

National Parks and Wildlife Service

Conservation Objectives

River Barrow and River Nore SAC 002162



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

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

002162 River Barrow and River Nore SAC

QI	Description
1016	Desmoulin's whorl snail <i>Vertigo moulinsiana</i>
1029	Freshwater pearl mussel <i>Margaritifera margaritifera</i>
1092	White-clawed crayfish <i>Austropotamobius pallipes</i>
1095	Sea lamprey <i>Petromyzon marinus</i>
1096	Brook lamprey <i>Lampetra planeri</i>
1099	River lamprey <i>Lampetra fluviatilis</i>
1103	Twaite shad <i>Alosa fallax</i>
1106	Atlantic salmon (<i>Salmo salar</i>) (only in fresh water)
1130	Estuaries
1140	Mudflats and sandflats not covered by seawater at low tide
1310	<i>Salicornia</i> and other annuals colonizing mud and sand
1330	Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>)
1355	Otter <i>Lutra lutra</i>
1410	Mediterranean salt meadows (<i>Juncetalia maritimi</i>)
1421	Killarney fern <i>Trichomanes speciosum</i>
1990	Nore freshwater pearl mussel <i>Margaritifera durrovensis</i>
3260	Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation
4030	European dry heaths
6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels
7220	* Petrifying springs with tufa formation (<i>Cratoneurion</i>)
91A0	Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles
91E0	* Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i>)

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

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

Title:	Desmoulin's whorl snail (<i>Vertigo moulinsiana</i> - 1016) Conservation Status Assessment Report
Year:	2011
Author:	Moorkens, E. ; Killeen, I.
Series:	Unpublished Report to NPWS
Title:	River Barrow and River Nore SAC (002162): Conservation objectives supporting document - woodland habitats [Version 1]
Year:	2011
Author:	NPWS
Series:	Unpublished Report to NPWS
Title:	River Barrow and River Nore SAC (002162): Conservation objectives supporting document - coastal habitats [Version 1]
Year:	2011
Author:	NPWS
Series:	Unpublished Report to NPWS
Title:	River Barrow and River Nore SAC (002162): Conservation objectives supporting document - marine habitats [Version 1]
Year:	2011
Author:	NPWS
Series:	Unpublished Report to NPWS
Title:	Second Draft Nore Freshwater Pearl Mussel Sub-basin Management Plan (2009-2015)
Year:	2010
Author:	DEHLG
Series:	Unpublished Report to NPWS
Title:	Site investigations for <i>Sabellaria alveolata</i> (Honey-comb worm) biogenic reefs in Ireland
Year:	2010
Author:	NPWS
Series:	Unpublished Report to NPWS
Title:	Irish Semi-natural Grasslands Survey. Annual report no. 3: Counties Donegal, Dublin, Kildare & Sligo
Year:	2010
Author:	O'Neill, F.H.; Martin, J.R.; Devaney, F.M.; McNutt, K.E.; Perrin, P.M. ; Delaney, A.
Series:	Unpublished Report to NPWS
Title:	A provisional inventory of ancient and long-established woodland in Ireland
Year:	2010
Author:	Perrin, P.M.; Daly, O.H.
Series:	Irish Wildlife Manuals No. 46
Title:	Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland [Version 1.0]
Year:	2010
Author:	Perrin, P.M.; Barron, S.J.; Roche, J.R.; O'Hanrahan, B.
Series:	Irish Wildlife Manuals No. 48

Title:	A technical manual for monitoring white-clawed crayfish <i>Austropotamobius pallipes</i> in Irish lakes
Year:	2010
Author:	Reynolds, J.D.; O'Connor, W.; O'Keeffe, C.; Lynn, D.
Series:	Irish Wildlife Manuals No. 45
Title:	Report of the standing scientific committee to the DCENR. The status of Irish salmon stocks in 2010 and precautionary catch advice for 2011
Year:	2010
Author:	SSC
Series:	Unpublished Report to DCENR
Title:	The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. [S.I. 296 of 2009]
Year:	2009
Author:	Government of Ireland
Series:	Irish Statute Book
Title:	The European Communities Environmental Objectives (Surface Water) Regulations 2009. [S.I. 272 of 2009]
Year:	2009
Author:	Government of Ireland
Series:	Irish Statute Book
Title:	Saltmarsh Monitoring Report 2007-2008
Year:	2009
Author:	McCorry, M.; Ryle, T.
Series:	Unpublished Report to NPWS
Title:	<i>Margaritifera durrovensis</i> Survey of Nore River. June – July 2009. NS 2 project
Year:	2009
Author:	Moorkens, E. A.
Series:	Unpublished Report to NPWS
Title:	Benthic Biotope classification of subtidal sedimentary habitats in the Lower River Suir candidate Special Area of Conservation and the River Nore and River Barrow candidate Special Area of Conservation
Year:	2008
Author:	ARMS
Series:	Unpublished Report to NPWS
Title:	A survey of mudflats and sandflats in Ireland. An intertidal soft sediment survey of Waterford Estuary
Year:	2008
Author:	ASU
Series:	Unpublished Report to NPWS
Title:	Assessment of the Risk of Barriers to Fish Migration in the Nore Catchment, Southern Regional Fisheries Board
Year:	2008
Author:	CFB; Compass Informatics
Series:	Unpublished Report to CFB

Title:	Poor water quality constrains the distribution and movements of Twaite shad <i>Alosa fallax fallax</i> (Lacepede, 1803) in the watershed of river Scheldt
Year:	2008
Author:	Maas, J.; Stevens, M. ; Breine, J.
Series:	Hydrobiologia 602, 129 - 143
Title:	All Ireland Species Action Plan - Killarney fern
Year:	2008
Author:	NPWS ; EHS-NI
Series:	Unpublished Report to NPWS & EHS-NI
Title:	National Survey of Native Woodlands 2003-2008
Year:	2008
Author:	Perrin, P.; Martin, J.; Barron, S.; O'Neill, F.; McNutt, K.; Delaney, A.
Series:	Unpublished Report to NPWS
Title:	Saltmarsh Monitoring Report 2006
Year:	2007
Author:	McCorry, M.
Series:	Unpublished Report to NPWS
Title:	Supporting documentation for the Habitats Directive Conservation Status Assessment - backing documents, Article 17 forms and supporting maps
Year:	2007
Author:	NPWS
Series:	Unpublished Report to NPWS
Title:	A Survey of Juvenile Lamprey Populations in the Corrib and Suir Catchments
Year:	2007
Author:	O'Connor, W.
Series:	Irish Wildlife Manuals No. 26
Title:	Assessment of fish passage and the ecological impact of migration barriers on the River Nore catchment
Year:	2007
Author:	Sullivan, A.
Series:	Nore Suir Rivers Trust & OPW
Title:	Otter Survey of Ireland 2004/2005
Year:	2006
Author:	Bailey, M.; Rochford, J.
Series:	Irish Wildlife Manuals No. 23
Title:	The status of host fish populations and fish species richness in European freshwater pearl mussel (<i>Margaritifera margaritifera</i>) streams
Year:	2006
Author:	Geist, J.; Porkka, M.; Kuehn, R.
Series:	Aquatic Conservation: Marine and Freshwater Ecosystems 16, 251–266
Title:	The distribution of Lamprey in the River Barrow SAC
Year:	2006
Author:	King, J.J.
Series:	Irish Wildlife Manuals No. 21

Title:	Otters - ecology, behaviour and conservation
Year:	2006
Author:	Kruuk, H.
Series:	Oxford University Press
Title:	The ecology and conservation of the gametophyte generation of the Killarney Fern (<i>Trichomanes speciosum</i> Willd.) in Ireland
Year:	2005
Author:	Kingston, N. ; Hayes, C.
Series:	Biology and Environment: Proceedings of the Royal Irish Academy 105B(2): 71-79
Title:	Pilot Project for Monitoring Populations of the Freshwater Pearl Mussel. Baseline survey of the Nore River SAC, Counties Laois and Kilkenny
Year:	2004
Author:	Moorkens, E. A.
Series:	Unpublished Report to NPWS
Title:	Monitoring the river, sea and brook lamprey, <i>Lampetra fluviatilis</i> , <i>L. planeri</i> and <i>Petromyzon marinus</i>
Year:	2003
Author:	Harvey, J.; Cowx, I.
Series:	Conserving Natura 2000 Rivers Monitoring Series No. 5, English Nature, Peterborough
Title:	Ecology of Watercourses Characterised by <i>Ranunculion fluitantis</i> and <i>Callitriche-Batrachion</i> Vegetation
Year:	2003
Author:	Hatton-Ellis, T.W.; Grieve, N.
Series:	Conserving Natura 2000 Rivers Ecology Series No. 11. English Nature, Peterborough.
Title:	Ecology of the Allis and Twaite shad
Year:	2003
Author:	Maitland, P.S.; Hatton-Ellis, T.W.
Series:	Conserving Natura 2000 Rivers Ecology Series No. 3. English Nature, Peterborough
Title:	A survey of the white-clawed crayfish, <i>Austropotamobius pallipes</i> (Lereboullet) and of water quality in two catchments of Eastern Ireland
Year:	2002
Author:	Demers, A.; Reynolds, J. D.
Series:	Bulletin Français de la Pêche et de la Pisciculture, 367: 729-740
Title:	Reversing the habitat fragmentation of British woodlands
Year:	2002
Author:	Peterken, G.
Series:	WWF-UK, London
Title:	A survey of broadleaf woodlands in 3 SACs: Barrow-Nore, River Unshin & Lough Forbes
Year:	2000
Author:	Browne, A.; Dunne, F.; Roche, N.
Series:	Unpublished Report to NPWS
Title:	Diet of Otters <i>Lutra lutra</i> on Inishmore, Aran Islands, west coast of Ireland
Year:	1999
Author:	Kingston, S.; O'Connell, M.; Fairley, J.S.
Series:	Biol & Environ Proc R Ir Acad B 99B:173–182

Title:	Conservation Management of the White-clawed Crayfish, <i>Austropotamobius pallipes</i>
Year:	1998
Author:	Reynolds, J.D.
Series:	Irish Wildlife Manuals No. 1
Title:	Studies on the biology and ecology of Margaritifera in Ireland
Year:	1996
Author:	Moorkens, E.A.
Series:	Unpublished PhD thesis, University of Dublin, Trinity College.
Title:	Imminent extinction of the Nore freshwater pearl mussel <i>Margaritifera durrovensis</i> Phillips: a species unique to Ireland
Year:	1994
Author:	Moorkens, E.A. ; Costello, M.J.
Series:	Aquatic Conservation: Marine and Freshwater Ecosystems 4,363-365
Title:	The spatial organization of otters (<i>Lutra lutra</i>) in Shetland
Year:	1991
Author:	Kruuk, H.; Moorhouse, A.
Series:	J. Zool, 224: 41-57
Title:	The vegetation of Irish rivers
Year:	1987
Author:	Heuff, H.
Series:	Unpublished Report
Title:	Otter survey of Ireland
Year:	1982
Author:	Chapman, P.J.; Chapman, L.L.
Series:	Unpublished Report to Vincent Wildlife Trust

