APPENDIX 1

AQUATIC AND FISHERIES SURVEYS

Aquatic Macroinvertebrate Sampling Report

MeenbogWind Farm, Co. Donegal

McCarthy Keville O'Sullivan

Planning & Environmental Consultants

DOCUMENT DETAILS

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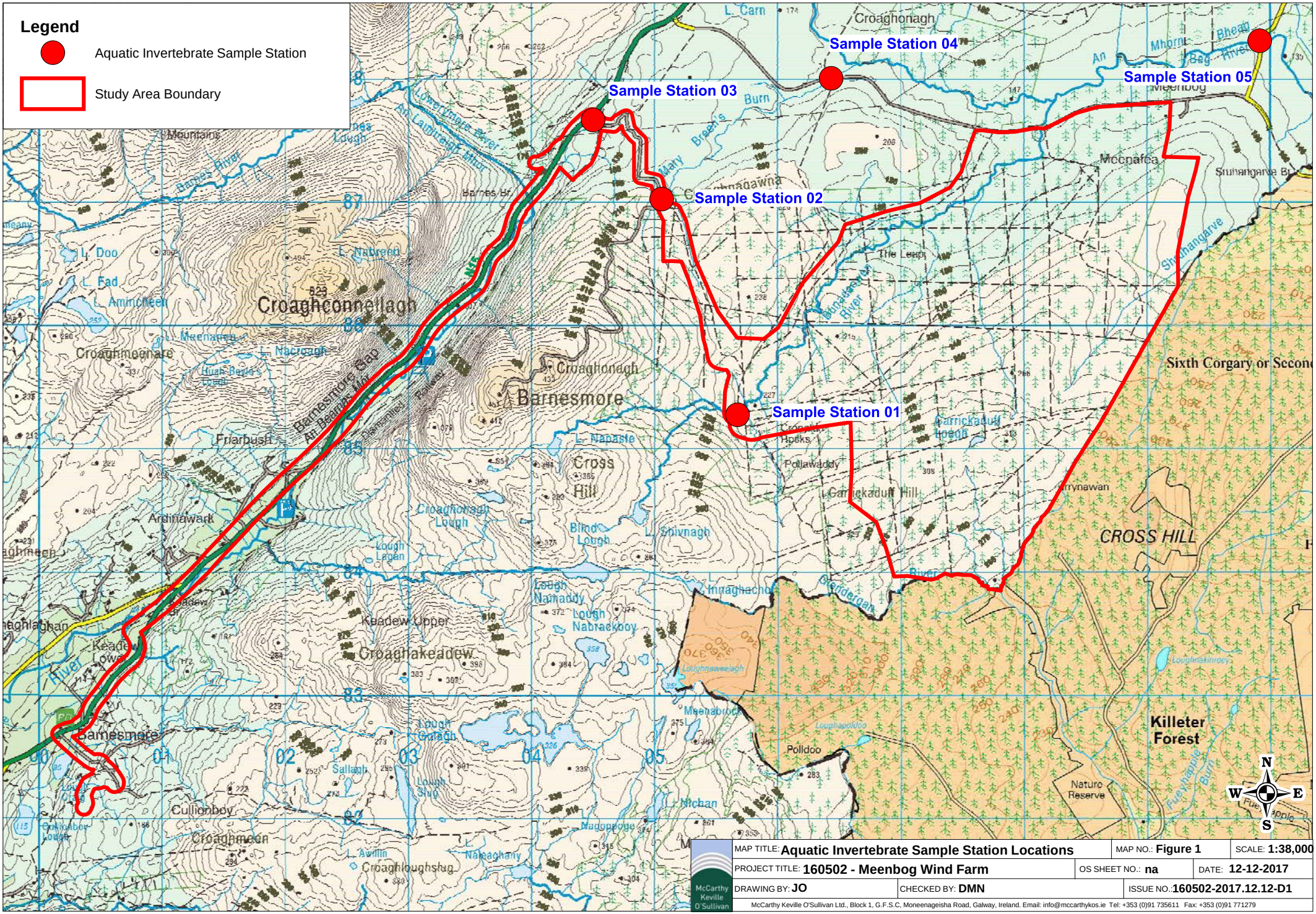
1 INTRODUCTION

1.1 Survey Background and Methodology

McCarthy Keville O'Sullivan Ltd. were appointed by Planree Ltd to conduct surveys for aquatic macroinvertebrates for Q-Value determination Mourne Beg/Derg catchment, Co. Donegal. The survey work was conducted by suitably qualified ecologists, Dr. Chris Peppiatt B.Sc., M.Sc. PhD MCIEEM, Mr John Hynes B.Sc., M.Sc., and Ms. Laoise Kelly B.Sc..

Sampling was carried out downstream of the study area at 5 sites on the 16-18th of September 2014. The method used was the same as that used by the EPA for their national water sampling regime (Toner *et al.* 2003). A two minute kick sample was collected from a stream bed area of approximately one square metre with a standard handnet (250 mm x 250 mm, with a 300 mm bag depth and a 1 mm mesh size). Rock washing was also carried out. The aquatic macroinvertebrates collected were sorted, stored in a 70% alcohol solution and identified using a binocular dissecting microscope.

Figure 1. provides a site location map showing the location of the surveys.



MAP TITLE: **Aquatic Invertebrate Sample Station Locations**		MAP NO.: **Figure 1**	SCALE: **1:38,000**
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2 RESULTS

The following sections outline the findings of the surveys.

2.1 Sample Station 1 (Mourne Beg/Derg catchment)

Sample Station 1 was located along a suitable riffle area within the Bunadaowen Stream, (Grid Ref: E 205677 N 385281). The watercourse was approximately 2-3 metres wide with a wet width of 2.5 metres and an average depth of 0.1 metres (Plate 2.1). The benthic substrate was dominated by exposed bedrock, boulders cobble and gravel. There was no cattle access to the channel and no instream rubbish. The substrate was loose with no compaction. There was a low discharge, moderate flow rate and the water was slightly coloured.

The only instream macrophyte was the aquatic moss *Fontinalis antipyretica*. The benthic substrate had a luxuriant covering of filamentous algae (*Cladophora* sp.). No emergent vegetation was recorded. The bankside vegetation was dominated by Creeping Buttercup (*Ranunculus repens*), Compact Rush (*Juncus conglomeratus*), Gorse (*Ulex europaeus*), Bent Grasses (*Agrostis* spp.) and Soft Rush (*Juncus effusus*) The adjoining habitats were dominated by Conifer Plantation (WD4).

The Q rating assigned to the channel was Q3-4. It was assigned this value as Group A invertebrates were few, Group B invertebrates were few and Group C invertebrates were dominant. Group D invertebrates were absent and Group E invertebrates (the most pollution tolerant) were few (Table 2.1).

Table 2.1: Invertebrate Sample Station 1 Results

Indicator Group	Taxon	Dominance
Group A - Very Pollution Sensitive	*Plecoptera*	Few
Group B - Moderately Pollution Sensitive	*Tricoptera* (Cased spp.)	Few
	Plecoptera (Leuctra)	Few
Group C - Moderately Pollution Tolerant	*Baetis rhodani*	Few
	Tricoptera (Uncased spp.)	Few
	Chironomidae (ex. Chironomus)	Few
	Simuliidae	Few
	Hydracarina	Few
Group D - Very Pollution Tolerant	*None*	None
Group E - Most Pollution Tolerant	*Oligochaeta*	Few

Plate 2.1: Sample Station 01

2.2 Sample Station 2 (Mourne Beg/Derg catchment)

Sample Station 2 was located along a suitable riffle area within Mary Breen's Burn (Grid Ref: E205062 N387033). The watercourse was approximately 0.5 metres wide with a wet width of 0.4 metres and an average depth of 0.1 metres (see Plate 2.2). The benthic substrate was dominated by boulders cobble and gravel. There was no cattle access to the channel and no instream rubbish. The substrate was loose with no compaction. There was a low discharge, moderate flow rate and the water was slightly coloured.

The only instream macrophytes were the aquatic moss *Fontinalis antipyretica* and filamentous algae (*Cladophora* sp.). The algal growth was luxuriant and suggests eutrophication of the stream. Horsetail (*Equisetum* sp.) was recorded in the emergent vegetation. The bankside vegetation was dominated by Bramble (*Rubus fruticosus agg.*), Sweet Vernal-grass (*Anthoxanthum odoratum*), Wild Angelica (*Angelica sylvestris*), Willow (*Salix* spp.), and Soft Rush (*Juncus effusus*). The adjoining habitats were dominated Wet grassland (GS4), Cutover Bog (PB4) and Conifer plantations (WD4).

The Q rating assigned to the channel was Q3-4. It was assigned this value as Group A invertebrates were few, Group B invertebrates were few and Group C invertebrates were few. Group D invertebrates were absent and Group E invertebrates (the most pollution tolerant) were few (table 2.2).

Table 2.2: Invertebrate Sample Station 2 Results

Indicator Group	Taxon	Dominance
Group A - Very Pollution Sensitive	*Plecoptera*	Few
Group B - Moderately Pollution Sensitive	*Plecoptera (Leuctra)*	Few
Group C - Moderately Pollution Tolerant	*Hydracarina*	Few
Group D - Very Pollution Tolerant	*None*	None
Group E - Most Pollution Tolerant	Oligochaeta	Few

Plate 2.2: Sample Station 2

2.3 Sample Station 3 (Mourne Beg/Derg catchment)

Sample Station 3 was located along a suitable riffle area within and unnamed stream located adjacent to the N15 National Primary Route, (Grid Ref: E 204505 N 387675). The watercourse was approximately 2-3 metres wide with a wet width of 2.5 metres and an average depth of 0.1 metres (Plate 2.3). The benthic substrate was dominated by boulders cobble and gravel. There was no cattle access to the channel and no instream rubbish. The substrate was loose with no compaction. There was a low discharge, moderate flow rate and the water was slightly coloured.

The only instream macrophyte was the aquatic moss *Fontinalis antipyretica*. The benthic substrate had a luxuriant covering of filamentous algae (*Cladophora* sp.). There was a strong Iron influence instream No emergent vegetation was recorded. The bankside vegetation was dominated by Brambles (*Rubus fruticusus* agg.), Compact Rush (*Juncus conglomeratus*), Gorse (*Ulex europaeus*), Bent Grasses (*Agrostis* spp.) and Soft Rush (*Juncus effusus*). The adjoining habitats were dominated by Wet Grassland (GS4), Scrub (WS1) and Blanket Bog (PB2).

The Q rating assigned to the channel was Q3-4. It was assigned this value as Group A invertebrates were few, Group B invertebrates were few and Group C invertebrates were few. Group D invertebrates and Group E invertebrates (the most pollution tolerant) were absent (table 2.3).

Table 2.3: Invertebrate Sample Station 3 Results

Indicator Group	Taxon	Dominance
Group A - Very Pollution Sensitive	*Plecoptera*	Few
Group B - Moderately Pollution Sensitive	*Plecoptera (Leuctra)*	Few
Group C - Moderately Pollution Tolerant	*Baetis rhodani*	Few
	Tricoptera (Uncased spp.)	Few
	Chironomidae (ex. Chironomus)	Few
	Simuliidae	Few
	Hydracarina	Few
Group D - Very Pollution Tolerant	*None*	None
Group E - Most Pollution Tolerant	*None*	None

Plate 2.3: Sample Station 03

2.4 Sample Station 4 (Mourne Beg/Derg catchment)

Sample Station 4 was located along a suitable riffle area within Mary Breen's Burn (Grid Ref: E 206437 N 388014). The watercourse was approximately 1-1.5 metres wide with a wet width of one metre and an average depth of 0.1 metres (Plate 2.4). The benthic substrate was dominated by boulders cobble and gravel. There was no cattle

access to the channel and instream rubbish was observed. The substrate was relatively loose with little compaction. There was a low discharge, moderate flow rate and the water was slightly coloured.

The only instream macrophyte was the aquatic moss *Fontinalis antipyretica*. The benthic substrate had a luxuriant covering of filamentous algae (*Cladophora* sp.). There was a strong Iron influence No emergent vegetation was recorded. The bankside vegetation was dominated by Brambles, Compact Rush (*Juncus conglomeratus*), Bent Grasses (*Agrostis* spp.) and Soft Rush (*Juncus effusus*) The adjoining habitats were dominated by Wet Grassland (GS4) and Blanket Bog (PB2).

The Q rating assigned to the channel was Q3-4. It was assigned this value as Group A invertebrates were few, Group B invertebrates were few and Group C invertebrates were few. Group D invertebrates were and Group E invertebrates (the most pollution tolerant) were absent (table 2.4).

Table 2.4: Invertebrate Sample Station 3 Results

Indicator Group	Taxon	Dominance
Group A - Very Pollution Sensitive	*Plecoptera*	Few
Group B - Moderately Pollution Sensitive	*None*	None
Group C - Moderately Pollution Tolerant	*Tricoptera* (Uncased spp.)	Few
	Hydracarina	Few
Group D - Very Pollution Tolerant	*None*	None
Group E - Most Pollution Tolerant	*None*	None

Plate 2.4: Sample Station 04

2.5 Sample Station 5 (Mourne Beg/Derg catchment)

Sample Station 5 was located along a suitable riffle area within the Mourne Beg River, (Grid Ref: E 209917 N 388319). The watercourse was approximately 12-15 metres wide with a wet width of 14 metres and an average depth of 0.4 metres (Plate 2.5). The benthic substrate was dominated by boulders, cobble and gravel. There was no cattle access to the channel and no instream rubbish. The substrate was loose with no compaction. There was a low discharge, moderate flow rate and the water was slightly coloured.

The only instream macrophytes were *Sparganium angustifolium* and the aquatic moss *Fontinalis antipyretica*. The benthic substrate had a covering of filamentous algae (*Cladophora* sp.). The algal growth was luxuriant and suggests eutrophication of the stream. No emergent vegetation was recorded. The bankside vegetation was dominated by Compact Rush (*Juncus conglomeratus*), Bent Grasses (*Agrostis* spp.) and Soft Rush (*Juncus effusus*). The adjoining habitats were dominated by Conifer Plantation(WD4) and Wet Grassland (GS4).

The Q rating assigned to the channel was Q3-4. It was assigned this value as Group A invertebrates were few, Group B invertebrates were few and Group C invertebrates were dominant. Group D invertebrates were absent and Group E invertebrates (the most pollution tolerant) were few (table 2.5).

Table 2.5: Invertebrate Sample Station 6 Results

Indicator Group	Taxon	Dominance
Group A - Very Pollution Sensitive	*None*	None
Group B - Moderately Pollution Sensitive	*Plecoptera (Leuctra)*	Few
Group C - Moderately Pollution Tolerant	*Baetis rhodani*	Common
	Tricoptera (Uncased spp.)	Few
	Chironomidae (ex. Chironomus)	Few
	Simuliidae	Few
	Coleoptera	Few
	Hydracarina	Few
Group D - Very Pollution Tolerant	*None*	None
Group E - Most Pollution Tolerant	*None*	None

Plate 2.5: Sample Station 05

3 CONCLUSIONS

Samples at 5 stations within the Mourne Beg/Derg catchment were surveyed. The survey was conducted in accordance with the methodology set out by the EPA in its survey guidelines.

There are a number E.P.A. Q-value monitoring sites for both catchments in the wider area. The most relevant sites for comparison are discussed here. The river sampling station "Bridge SW of Tonreagh" (Mourne Beg/Derg catchment, Grid Ref. E209903 N388300, the same position as Sample Station 5, above) was sampled in 2013 and a Q-Value of 3 (poor) was assigned, c.f. a value of 3-4 for Sample Station 5 in 2014. The data from these 5 sampling sites provides a baseline against which any water quality changes occurring in the future can be measured.

References

Toner, J. Bowman, K. Clabby, J. Lucey, M. McGarrigle, C. Concannon, C. Clenaghan, P. Cunningham, J. Delaney, S. O'Boyle, M. MacCárthaigh, M. Craig, R. Quinn (2005). Water Quality in Ireland 2001-2003. Environmental Protection Agency

MEENBOG WIND FARM
Fisheries Assessment

pauljohnstonassociates
FISHERIES CONSULTANTS

November 2017

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1 STATEMENT OF AUTHORITY

Paul Johnston Associates is an independent fisheries consultancy specialising in freshwater fisheries in Ireland, and providing a range of specialist services related to fish stock assessment, impact assessment and fisheries management.

The practice has completed a wide range of assignments in the areas of environmental impact assessment, fisheries development and catchment management, including fisheries assessments in connection to a series of land-based wind farm developments in Northern Ireland.

2 INTRODUCTION

The proposed Meenbog Wind Farm is located within the catchment of the River Derg which has been designated as a Special Area of Conservation with Atlantic salmon noted as the primary reason for selection of the site.

This chapter assesses the effects of the proposed wind farm on fish stocks and habitats in the river network both within the site boundary and in other areas of the catchment directly connected to the site.

Impacts on fisheries may be caused by:

- Loss of fish through pollution from the site during the construction phase;
- Loss of fish or damage to fish habitats through run-off of suspended solids due to site construction works;
- Reduced productivity due to obstruction of fish passage or loss of habitat in watercourses.

3 LOCATION & FISHERIES ADMINISTRATION

3.1 Location

The proposed wind farm is located adjacent to the border in Co Donegal, at its nearest point 8 km to the south-west of Ballybofey, 14 km north-east of Donegal town and 16 km west of Castlederg in Co Tyrone. The core wind farm development site lies entirely within the catchment of the River Derg (Fig 1), which is a cross border catchment between the Republic of Ireland and Northern Ireland.

3.2 Loughs Agency

The Derg forms part of the wider Foyle river system which is administered by the cross-border Loughs Agency.

Under Section 11 (6) of the Foyle Fisheries Act (Northern Ireland) 1952 and the Foyle Fisheries Act 1952 (Republic of Ireland), the Foyle Fisheries Commission was given the responsibility for "the conservation, protection and improvement of the Fisheries of the Foyle Area generally". The North/South Co-operation (Implementation Bodies) (Northern Ireland) Order 1999 and the British Irish Agreement Act 1999 extended these functions to include the Carlingford Area, and the Foyle Fisheries Commission transferred its functions to the Loughs Agency.

The Loughs Agency is an agency of the Foyle, Carlingford and Irish Lights Commission (FCILC), established under the 1998 Agreement between the Government of the United Kingdom of Great Britain and Northern Ireland and the Government of Ireland.

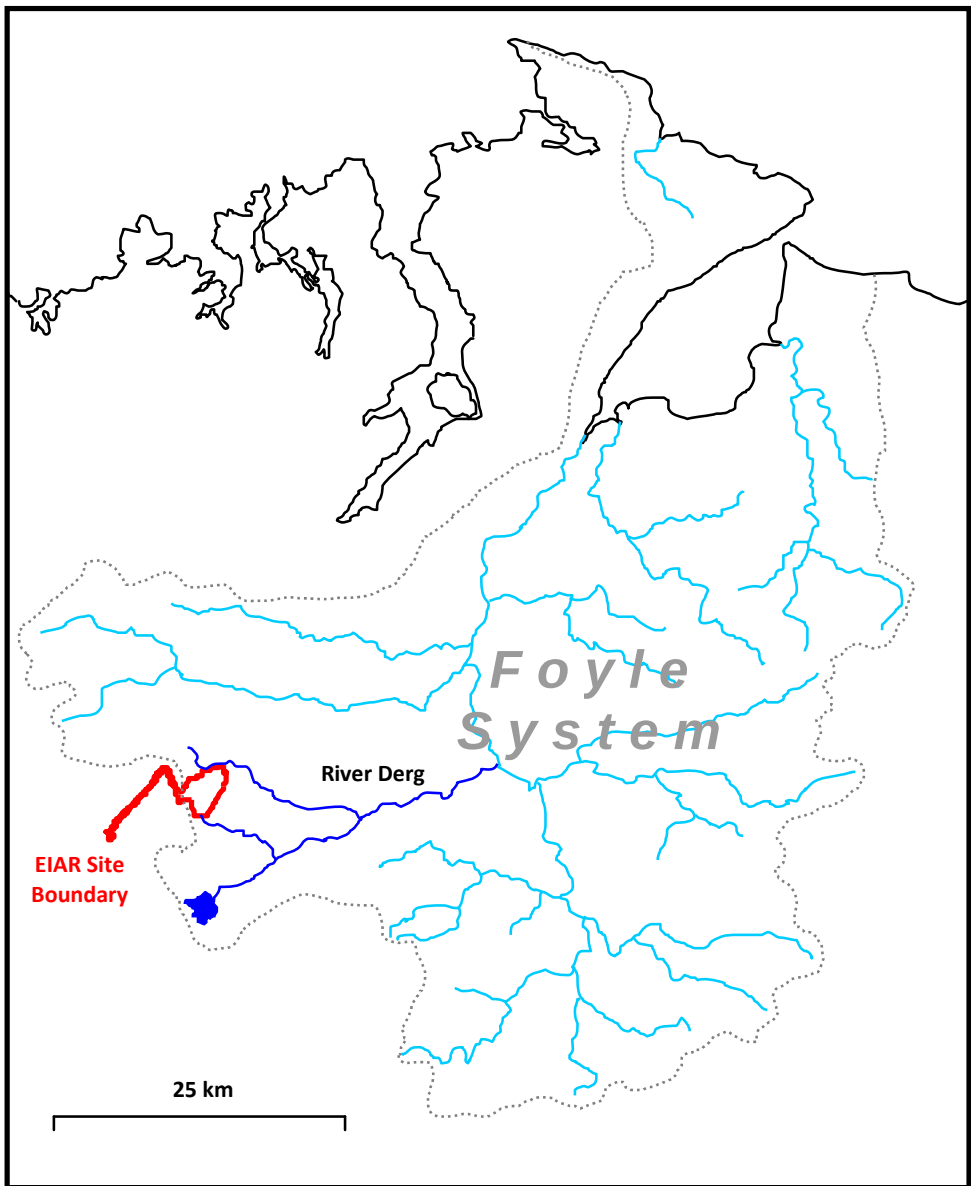

Figure 1: Location of proposed Meenbog wind farm (EIAR Site Boundary) in relation to the River Derg, and the wider Foyle catchment.

3.3 Fisheries Status

The Foyle in general is one of the most productive salmon and trout river systems in the world and has some of the best angling water in Ireland. The Derg is one of the most popular recreational fisheries for salmon and sea trout in the Foyle system, with peak runs of fish during the summer months.

4 CONSERVATION STATUS

4.1 WFD Ecological Status

Within the Derg catchment the development site traverses a total of 5 separate waterbodies as delineated under the Water Framework Directive (WFD). The Ecological Status of these waterbodies during the 2010-15 cycle is shown in Table 1.

Waterbody	ID code	Ecological Status
Glendergan	IE_XB_01_5	Moderate
Bunadaowen	IE_NW_01_1373	Poor
Mourne Beg	IE_NW_01_691	Poor
Mourne Beg	IE_NW_01_623	Poor
River Beg	IE_XB_01_4	Poor

Table 1: Ecological status of Derg catchment waterbodies partially included within proposed wind farm development boundary (Source: EPA).

These waterbodies connect to the the main channel River Derg within Northern Ireland - the middle section (River Derg (Killeter) UKGBNI1NW010102094) and lower section (River Derg (Millbrook) UKGBNI1NW010102095) of which have been assessed as of Good and Moderate Ecological Status respectively in 2015.

All of these waterbodies are located within the North Western International River Basin District, an area which incorporates the Foyle, Erne and Melvin catchments along with Co Donegal.

To achieve the ecological objectives of the Water Framework Directive, River Basin Management Plans will be implemented through Water Management Units (WMUs) during the 2010 to 2015 cycle. This area is covered by the Finn/Derg/Foyle WMU which assesses the status of constituent water bodies together with pressures/risks and proposes an action programme to ensure that each of these waters achieves its objectives in terms of WFD ecological status.

