

National Parks and Wildlife Service

Conservation Objectives Series

Cloghernagore Bog and Glenveagh National Park SAC 002047



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

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



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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

002047	Cloghernagore Bog and Glenveagh National Park SAC
1029	Freshwater Pearl Mussel <i>Margaritifera margaritifera</i>
1106	Salmon <i>Salmo salar</i>
1355	Otter <i>Lutra lutra</i>
1421	Killarney Fern <i>Trichomanes speciosum</i>
3110	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)
3260	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion vegetation
4010	Northern Atlantic wet heaths with <i>Calluna vulgaris</i>
4030	European dry heaths
4060	Alpine and Boreal heaths
6410	<i>Trifolium pratense</i> 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 <i>Quercus petraea</i> and <i>Q. robur</i> in the British Isles

Please note that this SAC overlaps with Derryveagh and Glendowan Mountains SPA (004039) and is adjacent to Fawnboy Bog/Lough Nacung SAC (000140), Gannivegil Bog SAC (000142), West of Ardara/Maas Road SAC (000197), Sheephaven SAC (001190), Leannan River SAC (002176) and River Finn SAC (002301). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping and adjacent sites as appropriate.

Supporting documents, relevant reports & publications

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

NPWS Documents

Year :	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 :	1990
Title :	A vegetation survey of Glenveagh National Park and the An Taisce property, Co. Donegal
Author :	Weekes, L.C.
Series :	Unpublished report to the OPW
Year :	1990
Title :	A survey to locate lowland blanket bogs of scientific interest in county Donegal and upland blanket bogs in counties Cavan, Leitrim and Roscommon
Author :	Douglas, C.; Dunnells, D.; Scally, L.; Wyse Jackson, M.
Series :	Unpublished report to NPWS
Year :	1995
Title :	Mapping of proposed SAC rivers for <i>Margaritifera margaritifera</i> . A report for the National Parks and Wildlife Service on work carried out from August to October 1995 (in two volumes) Volume 1
Author :	Moorkens, E.
Series :	Unpublished report to NPWS
Year :	1996
Title :	A study of woodland exclosures in Glenveagh National Park, Co. Donegal
Author :	Bleasdale, A.; Conaghan, J.
Series :	Unpublished report to NPWS
Year :	2006
Title :	Otter survey of Ireland 2004/2005
Author :	Bailey, M.; Rochford, J.
Series :	Irish Wildlife Manual No. 23
Year :	2007
Title :	Rapid Assessment of rivers with prior records of <i>Margaritifera margaritifera</i>
Author :	Moorkens, E.
Series :	Unpublished report to NPWS
Year :	2007
Title :	Supporting documentation for the Habitats Directive Conservation Status Assessment - backing documents. Article 17 forms and supporting maps
Author :	NPWS
Series :	Unpublished report to NPWS
Year :	2008
Title :	National survey of native woodlands 2003-2008
Author :	Perrin, P.M.; Martin, J.; Barron, S.; O'Neill, F.H.; McNutt, K.E.; Delaney, A.
Series :	Unpublished report to NPWS

Year :	2009
Title :	NS II freshwater pearl mussel sub-basin management plans: fisheries survey. Stage 1 report
Author :	Paul Johnston Associates
Series :	Unpublished report to NPWS
Year :	2009
Title :	NS II Freshwater pearl mussel sub-basin management plans: report on biological monitoring of surface water quality in Glaskeelan catchment, Co. Donegal
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 Owencarrow catchment, Co. Donegal
Author :	Williams, L.
Series :	Unpublished report to NPWS
Year :	2009
Title :	NS2 Freshwater pearl mussel sub-basin management plans. phytobenthos monitoring of the Glaskeelan catchment, Co. Donegal (NWIRBD). April 2009
Author :	Ní Chatháin, B.
Series :	Unpublished report to NPWS
Year :	2009
Title :	NS2 Freshwater pearl mussel sub-basin management plans. phytobenthos monitoring of the Owencarrow catchment, Co. Donegal (NWIRBD). April 2009
Author :	Ní Chatháin, B.
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 Glaskeelan
Author :	Moorkens, E.A.
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 Owencarrow
Author :	Moorkens, E.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 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 Glaskeelan Freshwater Pearl Mussel Sub-basin Management Plan (2009-2015) March 2010
Author :	NPWS
Series :	Unpublished document to Department of the Environment, Heritage and Local Government

Year :	2010
Title :	Second Draft Owencarrow Freshwater Pearl Mussel Sub-basin Management Plan (2009-2015) March 2010
Author :	NPWS
Series :	Unpublished document to Department of the Environment, Heritage and Local Government
Year :	2012
Title :	Monitoring populations of the freshwater pearl mussel <i>Margaritifera margaritifera</i> . A condition assessment survey of the freshwater pearl mussel in the Glaskeelan River, Co. Mayo.
Author :	Moorkens, E.
Series :	Unpublished report to NPWS
Year :	2012
Title :	Ireland Red List No. 8: Bryophytes
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	Ireland Red List series, NPWS
Year :	2013
Title :	National otter survey of Ireland 2010/12
Author :	Reid, N.; Hayden, B.; Lundy, M.G.; Pietravalle, S.; McDonald, R.A.; Montgomery, W.I.
Series :	Irish Wildlife Manual No. 76
Year :	2013
Title :	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 :	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 :	2014
Title :	Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland, Version 2.0
Author :	Perrin, P.M.; Barron, S.J.; Roche, J.R.; O'Hanrahan, B.
Series :	Irish Wildlife Manual No. 79
Year :	2015
Title :	Habitats Directive Annex I lake habitats: a working interpretation for the purposes of site-specific conservation objectives and Article 17 reporting
Author :	O Connor, Á.
Series :	Unpublished document by NPWS
Year :	2015
Title :	Monitoring methods for the Killarney fern (<i>Trichomanes speciosum</i> Willd.) in Ireland
Author :	Ní Dhúill, E.; Smyth, N.; Waldren, S.; Lynn, D.
Series :	Irish Wildlife Manual No. 82

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 : Survey and condition assessment of the population of the freshwater pearl mussel *Margaritifera margaritifera* in the Glaskeelan River, County Donegal
Author : Moorkens, E.
Series : Unpublished report to NPWS

Year : 2017
Title : Cloghernagore Bog and Glenveagh National Park SAC (site code: 2047) Conservation objectives supporting document- blanket bogs and associated habitats V1
Author : NPWS
Series : Conservation objectives supporting document

Other References

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 : 1990
Title : A phytosociological study and map of the vegetation of Glenveagh National Park and the An Taisce property, Co. Donegal
Author : Weekes, L.C.
Series : Unpublished M.Sc. Thesis, National University of Ireland, Galway

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 : Studies on the biology and ecology of *Margaritifera* in Ireland
Author : Moorkens, E.
Series : Unpublished Ph.D. thesis, University of Dublin, Trinity College.

Year : 1996
Title : The distribution and ecology of the freshwater pearl mussel, *Margaritifera margaritifera* L. 1758, in County Donegal, Ireland and implications for its conservation
Author : Beasley, C.R.
Series : Unpublished Ph.D. Thesis, The Queen's University of Belfast

Year : 2000
Title : Colour in Irish lakes
Author : Free, G.; Allott, N.; Mills, P.; Kennelly, C.; Day, S.
Series : Verhandlungen Internationale Vereinigung für theoretische und angewandte Limnologie, 27: 2620-2623

Year :	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 :	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 :	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 (<i>Margaritifera margaritifera</i>) 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 :	2008
Title :	Water Quality in Ireland 2004-2006
Author :	Clabby, K.J.; Bradley, C.; Craig, M.; Daly, D.; Lucey, J.; McGarrigle, M.; O'Boyle, S.; Tierney, D.; Bowman, J.
Series :	EPA, Wexford
Year :	2009
Title :	The identification, characterization and conservation value of isoetid lakes in Ireland
Author :	Free, G.; Bowman, J.; McGarrigle, M.; Little, R.; Coroni, R.; Donnelly, K.; Tierney, D.; Trodd, W.
Series :	Aquatic Conservation: Marine and Freshwater Ecosystems, 19(3): 264-273
Year :	2010
Title :	Otter tracking study of Roaringwater Bay
Author :	De Jongh, A.; O'Neill, L.
Series :	Unpublished draft report to NPWS
Year :	2010
Title :	Addressing the conservation and rehabilitation of <i>Margaritifera margaritifera</i> 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 :	2012
Title :	Rare and threatened bryophytes of Ireland
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	National Museums Northern Ireland
Year :	2012
Title :	A study of the ecology of the oceanic montane vegetation of western Ireland and its potential response to climate change
Author :	Hodd, R.
Series :	Unpublished Ph.D. thesis, National University of Ireland, Galway
Year :	2013
Title :	Interpretation manual of European Union habitats- Eur 28
Author :	European Commission- DG Environment
Series :	European Commission
Year :	2014
Title :	Assessing near-bed velocity in a recruiting population of the endangered freshwater pearl mussel (<i>Margaritifera margaritifera</i>) 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 :	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 habitat and to resolve any issues arising
Used For :	3110 (map 3)
Year :	Revision 2010
Title :	National Survey of Native Woodlands 2003-2008. Version 1
GIS Operations :	QIs selected; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	91A0 (map 4)
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 :	1029 (map 5)
Year :	2012
Title :	Margaritifera Sensitive Areas data revision
GIS Operations :	Relevant catchment boundaries identified. Expert opinion used as necessary to resolve any issues arising
Used For :	1029 (map 5)
Year :	2005
Title :	OSi Discovery series vector data
GIS Operations :	Creation of 10m buffer on the terrestrial side of river banks data; creation of 20m buffer applied to canal centreline data. Creation of a 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 (no map)
Year :	2010
Title :	OSi 1:5000 IG vector dataset
GIS Operations :	Creation of 80m buffer on the aquatic side of lake data; creation of 10m buffer on the terrestrial side of lake data. These datasets combined with the derived OSi Discovery Series river and canal datasets. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1355 (no map)