Spatial data sources

Year:	2010
Title:	EPA transitional waterbody data
GIS operations:	Clipped to SAC boundary
Used for:	1130 (map 2)
Year:	Interpolated 2011
Title:	Intertidal and subtidal surveys 2008 & 2010
GIS operations:	Polygon feature classes from marine community types base data sub-divided based on interpolation of marine survey data
Used for:	Marine community types, 1140 (maps 3 & 4)
Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	High water mark (HWM) and low water mark (LWM) polyline feature classes converted into polygon feature classes and combined; Saltmarsh and Sand Dune datasets erased out if applicable
Used for:	Marine community types base data (map 4)
Year:	Revision 2010
Title:	Saltmarsh Monitoring Project 2007-2008. Version 1
GIS operations:	QIs selected; clipped to SAC boundary; overlapping regions with Sand Dune data investigated and resolved with expert opinion used
Used for:	1310, 1330, 1410 (map 5)
Year:	Derived 2011
Title:	Internal NPWS files
GIS operations:	Dataset created from spatial reference contained in files
Used for:	7220 (map 6)
Year:	Revision 2010
Title:	National Survey of Native Woodlands 2003-2008. Version 1
GIS operations:	QIs selected; clipped to SAC boundary
Used for:	91A0, 91E0 (map 6)
Year:	2011
Title:	NPWS rare and threatened species database
GIS operations:	Dataset created from spatial references in database records
Used for:	1016, 1092, 1421, 1990 (map 7)
Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	Creation of an 80m buffer on the marine side of the high water mark (HWM); creation of a 10m buffer on the terrestrial side of the HWM; combination of 80m and 10m HWM buffer datasets; creation of a 10m buffer on the landward side of the river banks data; creation of a 20m buffer applied to river centerline and stream data; combination of 10m river banks and 20m river and stream centerline buffer datasets; combined river and stream buffer dataset clipped to HWM; combination of HWM buffer dataset with river and stream buffer dataset; overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary
Used for:	1355 (no map)

Conservation objectives for: River Barrow and River Nore SAC [002162]

1016 Desmoulin's whorl snail *Vertigo moulinsiana*

To maintain the favourable conservation condition of Desmoulin's whorl snail in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: occupied sites	Number	No decline. Two known sites: Borris Bridge, Co. Carlow S711503; Boston Bridge, Kilnaseer S338774, Co. Laois. See map 7	Data from NPWS rare and threatened species database
Population size: adults	Number per positive sample	At least 5 adults snails in at least 50% of samples	Attribute and target from Moorkens and Killeen (2011)
Population density	Percentage positive samples	Adult snails present in at least 60% of samples per site	Attribute and target from Moorkens and Killeen (2011)
Area of occupancy	Hectares	Minimum of 1ha of suitable habitat per site	Attribute and target from Moorkens and Killeen (2011)
Habitat quality: vegetation	Percentage of samples with suitable vegetation	90% of samples in habitat classes I and II as defined in Moorkens & Killeen (2011)	Attribute and target from Moorkens and Killeen (2011)
Habitat quality: soil moisture levels	Percentage of samples with appropriate soil moisture levels	90% of samples in moisture class 3-4 as defined in Moorkens & Killeen (2011)	Attribute and target from Moorkens and Killeen (2011)

1029 Freshwater pearl mussel *Margaritifera margaritifera*

The status of the freshwater pearl mussel (*Margaritifera margaritifera*) as a qualifying Annex II species for the River Barrow and River Nore SAC is currently under review. The outcome of this review will determine whether a site-specific conservation objective is set for this species. Please note that the Nore freshwater pearl mussel (*Margaritifera durrovensis*) remains a qualifying species for this SAC. This document contains a conservation objective for the latter species.

Conservation objectives for: River Barrow and River Nore SAC [002162]

1092 White-clawed crayfish *Austropotamobius pallipes*

To maintain the favourable conservation condition of White-clawed crayfish in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Occurrence	No reduction from baseline. See map 7	The crayfish is present almost throughout this SAC. The records extend as far downstream as Thomastown on the Nore and Graiguenamanagh on the Barrow
Population structure: recruitment	Percentage occurrence of juveniles and females with eggs	Juveniles and/or females with eggs in at least 50% of positive samples	See Reynolds et al. (2010) for further details
Negative indicator species	Occurrence	No alien crayfish species	Alien crayfish species are identified as major direct threat to this species and as disease vector. See Reynolds (1998) for further details
Disease	Occurrence	No instances of disease	Disease is identified as major threat and has occurred in Ireland even in the absence of alien vectors. See Reynolds (1998) for further details
Water quality	EPA Q value	At least Q3-4 at all sites sampled by EPA	Target taken from Demers and Reynolds (2002). Q values based on triennial water quality surveys carried out by the Environmental Protection Agency (EPA)
Habitat quality: heterogeneity	Occurrence of positive habitat features	No decline in heterogeneity or habitat quality	Crayfish need high habitat heterogeneity. Larger crayfish must have stones to hide under, or an earthen bank in which to burrow. Hatchlings shelter in vegetation, gravel and among fine tree-roots. Smaller crayfish are typically found among weed and debris in shallow water. Larger juveniles in particular may also be found among cobbles and detritus such as leaf litter. These conditions must be available on the whole length of occupied habitat

1095 Sea lamprey *Petromyzon marinus*

To restore the favourable conservation condition of Sea lamprey in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	% of river accessible	Greater than 75% of main stem length of rivers accessible from estuary	Artificial barriers can block or cause difficulties to lampreys' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas. See King (2006), Sullivan (2007) and CFB and Compass Informatics (2008) for further information on artificial barriers
Population structure of juveniles	Number of age/size groups	At least three age/size groups present	Attribute and target based on data from Harvey and Cowx (2003) and O'Connor, (2007). King (2007) provides survey information for the Barrow
Juvenile density in fine sediment	Juveniles/m ²	Juvenile density at least 1/m ²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003)
Extent and distribution of spawning habitat	m ² and occurrence	No decline in extent and distribution of spawning beds	Attribute and target based on spawning bed mapping by Inland Fisheries Ireland (IFI). Lampreys spawn in clean gravels. Artificial barriers are currently preventing lamprey from accessing suitable spawning habitat. See King (2006), Sullivan (2007) and CFB and Compass Informatics (2008) for further information
Availability of juvenile habitat	Number of positive sites in 3rd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Artificial barriers are currently preventing juvenile lampreys from accessing the full extent of suitable habitat. See King (2006), Sullivan (2007) and CFB and Compass Informatics (2008) for further information

1096 Brook lamprey *Lampetra planeri*

To restore the favourable conservation condition of Brook lamprey in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	% of river accessible	Access to all watercourses down to first order streams	Artificial barriers can block lampreys' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas. See King (2006), Sullivan (2007) and CFB and Compass Informatics (2008) for further information on artificial barriers
Population structure of juveniles	Number of age/size groups	At least three age/size groups of brook/river lamprey present	Attribute and target based on data from Harvey and Cowx (2003). King (2007) provides survey information for the Barrow. It is impossible to distinguish between brook and river lamprey juveniles in the field, hence they are considered together in this target
Juvenile density in fine sediment	Juveniles/m ²	Mean catchment juvenile density of brook/river lamprey at least 2/m ²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003) who state 10/m ² in optimal conditions and more than 2/m ² on a catchment basis
Extent and distribution of spawning habitat	m ² and occurrence	No decline in extent and distribution of spawning beds	Attribute and target based on spawning bed mapping by Inland Fisheries Ireland (IFI). Lampreys spawn in clean gravels. Artificial barriers are currently preventing lamprey from accessing suitable spawning habitat. See King (2006), Sullivan (2007) and CFB and Compass Informatics (2008) for further information
Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Artificial barriers are currently preventing juvenile lampreys from accessing the full extent of suitable habitat. See King (2006), Sullivan (2007) and CFB and Compass Informatics (2008) for further information

1099 River lamprey *Lampetra fluviatilis*

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

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	% of river accessible	Greater than 75% of main stem and major tributaries down to second order accessible from estuary	Artificial barriers can block lampreys' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas. See King (2006), Sullivan (2007) and CFB and Compass Informatics (2008) for further information on artificial barriers
Population structure of juveniles	Number of age/size groups	At least three age/size groups of river/brook lamprey present	Attribute and target based on data from Harvey and Cowx (2003). King (2007) provides survey information for the Barrow. It is impossible to distinguish between brook and river lamprey juveniles in the field, hence they are considered together in this target
Juvenile density in fine sediment	Juveniles/m ²	Mean catchment juvenile density of brook/river lamprey at least 2/m ²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003) who state 10/m ² in optimal conditions and more than 2/m ² on a catchment basis
Extent and distribution of spawning habitat	m ² and occurrence	No decline in extent and distribution of spawning beds	Attribute and target based on spawning bed mapping by Inland Fisheries Ireland (IFI). Lampreys spawn in clean gravels. Artificial barriers are currently preventing lamprey from accessing suitable spawning habitat. See King (2006), Sullivan (2007) and CFB and Compass Informatics (2008) for further information
Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Artificial barriers are currently preventing juvenile lampreys from accessing the full extent of suitable habitat. See King (2006), Sullivan (2007) and CFB and Compass Informatics (2008) for further information

1103 Twaite shad *Alosa fallax*

To restore the favourable conservation condition of Twaite shad in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	% of river accessible	Greater than 75% of main stem length of rivers accessible from estuary	In some catchments, artificial barriers block twaite shads' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas
Population structure: age classes	Number of age classes	More than one age class present	Regular breeding has been confirmed in the River Barrow in recent years, but not in the Nore
Extent and distribution of spawning habitat	m ² and occurrence	No decline in extent and distribution of spawning habitats	
Water quality: oxygen levels	Milligrammes per litre	No lower than 5mg/l	Attribute and target based on Maas, Stevens and Briene (2008)
Spawning habitat quality: Filamentous algae; macrophytes; sediment	Occurrence	Maintain stable gravel substrate with very little fine material, free of filamentous algal (macroalgae) growth and macrophyte (rooted higher plants) growth	See Maitland and Hatton-Ellis (2003) for further information

Conservation objectives for: River Barrow and River Nore SAC [002162]

