

NPWS

Carrowmore Point to Spanish Point and
Islands SAC
(site code 1021)

**Conservation objectives supporting document-
Coastal Lagoons**

Version 1
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1. Introduction

1.1 Carrowmore Point to Spanish Point and Islands SAC

This coastal SAC in Co. Clare extends from Spanish Point at its northern end to Carrowmore Point to the south. It encompasses a strip of coastline, several islands and a marine element which contains extensive reefs. The underlying geology is Carboniferous and this coastline experiences extreme Atlantic conditions, which in turn, leads to a highly dynamic coastline

The SAC is selected for four habitats listed on Annex I of the Habitats Directive; one of these being coastal lagoons.

“Coastal lagoons” (habitat code 1150) is a priority habitat in Annex I of the Habitats Directive. A coastal lagoon is a lake or pond that is fully or partially separated from the sea by a permeable barrier that can be entirely natural such as shingle, or can be an artificial embankment. Salinity varies depending on such factors such as freshwater inputs and barrier permeability. Lagoons support unique assemblages of flora and fauna, particularly invertebrates. In Ireland, coastal lagoons are considered to be in bad conservation status due to issues such as drainage and water pollution (NPWS, 2013).

There is one lagoon listed for this SAC (Oliver, 2007). The table below gives the conservation status assessment of Lough Donnell as outlined in that report. See map in Appendix 1 and Appendix 2 for an account of the lagoon (from Oliver, 2007).

Code ¹	Name	County	Conservation Assessment
IL035	Lough Donnell	Clare	Unfavourable- inadequate

¹ Codes are those used in Oliver, 2007.

1.2 Conservation objectives

A site-specific conservation objective aims to define the favourable conservation condition of a habitat or species at site level. The maintenance of habitats and species within sites at favourable condition will contribute to the maintenance of favourable conservation status of those habitats and species at a national level.

Conservation objectives are defined using attributes and targets that are based on parameters as set out in the Habitats Directive for defining favourable status, namely area, range, and structure and functions.

Provisional reference conditions for Irish lagoons are proposed by Roden and Oliver (2013). Reference conditions aim to define ecological status prior to human impacts (i.e. “natural” conditions). The targets for the water quality attributes given below are based on reference values given by Roden and Oliver (2013).

Attributes and targets may change/become more refined as further information becomes available.

2. Area

The target for habitat area is: stable or increasing, subject to natural processes. The favourable reference area for Lough Donnell is 12.5ha (calculated from spatial data derived from Oliver, 2007).

3. Range

The known distribution of lagoon habitat in Carrowmore Point to Spanish Point and Islands SAC (i.e. Lough Donnell) is shown in Appendix 1. There may be other lagoons in the site that have not yet been mapped by NPWS.

The target for the habitat distribution attribute is: no decline, subject to natural processes.

4. Structure and functions

Structure and functions relates to the physical components of a habitat (“structure”) and the ecological processes that drive it (“functions”). For lagoons these include attributes such as salinity, hydrology and various water quality attributes.

4.1 Salinity regime

Lagoons can vary considerably in salinity both within and between sites depending on the volume and timing of inflowing and outflowing fresh and seawater. Salinity is probably the most important variable in the classification of lagoon types (Roden and Oliver, 2013).

The target for the salinity regime attribute is: median annual salinity and temporal variation within natural range.

Salinity in Lough Donnell was reported as generally low, with some areas of high salinity near the barrier (Oliver, 2007, 2008).

The Annageeragh River is the main freshwater inflow to the lagoon. The main outflow from the lagoon to the sea was a large concrete pipe (known as “the Model”), which ran through the cobble barrier and was designed to prevent flooding of adjacent land. However, this structure was largely washed away by storms in December 2007 (O’Neill, 2007; Oliver, 2008), which caused a large volume of water to flow out of the lagoon at that time. However, following that breach, the shingle barrier seems to have re-sealed naturally and water levels rose, with an outflow channel being maintained by the river.

Seepage through the barrier appears to be the main source of seawater entering the lagoon (Oliver, 2008).

4.2 Hydrological regime

Fluctuations in water depth are a natural feature of lagoon hydrology. However, if water levels fluctuate beyond their natural values due to issues such as drainage, the condition of the habitat can deteriorate.

