

National Parks and Wildlife Service

Conservation Objectives Series

Ballyhoorisky Point to Fanad Head SAC 001975



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

001975	Ballyhoorisky Point to Fanad Head SAC
1014	Narrow-mouthed Whorl Snail <i>Vertigo angustior</i>
1220	Perennial vegetation of stony banks
1230	Vegetated sea cliffs of the Atlantic and Baltic coasts
1833	Slender Naiad <i>Naias flexilis</i>
3130	Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea
3140	Hard oligo-mesotrophic waters with benthic vegetation of <i>Ocladia</i> spp.

Please note that this SAC overlaps with Fanad Head SPA (004148) SPA and Horn Head to Fanad Head SPA (004194) and is adjacent to Mulroy Bay SAC (002159). 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 :	1999
Title :	National Shingle Beach Survey of Ireland 1999
Author :	Moore, D.; Wilson, F.
Series :	Unpublished Report to NPWS
Year :	2007
Title :	Management prescriptions for <i>Vertigo angustior</i> at cSAC sites for the species in the Republic of Ireland
Author :	Moorkens, E.
Series :	Unpublished report to NPWS
Year :	2009
Title :	Coastal Monitoring Project 2004-2006
Author :	Ryle, T.; Murray, A.; Connolly, K.; Swann, M.
Series :	Unpublished report to NPWS
Year :	2011
Title :	National survey and assessment of the conservation status of Irish sea cliffs
Author :	Barron, S.J.; Delaney, A.; Perrin, P.M.; Martin, J.; O'Neill, F.
Series :	Irish Wildlife Manual No. 53
Year :	2011
Title :	Monitoring and condition assessment of populations of <i>Vertigo geyeri</i> , <i>Vertigo angustior</i> and <i>Vertigo moulinsiana</i> in Ireland
Author :	Moorkens, E.; Killeen, I.
Series :	Irish Wildlife Manual No. 55
Year :	2013
Title :	A survey of the benthic macrophytes of three hard-water lakes: Lough Bunny, Lough Carra and Lough Owel
Author :	Roden, C.; Murphy, P.
Series :	Irish Wildlife Manual No. 70
Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 2. Habitats assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2015
Title :	Habitats Directive Annex I lake habitats: a working interpretation for the purposes of site-specific conservation objectives and Article 17 reporting
Author :	O Connor, Á.
Series :	Unpublished document by NPWS
Year :	2016
Title :	Ireland Red List No. 10: Vascular Plants
Author :	Wyse Jackson, M.; FitzPatrick, Ú.; Cole, E.; Jebb, M.; McFerran, D.; Sheehy Skeffington, M.; Wright, M.
Series :	Ireland Red Lists series, NPWS
Year :	2017
Title :	Ballyhoorisky Point to Fanad Head SAC (site code: 1975) Conservation objectives supporting document- coastal habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document

Year : 2017
Title : Ballyhoorisky Point to Fanad Head SAC (site code: 1975) Conservation objectives supporting document- *Najas flexilis* V1
Author : NPWS
Series : Conservation objectives supporting document

Other References

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

Year : 1999
Title : A survey of the sublittoral vegetation of 15 machair loughs in north west Ireland/ A survey of coastal lakes in Counties Galway, Mayo, Sligo and Donegal/ A survey of Irish machair loughs
Author : Roden, C.
Series : Report to the National Heritage Council, Kilkenny

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

Year : 2001
Title : Aquatic plants in Britain and Ireland
Author : Preston, C.D.; Croft, J.M.
Series : Harley Books, Colchester

Year : 2004
Title : The ecology of *Najas flexilis*
Author : Wingfield, R.A.; Murphy, K.J.; Hollingsworth, P.; Gaywood, M.J.
Series : Scottish Natural Heritage Commissioned Report No. 017 (ROAME No. F98PA02)

Year : 2005
Title : National inventory of sea cliffs and coastal heaths
Author : Browne, A.
Series : Unpublished Report to NPWS

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 : 2010
Title : Water quality in Ireland 2007-2009
Author : McGarrigle, M.; Lucey, J.; Ó Cinnéide, M.
Series : EPA, Wexford

Year : 2015
Title : Water quality in Ireland 2010-2012
Author : Bradley, C., Byrne, C., Craig, M., Free, G., Gallagher, T., Kennedy, B., Little, R., Lucey, J., Mannix, A., McCreesh, P., McDermott, G., McGarrigle, M., Ní Longphuirt, S., O'Boyle, S., Plant, C., Tierney, D., Trodd, W., Webster, P., Wilkes, R. & Wynne, C.
Series : EPA, Wexford

Year : in prep.
Title : Monitoring of hard-water lakes in Ireland using charophytes and other macrophytes
Author : Roden, C.; Murphy, P.
Series : Unpublished report to NPWS

Spatial data sources

Year :	Revision 2012
Title :	National Shingle Beach Survey
GIS Operations :	Clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1220 (map 3)
<hr/>	
Year :	2009
Title :	Coastal Monitoring Project 2004-2006. Version 1
GIS Operations :	QI selected; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1220 (map 3)
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Year :	2011
Title :	National survey and assessment of the conservation status of Irish sea cliffs
GIS Operations :	Clipped to SAC boundary
Used For :	1230 (map 4)
<hr/>	
Year :	2008
Title :	OSi 1:5000 IG vector dataset
GIS Operations :	WaterPolygons feature class clipped to the SAC boundary. Expert opinion used to identify Annex I habitat and to resolve any issues arising
Used For :	3130, 3140 (map 5)
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Year :	2016
Title :	NPWS rare and threatened species database
GIS Operations :	Dataset created from spatial references in database records. Expert opinion used as necessary to resolve any issues arising
Used For :	1014 (map 6)
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Year :	2013
Title :	<i>Najas flexilis</i> data
GIS Operations :	Lake habitat for species clipped to SAC boundary
Used For :	1833 (map 7)

1220 Perennial vegetation of stony banks

To restore the favourable conservation condition of Perennial vegetation of stony banks in Ballyhoorisky Point to Fanad Head SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes including erosion and succession	The current total area of perennial vegetation of stony banks in Ballyhoorisky Point to Fanad Head SAC is unknown. The habitat was recorded as being present, but its extent was not mapped, from three sub-sites during the National Shingle Beach Survey (NSBS) (Moore and Wilson, 1999): Fanad Head (NSBS site ID: 0020), Ballyhiernan Bay (NSBS site ID: 0021) and Rinboy Point to Ballyhoorisky Island (NSBS site ID: 0022). During the Coastal Monitoring Project (CMP), an area of 0.26ha of vegetated shingle was recorded within the sub-site Maheradrumman (CMP site ID: 172) (Ryle et al., 2009). It is important to note that further unsurveyed areas may be present within the SAC and the total area of the habitat is likely to be much greater. See the Ballyhoorisky Point to Fanad Head SAC conservation objectives supporting document for coastal habitats for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 3 for recorded locations	The full distribution of vegetated shingle within the SAC is unknown at present, although the habitat has been recorded within the sub-sites Fanad Head, Ballyhiernan Bay and Rinboy Point to Ballyhoorisky Island by Moore and Wilson (1999) and within the Maheradrumman sub-site by Ryle et al. (2009). The habitat is likely to be more widespread. See the coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Based on data from Moore and Wilson (1999) and Ryle et al. (2009). At Ballyhoorisky Point to Fanad Head SAC, shingle extraction has damaged the habitat. See the coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Moore and Wilson (1999). At Ballyhoorisky Point to Fanad Head SAC, vegetated shingle is associated with intertidal shingle, rocky shore, shingle-based grassland, cliffs, machair and sand dunes. See the coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain the typical vegetated shingle flora including the range of sub-communities within the different zones	Within the habitat in the SAC, the CMP recorded curled dock (<i>Rumex crispus</i>), scentless mayweed (<i>Tripleurospermum maritimum</i>), silverweed (<i>Potentilla anserina</i>), sand couch (<i>Elytrigia juncea</i>), sea holly (<i>Erygnium maritimum</i>), sea sandwort (<i>Honkenya peploides</i>), sea mayweed (<i>Matricaria maritima</i>), cleavers (<i>Galium aparine</i>) and Yorkshire fog (<i>Holcus lanatus</i>) (Ryle et al., 2009). The NSBS also noted creeping bent (<i>Agrostis stolonifera</i>), spear-leaved orache (<i>Atriplex prostrata</i>), daisy (<i>Bellis perennis</i>), thistles (<i>Cirsium</i> spp.), common scurvygrass (<i>Cochlearia officinalis</i>), ribwort plantain (<i>Plantago lanceolata</i>), broadleaved plantain (<i>P. major</i>), creeping buttercup (<i>Ranunculus repens</i>), dandelion (<i>Taraxacum</i> agg.) and clovers (<i>Trifolium</i> spp.) (Moore and Wilson, 1999). See the coastal habitats supporting document for further details

Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-native species) to represent less than 5% cover	Based on data from Moore and Wilson (1999). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. The NSBS noted the presence of common nettle (<i>Urtica dioica</i>) on the exposed shingle beach at Fanad Head. See the coastal habitats supporting document for further details
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Conservation Objectives for : Ballyhoorisky Point to Fanad Head SAC [001975]

1230 Vegetated sea cliffs of the Atlantic and Baltic coasts

To maintain the favourable conservation condition of Vegetated sea cliffs of the Atlantic and Baltic coasts in Ballyhoorisky Point to Fanad Head SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat length	Kilometres	Area stable, subject to natural processes, including erosion. For the four sub-sites mapped, total length of cliff sections: Croaghross - 4.25km; Doagh Beg - 0.95km; Pollet - 4.5km; Rinboy - 0.73km. See map 4	Based on data from the Irish Sea Cliff Survey (ISCS) (Barron et al., 2011). Cliffs are linear features and are therefore measured in kilometres. Four sub-sites were identified using a combination of aerial photos and the DCENR helicopter viewer: Croaghross (ISCS site ID: 03013), Doagh Beg (ISCS site ID: 03014), Pollet (ISCS site ID: 03043) and Rinboy (ISCS site ID: 03044). The length of each cliff was measured (in some cases the cliff was measured in sections) to give a total estimated area of 10.43km within the SAC. The length of cliff is likely to be underestimated. See the Ballyhoorisky Point to Fanad Head SAC conservation objectives supporting document for coastal habitats for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 4	Only hard cliffs have been noted in this SAC (Browne, 2005; Barron et al., 2011). See the coastal habitats supporting document for further details
Physical structure: functionality and hydrological regime	Occurrence of artificial barriers	No alteration to natural functioning of geomorphological and hydrological processes, including groundwater quality, due to artificial structures	Based on data from Barron et al. (2011). Maintaining natural geomorphological processes, including natural erosion, is important for the health of vegetated sea cliffs. Hydrological processes maintain flushes, and in some cases tufa formations, that can be associated with sea cliffs. See the coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of sea cliff habitat zonation, including transitional zones, subject to natural processes including erosion and succession	Based on data from Barron et al. (2011). The base of the cliffs consists of bedrock, gravel and shingle. The cliff-top soils are shallow, lithosolic-podzolic type soils with peaty topsoil. See the coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from Barron et al. (2011). See the coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain range of sub-communities with typical species listed in the Irish Sea Cliff Survey (Barron et al., 2011)	At Ballyhoorisky Point to Fanad Head SAC, species such as thrift (<i>Armeria maritima</i>), sea campion (<i>Silene vulgaris</i> subsp. <i>maritima</i>), common scurvygrass (<i>Cochlearia officinalis</i>), buck's-horn plantain (<i>Plantago coronopus</i>), sea plantain (<i>P. maritima</i>), angelica (<i>Angelica sylvestris</i>) and the scarce roseroot (<i>Rhodiola rosea</i>) occur on the cliffs. The Near Threatened species (Wyse Jackson et al., 2016) Scots lovage (<i>Ligusticum scoticum</i>) has been reported from sea cliffs in this SAC. See the coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage	Negative indicator species (including non-native species) to represent less than 5% cover	Based on data from Barron et al. (2011). See the coastal habitats supporting document for further details
Vegetation composition: bracken and woody species	Percentage	Cover of bracken (<i>Pteridium aquilinum</i>) on grassland and/or heath less than 10%. Cover of woody species on grassland and/or heath less than 20%	Based on data from Barron et al. (2011). See the coastal habitats supporting document for further details

Conservation Objectives for : Ballyhoorisky Point to Fanad Head SAC [001975]

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

To maintain the favourable conservation condition of Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoeto-Nanojuncetea in the Ballyhoorisky Point to Fanad Head SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes. See map 5	The SAC is located at the interface between outcropping granite and quartzite bedrock and calcareous, wind-blown sand, hence a mixture of habitats 3130 and 3140 occurs in the lakes. Habitat 3130 is believed to occur in Shannagh Lough and probably also in Kinny Lough and smaller lakes in the SAC (e.g. Rinboy and Eelburn Loughs). The 3130 characteristic species <i>Najas flexilis</i> occurs in Shannagh (see the <i>Najas flexilis</i> conservation objective). Kinny has a variety of plant communities indicative of soft and hard waters (Roden, 1999). 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) and the <i>Najas flexilis</i> conservation objective supporting document for the SAC
Habitat distribution	Occurrence	No decline, subject to natural processes	As noted above, habitat 3130 is likely to occur in Shannagh and Kinny Loughs, and possibly other smaller lakes in the SAC (see map 5). The characteristics and distribution of lake habitat 3130 in Ireland are not yet fully understood, and the distinction between lake habitats 3130 and 3140 is particularly challenging in coastal areas
Typical species	Occurrence	Typical species present, in good condition, and demonstrating typical abundances and distribution	For lists of typical plant species, see Article 17 habitat assessment for lake habitat 3130 (NPWS, 2013) and O Connor (2015). The <i>Najas flexilis</i> conservation objective supporting document provides specific information on Shannagh Lough. Kinny Lough has <i>Isoetes lacustris</i> , good pondweed diversity with <i>Potamogeton berchtoldii</i> , <i>P. crispus</i> , <i>P. filiformis</i> , <i>P. gramineus</i> , <i>P. pectinatus</i> , <i>P. perfoliatus</i> , <i>P. praelongus</i> , <i>P. pusilus</i> and <i>P. x nitens</i> , and dense stands of <i>Callitriche hermaphroditica</i> (C.D. Preston records; Roden, 1999)
Vegetation composition: characteristic zonation	Occurrence	All characteristic zones should be present, correctly distributed and in good condition	Further work is necessary to describe the characteristic zonation and other spatial patterns in lake habitat 3130 (see O Connor, 2015). Lake-specific information on vegetation zonation may be available from Roden (1999) or other sources
Vegetation distribution: maximum depth	Metres	Maintain maximum depth of vegetation, subject to natural processes	The maximum depth of vegetation is likely to be specific to the lake shoreline in question. An indicative target has not yet been set for this lake habitat type
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 3130 is associated with a range of substrate types that are more productive/base-rich relative to the substratum of lake habitat 3110. Substratum particle size is likely to vary with depth and along the shoreline within a single lake. Roden (1999) noted both Shannagh and Kinny Loughs have a sand shelf at the northern end, with rocky shores elsewhere
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. A specific target has yet to be established for this Annex I lake habitat. Habitat 3130 is associated with clear water, as evidenced by the growth of the character species <i>Najas flexilis</i> at depths of up to 10m. 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. There is likely to be some variation across lakes with habitat 3130 in Secchi depth and site-specific conditions should also be considered
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	Lake habitat 3130 is associated with high water quality, with naturally low dissolved nutrients. It is naturally more productive than lake habitat 3110, probably reflecting higher concentrations of nutrients such as calcium, rather than P alone. Lake habitat 3130 may reach favourable condition slightly above the oligotrophic boundary for nutrients, but in the absence of habitat-specific targets, the targets are Water Framework Directive (WFD) 'High Status' or oligotrophic (OECD, 1982). The "good-moderate" boundary is too enriched to support the habitat. Annual average TP concentration should be $\leq 10\mu\text{g/l}$ TP, average annual total ammonia should be $\leq 0.040\text{mg/l N}$ and annual 95th percentile for total ammonia should be $\leq 0.090\text{mg/l N}$. Where nutrient concentrations are lower, there should be no upward trend in nutrient concentrations. See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009
Water quality: phytoplankton biomass	$\mu\text{g/l Chlorophyll } a$	Maintain appropriate water quality to support the habitat, including high chlorophyll <i>a</i> status	Lake habitat 3130 is associated with high water quality, and naturally low algal growth. As for nutrients, the targets are WFD 'High Status' or oligotrophic (OECD, 1982). The "good-moderate" boundary is too enriched to support the habitat. The average growing season (March-October) chlorophyll <i>a</i> concentration must be $< 5.8\mu\text{g/l}$. The annual average chlorophyll <i>a</i> should be $< 2.5\mu\text{g/l}$ and the annual peak chlorophyll <i>a</i> should be $< 8.0\mu\text{g/l}$. 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. See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009
Water quality: phytoplankton composition	EPA phytoplankton composition metric	Maintain appropriate water quality to support the habitat, including high phytoplankton composition status	The EPA has developed a phytoplankton composition metric for nutrient enrichment of Irish lakes. As for other water quality indicators, habitat 3130 is considered to require WFD high status

