Atlantic Salmon in the Blackwater River (Cork/Waterford) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	% 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. Large weirs on the Blackwater may delay salmon upstream migration in certain water conditions but do not generally prevent access to spawning areas
Adult spawning fish	Number	Conservation Limit (CL) for each system consistently exceeded	A conservation limit 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 of the National Salmon Commission's annual model output of CL attainment levels. See SSC (2010). Stock estimates are either derived from direct counts of adults (rod catch, fish counter) or indirectly by fry abundance counts. The Blackwater is currently exceeding its CL for one sea winter salmon and its multi sea winter CL for 2012
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 min sampling	Target is threshold value for rivers currently exceeding their conservation limit (CL). As stock estimates are estimated by direct counts for the Blackwater, this attribute is not currently being measured at this site
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)

1130 Estuaries

To maintain the favourable conservation condition of Estuaries in the Blackwater River (Cork/Waterford) 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 1208ha using OSi data and the Transitional Water Body area as defined under the Water Framework Directive. See marine supporting document for further details
Community extent	Hectares	Maintain the extent of the *Mytilus edulis*-dominated community, subject to natural processes. See map 5	Estimated during 2009 subtidal and intertidal surveys (Aquafact, 2010; ASU, 2010). See marine supporting document for further details
Community structure: Mytilus edulis density	Individuals/m²	Conserve the high quality of the *Mytilus edulis*-dominated community, subject to natural processes	Observed during 2009 subtidal and intertidal surveys (Aquafact, 2010; ASU, 2010). See marine supporting document for further details
Community distribution	Hectares	Conserve the following community types in a natural condition: Intertidal estuarine sandy mud community complex; Subtidal estuarine fine sand with *Bathyporeia* spp. community complex; Sand and mixed sediment with polychaetes and crustaceans community complex; Coarse sediment community complex. See map 5	Habitat structure was elucidated from 2009 subtidal and intertidal surveys (Aquafact, 2010; ASU, 2010). See marine supporting document for further details

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 the Blackwater River (Cork/Waterford) 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 4	Habitat area was estimated using OSi data as 284ha. See marine supporting document for further details
Community extent	Hectares	Maintain the extent of the *Zostera*- and *Mytilus edulis*-dominated communities, subject to natural processes. See map 5	Estimated during 2009 intertidal survey (ASU, 2010). See marine supporting document for further details
Community structure: Zostera shoot density	Shoots/m²	Conserve the high quality of the *Zostera*-dominated community, subject to natural processes	Described as part of 2009 intertidal survey (ASU, 2010). See marine supporting document for further details
Community structure: Mytilus edulis density	Individuals/m²	Conserve the high quality of the *Mytilus edulis*-dominated community, subject to natural processes	Described as part of 2009 intertidal survey (ASU, 2010). See marine supporting document for further details
Community distribution	Hectares	The following community types should be conserved in a natural condition: Intertidal estuarine sandy mud community complex and Sand and mixed sediment with polychaetes and crustaceans community complex. See map 5	Habitat structure was elucidated from 2009 intertidal survey (ASU, 2010). See marine supporting document for further details

1220 Perennial vegetation of stony banks

To maintain the favourable conservation condition of Perennial vegetation of stony banks in the Blackwater River (Cork/Waterford) 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, including erosion and succession	Current area unknown. It was recorded from Ferrypoint during the National Shingle Beach Survey (Moore and Wilson, 1999). Extent was not mapped, but it was noted as one of the larger systems in County Waterford. NB further unsurveyed areas maybe present within the site
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes	Current distribution unknown
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Based on data from Moore and Wilson (1999). Shingle features are relatively stable in the long term. 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	Based on data from Moore and Wilson (1999). At Ferrypoint, the shingle is associated with shingle-based grassland and a lagoon. 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 the typical vegetated shingle flora including the range of sub-communities within the different zones	Based on data from Moore and Wilson (1999). 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 Moore and Wilson (1999). 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

1310 *Salicornia* and other annuals colonizing mud and sand

To maintain the favourable conservation condition of *Salicornia* and other annuals colonizing mud and sand in the Blackwater River (Cork/Waterford) 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, including erosion and succession	Habitat not recorded by McCorry and Ryle (2009) at Kinsalebeg but is known to occur at Foxhole, Black Bog and Tourig (Curtis and Sheehy-Skeffington, 1998). However, extent is un-mapped. NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes	Habitat not recorded by McCorry and Ryle (2009) at Kinsalebeg but is known to occur at Foxhole, Black Bog and Tourig (Curtis and Sheehy-Skeffington, 1998). *Salicornia* is an annual species, so its distribution can vary significantly from year to year. See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/ absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions	Sediment supply is particularly important for this pioneer saltmarsh community, as the distribution of this habitat depends on accretion rates. See coastal habitats backing document for further details
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession	Based on data from McCorry and Ryle (2009). Creeks deliver sediment throughout saltmarsh system. Creeks and pan structures well developed in the larger sections of the marsh at Kinsalebeg. See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	This pioneer saltmarsh community requires regular tidal inundation. 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	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimeters	Maintain structural variation within sward	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover	Maintain the presence of species-poor communities with typical species listed in saltmarsh Monitoring Project (McCorry and Ryle, 2009)	See coastal habitats supporting document for further details

1310 *Salicornia* and other annuals colonizing mud and sand

To maintain the favourable conservation condition of *Salicornia* and other annuals colonizing mud and sand in the Blackwater River (Cork/Waterford) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation structure: negative indicator species: *Spartina anglica*	Hectares	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%	Based on data from McCorry and Ryle (2009). *Spartina* was recorded at Ferrypoint, but it was not noted to form swards on the mudflats. See coastal habitats supporting document for further details

1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

To restore the favourable conservation condition of Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) in the Blackwater River (Cork/Waterford) 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, including erosion and succession. For sub-site mapped: Kinsalebeg - 2.77ha. See map 6	Based on data from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009). One sub-site that supported Atlantic salt meadow was mapped (2.77ha) and additional areas of potential saltmarsh (28.13ha) were identified from an examination of aerial photographs, giving a total estimated area of 30.90ha. Saltmarsh habitat also occurs at Tourig Hall and Ballintray House (Curtis and Sheehy-Skeffington, 1998). NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 6 for known distribution	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/ absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions	See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession	Creeks and pan structures well developed at the larger sections of marsh in the Kinsalebeg sub-site. See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	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	Atlantic salt meadow occurs in mosaic with Mediterranean salt meadow at the Kinsalebeg saltmarsh. Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimeters	Maintain structural variation within sward	Most of the Atlantic salt meadows habitat at Kinsalebeg is grazed to a high intensity and sward height is quite low. Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of the saltmarsh area vegetated	Bare substrate occurs as a result of overgrazing in places at Kinsalebeg. Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details