4.2 EC Habitats Directive

4.2.1 Atlantic Salmon

The Atlantic salmon is listed in Annex II of the EU Habitats Directive as a species of European importance. The species is featured in Ireland's National Biodiversity Plan (2011) which includes a series of actions aimed at restoration of stocks. In the UK, it was added to the UK Biodiversity Action Plan (BAP) list in 2007 as a priority species for conservation action.

4.2.2 River Foyle & Tributaries SAC

In Northern Ireland, the River Derg is included in the River Foyle and Tributaries Special Area of Conservation (SAC). The designation includes the Mourne Beg and Glendergan tributaries which drain the proposed wind farm site area.

The site was recommended as a candidate SAC in 2007, with salmon noted as the species providing the primary reason for selection of the site which subsequently received full designation as an SAC (UK0030320). The river has the largest population of Atlantic salmon (*Salmo salar*) in Northern Ireland, with around 15% of the estimated spawning numbers. The majority of the salmon returning are grilse (single wintering salmon), with a smaller but important number of spring salmon (multi-wintering salmon) also occurring. Research has indicated that individual sub-catchments within the system support genetically distinct salmon populations (JNCC, 2007). The Freshwater pearl mussel (*Margaritifera margaritifera*) is also noted as qualifying features of the site.

4.2.3 River Finn SAC

The River Finn (IE002301) was recommended as a candidate SAC in 2006, with salmon listed as one of the Annex II species providing the primary reason for selection of the site, and received full designation in 2014. The SAC comprises almost the entire freshwater element of the River Finn and its main tributaries but also the headwaters of the River Derg in Co Donegal, including the Mourne Beg tributary where its course follows the border over a reach of 9-10 km immediately downstream of the proposed wind farm site.

Lough Derg and the tidal stretch of the Foyle north of Lifford to the border are also part of the site.

4.2.4 Lough Eske and Ardnamona Wood SAC

Lough Eske and Ardnamona Wood (IE000163) was recommended as a candidate SAC in 1998 and was designated in 2015. The site was selected for two freshwater Annex II species, Freshwater pearl mussel and Atlantic salmon. The EIAR Site Boundary follows the course of the N15 and the Lowerymore River in a south-westerly direction to Keadew Bridge. Although the cable route does not encroach on the SAC it is hydrologically connected to the site via the river channel and terminates just before the upstream limit of the SAC at Keadew Bride.

5 EXISTING DATA

5.1 River Derg

The River Derg issues from Lough Derg in Co. Donegal and drains a catchment area of 438 km^2 through a river length of approximately 66 km including tributaries. A significant area of the wind farm site is drained by the Mourne Beg, the largest tributary of the Derg, which joins the main channel approximately 3.5 km upstream of Castlederg.

The location of the proposed wind farm site in the Derg catchment and the Foyle basin is shown in Figure 1.

5.2 Fish species

The following fish species are recorded by the Loughs Agency as being present in the River Derg system (Loughs Agency, 2011a):

- Atlantic salmon (*Salmo salar*);
- Brown trout and sea trout (*Salmon trutta*);
- Eel (*Anguilla anguilla*);
- Minnow (*Phoxinus phoxinus*);
- River/Brook lamprey (*Lampetra* sp);
- Sea lamprey (*Petromyzon marinus*).

Loughs Agency survey data also indicates the presence of:

- Minnow (*Phoxinus phoxinus*);
- Three-spined stickleback (*Gasterosteus aculeatus*);
- Stone loach (*Noemacheilus barbatula*)
- Pike (*Esox lucius*)
- Perch (*Perca fluviatilis*)
- Roach (*Rutilis rutilis*)
- Gudgeon (*Gobio gobio*)

5.3 Adult Salmon Runs

Adult salmon runs are now measured by electronic fish counters at six counting stations in the Foyle system, but there is no individual counter for the Derg. However, all fish running the river must pass through the River Mourne counter at Sion Mills – the data from this site may therefore be used to provide some indication of trends in annual runs although many of the fish counted at this point will be destined for other tributaries in the Mourne system. Annual counts for the Mourne over the last 16 years are shown in Figure 2.

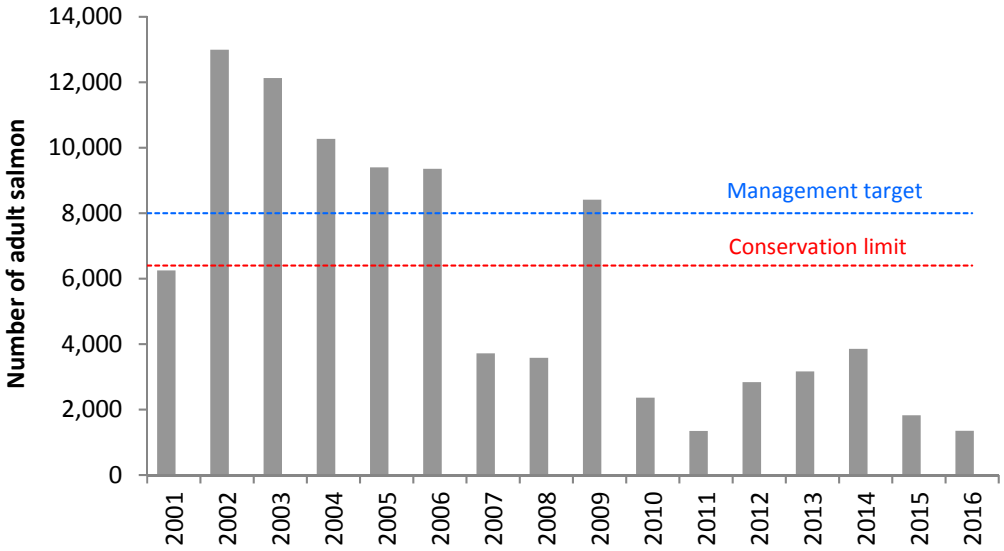

Figure 2: Numbers of salmon ascending River Mourne at Sion Mills fish counter, 2001-16 (Source: Loughs Agency).

This data indicates that the salmon runs exceeded the management target of 8,000 fish for the Mourne during 2002-2006 but, apart from 2009, have declined to significantly less than both the management target and the conservation limit of 6,400 fish. It should be noted that the figures for 2007 and 2010 are considered to be minimum counts due to specific technical difficulties in those years (Loughs Agency, 2011).

5.4 Salmon Spawning

Annual spawning redd counts for the last five years in the Derg and the Foyle system as a whole are shown in Table 2. Redd counts are highly dependent on river levels and therefore subject to considerable variability. However the data does indicate that the Derg is a key salmon spawning catchment with an average of 20% of the total spawning in the Foyle catchment as a whole.

Area/catchment	2009/10	2010/11	2011/12	2012/13	2013/14	Average
Total Foyle	4000	3382	1313	2152	3189	**2,807**
Derg catchment	637	442	269	698	866	**582**
Derg as % of Foyle	16%	13%	20%	32%	27%	**22%**

Table 2: Annual spawning redd counts for the Foyle and Derg, 2009/10 to 2013/14 (Source: Loughs Agency).

5.5 Juvenile Salmonids

Trends in abundance of juvenile salmon and trout are monitored by the Loughs Agency through annual semi-quantitative electrofishing surveys according to a methodology developed by Crozier & Kennedy (1994). Over 450 sites are sampled each year throughout the Foyle area including 35-40 in the Derg catchment.

Figure 3 shows the average catch of trout and salmon fry at 35 - 41 survey sites on the Derg over a recent seven year period. It would appear from this data that salmon spawning is more widespread and intense than trout spawning.

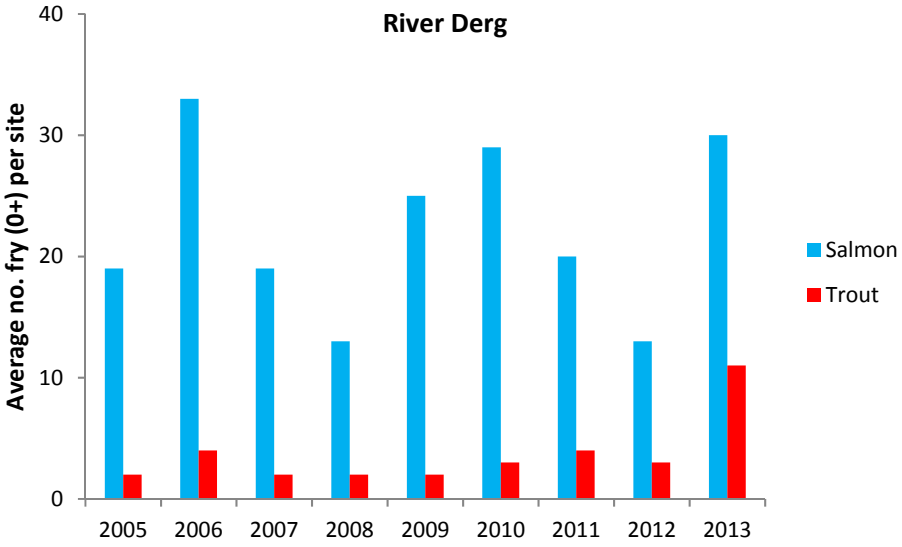

Figure 3: Salmon and trout fry index based on mean fry numbers at electrofishing sites on the Derg, 2005-13 (Source: Loughs Agency).

Fry abundance may be classified according to systems defined for trout (Kennedy, *unpublished*) and salmon (Crozier & Kennedy, 1994), each based on a calibration of the semi-quantitative electrofishing method in river reaches of known juvenile salmonid density (Table 3). On this basis salmon fry abundance has been *Excellent/Good* in 7 out of the last 9 years; trout abundance during this period has been mostly *Poor*.

Species	Abundance category	Semi-quantitative (Fry/5 min)	Quantitative (Fry/100m^2)
Trout	**Excellent**	18+	60+
	Good	9-17	32-59.9
	Moderate	4-8	17-31
	Poor/Fair	2-3	7.1-16.5
	Poor	0-1	0.1-7.0
	Absent	0	0
Salmon	**Excellent**	25+	114.6+
	Good	15-24	69.1-114.6
	Fair	5-14	41.1-69.0
	Poor	1-4	0.1-41.0
	Absent	0	0

Table 3: Semi-quantitative abundance categories for age 0 trout (Kennedy, *unpublished*) and salmon (Crozier & Kennedy, 1994).

Fry densities in the Derg for 2011 are compared with those from other leading catchments in the Foyle system in Figures 4 and 5. This illustrates that, in comparison to other rivers in the region, the Derg is in the mid-range of productivity for salmon and the lower range of productivity for trout.

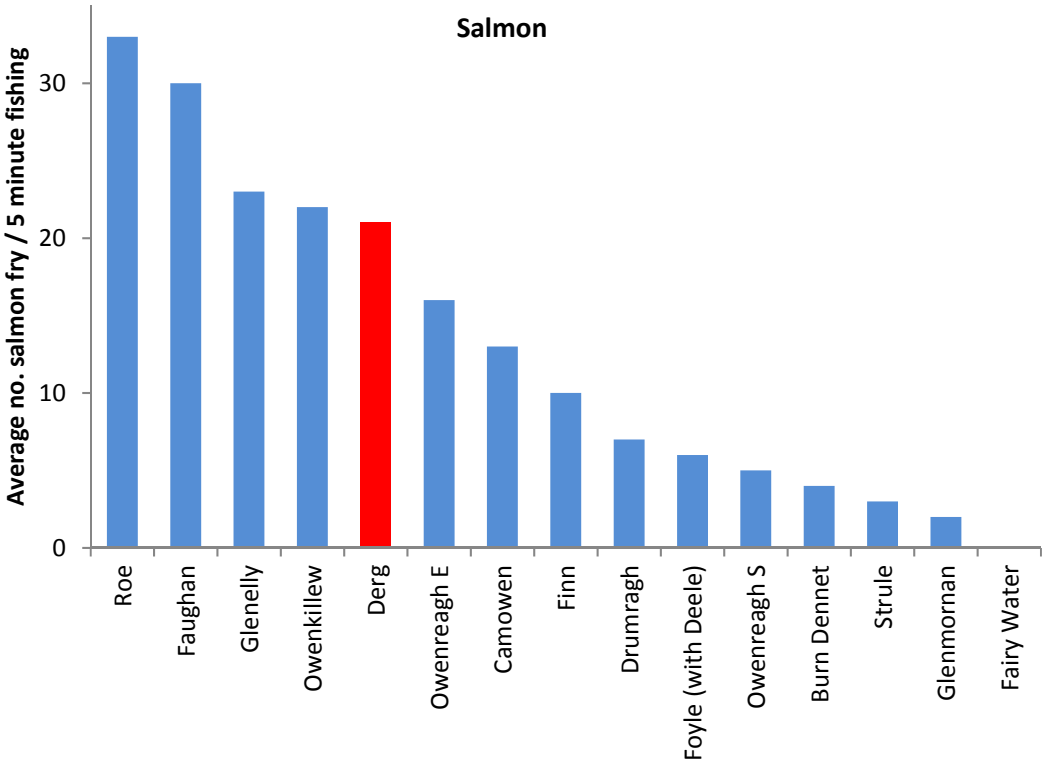

Figure 4: Salmon fry abundance index based on mean fry numbers in 15 principal catchments of the Foyle, 2016. (Source : Loughs Agency).

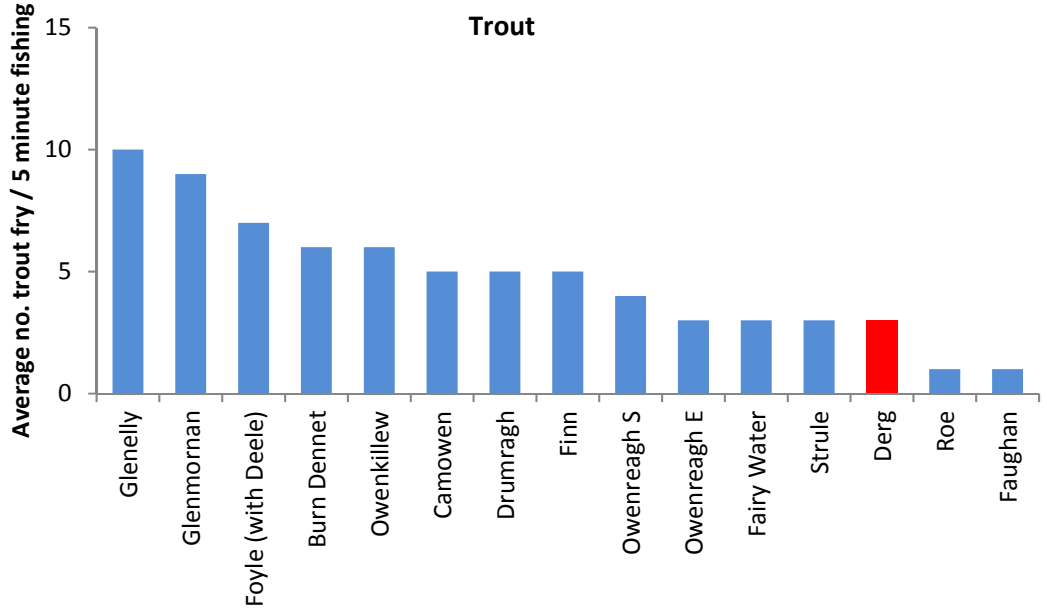

Figure 5: Trout fry abundance index based on mean fry numbers in 15 principal catchments of the Foyle, 2016. (Source : Loughs Agency).

5.6 Lamprey

The Loughs Agency has conducted a baseline survey of the River Foyle and Tributaries SAC to examine the distribution and abundance of juvenile lamprey (Niven & McCauley, 2013). A low density of River/Brook lamprey juveniles was recorded at downstream sites in the Mourne Beg with higher densities in the River Derg, notably from Castlederg downstream. Sea lamprey larvae were not detected at any sites in the Derg catchment.

5.7 Freshwater pearl mussel

Freshwater pearl mussel is noted as a qualifying feature of the SAC and a small population was still present in the Mourne River (also part of the River Foyle & Tributaries SAC) during the mid 1990s. There are no definitive records of pearl mussel in the Derg, but a recent population has been noted in a tributary of Lough Derg and is still under investigation (J McCartney, *pers comm*). The tributaries of Lough Derg are not hydrologically connected down-river of the proposed wind farm site and therefore cannot be impacted by any potential run-off from development of the wind farm.

5.8 Angling

The River Derg is one of the most productive rivers in the Foyle system and is a popular rod fishery for the local population and visitors to the area. Most of the angling downstream of Aghyaran Bridge is controlled and administered by the Castlederg Angling Club – upstream of this point the fishing rights are controlled by private estates. The season opens on 1 April and closes on 20 October but most angling takes place from June onwards.

Details of reported salmon catches from licence returns varying between 10% and 79% are shown in Table 4. These figures are adjusted by the Loughs Agency according to a methodology developed by Small (1991). This adjustment would suggest an annual catch of 200 to 850 salmon during this period with an average of 437 fish. By any standards this is a very productive angling river.

Catch statistics	2007	2008	2009	2010	2011	2012	2013	Average
% licence returns	22.1%	54.9%	43.9%	55.8%	46.0%	79.0%	10.0%	**44.5%**
Raising factor	2.06	1.25	1.38	1.24	1.35	1.08	3.7	**1.72**
Reported salmon catch	310	260	144	186	209	494	230	**262**
Adjusted salmon catch	638	324	199	230	283	533	851	**437**

Table 4: Adjustment of salmon angling catches on the Derg according to overall rate of licence/logbook return (Source: Loughs Agency).

5.9 Aquaculture

There is a commercial trout farm located on the Mourne Beg River approximately 10 km downstream of the proposed wind farm site – the unit is licensed by DAERA for the production of Rainbow trout. The farm operates by abstracting water directly from the Mourne Beg and is therefore heavily dependent on a constant supply of uncontaminated river water.

6 FIELD ASSESSMENT

6.1 Outline

Electrofishing by the Loughs Agency tends not to include sampling sites in the upper reaches of smaller tributaries in most river systems. This part of the fisheries assessment therefore sets out to obtain details on salmonid distribution in the headwater streams draining the Meenbog wind farm site.

6.2 Site Drainage and Local Hydrology

The proposed development site is drained through a series of streams connecting to the Mourne Beg and Glendergan tributaries of the River Derg (Figure 6). Further site drainage details are described in detail in Ch 8 Hydrology & Hydrogeology.

6.3 Methodology

A survey of the three main streams draining the wind farm site was carried out in September 2014 at six selected sites. All sites were examined for fisheries potential followed by juvenile fish stock surveys by electrofishing.

Electrofishing was carried out according to a semi-quantitative methodology described by Crozier & Kennedy (1994). The procedure involves two operators fishing continuously in an upstream direction for five minutes at each sampling location, using a single anode backpack electrofishing set (24V DC input; 250V, 100W 50 Hz DC output). All fish were caught using a dip net and retained for inspection and then returned to the water live. Any additional Age 0 salmonids seen but not captured were also recorded. This method is consistent with the annual Loughs Agency monitoring procedure.

Localised areas identified as potential lamprey larval habitat (stable fine sediment or sand > 15 cm deep, low water velocity and the presence of organic detritus) were sampled by adapting the electrofishing methodology as described by Harvey & Cowx, 2003).

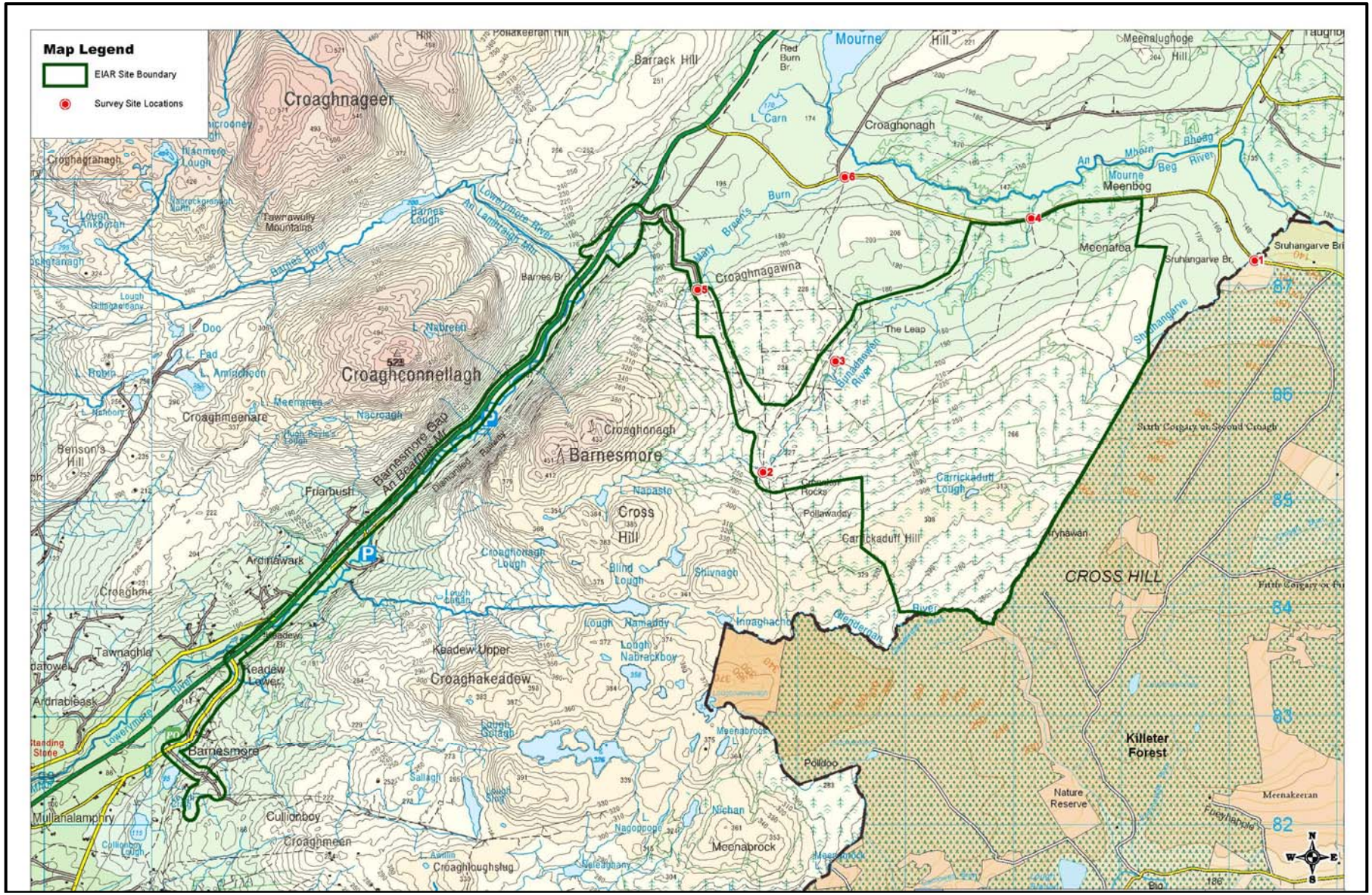

Figure 6: Location of survey sites on streams draining the proposed Meenbog wind farm site.

6.4 Fish Distribution

The survey results are presented in Table 5; as anticipated, the main fish species encountered was brown trout. A single site was assessed as being insufficient to support fish life due to poor habitat quality and was not electrofished.

Site	Stream	Grid reference	Trout		Salmon		Other species	Trout abundance
			Age 0+	Age 1++	Age 0+	Age 1++		
1	Sruhangarve	210238/387249	0	0	0	0	1 Eel	Absent
2	Bunadaowen	205681/385273	8	5	0	0	-	Moderate
3	Bunadaowen	206352/386306	5	7	0	0	-	Moderate
4	Bunadaowen	208167/387637	18	0	0	0	2 Eel	Excellent
5	Mary Breen's	205074/386978	(0)	(0)	(0)	(0)	(0)	(Absent)
6	Mary Breen's	206439/388021	15	4	0	0	-	Good

Table 5: Summary results of electrofishing survey of Mourne Beg tributaries, indicating numbers of Age 0+/1+ trout and salmon, and other species recorded at each site. Figures in brackets indicate sites not sampled but where fish were assumed to be absent.