Water quality: attached algal biomass	Algal cover and EPA phytobenthos metric	Maintain trace/absent attached algal biomass (<5% cover) and high phytobenthos status	Nutrient enrichment can favour epiphytic and epipellic algae that can out-compete the submerged vegetation. The cover abundance of attached algae in lake habitat 3130 should, therefore, be trace/absent (<5% cover). EPA phytobenthos can be used as an indicator of changes in attached algal biomass. As for other water quality indicators, habitat 3130 requires high phytobenthos status
Water quality: macrophyte status	EPA macrophyte metric (The Free Index)	Maintain high macrophyte status	Nutrient enrichment can favour more competitive submerged macrophyte species that out-compete the typical and characteristic species for lake habitat 3130. The EPA monitors macrophyte status for WFD purposes using the 'Free Index'. The target for habitat 3130 is high status or an Ecological Quality Ratio (EQR) for lake macrophytes of ≥ 0.90 , as defined in Schedule Five of the European Communities Environmental Objectives (Surface Waters) Regulations 2009
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 habitat 3130. Acidification reduces the abundance and reproductive capacity of <i>Najas flexilis</i> (Wingfield et al., 2004). The specific requirements of habitat 3130, in terms of water and sediment pH, alkalinity and cation concentration, have not been determined. In line with targets for <i>Najas flexilis</i> , median pH values should be greater than 7 pH units. Water and sediment alkalinity and concentrations of cations (notably calcium) should be appropriate to the habitat. The target for WFD Acidification/Alkalisiation status is high. Maximum pH should be <9.0 pH units, in line with the surface water standards. See The European Communities Environmental Objectives (Surface Waters) Regulations 2009
Water colour	mg/l PtCo	Maintain appropriate water colour to support the habitat	Increased water colour and turbidity decrease light penetration and can reduce the area of available habitat for lake macrophytes, particularly at the lower euphotic depths. The primary source of increased water colour in Ireland is disturbance to peatland. No habitat-specific or national standards for water colour currently exist. Studies have shown median colour concentrations in Irish lakes of 38mg/l PtCo (Free et al., 2000) and 33mg/l PtCo (Free et al., 2006). It is likely that the water colour in all Irish lake habitats would naturally be <50mg/l PtCo. Water colour is generally <30mg/l PtCo or, more naturally, <20mg/l PtCo in lakes with habitat 3130, where the peatland in the lake's catchment is intact
Dissolved organic carbon (DOC)	mg/l	Maintain appropriate organic carbon levels to support the habitat	Dissolved (and particulate) organic carbon (OC) in the water column is linked to water colour and acidification (organic acids). Increasing DOC in water has been documented across the Northern Hemisphere, including afforested peatland catchments in Ireland. Damage and degradation of peatland, leading to decomposition of peat is likely to be the predominant source of OC in Ireland. OC in water promotes decomposition by fungi and bacteria that, in turn, releases dissolved nutrients. The increased biomass of decomposers can also impact directly on the characteristic lake communities through shading, competition, etc.

Turbidity	Nephelometric turbidity units/ mg/l SS/ other appropriate unit	Maintain appropriate turbidity to support the habitat	Turbidity can significantly affect the quantity and quality of light reaching rooted and attached vegetation and can, therefore, impact on lake habitats. The settlement of higher loads of inorganic or organic material on lake vegetation communities may also have impacts on sensitive, delicate species. Turbidity can increase as a result of re-suspension of material within the lake, higher loads entering the lake, or eutrophication. Turbidity measurement and interpretation is challenging. As a result, it is likely to be difficult to set habitat-specific targets for turbidity in lakes
Fringing habitat: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the natural structure and functioning of habitat 3130	Most lake shorelines have fringing habitats of reedswamp, other swamp, fen, marsh or wet-woodland that intergrade with and support the structure and functions of the lake habitat. Equally, fringing habitats are dependent on the lake, particularly its water levels, and support wetland communities and species of conservation concern. Many of the fringing wetland habitats support higher invertebrate and plant species richness than the lake habitats themselves. In this SAC, lake shorelines may have marsh/swamp communities and are fringed by dune habitats and heath

Conservation Objectives for : Ballyhoorisky Point to Fanad Head SAC [001975]

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

To maintain the favourable conservation condition of Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. in Ballyhoorisky Point to Fanad Head SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	The SAC is located at the interface between outcropping granite and quartzite bedrock and calcareous, wind-blown sand, hence a mixture of habitats 3130 and 3140 occurs in the lakes. The hard water lake habitat (3140) is found in Magheradrumman Lough (Roden, 1999). Elements of the habitat may also occur in other lakes (see map 5). 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. See map 5	As noted above, habitat 3140 occurs in Magheradrumman Lough and possibly also in other lakes in the SAC. Magheradrumman Lough is a small lake with the coastal, machair form of lake habitat 3140, a well-developed sandy shelf and a range of plant communities typical of calcareous water (Roden, 1999). The machair form is generally shallower, has cloudier water and is probably naturally more productive than typical hard water forms. It is likely that the machair form of habitat 3140 intergrades with or is related to lake habitats 3150 and 3130. More research is needed to characterise coastal lakes and the inter-relationships of lake habitats 3130, 3140 and 3150
Vegetation composition: typical species	Occurrence	Typical species present, in good condition, and demonstrating typical abundances and distribution	For lists of typical species (cyanobacteria, algae, higher plants and water beetles), see Article 17 habitat assessment for lake habitat 3140 (NPWS, 2013) and the lake habitats supporting document (O Connor, 2015). The machair form of the hard water lake habitat (3140) differs from more typical forms by having characteristic plants such as <i>Ranunculus baudotii</i> and <i>Potamogeton pectinatus</i> . N.F. Stewart visited Magheradrumman Lough in August 1989 and again, with C.D. Preston, in June 1990 and recorded <i>Chara ?aspera</i> , <i>C. contraria</i> , <i>C. curta</i> , <i>C. rudis</i> and <i>Tolypella glomerata</i> , <i>Potamogeton crispus</i> , <i>P. filiformis</i> , <i>P. pectinatus</i> and <i>P. pusillus</i> (charophytes and pondweeds only listed). Roden (1999) also found a diverse charophyte flora in Magheradrumman Lough, including <i>Chara aspera</i> , <i>C. curta</i> , <i>C. globularis</i> and <i>Nitella flexilis</i>
Vegetation composition: characteristic zonation	Occurrence	All characteristic zones should be present, correctly distributed and in good condition	The characteristic zonation of lake habitat 3140 has been described (Roden and Murphy, 2013; in prep.). The zonation in machair forms of habitat 3140 differs from that of the clearer water forms (Roden and Murphy, in prep.)