Conservation Objectives for : Cloghernagore Bog and Glenveagh National Park SAC [002047]

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

To maintain the favourable conservation condition of Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) in Cloghernagore Bog and Glenveagh National Park SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Lake habitat 3110 is likely to occur in Loughs Barra, Veagh, Altan, Glentorman, Muck, Nambradden, Inshagh and others in Cloghernagore Bog and Glenveagh National Park SAC. In line with Article 17 reporting (NPWS, 2013), all lakes larger than 1ha were mapped as potential 3110 (see map 3). In lakes at higher altitude (above 200m), lake habitat 3160 may occur. 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 (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 lake habitat 3110 (NPWS, 2013) and O Connor (2015). Lough Veagh was investigated by Heuff (1984) and Free et al. (2006). Free et al. (2006) also studied Lough Barra. Loughs Barra, Glen, Upper Veagh, Nasnanida and Keel 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)
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 naturally be large in the SAC, as many of the lakes are deep and the water should be very clear. Information on vegetation depth may be available for the WFD monitoring lakes in the SAC
Hydrological regime: water level fluctuations	Metres	Maintain appropriate natural hydrological regime necessary to support the habitat	Fluctuations in lake water level are typical in Ireland, but can be amplified by activities such as abstraction and drainage. Increased water level fluctuations can increase wave action, up-root vegetation, increase turbidity, alter the substratum and lead to release of nutrients from the sediment. The hydrological regime of the lakes must be maintained so that the area, distribution and depth of the lake habitat and its constituent/characteristic vegetation zones and communities are not reduced
Lake substratum quality	Various	Maintain appropriate substratum type, extent and chemistry to support the vegetation	Research is required to further characterise the substratum types (particle size and origin) and substratum quality (notably pH, calcium, iron and nutrient concentrations) favoured by each of the five Annex I lake habitats in Ireland. It is likely that lake habitat 3110 is associated with a range of nutrient-poor substrates, from stones, cobble and gravel, through sands, silt, clay and peat. Substratum particle size is likely to vary with depth and along the shoreline within a single lake. Information on substratum may be available for the WFD monitoring lakes in the SAC

Water quality: transparency	Metres	Maintain appropriate Secchi transparency. There should be no decline in Secchi depth/transparency	Transparency relates to light penetration and, hence, to the depth of colonisation of vegetation. It can be affected by phytoplankton blooms, water colour and turbidity. Specific targets have yet to be established for lake habitat 3110 (O Connor, 2015). Habitat 3110 is associated with very clear water. The OECD fixed boundary system set transparency targets for oligotrophic lakes of $\geq 6\text{m}$ annual mean Secchi disk depth, and $\geq 3\text{m}$ annual minimum Secchi disk depth. Free et al. (2009) found high isoetid abundance in lakes with Secchi depths of more than 3m. High altitude and deep lakes, such as those found in the SAC, are expected to have high transparency. Heuff (1984) recorded transparency of 3m in Lough Veagh
Water quality: nutrients	$\mu\text{g/l P}$; mg/l N	Maintain the concentration of nutrients in the water column at sufficiently low levels to support the habitat and its typical species	As a nutrient-poor habitat, oligotrophic and 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 $\leq 10\mu\text{g/l TP}$, average annual total ammonia concentration should be $\leq 0.040\text{mg/l N}$ and annual 95th percentile for total ammonia should be $\leq 0.090\text{mg/l N}$. See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009. See McGarrigle et al. (2010) and Bradley et al. (2015) for nutrient status in the WFD monitoring lakes in the SAC in the 2007-09 and 2010-12 reporting periods
Water quality: phytoplankton biomass	$\mu\text{g/l Chlorophyll } a$	Maintain/restore appropriate water quality to support the habitat, including high chlorophyll <i>a</i> status	Oligotrophic and WFD 'high' status targets apply to lake habitat 3110. Where a lake has a chlorophyll <i>a</i> 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 <i>a</i> concentration must be $< 5.8\mu\text{g/l}$. The annual average chlorophyll <i>a</i> concentration should be $< 2.5\mu\text{g/l}$ and the annual peak chlorophyll <i>a</i> concentration should be $\leq 8.0\mu\text{g/l}$. See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009. See Clabby et al. (2008), McGarrigle et al. (2010) and Bradley et al. (2015) for chlorophyll <i>a</i> status in the WFD monitoring lakes in the SAC during the 2004-06, 2007-09 and 2010-12 reporting periods. Lough Barra failed the high chlorophyll <i>a</i> status target in 2010-12 (Bradley et al., 2015)
Water quality: phytoplankton composition	EPA phytoplankton composition metric	Maintain appropriate water quality to support the habitat, including high phytoplankton composition status	The EPA has developed a phytoplankton composition metric for nutrient enrichment of Irish lakes. As for other water quality indicators, habitat 3110 requires WFD high status. See Bradley et al. (2015) for phytoplankton composition status for the WFD monitoring lakes in the SAC for the 2010-12 reporting period
Water quality: attached algal biomass	Algal cover and EPA phytobenthos metric	Maintain trace/absent attached algal biomass ($< 5\%$ cover) and high phytobenthos status	Nutrient enrichment can favour epiphytic and epipelagic algae that can out-compete the submerged vegetation. The cover abundance of attached algae in lake habitat 3110 should, therefore, be trace/absent ($< 5\%$ cover). EPA phytobenthos can be used as an indicator of changes in attached algal biomass. As for other water quality indicators, habitat 3110 requires high phytobenthos status. See Bradley et al. (2015) for phytobenthos status for the WFD monitoring lakes in the SAC for the 2010-12 reporting period

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. See McGarrigle et al. (2010) and Bradley et al. (2015) for macrophyte status in the WFD monitoring lakes in the SAC for the 2007-09 and 2010-12 reporting periods. Glen and Keel Loughs failed to reach the high macrophyte status in 2010-12 (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 <i>Sphagnum</i> mosses and <i>Juncus bulbosus</i> (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 ≤ 100 mg/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 acidification status for the WFD monitoring lakes in the SAC in the 2007-09 and 2010-12 reporting periods
Water colour	mg/l PtCo	Maintain/restore appropriate water colour to support the habitat	Increased water colour and turbidity decrease light penetration and can reduce the area of available habitat for lake macrophytes, particularly at the lower euphotic depths. The primary source of increased water colour in Ireland is disturbance to peatland. No habitat-specific or national standards for water colour currently exist. Studies have shown median colour concentrations in Irish lakes of 38mg/l PtCo (Free et al., 2000) and 33mg/l PtCo (Free et al., 2006). It is likely that the water colour in all Irish lake habitats would naturally be < 50 mg/l PtCo. Water colour can be very low (< 20 mg/l PtCo or even < 10 mg/l PtCo) in lake habitat 3110, where the peatland in the lake's catchment is intact. Free et al. (2006) reported colour of 45mg/l, 60mg/l, 34mg/l and 42mg/l PtCo in Loughs Barra, Glen, Keel and Veagh, respectively
Dissolved organic carbon (DOC)	mg/l	Maintain/restore appropriate organic carbon levels to support the habitat	Dissolved (and particulate) organic carbon (OC) in the water column is linked to water colour and acidification (organic acids). Increasing DOC in water has been documented across the Northern Hemisphere, including afforested peatland catchments in Ireland. Damage and degradation of peatland, leading to decomposition of peat is likely to be the predominant source of OC in Ireland. OC in water promotes decomposition by fungi and bacteria that, in turn, releases dissolved nutrients. The increased biomass of decomposers can also impact directly on the characteristic lake communities through shading, competition, etc. Damage to peatland may be resulting in increased DOC and colour in lakes within Cloghernagore Bog and Glenveagh National Park SAC

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 Cloghernagore Bog and Glenveagh National Park SAC, lake shorelines are likely to have low-nutrient grassland, swamp, 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

Conservation Objectives for : Cloghernagore Bog and Glenveagh National Park SAC [002047]

