

National Parks and Wildlife Service

Conservation Objectives Series

Unshin River SAC 001898



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

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Introduction

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

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

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

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

Favourable conservation status of a habitat is achieved when:

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

The favourable conservation status of a species is achieved when:

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

Notes/Guidelines:

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

Qualifying Interests

* indicates a priority habitat under the Habitats Directive

001898	Unshin River SAC
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1106	Salmon <i>Salmo salar</i>
1355	Otter <i>Lutra lutra</i>
3260	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion vegetation
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)
6410	<i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)
91E0	Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, Alnion incanae, Salicion albae)*

Please note that this SAC is adjacent to Ballysadare Bay SAC (000622), Union Wood SAC (000638), Lough Arrow SAC (001673) and Lough Arrow SPA (004050). See map 2. The conservation objectives for this site should be used in conjunction with those for the adjacent sites as appropriate.

Supporting documents, relevant reports & publications

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

NPWS Documents

Year :	1992
Title :	Owenmore River Catchment. Proposed Arterial Drainage Environmental Impact Assessment - Botanical and Ornithological Surveys
Author :	Goodwillie, R.N.; Buckley, P.; Douglas, C.
Series :	Unpublished report
Year :	1996
Title :	River Unshin – macrophyte community. Notes of records made during May 1996 RHS surveys
Author :	Holmes, N.T.H.
Series :	Unpublished report to NPWS
Year :	2006
Title :	Otter survey of Ireland 2004/2005
Author :	Bailey, M.; Rochford, J.
Series :	Irish Wildlife Manuals, No. 23
Year :	2007
Title :	Supporting documentation for the Habitats Directive Conservation Status Assessment - backing documents. Article 17 forms and supporting maps
Author :	NPWS
Series :	Unpublished report to NPWS
Year :	2008
Title :	National survey of native woodlands 2003-2008
Author :	Perrin, P.M.; Martin, J.; Barron, S.; O'Neill, F.H.; McNutt, K.E.; Delaney, A.
Series :	Unpublished report to NPWS
Year :	2010
Title :	A provisional inventory of ancient and long-established woodland in Ireland
Author :	Perrin, P.M.; Daly, O.H.
Series :	Irish Wildlife Manuals, No. 46
Year :	2013
Title :	National otter survey of Ireland 2010/12
Author :	Reid, N.; Hayden, B.; Lundy, M.G.; Pietravalle, S.; McDonald, R.A.; Montgomery, W.I.
Series :	Irish Wildlife Manuals, No. 76
Year :	2013
Title :	Irish semi-natural grasslands survey 2007-2012
Author :	O'Neill, F.H.; Martin, J.R.; Devaney, F.M.; Perrin, P.M.
Series :	Irish Wildlife Manuals, No. 78
Year :	2013
Title :	Results of a monitoring survey of old sessile oak woods and alluvial forests
Author :	O'Neill, F.H.; Barron, S.J.
Series :	Irish Wildlife Manuals, No. 71
Year :	2018
Title :	The monitoring and assessment of three EU Habitats Directive Annex I grassland habitats
Author :	Martin, J.R.; O'Neill, F.H.; Daly, O.H.
Series :	Irish Wildlife Manuals, No. 102

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

Year : in prep.
Title : Floodplain and callows grasslands in Ireland
Author : Martin, J.R.; O'Neill, F.H.; Daly, O.H.
Series : Irish Wildlife Manuals

Other References

Year : 1982
Title : Otter survey of Ireland
Author : Chapman, P.J.; Chapman, L.L.
Series : Unpublished report to Vincent Wildlife Trust

Year : 1991
Title : The spatial organization of otters (*Lutra lutra*) in Shetland
Author : Kruuk, H.; Moorhouse, A.
Series : Journal of Zoology, 224: 41-57

Year : 1993
Title : Notes on the flora of the Owenmore Catchment Cos Sligo (H28) and East Mayo (H26)
Author : Douglas, C.; Goodwillie, R.; Mooney, E.
Series : Irish Naturalists' Journal, 24(5): 218-220

Year : 2000
Title : A guide to habitats in Ireland
Author : Fossitt, J.A.
Series : The Heritage Council, Kilkenny

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

Year : 2003
Title : Ecology of watercourses characterised by Ranunculion fluitantis and Callitriche-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 : 2010
Title : Otter tracking study of Roaringwater Bay
Author : De Jongh, A.; O'Neill, L.
Series : Unpublished draft report to NPWS

Year :	2010
Title :	Water Quality in Ireland 2007-2009
Author :	McGarrigle, M.; Lucey, J.; Ó Cinnéide, M.
Series :	Environmental Protection Agency, Wexford
Year :	2013
Title :	Management strategies for the protection of high status water bodies
Author :	Ní Chatháin, B.; Moorkens, E.; Irvine, K.
Series :	Strive Report Series No. 99. EPA, Wexford
Year :	2013
Title :	Interpretation manual of European Union habitats- Eur 28
Author :	European Commission- DG Environment
Series :	European Commission
Year :	2015
Title :	Water Quality in Ireland 2010-2012
Author :	Bradley, C.; Byrne, C.; Craig, M.; Free, G.; Gallagher, T.; Kennedy, B.; Little, R.; Lucey, J.; Mannix, A.; McCreesh, P.; McDermott, G.; McGarrigle, M.; Ní Longphuirt, S.; O'Boyle, S.; Plant, C.; Tierney, D.; Trodd, W.; Webster, P.; Wilkes, R.; Wynne, C.
Series :	Environmental Protection Agency, Wexford
Year :	2016
Title :	A narrative for conserving freshwater and wetland habitats in England
Author :	Mainstone, C.; Hall, R.; Diack, I.
Series :	Natural England Research Reports Number 064
Year :	2016
Title :	Irish Vegetation Classification: Technical Progress Report No. 2
Author :	Perrin, P.
Series :	Report submitted to National Biodiversity Data Centre
Year :	2017
Title :	Water Quality in Ireland 2010-2015
Author :	Fanning, A.; Craig, M.; Webster, P.; Bradley, C.; Tierney, D.; Wilkes, R.; Mannix, A.; Treacy, P.; Kelly, F.; Geoghegan, R.; Kent, T.; Mageean, M.
Series :	Environmental Protection Agency, Wexford
Year :	2019
Title :	Water Quality in Ireland 2013-2018
Author :	O'Boyle, S.; Trodd, W.; Bradley, C.; Tierney, D.; Wilkes, R.; Ní Longphuirt, S.; Smith, J.; Stephens, A.; Barry, J.; Maher, P.; McGinn, R.; Mockler, E.; Deakin, J.; Craig, M.; Gurrie, M.
Series :	Environmental Protection Agency, Wexford
Year :	2021
Title :	The Status of Irish Salmon Stocks in 2020 with Catch Advice for 2021
Author :	Gargan, P.; Fitzgerald, C.; Kennedy, R.; Maxwell, H.; McLean, S.; Millane, M.
Series :	Report of the Technical Expert Group on Salmon (TEGOS) to the North-South Standing Scientific Committee for Inland Fisheries