Lough Donnell is generally shallow and is subject to large fluctuations in water depth (noted especially when the barrier was breached in 2007 (Oliver, 2008)); see previous section.

The target for hydrological regime is: annual water level fluctuations and minima within natural ranges.

Further information is required to investigate historic fluctuations to enable more specific targets to be set. See Appendix 2 for the site report.

4.3 Barrier: connectivity between lagoon and sea

The morphology of the barrier between a lagoon and sea determines how it functions ecologically. Changes to the barrier can be due to natural processes such as storms, but they can also be modified through human intervention. Active management is sometimes necessary, particularly if the lagoon is artificial.

The barrier between Lough Donnell and the sea is an impressive cobble bank, described in Oliver (2007) as being approximately seven metres high and 40 metres wide. However, this is a high energy coastline and as such, the barrier is mobile and subject to modification by Atlantic storms. This was illustrated in December 2007 when storms virtually washed away the artificial structure, “the Model”, originally constructed through the barrier to prevent flooding in adjacent land (O’Neill, 2007; Oliver, 2008).

The target for the attribute barriers: connectivity between lagoon and sea is: appropriate hydrological connections between lagoons and sea, including where necessary, appropriate management.

See also site account in Appendix 2.

4.4 Water quality- Chlorophyll a

This attribute indicates the level of phytoplankton in the water column. Roden and Oliver (2013) make the assumption that, for shallow lagoons in “natural” condition, primary productivity is dominated by the benthos rather than the plankton. Phytoplankton tends to increase in density in response to increasing nutrient levels. Excessive shading from phytoplankton can reduce submergent macrophyte colonisation of the littoral zone of lagoons.

The target for the attribute water quality- Chlorophyll a is: annual median chlorophyll a within natural ranges and less than 5µg/L. Target based on Roden and Oliver (2013).

4.5 Water quality- Molybdate reactive phosphorus (MRP)

The target for the attribute water quality- Molybdate Reactive Phosphorus (MRP) is: annual median MRP within natural ranges and less than 0.1mg/L. The target is based on Roden and Oliver (2013).

This limit is required to ensure that excessive shading from phytoplankton does not reduce submergent colonisation of the littoral zone.

4.6 Water quality- Dissolved inorganic nitrogen (DIN)

The target for the attribute water quality- Dissolved Inorganic Nitrogen (DIN) is: annual median DIN within natural ranges and less than 0.15mg/L. The target is based on Roden and Oliver (2013).

As for phosphorus, the limit set for nitrogen is to ensure that excessive shading from phytoplankton does not reduce submergent colonisation.

4.7 Depth of macrophyte colonisation

Lough Donnell is described as shallow (most being less than 50cm in depth), thus, it is expected that macrophytes would extend down to its full depth.

The target for the attribute depth of macrophyte colonisation is: macrophyte colonisation to maximum depth of lagoon.

4.8 Typical plant species

As lagoon specialist species do not easily recolonise, their presence is one of the indicators of long term continuity of quality.

The target for the attribute typical plant species is: maintain number and extent of listed lagoonal specialists, subject to natural variation.

The flora of Lough Donnell is not considered to be of particularly high conservation value. Oliver (2007) reports the presence of *Ruppia maritima*, which is considered to be a lagoon specialist. See Appendix 2 for the site report.

4.9 Typical animal species

Some invertebrate species are regarded as lagoonal specialists and their presence can indicate long term quality. As species found within each lagoon can vary considerably, depending on other attributes such as salinity, the target is based on site-specific species lists.

The target for the attribute typical animal species is: maintain listed lagoon specialists, subject to natural variation

The species recorded at Lough Donnell are summarised in Oliver (2007). 32 taxa were identified with two of these (*Stigara stagnalis* and *Palaemonetes varians*) considered to be lagoonal specialists. See Appendix 2 for the site report.

4.10 Negative indicator species

Negative indicator species include non-native alien species as well as those that are not typical of the habitat. For example, accelerated encroachment by reedbeds can be caused by low salinity, shallow water and elevated nutrient levels.

The target for the attribute negative indicator species is: negative indicator species absent or under control.