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

To maintain the favourable conservation condition of Water courses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion vegetation in Cloghernagore Bog and Glenveagh National Park 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	The description of habitat 3260 covers upland rivers with bryophytes and macroalgae to lowland depositing rivers with pondweeds and starworts. The selection of this SAC used this broad interpretation. Conservation objectives for habitat 3260 concentrate on the high conservation value sub-types; however, little is known of its distribution or its sub-types in the SAC. There are a large number of upland streams and rivers, as well as associated springs and headwaters. Lowland rivers include the Gweebarra, Cloghernagore, Owencarrow and Calabber. All are likely to be macroalgal and bryophyte dominated. Note: rooted macrophytes should be absent or trace (<5% cover) in freshwater pearl mussel (<i>Margaritifera margaritifera</i>) habitat. The freshwater pearl mussel (1029) conservation objective takes precedence over this objective for habitat 3260 in the Glaskeelan and Owencarrow Rivers within this SAC because the mussel requires environmental conditions closer to natural background levels
Habitat distribution	Occurrence	No decline, subject to natural processes	Further study is needed of Irish sub-types and their conservation value to interpret the broad description of 3260 (European Commission, 2013). As noted above, little is known about the distribution of the habitat and its sub-types in Cloghernagore Bog and Glenveagh National Park SAC. The Vulnerable moss <i>Schistidium agassizii</i> (Lockhart et al., 2012) is found by the Lackagh River. Heuff (1987) surveyed three sites on the Barra/Gweebarra River and noted it as an excellent, oligotrophic system of high conservation interest. The rivers and streams are generally fast-flowing, with cascades and waterfalls, and are likely to be dominated by macroalgae and bryophytes, with limited submerged or emergent higher plants
Hydrological regime: river flow	Metres per second	Maintain appropriate hydrological regimes	Any high conservation value sub-types in the SAC will be 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 of the sub-types of this habitat, 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. Peatlands also have slow-flowing or ponded streams and rivers, with biotic communities likely to resemble those in associated lakes
Hydrological regime: groundwater discharge	Metres per second	Maintain appropriate hydrological regime	The groundwater contribution to rivers in the SAC is likely to be small, owing to the geology and dominance of blanket peat soils. Even small groundwater contributions, however, can significantly alter the hydrochemistry, particularly where there is basic bedrock and/or subsoils

Substratum composition: particle size range	Millimetres	Maintain appropriate substratum particle size range, quantity and quality, subject to natural processes	Many of the high conservation value sub-types are dominated by coarse substrata, and bedrock, boulders, cobbles and coarse gravels are likely to be common in this SAC. The size and distribution of particles is largely determined by the river flow. 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. Note: increased fine sediment is contributing to the unfavourable status of the freshwater pearl mussel (<i>Margaritifera margaritifera</i>) in the Glaskeelan and Owencarrow Rivers. See the freshwater pearl mussel (1029) conservation objective
Water quality	Various	Maintain appropriate water quality to support the natural structure and functioning of the habitat	The specific targets may vary among sub-types. The rivers within Cloghernagore Bog and Glenveagh National Park SAC are considered to be naturally very nutrient-poor and, therefore, to typically require Water Framework Directive high status, in terms of nutrient and oxygenation standards, and EQRs (Ecological Quality Ratios) for macroinvertebrates and phytobenthos
Vegetation composition: typical species	Occurrence	Maintain typical species in good condition, including appropriate distribution and abundance	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
Floodplain connectivity: area	Hectares	Maintain floodplain connectivity necessary to support the typical species and vegetation composition of the habitat and its sub-types	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)
Fringing habitats: area and condition	Hectares	Maintain the area and condition of marginal fringing habitats that support the typical species and vegetation composition of 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. The rivers and streams in this SAC are likely to be fringed by upland grassland, blanket bog, heath, flush/poor fen and riparian woodland

Conservation Objectives for : Cloghernagore Bog and Glenveagh National Park SAC [002047]

4010 Northern Atlantic wet heaths with *Erica tetralix*

To restore the favourable conservation condition of Northern Atlantic wet heaths with *Erica tetralix* in Cloghernagore Bog and Glenveagh National Park 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 <i>Erica tetralix</i> has not been mapped in detail for Cloghernagore Bog and Glenveagh National Park SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 3,396ha, covering 10% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Cloghernagore Bog and Glenveagh National Park SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	The habitat occurs in an intimate mosaic with blanket bog particularly on the lower slopes of hills, where peat is shallower. Good examples of wet heath can be found on the south-eastern slopes of Errigal and in the area around Croangar (NPWS internal files). Further information can be found within NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	A variety of wet heath vegetation communities have been recorded in this SAC (Douglas et al., 1990; NPWS internal files; R. Hodd, pers. comm.), four of which correspond to communities recorded in the National Survey of Upland Habitats and listed in the provisional list of vegetation communities described in Perrin et al. (2014). Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: cross-leaved heath	Occurrence within 20m of a representative number of monitoring stops	Cross-leaved heath (<i>Erica tetralix</i>) 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 <i>Cladonia</i> and <i>Sphagnum</i> species, <i>Racomitrium lanuginosum</i> 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 (<i>Empetrum nigrum</i>) 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). Pirri-pirri-bur (<i>Acaena novae-zelandiae</i>) (R. Hodd, pers. comm.) and rhododendron (<i>Rhododendron ponticum</i>) (NPWS internal files) are present within wet heaths in the SAC
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 (<i>Pteridium aquilinum</i>) 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 (<i>Juncus effusus</i>) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: <i>Sphagnum</i> condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the <i>Sphagnum</i> 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 (<i>Empetrum nigrum</i>) and bog-myrtle (<i>Myrica gale</i>) 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 (FPO) and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016). The FPO listed and Vulnerable liverworts <i>Scapania ornithopodioides</i> and <i>Bazzania pearsonii</i> (Lockhart et al., 2012) are present within hepatic mats associated with this habitat in the SAC (R. Hodd, pers. comm.)

Conservation Objectives for : Cloghernagore Bog and Glenveagh National Park SAC [002047]

4030 European dry heaths

To restore the favourable conservation condition of European dry heaths in Cloghernagore Bog and Glenveagh National Park 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 habitat has not been mapped in detail for Cloghernagore Bog and Glenveagh National Park SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 5,744ha, covering 17% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Cloghernagore Bog and Glenveagh National Park SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	This habitat typically occurs on slopes above 300m in the SAC. Examples of this habitat can be found at Grogan More, Crocknafarragh, Crookglass, Croaghdoon, Addernymore, Staghall Mountain, Farscallop, Kinnaveagh, Leahanmore, and the area between Dooish and Kingarow (NPWS internal files). Further information can be found within NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	A variety of dry heath vegetation communities have been recorded in this SAC (NPWS internal files; R. Hodd, pers. comm.), 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: 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 <i>Campylopus</i> and <i>Polytrichum</i> 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 (<i>Myrica gale</i>), creeping willow (<i>Salix repens</i>) and western gorse (<i>Ulex gallii</i>) 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 (<i>Rhododendron ponticum</i>) is present within dry heaths in the SAC (R. Hodd, pers. comm.)
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 (<i>Pteridium aquilinum</i>) 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 (<i>Juncus effusus</i>) 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 (<i>Calluna vulgaris</i>) 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 (<i>Empetrum nigrum</i>) 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 (<i>Calluna vulgaris</i>) 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 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 are historic records for the FPO listed and Vulnerable small-white orchid (<i>Pseudorchis albida</i>) (Wyse Jackson et al., 2016) from the SAC (NPWS internal files), but this species cannot be attributed specifically to dry heaths. The FPO listed and Vulnerable liverworts <i>Scapania ornithopodioides</i> , <i>Bazzania pearsonii</i> and <i>Adelanthus lindenbergianus</i> (Lockhart et al., 2012) are present within hepatic mats associated with this habitat in the SAC (R. Hodd, pers. comm.)

Conservation Objectives for : Cloghernagore Bog and Glenveagh National Park SAC [002047]

4060 Alpine and Boreal heaths

To restore the favourable conservation condition of Alpine and Boreal heaths in Cloghernagore Bog and Glenveagh National Park 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 habitat has not been mapped in detail for Cloghernagore Bog and Glenveagh National Park SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 245ha, covering 1% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Cloghernagore Bog and Glenveagh National Park 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 all the main summits and ridges above 400-500m. The best examples of this habitat are on the higher parts of Errigal, Slieve Snaght, Dooish and Mackoght (Hodd, 2012; NPWS internal files). Further information can be found within Hodd (2012), 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	R. Hodd (pers. comm.) noted a variety of Alpine and Boreal 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	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). Pirri-pirri-bur (<i>Acaena novae-zelandiae</i>) occurs in this habitat in the SAC (R. Hodd, pers. comm.)
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 (<i>Empetrum nigrum</i>) 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 (FPO) and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016). The Near Threatened alpine clubmoss (<i>Diphasiastrum alpinum</i>) (Wyse Jackson et al., 2016) is present in Alpine and Boreal heaths in the SAC (R. Hodd, pers. comm.). The FPO listed and Vulnerable bryophytes <i>Scapania ornithopodioides</i> , <i>Bazzania pearsonii</i> and <i>Adelanthus lindenbergianus</i> (Lockhart et al., 2012) are present within hepatic mats associated with this habitat in the SAC (R. Hodd, pers. comm.)