Spatial data sources

Year :	2018
Title :	Grasslands Monitoring Survey 2015-2017
GIS Operations :	Dataset clipped to the SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	6210, 6410 (map 3)
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Year :	2021
Title :	Floodplain and Callows Grasslands in Ireland
GIS Operations :	Dataset clipped to the SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	6410 (map 3)
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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 :	91E0 (map 4)
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Year :	2018
Title :	Woodland Monitoring Survey 2017-2018
GIS Operations :	QIs selected; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	91E0 (map 4)
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Conservation Objectives for : Unshin River SAC [001898]

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

To maintain the favourable conservation condition of Water courses of plain to montane levels with the *Ranunculus fluitantis* and *Callitriche-Batrachion* vegetation in Unshin River SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Kilometres	Area stable or increasing, subject to natural processes	Conservation objectives concentrate on the high conservation value sub-types of the habitat. Selection of the SAC was based on the vegetation communities of the Unshin River, which were described by Goodwillie et al. (1992) as of international importance, the Unshin being one of the few undrained limestone rivers in Ireland, and by Holmes (1996) as the 'best reach of a river for macrophytes ever experienced' having an 'unquestionably unique' combination of species. The SAC also includes much of the Owenbeg/Owenboy River and lower Owenmore. Goodwillie et al. (1992) described the site in detail. The Unshin flows out of Lough Arrow SAC, and Templehouse and Cloonacleigha Loughs SAC is upstream of the Owenboy on the Owenmore
Habitat distribution	Occurrence	No decline, subject to natural processes	As noted above, the habitat is distributed throughout the alkaline Unshin River, which has many slow-flowing, deep and meandering stretches and some faster-flows, including low-falls/cascades (Goodwillie et al., 1992; Douglas et al., 1993; Holmes, 1996). The Owenbeg/Owenboy is also in the SAC and is a more base-poor mountain river subject to spates (Goodwillie et al., 1992). The Owenbeg joins the Owenmore above Collooney and the Unshin joins below Collooney. Further study of Irish rivers is needed to interpret the broad description of habitat 3260 which covers from upland bryophyte/macroalgal dominated to lowland depositing rivers with pondweeds and starworts (European Commission, 2013)
Hydrological regime: river flow	Metres per second	Maintain appropriate hydrological regimes	The Unshin flows from spring-fed Lough Arrow, and Holmes (1996) considered that the lake has a stabilising influence on the river's flow regime, as does the significant base-rich groundwater input. Goodwillie et al. (1992) described the broad flow regime of the Unshin as slow-moving over much of its length, but with two steeper stretches with falls/cascades. Deep, ponded sections occur in peat, meandering stretches through alluvium and some faster stony reaches. By contrast, the Owenbeg rises in the Ox Mountains and is a spatey river. A series of waterfalls occurs near Collooney below the confluence of the Owenmore and Owenbeg/boy Rivers. 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)

Hydrological regime: groundwater discharge	Metres per second	Maintain appropriate hydrological regime	Carboniferous limestone and calcareous shale dominate the catchments and, as a result, groundwater makes a significant contribution to the rivers in the SAC, particularly the Unshin. As noted above, Holmes (1996) highlighted the stabilising effect of the significant base-rich groundwater input on the flow-regime of the Unshin, as well as its critical influence on the river's macrophytes. It is essential that the appropriate groundwater contributions necessary for the natural functioning of the habitat be maintained and that there is no significant disturbance of the catchments' groundwater regimes
Substratum composition: particle size range	Millimetres	Maintain appropriate substratum particle size range, quantity and quality, subject to natural processes	Goodwillie et al. (1992) described the Unshin, Owenbeg and Owenmore rivers. Fine particles dominate the slow-flowing Unshin, which also has stony stretches and bedrock cascades; peat occurs in the upper reaches. The Owenbeg has a gravel bed and peat is a significant feature of its valley. The Owenmore is flat, slow-moving, partly channelised and dominated by fine sediments. Although many high conservation value sub-types are dominated by coarse substrata and bedrock, certain sub-types, notably those associated with lake inflows/outflows, peatlands and groundwater inputs, such as those in this SAC, are dominated by fine substrata. The size and distribution of particles is largely determined by the river flow and geology. The chemical composition (particularly minerals and nutrients) of the substratum is also important. The quality of finer sediment particles is a notable driver of rooted plant communities
Water quality	Various	Maintain/restore appropriate water quality to support the natural structure and functioning of the habitat	Goodwillie et al. (1992) stated that the Unshin becomes more nutrient-rich as it approaches Collooney. Holmes (1996) also found, based on macrophyte trophic indicators, that the Unshin becomes more enriched as one moves downstream, and noted a significant deterioration below Newtown. By contrast, EPA Q values have generally improved in a downstream direction from Q3-4 or Q4 at Bellarush Bridge below Lough Arrow to Q4-5 at Ballygrania Bridge and, under the Water Framework Directive, a High Status objective applies to the lower Unshin. See also The European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2019, EPA river water quality reports (e.g. McGarrigle et al., 2010; Bradley et al., 2015; Fanning et al., 2017; O'Boyle et al., 2019) and Ní Chatháin et al. (2013)
Typical species	Occurrence	Typical species of the relevant habitat sub-type should be present and in good condition	Typical species have not been fully defined but may include higher plants, bryophytes, algae and invertebrates. Goodwillie et al. (1992), Douglas et al. (1993) and Holmes (1996) recorded macrophytes in the Unshin. All highlighted the exceptionally high species-richness and importance of the community. Holmes (1996) hadn't encountered such rich and unusual combinations of river plants (e.g. <i>Apium inundatum</i> , <i>Littorella uniflora</i> , <i>Oenanthe fluviatilis</i> , <i>Potamogeton praelongus</i>) on the British Isles or Europe and the Unshin had >30% more species than rivers of similar type in GB and Ireland; other species recorded include <i>Cinclidotus sp.</i> , <i>Hygroamblystegium fluviatile</i> , <i>Pellia endiviifolia</i> , <i>Callitriche obtusangula</i> , <i>C. stagnalis</i> , <i>Hippuris vulgaris</i> , <i>Lemna minor</i> , <i>L. trisulca</i> , <i>Menyanthes trifoliata</i> , <i>Myriophyllum spicatum</i> , <i>Nuphar lutea</i> , <i>Potamogeton crispus</i> , <i>P. natans</i> , <i>P. pectinatus</i> , <i>P. praelongus</i> , <i>Ranunculus penicillatus</i> subsp. <i>penicillatus</i> , <i>Sparganium emersum</i> , <i>S. erectum</i>