Trout were detected in two of the tributaries and were observed to be widely distributed throughout the Bunadaowen River; salmon absent from all sites and none of the sites were adjudged suitable for lamprey larvae. Eels were the only other species noted during the survey.

Trout fry abundance index was assigned according to the classification system defined for trout (Kennedy, *unpublished*) outlined in Table 3 (See 5.5). Where present, trout were observed at *Moderate*, *Good* or *Excellent* indices of abundance.

As already noted, salmon were absent from the streams surveyed – this is believed to be a function of fish distribution rather any limiting habitat factors.

6.5 Eels

Eels were regularly observed at two sites and this is a significant finding in view of the current poor status of eel stocks in general.

Over a wider range the European eel stock has been in rapid decline since around 1980, and the species has recently been added to the IUCN Red List of Threatened Species in the category of *Critically Endangered*. The European Eel Regulation (EC) 1100/2007 aims to establish measures for the recovery of the stock through action by Member States to implement Eel Management Plans in each eel river basin, in this case the North Western International River Basin District.

6.6 Stream Details

Habitat details in the three streams are summarized in the following paragraphs:

6.6.1 Sruhangarve Burn

Outline Description: Moderate quality stream; low conductivity.

Fisheries Interest:

- *Within site boundary:* Minor
- *Downstream of site:* N/a – located within site and along site boundary.

Fish stocks: Eel.

Annex II species*:* None.

Site 16 Lower section.

6.6.2 Bunadaowen River

Outline Description: Good quality stream trout throughout.

Fisheries Interest:

- *Within site boundary:* Significant
- *Downstream of site:* N/a – located within site and along site boundary.

Fish stocks: Brown trout, eel

Annex II species*:* None.

Site 17 Good nursery stretch.

Site 18 Near waterfall and abstraction point.

Site 19 Up to 8m wide; good trout habitat.

6.6.3 Mary Breen's Burn

Outline Description: Poor quality stream but significant fish stock; ferric run-off evident.

Fisheries Interest:

- *Within site boundary:* N/a
- *Downstream of site:* Significant

Fish stocks: Brown trout

Annex II species*:* None

Site 17 Cobble bed but very low flow.

Site 18 Riffle/glide habitat.

7 IMPACTS ON FISH/FISH HABITATS AND ASSOCIATED MITIGATION MEASURES

7.1 Description of Impacts

Impacts are described in accordance with the definitions provided in the Glossary of Impacts contained in the guidance documents produced by the Environmental Protection Agency (EPA):

- Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (EPA, 2003)
- Guidelines on the Information to be contained in Environmental Impact Assessment Reports – Draft August 2017 (EPA 2017)

The glossary of impacts as published in the EPA guidance documents is summarised in Table 6.

Impact Characteristic	Qualification	Description
Quality	Positive	A change which improves the quality of the environment
	Neutral	No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error
	Negative	A change which reduces the quality of the environment
Significance	Imperceptible	An effect capable of measurement but without significant consequences
	Not significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
	Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities
	Moderate	An impact that alters the character of the environment in a manner consistent with existing and emerging trends
	Significant	An effect that alters the character of the environment in a manner consistent with existing and emerging baseline trends
	Very significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment
	Profound	An impact which obliterates sensitive characteristics
Duration & Frequency	Momentary	Effects lasting from seconds to minutes
	Brief	Effects lasting less than a day
	Temporary	Effects lasting less than a year
	Short-term	Effects lasting one to seven years
	Medium-term	Effects lasting seven to fifteen years
	Long-term	Effects lasting fifteen to sixty years
	Permanent	Effect lasting over sixty years
	Reversible	Effects that can be undone, for example through remediation or restoration
	Frequency	Describe how often the effect will occur. (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually)
Type	Indirect	Impacts on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway
	Cumulative	The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects.
	'Do Nothing'	The environment as it would be in the future should the subject project not be carried out

Worst Case'	The effects arising from a project in the case where mitigation measures substantially fail
Indeterminable	When the full consequences of a change in the environment cannot be described
Irreversible	When the character, distinctiveness, diversity, or reproductive capacity of an environment is permanently lost
Residual	Degree of environmental change that will occur after the proposed mitigation measures have taken effect
Synergistic	Where the resultant effect is of greater significance than the sum of its constituents

Table 6: Impact Classification Terminology (EPA, 2017)

7.2 "Do Nothing" Impact

A significant area of the land that forms the site of the proposed development is currently under forestry plantation.

If the proposed wind energy development does not proceed, it is assumed that the character of the landscape and its uses will remain much as they are today i.e. that forestry will dominate the site and that mature trees will be harvested and felled areas replanted to maintain forestry rotation in the area. Since the area of forestry that will be felled to make way for the development footprint is relatively small, the main land use of the area will effectively remain as forestry, with land use for wind energy being superimposed over forestry during the lifetime of the proposed development.

The proposed development will provide green energy that can partly replace power generation methods that produce carbon dioxide emissions. The development will be responsible for virtually no carbon emissions in the operational phase, and will contribute to the slowing or reversal of climate change.

An EPA study has considered the potential Impacts of Climate Change on Biodiversity in Ireland (Sweeney et al, 2003); among fish species the salmon was highlighted along with Arctic char as being particularly susceptible to climate change by 2055 with a negative response to changes in temperature and rainfall, and a vulnerability rank of Medium-High.

Clearly these are major concerns for the future and will have the potential to impact not only on water quality through reduced dilution, but will also have implications for salmon in other ways. Increasing water temperatures will lead to alterations in the aquatic community in general. With regard to salmon higher temperatures may reduce egg survival, retard fish growth, and increase stress and susceptibility to disease. There is also evidence that salmon smolts are leaving rivers earlier and it has been suggested that this may be a factor in reduced marine survival rates. Moreover, changing rainfall patterns are leading to more concentrated periods of rain leading to flash floods which has resulted in the wash-out of spawning gravels and salmon redds in some Scottish rivers. At the other end of the scale, longer periods without rain could limit the distribution of spawning fish throughout river catchments.

It is possible that part of the cumulative 'Do Nothing' impact for this and other renewable energy developments will accelerate the loss of salmon and other aquatic species from their range of distribution in Ireland as a whole.

7.3 Hydrological Connection to SACs

The proposed wind farm site drains into two key tributaries of the River Derg, the Mourne Beg and the Glendergan, both of which are included the River Foyle and Tributaries SAC in Northern Ireland. Similarly, a 9 km reach of the Mourne Beg along the border is included in the River Finn SAC in the Republic to mirror the designation in the north.

the proposed wind farm site has direct hydrological connection to the above SAC channels via a series of principal drainage streams, and therefore a number of potential routes for run-off of suspended solids or other adverse materials to either designated site.

7.4 Trans-frontier Impacts

The location of the proposed site adjacent to the international boundary between the Republic of Ireland and Northern Ireland, combined with the hydrological connection with the River Foyle system in Northern Ireland, implies that any significant impacts resulting from the development could have trans-frontier implications.

The following discussion of potential impacts, mitigation measures and residual impacts does not distinguish between trans-frontier impacts and internal impacts, but does highlight potential impacts on the two designated SACs hydrologically connected to the proposed site and located within the two national jurisdictions.

7.5 Impacts during Preparation and Construction Phases

7.5.1 Run-off of Suspended solids

Salmonid fish are particularly sensitive to reductions in water quality and habitats can be damaged by siltation from settlement of Suspended Solids (SS) (Alabaster & Lloyd, 1980). This is recognised through the EC Freshwater Fish Directive which specifies a normal maximum SS concentration of 25 mg/l for salmonids, although a precautionary target of less than 10 mg/l (annual mean) is recommended for most river reaches by JNCC (2005).

The impacts of SS on fish have been reviewed by Bilotta & Brazier (2008) who confirm that there are a range of potential impacts notably with regard to the deposition of sediments in salmonid spawning areas of rivers and its impact on development on eggs and fry. There can also be a direct effect on fish gills either through physical damage to the gill tissue or through clogging of the gills with waterborne particulate matter.

The settlement of sediments on the substrate can smother invertebrates and fish eggs, while the infiltration of coarse sediments (gravel and cobble) with fines can have longer term implications for the productivity of both groups. The characteristics of the riverbed are critical for fish spawning (Fluskey 1989), and the tolerance of salmon eggs to sedimentation has been examined on the River Bush by O'Connor & Andrew (1998) who found that alevin survival was closely related to the level of fines with impacts detectable at a level of 10% fines.

The discharge of suspended solids could result from:

- Clear felling of coniferous plantation
- Earthworks – removal of vegetation cover, excavations and stock-piling
- Erosion around new structures at watercourse crossings
- Road run-off

Much of the natural drainage at each site will be by soakage rather than direct run-off. However, whenever the ground is saturated a high percentage of the rainfall will run off quickly to receiving

watercourses. The main risk to these streams will therefore be during and following periods of heavy and sustained rainfall; such events are more likely during the autumn/winter period.

There is a direct hydrological connection with two SACs incorporating the Mourne Beg river (River Foyle & Tributaries (NI); River Finn (RoI)), and therefore a potential route for suspended solids run-off from proposed site. Corgary Trout Farm is also located on the Mourne Beg River approximately 10 km downstream of the site, and would therefore be subject to any elevation in suspended sediments during the construction phase. This would have the potential to affect fish feeding and growth rates or, in an extreme case, to cause gill damage possibly leading to fish mortalities.

Similarly, the proposed grid connection route follows the course of the Lowerymore River and will require a series of watercourse crossings of both the main river and small adjoining streams, with the potential for run-off of sediment. The river channel and terminates just before the upstream limit of the SAC at Keadew Bride

Impact Assessment
Impacts from run-off of suspended solids have the potential to be:

- Negative
- Significant
- Short to Medium-term
- Cumulative

Mitigation (by Avoidance)
It is important that sensitive aquatic areas of the site should be avoided during the construction phase. To this end a 50m wide watercourse buffer zone has been applied with regard to significant watercourses as detailed in Chapter 9: Hydrology & Hydrogeology.

Mitigation (by Design)
Chapter 9 (Hydrology & Hydrogeology) describes a series of construction phase runoff control measures with source controls, in-line controls and treatment systems to ensure that there will be a negligible impact on the suspended sediment load in surface waters draining from the site. A water treatment train will also be put in place to filter and treat all surface discharge water collected in the dirty water drainage system, and silt fences will be deployed down-gradient of construction areas that drain towards on-site natural streams. In addition, a pre-emptive site drainage management will be applied to take account of predicted rainfall so that large excavations and internal transportation of peat/subsoil or vegetation stripping can be suspended or scaled back when heavy rain is forecast.

With regard to new stream crossings bottomless culverts will be used where possible, to avoid instream works and disturbance of banks. Where near stream construction work is required, double row silt fences will be erected immediately down-gradient of the construction area and maintained during the construction phase. Watercourse crossings on the grid connection route will employ construction methodologies which have been designed to eliminate the requirement for in-stream works. In most cases a trench will be excavated above existing culverts to install the duct which will contain the cable. Crossings of the main channel Lowerymore River will be beneath the riverbed by means of either Directional or Horizontal Drilling.

These measures will prevent the run-off of excess sediments via the streams directly draining the site to key adjoining watercourses, in particular the three designated SACs.

Mitigation (by Timing of Works)
The Loughs Agency's Guidelines for Fisheries Protection during Development Works (2011b) recommends that instream river works should be avoided during the salmonid spawning season and egg incubation phases, 1 October – 30 April. As there are no significant instream works required in

this development, restrictions on timing of construction need not apply. However, it is recommended that to minimise the risk of suspended sediment entrainment in surface water run-off, the site drainage system should only be constructed during periods of low rainfall and therefore minimum run-off rates.

Residual Impacts
With the recommended mitigation measures in place the residual impacts from run-off of suspended solids will be Neutral.

7.5.2 Release of other pollutants

As the development site drains directly to a series of tributaries and thence to the Mourne Beg and the Derg, there is some potential for spillage or release of diesel, oil or other polluting substances to reach any of these channels with consequences for resident fish together with invertebrate organisms.

During site development with high usage of plant fuel and oil there is clearly an increased risk of accidental spillage and discharge to the river. Similarly, the application of concrete slurries in construction processes carries some risk of inadvertent discharge with the potential to impact on wild fish stocks and also on Corgary Trout Farm.

Impact Assessment
Impacts from the release of pollutants have the potential to be:

- Negative
- Significant
- Short to Medium-term

Mitigation (by Design)
Chapter 9 (Hydrology & Hydrogeology) outlines a series of measures to mitigate the probability of runoff of hydrocarbons including:

- Storage of fuels on-site to be minimised
- On site re-fuelling of machinery using mobile double-skinned fuel bowser according to clearly defined refuelling protocol.
- On-site storage of fuels will be minimised

The proposed drainage system for the site including detention basins will also facilitate the interception of diesel, oil or other polluting substances during the construction phase.

Mitigation (by Management)
All precautions will be taken to avoid spillages of diesel, oil or other polluting substances during the construction phase. This may be achieved through good site practices and in line with EPA Integrated Pollution Prevention Control procedures.

In addition, the Environmental Management Plan will contain an emergency plan to deal with accidental spillages during the construction phase of the project.

Residual Impacts
With the recommended mitigation measures in place the residual impacts from the release of pollutants will be Neutral.

7.6 Impacts during Operational Phase

7.6.1 Habitat loss at culvert sites and main watercourse crossings

A watercourse crossing may result in significant loss of habitat if an extensive length of channel is enclosed in a culvert structure, particularly where the original channel bed is lost and cannot be restored. Unnecessary removal of bed materials at stream crossing points can also result in long term loss of habitat, loss of channel diversity and damage to invertebrate food organisms.

As noted above bottomless culverts will be used where possible new stream crossings, to preserve the streambed and existing aquatic habitats. There will therefore be no perceptible loss of habitat or reduced productivity at stream crossings on the proposed development site.

Impact Assessment
Impacts due to habitat loss have the potential to be:

- Neutral
- Imperceptible

Mitigation
No specific measures required.

Residual Impacts
None.

7.6.2 Fish Passage – permanent obstruction/inhibition

There is likely to be a degree of localised fish migration within the proposed site boundary in some of the site drainage streams. Poorly designed or improperly installed culverts at crossing points on these streams could result in obstruction of the stream channel preventing fish migration during critical periods e.g. spawning.

Impact Assessment
Impacts due to the obstruction of fish passage have the potential to be:

- Negative
- Significant
- Permanent

Mitigation (by Design)
A series of reports have been produced on the issues relating to river crossings and migratory fish, with recommended procedures to avoid impacts (Loughs Agency, 2011; Anon, 1998; ERFB 2004).

The design principles outlined by the Loughs Agency should be followed at significant on-site stream crossings:

- Culverts should be as short as possible
- Where the topography allows, they should be laid so as to remain backwatered in drought flow to a depth of not less than 500mm at the upstream invert, thereby providing a fishway over their full length.
- In all cases, provisions must be made to ensure that the velocity of flow will be less than the swimming speed which can be comfortably maintained by the weakest upstream migrants.
- Transition pools should be formed at each end to allow upstream migrants to enter and exit without stress or delay.

New crossings of significant watercourses will utilise bottomless culverts where possible to comply with the above conditions. Minor watercourse crossings required within the site will not interfere directly with fish movements as it is unlikely that fish will be present at these locations. Standard culverts will be adequate at these locations but should be installed in a way that will minimise the release of suspended solids into the watercourse to avoid impacts further downstream.

Residual Impacts
With the recommended mitigation measures in place the residual impacts in terms of the obstruction of fish passage will be Neutral.

7.6.3 Surface Water Run-off

Surface water run-off from hard surfaced areas (i.e. access tracks, hardstands, control building area) have the potential to lead to excess discharge of suspended solids to the receiving watercourses with impacts on fish and other forms of aquatic life as outlined above.

Wash-out of storage areas of excavated peat/subsoil during or following periods of heavy rainfall have the potential to result in run-off of suspended solids to the receiving watercourses with potential increases in sediment load impacting on fish stocks, habitats and the nearby trout farm.

Impact Assessment
Depending of the sensitivity of individual watercourse, impacts due to the run-off of suspended solids have the potential to be:

- Negative
- Significant
- Long-term

Mitigation (by Design)
Chapter 9 (Hydrology & Hydrogeology) outlines a series of measures to be implemented with regard to the control and attenuation of surface water run-off including:

- Stilling ponds to buffer runoff from the drainage system during periods of high rainfall
- Reduction in flow velocity of discharge water by stilling ponds
- Check dams along the drainage route to reduce the velocity of flow thereby preventing channel erosion
- Vegetation filters to receive drainage water from overland flow, will remove suspended sediment
- No direct discharge of development storm water into the existing natural watercourses within the site.

These measures will prevent the run-off of excess sediments to the River Foyle & Tributaries SAC via the streams directly draining the site.

Residual Impacts
With the recommended mitigation measures in place the residual impacts from run-off of suspended solids will be Neutral.

7.7 Impacts during De-commissioning Phase

The decommissioning process will involve the removal of all above ground structures, and reinstatement of disturbed areas. Access tracks will remain for farm and forestry use.

Impact Assessment
The impacts of decommissioning are likely to be similar to those of construction although probably of lower magnitude, as it is unlikely that any of the structures at or near to primary watercourses will be removed or modified in any way.

Impacts will therefore have the potential to be:

- Neutral
- Imperceptible

Mitigation
No specific measures required.

Residual Impacts
None.

8 CUMULATIVE IMPACTS

8.1 Additional Developments

This section considers other wind farm developments within a 20 km radius which have either been constructed or are at different stages of the planning process in RoI or NI. Along with the proposed wind farm at Meenbog, these developments/proposals could give rise to the potential cumulative impacts on local rivers, in particular the River Derg in the context of its SAC status on both sides of the border.

With regard to fisheries and the aquatic environment, the potential for cumulative effects is only relevant when proposed or existing developments are either hydrologically connected or which drain to the same receiving environment. It is therefore more important to consider additional developments in the context of river catchments, both locally and on a wider river basin scale.

Within a 20 km radius of the Development a total of 16 additional wind farm developments have been identified which are located within River Derg catchment and might therefore be considered to have the potential for cumulative impacts on the river (Table 7). Currently there are 28 turbines operational within the catchment with a potential for 91 additional turbines and associated infrastructure including the Meenbog development.

Windfarm Name	RoI/NI	No. of turbines	Status Nov 2017
Crighshane	NI	14	Operational
Lough Hill	NI	6	Operational
Church Hill	NI	8	Operational
Meenagrauv	RoI	1	Permitted
Tievenamenta	NI	15	Permitted
Bin Mountain	NI	6	Permitted
Seegronan	NI	6	Permitted
Altgolan	NI	7	Under Appeal
Meenablagh	NI	11	Under Appeal
Church Hill Ext	NI	1	Proposed
Crighshane Ext	NI	4	Proposed
Crilly Tullylinn	RoI	4	Proposed
Gronan	NI	4	Proposed
Meenakeeran	NI	4	Proposed
Meenamullen	NI	4	Proposed
Seegronan Ext	NI	3	Proposed
	TOTAL	**100**	

Table 7: Additional wind farm developments within 20 km radius of Meenbog and located within the River Derg catchment.

All of the projects listed above have had or will involve civil engineering works including land excavation to a greater or lesser extent and possibly including in-river works, each with the potential for similar effects on the aquatic environment including fisheries. As such there is the potential for the run-off of sediments to local watercourses with resultant damage to aquatic fauna and habitats.

There are a further 15 operational and 7 permitted developments within a 20 km radius of Meenbog, but not within the Derg catchment (Table 8), and therefore with no potential for cumulative impact on the aquatic environment.

Windfarm Name	RoI/NI	No. of turbines	Status Nov 2017
Cark	RoI	25	Operational
Lough Golagh	RoI	25	Operational
Culliagh	RoI	18	Operational
Culliagh Extn	RoI	3	Operational
Cark/Largymore	RoI	9	Operational
Meentycat 1	RoI	9	Operational
Meehahorna	RoI	7	Operational
Meenlaban	RoI	7	Operational
Anarget	RoI	6	Operational
Ballystrang	RoI	6	Operational
Cark Extension	RoI	6	Operational
Meenadreen	RoI	4	Operational
Meenagrauv	RoI	4	Operational
Ballystrang	RoI	6	Operational
Meenanilta	RoI	6	Operational
Meenagrauv II	RoI	1	Permitted
Dromnahough	RoI	15	Permitted
Lenalea	RoI	9	Permitted
Lough Cuill	RoI	8	Permitted
Croaghnameal	RoI	7	Permitted
Meenadreen Ext	RoI	5	Permitted
Altilow	RoI	1	Permitted
	TOTAL	**191**	

Table 8: Additional wind farm developments within 20 km radius of Meenbog but not located within the River Derg catchment.

8.2 Assessment

The greatest risk to fisheries and the aquatic environment is during the construction phase of these projects when the civil engineering works are carried out. It follows that it is vital for the highest standards to be maintained with regard to site preparation, temporary works and site drainage issues, and that full mitigation measures must be applied to remove any potential for this type of incident.

There is no evidence that existing wind farm developments in the area have had any adverse impact on the River Derg catchment which in turn could have affected the integrity of either of the two designated SAC sites.

The likelihood of significant cumulative impacts on the aquatic environment is increased if two or more wind farms are to be constructed or decommissioned simultaneously. The likelihood of simultaneous construction cannot be determined at this stage but, provided high standards of construction and site management are maintained in subsequent developments, the development of the proposed wind farm at Meenbog with specific mitigation measures as outlined, should not contribute to any cumulative impact with other similar developments in the Derg catchment.

Implementation of the mitigation measures as described will ensure that the proposed Meenbog development will not contribute to any cumulative impact on either of the designated SAC sites, in particular on Atlantic salmon as a leading selection feature of each site.

9 CONCLUSION

The proposed Meenbog wind farm development is located in the headwaters of the River Derg which is subject to SAC designations in RoI and NI due to its stocks of Atlantic salmon. The principal risk to fish and the aquatic environment will be during the construction phase of the proposed development.

A series of specific mitigation measures have been designed to prevent negative impacts on fisheries with regard to construction and operational phases of the project. Implementation of these measures will mitigate any effects relating to run-off of suspended sediments, release of pollutants, loss of habitat and obstruction of fish passage, thus ensuring that the overall significance of effects will be neutral with regard to fish stocks and aquatic biology of the River Derg system as the sensitive receptor.

In relation to the SAC designation of the Derg on both sides of the border, construction and operation of the proposed wind farm will have no effect on the conservation objectives or status of the site in either jurisdiction. Similarly, the works required to deliver the grid connection will have a neutral effect on the Lough Eske and Ardnamona Wood SAC.

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Aquatic & fisheries assessment of peat slide impacts on the Mourne Beg River catchment draining Meenbog wind farm, Co. Donegal

Triturus

Prepared by Triturus Environmental Ltd. for McCarthy Keville O'Sullivan

April 2022

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Non-technical summary

Triturus Environmental Ltd. in conjunction with McCarthy Keville O'Sullivan, the Lough's Agency and RIVUS Ltd., undertook a fisheries and aquatic habitat assessment of the Mourne Beg catchment draining Meenbog wind farm near Ballybofey, Co. Donegal. Following a significant peat-slide event that occurred at the site in November 2020, the surveys focused on the Sruhangarve (peat slide pathway) and downstream Mourne Beg River to determine impacts to fish populations, fish spawning and nursery habitat. The assessment also considered direct impacts to riverbed condition in addition to biological water quality and hydromorphology. Long-term Loughs Agency fisheries data and salmonid spawning (redd count) data was also reviewed and used to inform our assessment. A total of 18.95km of riverine channel was surveyed, both upstream and downstream of the peat impact zone, in July and October 2021.