Conservation Objectives for : Cloghernagore Bog and Glenveagh National Park SAC [002047]

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

To maintain the favourable conservation condition of *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) in Cloghernagore Bog and Glenveagh National Park 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	<i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) have not been mapped in detail for Cloghernagore Bog and Glenveagh National Park SAC and thus the total area of the qualifying habitat is unknown. <i>Molinia</i> meadows are known to occur in areas that are subjected to occasional flooding in the SAC (NPWS internal files)
Habitat distribution	Occurrence	No decline, subject to natural processes	See notes for Habitat area above
Vegetation composition: typical species	Number at a representative number of monitoring stops	At least seven positive indicator species present, including one "high quality" species as listed in O'Neill et al. (2013)	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 (<i>Molinia caerulea</i>) is a positive indicator species, but not necessarily an essential component of the habitat. The high quality indicator conglomerate rush (<i>Juncus conglomeratus</i>) and the positive indicators purple moor-grass and sharp-flowered rush (<i>Juncus acutiflorus</i>) have been recorded from this habitat in the SAC (Weekes, 1990; NPWS internal files)
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 (<i>Polytrichum</i> 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 (<i>Pteridium aquilinum</i>) 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)

Conservation Objectives for : Cloghernagore Bog and Glenveagh National Park SAC [002047]

7130 Blanket bogs (* if active bog)

To restore the favourable conservation condition of Blanket bogs (* if active bog) in Cloghernagore Bog and Glenveagh National Park 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 Cloghernagore Bog and Glenveagh National Park SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 22,607ha, covering 68% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Cloghernagore Bog and Glenveagh National Park SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	The habitat occurs throughout the SAC. The area around Cloghernagore constitutes the most extensive blanket bog system remaining in the north-west of Ireland (NPWS internal files). Other examples of this habitat are present at Glenveagh Bridge, Cashelnagor, Dunlewy Far, Derrybeg, Calabber Valley, Attinadague, Meenagoppoge, Carrickatimpan, Commeen and Skeagh (Douglas et al., 1990). Further information can be found within Douglas et al. (1990), NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Ecosystem function: peat formation	Active blanket bog as a proportion of the total area of Annex I blanket bog habitat	At least 99% of the total Annex I blanket bog area is active	See the blanket bogs and associated habitats supporting document for further details
Ecosystem function: hydrology	Flow direction, water levels, occurrence of drains and erosion gullies	Natural hydrology unaffected by drains and erosion	Further details and a brief discussion of restoration potential is presented in the blanket bogs and associated habitats supporting document
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	A variety of blanket bog vegetation communities have been recorded in this SAC (NPWS 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: 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 <i>Sphagnum fallax</i> , 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 (<i>Rhododendron ponticum</i>) and the non-native moss <i>Campylopus introflexus</i> were recorded in this habitat in the SAC (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 10%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: <i>Sphagnum</i> condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the <i>Sphagnum</i> 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 (<i>Empetrum nigrum</i>) and bog-myrtle (<i>Myrica gale</i>) 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 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 are historic records for the FPO listed and Near Threatened bog orchid (<i>Hammarbya paludosa</i>) (Wyse Jackson et al., 2016) from the SAC (NPWS internal files), but this species cannot be attributed specifically to blanket bogs. The FPO listed and Vulnerable liverworts <i>Scapania ornithopodioides</i> and <i>Bazzania pearsonii</i> (Lockhart et al., 2012) are present within hepatic mats associated with this habitat in the SAC (R. Hodd, pers. comm.)

Conservation Objectives for : Cloghernagore Bog and Glenveagh National Park SAC [002047]

7150 Depressions on peat substrates of the Rhynchosporion

To restore the favourable conservation condition of Depressions on peat substrates of the Rhynchosporion in Cloghernagore Bog and Glenveagh National Park 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 Cloghernagore Bog and Glenveagh National Park SAC and thus the total area of the qualifying habitat is unknown. Further details on this and the following attributes can be found in the Cloghernagore Bog and Glenveagh National Park SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	The habitat mostly occurs in areas of lowland blanket bog on wet and quaking terrain. Good examples of this habitat are present at Cloghernagore Bog and at Glenveagh Bridge Bog (NPWS internal files). It is also present at Attinadague Bog, Derrybeg Bog and Skeagh Bog (Douglas et al., 1990). Further information can be found in Douglas et al. (1990), NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Vegetation composition: positive indicator species	Number of species at a representative number of 2m x 2m monitoring stops	Number of positive indicator species at each monitoring stop is at least five	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: <i>Rhynchospora</i> spp.	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of white beaked sedge (<i>Rhynchospora alba</i>) and brown beaked sedge (<i>R. fusca</i>) 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: <i>Sphagnum</i> condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the <i>Sphagnum</i> 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 (<i>Empetrum nigrum</i>) and bog-myrtle (<i>Myrica gale</i>) 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)

Conservation Objectives for : Cloghernagore Bog and Glenveagh National Park SAC [002047]

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 Cloghernagore Bog and Glenveagh National Park 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 37.3ha, for the sub-sites (Mullangore Wood, NSNW site code 1423; Derry Beg, NSNW site code 1424) surveyed. See map 4 for surveyed areas	The main area of old oak woodland in Cloghernagore Bog and Glenveagh National Park SAC is Mullangore Wood, on the south-eastern side of Lough Veagh; other areas include Sruhanacullia Wood, Brogan's Wood, Derrybeg Wood, Upper Glen Wood and Garman Wood (Bleasdale and Conaghan, 1996; NPWS internal files). Two sites within the SAC were surveyed by Perrin et al. (2008) as part of the National Survey of Native Woodlands (NSNW): Mullangore Wood (NSNW site code 1423) and Derry Beg (NSNW site code 1424). Mullangore Wood (1423) was also included in a national monitoring survey (O'Neill and Barron, 2013). Map 4 shows the surveyed woodlands classified as 91A0 (37.3ha) by the NSNW. NB further unsurveyed areas are present within the SAC
Habitat distribution	Occurrence	No decline, subject to natural processes. Surveyed woodland locations are shown on map 4	Distribution based on Perrin et al. (2008). It is important to note that there are additional areas of woodland, which were not mapped by the NSNW, present within this 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
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 (<i>Quercus petraea</i>) generally regenerates poorly. In suitable sites, ash (<i>Fraxinus excelsior</i>) 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 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, archaeological and geological features as well as red-data and other rare or localised species. Perrin and Daly (2010) identified Mullangore Wood (NSNW site code 1423) as "possible ancient woodland". The Near Threatened beech fern (<i>Phegopteris connectilis</i>) (Wyse Jackson et al., 2016) and the Annex V listed fir clubmoss (<i>Huperzia selago</i>) are present in Mullangore Wood (Perrin et al., 2008)
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 (<i>Quercus petraea</i>) and birch (<i>Betula pubescens</i>)	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	Rhododendron (<i>Rhododendron ponticum</i>) infestation is a problem within this habitat in the SAC, although an extensive clearance programme is on-going (Perrin et al., 2008; NPWS internal files)

Conservation Objectives for : Cloghernagore Bog and Glenveagh National Park SAC [002047]

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

To restore the favourable conservation condition of Freshwater Pearl Mussel in Cloghernagore Bog and Glenveagh National Park SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Kilometres	See targets below and see map 5	The conservation objective applies to the Glaskeelan and Owencarrow freshwater pearl mussel (<i>Margaritifera margaritifera</i>) populations, which are listed on the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 (SI 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 Glaskeelan and Owencarrow systems (see further information below). The Glaskeelan, owing to the relatively few pressures in the catchment, is one of eight Irish populations prioritised for conservation action. This SAC covers much of the Glaskeelan and Owencarrow catchments. It also covers upper parts of the Clady catchment, while the Glaskeelan is a sub-catchment of the Leannan (see map 5). Conservation objectives for the Clady and Leannan freshwater pearl mussel populations are detailed for SACs 000140 and 002176, respectively
Distribution: Glaskeelan	Kilometres	Maintain Glaskeelan distribution at 3.17km	As noted above, the Glaskeelan freshwater pearl mussel population is one of eight Irish populations prioritised for conservation action (Moorkens, 2010; NPWS, 2010). Information on the distribution of the freshwater pearl mussel in the Glaskeelan comes from Moorkens (1995, 1996, 2007, 2009). Mussels have been found from just downstream of the national park boundary to the mouth of the river at Gartan Lough; however, most of the population occurs between a 'large rock' at C04873 17424 and the lake. Further survey is required of the stretches from the national park boundary downstream to the 'large rock'. The target is for the species to be sufficiently widespread to maintain itself on a long-term basis as a viable component of the Glaskeelan system. See NPWS (2010) for further information
Distribution: Owencarrow	Kilometres	Maintain Owencarrow distribution at 7.3km	The distribution of the freshwater pearl mussel is poorly known for the Owencarrow system, but is considered to be from the outflow from Lough Beagh to the New Bridge (N56) (based on records from: Beasley, 1996; Moorkens, 1995, 1996, 2007, 2009). Further survey is required of the distribution, abundance and condition of the species and its habitat in the Owencarrow. The target is for the species to be sufficiently widespread to maintain itself on a long-term basis as a viable component of the Owencarrow system. See NPWS (2010) for further information