Floodplain connectivity: area	Hectares	Maintain/restore the area of active floodplain at and upstream of the habitat	Holmes (1996) also recorded emergent and marginal species in the Unshin including <i>Berula erecta</i> , <i>Caltha palustris</i> , <i>Carex paniculata</i> , <i>Cicuta virosa</i> , <i>Comarum palustre</i> , <i>Geum rivale</i> , <i>Glyceria fluitans</i> , <i>Lysimachia vulgaris</i> , <i>Pedicularis palustris</i> , <i>Phalaris arundinacea</i> , <i>Phragmites australis</i> , <i>Ranunculus circinatus</i> , <i>R. flammula</i> , <i>R. lingua</i> , <i>Schoenoplectus lacustris</i> , <i>Typha latifolia</i> , <i>Veronica anagallis-aquatica</i> . River connectivity with the floodplain is important for the functioning of this habitat. Channels with a naturally functioning floodplain are better able to maintain habitat and water quality (Hatton-Ellis and Grieve, 2003). Floodplain connectivity is particularly important in terms of sediment sorting and nutrient deposition. High conservation value rivers are intimately connected to floodplain habitats and function as important wildlife corridors connecting otherwise isolated or fragmented habitats in the wider countryside (Hatton-Ellis and Grieve, 2003; Mainstone et al., 2016)
Riparian habitat: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the habitat and its sub-types	A number of areas of wet alluvial woodlands occur along the Unshin (see 91E0 objective in this volume). See Goodwillie et al. (1992) and Douglas et al. (1993) for information on the fringing habitats along the Unshin and Owenbeg/Owenboy Rivers, which included willow woodland, peatland, tall herb and reedgrass and reedswamp. Some of the riparian species recorded by Holmes (1996) are listed above. Riparian habitats are integral to the structure and functioning of rivers, even where not part of a floodplain. Fringing habitats contribute to the aquatic food web, provide habitat for 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 suppress algal growth and moderate temperatures. Equally, fringing habitats are dependent on rivers, particularly their water levels, and support wetland communities and species of conservation concern. See Mainstone et al. (2016)

Conservation Objectives for : Unshin River SAC [001898]

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

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

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Some areas supporting species-rich calcareous grassland were surveyed as part of the Irish Semi-natural Grassland Survey (ISGS; O'Neill et al., 2013) and the Grasslands Monitoring Survey (GMS; Martin et al., 2018) within the sub-site Cloonmacduff (site code 1541), located just east of Collooney. An area of 1.9ha of the habitat was mapped by the GMS (Martin et al., 2018). See map 3. It is important to note that further unsurveyed areas may be present within this large SAC
Habitat distribution	Occurrence	No decline, subject to natural processes	Distribution based on the GMS (Martin et al., 2018). See map 3. The main areas of this habitat at the Cloonmacduff sub-site (code 1541) appear to be along the slopes of the hillocks which pepper the site. Note that further unsurveyed areas of the habitat may be present within this large SAC
Vegetation composition: positive indicator species	Number at a representative number of 2m x 2m monitoring stops; within 20m surrounding area of monitoring stops	At least 7 positive indicator species present in monitoring stop or, if 5–6 present in stop, additional species within 20m of stop; this includes at least two 'high quality' positive indicator species present in stop or within 20m of stop	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018), where the lists of positive indicator species, including high quality indicators, are also presented. A small number of additional positive indicators for upland examples of this habitat are also provided (Martin et al., 2018). These documents should be consulted for further details. The areas mapped as 6210 at Cloonmacduff (1541) were noted by ISGS (O'Neill et al., 2013) to be species-rich, with good cover and spread of positive indicator species
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Negative indicator species collectively not more than 20% cover, with cover of an individual species not more than 10%	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018), where the list of negative indicator species is presented
Vegetation composition: non-native species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of non-native species not more than 1%	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018)
Vegetation composition: woody species and bracken	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of woody species (except certain listed species) and bracken (<i>Pteridium aquilinum</i>) not more than 5%	Woody species that can occur above 5% cover are juniper (<i>Juniperus communis</i>), burnet rose (<i>Rosa spinosissima</i>), mountain avens (<i>Dryas octopetala</i>) and hoary rock-rose (<i>Helianthemum oelandicum</i>). However, cover of these species above 25% may indicate transition to another Annex I habitat such as Alpine and Boreal heaths (4060) or <i>Juniperus communis</i> formations (5130). Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018)
Vegetation structure: broadleaf herb:grass ratio	Percentage at a representative number of 2m x 2m monitoring stops	Broadleaf herb component of vegetation between 40% and 90%	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018). Broadleaf herb component of vegetation between 30% and 40% may be allowed to pass on expert judgement (Martin et al., 2018). Broadleaf herb cover was noted as being high at Cloonmacduff (1541) by the ISGS (O'Neill et al., 2013)
Vegetation structure: sward height	Percentage at a representative number of 2m x 2m monitoring stops	At least 30% of sward between 5cm and 40cm tall	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018). Sward height was low when the sub-site Cloonmacduff was surveyed by the GMS (Martin et al., 2018), due to sheep preferentially grazing drier parts of the sub-site (code 1541)

Vegetation structure: litter	Percentage cover at a representative number of 2m x 2m monitoring stops	Litter cover not more than 25%	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018)
Physical structure: bare soil	Percentage cover at a representative number of 2m x 2m monitoring stops	Not more than 10% bare soil	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018)
Physical structure: grazing or disturbance	Area in local vicinity of a representative number of monitoring stops	Area of the habitat showing signs of serious grazing or disturbance less than 20m ²	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018)

Conservation Objectives for : Unshin River SAC [001898]