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

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

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	% of river accessible	100% of river channels down to second order accessible from estuary	Artificial barriers block salmon's upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas. See Sullivan (2007) and CFB and Compass Informatics (2008) for further information on artificial barriers
Adult spawning fish	Number	Conservation Limit (CL) for each system consistently exceeded	A conservation limit is defined by the North Atlantic Salmon Conservation Organisation (NASCO) as "the spawning stock level that produces long-term average maximum sustainable yield as derived from the adult to adult stock and recruitment relationship". The target is based on the Standing Scientific Committee of the National Salmon Commission's annual model output of CL attainment levels. See SSC (2010). Stock estimates are either derived from direct counts of adults (rod catch, fish counter) or indirectly by fry abundance counts. The Nore is currently exceeding its CL, while the Barrow is below its CL
Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 min 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. Artificial barriers are currently preventing salmon from accessing suitable spawning habitat
Water quality	EPA Q value	At least Q4 at all sites sampled by EPA	Q values based on triennial water quality surveys carried out by the Environmental Protection Agency (EPA)

1130 Estuaries

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

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 2	Habitat area was estimated using OSI data and the defined Transitional Water Body area under the Water Framework Directive as 3856ha. See marine supporting document for further details
Community distribution	Hectares	The following sediment communities should be maintained in a natural condition: Muddy estuarine community complex; Sand to muddy fine sand community complex; Fine sand with <i>Fabulina fabula</i> community. See map 4	The likely area of sediment communities was derived from a combination of intertidal and subtidal surveys undertaken in 2008 (ARMS, 2008; ASU, 2008). See marine supporting document for further details
Community extent	Hectares	Maintain the natural extent of the Sabellaria alveolata reef, subject to natural process. See map 4	The likely area of this community is derived from a survey undertaken in 2010 (NPWS, 2010). See marine supporting document for further details

1140 Mudflats and sandflats not covered by seawater at low tide

To maintain the favourable conservation condition of the Mudflats and sandflats not covered by seawater at low tide in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 3	Habitat area was estimated using OSI data as 926ha. See marine supporting document for further details
Community distribution	Hectares	The following sediment communities should be maintained in a natural condition: Muddy estuarine community complex; Sand to muddy fine sand community complex. See map 4	The likely area of sediment communities was derived from a combination of intertidal and subtidal surveys undertaken in 2008 (ARMS, 2008; ASU, 2008). See marine supporting document for further details

1310 *Salicornia* and other annuals colonizing mud and sand

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

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For the one sub-site mapped: Ringville - 0.03ha. See map 5	Based on data from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009). The Ringville sub-site was mapped and no additional areas of potential <i>Salicornia</i> mudflat were identified from an examination of aerial photographs, giving a total estimated area of 0.03ha. NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 5	See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain or where necessary restore natural circulation of sediments and organic matter, without any physical obstructions	See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of saltmarsh habitat zonation including transitional zones, subject to natural processes including erosion and succession. See map 5	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated.	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009).	See coastal habitats supporting document for further details
Vegetation structure: negative indicator species: <i>Spartina anglica</i>	Hectares	No significant expansion of <i>Spartina</i> . No new sites for this species and an annual spread of less than 1% where it is already known to occur	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details

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

To restore the favourable conservation condition of Atlantic salt meadows in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Dunbrody Abbey - 1.25ha, Killowen - 2.59ha, Rochestown - 17.50ha, Ringville - 6.70ha. See map 5	Based on data from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009). Four sub-sites were mapped and additional areas of potential saltmarsh were identified from an examination of aerial photographs, giving a total estimated area of Atlantic salt meadow of 35.07ha. NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 5	See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain/restore natural circulation of sediments and organic matter, without any physical obstructions	See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession. See map 5	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009)	See coastal habitats supporting document for further details
Vegetation structure: negative indicator species: <i>Spartina anglica</i>	Hectares	No significant expansion of <i>Spartina</i> . No new sites for this species and an annual spread of less than 1% where it is already known to occur	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details

1355 Otter *Lutra lutra*

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

Attribute	Measure	Target	Notes
Distribution	Percentage positive survey sites	No significant decline	Measure based on standard otter survey technique. FCS target, based on 1980/81 survey findings, is 88% in SACs. Current range in south-east estimated at 73% (Bailey and Rochford, 2006)
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 122.8ha above high water mark (HWM); 1136.0ha along river banks / around ponds	No field survey. Areas mapped to include 10m terrestrial buffer along shoreline (above HWM and along river banks) identified as critical for otters (NPWS, 2007)
Extent of marine habitat	Hectares	No significant decline. Area mapped and calculated as 857.7ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (HWM) (NPWS, 2007; Kruuk, 2006)
Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 616.6km	No field survey. River length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (Chapman and Chapman, 1982)
Extent of freshwater (lake) habitat	Hectares	No significant decline. Area mapped and calculated as 2.6ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (NPWS, 2007)
Couching sites and holts	Number	No significant decline	Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk, 2006; Kruuk and Moorhouse, 1991)
Fish biomass available	Kilograms	No significant decline	Broad diet that varies locally and seasonally, but dominated by fish, in particular salmonids, eels and sticklebacks in freshwater (Bailey and Rochford, 2006) and wrasse and rockling in coastal waters (Kingston et al., 1999)

1410 Mediterranean salt meadows (*Juncetalia maritimi*)

To restore the favourable conservation condition of Mediterranean salt meadows in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Dunbrody Abbey - 0.08ha, Rochestown - 0.04ha, Ringville - 6.70ha. See map 5	Based on data from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009). Three sub-sites were mapped and no additional areas of potential saltmarsh were identified from an examination of aerial photographs, giving a total estimated area of Mediterranean salt meadow of 6.82ha. NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 5	See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain or where necessary restore natural circulation of sediments and organic matter, without any physical obstructions	See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession. See map 5	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated.	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009)	See coastal habitats supporting document for further details
Vegetation structure: negative indicator species: <i>Spartina anglica</i>	Hectares	No significant expansion of <i>Spartina</i> . No new sites for this species and an annual spread of less than 1% where it is already known to occur	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details

1421 Killarney fern *Trichomanes speciosum*

To maintain the favourable conservation condition of Killarney Fern in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Location	No decline. Three locations known, with three colonies of gametophyte and one sporophyte colony. See map 7	Data from NPWS rare and threatened species database
Population size	Number	Maintain at least three colonies of gametophyte, and at least one sporophyte colony of over 35 fronds	Data from NPWS rare and threatened species database
Population structure: juvenile fronds	Occurrence	At least one of the locations to have a population structure comprising sporophyte, unfurling fronds, 'juvenile' sporophyte and gametophyte generations	'Juvenile' sporophytes, which appear as small entire fronds, are known from this site. However, it is unknown whether they are due to apogamous growth or sexual reproduction. Based on Kingston and Hayes (2005) and Ni Dhuill (pers. Comm.)
Habitat extent	m ²	No loss of suitable habitat, such as shaded rock crevices, caves or gullies in or near to, known colonies. No loss of woodland canopy at or near to known locations	Based on Kingston and Hayes (2005) and Ni Dhuill (pers. Comm.)
Hydrological conditions: visible water	Occurrence	Maintain hydrological conditions at the locations so that all colonies are in dripping or damp seeping habitats, and water is visible at all locations	Based on Kingston and Hayes (2005) and Ni Dhuill (pers. Comm.)
Hydrological conditions: humidity	Number of dessicated fronds	No increase. Presence of dessicated sporophyte fronds or gametophyte mats indicates conditions are unsuitable	Based on Kingston and Hayes (2005) and Ni Dhuill (pers. Comm.)
Light levels: shading	Percentage	No changes due to anthropogenic impacts	Based on Kingston and Hayes (2005) and Ni Dhuill (pers. Comm.)
Invasive species	Occurrence	Absent or under control	NPWS and EHS-NI (2008) provides further details

Conservation objectives for: River Barrow and River Nore SAC [002162]

1990 Nore freshwater pearl mussel *Margaritifera durrovensis*

To restore the favourable conservation condition of the Nore freshwater pearl mussel in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Kilometres	Maintain at 15.5km. See map 7	The population stretches from Poorman's Bridge (S407859) to Lismaine Bridge (S442660), with most of the population found between Poorman's Bridge and the Avonmore Creamery above Ballyragget (S 440 722) (Moorkens, 1996)
Population size: adult mussels	Number	Restore to 5,000 adult mussels	The extant wild population of Nore freshwater pearl mussel is estimated as 300 adult individuals (Moorkens, 2009)
Population structure: recruitment	Percentage per size class	Restore to at least 20% of population no more than 65mm in length; and at least 5% of population no more than 30mm in length	Mussels of no more than 65mm are considered 'young mussels' and may be found buried in the substratum and/or beneath adult mussels. Mussels of no more than 30mm are 'juvenile mussels' and are always buried in the substratum. This species is known not to have reproduced successfully in the River Nore since 1970 (Moorkens and Costello, 1994; Moorkens, 2004; Government of Ireland, 2009 [S.I. 272 of 2009])
Population structure: adult mortality	Percentage	No more than 5% decline from previous number of live adults counted; dead shells less than 1% of the adult population and scattered in distribution	5% is considered the cut-off between the combined errors associated with natural fluctuations and sampling methods and evidence of true population decline. 1% of dead shells is considered to be indicative of natural losses
Habitat extent	Kilometres	Restore suitable habitat in length of river corresponding to distribution target (15.5km; see map 7) and any additional stretches necessary for salmonid spawning	The species habitat is a stretch of large lowland river and is a combination of 1) the area of habitat adult and juvenile mussels can occupy and 2) the area of spawning and nursery habitats the host fish can occupy. Fish nursery habitat typically overlaps with mussel habitat. Fish spawning habitat is generally adjacent mussel habitat, but may lie upstream of the generalised mussel distribution. Only those salmonid spawning areas that could regularly contribute juvenile fish to the areas occupied by adult mussels should be considered. The availability of mussel habitat and fish spawning and nursery habitats are determined by flow and substratum conditions. The habitat for the species is currently unsuitable for the survival of adult mussels or the recruitment of juveniles

Conservation objectives for: River Barrow and River Nore SAC [002162]