The July 2021 site surveys found that siltation impacts (from peat) were evident throughout the length of our Mourne Beg River survey area some 8 months after the peat slide event, extending to >14km downstream of the Sruhangarve confluence. Siltation, in terms of riverbed surface cover, infiltration into riverine gravels and oxygen exchange (redox) was often severe. This resulted in significant reductions in the quality of habitat for salmonids and macro-invertebrates. Whilst siltation was evident in almost all areas of the peat impact zone (including shallow, fast-flowing reaches), the most significant volumes were present in depositional slow-moving glide and pool areas. Reductions in riverbed condition also impacted the hydromorphology of the river, mainly through the deterioration of bed condition, albeit much of the survey area retained hydromorphology equivalent to WFD good status (as would be expected for a natural upland river system).

Based on long term monitoring data (2011-2021), there was a significant restriction in the distribution of salmonid spawning areas (redds) in the first spawning season after the peat slide. This was primarily due to the (often severe) siltation of routinely used spawning areas. However, despite a considerable reduction, salmonid spawning was confirmed in several impacted areas of the Mourne Beg River in the December 2020-January 2021 period. Of note was the marked increase in spawning in the upper Mourne Beg River, upstream of the peat impact zone, in December 2020-January 2021.

Despite evident impacts, numbers of juvenile Atlantic salmon (recorded via electro-fishing) increased in 2021 compared to the previous year (before the peat slide), thus indicating successful spawning and recruitment within the system. However, the increasing numbers of juvenile salmon may also be explained by a parallel reduction in trout consequential of the peat slippage event. Juvenile brown trout numbers were noticeably reduced within the impact zone in 2021 and this is thought to be linked to a higher degree of impact due to an earlier (than salmon) spawning season that likely coincided with the peat slide event causing significant mortality.

A swift recovery in biological water quality of the impact zone was observed (as assessed by Q-sampling of macro-invertebrates). Most sites sampled on the Mourne Beg River had recovered to Q4 (good status) water quality by October 2021, having been significantly worse in December 2020 (when some sites supported an absence macro-invertebrate life due to severe siltation impacts). An increased diversity of clean water indicator species, such as mayflies and stoneflies, were recorded in

October 2021 demonstrating an improvement in biological water quality. The Sruhangarve, where peat slide impacts were most severe, was failing to meet Q4 (good status) thresholds in October 2021.

In conclusion, the Meenbog peat slide caused and continues to cause considerable impacts to the quality of aquatic habitats within the Sruhangarve and Mourne Beg River. Whilst there is evidence of considerable recovery, impacts are predicted to last long-term. Given the large volumes of peat present within the system as a result of the peat slide, the spate nature of the Sruhangarve and Mourne Beg River will likely result in medium-term resuspension and flushing of peat downstream, providing a lasting source of peat and associated impacts to fisheries and aquatic habitats. Other sources of impact to aquatic habitats and water quality, namely coniferous afforestation and agriculture, were identified during the 2021 surveys. These will continue to act in synergy with peat slide impacts and affect the Sruhangarve and Mourne Beg River (and also likely the downstream River Derg) into the future. Management measures recommended to alleviate these impacts include the installation and maintenance of riparian buffer zones and changes in land use practices and the stabilisation of peat banks on the Sruhangarve.

1. Introduction

1.1 Background

Triturus Environmental Ltd. were contracted by McCarthy Keville O'Sullivan to undertake a fisheries and aquatic assessment of impacts to the Mourne Beg River draining Meenbog wind farm near Ballybofey, Co. Donegal (**Figure 2.1**).

The survey was undertaken to establish fisheries and aquatic health of the watercourses draining Meenbog in light of a significant peat-slide event that occurred at the site in November 2020. A large volume of peat entered the Sruhangarve (EPA code: 01S26) to the eastern extent of the proposed wind farm site and mobilised downstream to the Mourne Beg River (01M01).

The current surveys would therefore focus on the Mourne Beg River downstream of the peat slide event and the Sruhangarve to assess impacts to fish populations, fisheries habitat and biological water quality. Furthermore, 0.25km of the Bunadowen River and 2.2km of the Mourne Beg River located upstream of the Mourne Beg-Sruhangarve confluence was included as upstream control areas. The survey work was led by Triturus Environmental and completed in conjunction with MKO, the Lough's Agency and RIVUS Ltd. Historical fisheries data (redd counting) and electrofishing data provided by the Lough's Agency was also used to help infer changes in the fisheries composition and to the known spawning areas downstream of the impact area. The integrated assessment would help determine the significance of impacts to the ecological and fisheries health of the Mourne Beg catchment and consider the prospects for ecological recovery with recommendations for future monitoring.

1.2 Fisheries asset of the survey area

The survey area is located within the MourneBeg_SC_010 and MourneBeg_SC_020 river sub-catchments. The uppermost reaches of the Mourne Beg River (EPA code: 01M01), near Lough Mourne, forms part of the Croaghonagh Bog SAC (000129), a site designated for blanket bog habitat. From near the Sruhangarve confluence (within the Republic of Ireland), the Mourne Beg River is located within the River Finn SAC (002301), for which Atlantic salmon (*Salmo salar*) are listed as a qualifying interest (NPWS, 2014). The Mourne Beg River, from its confluence with the Sruhangarve, also forms part of the River Foyle and Tributaries ASSI (229), which is designated for, among other species, Atlantic salmon (DAERA, 2015). In the upper catchment, the river also forms a boundary with Croagh Bog ASSI (378) (no aquatic qualifying interests).

The Mourne Beg River rises at Mourne Lough and flows, primarily through peatland areas, for approx. 26km before joining the River Derg 3.5km upstream of Castlederg, Co. Tyrone. The river is known to support Atlantic salmon and brown trout (*Salmo trutta*), in addition to minnow (*Phoxinus phoxinus*), stone loach (*Barbatula barbatula*), three-spined stickleback (*Gasterosteus aculeatus*) and pike (*Esox lucius*) (Paul Johnston Associates, 2017; Triturus data 2021; Loughs Agency data 2011-2021). It its lower reaches, the river also supports *Lampetra* sp. (Niven & McAuley, 2013). Within the wider Foyle catchment, the Mourne Beg is an important spawning river for Atlantic salmon.

The Bunadowen River (01B01), a Mourne Beg tributary, is also known to support Atlantic salmon, brown trout and European eel (Loughs Agency data, 2020-21; Paul Johnston Associates, 2017)

Since the peat slide event (November 2020), the Sruhangarve (01S26) is known to support European eel and a low density of brown trout (Loughs Agency data, 2020-21; Paul Johnston Associates, 2017).

1.3 Peat and impacts of peat slides

Peat is a type of soft soil containing at least 65% fibrous organic material or less than 35% mineral content (Salimin et al., 2010; Huat et al., 2011). Commonly found across Ireland, peatlands are formed by the accumulation of partially decayed vegetation in areas of high rainfall, that are decomposed through anoxic conditions over thousands of years (Deboucha et al., 2008). Peatlands store large amounts of carbon and are considered to be the most space-effective carbon stores of all terrestrial ecosystems (Dise, 2009). Peatlands cover approximately 20% or 14,000km^2 of the Irish national land area (Connolly & Holden 2009), holding approximately 75% of national soil carbon stocks (Renou-Wilson et al., 2011). The chemical characteristics of peats include chemical composition, cation exchange capacity (CEC) and acidity (Huat et al., 2011). Peat comprises predominantly dissolved organic carbon (DOC), oxygen (O), hydrogen (H) and small amounts of nitrogen (N) with percentage ranges of 40 to 60%, 20 to 40%, 4 to 6% and 0 to 5%, respectively (Parfenova et al., 2016; Andriesse, 1988; Schelkoph & Hasset, 1983). Other nutrient components in peat include calcium, magnesium, phosphorus and potassium (Wang et al., 2015; Worrall et al., 2002).

For centuries peatlands have been subject to artificial drainage, which has been in response to agricultural demand, forestry, horticultural and energy properties of peat and alleviation of flood risk (Holden et al., 2004). However, there are several environmental problems associated with drainage of peatlands, which have implications on soil properties and water quality (Holden et al., 2006). The draining of peatlands tends to increase the leaching of nutrients into receiving waters which can show large increases in ammonium (NH_4) concentrations (Harrison et al., 2014; Sallantaus, 1995), changes to pH (acidification) (Miller et al., 1996) and a net loss of calcium (Ca), magnesium (Mg) manganese (Mn) and aluminium (Al) from drained catchments (Sallantaus, 1995). A study by Daniels et al. (2012) demonstrated that streams draining eroded upland peatlands were nitrogen saturated, with significant leaching of dissolved inorganic nitrogen (DIN), particularly ammonium. A number of processes take place within peat which affects its physical and chemical properties due to the lowering of the water table following drainage. Increases in air-filled porosity promote aerobic decomposition, enhancing the mineralization of nutrients, including the carbon-bound nitrogen and sulphur and the organically bound phosphorus (Holden et al., 2006).

Events which cause severe erosion of organic soils into receiving headwaters, such as the Meenbog peat slide in November 2020, can have profound, deleterious impacts on river ecosystems. These can lead to major shifts in biodiversity via smothering of the benthos, increased abrasive suspended loads, a reduction in water quality, modifications to river habitat and changes to functional processes which provide energy to aquatic food webs, such as primary production (Aspray et al. 2017, Kemp et al., 2011).

Colmation, also referred to as clogging, fine sediment infiltration, fine sediment deposition, ingress, infilling, intrusion of fines, siltation, and the surface-subsurface exchange of particles (Brunke, 2013; Wharton et al., 2017), is particularly damaging to riverine habitats. Impacts of sedimentation in aquatic ecosystems can manifest across multiple levels of biological organisation, from individual organisms to whole-ecosystem processes. Impacts on individuals occur via changes to oxygen

concentrations (physiology), foraging efficiency and locomotion (behaviour). These alterations may lead to emigration of organisms from the degraded habitat (Aspray et al. 2017), mortality and local extinctions of sensitive species (Kemp et al., 2011; Wood & Armitage, 1997), and proliferation of sediment and nutrient-tolerant biota (Larsen & Ormerod, 2010). Increased concentrations of metals, nutrients, and dissolved organic carbon because of sedimentation (Jones et al., 2012; Bilotta & Brazier, 2008) can further stress river ecosystems (Ramchunder et al., 2012). Medium to long-term indirect impacts are evident due to changes of the physical environment (e.g., changes in sedimentology, loss of spawning sites) as well as short-term, direct (highly dynamic) impacts due to physiological stress (e.g., high turbidity for fish) or risk of abrasion (e.g., for macro-invertebrates) (Hauer et al., 2018). Large shifts in community structure can negatively impact on key ecosystem processes for a variety of groups, including benthic algae and macrophytes (Izagirre et al., 2009; Jones et al., 2014), macro-invertebrates (Extence et al., 2013; Larsen et al., 2010), and fish, especially salmonids (Greig et al., 2005, 2007). In particular, salmonid reproduction is often curtailed because of colmation or depletion of river substratum (Sternecker et al., 2013b).

2. Methodology

2.1 Selection of watercourses for assessment

To evaluate any potential fisheries and water quality-related impacts of the November 2020 Meenbog peat slide event on the Sruhangarve (EPA code: 01S26) and Mourne Beg River (01M01), a total of 18.95km of riverine channel was surveyed in July 2021 (**Table 2.1; Figure 2.1**). This included a 2.2km length of the Mourne Beg River upstream of the Sruhangarve confluence (i.e. upstream control area), in addition to the lowermost 0.25km of the Bunadowen River (01B01).

Table 2.1 Summary of RHAT and fisheries habitat survey sections, June 2021

Section no.	Watercourse	Total length	No. RHAT sections	No. Life Cycle Unit sections	ITM start	ITM stop
U1-U5	Mourne Beg River (upstream control area)	2.2km	5	25	609871, 888292	608567, 888020
B1	Bunadowen River (upstream control area)	0.25km	1	3	608091, 887605	608204, 887820
S1-S5	Sruhangarve (d/s of peat slide)	2.3km	5	25	608894, 886222	610576, 887670
M1-M29	Mourne Beg River (d/s of peat slide)	14.2km	29	145	610576, 887670	620630, 883798
	Total	**18.95km**	**40**	**197**		

2.2 Fisheries assessment data (electro-fishing)

Semi-quantitative electro-fishing data (10-minute CPUE) on fish populations collected by the Loughs Agency in the 2011 to 2021 period was analysed to determine any trends in the salmonid populations of the Mourne Beg River, Bunadowen River and Sruhangarve before and after the November 2020 peat slide event.

Furthermore, electro-fishing data for *n*=4 sites the Mourne Beg River collated by Triturus Environmental Ltd. during surveys undertaken for the aquatic baseline of the proposed Lismullyduff wind farm project in July 2021 (Triturus, 2022) was also reviewed in context of peat slide impacts.

2.3 Salmonid habitat quality (Life Cycle Unit scores)

Fisheries habitat quality for salmonids was assessed using the Life Cycle Unit method (Kennedy, 1984; O'Connor & Kennedy, 2002) to map the Mourne Beg River, Sruhangarve and Bunadowen River survey areas as nursery, spawning and holding habitat, by assigning quality scores to each type of habitat (**Table 2.2**). Those habitats with poor quality substrata, shallow depth and a poorly defined river profile receive a higher score. Higher scores in the Life Cycle Unit method of fisheries quantification are representative of poorer value, with lower numerical scores being more optimal.

Life Cycle Unit scores were evaluated for every 100m linear length of river, equating to a total of *n*=197 survey sections and covering a total channel length of 18.95km (**Table 2.2; Figure 2.1**). The

quantification of salmonid habitat quality at this micro-scale ensured the most accurate baseline data was collated, thus better informing the assessment of peat slide impacts to salmonid populations.

Table 2.2 Life Cycle Unit scoring system for salmonid nursery, spawning and holding habitat value (as per Kennedy, 1984 & O'Connor & Kennedy, 2002)

Habitat quality	Habitat score	Total score (three components)
Poor	4	12
Moderate	3	9-11
Good	2	6-8
Excellent	1	3-5

2.4 Salmonid fry abundance

The abundance of Atlantic salmon fry (i.e. 0+) recorded was classified according to the systems defined by Crozier & Kennedy (1994) (Atlantic salmon) and Kennedy (unpublished) (brown trout) (**Table 2.3**). Both systems are based on the number of fry recorded per 5-minute CPUE electro-fishing (i.e. semi-quantitative). While a ten-minute CPUE was used during the current survey, the timed fish density recorded was divided by 0.5 to assign the data to the abundance categories of Crozier & Kennedy (1994).

Table 2.3 Semi-quantitative abundance categories for 0+ Atlantic salmon (Crozier & Kennedy, 1994 and brown trout (Kennedy, unpublished)

Species	Abundance category	No. fry per 5-min CPUE
Atlantic salmon	Excellent	≥25
	Good	15-24
	Fair	5-14
	Poor	1-4
	Absent	0
Brown trout	Excellent	≥18
	Good	9-17
	Moderate	4-8
	Fair	2-3
	Poor	0-1
	Absent	0

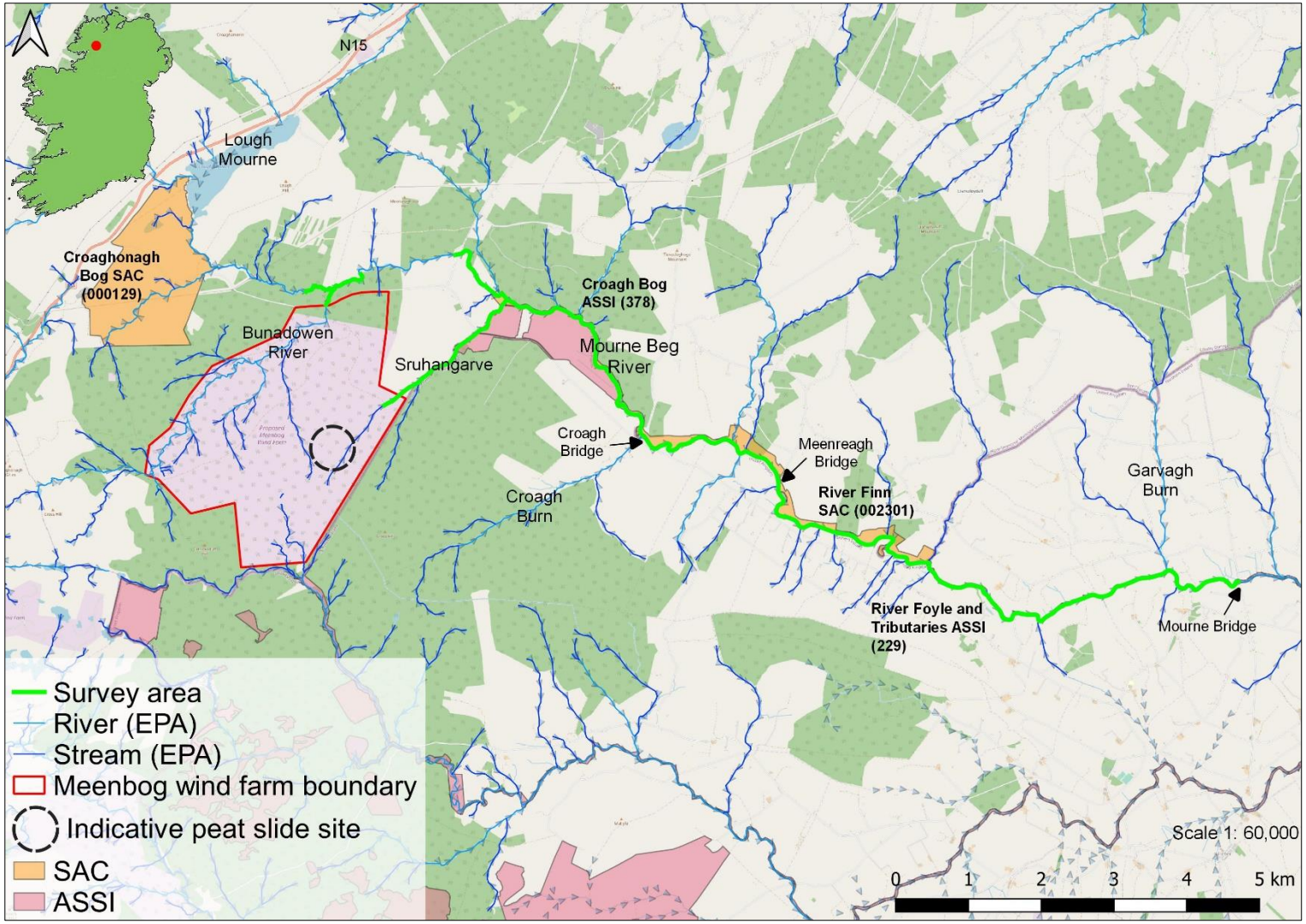

Figure 2.1 Overview of the Meenbog survey area, June 2021 (18.95km of channel)

2.5 Riverbed condition assessment (redox potential)

The condition of the river/stream bed (silt infiltration) in terms of suitability for salmonid and macro-invertebrate life stages was assessed through the measurement of redox potential. Redox potential measurements are used to determine a reading (voltage, mV) that can be used to infer the ability to obtain oxygen within the riverbed sediment (Moorkens & Killeen, 2020). Differences in redox potential between the water column and the substrate correlate with differences in oxygen levels, which serves as a proxy for assessing the condition of the riverbed in terms of suitability for spawning and early life stages of lithophilic salmonids (e.g. Atlantic salmon *Salmo salar*) and macro-invertebrates.

Three sets of three replicate redox measurements were taken for the substrata and water column, respectively, in each of the *n*=40 500m survey sections (**Figure 2.2**), in the most ostensibly suitable salmonid spawning/nursery zones (i.e. gravel/cobble areas). These areas and habitats were surveyed given the higher likelihood of impact through peat siltation/infiltration. Deeper glide and pool (holding habitat) was not surveyed. A low number of sampling sites (*n*=7) were unsuitable for redox substrata measurements due to heavily compacted/bedrock substrata (**Appendix C**). Furthermore, it was not always possible to collect three substrata replicates at each sampling site for the same reasons (e.g. sometimes only two replicates were possible). Where substrata measurements could not be collected, accompanying water column measurements were also omitted. Thus, a total of *n*=209 redox measurements were taken from the substrata and water column, respectively (*n*=418 total), from *n*=73 locations along 18.95km of riverine channel on the Mourne Beg River, Bunadowen River and Sruhangarve in July 2021.

Redox potential measurements were carried out using a WTW-modified pH instrument (Xylem Analytics, UK). This consisted of a platinum electrode and a reference electrode, silver/silver chloride (Ag/AgCl) with potassium chloride (KCl) electrolyte, connected to a pH meter. Redox potential was measured as the voltage between the platinum and reference electrodes with the measured redox potential not corrected for temperature. Redox potential readings are expressed in millivolts (mV). The redox and reference electrodes were calibrated with a standardized redox buffer solution of Eh 220mV and pH 7.0.

For water readings, both electrodes were suspended in the water column while for substrata measurements the platinum electrode was inserted to a **substrate depth of 5cm** and readings taken once the electrode readings stabilised. Where required (i.e. harder/more compacted substrata), pilot holes for the probes were bored in the sediment/substrata using a metal rod (of smaller diameter than the probes to limit water/oxygen flow during measurement).

2.6 Riverbed condition assessment (silt cover & infiltration)

Further to the assessment of redox potential, the physical coverage of silt (organic & inorganic) on riverine substrata was recorded at a total of *n*=67 locations within the 40 no. 500m survey sections on the Mourne Beg River, Bunadowen River and Sruhangarve (**Figure 2.2**). The location of these sites followed the same rationale as the redox methodology outlined in section 2.5 above, i.e. survey effort focused on shallow, faster-flowing areas suitable as salmonid spawning/nursery habitat. Following the approach for freshwater pearl mussel surveys (Moorkens & Killeen, 2020), the level of siltation as % surface cover was recorded as one of four categories, namely;

1. **No**: clean substrate surface
2. **Slight:** less than 5% cover, usually in small (sheltered) pockets
3. **Moderate**: greater than 5% but less than 25% and not forming a more or less continuous layer
4. **Severe**: greater than 25% and forming a more or less continuous layer

In addition to redox measurements (section 2.5 above), silt infiltration into the river/stream bed (**substrate depth of 5cm**) was also assessed objectively at a total of *n*=67 locations based on the presence of silt plumes (**Figure 2.2**). The degree of infiltration was scored according to the following (Moorkens & Killeen, 2020);

1. **No**: no plume
2. **Slight:** a small plume which quickly dissipates
3. **Moderate**: a small plume which is slow to dissipate
4. **Severe**: a significant plume released from the substrate

2.7 River hydromorphology (RHAT)

In order to evaluate and catalogue the degree of riverine habitat 'naturalness' on the survey watercourses in terms of overall ecology and suitability for fish species, the River Hydromorphological Assessment Technique (RHAT) was used (Murphy & Toland, 2014). The Mourne Beg River, Bunadowen River and Sruhangarve survey areas were assessed in *n*=40 discrete survey sections, along both banks (left and right, facing downstream), covering a total channel length of 18.95km (**Table 2.1**; **Figure 2.1**).

RHAT expands on the previous standards for river surveys, such as the River Habitat Survey (RHS) methodology (EA, 2003). It is assumed that natural systems support ecology better than modified systems. Hence, the RHAT method classifies river hydromorphology based on a departure from naturalness and allows for the assignment of a morphological classification directly related to Water Framework Directive (WFD) status (**Table 2.4**), i.e. high, good, moderate, poor or bad. Score calculation is based on eight semi-qualitative and quantitative hydromorphological criteria, namely:

1. Channel morphology and flow types
2. Channel vegetation
3. Substrate diversity and condition
4. Barriers to continuity
5. Bank structure and stability
6. Bank and bank top vegetation
7. Riparian land use
8. Floodplain interaction

The RHAT is designed to be a holistic visual assessment based on information from both desktop and field (walkover) studies incorporating GIS data, aerial (ortho) photography and historical data. The RHAT method was developed for WFD classification, but it also has other applications including assessing morphological pressures at a site.