5. References

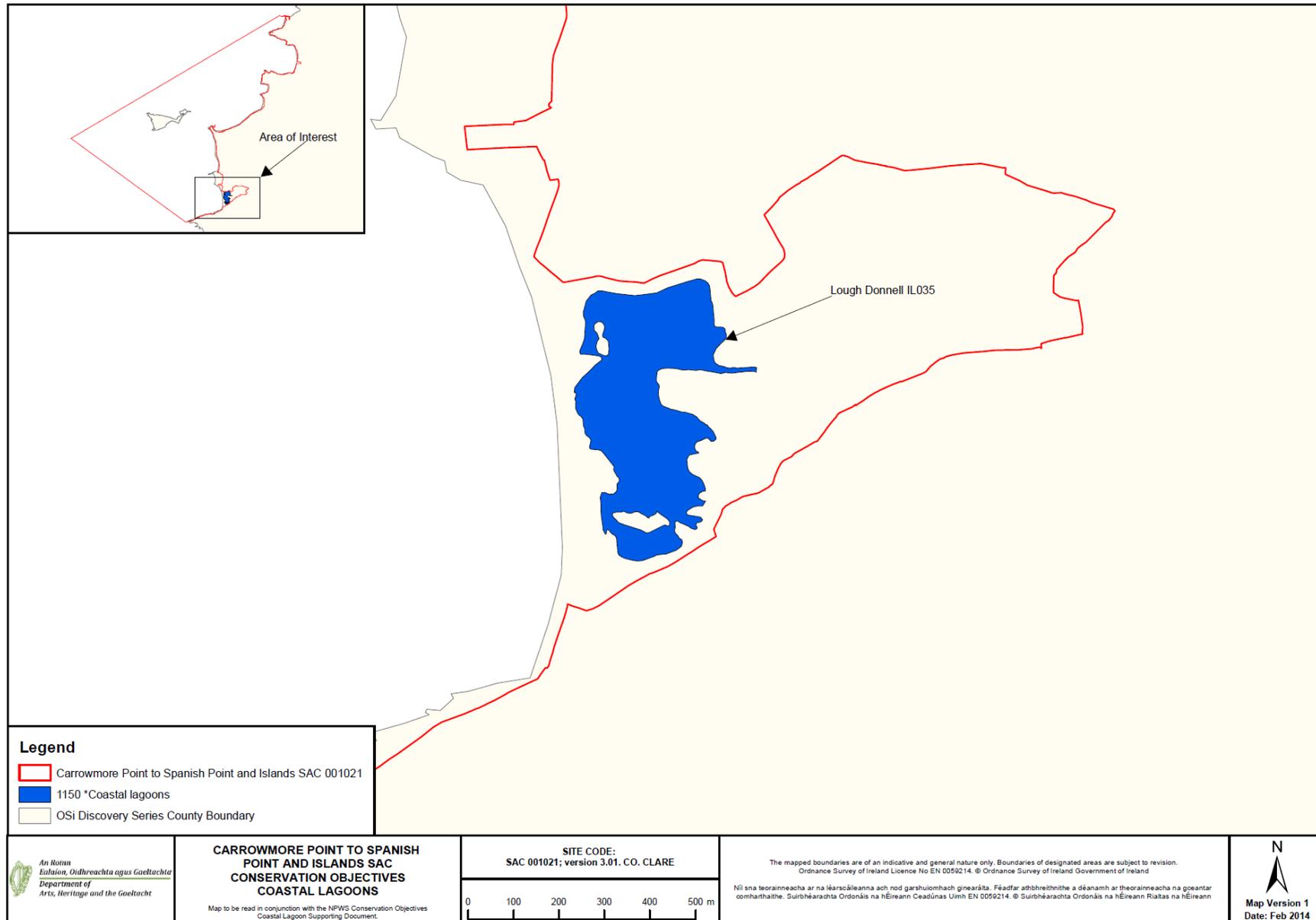
Roden, C.M. and Oliver, G. (2013) Monitoring and assessment of Irish lagoons for the purpose of the EU Water framework Directive. Unpublished report to the Environmental Protection Agency.