1990 Nore freshwater pearl mussel *Margaritifera durrovensis*

To restore the favourable conservation condition of the Nore freshwater pearl mussel in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Water quality: Macroinvertebrates and phytobenthos (diatoms)	Ecological quality ratio (EQR)	Restore water quality-macroinvertebrates: EQR greater than 0.90; phytobenthos: EQR greater than 0.93	These EQRs correspond to high ecological status for these two Water Framework Directive biological quality elements. They represent high water quality with very low nutrient concentrations (oligotrophic conditions). The habitat of the Nore pearl mussel failed both standards during 2009 sampling for the Sub-basin Management Plan (DEHLG, 2010). See also The European Communities Environmental Objectives (Surface Water Objectives) Regulations 2009
Substratum quality: Filamentous algae (macroalgae), macrophytes (rooted higher plants)	Percentage	Restore substratum quality-filamentous algae: absent or trace (<5%); macrophytes: absent or trace (<5%)	High abundance of macroalgae was recorded during 2009 sampling for the Sub-basin Management Plan (DEHLG, 2010). Recruitment of juvenile mussels is being prevented by the poor quality of the river substrate
Substratum quality: sediment	Occurrence	Restore substratum quality-stable cobble and gravel substrate with very little fine material; no artificially elevated levels of fine sediment	The habitat for the species is currently unsuitable for the survival of adult mussels or the recruitment of juveniles owing to sedimentation of the substratum. Significant sedimentation has been recorded during all recent mussel monitoring surveys. Recruitment of juvenile mussels is being prevented by the poor quality of the river substrate
Substratum quality: oxygen availability	Redox potential	Restore to no more than 20% decline from water column to 5cm depth in substrate	Differences in redox potential between the water column and the substrate correlate with differences in oxygen levels. Juvenile mussels require full oxygenation while buried in gravel. In suitable habitat, there should be very little loss of redox potential between the water column and underlying gravels. The redox potential loss in 2009 was 58-64% at 5cm depth (DEHLG, 2010)
Hydrological regime: flow variability	Metres per second	Restore appropriate hydrological regimes	The availability of suitable Nore freshwater pearl mussel habitat is largely determined by flow (catchment geology being the other important factor). In order to restore the habitat for the species, flow variability over the annual cycle must be such that: 1) high flows can wash fine sediments from the substratum, 2) low flows do not exacerbate the deposition of fines and 3) low flows do not cause stress to mussels in terms of exposure, water temperatures, food availability or aspects of the reproductive cycle

1990 Nore freshwater pearl mussel *Margaritifera durrovensis*

To restore the favourable conservation condition of the Nore freshwater pearl mussel in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Host fish	Number	Maintain sufficient juvenile salmonids to host glochidial larvae	Salmonid fish are host to the larval form of freshwater pearl mussels and thus, they are essential to the completion of the life cycle. 0+ and 1+ fish are typically used, both because of the habitat overlaps and the development of immunity with age in the fish. Fish presence is considered sufficient, as higher densities and biomass of fish is indicative of enriched conditions in mussel rivers. Geist et al. (2006) found that higher densities of host fish coincided with eutrophication, poor substrate quality for pearl mussels and a lack of pearl mussel recruitment, while significantly lower densities and biomass of host fish were associated with high numbers of juvenile mussels. Fish movement patterns must be such that 0+ fish in the vicinity of the mussel habitat remain in the mussel habitat until their 1+ summer. As native brown trout appear to be favoured by the Nore freshwater pearl mussel, it is particularly important that these are not out-competed by stocked fish

Conservation objectives for: River Barrow and River Nore SAC [002162]

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

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

Attribute	Measure	Target	Notes
Habitat distribution	Occurrence	No decline, subject to natural processes	The full distribution of this habitat and its sub-types in this site is currently unknown. The basis of the selection of the SAC for the habitat is the presence of an excellent example of the vegetation community (nutrient-rich type) associated with extensive tufa deposits on the river bed in the Kings tributary of the Nore (Heuff, 1987). Other examples of this or other sub-types may be present within the SAC
Habitat area	Kilometres	Area stable or increasing, subject to natural processes	The full extent of this habitat in this site is currently unknown. See above
Hydrological regime: river flow	Metres per second	Maintain appropriate hydrological regimes	Due to regular disturbance (through variations in flow), river macrophytes rarely reach a climax condition but frequently occur as transient communities. A natural (relatively unmodified) flow regime is required for both plant communities and channel geomorphology to be in favourable condition, exhibiting typical dynamics for the river type (Hatton-Ellis and Grieve, 2003). For most of the sub-types of this habitat, high flows are required to maintain the substratum (see below) necessary for the characteristic species. Flow variation is particularly important, with high and flood flows being critical to the hydromorphology
Hydrological regime: groundwater discharge	Metres per second	The groundwater flow to the habitat should be permanent and sufficient to maintain tufa formation	This attribute refers to sub-types with tufa formations. Groundwater discharges to this habitat throughout the year
Substratum composition: particle size range	Millimetres	The substratum should be dominated by large particles and free from fine sediments	The tufaceous sub-types develop on relatively stable substrata such as bedrock, boulders and cobbles, where tufa can deposit and accumulate. Tufa deposition is believed to be biologically mediated, by algae and bryophytes. The substratum must remain free of fine sediments such as clay, silt and fine sand, which would adversely affect the growth of algae and mosses

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

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

Attribute	Measure	Target	Notes
Water chemistry: minerals	Milligrammes per litre	The groundwater and surface water should have sufficient concentrations of minerals to allow deposition and persistence of tufa deposits	The tufaceous sub-types require mineral- (typically calcium-) rich groundwaters to allow deposition of tufa. Surface water must also be sufficiently base-rich to prevent chemical erosion. Alkalinity and/or total hardness data may also be relevant
Water quality: suspended sediment	Milligrammes per litre	The concentration of suspended solids in the water column should be sufficiently low to prevent excessive deposition of fine sediments	See substratum composition above. Turbidity data may also be relevant
Water quality: nutrients	Milligrammes per litre	The concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition	Phosphorus (MRP) is typically the limiting nutrient, however increased nitrogen (NO ₃ -) negatively impacts upon the N-fixing blue-green algal communities that frequently contribute to tufa deposition. Nutrient enrichment of the habitat typically leads to increased filamentous-green-algal biomass, and consequent changes in other algae, bryophyte and macrophyte species composition and abundance. Water quality should reach a minimum of Water Framework Directive good status, in terms of nutrient standards, and macroinvertebrate and phytobenthos quality elements
Vegetation composition: typical species	Occurrence	Typical species of the relevant habitat sub-type should be present and in good condition	The sub-types of this habitat are poorly understood and their typical species have not yet been defined. Typical species and appropriate targets may emerge to be site-specific. The typical species of the tufaceous sub-type in the Kings tributary of the Nore are identified in Heuff (1987). The typical species may include higher plants, bryophytes, macroalgae and microalgae
Floodplain connectivity	Area	The area of active floodplain at and upstream of the habitat should be maintained	River connectivity with the floodplain is essential for the functioning of this habitat. The site of the tufaceous sub-type in the King's River is within an area of floodplain, with further large floodplains upstream. Floodplains regulate fine sediment deposition within the channel. See substratum composition above

4030 European dry heaths

To maintain the favourable conservation condition of European dry heaths in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat distribution	Occurrence	No decline from current habitat distribution, subject to natural processes	Spatial extent currently unmapped but indicated as occurring on the steep, free-draining, river valley sides especially the Barrow and tributaries in the foothills of the Blackstairs Mountains (based on NPWS NHA Survey - 1997/98 Site Notes; Natura 2000 Form Explanatory Notes - May 2006; The above NHA survey was prior to the extensions to the SAC that included river habitat and estuary at Ballyhack which may have incorporated additional dry heath habitat)
Habitat area	Hectares	Area stable or increasing, subject to natural processes. Habitat area is not known but estimated as less than 400ha of the area of the SAC, occurring in dispersed locations	Based on NPWS NHA Survey Site Notes (1997/98); Natura 2000 Form Explanatory Notes - May 2006
Physical structure: free-draining, acid, low nutrient soil; rock outcrops	Occurrence	No significant change in soil nutrient status, subject to natural processes. No increase or decrease in area of natural rock outcrop	Based on NPWS NHA Survey Site Notes - 1997/98; Natura 2000 Form Explanatory Notes - May 2006
Vegetation structure: sub-shrub indicator species	Percentage cover	Cover of characteristic sub-shrub indicator species at least 25%: gorse (<i>Ulex europaeus</i>) and where rocky outcrops occur bilberry (<i>Vaccinium myrtillus</i>) and woodrush (<i>Luzula sylvatica</i>). Some rock outcrops support English stonecrop (<i>Sedum anglicum</i>), sheep's bit (<i>Jasione montana</i>) and wild madder (<i>Rubia perigrina</i>) as well as important moss and lichen assemblages	Dry heath in this SAC occurs on free-draining nutrient poor soils and is often characterised by gorse and open acid grassland areas. A characteristic coastal dry heath of the southeast also occurs. Several rare plants occur including two species listed in the Red Data Book (Curtis and McGough, 1988). The species occurring on the site are listed in NPWS NHA Survey Site Notes - 1997/98. A brief overview of the principal characteristics of the dry heath habitat of this SAC is given in the Natura 2000 Explanatory Notes - May 2006
Vegetation structure: senescent gorse	Percentage cover	Cover of senescent gorse less than 50%	Based on NPWS NHA Survey Site Notes and Natura 2000 Form Explanatory Notes - May 2006 and on a modified version of the dry heath condition assessment methodology of Perrin et al. (2010)
Vegetation structure: browsing	Percentage cover	Long shoots of bilberry with signs of browsing collectively less than 33%	Based on NPWS NHA Survey Site Notes and Natura 2000 Form Explanatory Notes - May 2006 and on a modified version of the dry heath condition assessment methodology of Perrin et al. (2010)

4030 European dry heaths

To maintain the favourable conservation condition of European dry heaths in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation structure: native trees and shrubs	Percentage cover	Cover of scattered native trees and shrub less than 20%	Based on NPWS NHA Survey Site Notes - 1997/98; Natura 2000 Form Explanatory Notes - May 2006 and on a modified version of the dry heath habitat condition assessment methodology of Perrin et al. (2010). From the NHA survey notes the main threats appear to be reclamation or invasion by scrub woodland
Vegetation composition: positive indicator species	Number	Number of positive indicator species at least 2 e.g. gorse and associated dry heath/ acid grassland flora	Dry heath in this SAC occurs on free-draining nutrient poor soils and is characterised by gorse and acid grassland areas. It corresponds to Annex I sub-type "heaths rich in gorse (<i>Ulex</i>) of the Atlantic margins" (European Commission, 2007). Based on NPWS NHA Survey Site Notes -1997/98; Natura 2000 Form Explanatory Notes - May 2006 and a modified version of the dry heath habitat condition assessment methodology of Perrin et al. (2010)
Vegetation structure: positive indicator species	Percentage cover	Cover of positive indicator species at least 60%. This should include plant species characteristic of dry heath in this SAC including gorse, bilberry and associated acid grassland flora	Dry heath in this SAC is characterised by gorse and acid grassland areas and locally bilberry and woodrush. Based on NPWS NHA Survey Site Notes and Natura 2000 Form Explanatory Notes - May 2006 and a modified version of the dry heath habitat condition assessment methodology of Perrin et al. (2010)
Vegetation composition: bryophyte and non-crustose lichen species	Number	Number of bryophyte or non-crustose lichen species present at least 2	Based on NPWS NHA Survey Site Notes and Natura 2000 Form Explanatory Notes - May 2006 and on a modified version of the dry heath habitat condition assessment methodology of Perrin et al. 2010
Vegetation composition: bracken (<i>Pteridium aquilinum</i>)	Percentage cover	Cover of bracken less than 10% - however see 'Notes'	Based on NPWS NHA Survey Site Notes and Natura 2000 Form Explanatory Notes - May 2006 and on a modified version of the dry heath habitat condition assessment methodology of Perrin et al. (2010). Bracken appears to be quite dense in places and before any management action is considered its rate of spread needs to be established as well as its threat, if any, to other dry heath species and its potential value to important fauna (e.g. Twite)