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, but is typically expected to be deep in clear, hard water lakes. An indicative target of >6 m has been developed for hard water lakes (3140), but this may need to be modified based on the habitat sub-type/form and/or the specific lake in question (see Roden and Murphy, 2013; in prep.). Colonisation tends to be shallower in the machair form of hard water lakes, owing to cloudier water and shallower lake depth (Roden and Murphy, in prep.). Extremely clear marl lakes can have charophyte vegetation to far greater depths, such as Lough Rea (charophytes to 10-11m), or Coolorta (>9m) (Roden and Murphy, in prep.). In this SAC, vegetation was found to depths of at least 6m in Magheradrumman Lough (Roden, 1999)
Hydrological regime: water level fluctuations	Metres	Maintain appropriate natural hydrological regime necessary to support the habitat	The hydrological regime of lakes with habitat 3140 is driven by groundwater flows. Groundwater can discharge directly to the lake, via springs or seepages, or to in-flowing rivers. For machair forms, the hydrological regime is that of the surrounding sand plain. 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, particularly the groundwater contribution, 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	The hard water lake habitat is associated with a range of base-rich substratum types, from marl and limestone bedrock, through rocks, cobbles, gravel, muds and even peat. Further research into substratum quality (notably calcium, iron and nutrient concentrations) in the hard water lake habitat would be beneficial. Magheradrumman Lough has a sand shelf along the northern shoreline, elsewhere sand with some stones, no rock outcrops and a sandy lake bed embedded with shells (Roden, 1999)
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. A target has been set for hard water lakes (3140) of >6m (Roden and Murphy, in prep.). The OECD fixed boundary system set transparency targets for oligotrophic lakes of ≥ 6 m annual mean Secchi disk depth and ≥ 3 m annual minimum Secchi disk depth. Hard water lakes typically have high transparency, particularly in the very clear and typical marl forms; however, transparency may be relatively lower in the machair form (Roden and Murphy, in prep.)

Water quality: nutrients	µg/l P; mg/l N	Maintain the concentration of nutrients in the water column at sufficiently low levels to support the habitat and its typical species	Habitat 3140 is typically associated with high water quality, as demonstrated by naturally low dissolved nutrients. Some forms appear to be naturally more productive than others however. In particular, the machair form may be naturally more nutrient-rich. The default target is Water Framework Directive (WFD) High Status or oligotrophic (OECD, 1982). Annual average TP concentration should be ≤10µg/l TP, average annual total ammonia concentration should be ≤0.04mg/l N and annual 95th percentile for total ammonia should be ≤0.09mg/l N. For machair sites, where study demonstrates it can maintain favourable condition for the long-term, a target of 'good' status or mesotrophic can be applied: annual average TP≤ 20µg/l TP and total ammonia ≤0.065mg/l N, total ammonia 95th percentile ≤0.14mg/l N. Where nutrient concentrations are lower than the targets, there should be no upward trend in concentrations. See The European Communities Environmental Objectives (Surface Waters) Regulations 2009
Water quality: phytoplankton biomass	µg/l Chlorophyll <i>a</i>	Maintain appropriate water quality to support the habitat, including high chlorophyll <i>a</i> status	Habitat 3140 is associated with high water quality, as demonstrated by naturally low algal growth. As for nutrients, the default target is WFD High Status or oligotrophic (OECD, 1982). Average growing season (March-October) chlorophyll <i>a</i> concentration must be <5.8µg/l. Annual average chlorophyll <i>a</i> concentration should be <2.5µg/l and the annual peak should be <8.0µg/l. For machair sites, where study demonstrates it can maintain favourable condition for the long-term, a target of 'good' status or mesotrophic can be applied: average growing season chlorophyll <i>a</i> <10µg/l; annual average <8.0µg/l; annual peak <25µg/l. Where chlorophyll <i>a</i> concentrations are lower than the targets, there should be no upward trend in phytoplankton biomass. See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009
Water quality: phytoplankton composition	EPA phytoplankton composition metric	Maintain appropriate water quality to support the habitat, including high phytoplankton composition status	The EPA has developed a phytoplankton composition metric for nutrient enrichment of Irish lakes. As for other water quality indicators, the default target for habitat 3140 is WFD high status
Water quality: attached algal biomass	Algal cover and EPA phytobenthos metric	Maintain trace/absent attached algal biomass (<5% cover) and high phytobenthos status	Nutrient enrichment can favour epiphytic and epipelagic algae that can out-compete the submerged vegetation. The cover abundance of attached algae in hard water lakes (3140) 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, the default target for habitat 3140 is high phytobenthos status
Water quality: macrophyte status	EPA macrophyte metric (The Free Index)	Maintain high macrophyte status	Nutrient enrichment can favour more competitive submerged macrophyte species that out-compete the typical and characteristic species for hard water lakes (3140). The EPA monitors macrophyte status for WFD purposes using the 'Free Index'. The target for lake habitat 3140 is high status or an Ecological Quality Ratio (EQR) for lake macrophytes of ≥0.90, as defined in Schedule Five of the European Communities Environmental Objectives (Surface Waters) Regulations 2009
Acidification status	pH units; mg/l	Maintain appropriate water and sediment pH, alkalinity and cation concentrations to support the habitat, subject to natural processes	The specific requirements of habitat 3140, in terms of water and sediment pH, alkalinity and cation concentration, have not been fully determined. Acidification is not considered a threat to habitat 3140, however eutrophication can lead to at least temporary increases in pH to toxic levels (>9/9.5 pH units). Maximum pH should be <9.0 pH units, in line with the surface water standards. See Schedule Five of the European Communities Environmental Objectives (Surface Waters) Regulations 2009

Water colour	mg/l PtCo	Maintain appropriate water colour to support the habitat	Increased colour decreases light penetration and reduces the area of macrophyte habitat, particularly at the lower euphotic depths. Higher colour also appears to favour angiosperms over charophytes in hard water lakes (Roden and Murphy, in prep.). The primary source of increased colour in Ireland is peatland disturbance. No habitat-specific or national standards for water colour 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). Habitat 3140 is typically associated with very clear waters and expected colour would be <10 or, more likely, <5 mg/l PtCo. Higher colour is found in some hard water lakes with significant areas of peatland in their catchment, but it is not clear whether this is natural or the result of peatland degradation
Dissolved organic carbon (DOC)	mg/l	Maintain appropriate organic carbon levels to support the habitat	Dissolved (and particulate) organic carbon (OC) in the water column is linked to water colour and acidification (organic acids). Increasing DOC in water has been documented across the Northern Hemisphere, including afforested peatland catchments in Ireland. Damage and degradation of peatland, leading to decomposition of peat is likely to be the predominant source of OC in Ireland. OC in water promotes decomposition by fungi and bacteria that, in turn, releases dissolved nutrients. The increased biomass of decomposers can also impact directly on the characteristic lake communities through shading, competition, etc.
Turbidity	Nephelometric turbidity units/ mg/l SS/ other appropriate unit	Maintain appropriate turbidity to support the habitat	Turbidity can significantly affect the quantity and quality of light reaching rooted and attached vegetation and can, therefore, impact on lake habitats. The settlement of higher loads of inorganic or organic material on lake vegetation communities may also have impacts on sensitive, delicate species. Turbidity can increase as a result of re-suspension of material within the lake, higher loads entering the lake, or eutrophication. Turbidity measurement and interpretation is challenging. As a result, it is likely to be difficult to set habitat-specific targets for turbidity in lakes
Fringing habitat: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the natural structure and functioning of habitat 3140	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. Equally, fringing habitats are dependent on the lake, particularly its water levels, and support wetland communities and species of conservation concern. Many of the fringing wetland habitats support higher invertebrate and plant species richness than the lake habitats themselves. Fringing fen habitats can be particularly important around hard water lakes, notably the Annex I habitats alkaline and <i>Cladium</i> fen, and petrifying springs (habitat codes 7230, 7210 and 7220). In this SAC, lake shorelines may have marsh/swamp communities and are fringed by dune habitats and heath

Conservation Objectives for : Ballyhoorisky Point to Fanad Head SAC [001975]