Population size	Number of adult mussels	Restore populations to at least: 10,000 adult mussels in the Glaskeelan and 10,000 in the Owencarrow	The 2009 population estimate for the Glaskeelan was a maximum of 10,000 (Moorkens, 2009; NPWS, 2010). NPWS (2010) provided a population estimate of 15,000 for the Owencarrow, however Moorkens (2010) considered it more likely to be less than 10,000. Pearl fishing appears to have contributed significantly to the Owencarrow population decline (Beasley, 1996; Moorkens, 2009; NPWS, 2010) and the available mussel habitat is below capacity for mussels (Moorkens, 2009). Further survey of both systems is required to provide more robust population targets. NPWS (2013) assumed the Glaskeelan, like other priority populations, had declined at a rate of 1% per year and the Owencarrow at 3% per year. Moorkens (2017), however, found that one stretch of the Glaskeelan had declined by 82% in 4 years. The target is for the species to be sufficiently abundant to maintain itself on a long-term basis as a viable component of the Glaskeelan and Owencarrow 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 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. See the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. Beasley (1996) conducted age studies of Glaskeelan and Owencarrow mussels. In 2009, the smallest Glaskeelan mussel was 26mm, but it failed both targets with only 6.6% $\leq 65\text{mm}$ and 1.3% $\leq 30\text{mm}$ (Moorkens, 2009). No juvenile or young mussels were found in the Glaskeelan in 2012 or 2016 (Moorkens, 2012, 2017). No juveniles or young mussels were found in the Owencarrow in 2009 (Moorkens, 2009; NPWS, 2010). Both populations are unsustainable owing to lack of survival of juvenile mussels. The target is for sufficient juvenile recruitment to allow the species to maintain itself on a long-term basis as a viable component of the Glaskeelan and Owencarrow 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 Glaskeelan was assumed to pass both targets in 2009 and again in 2012, when the absence of baseline data made assessment of changes in live adults difficult (Moorkens, 2009, 2012; NPWS, 2010). In 2016, a severe decline was recorded, with an 82% drop in adults between 2012-16 in one stretch, the highest density was 3 mussels/m ² and the 8 mussels tested by tongs were found to be 'Stressed'. The Owencarrow failed both targets in 2009, when more dead shells (more than 145) than large, live adults (c.110) were counted (Moorkens, 2009, 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 Glaskeelan and Owencarrow systems

Suitable habitat: extent	Kilometres	See targets below	The habitat is a combination of 1) the area of habitat adult and juvenile mussels can occupy; 2) the area of spawning and nursery habitats host fish can occupy. Fish nursery habitat typically overlaps with mussel habitat. Fish spawning habitat is generally adjacent to mussel habitat, but may lie upstream of the generalised mussel distribution. Only spawning areas that can regularly contribute juvenile fish to 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 (map 5) contribute to such impacts. Habitat in the Glaskeelan and Owencarrow is unsuitable for juvenile recruitment (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 Glaskeelan and Owencarrow systems. See below
Suitable habitat: extent - Glaskeelan	Kilometres	Restore suitable habitat in more than 3.17km in the Glaskeelan system and any additional stretches necessary for salmonid spawning	The extent of the mussel habitat in the Glaskeelan, in correspondence with the species' distribution, is considered to be from just downstream of the National Park boundary to the mouth of the river at Gartan Lough (Moorkens, 1995, 1996, 2007, 2009). As noted above, however, further survey is required, particularly of the more upstream stretches, to confirm the habitat extent. Most of the mussel habitat is considered to be under carrying capacity and mussel density is particularly poor in some patches (Moorkens, 2009, 2017; NPWS, 2010). Sedimentation and organic enrichment are the key impacts on the Glaskeelan mussel habitat. 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 Glaskeelan system
Suitable habitat: extent - Owencarrow	Kilometres	Restore suitable habitat in more than 5.0km in the Owencarrow system and any additional stretches necessary for salmonid spawning	Further survey is required to accurately map the extent of mussel habitat in the Owencarrow system. The habitat polyline is likely to underestimate habitat extent downstream of Owencarrow Bridge and overestimate it above that bridge. Suitable habitat was patchy and limited in extent in the stretches surveyed in 2007 and 2009, and where found was below carrying capacity for mussels (Moorkens, 2007, 2009). Sedimentation and nutrient enrichment are impacting on the condition of the Owencarrow mussel habitat. 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 Owencarrow 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 (WFD) biological quality elements. They represent high water quality with very low nutrient concentrations (oligotrophic conditions). In 2009, the habitat in both the Glaskeelan and Owencarrow systems failed the macroinvertebrate target, but passed the diatom target (Ní Chatháin, 2009; Williams, 2009; NPWS, 2010). See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Glaskeelan and Owencarrow 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%)	Both the Glaskeelan and Owencarrow systems failed the macroalgal target in 2009, but (marginally) passed the macrophyte target (NPWS, 2010). Macroalgal cover of 60% and 70% was recorded in the Glaskeelan during macroinvertebrate surveys (Williams, 2009; NPWS, 2010). The macrophyte <i>Potamogeton</i> was more abundant than expected in the Glaskeelan mussel habitat (Moorkens, 2009, 2017; NPWS, 2010). <i>Littorella</i> was also abundant in 2016 (Moorkens, 2017). Bacterial and fungal growth requires further investigation in the Glaskeelan given the loading of organic matter that has entered the river (see Moorkens, 2012). Algal cover varied spatially and temporally in the Owencarrow mussel habitat, but was greatest (60%) at the bridge near the Glenveagh visitor centre (Williams, 2009; 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 Glaskeelan and Owencarrow 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 Glaskeelan failed the target for the Sub-basin Management Plan, having strong silt plumes (Moorkens, 2009; Williams, 2009; NPWS, 2010). There was a clear relationship between heavy siltation and higher macrophyte cover abundance. It failed again in 2012 (high/increased silt cover (drape) and substantial silt plumes when agitated) and in 2016 (silt infiltration on all transects) (Moorkens, 2012, 2017). The Owencarrow failed the target in 2009, with slight to moderate silt plumes in mussel habitat (Williams, 2009; NPWS, 2010). Sufficient survival of juvenile mussels is being prevented by the poor condition of the river substratum in both systems. 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 Glaskeelan and Owencarrow 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 Glaskeelan failed the redox target in 2009, with an average loss of 21.3% redox potential at 5cm (range 11-27.5%) (Moorkens, 2009; NPWS, 2010). In 2012, average redox was 30.6% and substratum condition had deteriorated significantly throughout the Glaskeelan (Moorkens, 2012). It failed again in 2016 (average of 24.9%, all readings at lower sites over 20%) (Moorkens, 2017). The Owencarrow failed the target in 2009, with average redox of 24.1% (Moorkens, 2009; 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 Glaskeelan and Owencarrow systems

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) 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 Glaskeelan and Owencarrow 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 thus are essential to completion of the life cycle. 0+ and 1+ fish are typically used, both because of habitat overlaps and the development of immunity with age in fish. Fish presence is considered sufficient, as higher fish density and biomass is indicative of enriched conditions in mussel rivers. Geist et al. (2006) found that higher densities of host fish coincided with eutrophication, poor substrate quality for mussels and a lack of mussel recruitment, while significantly lower densities and biomass of host fish were associated with high juvenile mussel numbers. Fish movements must be such that 0+ fish remain in the mussel habitat until their 1+ summer. No fish stocking should occur within the mussel habitat, nor any works that may change the salmonid balance or residency time. In the Glaskeelan and Owencarrow, neither salmon nor trout were encysted with glochidia in May 2009 (Johnston, 2009; NPWS, 2010)
Fringing habitats: 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) and provide habitat (refuge and resources) 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 Glaskeelan and Owencarrow systems

Conservation Objectives for : Cloghernagore Bog and Glenveagh National Park SAC [002047]

1106 Salmon *Salmo salar*

To maintain the favourable conservation condition of Atlantic Salmon in Cloghernagore Bog and Glenveagh National Park 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 salmon's upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas
Adult spawning fish	Number	Conservation limit (CL) for each system consistently exceeded	A conservation limit (CL) is defined by the North Atlantic Salmon Conservation Organisation (NASCO) as "the spawning stock level that produces long-term average maximum sustainable yield as derived from the adult to adult stock and recruitment relationship". The target is based on the Standing Scientific Committee on Salmon (SSCS) annual model output of CL attainment levels. See SSCS (2016). Attainment of CL estimates are derived from direct counts of adults (rod catch, fish counter) or indirectly by fry abundance counts. The Gweebarra River is currently achieving 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 (<i>Lepeophtheirus salmonis</i>)
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)

Conservation Objectives for : Cloghernagore Bog and Glenveagh National Park SAC [002047]