Table 2.4 RHAT hydromorph scores and their corresponding Water Framework Directive (WFD) classification (Murphy & Toland, 2014)

Attribute score	Hydromorph score	WFD status
≥26	≥0.8	High status
≥19.5 to <26	≥0.7 ≤0.8	Good status
≥13 to <19.5	≥0.5 ≤0.6	Moderate status
≥6.5 to <13	≥0.3 ≤0.4	Poor status
< 6.5	≤0.2	Bad status

2.8 Biological water quality (Q-sampling)

A total of *n*=10 riverine survey sites on the Mourne Beg River (M1-M8), Bunadowen River (B1) and Sruhangarve (S1) were assessed for biological water quality through Q-sampling in October 2021 (**Figure 2.2**). Macro-invertebrate samples were converted to Q-ratings as per Toner et al. (2005). All riverine samples were taken with a standard kick sampling hand net (250mm width, 500µm mesh size) from areas of riffle/glide utilising a three-minute sample. Large cobble was also washed at each site where present and samples were elutriated and fixed in 70% ethanol for subsequent laboratory identification. Any rare invertebrate species were identified from the NPWS Red List publications for beetles (Foster et al., 2009), mayflies (Kelly-Quinn & Regan, 2012), stoneflies (Feeley et al., 2020) and other relevant taxa (i.e. Byrne et al., 2009; Nelson et al., 2011).

Table 2.5 Reference categories for EPA Q-ratings (Q1 to Q5)

Q Value	WFD Status	Pollution status	Condition
Q5 or Q4-5	High status	Unpolluted	Satisfactory
Q4	Good status	Unpolluted	Satisfactory
Q3-4	Moderate status	Slightly polluted	Unsatisfactory
Q3 or Q2-3	Poor status	Moderately polluted	Unsatisfactory
Q2, Q1-2 or Q1	Bad status	Seriously polluted	Unsatisfactory

2.9 Biosecurity

A strict biosecurity protocol following the Check-Clean-Dry approach was employed during the survey. Equipment and PPE used was disinfected with Virkon® between survey sites to prevent the transfer of pathogens and/or invasive species between survey areas. As per best practice, surveys were undertaken at sites in a downstream order (i.e. uppermost site surveyed first etc.) to prevent the upstream mobilisation of invasive propagules and pathogens.

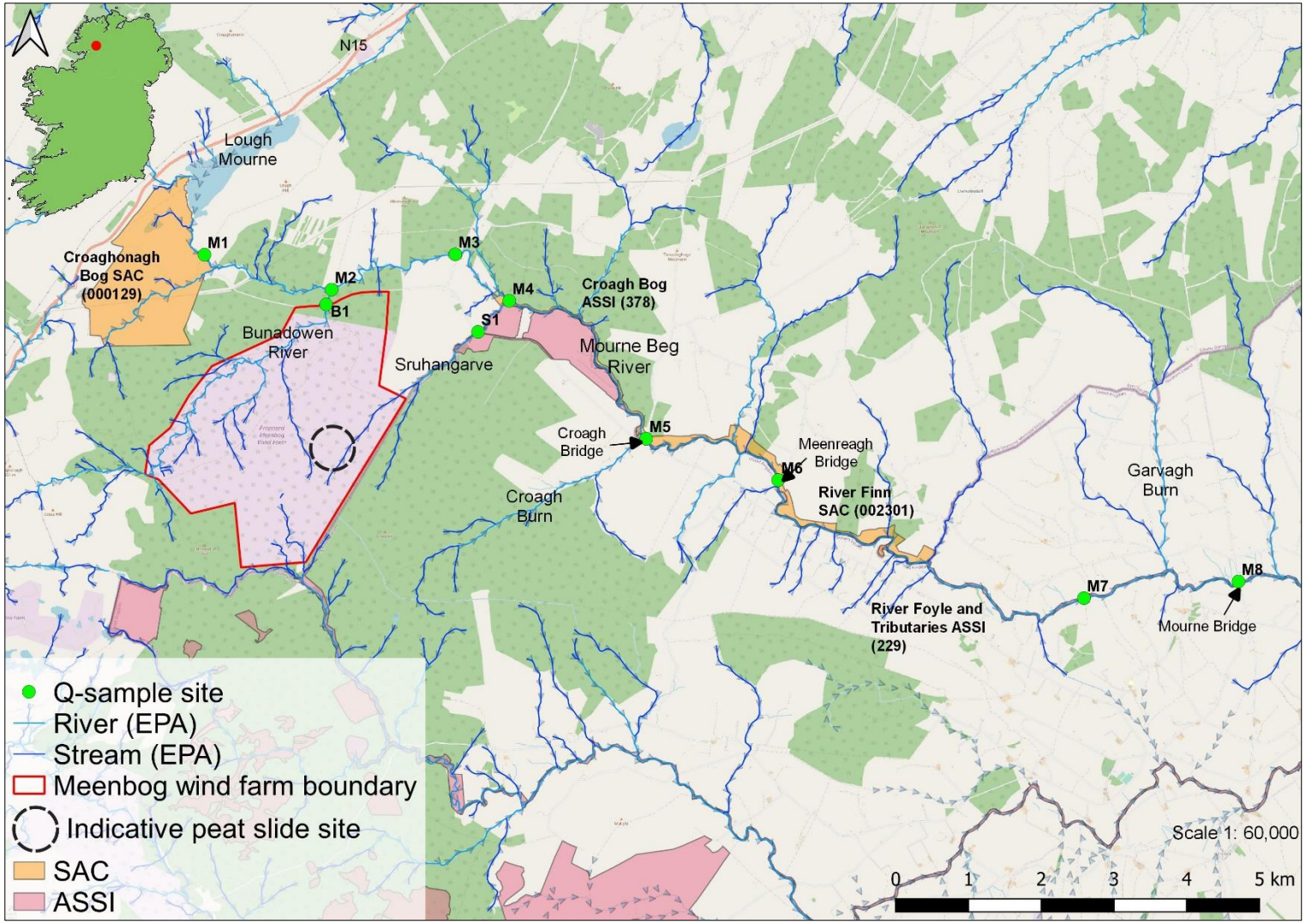

Figure 2.2 Overview of the *n*=10 biological water quality sampling locations in the vicinity of the Meenbog peat slide, October 2021

3. Results

3.1 Salmonid habitat quality (Life Cycle Unit scores)

The quality of salmonid spawning, nursery and holding habitat was mapped along 18.95km of the Mourne Beg River, including both upstream and downstream of the Sruhangarve confluence (i.e. peat impact zone). The Sruhangarve (2.3km) and Bunadowen River (0.25km) also formed part of the fisheries habitat survey area. Life Cycle Unit scores per 100m of channel are presented in **Figures 3.6, 3.7 and 3.8** below. A breakdown of the Life Cycle Unit scores for each of the *n*=197 100m survey sections is provided in **Appendix A**.

3.1.1 Upstream control area (Mourne Beg River & Bunadowen River)

The upstream control area on the Mourne Beg River (Sections U1-U5) typically supported superior salmonid habitat when compared to downstream areas, with 22 of 25 survey sections gradings as good quality overall salmonid habitat (**Appendix A**). While subject to some local variability, the good quality salmonid Life Cycle Unit Scores were attributed to the presence of good quality spawning and nursery habitat. Section U1_a (uppermost survey section) featured excellent quality spawning habitat. The Bunadowen River, which adjoined the upstream control reaches of the Mourne Beg, provided good quality salmonid habitat particularly in terms of nursery habitat (**Appendix A**).

3.1.2 Sruhangarve

Approximately half (48% & 52%) of the *n*=23 survey sections on the Sruhangarve provided moderate and good quality salmonid habitat, respectively according to the Life Cycle Unit scores. None of the survey sections provided poor quality or, conversely, excellent quality salmonid habitat according to Life Cycle Unit scores (**Appendix A**). Siltation impacts (from peat escapement) were evident throughout the survey area.

The Sruhangarve is a higher-gradient, narrow upland eroding channel that is typically of low value as a salmonid spawning habitat, ranging from poor to moderate in terms of quality. However, approximately half of survey sections (*n*=12) provided good-quality nursery habitat (**Figure 3.6**).

The Sruhangarve was of greatest value as a salmonid holding habitat. The majority of the survey sections (*n*=18) were considered as good quality holding areas (**Figure 3.8**) for brown trout only given the small size of the channel.

3.1.3 Mourne Beg River (downstream of Sruhangarve)

Approximately half (49% & 51%) of the *n*=144 survey sections on the Mourne Beg River provided moderate and good quality salmonid habitat, respectively, according to the Life Cycle Unit Scores. None of the survey sections provided poor quality salmonid habitat. Section 21_e, located downstream of Corgary Trout Farm, was the only Mourne Beg River survey section to provide excellent-quality salmonid habitat (combination of moderate spawning with excellent quality nursery and holding habitat).

Downstream of the Sruhangarve confluence, the Mourne Beg River was typically of moderate to poor quality in terms of spawning habitat. Good quality spawning areas were highly localised and present in just *n*=6 (4%) of *n*=144 survey sections (e.g. section M8 downstream of Croagh Bridge) (**Figure 3.6**). Section M9_d was the only survey section to provide excellent quality spawning habitat.

The Mourne Beg River was of greatest value as a salmonid nursery habitat. Excellent quality nursery habitat was recorded in *n*=25 (17%) of the survey sections, with good quality nursery habitat present in a total of *n*=59 (41%) of the survey sections (**Appendix A**). Only a single survey section (M8_e) provided poor quality nursery habitat. Particularly valuable nursery habitat was located between section M4_and M6_b, covering a 1.2km contiguous length of river channel. This was located ≥1.5km downstream of the Sruhangarve confluence (**Figure 3.7**).

The Mourne Beg River downstream of the Sruhangarve also provided widespread good quality or excellent quality holding habitat for adult salmonids. This was primarily due to the high frequency of deeper glide although deep pools were also present locally (e.g. on meanders). Of the survey sections, *n*=35 (25%) and *n*=36 (25%) provided excellent and good quality holding habitat, respectively. Whilst some high-quality holding areas were located in the upper reaches (e.g. near the Sruhangarve confluence), the quality of holding habitat typically improved moving downstream.

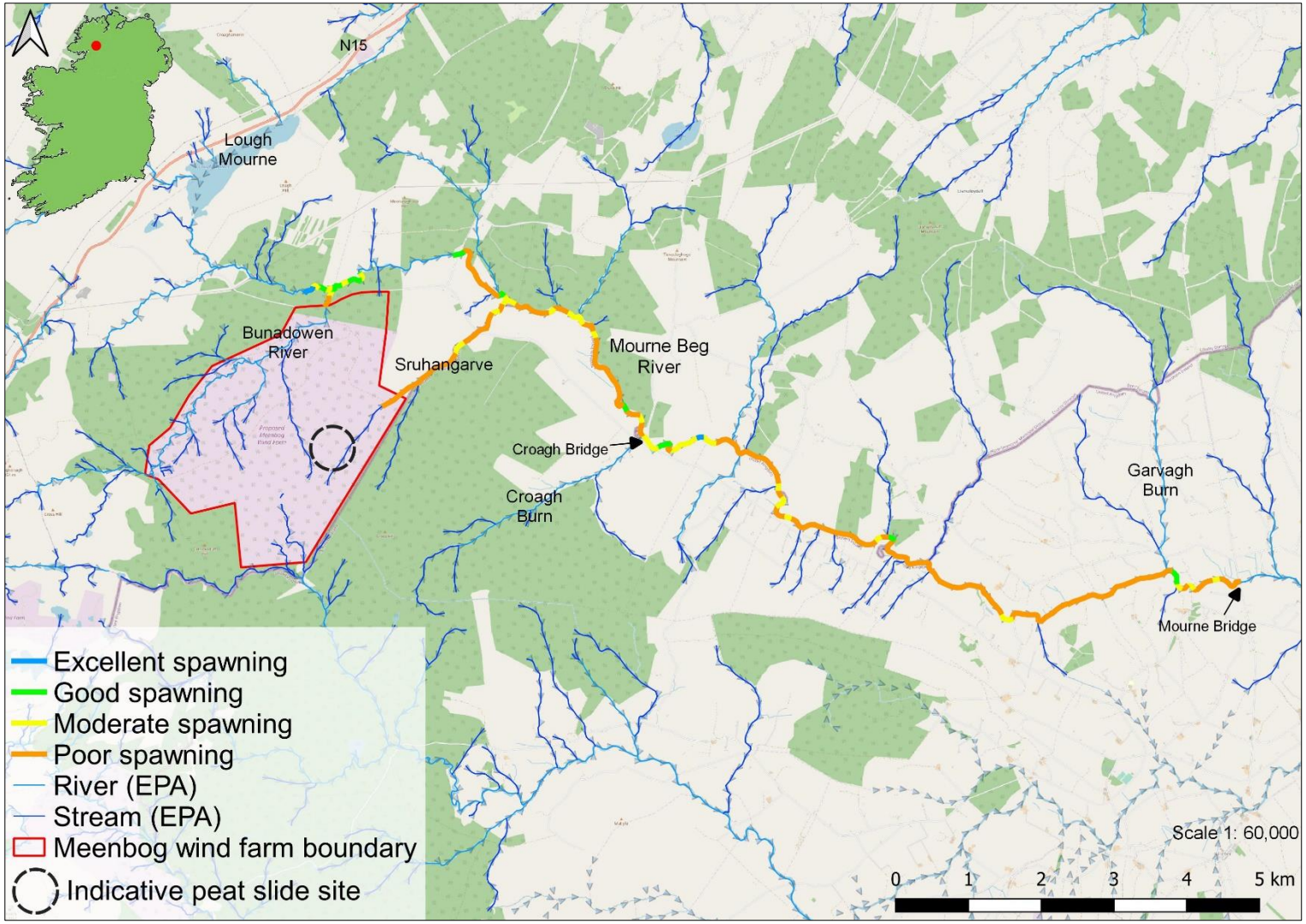

Figure 3.1 Distribution and quality of salmonid spawning habitat within the survey area, July 2021 (Life Cycle Unit scores)

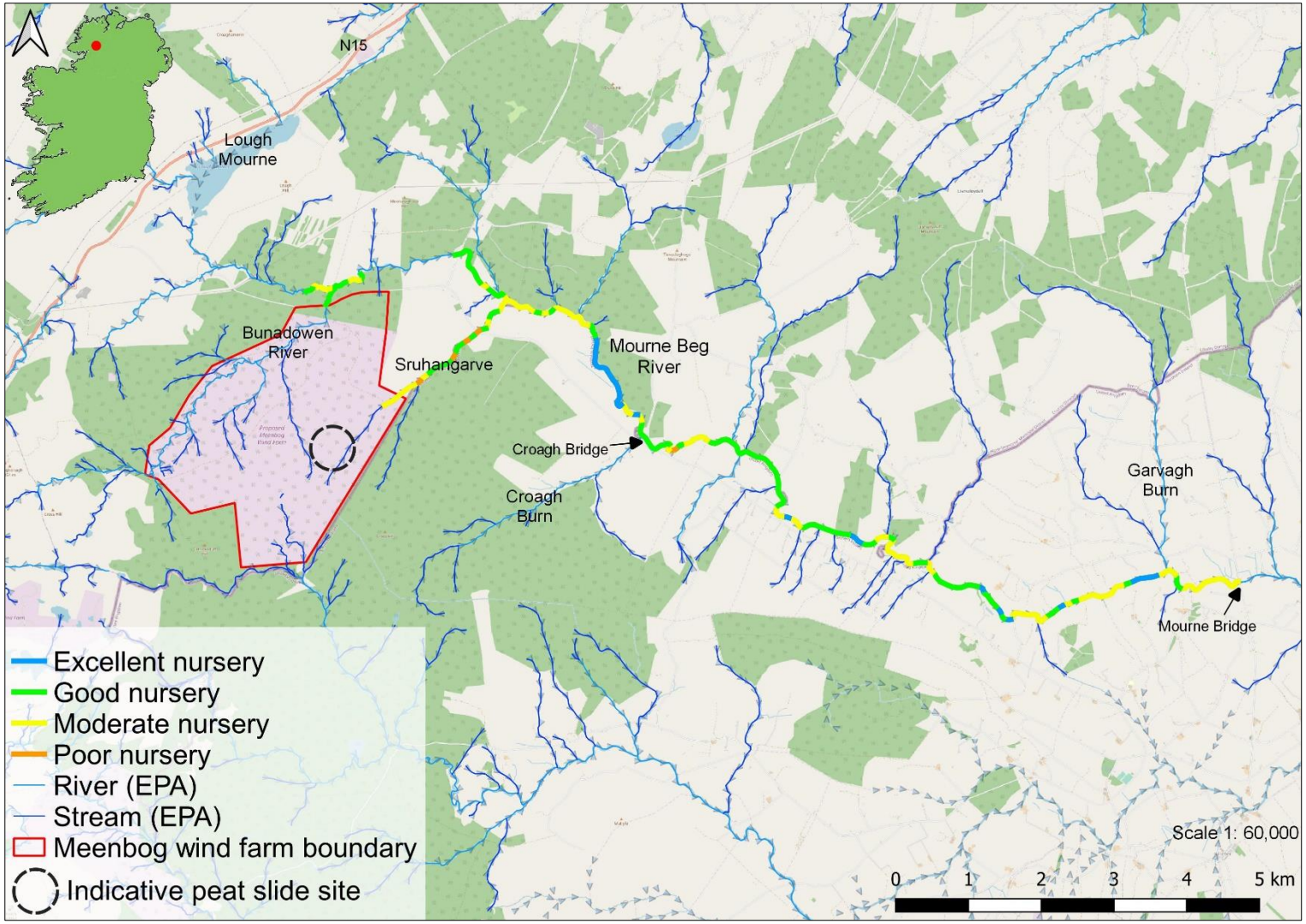

Figure 3.2 Distribution and quality of salmonid nursery habitat within the survey area, July 2021 (Life Cycle Unit scores)

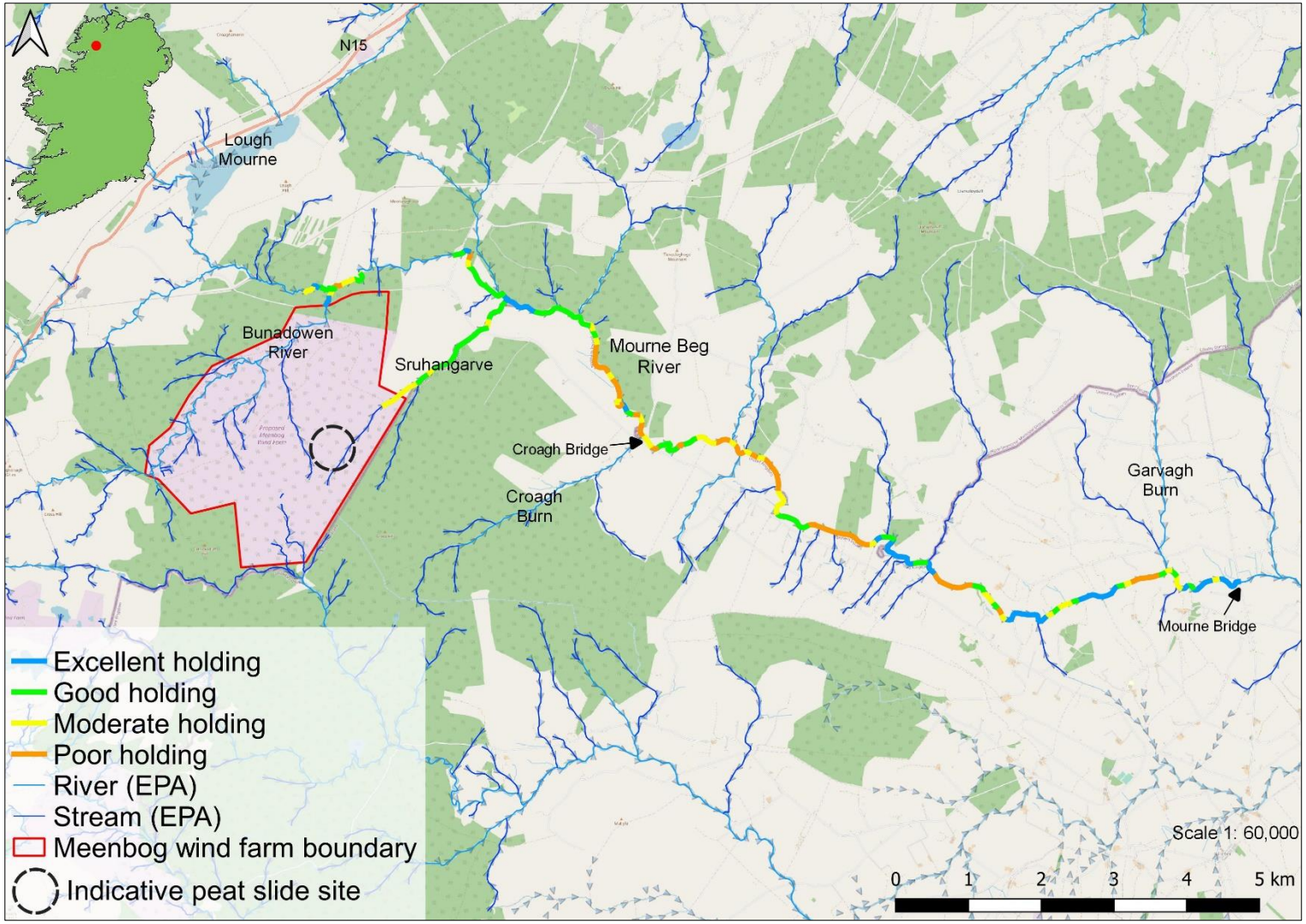

Figure 3.3 Distribution and quality of salmonid holding habitat within the survey area, July 2021 (Life Cycle Unit scores)

3.2 Riverbed condition assessment

3.2.1 Redox potential

The condition of the riverbed in terms of suitability for salmonid and macro-invertebrate life stages in the Mourne Beg River, Bunadowen River and Sruhangarve was assessed through the measurement of the percentage redox loss (between water column and substrata). A total of *n*=209 redox measurements were taken from the substrata and water column, respectively (*n*=418 total), from *n*=73 locations along 18.95km of riverine channel in July 2021.

Redox readings from the water column ranged from 184-371mV (±36.4 SD) in the Mourne Beg River and 213-383mV (±37.3 SD) in the Sruhangarve (**Appendix B**). A single site was analysed on the Bunadowen River (mean 316mV ±22.8 SD). On the Mourne Beg River, four of the five lowest mean water column readings (three replicates) were in the upstream control sections (i.e. 210, 248, 254 & 273mV), respectively (**Appendix B**). On the Sruhangarve, the lowest water column readings were located in the uppermost survey sections (i.e. nearest to the peat slide).

Substrata redox readings (5cm depth) were lower than accompanying water column readings and ranged from 108-363mV (±32.0 SD) and 89-369mV (±84.4 SD) in the Mourne Beg River and Sruhangarve, respectively. A single site was analysed on the Bunadowen River (294mV ±12.0 SD). The lowest mean substrata readings were recorded on the Sruhangarve (**Appendix B**).

Percentage redox differentials in the Mourne Beg River (sections M1 to M27) ranged from -31% to +10%, with a mode loss of -15% (**Figure 3.8; Appendix B**). With only a few exceptions (e.g. section M5), there was a general downward trend (i.e. higher % loss) moving downstream along the Mourne Beg River (**Figure 4.8**). Losses of >30% are typically considered to be reflective of anoxic conditions (Moorkens & Killeen, 2020).