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O'Neill (2007) The Model- Annageeragh River, Quilty, Co. Clare. Structure erosion & collapse. Shannon Regional Fisheries Board.

Appendix 1 Lagoon distribution map



Appendix 2 Site report

The following is the site account from Oliver (2007)

Code¹	Name
IL035	Lough Donnell

¹ Code is that used in Oliver, 2007.

Lough Donnell was surveyed in 1996 for vegetation (Hatch 1996, Hatch & Healy 1998), aquatic fauna (Healy & Oliver 1996, Oliver & Healy 1998) and ecotonal coleoptera (Good 1996, Good & Butler 1998). Results of these surveys are summarised by Healy *et al.* (1997a,b,c), Healy & Oliver (1998) and Healy (1999, 2003).

Stations used for faunal sampling are not necessarily the same as those used for vegetation or ecotonal coleoptera.

Flora

Vegetation was surveyed by P. Hatch in 1996 (Hatch 1996, Hatch & Healy 1998). Water depth in 1996, over most of the lagoon was less than 50cm, except at the outlet and the freshwater inflow only. Therefore, the aquatic species of this lagoon were more comprehensively surveyed than those of most sites.

Ruppia maritima was the only aquatic higher plant species and is listed as a lagoonal specialist. It was widely distributed across the site, being completely absent from the vicinities of the outlet pipe and the freshwater inflow and the area of periodic flooding to the south only. *Ruppia* had a patchy cover to the north of the freshwater inflow and a more extensive cover to the south. It was typically low-growing.

Ruppia spp. are the most characteristic aquatic plant taxa of Irish coastal lagoons. The species are hard to distinguish when not flowering, and remain uncertain at some sites, but *Ruppia* of one species or the other (*R. maritima*, *R. maritima* var *brevirostris*, *R. cirrhosa*) was found at 62 of the 87 lagoons (71.3%) surveyed, and is one of the most useful indicators of coastal lagoon status. *Ruppia maritima* appears to be the more common of the species and was found at 41 of the lagoons surveyed.

There is a high diversity of swamp and other marginal communities. *Scirpus maritimus*, *Schoenoplectus* and *Phragmites australis* occur in mixed and single species stands on the eastern and southern shores. These are all fairly extensive in places. Eastern swamps grade to freshwater *Phragmites* fen. A community of salt tolerant species with dominant *Eleocharis uniglumis* and *Agrostis stolonifera* occurs in the south. An open shore community consisting of *Glaux maritima*, *Spergularia marina* and *Triglochin maritima* is found in the north and south of the site and *Puccinellia maritima* dominated saltmarsh vegetation borders part of the barrier shore.

Lough Donnell is an interesting site in terms of the diversity of its marginal communities. However, aquatic species composition is poor and based on vegetation the lagoon is rated as of **no conservation value**. (Hatch 1996).

Fauna

Aquatic fauna was sampled at five stations in Lough Donnell (Figure 35.2), by Healy & Oliver (1996, Oliver & Healy 1998), details of which are shown in Table 35.1

Table 35.1 Positions of sampling stations in Lough Donnell, with sampling date, salinity, depth of water and type of substratum.

	Sampling stations				
	Sta A	Sta B	Sta C	Sta D	Sta E
Sampling dates	8-9/8/96	8-9/8/96	8-9/8/96	8-9/8/96	8-9/8/96
GPS position	R 0041 7092	R 0441 7092	R 0399 7068	R 0022 7065	R 0056 7075
Salinity (psu)	2-6	3-4	3	5	5-6
Depth(cm)	0-100	25-100	25-50	25-50	10-40
Substratum	Sand, occasional stones	Soft organic silt	Firm sand	sand	Sand and cobles

A total of 32 taxa were recorded in Lough Donnell, of which 27 are identified to species (Table 35.2). Two of these species are lagoonal specialists (*Sigara stagnalis*, *Palaemonetes varians*), both of which are common species in Ireland. Two other species (*Notonecta viridis*, *Jaera normanni*) are proposed lagoonal specialists in Ireland, and appear to be relatively uncommon.