1355 Otter *Lutra lutra*

To maintain the favourable conservation condition of Otter in Cloghernagore Bog and Glenveagh National Park 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 1,130.1ha along river banks/lake shoreline/ around ponds	No field survey. Areas mapped to include 10m terrestrial buffer along rivers and around water bodies, as identified as critical for otters (NPWS, 2007)
Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 490.3km	No field survey. River length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (Chapman and Chapman, 1982)
Extent of freshwater (lake) habitat	Hectares	No significant decline. Area mapped and calculated as 745.5ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (NPWS, 2007)
Couching sites and holts	Number	No significant decline	Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk and Moorhouse, 1991; Kruuk, 2006)
Fish biomass available	Kilograms	No significant decline	Broad diet that varies locally and seasonally, but dominated by fish, in particular salmonids, eels and sticklebacks in freshwater (Bailey and Rochford, 2006; Reid et al., 2013)
Barriers to connectivity	Number	No significant increase	Otters will regularly commute across stretches of open water up to 500m. e.g. between the mainland and an island; between two islands; across an estuary (De Jongh and O'Neill, 2010). It is important that such commuting routes are not obstructed

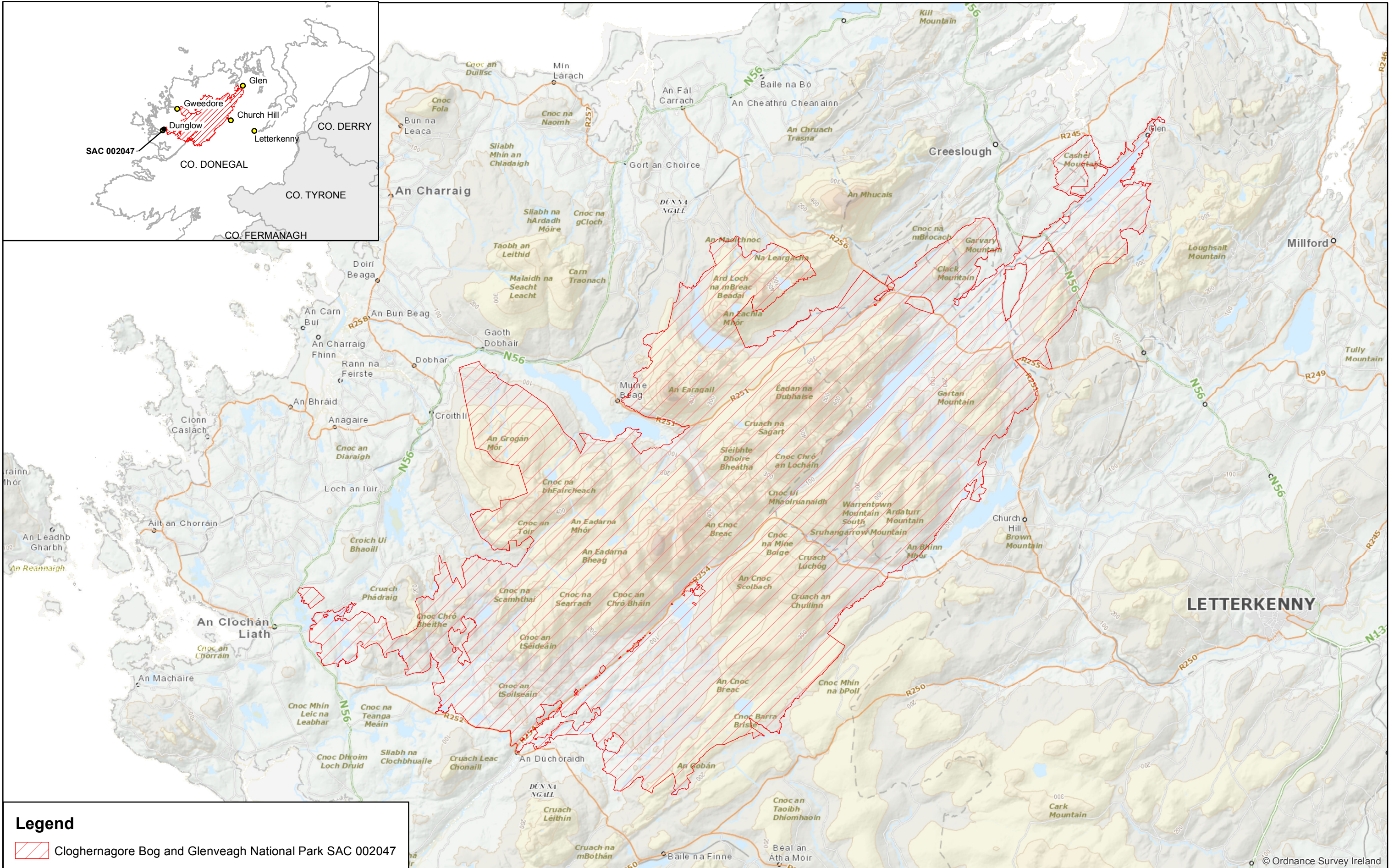
Conservation Objectives for : Cloghernagore Bog and Glenveagh National Park SAC [002047]

1421 Killarney Fern *Trichomanes speciosum*

To maintain the favourable conservation condition of Killarney Fern in Cloghernagore Bog and Glenveagh National Park 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	Killarney fern (<i>Trichomanes speciosum</i>) is currently known from one location in Cloghernagore Bog and Glenveagh National Park SAC, within hectad B91. The exact location is not mapped here on account of the threat posed by illegal collecting. The species has also been recorded from a second location in the SAC but not, apparently, since 1955; recent searches of the second location have failed to record the species and it is considered likely to be no longer extant there. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Populations	Number	No decline, subject to natural processes	One population of the species is known from the SAC. It was first recorded here in 1961 and subsequently in 1976, 1993, 1995 and 2011. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Colonies	Number	No decline, subject to natural processes	The sole population of Killarney fern known from the SAC comprises a single colony. 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	The single colony of the species known from the SAC comprises a mixture of sporophytes (frond stage) and gametophytes (filamentous stage). 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	The area of occupancy was recorded as 0.33 square metres in 2011. 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	38 fronds were recorded in 2011. 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 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 not been recorded from the SAC to date. 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 not been recorded from the SAC to date. 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. Woodland colonies have not been recorded from the SAC to date. 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, location of population 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 to take account of its habitat requirements, in particular, with regard to maintenance of sufficient canopy cover. Woodland colonies have not been recorded from the SAC to date. 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 <i>T. speciosum</i>	In order to avoid negative impacts on <i>Trichomanes speciosum</i> , 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



Legend

 Cloghernagore Bog and Glenveagh National Park SAC 002047

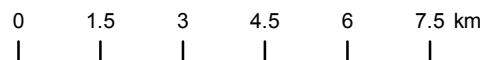


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 Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

**MAP 1:
 CLOGHERNAGORE BOG AND
 GLENVEAGH NATIONAL PARK SAC
 CONSERVATION OBJECTIVES
 SAC DESIGNATION**

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

**SITE CODE:
 SAC 002047; version 3. CO. DONEGAL**



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


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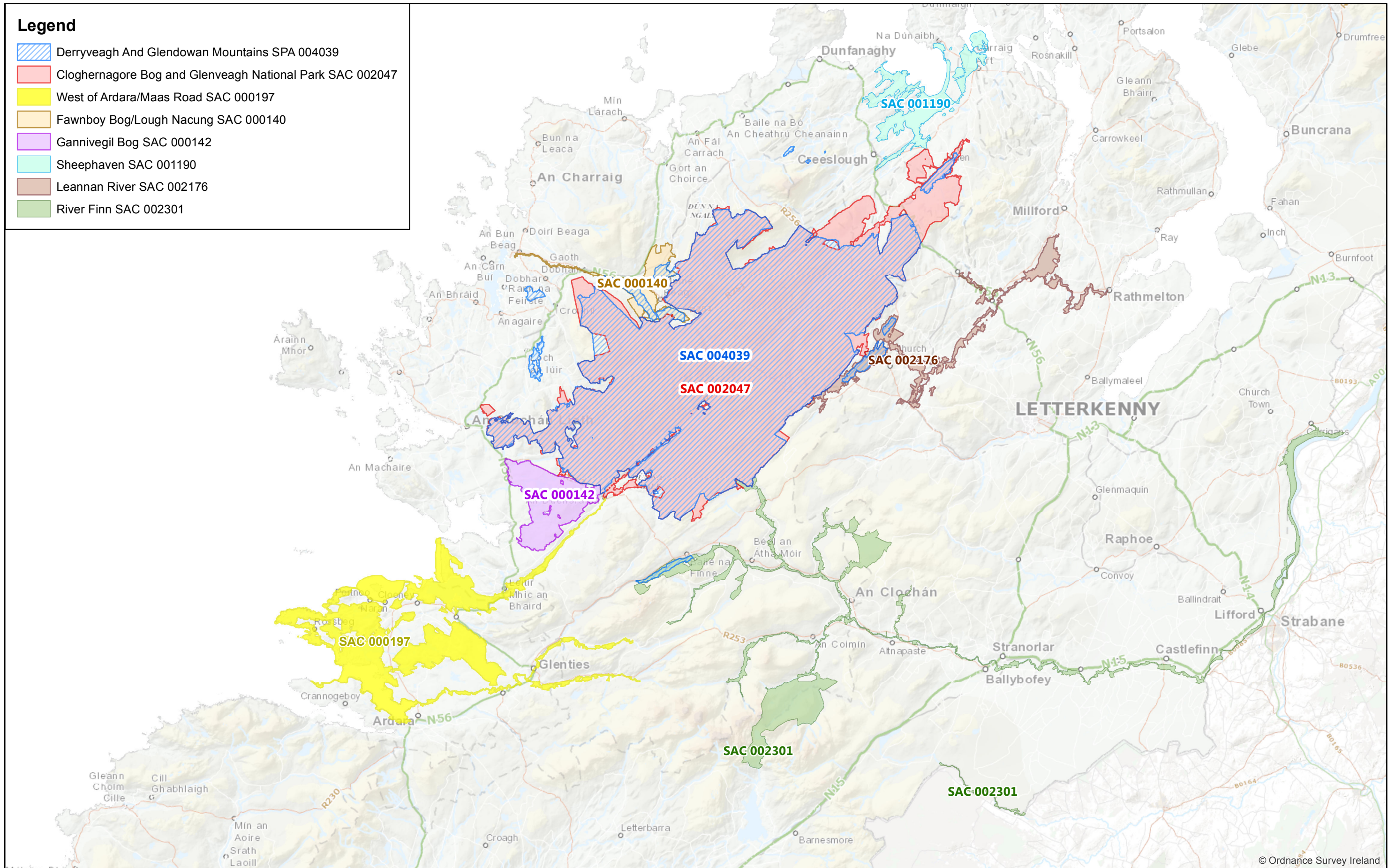