1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

To restore the favourable conservation condition of Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) in the Blackwater River (Cork/Waterford) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
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 Saltmarsh Monitoring Project (McCorry and Ryle, 2009)	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: negative indicator species - *Spartina anglica*	Hectares	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%	Based on data from McCorry and Ryle (2009). *Spartina* occurs at Kinsalebeg sub-site, but does not occupy a significant part of the saltmarsh vegetation. See coastal habitats supporting document for further details

1355 Otter *Lutra lutra*

To restore the favourable conservation condition of Otter in the Blackwater River (Cork/Waterford) 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. FCS target, based on 1980/81 survey findings, is 88% in SACs. Current range in south-west estimated at 74.5% (Bailey & Rochford 2006)
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 103ha above high water mark (HWM); 1165.7ha along river banks/ around ponds	No field survey. Areas mapped to include 10m terrestrial buffer along shoreline (above 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 647.2ha	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 599.54km	No field survey. River length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (Chapman & Chapman, 1982)
Extent of freshwater (lake) habitat	Hectares	No significant decline. Area mapped and calculated as 25.06ha	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, 2006; Kruuk & Moorhouse, 1991)
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 & Rochford 2006) and wrasse and rockling in coastal waters (Kingston et al. 1999)
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 & O'Neill, 2010). It is important that such commuting routes are not obstructed

1410 Mediterranean salt meadows (*Juncetalia maritimi*)

To maintain the favourable conservation condition of Mediterranean salt meadows (*Juncetalia maritimi*) in the Blackwater River (Cork/Waterford) 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, including erosion and succession. For sub-site mapped: Kinsalebeg: 1.36ha. See map 6	Based on data from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009). One sub-site that supports Mediterranean salt meadows was mapped (1.36ha) and additional areas of potential saltmarsh (8.67ha) were identified from an examination of aerial photographs, giving a total estimated area of 10.03ha. NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 6 for known distribution	Based on data from the Saltmarsh Monitoring Project (McCorry and Ryle 2009). See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/ absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions	Based on data from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009). See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession	Based on data from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009). The MSM at Kinsalebeg has a well developed saltmarsh structure in places. See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	Mediterranean salt meadow is found high up in the saltmarsh but requires occasional tidal inundation. 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	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated	Based on data from McCorry and Ryle (2009). Grazing intensity is not as high as in the Atlantic salt meadows. See coastal habitats supporting document for further details

1410 Mediterranean salt meadows (*Juncetalia maritimi*)

To maintain the favourable conservation condition of Mediterranean salt meadows (*Juncetalia maritimi*) in the Blackwater River (Cork/Waterford) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation composition: typical species	Percentage cover	Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009)	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: negative indicator species - *Spartina anglica*	Hectares	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%	Based on data from McCorry and Ryle (2009). *Spartina* occurs at Kinsalebeg sub-site, but does not occupy a significant part of the saltmarsh vegetation. See coastal habitats supporting document for further details

1421 Killarney Fern *Trichomanes speciosum*

To maintain the favourable conservation condition of Killarney Fern in the Blackwater River (Cork/Waterford) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Location	No decline. Two locations known within the SAC. See map 10	Data from NPWS rare and threatened species database
Population size	Number	Maintain size and extent of existing colonies, including sporophyte frond counts and number of gametophyte patches	
Habitat extent	m^2	No loss of suitable habitat, such as shaded rock crevices, caves or gullies in, or near to, known colonies. No loss of woodland canopy at or near to known locations	Based on Kingston & Hayes (2005) and Ni Dhuill (pers comm)
Hydrological conditions: visible water	Occurrence	Maintain hydrological conditions at the locations so that all colonies are in dripping or damp seeping habitats, and water is visible at all locations	Based on Kingston & Hayes (2005) and Ni Dhuill (pers comm)
Hydrological conditions: humidity	Number of dessicated fronds	No increase. Presence of dessicated sporophyte fronds or gametophyte mats indicates conditions are unsuitable	Based on Kingston & Hayes (2005) and Ni Dhuill (pers comm)
Light levels: shading	Percentage	No changes due to anthropogenic impacts	Based on Kingston & Hayes (2005) and Ni Dhuill (pers comm)
Invasive species	Occurrence	Absent or under control	EHS & NPWS (2008) provides further details

3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

To maintain the favourable conservation condition of Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation in the Blackwater River (Cork/Waterford) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat distribution	Occurrence	No decline, subject to natural processes	The full distribution of this habitat and its sub-types in this site are currently unknown. The basis of the selection of the SAC for the habitat was the presence of plant species listed in the Interpretation Manual (European Commission, 2007), recorded during the Natural Heritage Area (NHA) survey of the river (internal NPWS files). Further records of these and other aquatic plant species in the Blackwater can be found in Green (2008) and O'Mahony (2009). The dominant floating-leaved species appears to be the common and widespread stream water-crowfoot (*Ranunculus penicillatus* subsp. *penicillatus*) (Green, 2008, O'Mahony, 2009). No high conservation value sub-types are known to occur in the SAC and further survey is required to determine whether any such are present. Only one rare/threatened vascular plant species is known to occur in the SAC, the protected opposite-leaved pondweed (*Groenlandia densa*), which is abundant in the tidal stretches around Cappoquin (Green, 2008). **Note: rooted macrophytes should be absent or trace (< 5% cover) in freshwater pearl mussel (*Margaritifera margaritifera*) habitat. The freshwater pearl mussel (1029) conservation objective takes precedence over this objective for habitat 3260 in this SAC, because the mussel requires environmental conditions closer to natural background levels**
Habitat area	Kilometres	Area stable or increasing, subject to natural processes	The full extent of this habitat in this site is currently unknown. See above

3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

To maintain the favourable conservation condition of Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation in the Blackwater River (Cork/Waterford) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Hydrological regime: river flow	Metres per second	Maintain appropriate hydrological regimes	Due to regular disturbance (through variations in flow), river macrophytes rarely reach a climax condition but frequently occur as transient communities. A natural (relatively unmodified) flow regime is required for both plant communities and channel geomorphology to be in favourable condition, exhibiting typical dynamics for the river type (Hatton-Ellis and Grieve, 2003). For most of the sub-types of this habitat, high flows are required to maintain the substratum (see below) necessary for the characteristic species. Flow variation is particularly important, with high and flood flows being critical to the hydromorphology. Other aspects of hydrological regime, such as groundwater discharge are important for certain sub-types of the habitat, which may be present within the SAC
Hydrological regime: tidal influence	Daily water level fluctuations- metres	Maintain natural tidal regime	Tidal regime appears to be an important influence on the distribution of opposite-leaved pondweed (*Groenlandia densa*) in Ireland. The species is also typical of the tidal reaches of other large Irish rivers, e.g. the Slaney, the Suir and the Shannon (see Preston, 2003; Preston and Croft, 2001). Both the disturbance and substratum associated with the tidal regime may be important drivers
Substratum composition: particle size range	Millimetres	The substratum should be dominated by the particle size ranges, appropriate to the habitat sub-type (typically sands, gravels and cobbles)	The size and distribution of substratum particles is largely determined by the river flow. Different habitat sub-types and species have different substratum requirements. Opposite-leaved pondweed (*Groenlandia densa*) is typically found on silts (mud), and sometimes sands