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

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

Attribute	Measure	Target	Notes
Habitat area	Habitat area	Area stable or increasing, subject to natural processes	Some areas supporting <i>Molinia</i> meadows were surveyed as part of the Irish Semi-natural Grassland Survey (ISGS; O'Neill et al., 2013) and the Grassland Monitoring Survey (GMS; Martin et al., 2018) within the sub-site Cloonmacduff (grassland survey site code 1541), located just east of Collooney. Additional areas were surveyed in 2021 as part of a nationwide survey of floodplain grasslands (Martin et al., in prep.). The total area of habitat mapped in the SAC is 4.88ha. See map 3. It is important to note that further unsurveyed areas may be present within the SAC
Habitat distribution	Occurrence	No decline, subject to natural processes	Distribution based on Martin et al. (2018) and Martin et al. (in prep.). See map 3. Note that at Cloonmacduff (1541) some areas are intermixed with PF1 (rich fen and flush; Fossitt, 2000), while others grade into a more rank sward; the latter tends to be less species-rich, and not referable to the Annex vegetation type. Note that further unsurveyed areas of the habitat may be present within the SAC
Vegetation composition: positive indicator species	Number at a representative number of 2m x 2m monitoring stops; within 20m surrounding area of monitoring stops	At least 7 positive indicator species present in monitoring stop or, if 5–6 present in stop, additional species within 20m of stop; this includes at least one 'high quality' positive indicator species present in the stop or within 20m of stop	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018), where lists of positive indicator species are presented (consult for details). Note that purple moor-grass (<i>Molinia caerulea</i>) is a positive indicator species and should be present in at least one monitoring stop, or within 20m of a monitoring stop, for the attribute to pass (Martin et al., 2018). Note that Martin et al. (2018) mention two additional species which may be considered, should stops fail marginally on presence of indicators. High quality positive indicator species which have been recorded at Cloonmacduff (1541) include: meadow thistle (<i>Cirsium dissectum</i>), marsh hawk's-beard (<i>Crepis paludosa</i>) and western marsh-orchid (<i>Dactylorhiza majalis</i>). While the cover of positive indicators has been noted to be generally good in parts of Cloonmacduff, some areas are rank and dominated by soft rush (<i>Juncus effusus</i>) due to uneven grazing pressure (Martin et al., 2018)
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Negative indicator species collectively not more than 20% cover, with cover by an individual species not more than 10%	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018), where the list of negative indicator species is presented
Vegetation composition: non-native species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of non-native species not more than 1%	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018)
Vegetation composition: moss species	Percentage cover at a representative number of 2m x 2m monitoring stops	Hair mosses (<i>Polytrichum</i> spp.) not more than 25% cover	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018)
Vegetation composition: woody species and bracken	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of woody species and bracken (<i>Pteridium aquilinum</i>) not more than 5% cover	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018)

Vegetation structure: broadleaf herb:grass ratio	Percentage at a representative number of 2m x 2m monitoring stops	Broadleaf herb component of vegetation between 40% and 90%	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018). Broadleaf herb component of vegetation between 30% and 40% may be allowed to pass on expert judgement (Martin et al., 2018). Herb cover and diversity has been noted to be generally high at the Cloonmacduff site (1541), but some areas are rank and dominated by soft rush (<i>Juncus effusus</i>) due to uneven grazing pressure across the site (Martin et al., 2018)
Vegetation structure: sward height	Percentage at a representative number of 2m x 2m monitoring stops	At least 30% of sward between 10cm and 80cm tall	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018)
Vegetation structure: litter	Percentage cover at a representative number of 2m x 2m monitoring stops	Litter cover not more than 25%	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018)
Physical structure: bare ground	Percentage cover at a representative number of 2m x 2m monitoring stops	Not more than 10% bare ground	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018)
Physical structure: grazing or disturbance	Area in local vicinity of a representative number of monitoring stops	Area of the habitat showing signs of serious grazing or disturbance less than 20m ²	Attribute and target based on O'Neill et al. (2013) and Martin et al. (2018)

Conservation Objectives for : Unshin River SAC [001898]

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

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

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, Alnion incanae, Salicion albae)* is present within Unshin River SAC. The surveyed habitat comprises numerous small stands, many of which are less than 1ha in area. As part of the National Survey of Native Woodlands (NSNW), the sub-sites Woodview Gate (Markree) (NSNW site code 523), Toberscanavan III (Markree) (528), Bridge (Coopershill) (530), Ardneaskan (Coopershill) (531), Isolated Woodland (Coopershill) (532), Coolbock Bridge (533), Fidwog (534), Knocknacross (535) and Closkeybridge (537) were surveyed by Perrin et al. (2008). Sub-site Fidwog (code 534) was also included in national monitoring surveys (O'Neill and Barron, 2013; Daly et al., in prep.). Map 4 shows the minimum area of alluvial forests within the SAC, which is estimated to be 8.87ha (Perrin et al., 2008; Daly et al., in prep.). It is important to note that further unsurveyed areas may be present within the SAC
Habitat distribution	Occurrence	No decline, subject to natural processes. The surveyed woodland areas are shown on map 4	Distribution based on Perrin et al. (2008) and Daly et al. (in prep.). It is important to note that further unsurveyed areas may be present within the SAC
Woodland size	Hectares	Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and "small" woods at least 3ha in size	The target areas for individual woodlands aim to reduce habitat fragmentation and benefit those species requiring 'deep' woodland conditions (Peterken, 2002). In some cases, topographical constraints may restrict expansion
Woodland structure: cover and height	Percentage; metres; centimetres	Total canopy cover at least 30%; median canopy height at least 7m; native shrub layer cover 10-75%; native herb/dwarf shrub layer cover at least 20% and height at least 20cm; bryophyte cover at least 4%	The target aims for a diverse structure with a canopy containing mature trees, shrub layer with semi-mature trees and shrubs, and well-developed field layer (herbs, graminoids and dwarf shrubs) and ground layer (bryophytes). Assessment criteria are described in Daly et al. (in prep.) and O'Neill and Barron (2013). Perrin et al. (2008) found the shrub layer and/or field layer to be poorly developed within a number of the alluvial forest sites surveyed within the SAC
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	Described in Perrin et al. (2008). See also the Irish Vegetation Classification (Perrin, 2016; www.biodiversityireland.ie/projects/ivc-classification-explorer)
Woodland structure: natural regeneration	Seedling:sapling:pole ratio	Seedlings, saplings and pole age-classes of target species for 91E0* woodlands and other native tree species occur in adequate proportions to ensure survival of woodland canopy	The target species for 91E0* are alder (<i>Alnus glutinosa</i>), ash (<i>Fraxinus excelsior</i>) and willows (<i>Salix</i> spp.). Assessment criteria are described in Daly et al. (in prep.) and O'Neill and Barron (2013)
Hydrological regime: flooding depth/height of water table	Metres	Appropriate hydrological regime necessary for maintenance of alluvial vegetation	Periodic flooding is essential to maintain alluvial woodlands along river and lake floodplains, but not for woodland around springs/seepage areas