**Map Version 1
 Date: May 2017**

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Legend

-  Derryveagh And Glendowan Mountains SPA 004039
-  Cloghernagore Bog and Glenveagh National Park SAC 002047
-  West of Ardara/Maas Road SAC 000197
-  Fawnboy Bog/Lough Nacung SAC 000140
-  Gannivegil Bog SAC 000142
-  Sheephaven SAC 001190
-  Leannan River SAC 002176
-  River Finn SAC 002301



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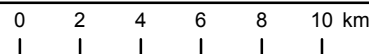


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**MAP 2:
CLOGHERNAGORE BOG AND
GLENVEAGH NATIONAL PARK SAC
CONSERVATION OBJECTIVES
ADJACENT, ADJOINING AND
OVERLAPPING DESIGNATIONS**

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

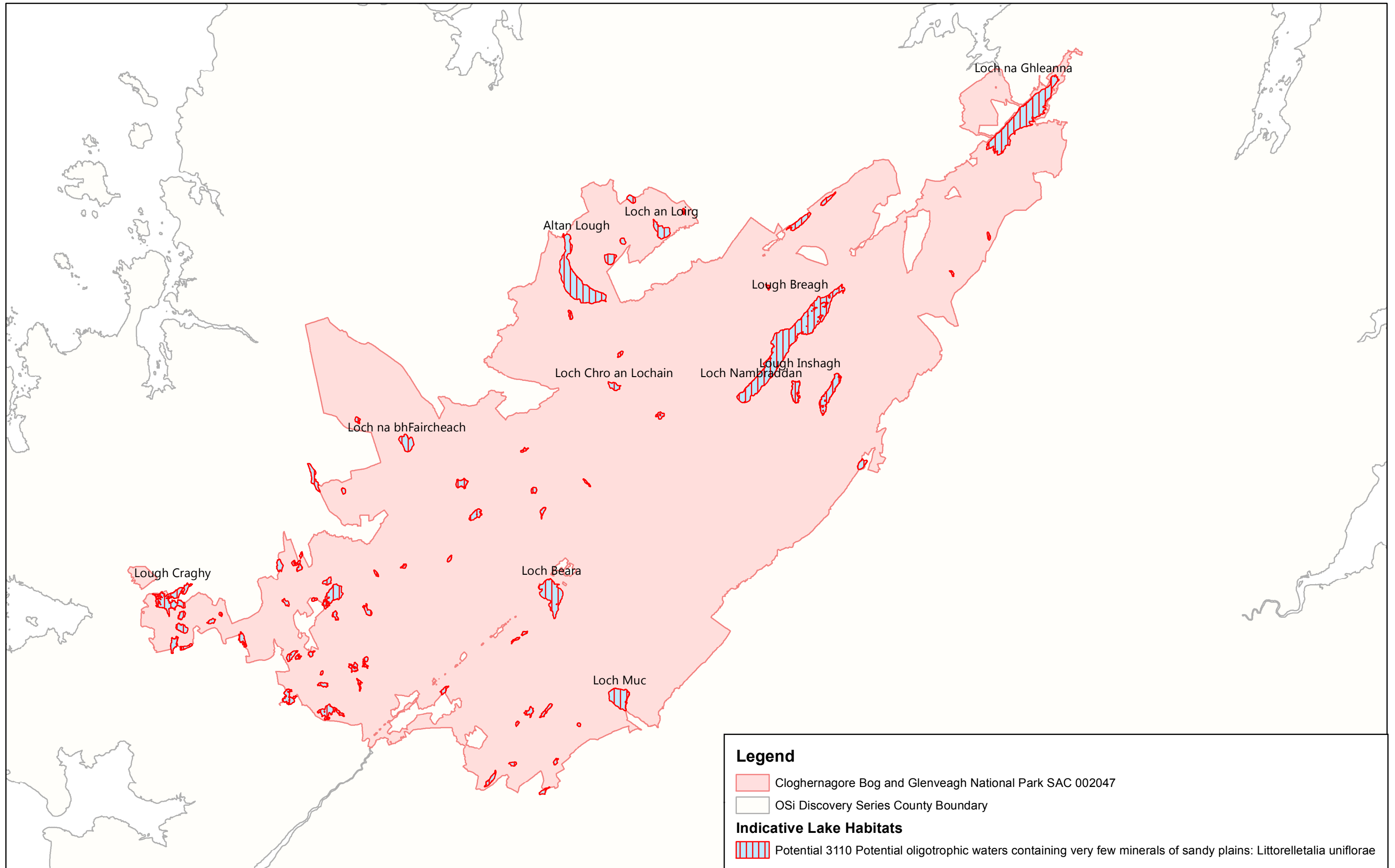
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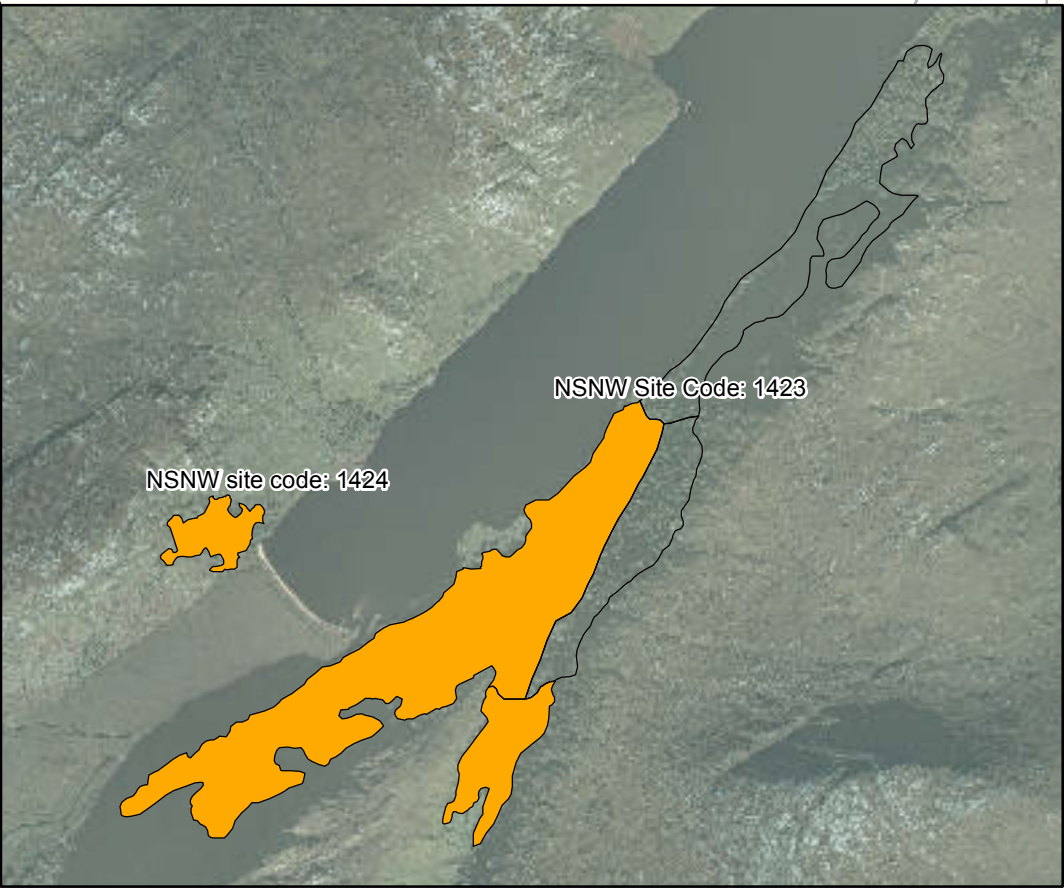
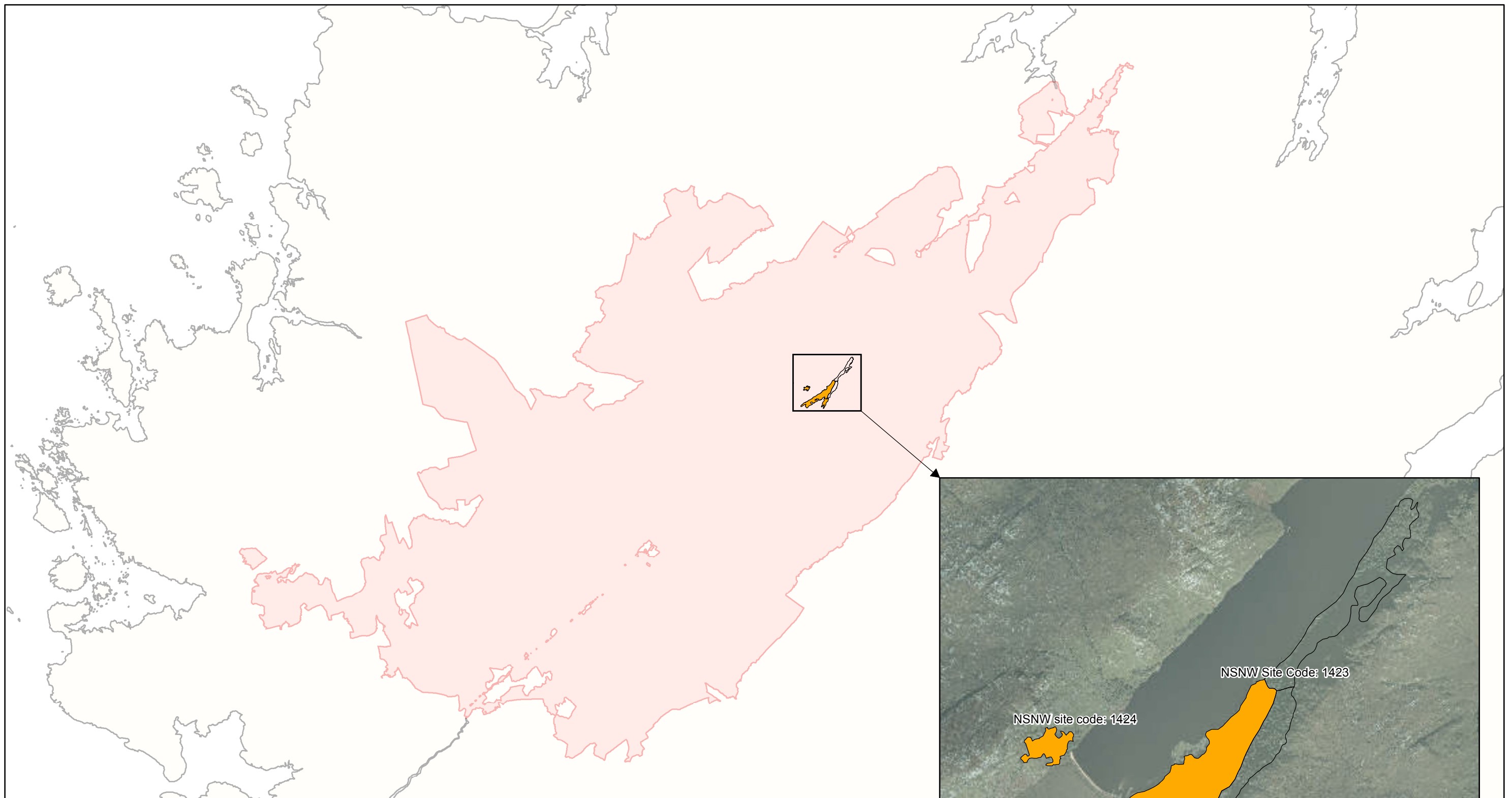