3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

To maintain the favourable conservation condition of Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation in the Blackwater River (Cork/Waterford) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Water quality: nutrients	Milligrammes per litre	The concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition	Phosphorus (MRP) is typically the limiting nutrient, however increased nitrogen (NO3-) negatively impacts upon some aquatic plant communities. Nutrient enrichment typically leads to increased filamentous-green-algal biomass, and consequent changes in other algae, bryophyte and macrophyte species composition and abundance. Water quality should reach a minimum of Water Framework Directive good status, in terms of nutrient and oxygenation standards and EQRs (ecological quality ratios) for macroinvertebrates and phytobenthos. For certain sub-types, other aspects of water quality, such as suspended sediment and minerals, should be considered
Vegetation composition: typical species	Occurrence	Typical species of the relevant habitat sub-type should be present and in good condition	The sub-types of this habitat are poorly understood and their typical species have not yet been defined. Typical species and appropriate targets may emerge to be site-specific. The typical species may include higher plants, bryophytes, macroalgae and microalgae
Floodplain connectivity: area	Hectares	The area of active floodplain at and upstream of the habitat should be maintained	River connectivity with the floodplain is essential for the functioning of this habitat. Floodplain connectivity is particularly important in terms of sediment sorting and nutrient deposition. The Blackwater valley has extensive floodplains. The functioning of these floodplains, in relation to sediment and nutrient dynamics, is currently being impaired by arable agriculture

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 Blackwater River (Cork/Waterford) 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, at least 263.7ha for sub-sites surveyed. See map 7	Minimum area, based on 15 sites surveyed by Perrin et al. (2008) - site codes 1326, 1340, 1354, 1355, 1359, 1459, 1488, 1490, 1492, 1543, 1626, 1819, 1842, 1844, 1846. NB further unsurveyed areas are almost certainly present within the site. Map 7 shows semi-natural woodland extent within the SAC. See woodland habitats supporting document for further details
Habitat distribution	Occurrence	No decline. Surveyed locations shown on map 7	Distribution based on Perrin et al. (2008). NB further unsurveyed areas maybe present within the site. Map 7 shows semi-natural woodland distribution within the SAC. See woodland habitats supporting document for further details
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 sizes of at least some of the existing woodlands need to be increased in order to reduce habitat fragmentation and benefit those species requiring ‘deep’ woodland conditions (Peterken, 2002). Topographical constraints may restrict expansion. See woodland habitats supporting document for further details
Woodland structure: cover and height	Percentage and metres	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi-mature trees and shrubs; and well-developed herb layer	Described in Perrin et al. (2008). See woodland habitats supporting document for further details
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	Described in Perrin et al. (2008). See woodland habitats supporting document for further details
Woodland structure: natural regeneration	Seedling: sapling: pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	Oak regenerates poorly. In suitable sites ash can regenerate in large numbers although few seedlings reach pole size
Woodland structure: dead wood	m^3 per hectare; number per hectare	At least 30m^3/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem

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 Blackwater River (Cork/Waterford) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Woodland structure: veteran trees	Number per hectare	No decline	Mature and 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 disctinctiveness	Occurrence	No decline	Includes ancient or long-established woodlands, archaeological and geological features as well as red-data and other rare or localised species. Perrin and Daly (2010) list the 15 sites listed above as containing potential ancient/long established woodlands
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover not less than 95%	Species reported in Perrin et al. (2008)
Vegetation composition: typical species	Occurrence	A variety of typical native species present, depending on woodland type, including sessile oak (*Quercus petraea*) and birch (*Betula pubescens*)	Species reported in Perrin et al. (2008)
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control	The following are the most common invasive species in this woodland type: beech (*Fagus sylvatica*), sycamore (*Acer pseudoplatanus*), rhododendron (*Rhododendron ponticum*), cherry laurel (*Prunus laurocerasus*)

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 the Blackwater River (Cork/Waterford) 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, at least 19.2ha for sites surveyed. See map 7	Minimum area, based on 6 sites surveyed by Perrin et al. (2008) - site codes 1343, 1459, 1464, 1488, 1824, 1998. NB further unsurveyed areas are almost certainly present within the SAC. Map 7 shows semi-natural woodland extent within the SAC. See woodland habitats supporting document for further details
Habitat distribution	Occurrence	No decline. Surveyed locations shown on map 7	Distribution based on Perrin et al. (2008). NB further unsurveyed areas may be present within the SAC. Map 7 shows semi-natural woodland distribution within the SAC. See woodland habitats supporting document for further details
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 sizes of at least some of the existing woodlands need to be increased in order to reduce habitat fragmentation and benefit those species requiring ‘deep’ woodland conditions (Peterken, 2002). Topographical and land-ownership constraints may restrict expansion
Woodland structure: cover and height	Percentage and metres	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi-mature trees and shrubs; and well-developed herb layer	Described in Perrin et al. (2008). See woodland habitats supporting document for further details
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	Described in Perrin et al. (2008). See woodland habitats supporting document for further details
Woodland structure: natural regeneration	Seedling: sapling: pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	Alder and oak regenerate poorly. Ash often regenerates in large numbers although few seedlings reach pole size
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 floodplains
Woodland structure: dead wood	m^3 per hectare; number per hectare	At least 30m^3/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter (greater than 20cm diameter in the case of alder)	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem

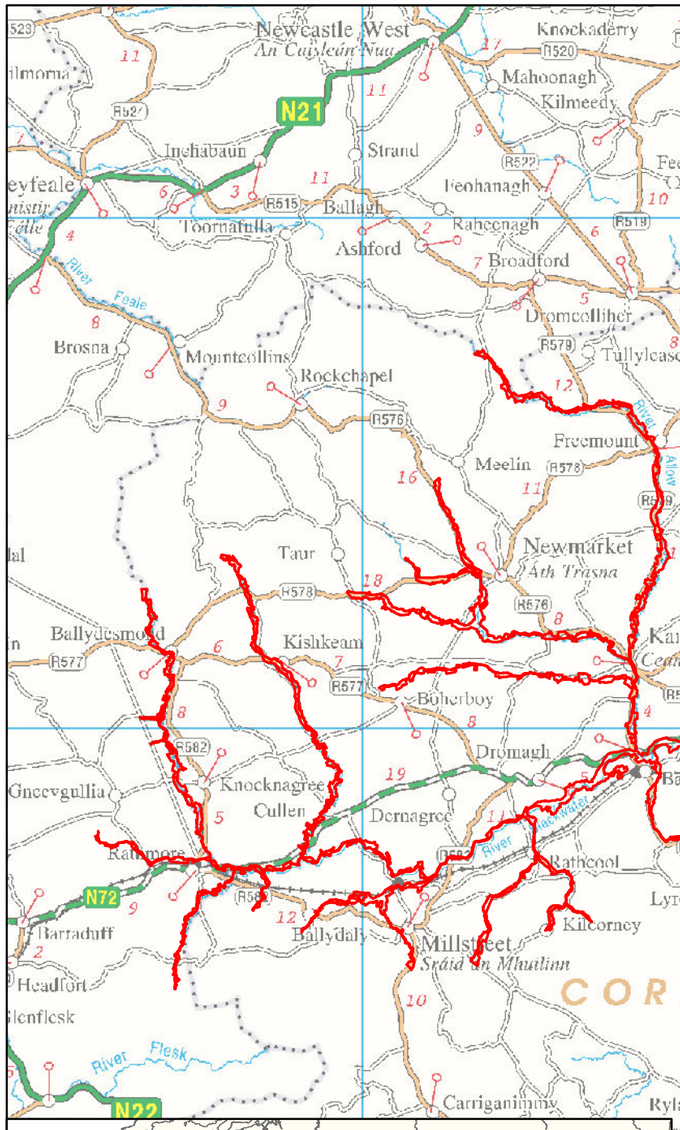
91E0 *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)

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

Attribute	Measure	Target	Notes
Woodland structure: veteran trees	Number per hectare	No decline	Mature and 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 disctinctiveness	Occurrence	No decline	Includes ancient or long-established woodlands, archaeological and geological features as well as red-data and other rare or localised species. Perrin & Daly (2010) list three sites as containing potential ancient/long established woodlands in the SAC
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover not less than 95%	Species reported in Perrin et al. (2008)
Vegetation composition: typical species	Occurrence	A variety of typical native species present, depending on woodland type, including alder (*Alnus glutinosa*), willows (*Salix* spp) and, locally, oak (*Quercus robur*) and ash (*Fraxinus excelsior*)	Species reported in Perrin et al. (2008)
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control	The following are the most common invasive species in this woodland type: beech (*Fagus sylvatica*), sycamore (*Acer pseudoplatanus*), cherry laurel (*Prunus laurocerasus*), Himalayan balsam (*Impatiens glandulifera*)

91J0 **Taxus baccata* woods of the British Isles

The status of *Taxus baccata* woods of the British Isles as a qualifying Annex I habitat for the Blackwater River (Cork/Waterford) SAC is currently under review. The outcome of this review will determine whether a site-specific conservation objective is set for this habitat.



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MAP 1:
BLACKWATER RIVER SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

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

SITE CODE: SAC 002170
CO. CORK; version 1.15, CO. KERRY; version 1.04,
CO. TIPPERARY; version 1, CO. WATERFORD; version 1.06

0 5 10 15 20 km

N

Map Version 1
Date: March 2012

SPA 004161

SAC 002170

SPA 004094

SAC 000365

SPA 004028

Legend

- SAC 002170
- SAC 000365
- SPA 004028
- SPA 004094
- SPA 004161
- OSi Discovery Series County Boundary

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MAP 2:
BLACKWATER RIVER SAC
CONSERVATION OBJECTIVES
ADJOINING/OVERLAPPING
DESIGNATIONS

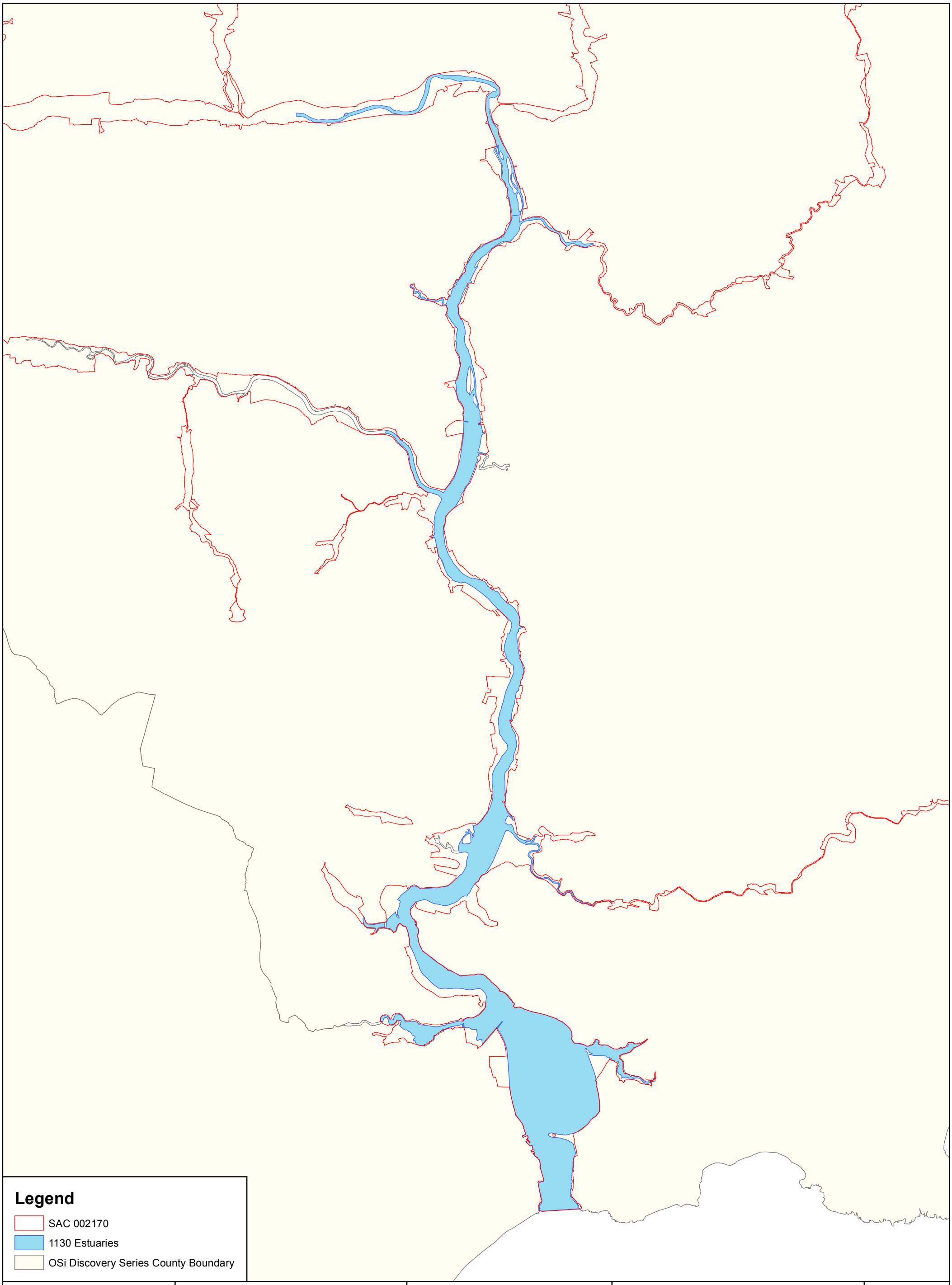
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002170 CO. CORK; version 1.15, CO. KERRY; version 1.04, CO. TIPPERARY; version 1, CO. WATERFORD; version 1.06
SAC 000365 CO. CORK; version 1, CO KERRY; version 1.19
SPA 004028 CO.CORK; version 1.04, CO.WATERFORD; version 1.06
SPA 004094 CO.CORK; version 1.01, CO. WATERFORD; version 1.02
SPA 004161 CO.CORK; version 2.12, CO. LIMERICK; version 2.14, CO. KERRY; version 2.17