Woodland structure: dead wood	Number per hectare	At least 19 stems/ha of dead wood of at least 20cm diameter	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem. Dead wood comprises old senescent trees, standing dead trees, fallen dead wood (including large branches) and rotten stumps of any tree species. Assessment criteria are described in Daly et al. (in prep.) and O'Neill and Barron (2013)
Woodland structure: veteran trees	Number per hectare	No decline	Veteran trees are important habitats for bryophytes, lichens, saproxylic organisms and some bird species. Their retention is important to ensure continuity of habitats/niches and propagule sources
Woodland structure: indicators of local distinctiveness	Occurrence; population size	No decline in distribution and, in the case of red listed and other rare or localised species, population size	Includes ancient or long-established woodlands (see Perrin and Daly, 2010), archaeological and geological features as well as red listed and other rare or localised species. Parts of the alluvial forest habitat at Fidwog (NSNW site code 534) have been categorised as Long-established Woodland (I) i.e. they appear on the 1830s 1st edition Ordnance Survey maps but no further evidence of antiquity could be found in older documentation (Perrin and Daly, 2010). The tree lungwort lichen (<i>Lobaria pulmonaria</i>) was recorded at Woodview Gate (Markree) (site code 523) (Perrin et al., 2008). See also the conservation objective for otter (<i>Lutra lutra</i> ; Annex II species code 1355) in this volume
Woodland structure: indicators of overgrazing	Occurrence	All five indicators of overgrazing absent	There are five indicators of overgrazing within 91E0*: topiary effect on shrubs and young trees, browse line on mature trees, abundant dung, severe recent bark stripping, and trampling (Daly et al., in prep.). Perrin et al. (2008) noted that parts of Fidwog (NSNW site code 534) were grazed by cattle, and Closkeybridge (537) was grazed by sheep from adjacent pastures
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover at least 90% of canopy; target species cover at least 50% of canopy	The target species for 91E0* are alder (<i>Alnus glutinosa</i>), ash (<i>Fraxinus excelsior</i>) and willows (<i>Salix</i> spp.) (Daly et al., in prep.; O'Neill and Barron, 2013)
Vegetation composition: typical species	Occurrence	At least 1 target species for 91E0* woodlands present; at least 6 positive indicator species for 91E0* woodlands present	A variety of typical native species should be present, depending on woodland type. The target species for 91E0* are alder (<i>Alnus glutinosa</i>), ash (<i>Fraxinus excelsior</i>) and willows (<i>Salix</i> spp.). Positive indicator species for 91E0* are listed in Daly et al. (in prep.) and O'Neill and Barron (2013)
Vegetation composition: negative indicator species	Occurrence	Negative indicator species cover not greater than 10%; regeneration of negative indicator species absent	Negative indicator species (i.e. any non-native species, including herbaceous species) should be absent or under control. Invasive non-native species are a significant pressure affecting the alluvial forests habitat within Unshin River SAC. The non-native trees beech (<i>Fagus sylvatica</i>), sycamore (<i>Acer pseudoplatanus</i>) and horse-chestnut (<i>Aesculus hippocastanum</i>) are present within the alluvial forests habitat (Perrin et al., 2008). Invasive non-native trees were problematic at the monitoring site at Fidwog (NSNW site code 534) (Daly et al., in prep.). Perrin et al. (2008) recorded dense areas of Rhododendron (<i>Rhododendron ponticum</i>) at Woodview Gate (Markree) (site code 523) and Toberscanavan III (Markree) (528). Close to the river bank at Ardneaskan (Coopershill) (531), the shrub layer was dominated by Japanese knotweed (<i>Reynoutria japonica</i>) and cherry laurel (<i>Prunus laurocerasus</i>)
Vegetation composition: problematic native species	Percentage	Cover of common nettle (<i>Urtica dioica</i>) less than 75%	Common nettle (<i>Urtica dioica</i>) is a positive indicator species for 91E0* but, in some cases, it may become excessively dominant. Increased light and nutrient enrichment are factors which favour proliferation of common nettle (Daly et al., in prep.). Perrin et al. (2008) noted that <i>U. dioica</i> was abundant in wetter areas at Closkeybridge (NSNW site code 537)

Conservation Objectives for : Unshin River SAC [001898]

1106 Salmon *Salmo salar*

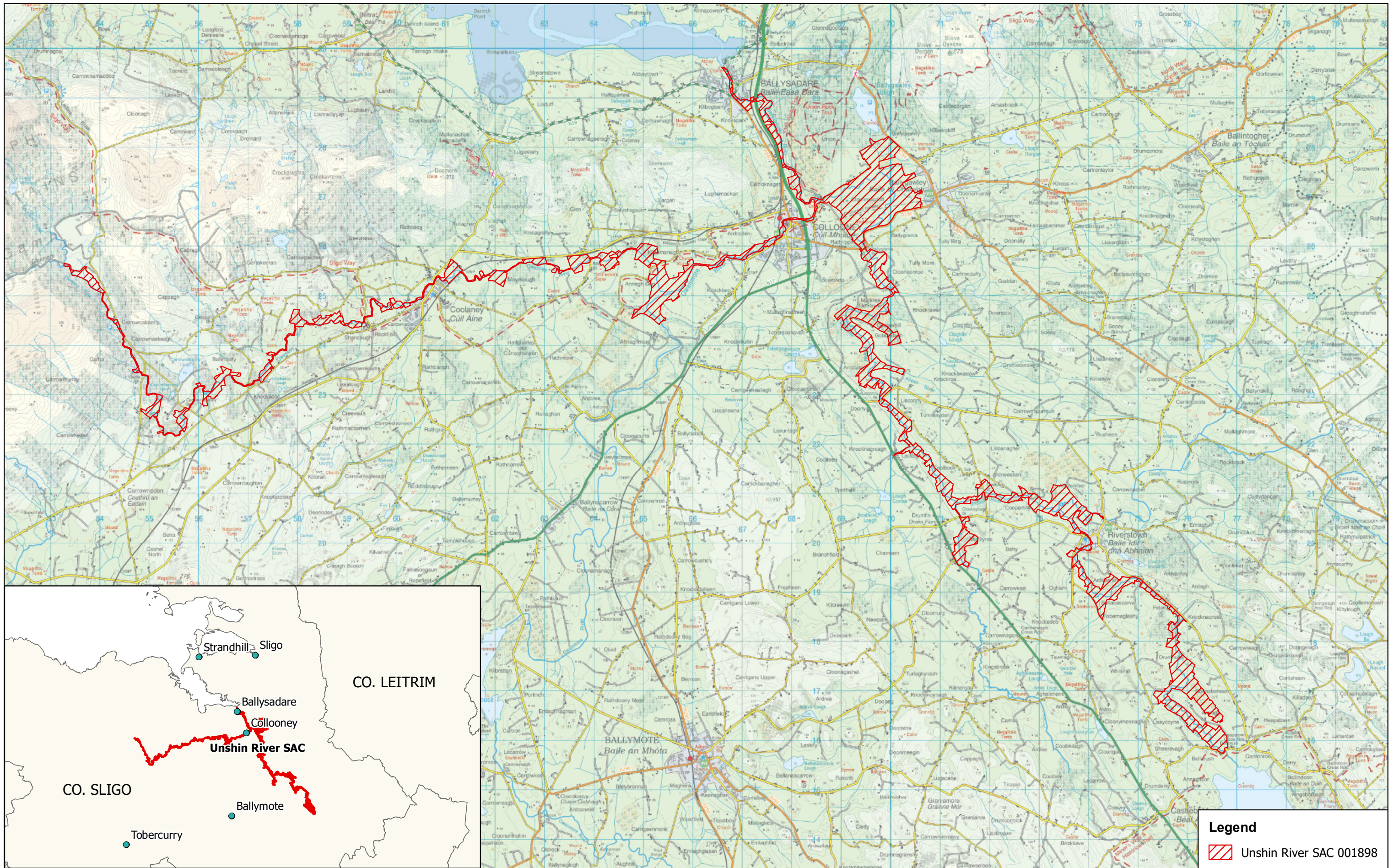
To maintain the favourable conservation condition of Atlantic Salmon (*Salmo salar*) in Unshin River SAC, which is defined by the following list of attributes and targets:

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 Technical Expert Group on Salmon's (TEGOS) annual model output of CL attainment levels. See Gargan et al. (2021) for further details. Stock estimates are either derived from direct counts of adults (rod catch, fish counter) or indirectly by fry abundance counts. The Unshin River is part of the Ballysadare catchment and is currently above its CL for salmon
Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 minutes sampling	Target is threshold value for rivers currently exceeding their conservation limit (CL)
Out-migrating smolt abundance	Number	No significant decline	Smolt abundance can be negatively affected by a number of impacts such as estuarine pollution, predation and sea lice (<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 : Unshin River SAC [001898]**1355 Otter *Lutra lutra***

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

Attribute	Measure	Target	Notes
Distribution	Percentage positive survey sites	No significant decline	Measure based on standard otter survey technique. 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 124.68ha	No field survey. Areas mapped to include 10m terrestrial buffer along river banks and around water bodies identified as critical for otters (NPWS, 2007)
Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 66.55km	No field survey. River length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (Chapman and Chapman, 1982)
Couching sites and holts	Number	No significant decline	Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk and Moorhouse, 1991; Kruuk, 2006)
Fish biomass available	Kilograms	No significant decline	Broad diet that varies locally and seasonally, but dominated by fish, in particular salmonids, eels and sticklebacks in freshwater (Bailey and Rochford, 2006; Reid et al., 2013)
Barriers to connectivity	Number	No significant increase	Otters will regularly commute across stretches of open water up to 500m. e.g. between the mainland and an island; between two islands; across an estuary (De Jongh and O'Neill, 2010). It is important that such commuting routes are not obstructed



Legend
 Unshin River SAC 001898

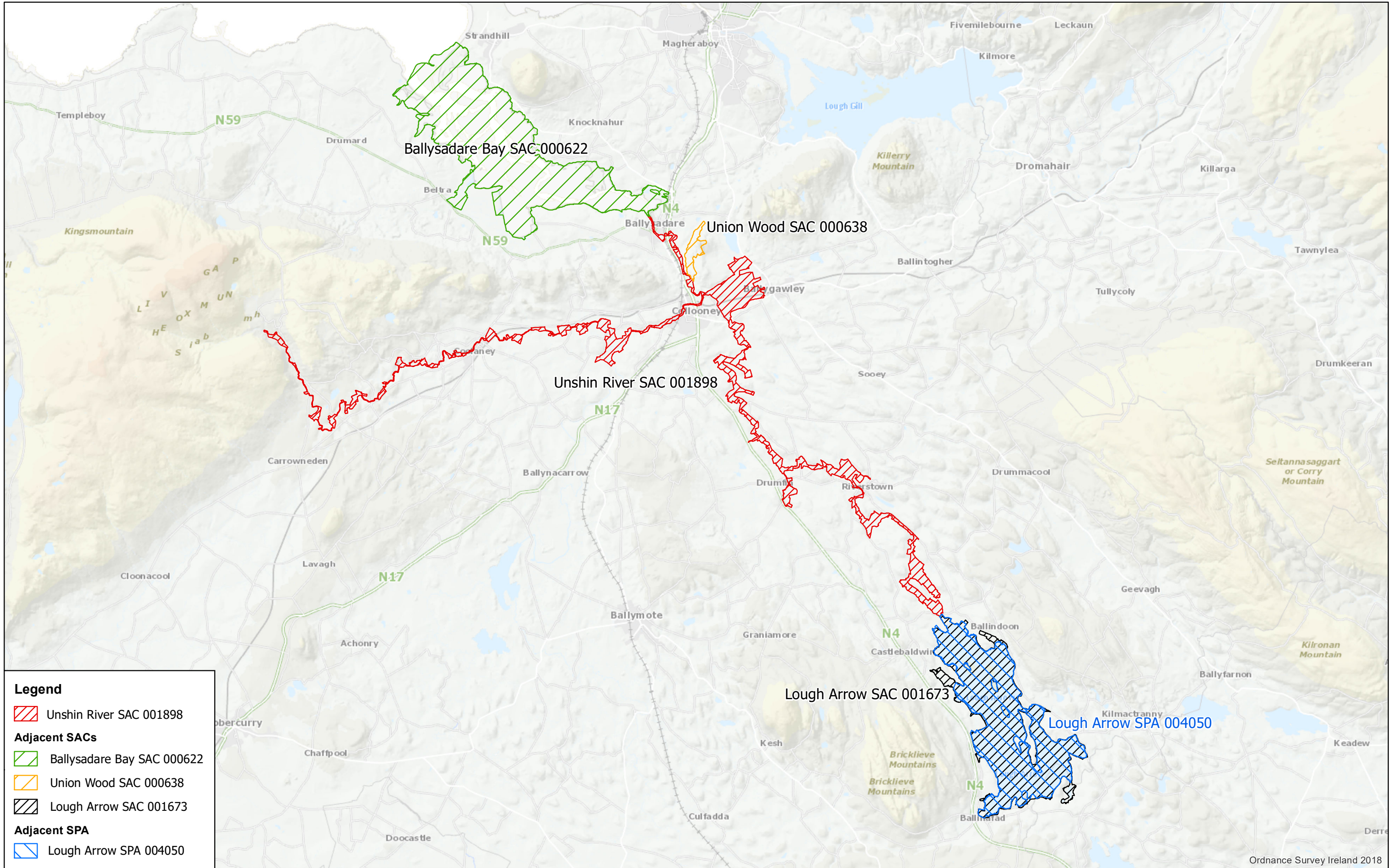
An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreacht
 Department of Housing, Local Government and Heritage