4030 European dry heaths

To maintain the favourable conservation condition of European dry heaths in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation structure: weedy negative indicator species	Percentage cover	Cover of agricultural weed species (negative indicator species) less than 1%	Based on NPWS NHA Survey Site Notes and Natura 2000 Form Explanatory Notes - May 2006 and on a modified version of the dry heath habitat condition assessment methodology of Perrin et al. (2010)
Vegetation composition: non-native species	Percentage cover	Cover of non-native species less than 1%.	Based on NPWS NHA Survey Site Notes and Natura 2000 Form Explanatory Notes - May 2006 and on a modified version of the dry heath habitat condition assessment methodology of Perrin et al. (2010)
Vegetation composition: rare/scarce heath species	Location, area and number	No decline in distribution or population sizes of rare, threatened or scarce species, including Greater Broomrape (<i>Orobanche rapum-genistae</i>) and the legally protected clustered clover (<i>Trifolium glomeratum</i>)	Broomrape is dependent on gorse at this site as it is parasitic on gorse roots. It is recorded as occurring on steep slopes above New Ross. A small area of excellent dry coastal heath at Ballyhack is interspersed with patches rock and of dry lowland grassland and has a high species diversity. Notably there is an excellent range of Clover (<i>Trifolium</i>) species including the legally protected clustered clover, a species known only from one other site in Ireland. Also <i>T. ornithopodioides</i> , <i>T. striatum</i> and <i>Torilus nodosa</i> . Based on Natura 2000 Form Explanatory Notes May 2006, Irish Red Data Book (Curtis and Mc Gough, 1988) and on the NPWS database of rare and threatened vascular plants. Other areas of coastal heath may also occur
Vegetation structure: disturbed bare ground	Percentage cover	Cover of disturbed bare ground less than 10% (but if peat soil less than 5%)	Based on NPWS NHA Survey Site Notes and Natura 2000 Form Explanatory Notes - May 2006 and on a modified version of the dry heath habitat condition assessment methodology of Perrin et al. (2010)
Vegetation structure: burning	Occurrence	No signs of burning within sensitive areas	Perrin et al. (2010) defines sensitive areas

6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels

To maintain the favourable conservation condition of Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat distribution	Occurrence	No decline, subject to natural processes	Distribution of this habitat in this site is currently unknown. Considered to occur in association with some riverside woodlands, unmanaged river islands and in narrow bands along the floodplain of slow-flowing stretches of river (Natura 2000 Form Explanatory Notes)
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Extent of this habitat in this site is currently unknown. See above
Hydrological regime: Flooding depth/height of water table	Metres	Maintain appropriate hydrological regimes	This habitat requires winter inundation, which results in deposition of naturally nutrient-rich sediment
Vegetation structure:sward height	Centimetres	30-70% of sward is between 40 and 150cm in height	Bare ground, due to natural inundation processes, may often be present. Attribute and target based on the Irish Semi-natural Grassland Survey (O'Neill et al., 2010)
Vegetation composition: broadleaf herb: grass ratio	Percentage	Broadleaf herb component of vegetation between 40 and 90%	Attribute and target based on O'Neill et al. (2010)
Vegetation composition: typical species	Number	At least 5 positive indicator species present	List of positive indicator species identified by O'Neill et al. (2010)
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control- NB Indian balsam (<i>Impatiens glandulifera</i>), monkeyflower (<i>Mimulus guttatus</i>), Japanese knotweed (<i>Fallopia japonica</i>) and giant hogweed (<i>Heracleum mantegazzianum</i>)	Species listed as being present in the site (Natura 2000 Form Explanatory Notes)

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

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

Attribute	Measure	Target	Notes
Habitat area	Square metres	Area stable or increasing, subject to natural processes	Extent of this habitat in this site is currently unknown. An area ("Tens of square metres") has been described at one location (Natura 2000 Form Explanatory Notes; internal NPWS files), see below
Habitat distribution	Occurrence	No decline. See map 6 for recorded location	Full distribution of this habitat in this site is currently unknown. It has been described in woodlands at Dysart, between Thomastown and Inistioge (Natura 2000 Form Explanatory Notes; internal NPWS files). NB further areas are likely to occur within the site
Hydrological regime: height of water table; water flow	Metres; metres per second	Maintain appropriate hydrological regimes	Current hydrological regimes are unknown. Petrifying springs rely on permanent irrigation, usually from upwelling groundwater sources or seepage sources
Water quality	Water chemistry measures	Maintain oligotrophic and calcareous conditions	Water chemistry is currently unknown. Water supply to petrifying springs is characteristically oligotrophic and calcareous
Vegetation composition: typical species	Occurrence	Maintain typical species	The bryophytes <i>Cratoneuron commutatum</i> and <i>Eucladium verticillatum</i> are diagnostic of this habitat. Both are found at the location described above. Natura 2000 Form Explanatory Notes and internal NPWS files also list other typical species

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

To restore the favourable conservation condition of Old oak woodland with *Ilex* and *Blechnum* in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, at least 85.08ha for sub-sites surveyed: see map 6	Minimum area, based on 13 sites surveyed by Perrin et al. (2008) - site codes 14, 20, 49, 73, 125, 508, 509, 510, 514, 515, 518, 519, 521, and other sources. NB further unsurveyed areas maybe present within the site
Habitat distribution	Occurrence	No decline. Surveyed locations shown on map 6	Distribution based on Perrin et al. (2008). NB further unsurveyed areas maybe present within the site
Woodland size	Hectares	Area stable of increasing. Where topographically possible, "large" woods at least 25ha in size and "small" woods at least 3ha in size	The sizes of at least some of the existing woodlands need to be increased in order to reduce habitat fragmentation and benefit those species requiring 'deep' woodland conditions (Peterken, 2002). Topographical and land ownership constraints may restrict expansion
Woodland structure: cover and height	Percentage and metres	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi-mature trees and shrubs; and well-developed herb layer	Described in Perrin et al. (2008); Browne et al. (2000). See woodland habitats supporting document for further details
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	Described in Perrin et al. (2008); Browne et al. (2000). See woodland habitats supporting document for further details
Woodland structure: natural regeneration	Seedling:sapling:pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	Oak regenerates poorly. In suitable sites ash can regenerate in large numbers although few seedlings reach pole size
Woodland structure: dead wood	m ³ per hectare; number per hectare	At least 30m ³ /ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem.
Woodland structure: veteran trees	Number per hectare	No decline	Mature and veteran trees are important habitats for bryophytes, lichens, saproxylic organisms and some bird species. Their retention is important to ensure continuity of habitats/niches and propagule sources

Conservation objectives for: River Barrow and River Nore SAC [002162]

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

To restore the favourable conservation condition of Old oak woodland with *Ilex* and *Blechnum* in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Woodland structure: indicators of local distinctiveness	Occurrence	No decline	Includes ancient or long-established woodlands, archaeological and geological features as well as red-listed and other rare or localised species. Perrin and Daly (2010) list sites 14, 20, 73, 125, 508, 509, 510, 514, 515, 518, 521 as potential ancient/long established woodlands
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover not less than 95%	Species reported in Perrin et al. (2008); Browne et al. (2000)
Vegetation composition: typical species	Occurrence	A variety of typical native species present, depending on woodland type, including oak (<i>Quercus petraea</i>) and birch (<i>Betula pubescens</i>)	Species reported in Perrin et al. (2008); Browne et al. (2000)
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control	The following are the most common invasive species in this woodland type: beech (<i>Fagus sylvatica</i>), rhododendron (<i>Rhododendron ponticum</i>), cherry laurel (<i>Prunus laurocerasus</i>)

Conservation objectives for: River Barrow and River Nore SAC [002162]