0 5 10 15 20 km

N

Map Version 1
Date: March 2012



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MAP 3: BLACKWATER RIVER SAC CONSERVATION OBJECTIVES ESTUARIES

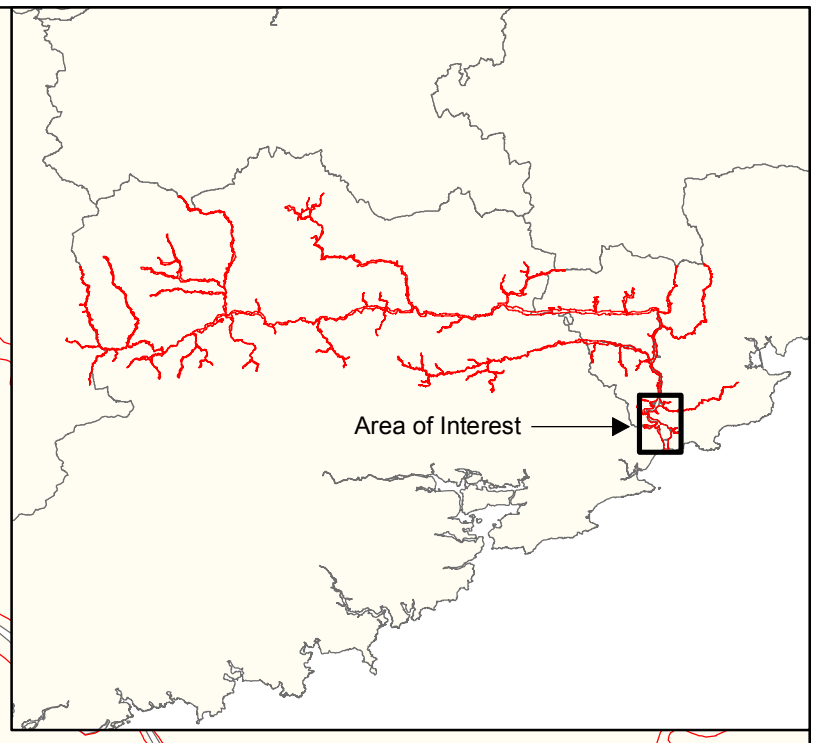
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002170
CO. CORK; version 1.15, CO. KERRY; version 1.04,
CO. TIPPERARY; version 1, CO. WATERFORD; version 1.06

0 1 2 3 km

N

Map Version 1
Date: March 2012



Legend

- SAC 002170
- 1140 Mudflats and sandflats not covered by seawater at low tide
- OSi Discovery Series County Boundary

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MAP 4: BLACKWATER RIVER SAC CONSERVATION OBJECTIVES TIDAL MUDFLATS & SANDFLATS

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

SITE CODE: SAC 002170
CO. CORK; version 1.15, CO. KERRY; version 1.04,
CO. TIPPERARY; version 1, CO. WATERFORD; version 1.06

0 0.25 0.5 0.75 1 km

N

Map Version 1
Date: March 2012

Legend

- SAC 002170
- OSi Discovery Series County Boundary

Marine Community Type

- Coarse sediment community complex
- Intertidal estuarine sandy mud community complex
- *Mytilus edulis*-dominated community
- River
- Sand and mixed sediment with polychaetes and crustaceans community complex
- Subtidal estuarine fine sand with *Bathyporeia* spp. community complex
- *Zostera*-dominated community

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MAP 5: BLACKWATER RIVER SAC CONSERVATION OBJECTIVES MARINE COMMUNITY TYPES

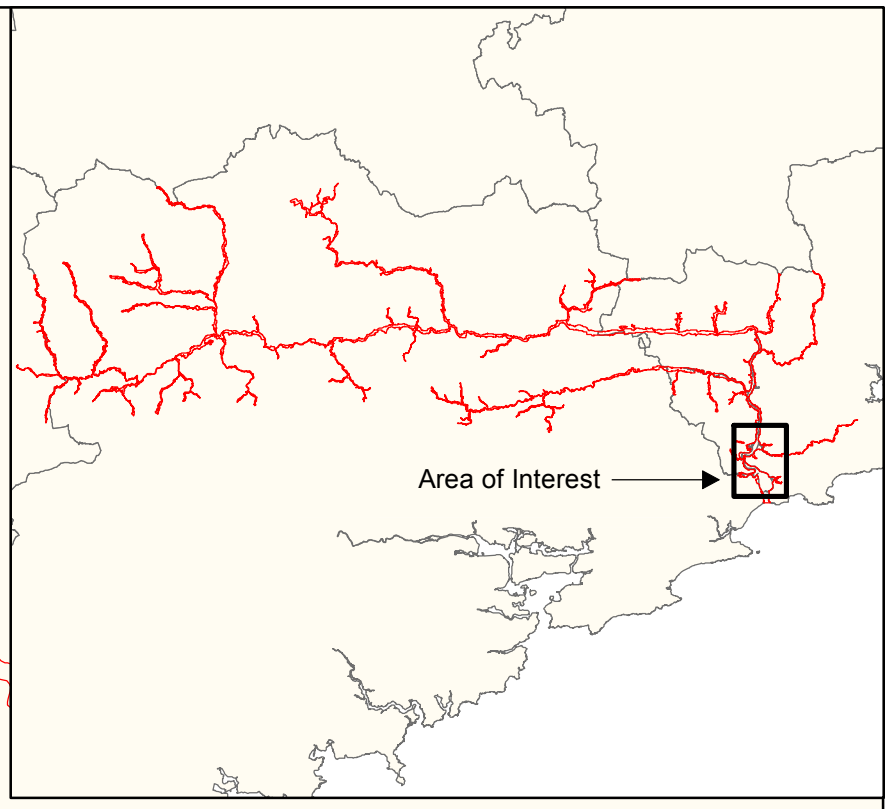
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002170
CO. CORK; version 1.15, CO. KERRY; version 1.04,
CO. TIPPERARY; version 1, CO. WATERFORD; version 1.06