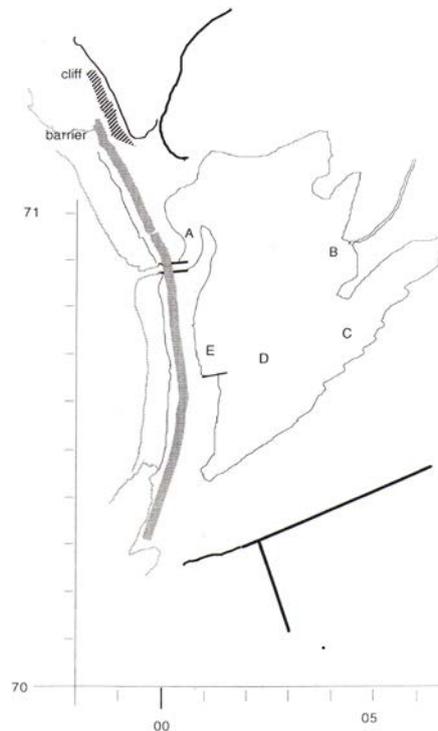


Figure 35.2 Sampling stations used at Lough Donnell.

Differences between stations are mainly correlated with habitat as the salinity was similar at all stations. *Sigara dorsalis*, *Notonecta viridis*, *Ischnura elegans* and four of the Coleoptera were only taken at B at the edge of the reed beds, while *Jaera nordmanni* and *Ligia oceanica* were confined to the seaward shore where they were found under cobbles. *Crangon crangon*, and *Palaemonetes varians* were only found at A, near the main tidal stream. *Potamopyrgus antipodarum*, *Neomysis integer* and *Sigara stagnalis* were common throughout the lake. Chironomid larvae constituted the only fauna in the sediment.

Jaera nordmanni. Isopod crustacean recorded at 24 of the 87 lagoons surveyed (27.6%) and may occur at others where it was not recorded due to the fact that only adult males are easily identified. This species may occur in freshwater, as in L. Errol, Cape Clear, Co. Cork. Described in England (Barnes 1994, Hayward and Ryland 1995) as occurring in streams flowing down the shoreline, on south and west coasts only. All records in Ireland are from West Cork to Donegal. Proposed as a lagoonal specialist for Ireland by Oliver and Healy (1998).

Palaemonetes varians Decapod crustacean listed as a lagoonal specialist in the U.K. by Barnes (1989 and Bamber (1997), but apparently is no longer regarded as such. Although found in estuaries, this species appears to be far more characteristic of lagoons in Ireland, found in 64 of the 87 lagoons surveyed (73.6%) and may require a lagoonal environment for reproduction. Therefore, it remains on the proposed list of lagoonal specialists for Ireland.

Notonecta viridis Hemipteran insect (back-swimmer) recorded on the east coast at Kilcoole, on the south coast at North Slob, Lady's Island L., Tacumshin L., Ballyteige, Clogheen/White's Marsh and Kilkieran L. and also on the west coast at Reenydonegan, Co. Cork and L. Donnell, Co. Clare. A rare brackish water species in

Ireland. According to Southwood and Leston (1959), it was recorded only for Wexford and North Kerry. Recorded previously in Lady's Island L (Healy *et al.* 1982) in Lady's Island L. and the North Slob by Galvin (1992) and from the Dingle Peninsula by McCarthy and Walton (1980). *N. viridis* is found at inland sites in the U.K. but appears to be largely restricted to lagoons in Ireland, and was proposed as a lagoonal specialist for Ireland by Oliver and Healy (1998).

Table 35.2 Aquatic Fauna Recorded at Lough Donnell, Co. Clare. June and September, 1996.

L.T. = Light Trap, () = records for June, + = present, o = occasional, c = common, a = abundant, F = fyke net. Species in bold text are lagoonal specialists or notable species.