Legend

- Cloghernagore Bog and Glenveagh National Park SAC 002047
- OSi Discovery Series County Boundary

Indicative Lake Habitats

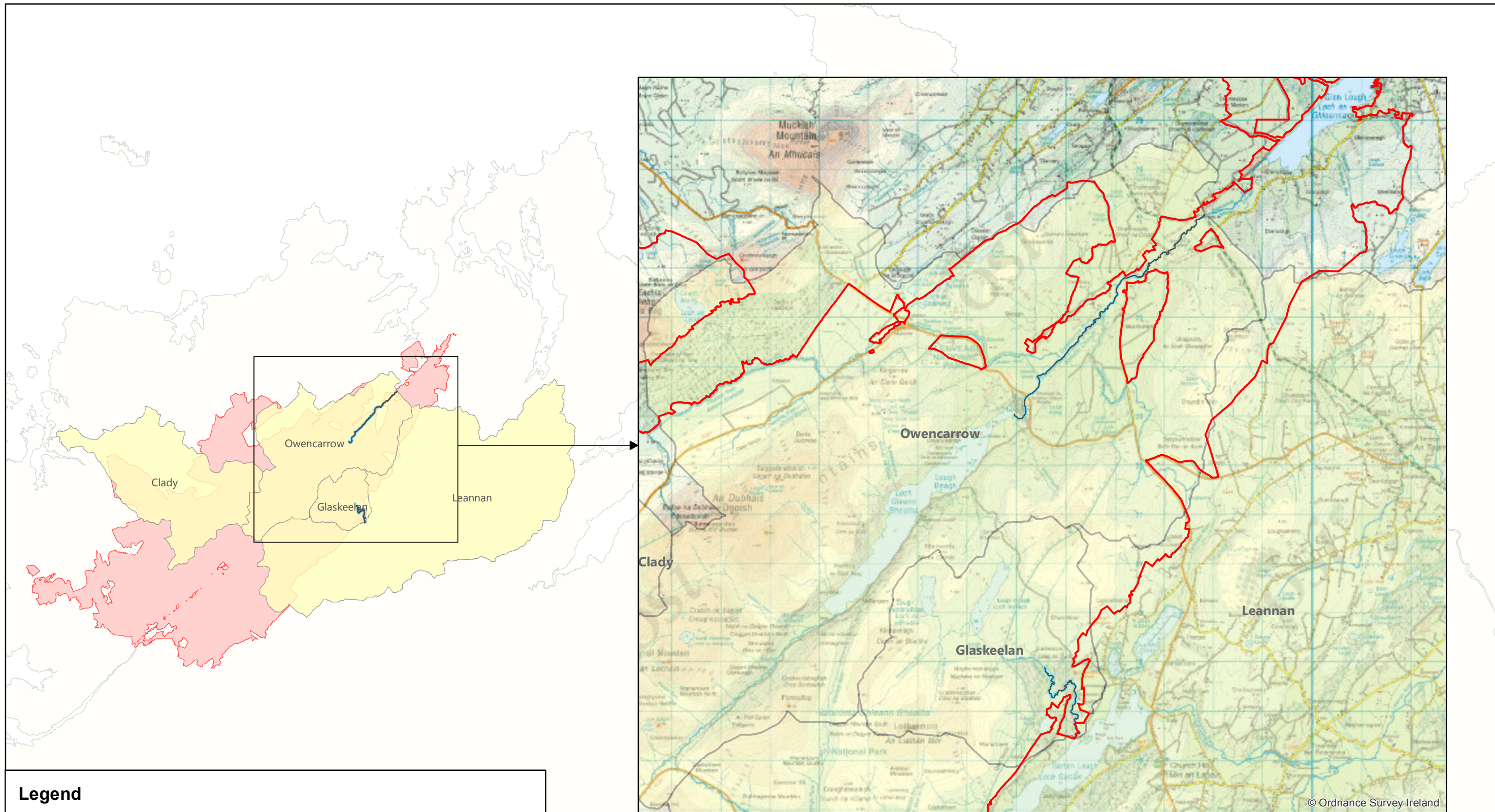
- Potential 3110 Potential oligotrophic waters containing very few minerals of sandy plains: *Littorelletalia uniflorae*



Legend

Annex I Woodland Habitats

- 91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
- Cloghernagore Bog and Glenveagh National Park SAC 002047
- OSi Discovery Series County Boundary



Legend

- 1029 Freshwater Pearl Mussel *Margaritifera margaritifera* Distribution Target
- 1029 Freshwater Pearl Mussel *Margaritifera margaritifera* Suitable Habitat Target
- 1029 Freshwater Pearl Mussel *Margaritifera margaritifera* Catchment
- Cloghernagore Bog and Glenveagh National Park SAC 002047
- OSi Discovery Series County Boundaries