1014 Narrow-mouthed Whorl Snail *Vertigo angustior*

To maintain the favourable conservation condition of Narrow-mouthed Whorl Snail in Ballyhoorisky Point to Fanad Head SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: occupied sites	Number	No decline. There is one known site for this species in the SAC, within three 1km squares - C1744, C1844 and C1944. See map 6	The <i>Vertigo angustior</i> population in Ballyhoorisky Point to Fanad Head SAC is found on the dunes in Kinlackagh Bay (Moorkens, 2007; Moorkens and Killeen, 2011) which should be considered as a single site (site number VaCAM6 in Moorkens and Killeen, 2011). There have been records from three 1km grid squares (C1744, C1844, C1944)
Occurrence in suitable habitat	Percentage positive records in a representative number of samples	A minimum of 67% positive samples in optimal habitat areas; 20% in areas defined as sub-optimal	Target is based on Moorkens and Killeen (2011). Positive samples mean the confirmed presence of snails (either living or recently dead adults and/or juveniles). See the habitat extent attribute below for the definitions of optimal and sub-optimal habitat
Habitat quality: optimal soil wetness	Metres along monitoring transect	Soils, at time of sampling, are at optimal wetness for at least 35m along the established monitoring transect	Transect established as part of condition assessment monitoring by Moorkens and Killeen (2011). At least 35m of the established monitoring transect should be assessed as optimal wetness as defined in Moorkens and Killeen (2011)
Habitat extent	Hectares	Stable or increasing, subject to natural processes. No less than 16ha of at least sub-optimal habitat	The majority of suitable habitat is in dune grassland in C1844 and C1944. A minimum of 16ha should be at least sub-optimal (Moorkens and Killeen, 2011). Optimal habitat is defined as fixed dune species-rich grassland dominated by red fescue (<i>Festuca rubra</i>), with sparse marram (<i>Ammophila arenaria</i>), lady's bedstraw (<i>Galium verum</i>), mouse-ear-hawkweed (<i>Pilosella officinarum</i>), pyramidal orchid (<i>Anacamptis pyramidalis</i>), ribwort plantain (<i>Plantago lanceolata</i>) and other low growing herbs, and grassland with silverweed (<i>Potentilla anserina</i>) on flatter zones. Vegetation height is 10-30cm. The habitat is on damp, friable soil covered with a layer of humid, open structured thatch. Sub-optimal habitat is defined as fixed dunes with vegetation composition as per optimal habitat but either the vegetation height is less than 10cm or between 30cm and 50cm, or the soil is dry and sandy, or the thatch is wetter with a denser structure

Conservation Objectives for : Ballyhoorisky Point to Fanad Head SAC [001975]

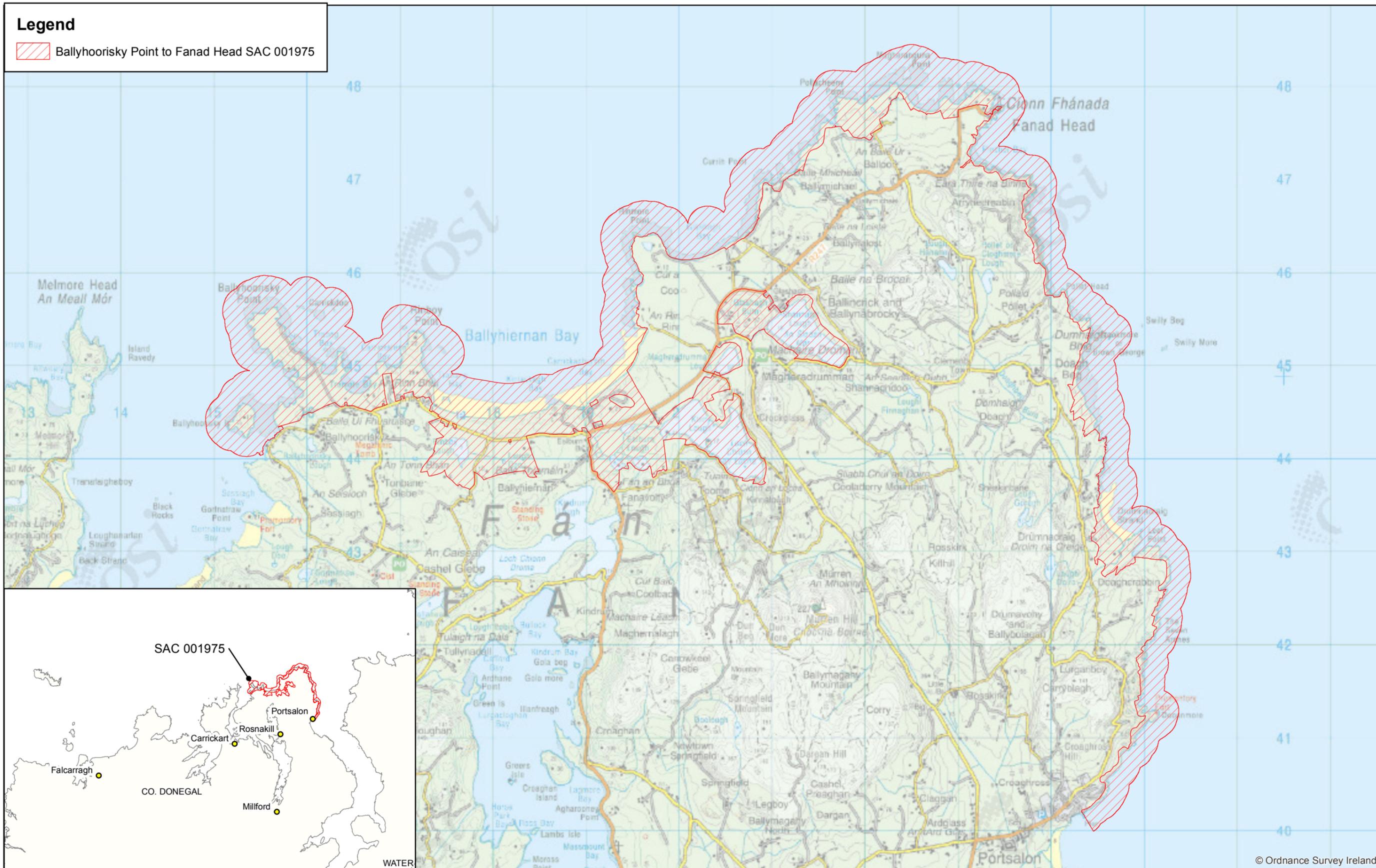
1833 *Slender Naiad Najas flexilis*

To maintain the favourable conservation condition of Slender Naiad in Ballyhoorisky Point to Fanad Head SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population extent	Hectares; distribution	No change to the spatial extent of <i>Najas flexilis</i> within Shannagh Lough, subject to natural processes. See map 7 for known locations	See the <i>Najas flexilis</i> supporting document for further details
Population depth	Metres	No change to the depth range of <i>Najas flexilis</i> within Shannagh Lough, subject to natural processes	See the <i>Najas flexilis</i> supporting document for further details
Population viability	Plant traits	No decline in plant fitness, subject to natural processes	See the <i>Najas flexilis</i> supporting document for further details
Population abundance	Square metres	No change to the cover abundance of <i>Najas flexilis</i> , subject to natural processes	See the <i>Najas flexilis</i> supporting document for further details
Species distribution	Occurrence	No decline, subject to natural processes	See the <i>Najas flexilis</i> supporting document for further details
Habitat extent	Hectares	No decline, subject to natural processes	See the <i>Najas flexilis</i> supporting document for further details
Hydrological regime: water level fluctuations	Metres	Maintain appropriate natural hydrological regime necessary to support the habitat for the species	See the <i>Najas flexilis</i> supporting document for further details
Lake substratum quality	Various	Maintain appropriate substratum type, extent and chemistry to support the population of the species	See the <i>Najas flexilis</i> supporting document for further details
Water quality	Various	Maintain appropriate water quality to support the population of the species	See the <i>Najas flexilis</i> supporting document for further details
Acidification status	pH units; mg/l	Maintain appropriate water and sediment pH, alkalinity and cation concentrations to support the population of <i>Najas flexilis</i> , subject to natural processes	See the <i>Najas flexilis</i> supporting document for further details
Water colour	mg/l PtCo	Maintain appropriate water colour to support the population of <i>Najas flexilis</i>	See the <i>Najas flexilis</i> supporting document for further details
Associated species	Species composition and abundance	Maintain appropriate associated species and vegetation communities to support the population of <i>Najas flexilis</i>	See the <i>Najas flexilis</i> supporting document for further details
Fringing habitat: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the population of <i>Najas flexilis</i>	See the <i>Najas flexilis</i> supporting document for further details