**MAP 1:
 UNSHIN RIVER SAC
 CONSERVATION OBJECTIVES
 SAC DESIGNATION**
 Map to be read in conjunction with the NPWS Conservation Objectives Document

**SITE CODE:
 SAC 001898; version 3.02.
 CO. SLIGO**
 0 0.5 1 2 Kilometres

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision.
 Ordnance Survey of Ireland Licence No OSI-NMA-014. © Ordnance Survey of Ireland Government of Ireland
 Níl sna teorainneacha ar na léarscáileanna ach nod garshuíomhach ginearálta. Féadfar athbheithnithe a déanamh ar theorainneacha na gceantar comharthaíthe. Suirbhéarachta Ordonáis na hÉireann Ceadúnas Uimh OSI-NMA-014. © Suirbhéarachta Ordonáis na hÉireann Rialtas na hÉireann

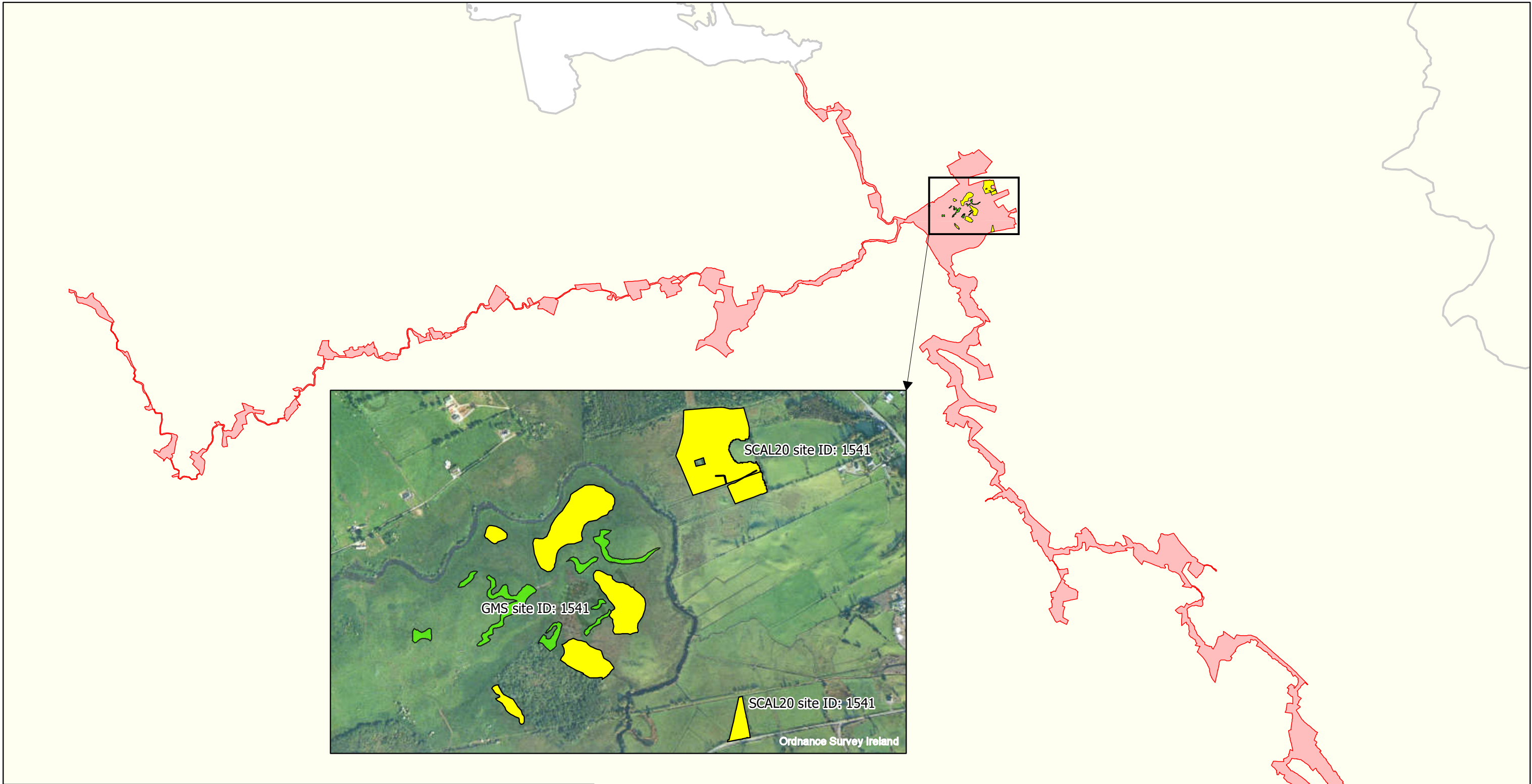
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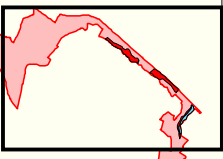
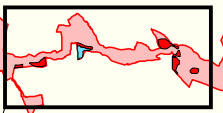