The percentage redox loss was considerably lower in the upstream control sections located immediately upstream of the Sruhangarve confluence (i.e. sections U3, U4 & U5; -19% to +25% range; **Figure 3.8**).

3.2.2 Siltation & silt infiltration of riverine substrata

An assessment of siltation of riverine substrata (% cover' Moorkens & Killeen, 2020) was made at a total of *n*=60 locations on the Mourne Beg River and *n*=5 locations on the Sruhangarve. These locations were chosen based on their suitability as salmonid spawning/nursery habitat.

There was a marked difference in % surface cover of riverine substrata by peat upstream and downstream of the Sruhangarve confluence, reflecting the impact of the peat slide (**Figure 3.6; Appendix D**). Whilst some siltation was present, all *n*=10 replicates examined on the Mourne Beg River upstream of the Sruhangarve confluence featured slight siltation (≤5% cover of riverine substrata). However, the majority of downstream replicates (*n*=42 of 50) featured severe siltation (≥25% cover, range 40-90%). A total of *n*=7 replicates featured moderate levels of siltation (<25% cover). These were mostly confined to the lower survey reaches. A single replicate (M21_a) did not feature any siltation (0% cover) due to a riverbed of bedrock and fast, cascading flows. As would be expected,

levels of siltation by peat were typically severe (30-100% cover) on the Sruhangarve, with only one of 5 no. replicates (S4_a) featuring moderate siltation (**Figure 3.7**).

Similar to the % cover of peat, there was a marked difference in peat infiltration of riverine substrata upstream and downstream of the Sruhangarve confluence (**Figure 3.8; Appendix D**). Whilst some siltation was present, all *n*=10 replicates examined on the Mourne Beg River upstream of the Sruhangarve confluence featured slight infiltration of sediment into riverine substrata (small plume which quickly dissipated). By contrast, the majority of downstream replicates (*n*=42 of 50) featured severe infiltration (significant plumes released upon disturbance). A total of *n*=4 and *n*=3 replicates featured slight and moderate levels of infiltration, respectively.). These were mostly confined to the lower survey reaches. These replicates were confined to the lower survey reaches (i.e. M19 onwards). A single replicate (M21_a) did not feature any infiltration of silt due to a riverbed of bedrock. As would be expected, levels of silt infiltration into riverine substrata were typically severe on the Sruhangarve, with only one of 5 no. replicates (S4_a) featuring moderate infiltration (**Figure 3.9**).

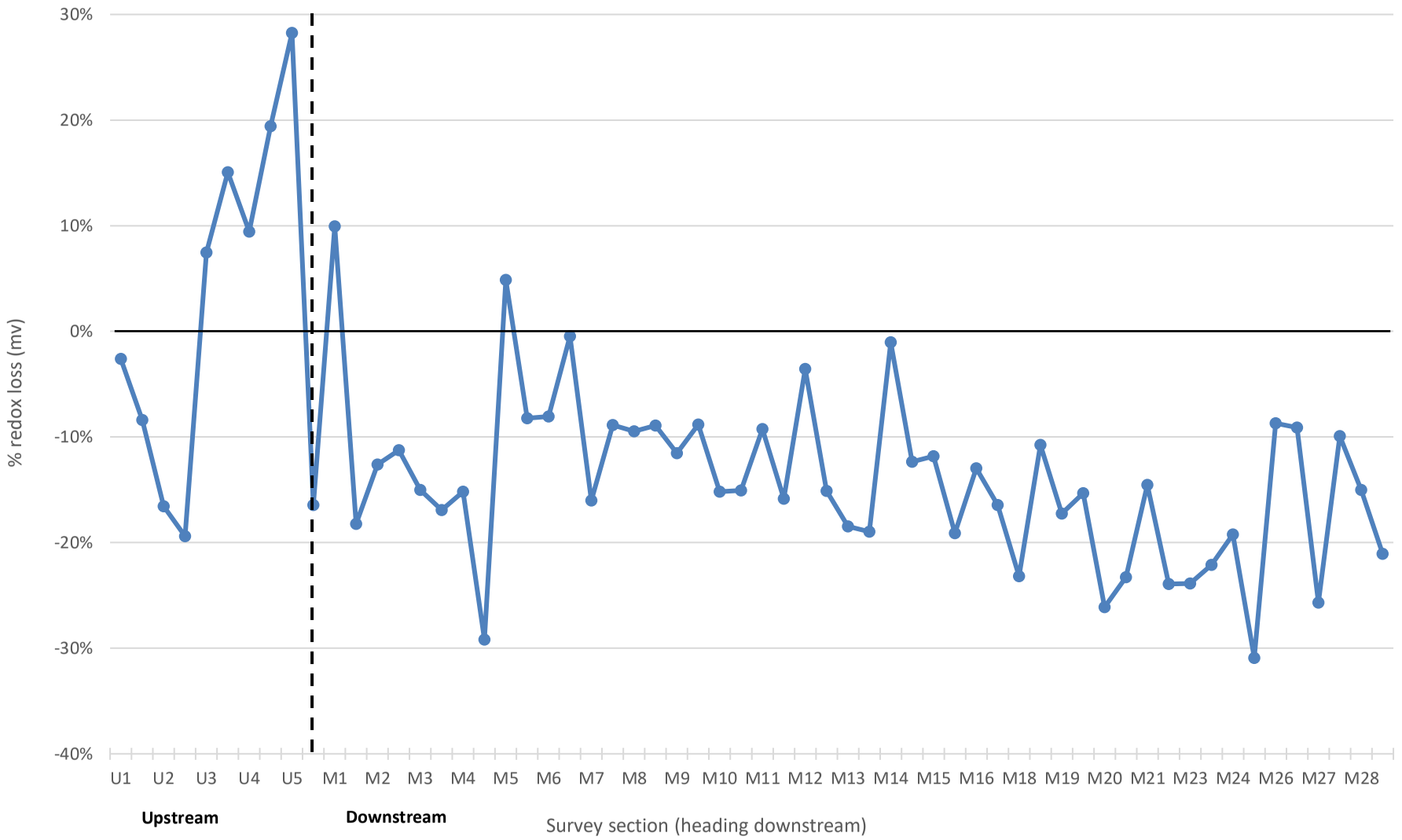

Figure 3.4 Percentage redox loss (between water column and substrata) along the Mourne Beg River, July 2021 (dashed line indicates peat slide event)

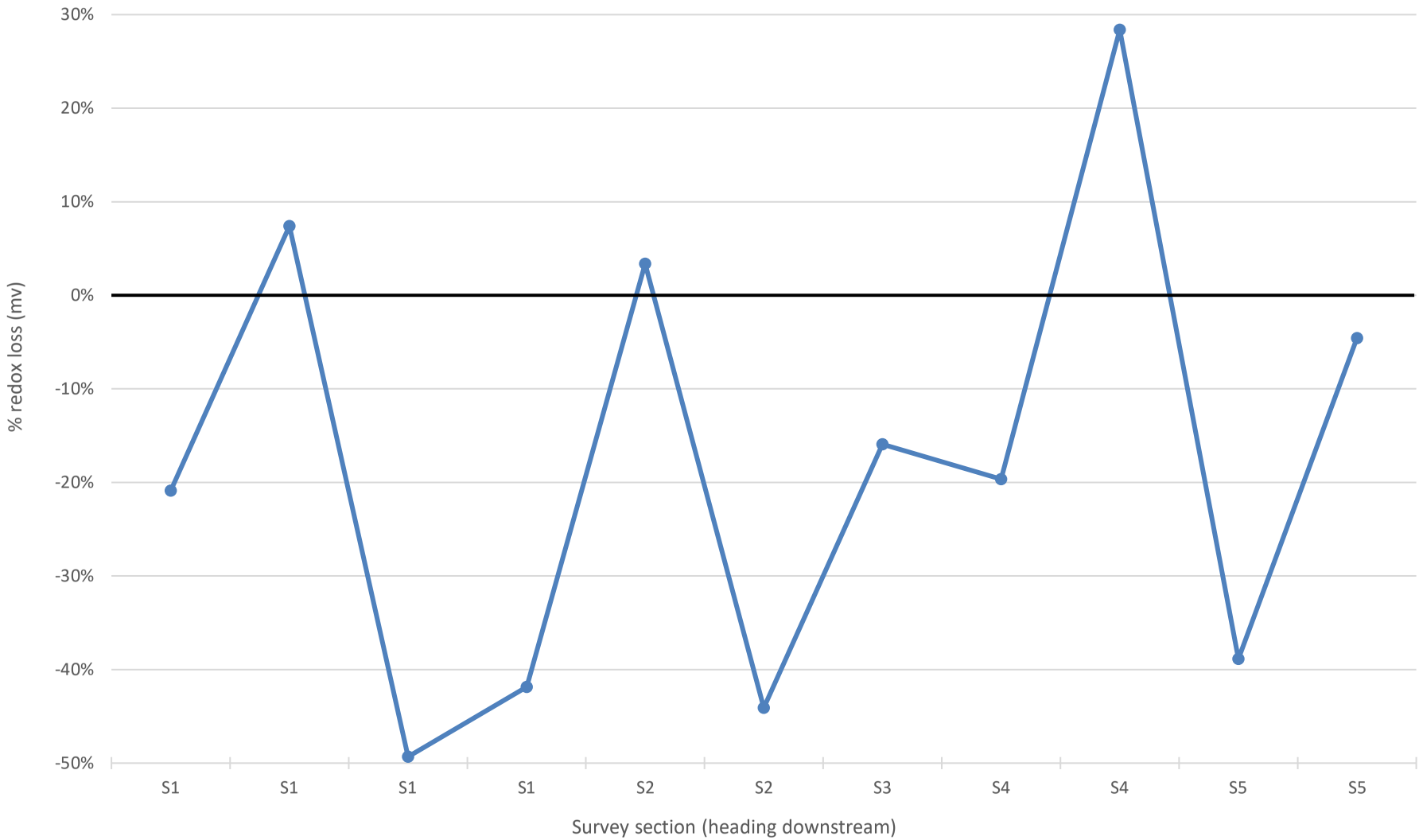

Figure 3.5 Percentage redox loss (between water column and substrata) along the Sruhangarve, July 2021

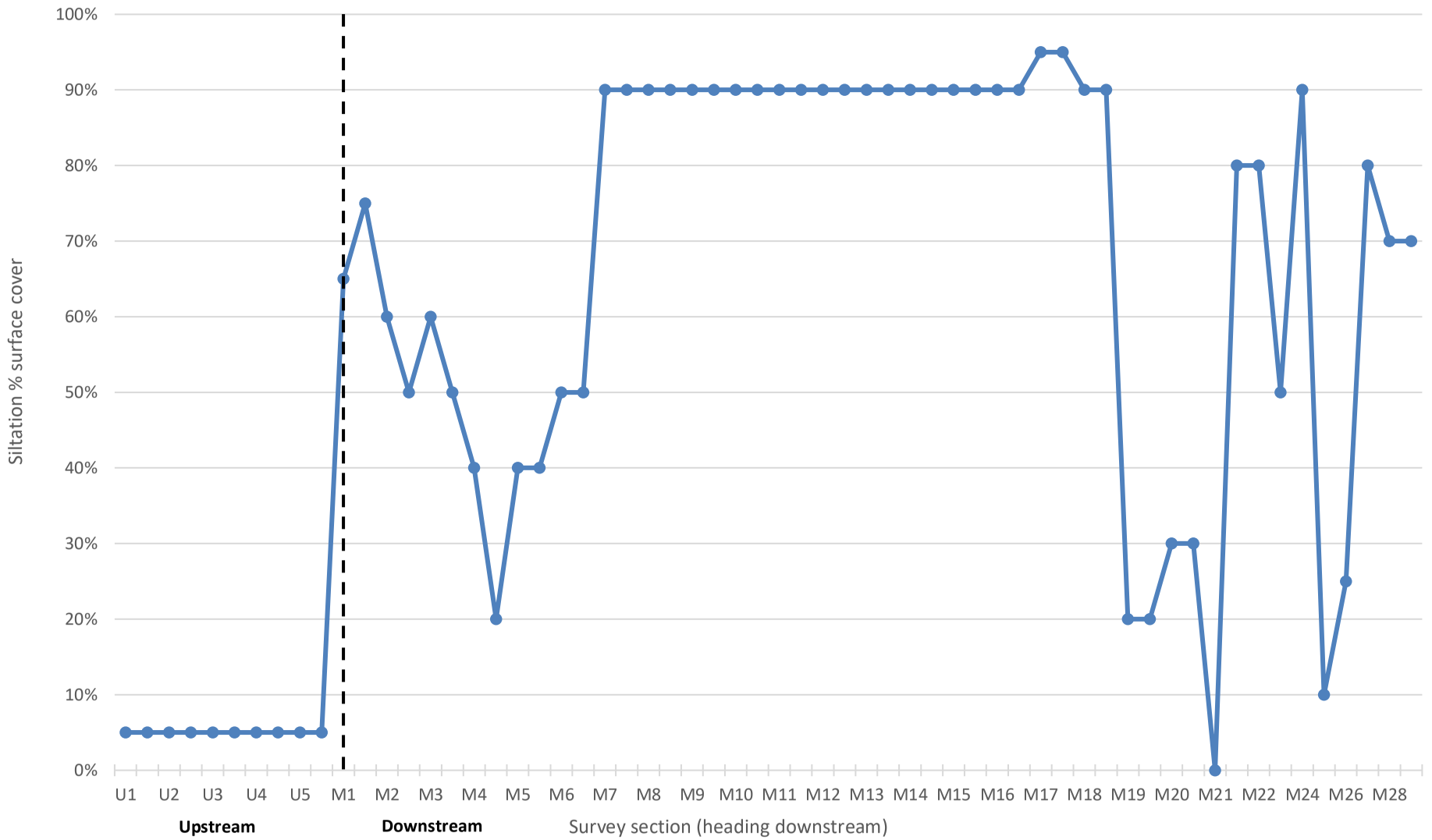

Figure 3.6 Percentage cover of siltation on the riverbed along the Mourne Beg River, July 2021 (dashed line indicates peat slide event). 0% = none, <5% = slight, <25% = moderate, >25% = severe siltation

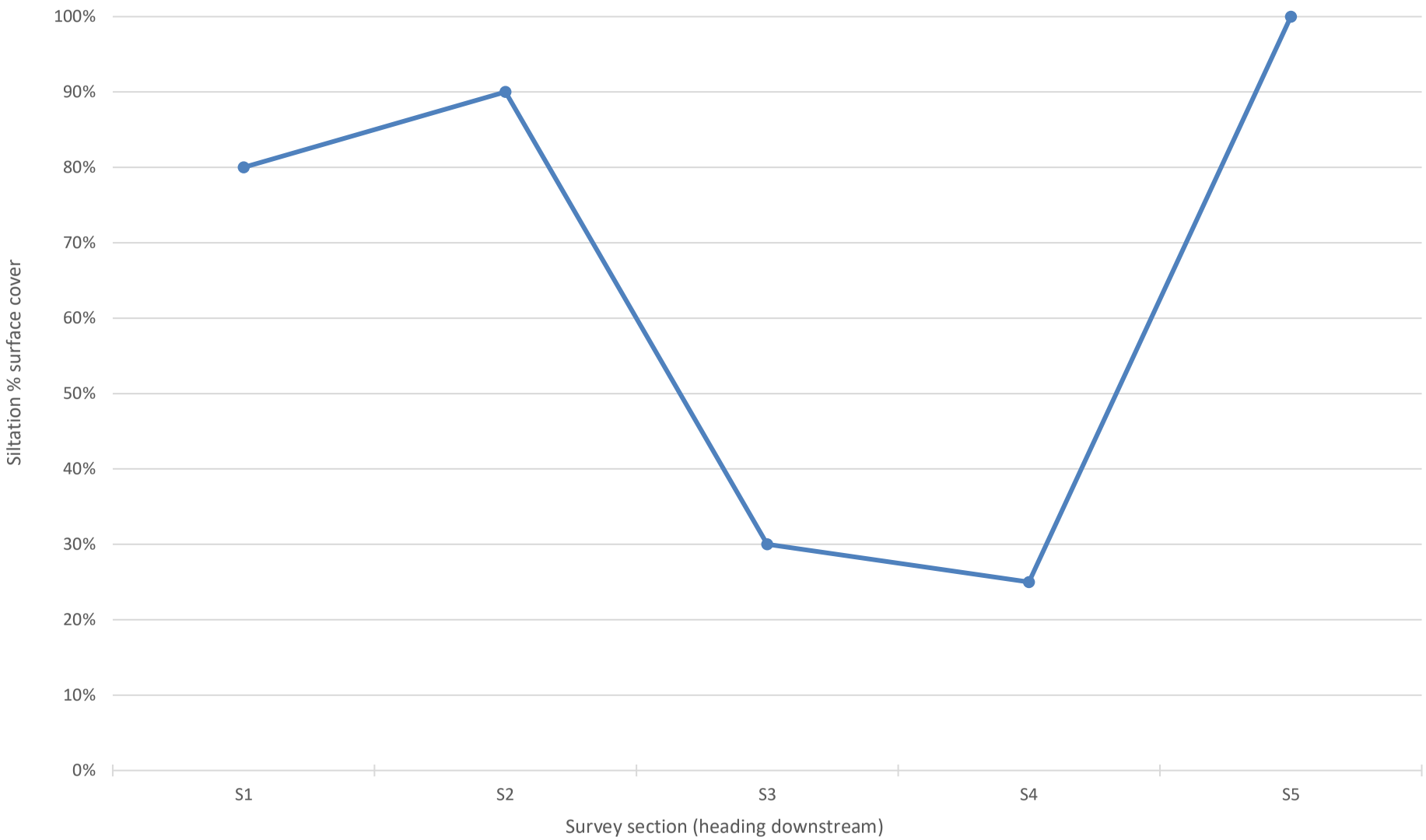

Figure 3.7 Percentage cover of siltation on riverbed along the Sruhangarve, July 2021. 0% = none, <5% = slight, <25% = moderate, >25% = severe siltation

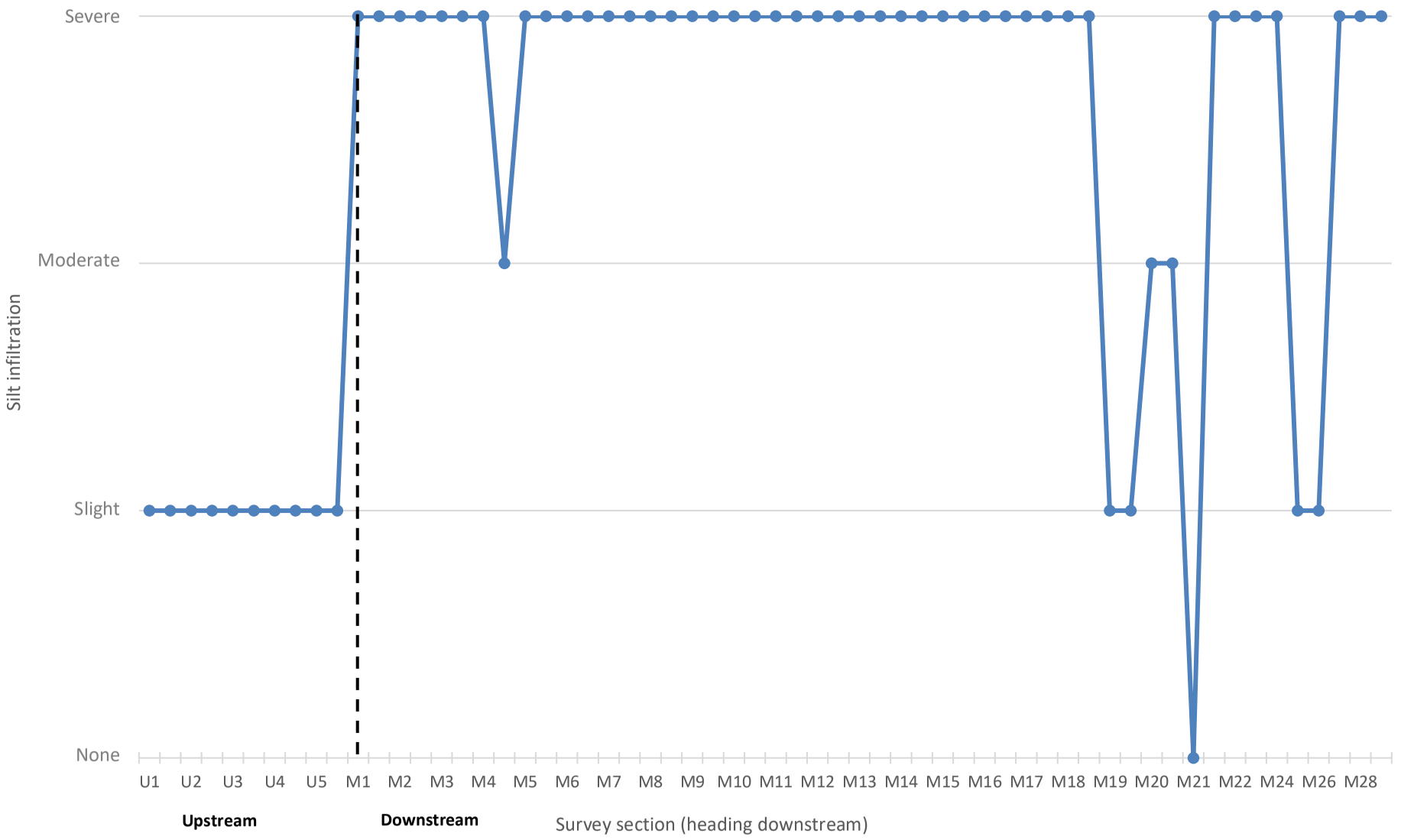

Figure 3.8 Level of silt infiltration of riverine substrata along the Mourne Beg River, July 2021 (dashed line indicates peat slide event)

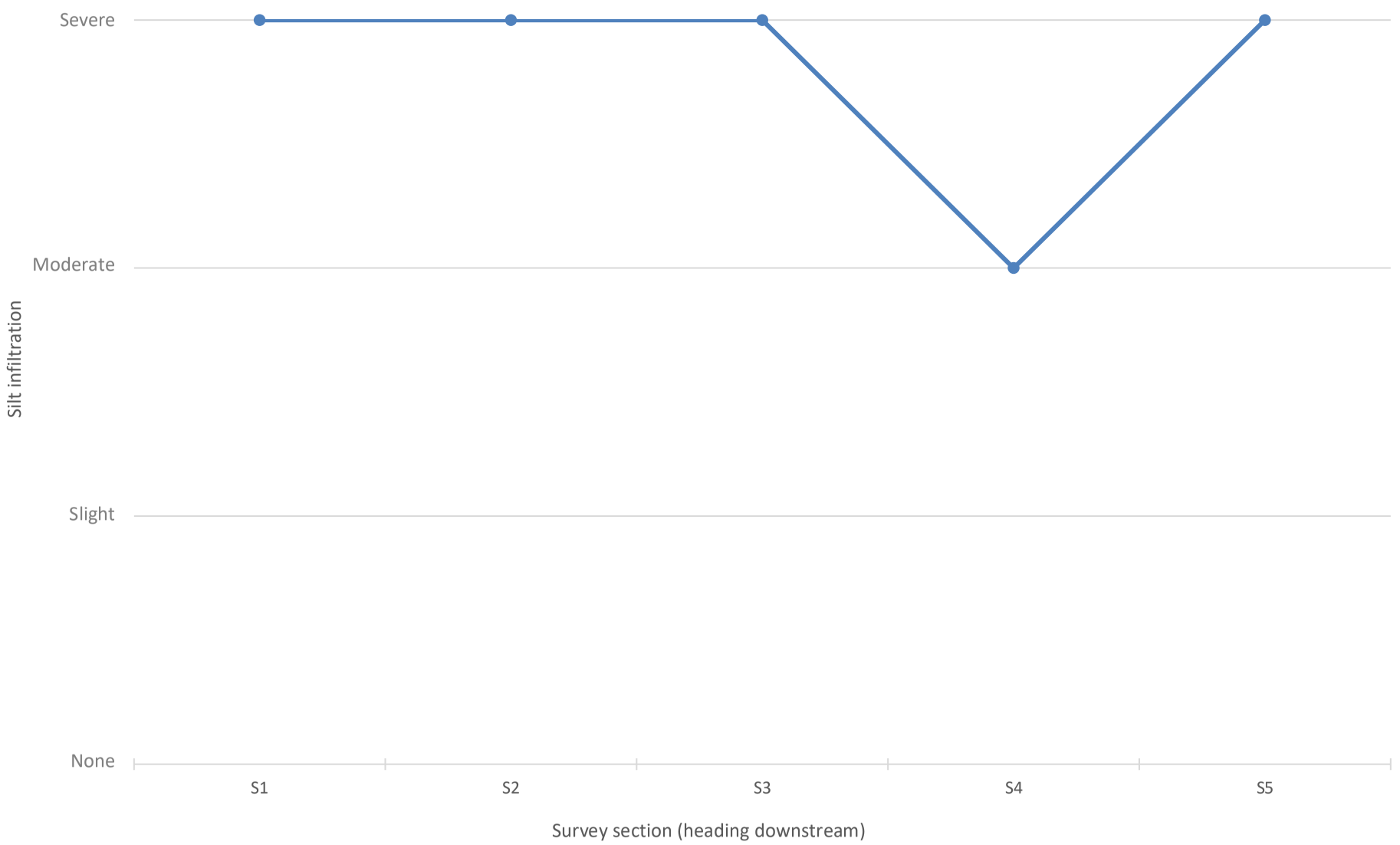

Figure 3.9 Level of silt infiltration of riverine substrata along the Sruhangarve, July 2021

3.3 Juvenile salmonid population trends (electro-fishing data)

Utilising the Lough's Agency electro-fishing data from the same 7 no. survey sites pooled, there were evident temporal changes in salmonid fry abundance between September 2020 (pre-impact) and June 2021 (post-impact) (**Figures 3.10-3.13; Tables 3.1 & 3.2**). The two survey sites located upstream of the Sruhangarve confluence (650m d/s Lough Mourne & 250m upstream Bunadowen-Mourne Beg confluence) supported very low numbers of 0+ Atlantic salmon fry (**Table 3.1**) and 0+ brown trout fry (**Table 3.2**) in both years, respectively. The abundance of Atlantic salmon fry showed a general positive trend (increase) moving downstream along the Mourne Beg River in both years with a considerable decline observed only at Meenreagh Bridge (station 05_022) **(Table 3.1)**.