Legend

 Ballyhoorisky Point to Fanad Head SAC 001975



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

**MAP 1:
BALLYHOORISKY POINT TO FANAD HEAD SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION**

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

**SITE CODE:
SAC 001975; version 3.
CO. DONEGAL**



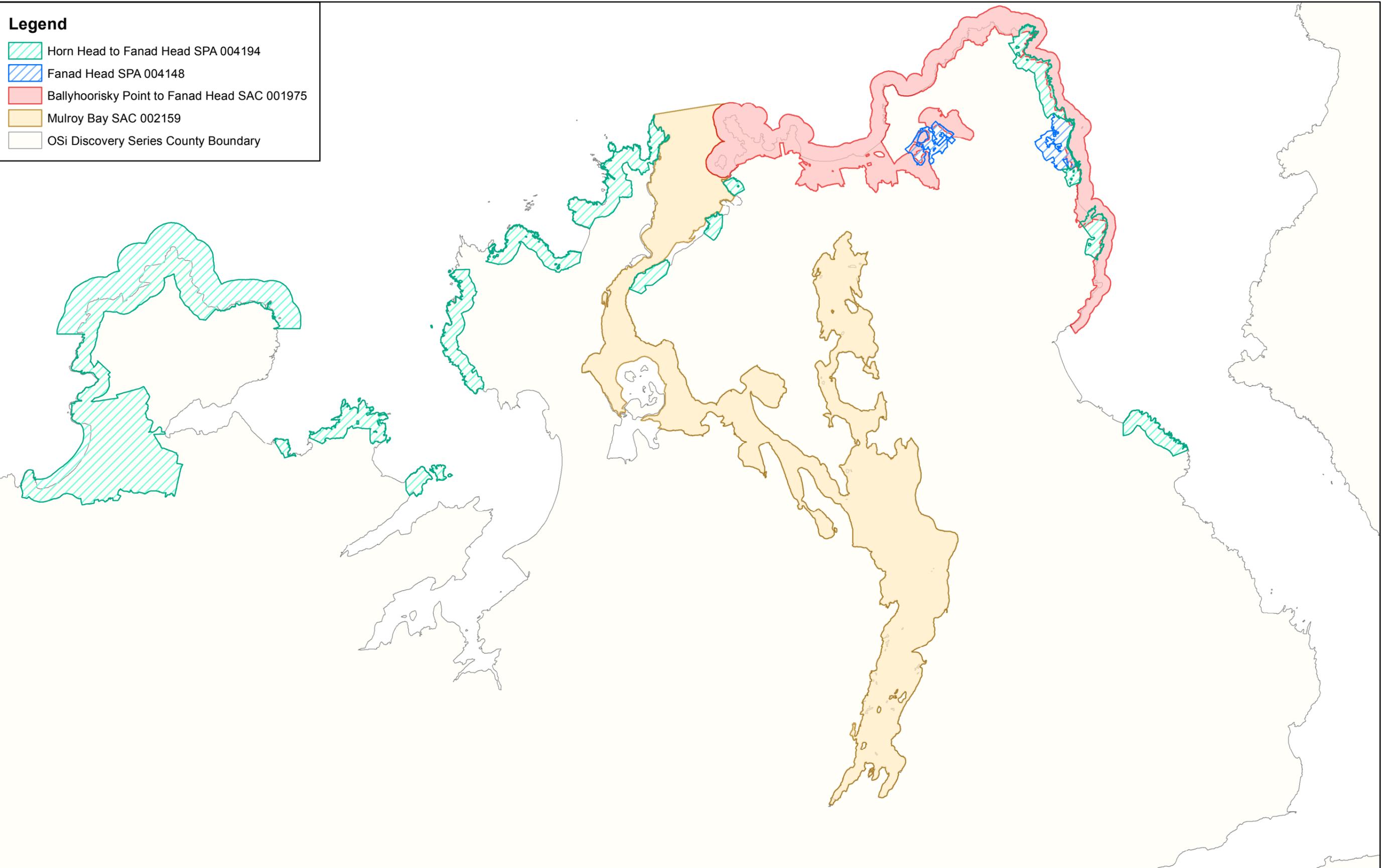
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**Map Version 1
Date: Nov 2016**

Legend

-  Horn Head to Fanad Head SPA 004194
-  Fanad Head SPA 004148
-  Ballyhoorisky Point to Fanad Head SAC 001975
-  Mulroy Bay SAC 002159
-  OSi Discovery Series County Boundary



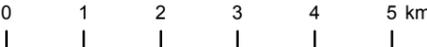

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Department of Arts, Heritage,
Regional, Rural and Gaeltacht Affairs

MAP 2:
BALLYHOORISKY POINT TO FANAD HEAD SAC
CONSERVATION OBJECTIVES
ADJACENT / ADJOINING AND
OVERLAPPING DESIGNATIONS

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

SITE CODE:
SAC 001975; version 3. SAC 002195; version 3.
SPA 004148; version 3. SPA 004194; version 3.
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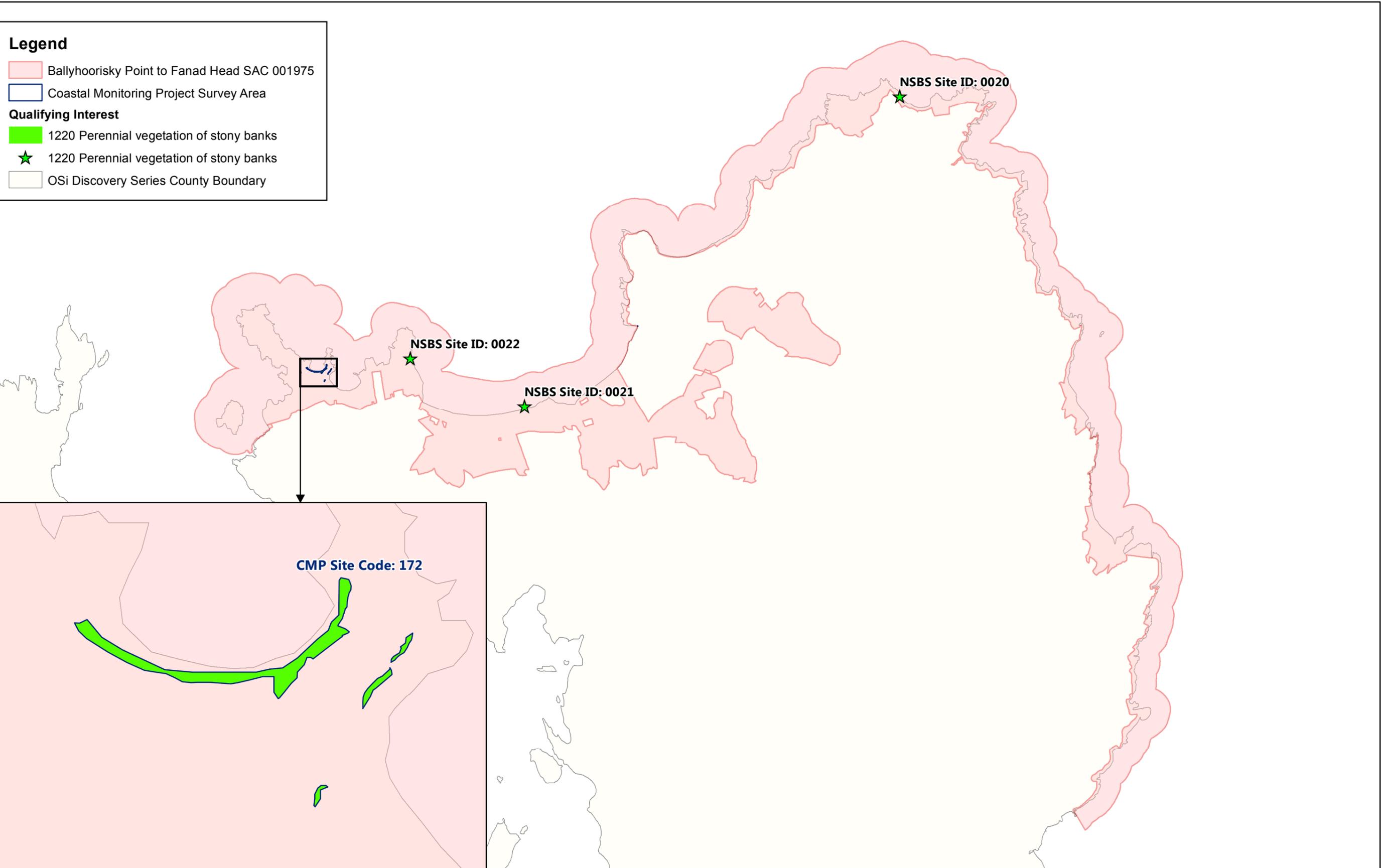
Map Version 1
Date: Nov 2016