0 1 2 3 km

N

Map Version 1
Date: March 2012



SMP 0054

Legend

- SAC 002170
- OSi Discovery Series County Boundary
- SMP: 0054 Saltmarsh Monitoring Project Site Codes

Saltmarsh Habitats

Qualifying Interests

- 1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
- 1410 Mediterranean salt meadows (Juncetalia maritimi)
- 1330 / 1410 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) / Mediterranean salt meadows (Juncetalia maritimi)
- Potential 1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
- Potential 1330 / 1410 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) / Mediterranean salt meadows (Juncetalia maritimi)

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MAP 6: BLACKWATER RIVER SAC CONSERVATION OBJECTIVES SALTMARSH HABITATS

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

SITE CODE: SAC 002170
CO. CORK; version 1.15, CO. KERRY; version 1.04, CO. TIPPERARY; version 1, CO. WATERFORD; version 1.06

0 0.5 1 km

N

Map Version 1
Date: March 2012

NSNW: 1326
NSNW: 1490
NSNW: 1459
NSNW: 1343
NSNW: 1464
NSNW: 1355
NSNW: 1359
NSNW: 1340
NSNW: 1626
NSNW: 1543
NSNW: 1819
NSNW: 1824
NSNW: 1354
NSNW: 1492
NSNW: 1998
NSNW: 1488
NSNW: 1842
NSNW: 1846
NSNW: 1844

Legend

- SAC 002170
- OSi Discovery Series County Boundary
- NSNW: 1326 National Survey of Native Woodland Site Codes

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)
- 91J0 **Taxus baccata* woods of the British Isles
- Semi-natural Woodland

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MAP 7:
BLACKWATER RIVER SAC
CONSERVATION OBJECTIVES
WOODLAND HABITATS

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

SITE CODE: SAC 002170
CO. CORK; version 1.15, CO. KERRY; version 1.04,
CO. TIPPERARY; version 1, CO. WATERFORD; version 1.06

0 5 10 15 20 km

N

Map Version 1
Date: March 2012

Legend

- SAC 002170
- 1029 *Margaritifera margaritifera* Suitable Habitat
- 1029 *Margaritifera margaritifera* Distribution
- 1029 *Margaritifera margaritifera* Catchment
- OSi Discovery Series County Boundary

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MAP 8:
BLACKWATER RIVER SAC
CONSERVATION OBJECTIVES
FRESHWATER PEARL MUSSEL

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

SITE CODE: SAC 002170
CO. CORK; version 1.15, CO. KERRY; version 1.04,
CO. TIPPERARY; version 1, CO. WATERFORD; version 1.06

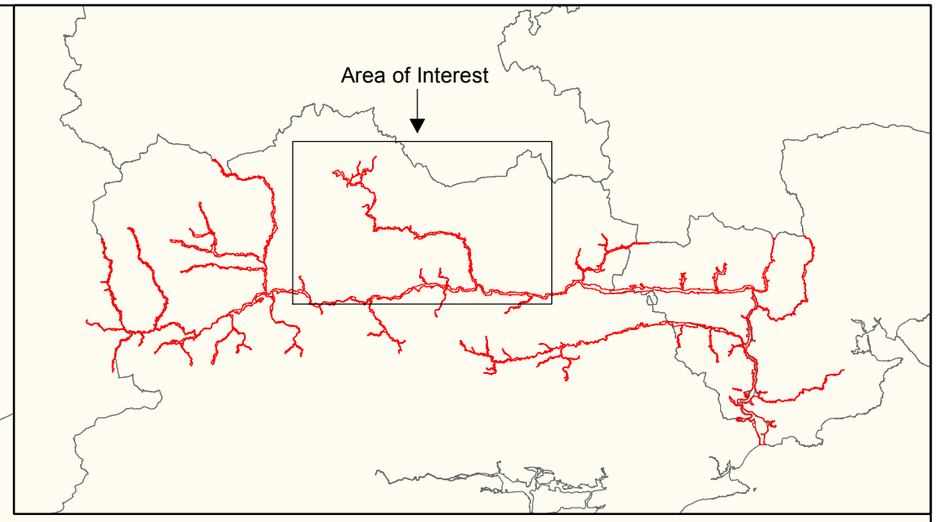
0 5 10 15 20 km

N

Map Version 1
Date: March 2012

Legend

- SAC 002170
- 1092 White-Clawed Crayfish (*Austropotamobius pallipes*)
- OSi Discovery Series County Boundary



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MAP 9:
BLACKWATER RIVER SAC
CONSERVATION OBJECTIVES
WHITE-CLAWED CRAYFISH

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

SITE CODE: SAC 002170
CO. CORK; version 1.15, CO. KERRY; version 1.04,
CO. TIPPERARY; version 1, CO. WATERFORD; version 1.06

0 1 2 3 4 5 km

N

Map Version 1
Date: March 2012

Legend

- SAC 002170
- 1095 Sea Lamprey -*Petromyzon marinus* Juvenile
- 1095 Sea Lamprey -*Petromyzon marinus* Spawning
- 1099 / 1096 River Lamprey -*Lampetra fluviatilis* / Brook Lamprey -*Lampetra planeri* Juvenile
- 1421 Killarney Fern - *Trichomanes speciosum*
- OSi Discovery Series County Boundary

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MAP 10:
BLACKWATER RIVER SAC
CONSERVATION OBJECTIVES
SEA LAMPREY, RIVER LAMPREY/
BROOK LAMPREY & KILLARNEY FERN

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

SITE CODE: SAC 002170
CO. CORK; version 1.15, CO. KERRY; version 1.04,
CO. TIPPERARY; version 1, CO. WATERFORD; version 1.06

0 5 10 15 20 km

N

Map Version 1
Date: March 2012

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Glanlough Woods SAC 002315

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

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E-mail: nature.conservation@chg.gov.ie

Citation:

NPWS (2018) Conservation Objectives: Glanlough Woods SAC 002315. 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***

002315 Glanlough Woods SAC

1303 Lesser Horseshoe Bat *Rhinolophus hipposideros*

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 :	Bat mitigation guidelines for Ireland
Author :	Kelleher, C.; Marnell, F.
Series :	Irish Wildlife Manual No. 25
Year :	2018
Title :	Conservation objectives supporting document – lesser horseshoe bat (*Rhinolophus hipposideros*)
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	2008
Title :	The lesser horseshoe bat conservation handbook
Author :	Schofield, H.W.
Series :	The Vincent Wildlife Trust
Year :	2009
Title :	Importance of night roosts for bat conservation: roosting behaviour of the lesser horseshoe bat *Rhinolophus hipposideros*
Author :	Knight, T.; Jones, G.
Series :	Endangered Species Research, 8: 79-86