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

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

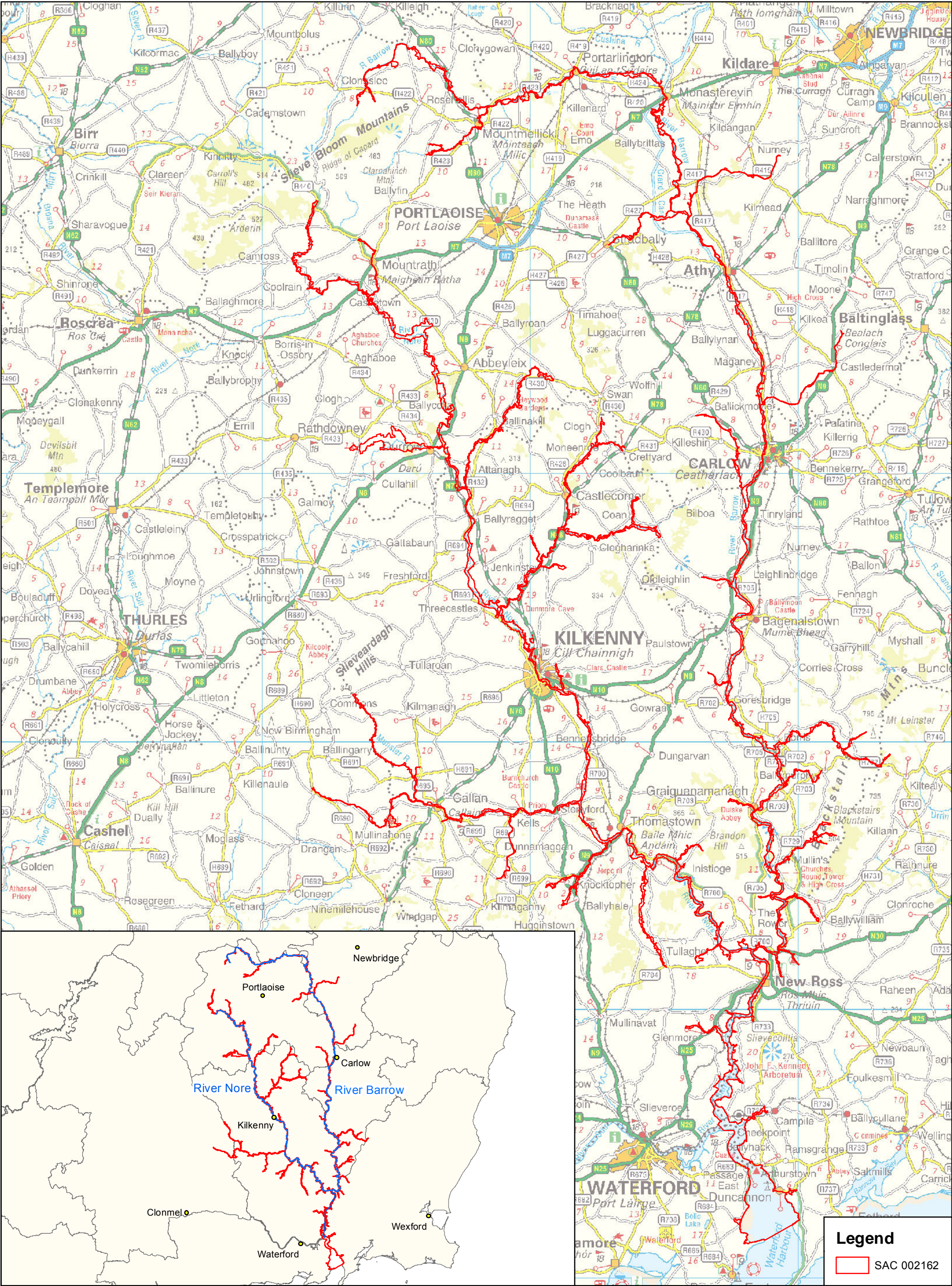
Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, at least 181.54ha for sites surveyed: see map 6	Minimum area, based on 16 sites surveyed by Perrin et al. (2008) - site codes 10, 15, 17, 126, 127, 262, 282, 287, 511, 516, 517, 518, 520, 608, 1021; Coillte LIFE project and other sources. NB further unsurveyed areas maybe present within the SAC
Habitat distribution	Occurrence	No decline. Surveyed locations shown on map 6	Distribution based on Perrin et al. (2008). NB further unsurveyed areas maybe present within the site
Woodland size	Hectares	Area stable of increasing. Where topographically possible, "large" woods at least 25ha in size and "small" woods at least 3ha in size	The sizes of at least some of the existing woodlands need to be increased in order to reduce habitat fragmentation and benefit those species requiring 'deep' woodland conditions (Peterken, 2002). Topographical and land ownership constraints may restrict expansion
Woodland structure: cover and height	Percentage and metres	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi-mature trees and shrubs; and well-developed herb layer	Described in Perrin et al. (2008); Browne et al. (2000). See woodland habitats supporting document for further details
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	Described in Perrin et al. (2008); Browne et al. (2000). See woodland habitats supporting document for further details
Woodland structure: natural regeneration	Seedling:sapling:pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	Alder and oak regenerate poorly. Ash often regenerates in large numbers although few seedlings reach pole size
Hydrological regime: Flooding depth/height of water table	Metres	Appropriate hydrological regime necessary for maintenance of alluvial vegetation	Periodic flooding is essential to maintain alluvial woodlands along river flood plains but not for woodland around springs/seepage areas
Woodland structure: dead wood	m ³ per hectare; number per hectare	At least 30m ³ /ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter (greater than 20cm diameter in the case of alder)	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem

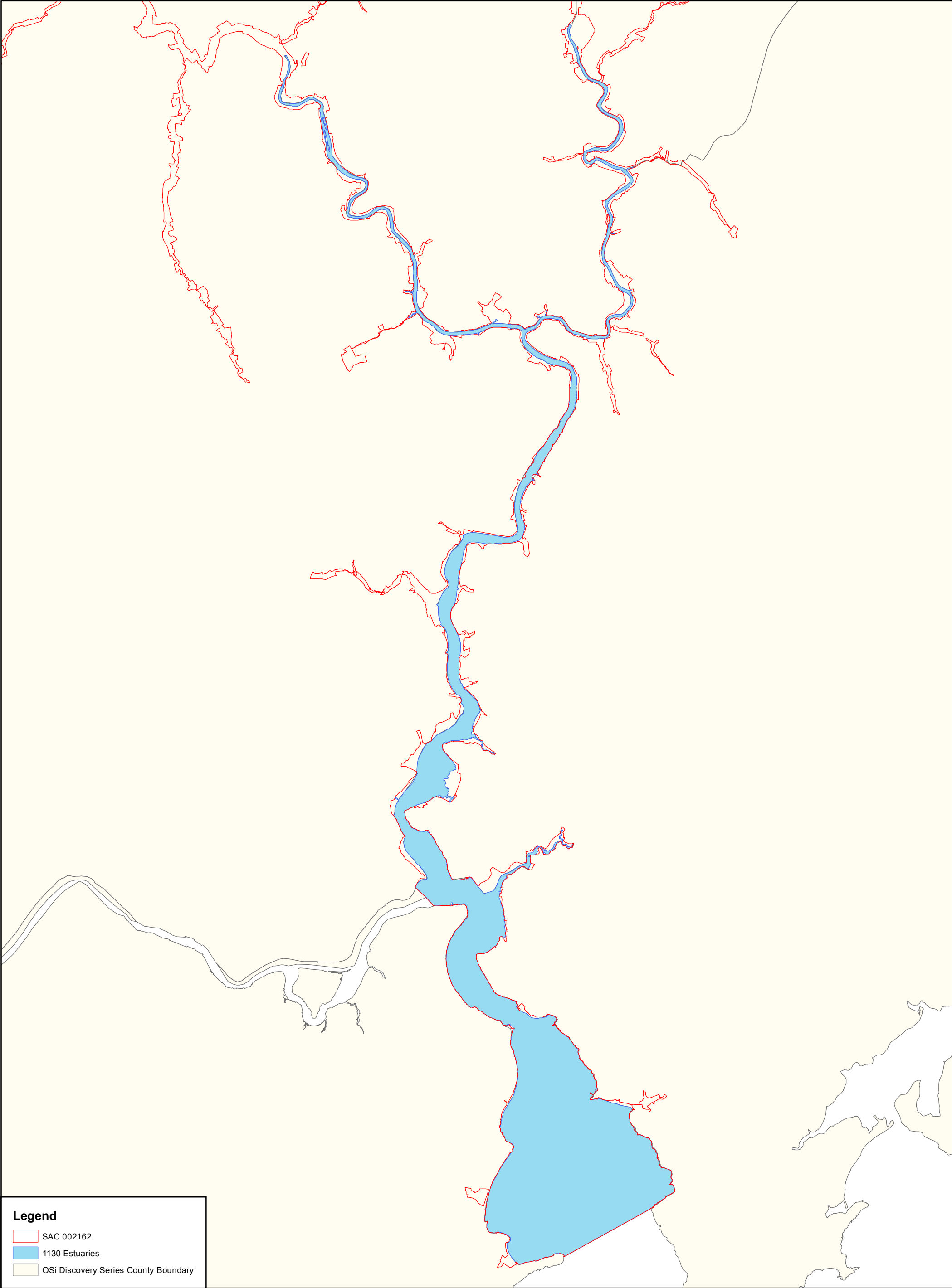
Conservation objectives for: River Barrow and River Nore SAC [002162]

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

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

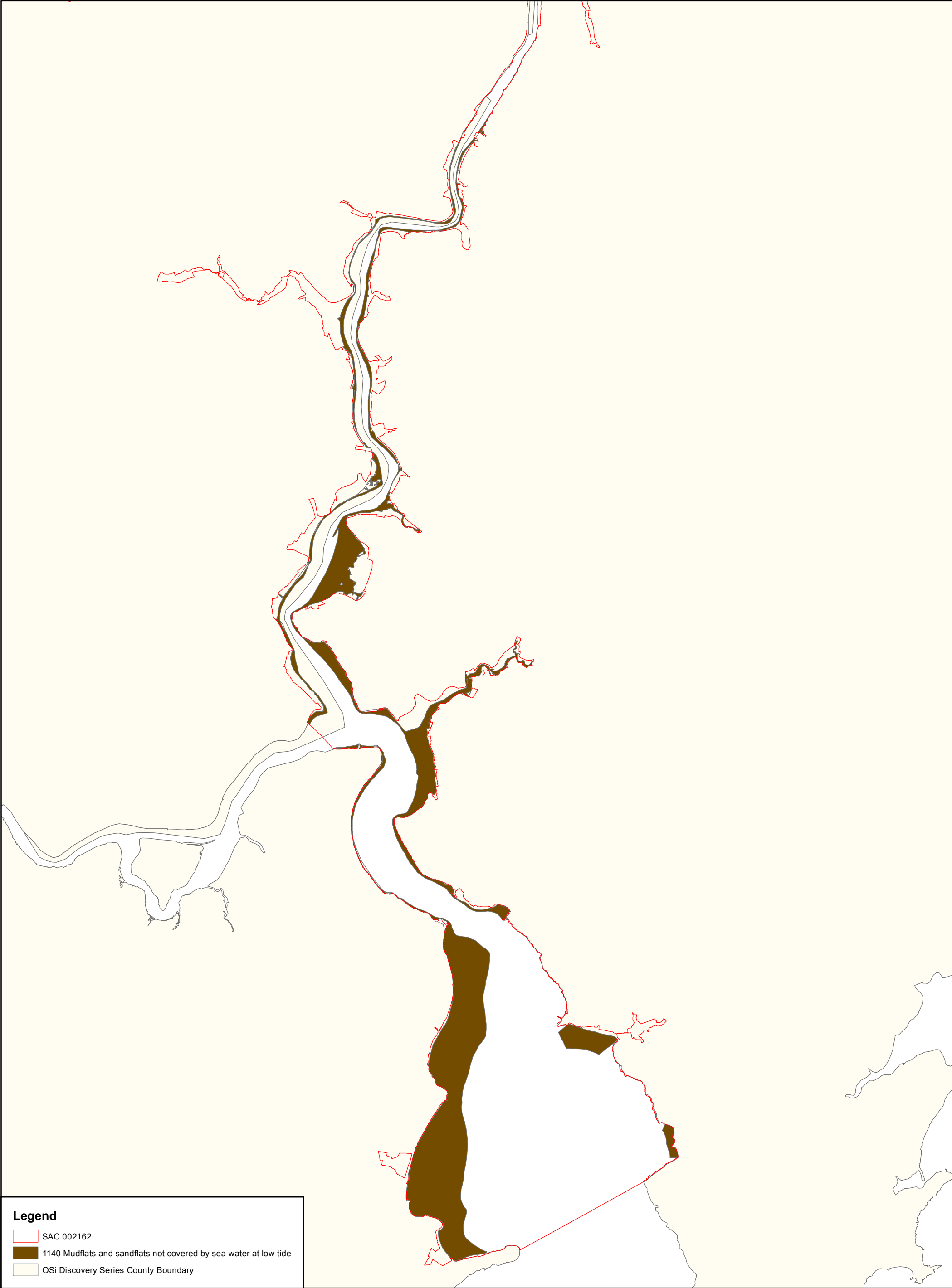
Attribute	Measure	Target	Notes
Woodland structure: veteran trees	Number per hectare	No decline	Mature and veteran trees are important habitats for bryophytes, lichens, saproxylic organisms and some bird species. Their retention is important to ensure continuity of habitats/niches and propagule sources
Woodland structure: indicators of local distinctiveness	Occurrence	No decline	Includes ancient or long-established woodlands, archaeological and geological features as well as red-listed and other rare or localised species. Perrin and Daly (2010) list sites 10, 15, 17, 127, 282, 516, 517, 518, 608 as potential ancient/long established woodlands
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover not less than 95%	Species reported in Perrin et al. (2008); Browne et al. (2000)
Vegetation composition: typical species	Occurrence	A variety of typical native species present, depending on woodland type, including ash (<i>Fraxinus excelsior</i>) alder (<i>Alnus glutinosa</i>), willows (<i>Salix</i> spp) and locally, oak (<i>Quercus robur</i>)	Species reported in Perrin et al. (2008); Browne et al. (2000)
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control	The following are the most common invasive species in this woodland type: sycamore (<i>Acer pseudoplatanus</i>), beech (<i>Fagus sylvatica</i>), rhododendron (<i>Rhododendron ponticum</i>), cherry laurel (<i>Prunus laurocerasus</i>), dogwood (<i>Cornus sericea</i>), Himalayan honeysuckle (<i>Leycesteria formosa</i>) and Himalayan balsam (<i>Impatiens grandiflora</i>)