Legend

- Ballyhoorisky Point to Fanad Head SAC 001975
- Coastal Monitoring Project Survey Area

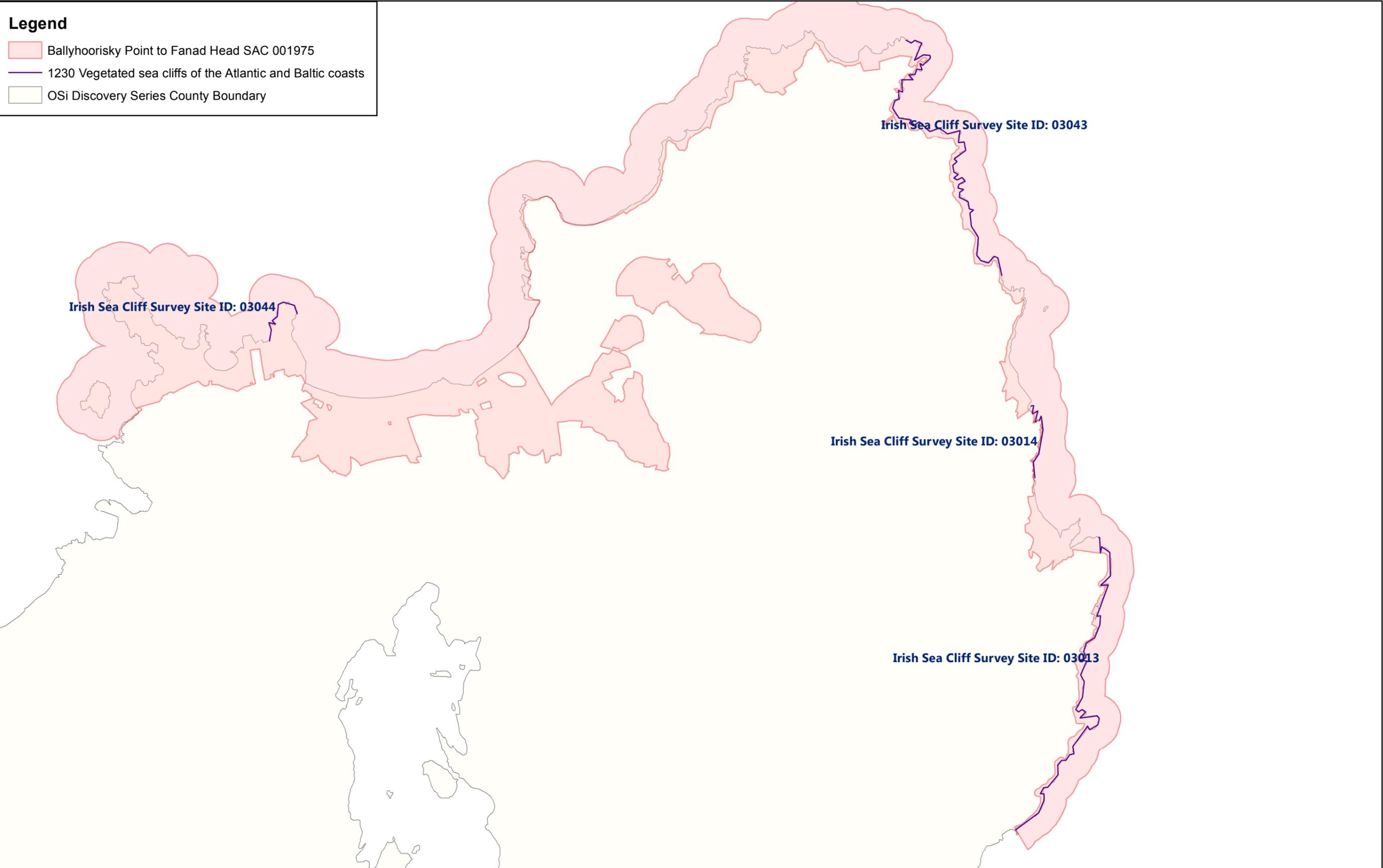
Qualifying Interest

- 1220 Perennial vegetation of stony banks
- 1220 Perennial vegetation of stony banks
- OSi Discovery Series County Boundary



Legend

- Ballyhoorisky Point to Fanad Head SAC 001975
- 1230 Vegetated sea cliffs of the Atlantic and Baltic coasts
- OSi Discovery Series County Boundary