Spatial data sources

Year :	2018
Title :	NPWS lesser horseshoe bat database
GIS Operations :	Roosts identified, clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1303 (map 2)
Year :	2007
Title :	Forest Inventory and Planning System (FIPS)
GIS Operations :	Dataset clipped to 2.5km buffer centred on roost locations
Used For :	1303 (map 2)

1303 Lesser Horseshoe Bat *Rhinolophus hipposideros*

To restore the favourable conservation condition of Lesser Horseshoe Bat in Glanlough Woods SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population per roost	Number	Minimum number of 100 bats for the summer roost (linked roost ids 590 and 860 in NPWS database). See map 2	A figure of 100 bats for summer roosts and 50 bats for winter roosts was set as a minimum qualifying standard (MQS) when SACs were being selected for lesser horseshoe bat (*Rhinolophus hipposideros*). Where possible, NPWS conduct annual counts at each qualifying roost. For most summer roosts, qualified means from the five most recent years of available count data are calculated whereby the year with the highest maximum count and the year with the lowest maximum count are removed and the mean of the remaining years is calculated. This mean is usually set as the target figure for the roost. However, in the case of this SAC, where just one count is available for roost id 590, (50 bats recorded in 2013), and bats have only recently colonised the renovated building nearby (id 860) (104 counted in 2018), the target is set at the MQS of 100. See the conservation objectives supporting document for lesser horseshoe bat (NPWS, 2018) for further information on all attributes and targets
Summer roosts	Condition	No decline	Glanlough Woods SAC has been selected for lesser horseshoe bat because of the presence of two linked roosts (roost id. 590 and roost id. 860 in NPWS database) that together form an internationally important summer roost. Damage or disturbance to the linked roosts or to the habitat immediately surrounding the roosts will lead to a decline in their condition (Kelleher and Marnell, 2006)
Auxiliary roosts	Number and condition	No decline	Lesser horseshoe bat populations will use a variety of roosts during the year besides the main summer maternity and winter hibernation roosts. Such additional roosts within the SAC may be important as night roosts, satellite roosts, etc. Night roosts are also considered an integral part of core foraging areas and require protection (Knight and Jones, 2009). In addition, in response to weather conditions for example, bats may use different seasonal roosts from year to year; this is particularly noticeable in winter. A database of all known lesser horseshoe bat roosts is available on the National Biodiversity Data Centre website. NB further unrecorded roosts may also be present within this SAC
Extent of potential foraging habitat	Hectares	No significant decline within 2.5km of qualifying roosts	Lesser horseshoe bats normally forage in woodlands/scrub within 2.5km of their roosts (Schofield, 2008). See map 2 which shows a 2.5km zone around the above roosts and identifies potential foraging grounds
Linear features	Kilometres	No significant loss within 2.5km of qualifying roosts. See map 2	This species follows commuting routes from its roost to its foraging grounds. Lesser horseshoe bats will not cross open ground. Consequently, linear features such as hedgerows, treelines and stone walls provide vital connectivity for this species within 2.5km around each roost (Schofield, 2008)
Light pollution	Lux	No significant increase in artificial light intensity adjacent to named roosts or along commuting routes within 2.5km of those roosts. See map 2	Lesser horseshoe bats are very sensitive to light pollution and will avoid brightly lit areas. Inappropriate lighting around roosts may cause abandonment; lighting along commuting routes may cause preferred foraging areas to be abandoned, thus increasing energetic costs for bats (Schofield, 2008)

Glashagoruv River

CO. KERRY

Kenmare

SAC 002315

CO. CORK

Gougane Barra

Legend

Glanlough Woods SAC 002315

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

MAP 1:
GLANLOUGH WOODS SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

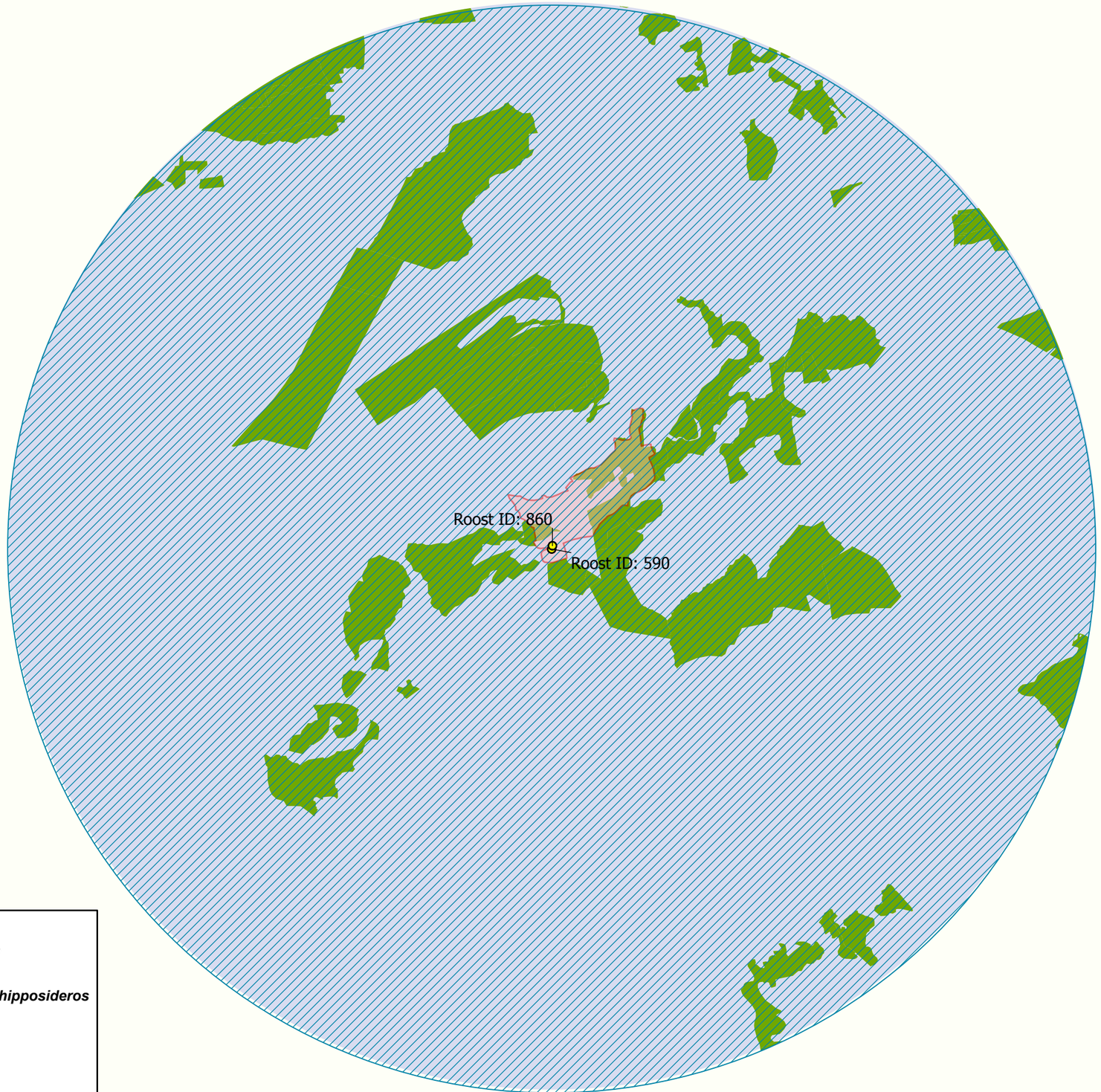
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002315; version 3.0. CO. KERRY