	Sampling Stations								
	A	L.T.A	B	L.T.B	C	L.T.C	D	L.T.D	E
Crustacea									
Mysidacea <i>Neomysis integer</i>	+		c		c	c100	a	a	
Isopoda <i>Jaera nordmanni</i>	+						+		
Amphipoda <i>Gammarus duebeni</i>	+		+						+
Decapoda <i>Carcinus maenas</i>	+		+						
<i>Crangon crangon</i>	+		(+)						
<i>Palaemonetes varians</i>	1								
Acarina									
					+				
Insecta									
Odonata <i>Ischnura elegans</i>			o						
<i>sp. 2</i>			1						
Trichoptera (cases)	+		+						
Hemiptera Corixidae	a	150	o	2	a	50	a	40	
<i>Sigara stagnalis</i>	+		+		+		+		
<i>S. dorsalis</i>			+						
<i>Notonecta viridis</i>			o						
Coleoptera <i>Dryops luridus</i>	+								
<i>*Gyrinus caspius</i>									
<i>Haliplus flavicollis</i>							+		
<i>H. lineatocollis</i>				+					
<i>H. ruficollis</i>				+	+				
<i>H. wehnckeii</i>	+			+					
<i>Helophorus brevipalpis</i>	+								
<i>Hygrotus inaequalis</i>				+					
<i>Noterus clavicornis</i>			+						
Diptera Chironomidae	+		+		o		a		
Culicidae	+	10							
<i>Ephydra riparia</i>	+								
Mollusca									
Prosobranchia Hydrobiidae	a		a		o		o		
<i>Potamopyrgus antipodarum</i>	+		+		+		+		
Teleostei									
<i>Anguilla anguilla</i>			F, 4						
<i>Dicentrarchus labrax</i>			F, 1						
<i>Gasterosteus aculeatus</i>	+	5	+		+	15	o	7	
Mugilidae	F, 1		F, 7						
<i>Platichthys flesus</i>	F, 1		F, 6		+				
<i>Pomatoschistus microps</i>	+	2	+		+	1	+	2	

The faunal assemblage reflects the predominance of freshwater over marine influence throughout the lake. Although seawater may enter on most tides, it is flushed out by the

river water and no fucoids or marine fauna were established near the sea inlet. The fauna was moderately rich and typical of a lagoon with persistently low salinity but with an open inlet allowing some colonisation from the sea.

Based on aquatic invertebrate fauna Lough Donnell is rated as of **moderate conservation interest**.

Ecotonal Coleoptera

Five species of carabid and twenty-four species of staphylinid were recorded by Good and Butler (1998). Two species (*Bembidion bipunctatum*, *Cypha punctatum*) are regarded as indicator species. The former appears to be widespread but local and found in coastal shingle and brackish pools, but also inland. The other, *C. punctatum*, appears to be rare in Europe, with only one published Irish record (Allen, 1975).

Based on ecotonal coleoptera, the site was described as of **low conservation interest** (Good & Butler 1998, Healy *et al.* 1997).

Summary

Despite the artificial inlet running through the barrier and the number of tourists visiting this part of the coast during the summer, Lough Donnell is still relatively natural and unspoilt by adverse developments. The lagoon is of relatively **low conservation value** based on its invertebrate fauna, vegetation and ecotonal coleoptera. It is of higher value ornithologically and perhaps for commercially valuable fish species. Although possibly becoming increasingly shallow due to siltation, it is still a classic lagoon with one of the most impressive cobble barriers of the entire coastline. Based on the geomorphology and scenic value of the lagoonal barrier, Lough Donnell is rated as of **exceptional conservation value**.

Although, biologically, Lough Donnell is of low conservation value, geomorphologically it is exceptional. Overall value is therefore rated as high.

Overall Conservation Value = High

Conservation Status Assessment (from Oliver 2007)

Impacts	Moderate eutrophication in shallow lagoon but significant tidal flushing. Appears to be becoming increasingly shallow due to siltation. Poaching by cattle.
Conservation Status	Unfavourable-Inadequate

Further Information

Lough Donnell was surveyed in 1996 for vegetation (Hatch 1996, Hatch & Healy 1998), aquatic fauna (Healy & Oliver 1996, Oliver & Healy 1998) and ecotonal coleoptera (Good 1996, Good & Butler 1998). Results of these surveys are summarised by Healy *et al.* (1997a,b,c), Healy & Oliver (1998), and Healy (1999, 2003). Included in a biological classification of Irish coastal lagoons (Oliver 2005) and in the Conservation Status Assessment (Oliver 2007).

Barrier breached in December 2007, draining the lagoon. Lagoonal status and future now uncertain. (see Oliver 2008).

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