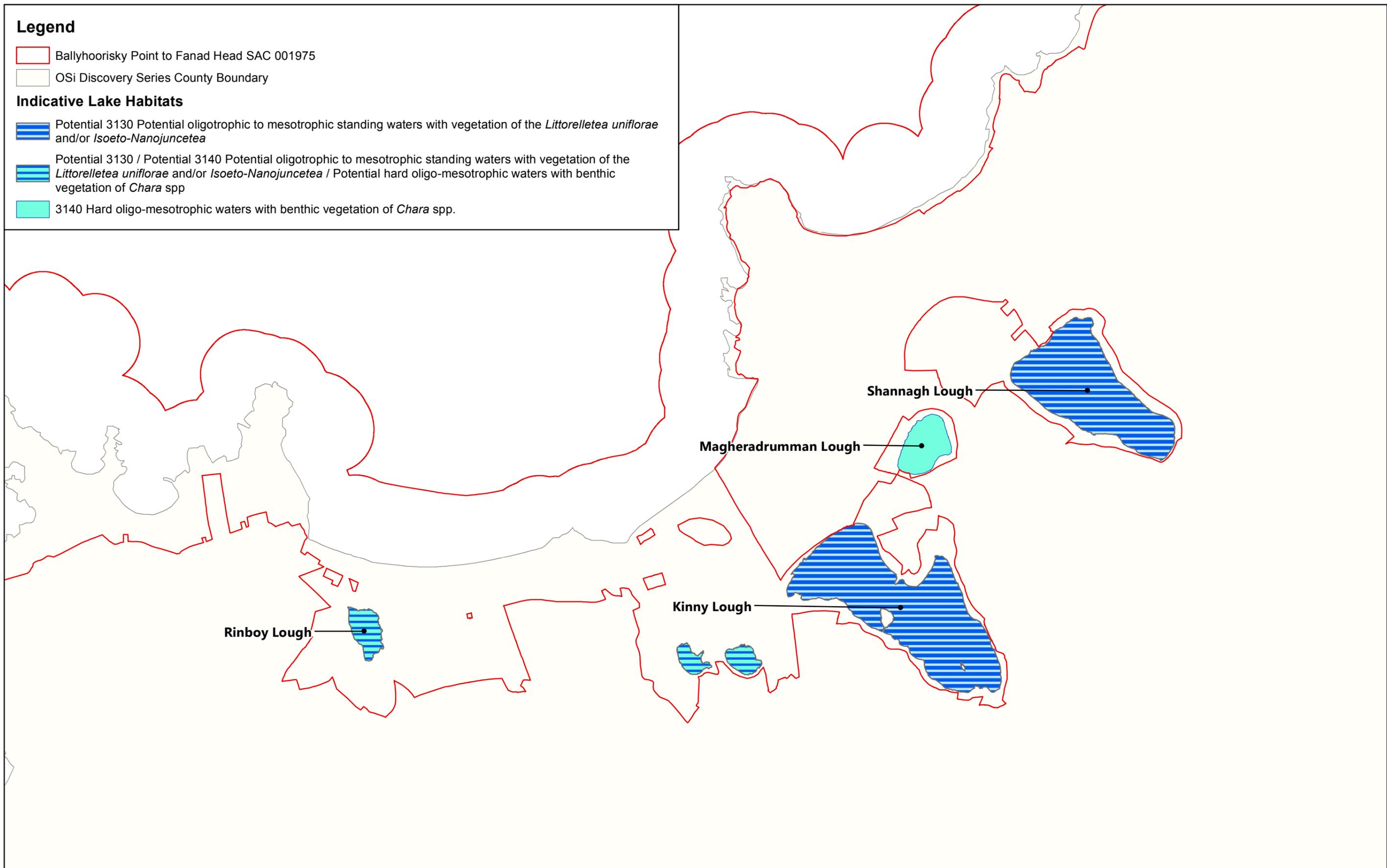


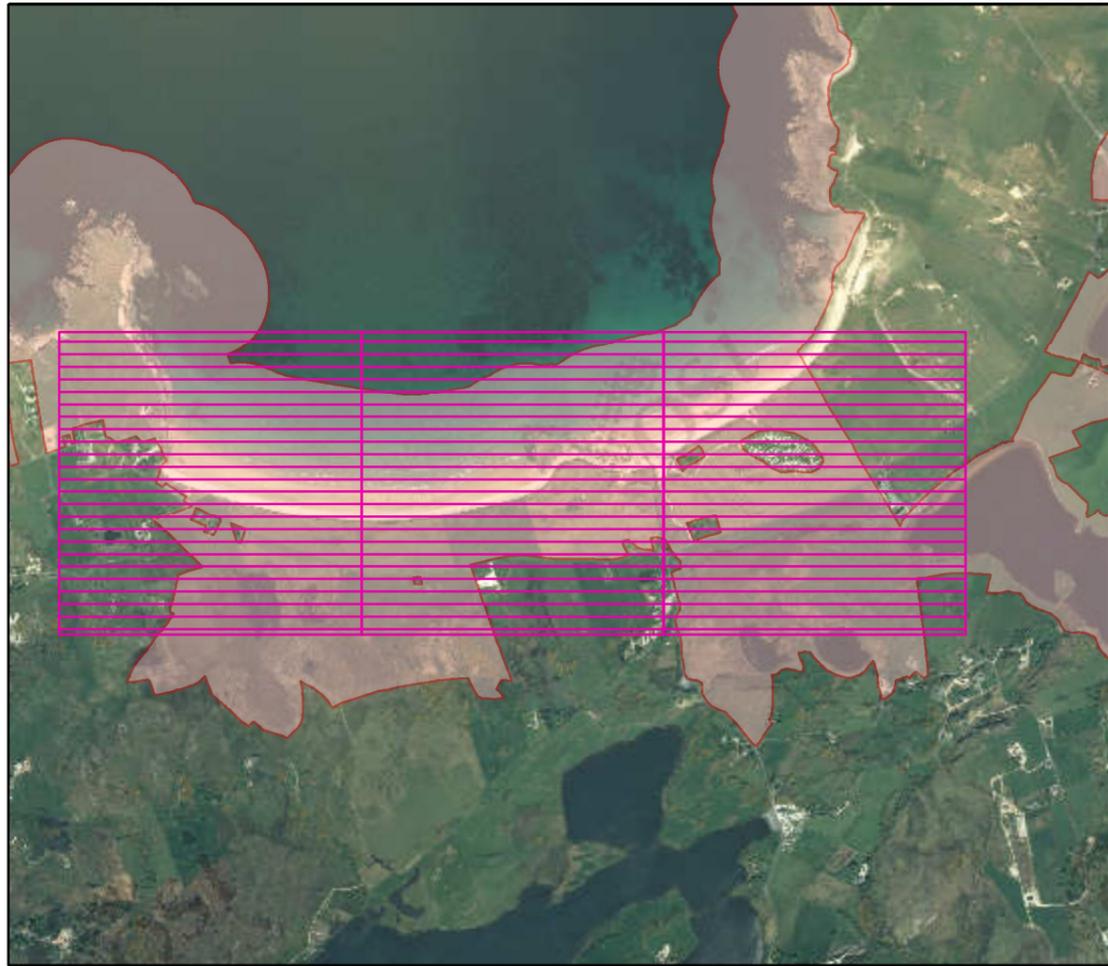
Legend

-  Ballyhoorisky Point to Fanad Head SAC 001975
-  OSi Discovery Series County Boundary

Indicative Lake Habitats

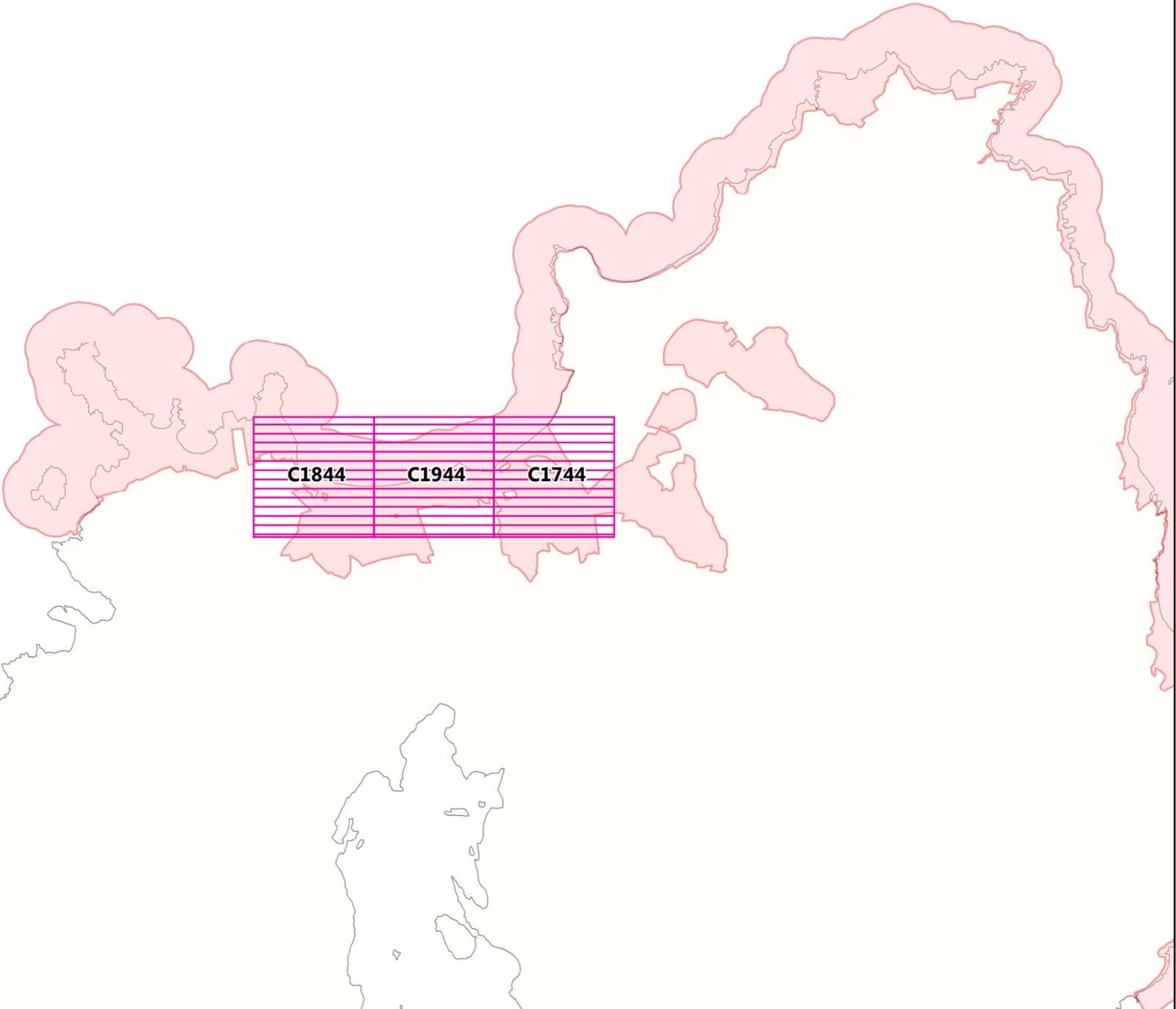
-  Potential 3130 Potential oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea*
-  Potential 3130 / Potential 3140 Potential oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea* / Potential hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp
-  3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.





Legend

- Ballyhoorisky Point to Fanad Head SAC 001975
- 1014 Narrow-mouthed Whorl Snail *Vertigo angustior*
- OSi Discovery Series County Boundary



Legend

- Ballyhoorisky Point to Fanad Head SAC 001975
- OSi Discovery Series County Boundary
- 1833 Slender Naiad - *Najas flexilis*