Legend

- SAC 002162
- 1130 Estuaries
- OSi Discovery Series County Boundary



Legend

-  SAC 002162
-  1140 Mudflats and sandflats not covered by sea water at low tide
-  OSi Discovery Series County Boundary



MAP 3:
RIVER BARROW AND RIVER NORE
CONSERVATION OBJECTIVES
TIDAL MUDFLATS AND SANDFLATS

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

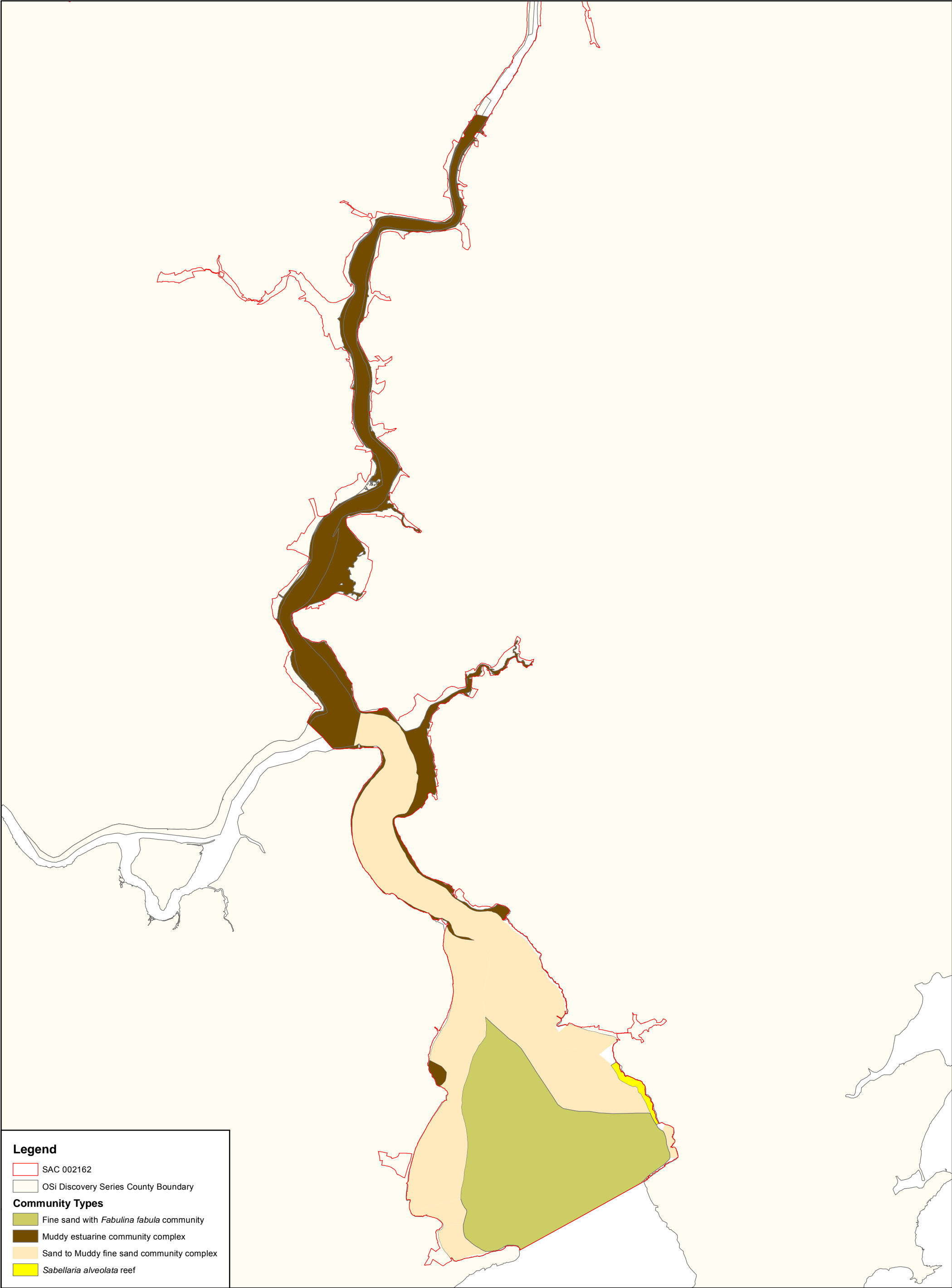
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CO. KILKENNY; version 1.1, CO. LAOIS; version 1.07,
CO. OFFALY; version 1.01, CO. TIPPERARY; version 1.01,
CO. WATERFORD; version 1.01, CO. WEXFORD; version 1.01



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Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar
comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis
le chead ón Rialtas (Ceadúnas Uimh. EN 0059208)



Map Version 1
Date: April 2011



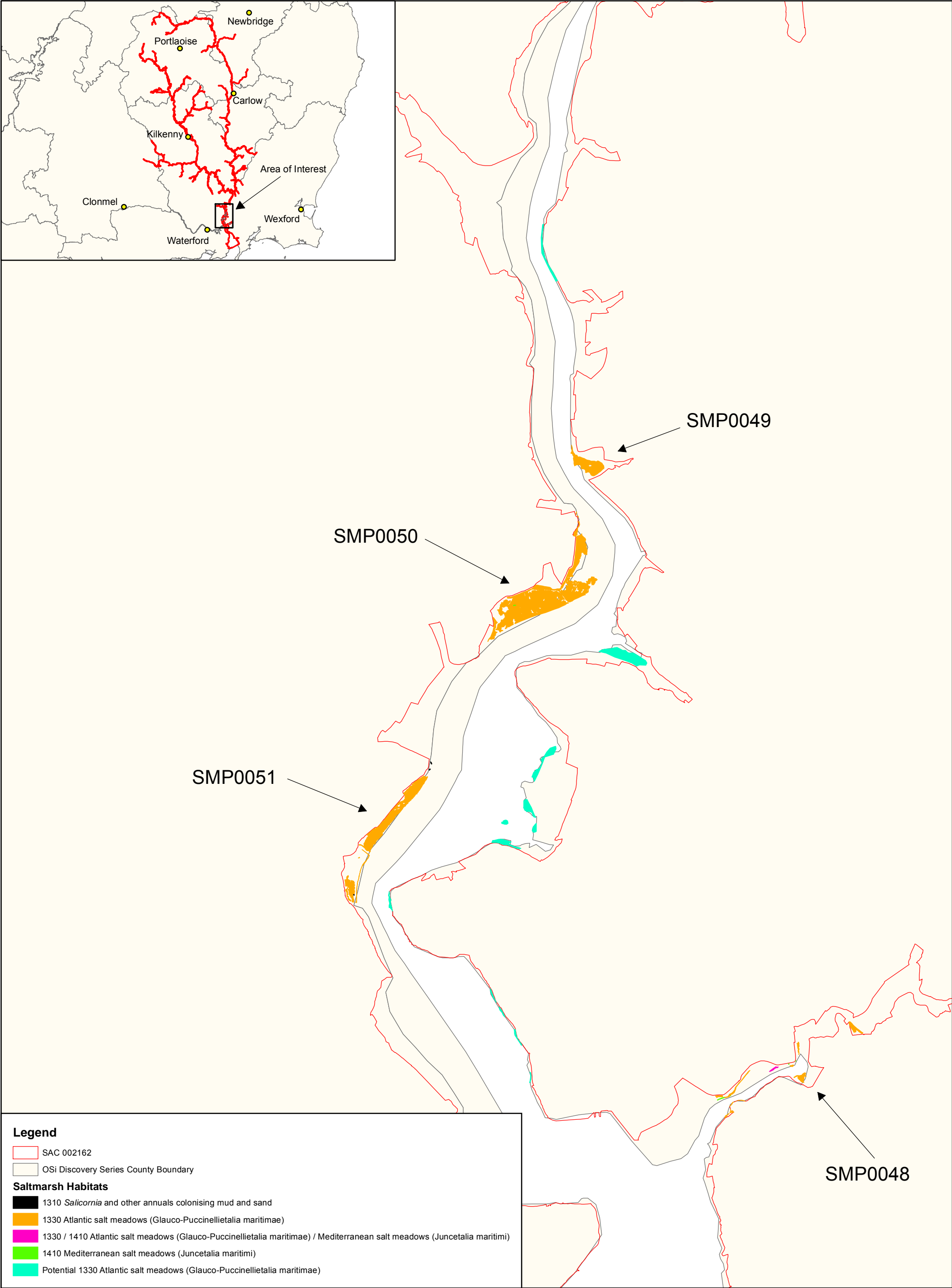
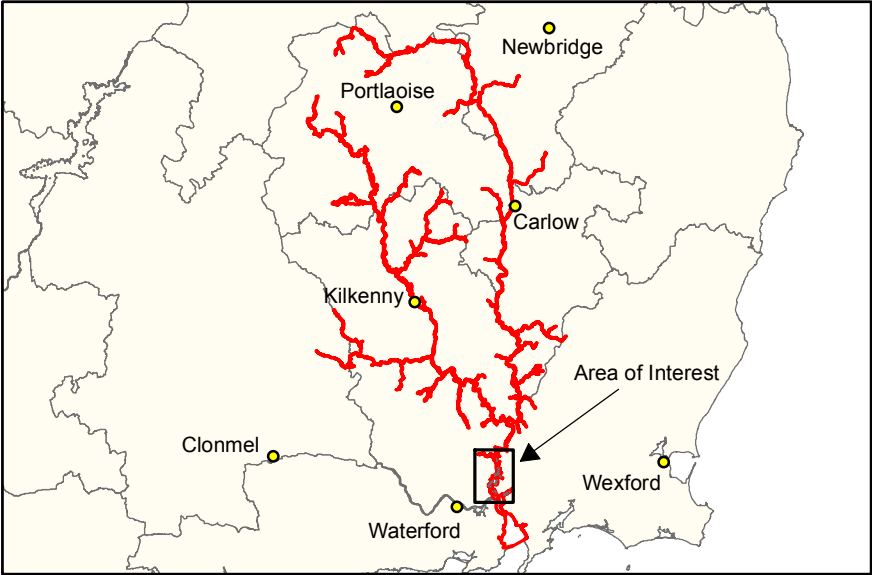
Legend