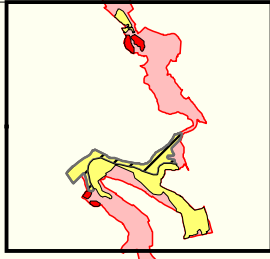
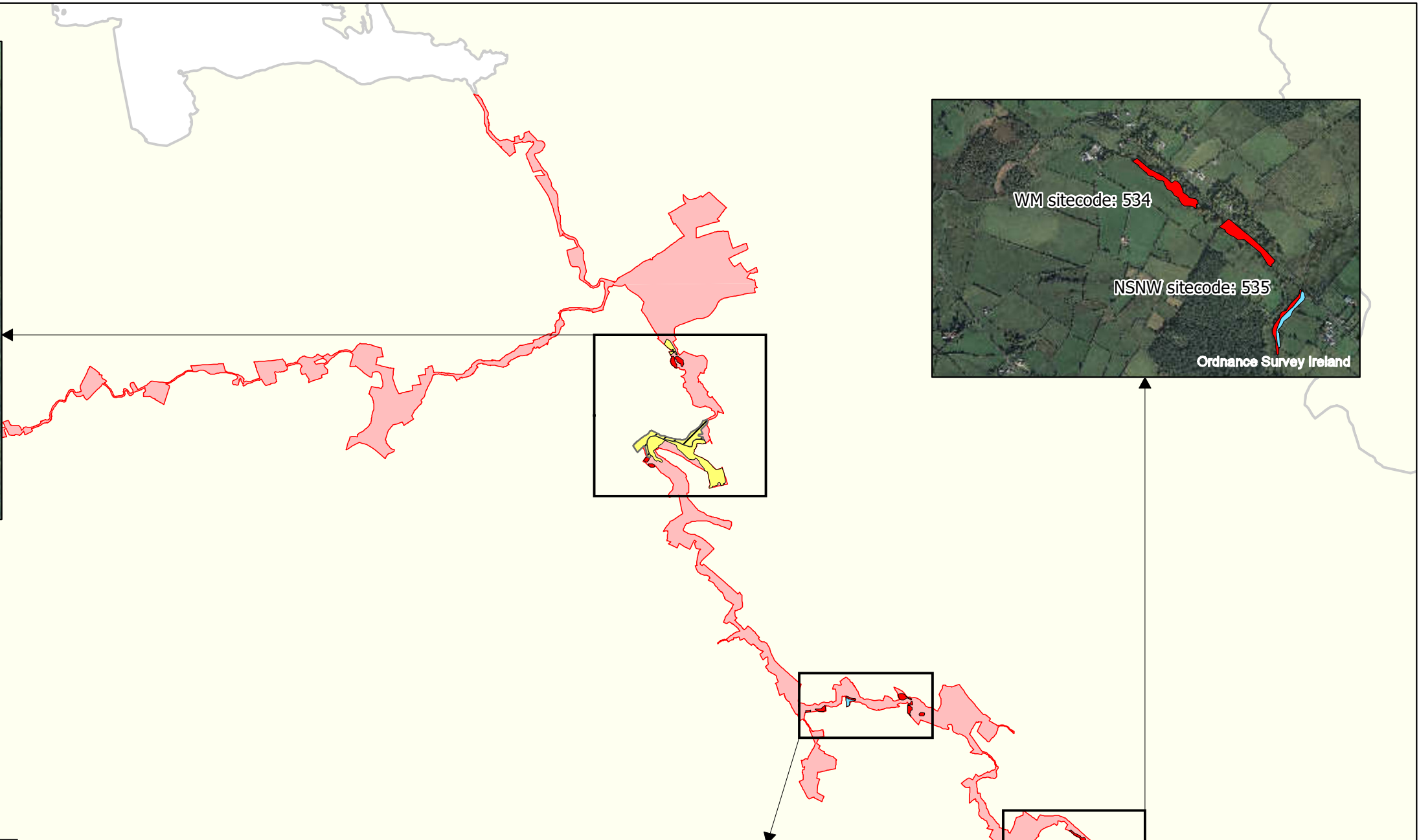
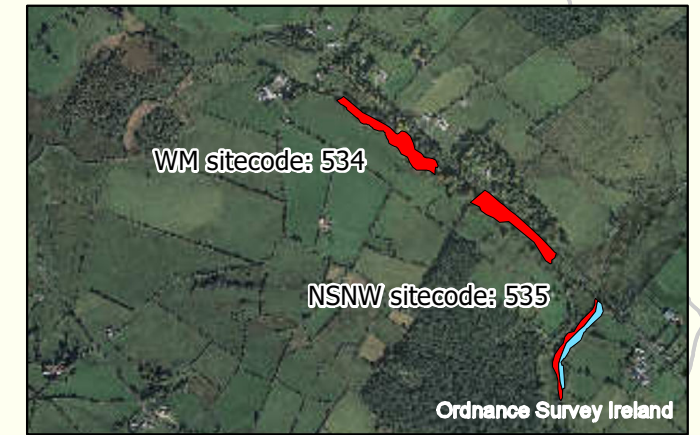
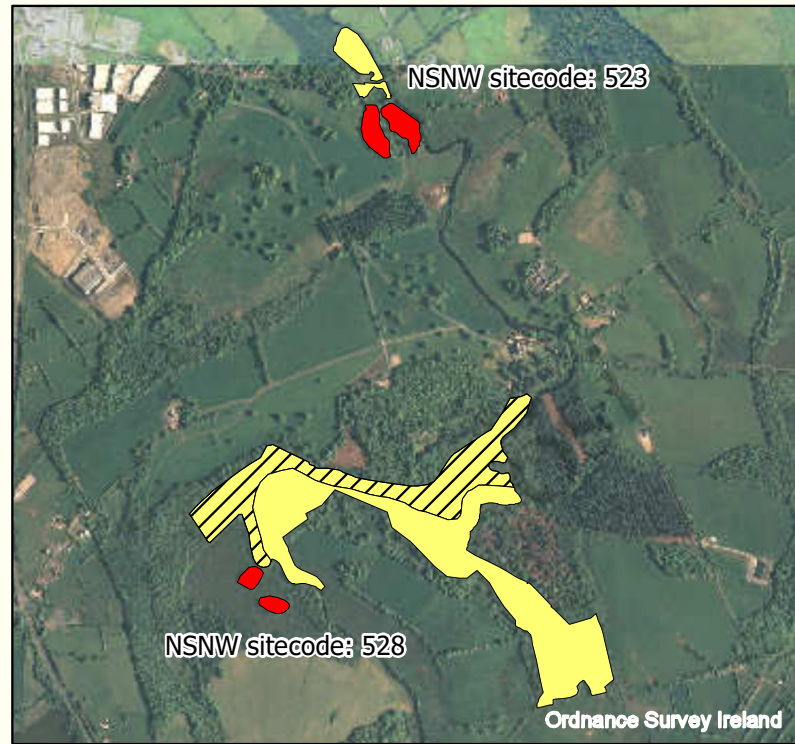
- Unshin River SAC 001898
- Adjacent SACs**
- Ballysadare Bay SAC 000622
- Union Wood SAC 000638
- Lough Arrow SAC 001673
- Adjacent SPA**
- Lough Arrow SPA 004050

Ordnance Survey Ireland 2018



Legend

- 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites)
- 6410 Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)
- Unshin River SAC 001898
- OSI Discovery Series County Boundary



Legend

Annex woodland habitat

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

Non-Annex woodland habitats

- WD1 (Mixed) broadleaved woodland
- WD1 / WN6 (Mixed) broadleaved woodland / Wet willow-alder-ash woodland
- WN2 Oak-ash-hazel woodland

- Unshin River SAC 001898
- OSI Discovery Series County Boundary