0 40 80 120 160 Meters

N

Map Version 1
Date: July 2018



Legend

- OSi Discovery Series County Boundary
- Glanlough Woods SAC 002315

1303 Lesser Horseshoe Bat *Rhinolophus hipposideros*

- Roost Location
- Roost ID 860 Foraging Range
- Roost ID 590 Foraging Range
- Potential Foraging Grounds

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Department of Culture, Heritage and the Gaeltacht

MAP 2:
GLANLOUGH WOODS SAC
CONSERVATION OBJECTIVES
LESSER HORSESHOE BAT

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

SITE CODE:
SAC 002315; version 3.0. CO. KERRY

0 0.2 0.4 0.6 0.8 Kilometers

N

Map Version 1
Date: Apr 2018

Conservation objectives for Killarney National Park SPA [004038]

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.

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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
A098	Merlin	*Falco columbarius*
A395	Greenland White-fronted Goose	*Anser albifrons flavirostris*

Citation: *NPWS (2022) Conservation objectives for Killarney National Park SPA [004038]. 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

Mullaghanish to Musheramore Mountains SPA 004162

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,

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E-mail: natureconservation@housing.gov.ie

Citation:

NPWS (2022) Conservation Objectives: Mullaghanish to Musheramore Mountains SPA 004162. 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

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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***

004162	Mullaghanish to Musheramore Mountains 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

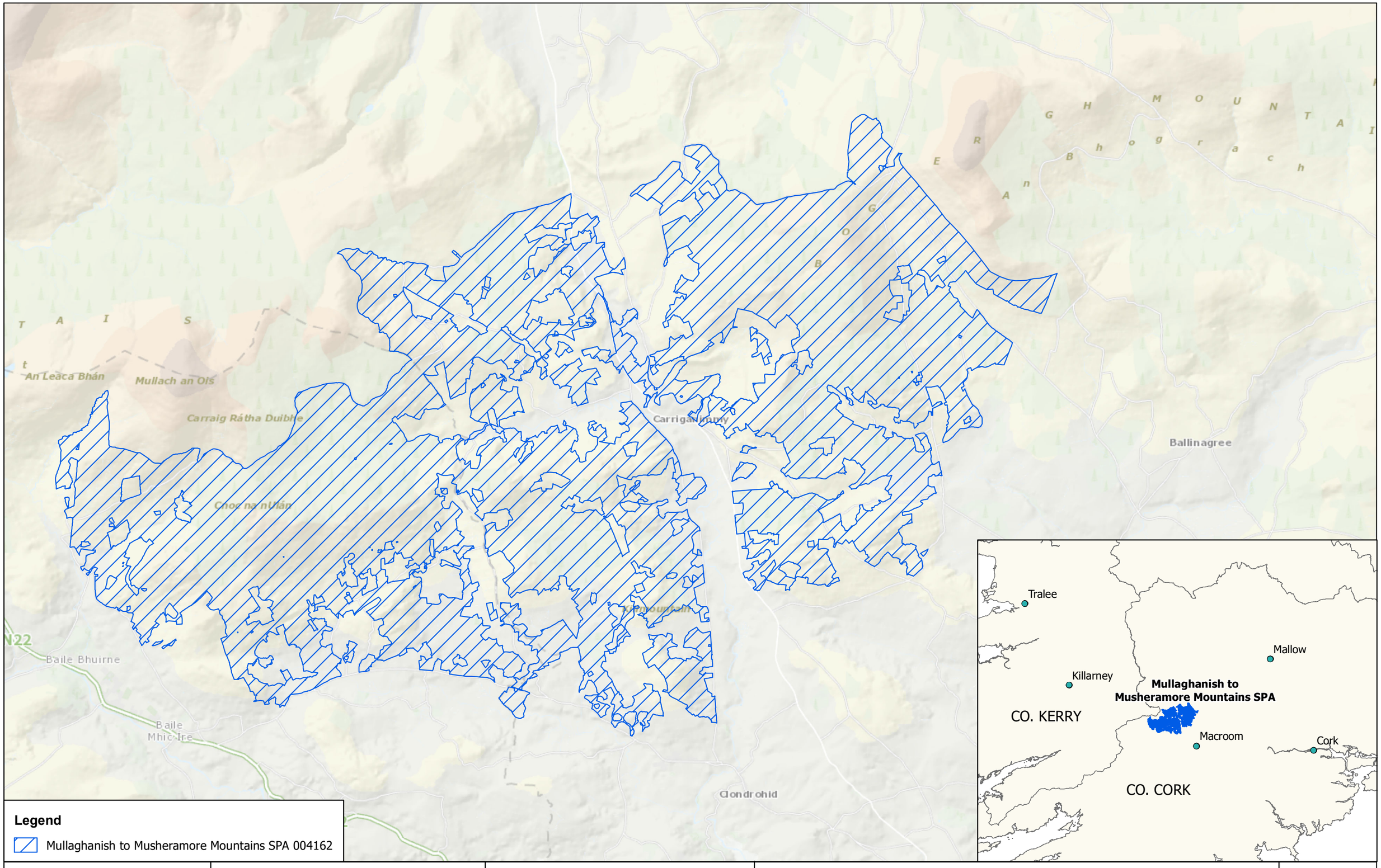
Conservation Objectives for : Mullaghanish to Musheramore Mountains SPA [004162]

A082 Hen Harrier *Circus cyaneus*

To restore the favourable conservation condition of hen harrier in Mullaghanish to Musheramore Mountains 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 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	Restore the spatial utilisation of the SPA by breeding pairs to 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	Restore 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 1,022ha. 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	Restore the 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 688ha. 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	Hectares; condition assessment	Maintain at least 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 103.1km, with two structural hedgerow types namely 'intact and dense' and 'boxed and moderate' accounting for 23.9km of that total. These combined types account for 23% of the total hedgerow resource of the SPA
Age structure of forest estate	Percentage	Achieve 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



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Department of Housing,
Local Government and Heritage

MAP 1:
MULLAGHANISH TO
MUSHERAMORE MOUNTAINS SPA
CONSERVATION OBJECTIVES
SPA DESIGNATION

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

SITE CODE:
SPA 004162; version 3
CO. CORK

0 0.5 1 2 Kilometres

N

Date: July 2022