For Atlantic salmon, there was either no change or an increase in juvenile (0+ and 1+) fish abundance in 5 of these 7 survey sites in June 2021 compared with September 2020 (**Figures 3.10 & 3.11**). The number of 0+ Atlantic salmon remained the same or increased at 6 of the 7 survey sites. There was a **62% increase** in the total number of juvenile Atlantic salmon recorded in June 2021 (*n*=89) compared with September 2020 (*n*=55).

However, in terms of brown trout abundance, there was a clear reduction in overall numbers of 0+ and 1+ fish in June 2021 compared with September 2020 (**Figures 3.12 & 3.13**). There were less 0+ trout recorded at all 7 no. comparable survey sites in June 2021, with trout absent from two survey sites (i.e. 250m upstream Bunadowen-Mourne Beg confluence and Mournebeg Bridge). There was an **81% decrease** in the total number of 0+ brown trout fry recorded in June 2021 (*n*=7) compared with September 2020 (*n*=37), with lower numbers recorded at all 7 no. survey sites (**Table 3.2; Figures 3.12 & 3.13**). The numbers of 1+ brown trout were slightly higher at the three survey sites upstream of the Sruhangarve in 2021 compared with 2020, but lower at all sites downstream (Loughs Agency data not shown). Similarly, the total numbers of numbers of brown trout (0+ and 1+ combined) increased or remained the same at the three survey sites upstream of the Sruhangarve confluence but decreased at all sites downstream (**Figure 3.15**).

For context, the total number of juvenile Atlantic salmon and brown trout recorded in the 2015-2021 period (excluding 2017, no data) are provided in **Figures 3.14** and **Figure 3.15**, respectively.

Table 3.1 Semi-quantitative abundance categories (Crozier & Kennedy, 1994) for **0+ Atlantic salmon fry** in September 2020 (pre-impact) and June 2021 (post-impact). Abundance categories shown as 5-minute CPUE equivalents

Site ID	Site	2020		2021	
		No. fry (10-min CPUE)	Abundance category (5-min CPUE)	No. fry (10-min CPUE)	Abundance category (5-min CPUE)
05_033	650m d/s Lough Mourne	1	Poor	0	Absent
05_032	250m upstream Bunadowen-Mourne Beg confluence[1]	2	Poor	2	Poor
05_031	Meenglass Bridge	4	Poor	13	Fair
05_023	Croagh Bridge	6	Poor	**11**	**Fair**
05_022	Meenreagh Bridge	18	Fair	**3**	**Poor**
05_019	Mourne Bridge	7	Poor	21	Fair
05_018	Mournebeg Bridge	18	Fair	39	Good
	Total	**55**		**89**	

Table 3.2 Semi-quantitative abundance categories (Kennedy, unpublished) for **0+ brown trout fry** in September 2020 (pre-impact) and June 2021 (post-impact). Abundance categories shown as 5-minute CPUE equivalents

Site ID	Site	2020		2021	
		No. fry (10-min CPUE)	Abundance category (5-min CPUE)	No. fry (10-min CPUE)	Abundance category (5-min CPUE)
05_033	650m d/s Lough Mourne	4	Poor	3	Poor
05_032	250m upstream Bunadowen-Mourne Beg confluence[1]	3	Poor	0	Absent
05_031	Meenglass Bridge	2	Poor	1	Poor
05_023	Croagh Bridge	3	Poor	2	Poor
05_022	Meenreagh Bridge	11	Fair	1	Poor
05_019	Mourne Bridge	6	Poor	2	Poor
05_018	Mournebeg Bridge	8	Poor	0	Absent
	Total	**37**		**7**	

[1] In 2020 this site was located at the Bunadowen River-Mourne Beg River confluence rather than on the Mourne Beg 250m upstream of this point

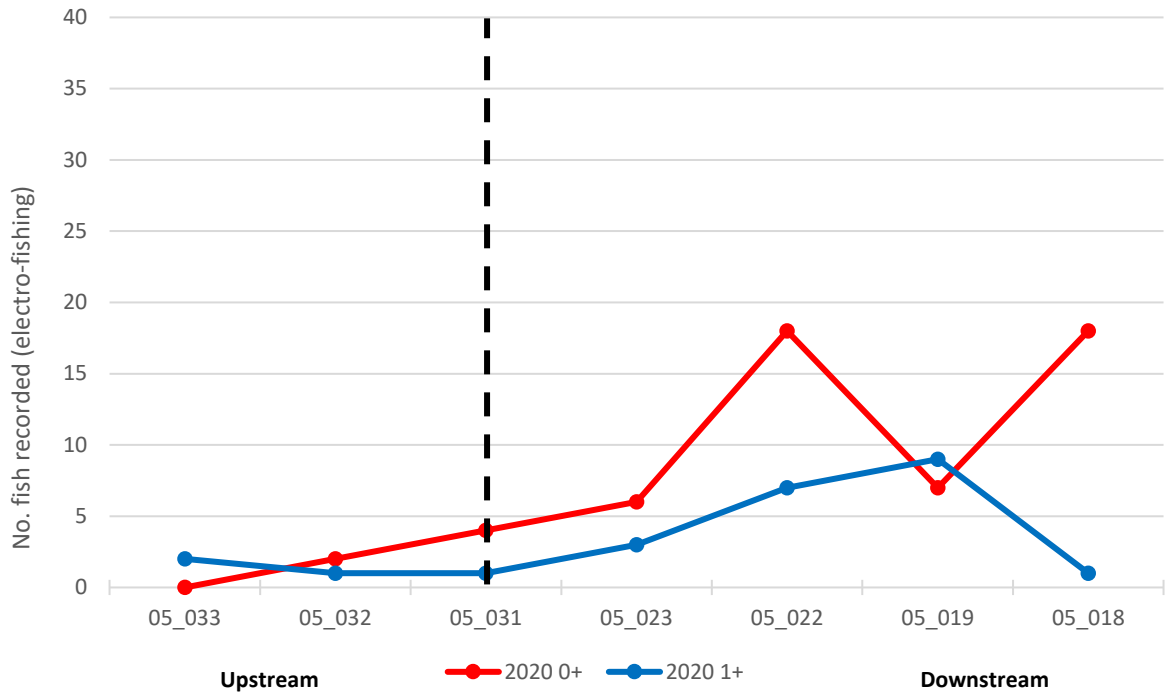

Figure 3.10 Numbers of 0+ & 1+ Atlantic salmon recorded via electro-fishing from the same 7 no. sites on the Mourne Beg River in **2020** (upstream to downstream). Dashed line indicates peat slide event location

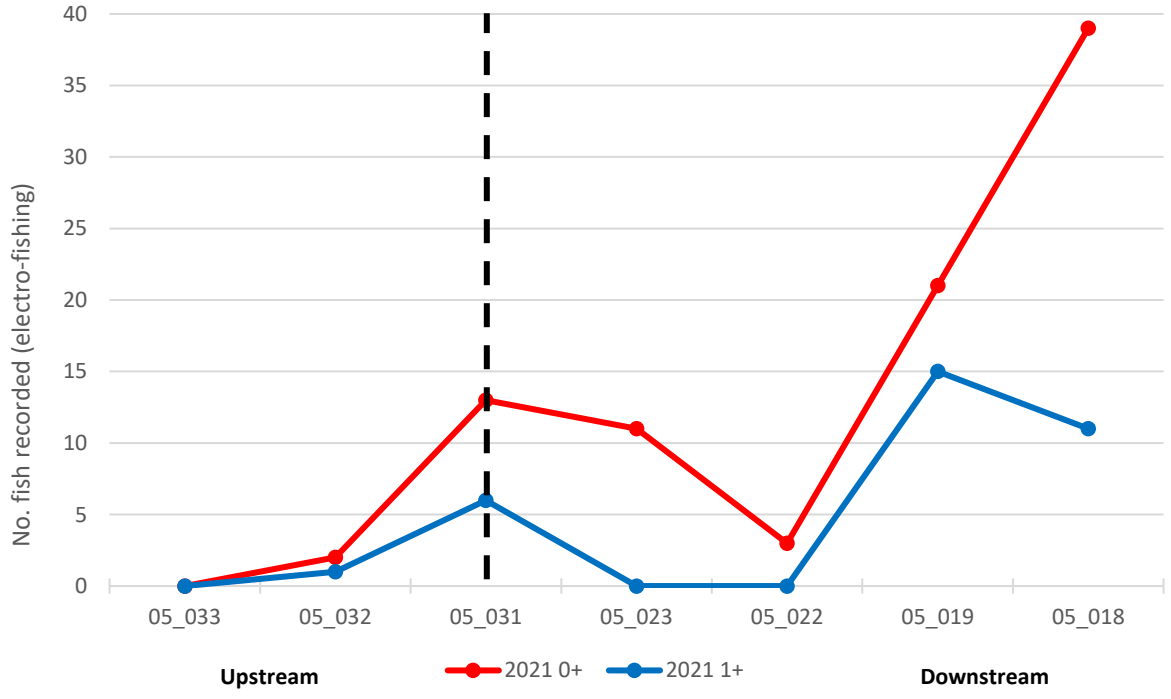

Figure 3.11 Numbers of 0+ & 1+ Atlantic salmon recorded via electro-fishing from the same 7 no. sites on the Mourne Beg River in **2021** (upstream to downstream). Dashed line indicates peat slide event location

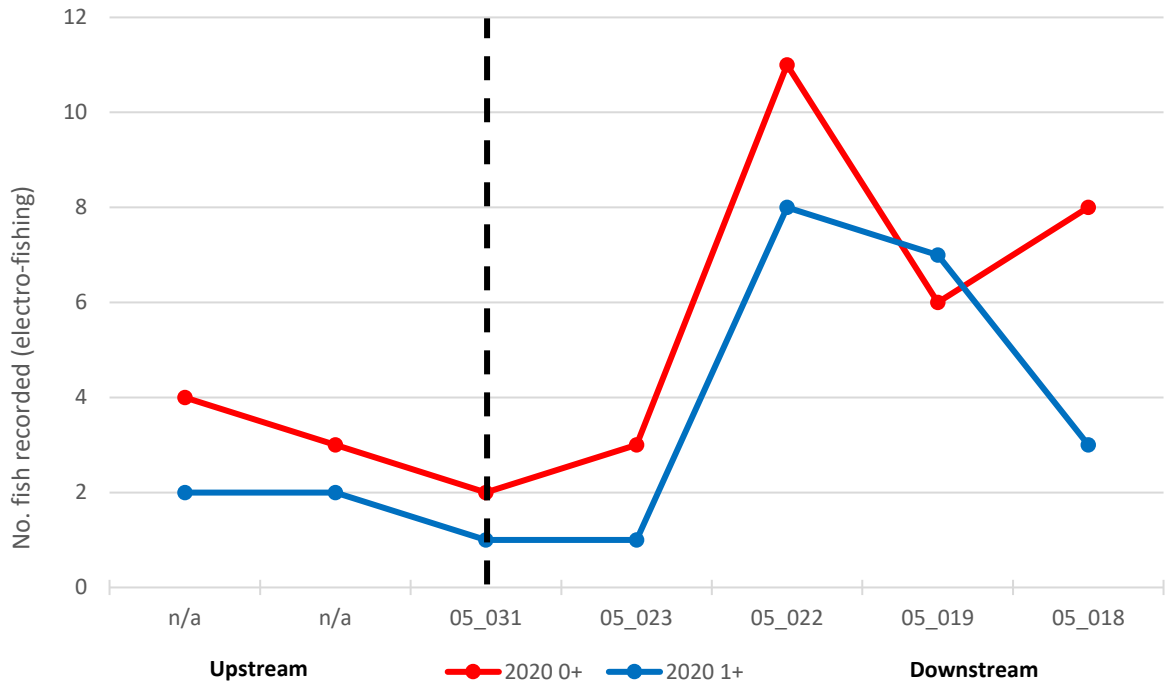

Figure 3.12 Numbers of 0+ & 1+ brown trout recorded via electro-fishing from the same 7 no. sites on the Mourne Beg River in **2020** (upstream to downstream). Dashed line indicates peat slide event location

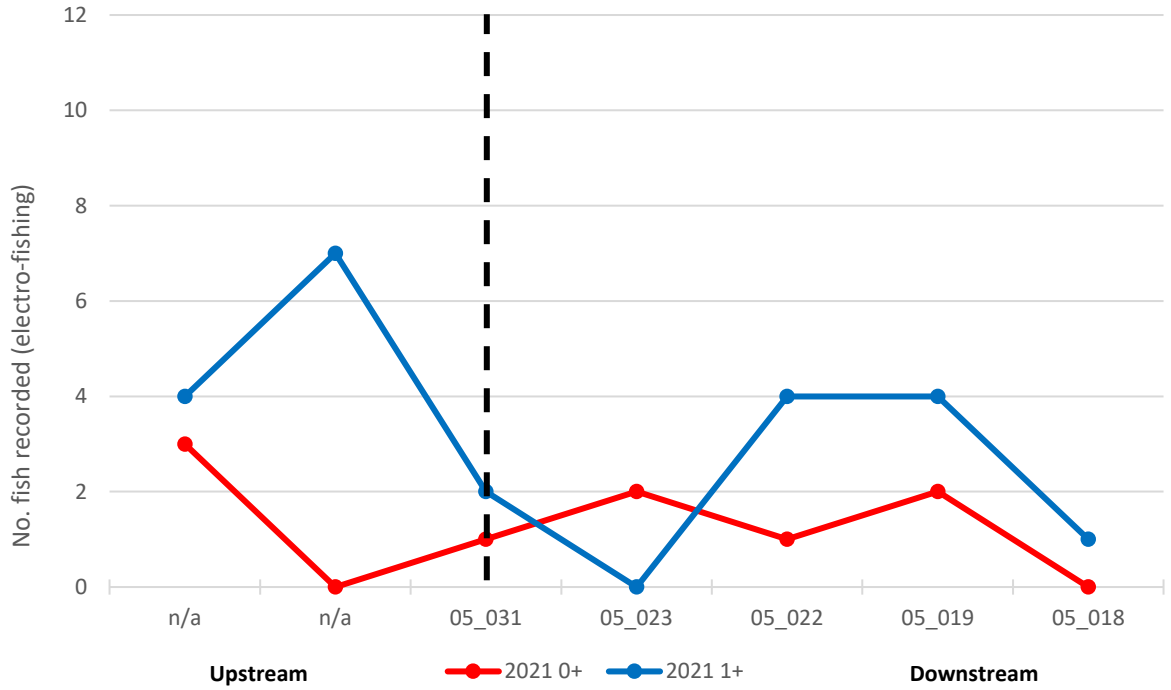

Figure 3.13 Numbers of 0+ & 1+ brown trout recorded via electro-fishing from the same 7 no. sites on the Mourne Beg River in **2021** (upstream to downstream). Dashed line indicates peat slide event location

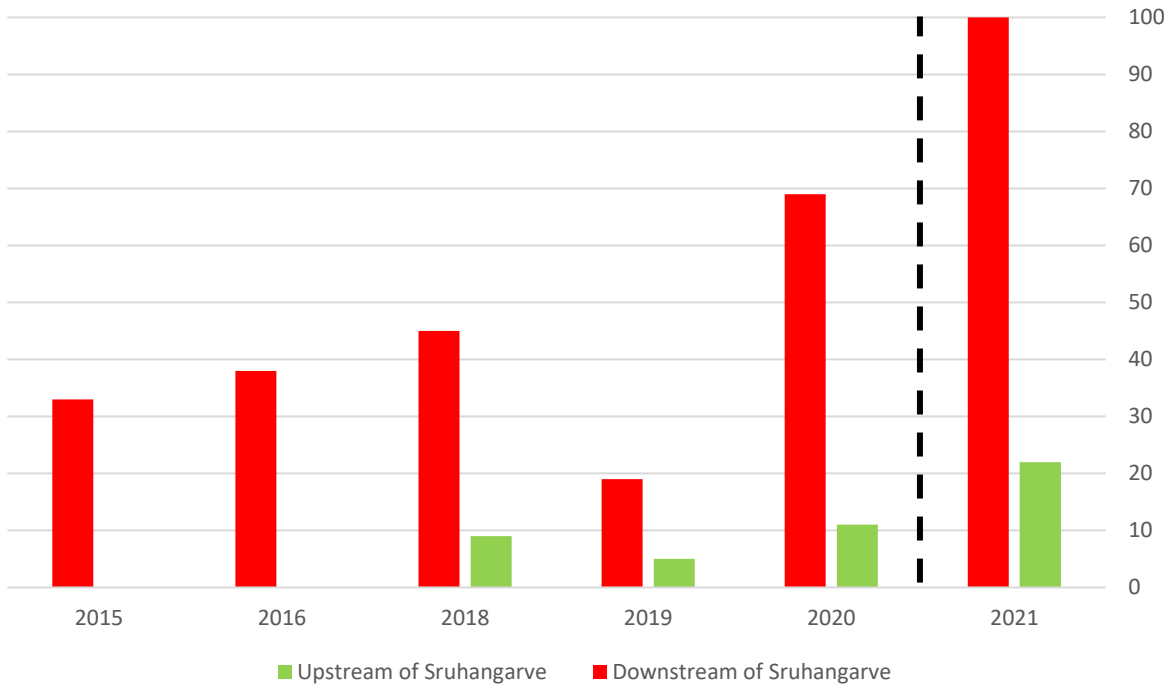

Figure 3.14 Total number of **Atlantic salmon juveniles (0+ & 1+)** recorded via electro-fishing from the same 7 no. sites on the Mourne Beg River in 2015-2021 (upstream to downstream). Dashed line indicates timing peat slide event

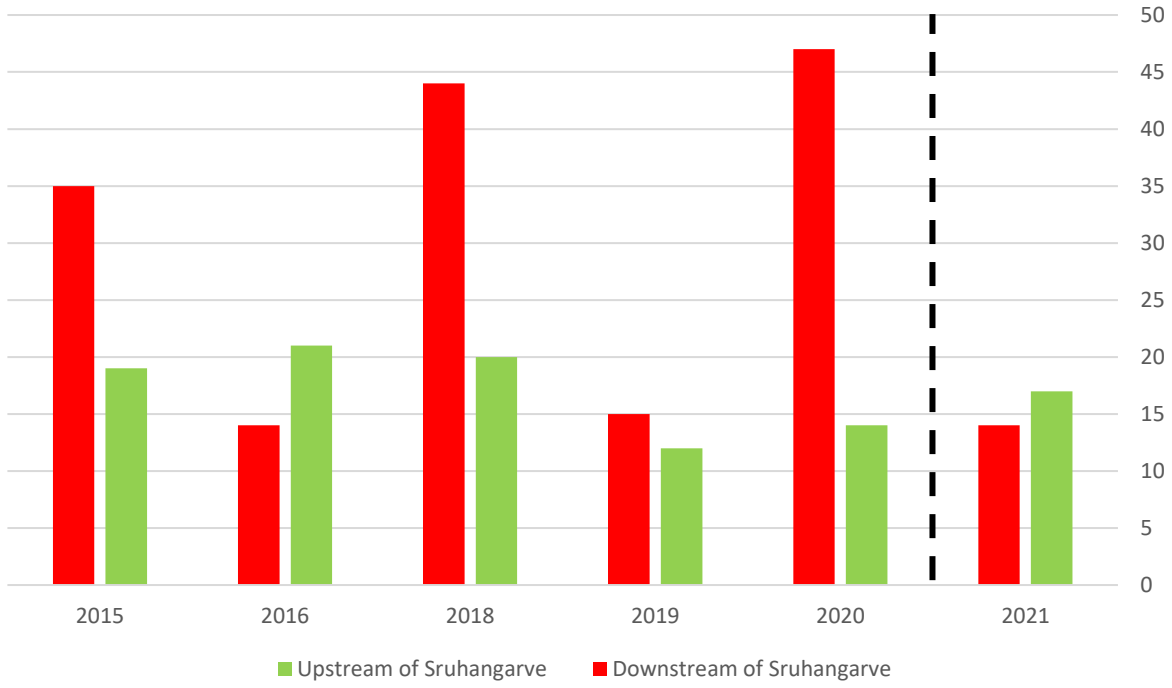

Figure 3.15 Total number of **brown trout (0+ & 1+)** recorded via electro-fishing from the same 7 no. sites on the Mourne Beg River in 2015-2021 (upstream to downstream). Dashed line indicates timing of peat slide event

3.4 Salmonid redd counts

Salmonid redd count data before (winter of 2019-20) and after the peat slide event (winter of 2020-21) is summarised in **Table 3.3** and shown in **Figures 3.5** to **3.7** below. Annual redd count data is presented in **Appendix B**.

There was a clear difference in the number and distribution of salmonid redds on the Mourne Beg River in the first spawning season after the peat slide event (i.e. winter of 2020-21). There was a marked reduction in both the total number and distribution of redds identified downstream of the Sruhangarve confluence compared with previous years (a total of just *n*=4 redds; **Table 3.3**).

In contrast, there was a noticeable increase in the number of redds upstream of the Sruhangarve confluence (*n*=37) compared with the previous year (*n*=2; 2019-20) (**Table 3.3**). Please note that redd count data for the 2011-12 to 2018-2019 periods on the Mourne Beg River upstream of the Sruhangarve confluence was not available.