- SAC 002162
- OSi Discovery Series County Boundary

Community Types

- Fine sand with *Fabulina fabula* community
- Muddy estuarine community complex
- Sand to Muddy fine sand community complex
- Sabellaria alveolata* reef





Legend

SAC 002162

OSi Discovery Series County Boundary

Saltmarsh Habitats

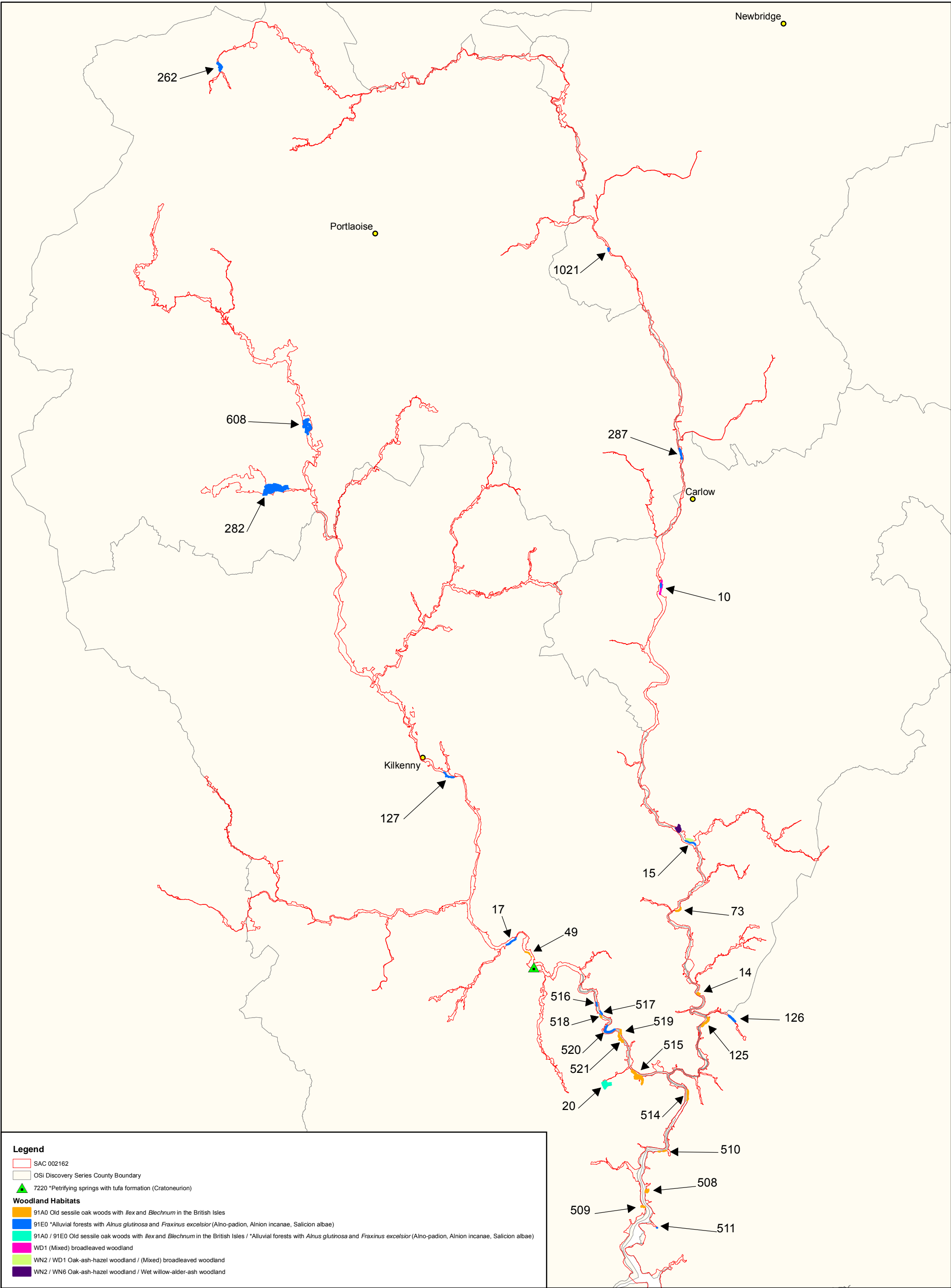
1310 *Salicornia* and other annuals colonising mud and sand

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

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

1410 Mediterranean salt meadows (*Juncetalia maritimi*)

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



Legend

SAC 002162

OSi Discovery Series County Boundary

7220 *Petrifying springs with tufa formation (Cratoneurion)

Woodland Habitats

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

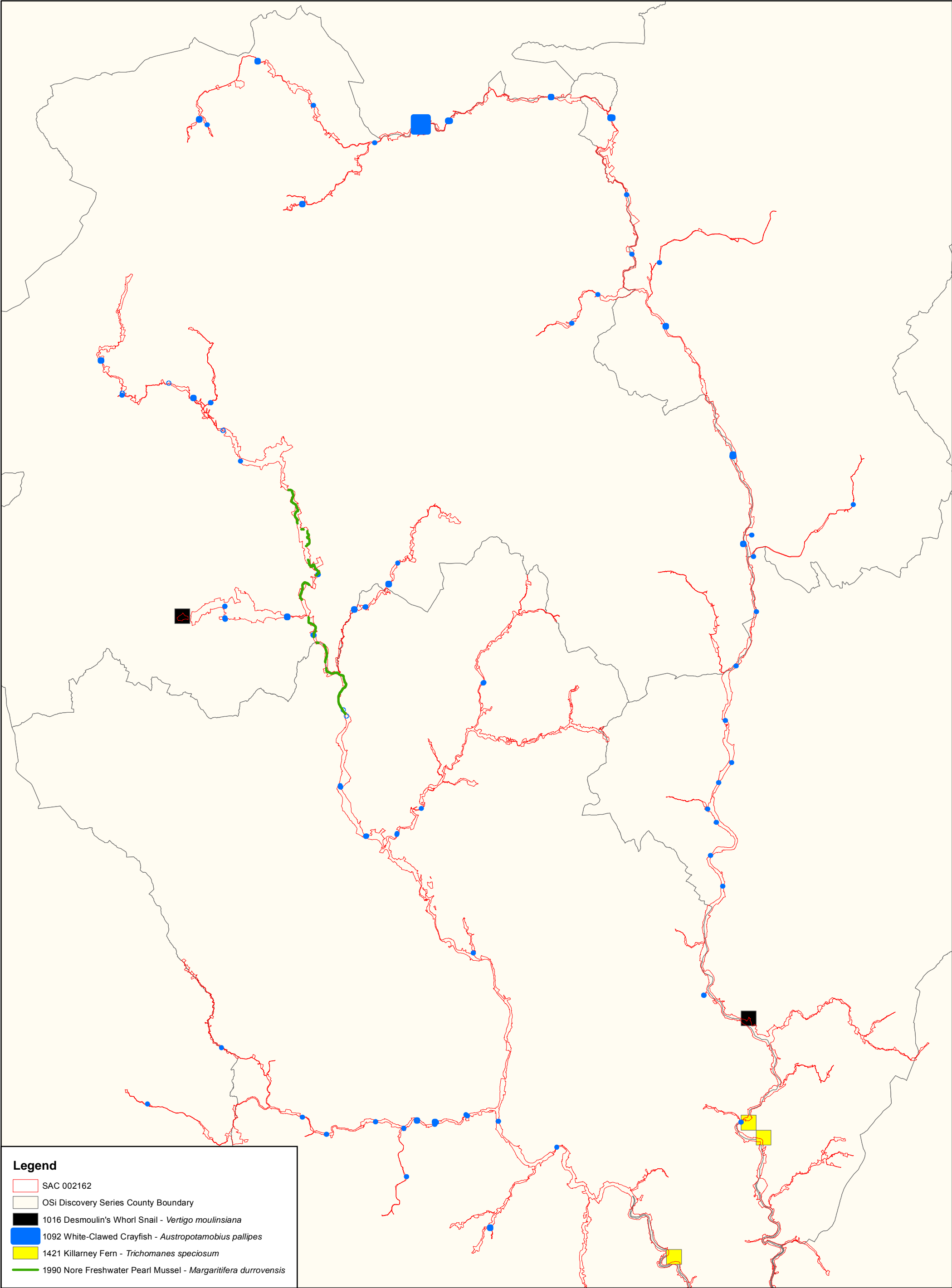
91E0 *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-padion, Alnion incanae, Salicion albae)

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

WD1 (Mixed) broadleaved woodland

WN2 / WD1 Oak-ash-hazel woodland / (Mixed) broadleaved woodland

WN2 / WN6 Oak-ash-hazel woodland / Wet willow-alder-ash woodland



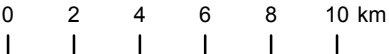
Legend

- SAC 002162
- OSi Discovery Series County Boundary
- 1016 Desmoulin's Whorl Snail - *Vertigo moulinsiana*
- 1092 White-Clawed Crayfish - *Austropotamobius pallipes*
- 1421 Killarney Fern - *Trichomanes speciosum*
- 1990 Nore Freshwater Pearl Mussel - *Margaritifera durrovensis*



MAP 7:
RIVER BARROW AND RIVER NORE
CONSERVATION OBJECTIVES
DESMOULIN'S WHORL SNAIL, WHITE-CLAWED CRAYFISH, NORE FRESHWATER PEARL MUSSEL & KILLARNEY FERN
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002162
CO. CARLOW; version 1.03, CO. KILDARE; version 1.04,
CO. KILKENNY; version 1.1, CO. LAOIS; version 1.07,
CO. OFFALY; version 1.01, CO. TIPPERARY; version 1.01,
CO. WATERFORD; version 1.01, CO. WEXFORD; version 1.01



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Map Version 1
Date: April 2011



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

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Department of Arts, Heritage and the Gaeltacht,
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