Table 3.3 Salmonid redd count data per year (winter spawning season) for the Mourne Beg River (source: Loughs Agency)

Year	Upstream of Sruhangarve	Downstream of Sruhangarve	Total count
2020-21	37	4	41
2019-20	2	67	69
2018-19	0	32	32
2017-18	0	13	13
2016-17	0	44	44
2015-16	0	4	4
2014-15	0	32	32
2012-13	0	12	12
2011-12	0	7	7
Total	**39**	**215**	**254**

*no data available for the Mourne Beg River in the 2013-2014 period

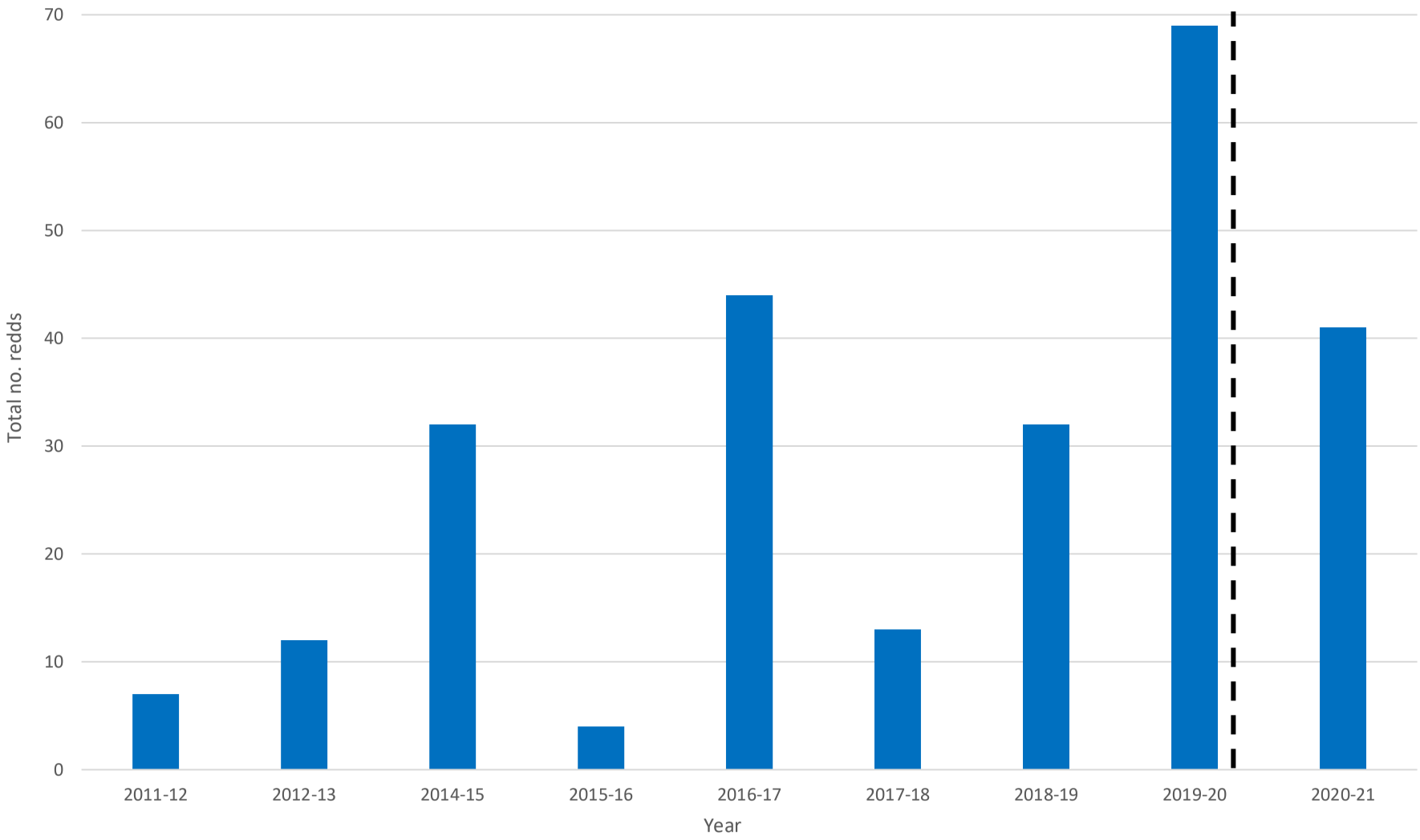

Figure 3.16 Total salmonid spawning redd counts for the Mourne Beg River (entire river) in the 2011-12 to 2021-2021 period (source: Loughs Agency) (no data available for the 2013-14 period). Dashed line indicates timing of peat slide event

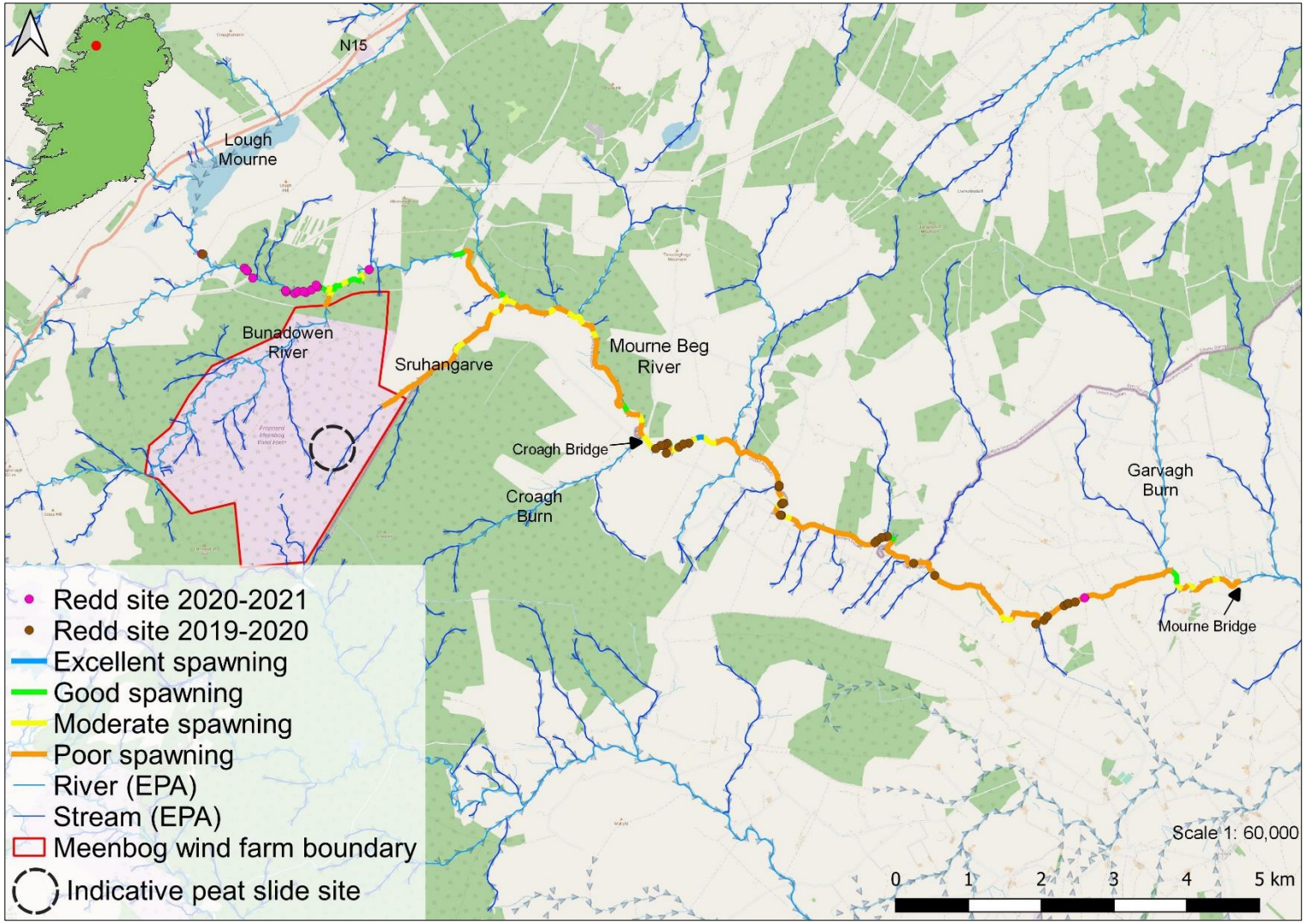

Figure 3.17 Distribution of salmonid spawning redds on the Mourne Beg River before (2019-20) and after the peat slide event (2020-21), with spawning habitat quality (Life Cycle Unit score) per 100m section

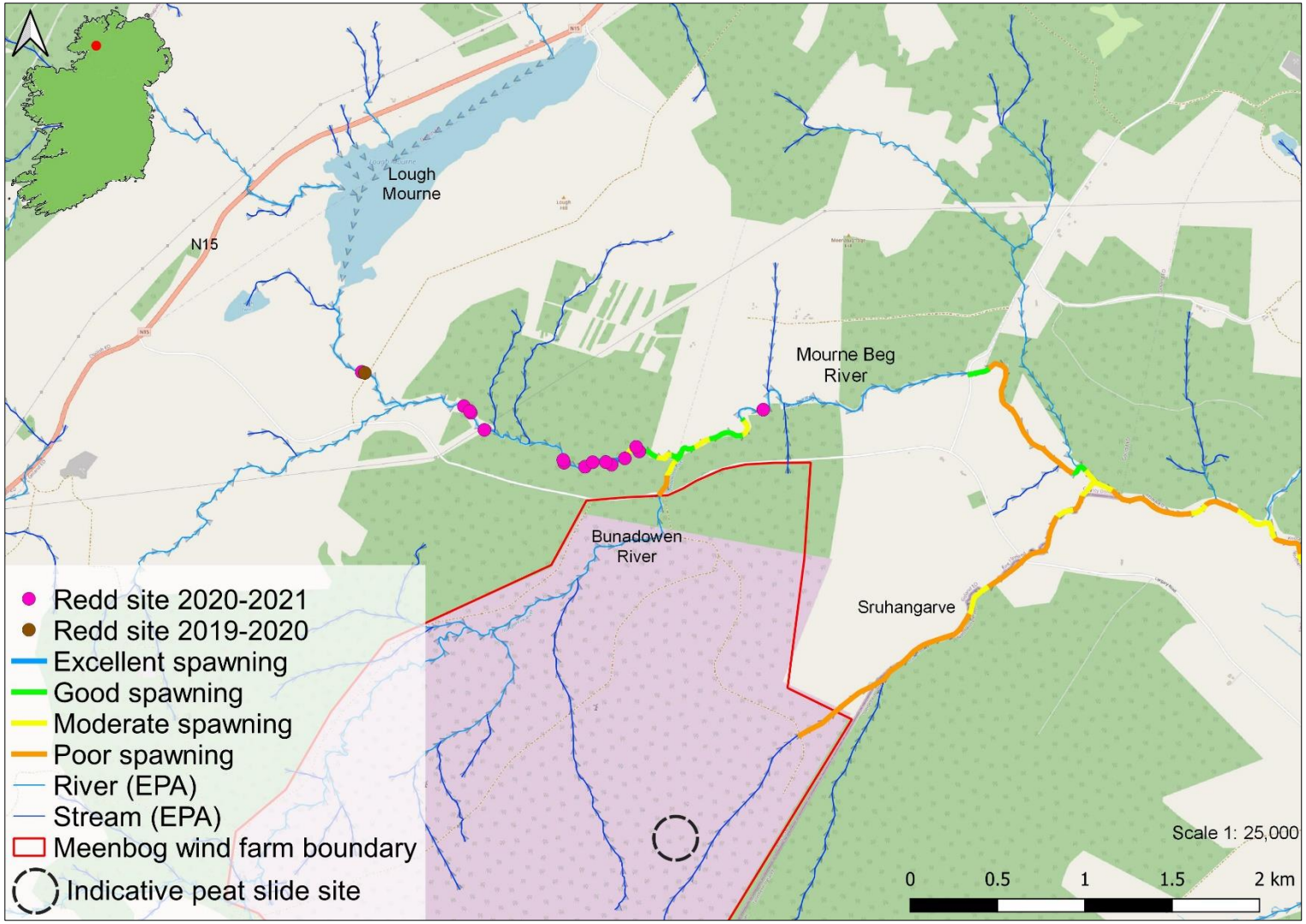

Figure 3.18 Distribution of salmonid spawning redds on the Mourne Beg River **upstream of the Sruhangarve** confluence before (2019-20) and after the peat slide event (2020-21), with spawning habitat quality (Life Cycle Unit score) per 100m section

3.5 River Hydromorphological Assessment Technique (RHAT) scores

Of the *n*=40 survey sections assessed for RHAT within the survey area, only section M4 achieved a RHAT score equivalent to **high WFD status** (i.e. hydromorph score ≥26) (**Appendix E; Figure 3.19**). This higher gradient, boulder-cascade section was located 1.5km downstream of the Sruhangarve confluence.

The majority of the survey sections (*n*=29) were equivalent to **good WFD status** (hydromorph score ≥19.5) (**Figure 3.19**). All 5 no. upstream control sections on the Mourne Beg River (U1-U5), in addition to the Bunadowen survey section (B1), were also equivalent to good WFD status (**Figure 3.19**).

Survey sections M20, M21 and M24 on the Mourne Beg River achieved **moderate WFD status** given significant water abstraction pressures and channel modifications (e.g. artificial weir in section M20). Sections M17 and M18 achieved **poor WFD status** given significant historical modifications (straightening and deepening) and resulting poor hydromorphology.

The upper survey sections on the Sruhangarve achieved RHAT scores equivalent to **poor WFD status** (S1) and **moderate WFD status** (S2 & S3). However, the lower 1km of the Sruhangarve channel (Sections S4 & S5) were considered of good WFD status (**Appendix E; Figure 3.19**).

3.6 Biological water quality (macro-invertebrates)

No rare or protected macro-invertebrate species (according to national red lists) were recorded in the biological water quality samples taken from *n*=9 riverine sites in October 2021 (**Figure 3.20, Appendix F**).

Sites M4 and M5 on the Mourne Beg River achieved **Q4-5 (high status)** water quality, based on Q-sampling, and thus met the good status (≥Q4) requirements of the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 and the Water Framework Directive (2000/60/EC). Additionally, 6 no. sites, namely site B1 on the Bunadowen River and sites M2, M3, M6, M7 and M8 on the Mourne Beg River obtained **Q4 (good status)** and thus also met the requirements of the of the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 and the Water Framework Directive (2000/60/EC). Only two sites, M1 on the Mourne Beg River and site S1 on the Sruhangarve, obtained **Q3-4 (moderate status)** and thus failed to meet the good status (≥Q4) requirements of the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 and the Water Framework Directive (2000/60/EC) (**Figure 3.20**).

It is clear that when comparing the biological water quality data between October 2021 and December 2020 that there is a significant improvement between the two periods (**Table 3.4, Figures 3.20 & 3.21**). The biological water quality improved across each of the five comparative sampling stations both upstream and downstream of the peat slide impact contribution area (i.e. Sruhangarve confluence). All of the sampling sites achieved the good status (≥Q4) requirements of the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 and the Water Framework Directive (2000/60/EC).

Table 3.4 Comparative Q-sample results between biological sampling stations in December 2020 and October 2021 (both after the peat slide event)

Survey station	Area	Q-rating Dec 2020	Q -rating Oct 2021
M2 (Bunadowen confluence)	u/s Sruhangarve confluence	Q4 (good status)	Q4-5 (high status)
M4 (Sruhangarve confluence)	u/s Sruhangarve confluence	Q4 (good status)	Q4-5 (high status)
M5 (Croagh Bridge)	d/s Sruhangarve confluence	Q4 (good status)	Q4-5 (high status)
M6 (Meenreagh Bridge)	d/s Sruhangarve confluence	Q3-4 (moderate status)	Q4 (good status)
M8 (Mourne Bridge)	d/s Sruhangarve confluence	Q3-4 (moderate status)	Q4 (good status)

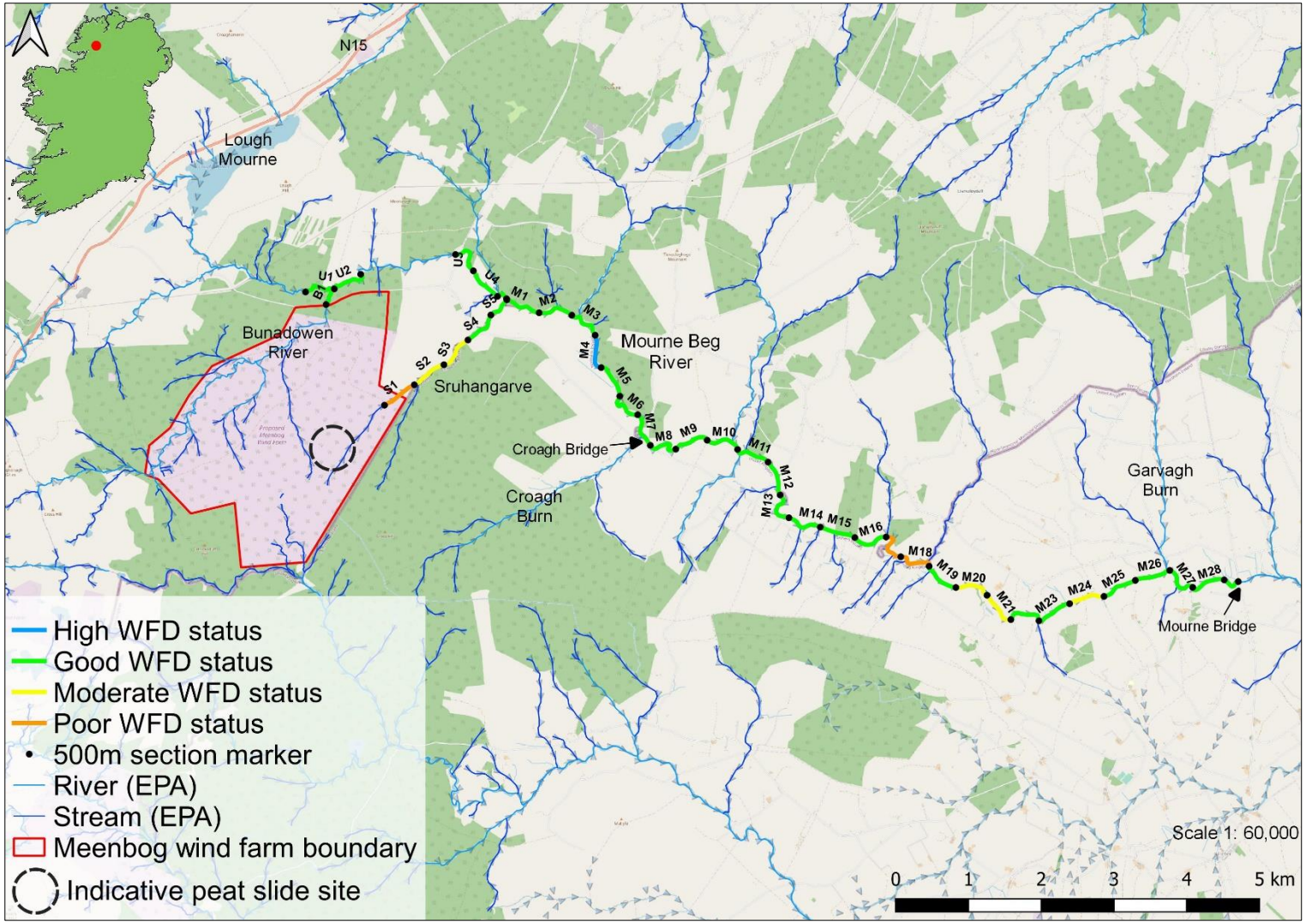

Figure 3.19 RHAT scores per survey section on the Mourne Beg River, Bunadowen River and Sruhangarve, July 2021

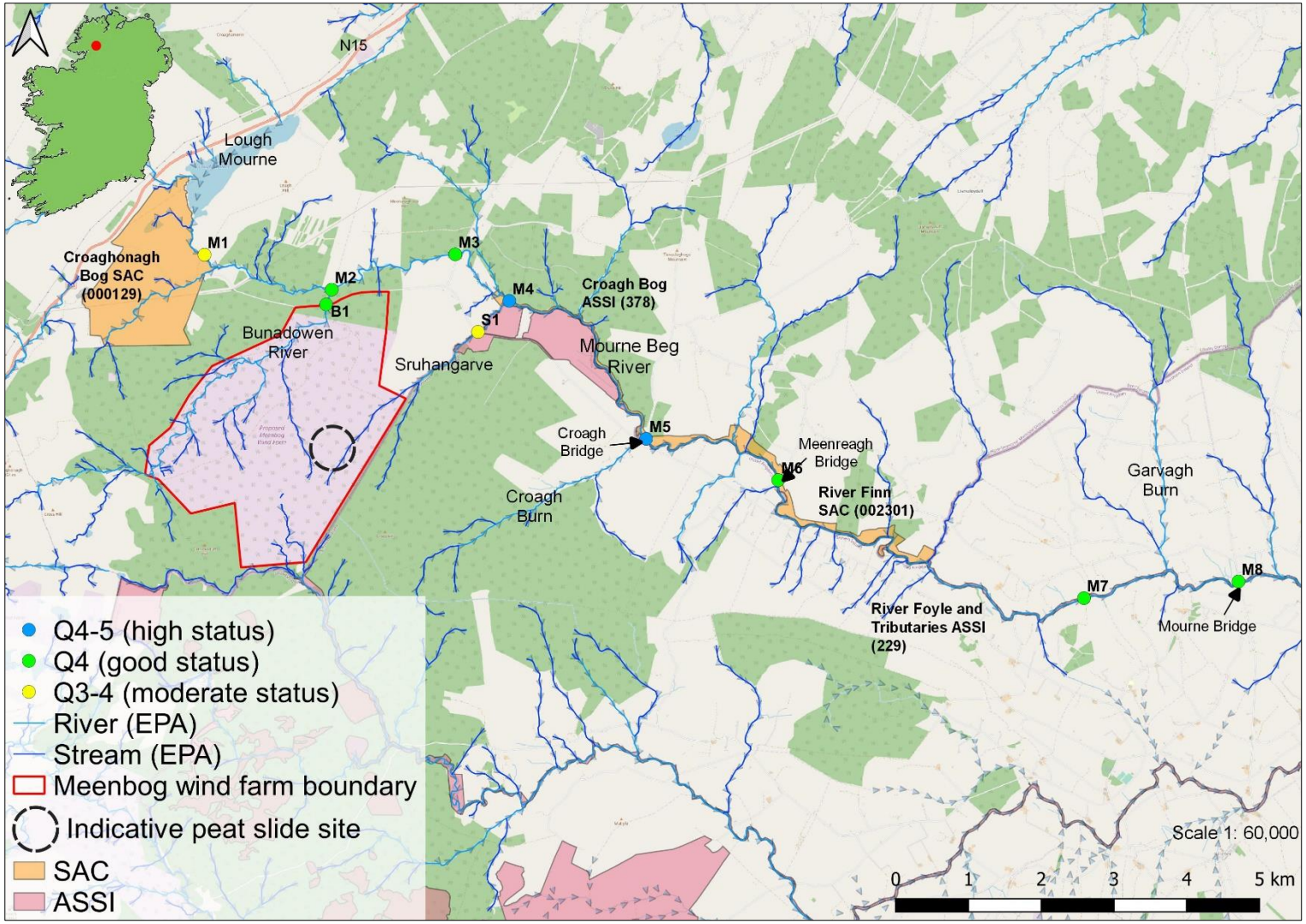

Figure 3.20 Biological water quality of the Mourne Beg River, Bunadowen River and Sruhangarve survey sites, **October 2021**

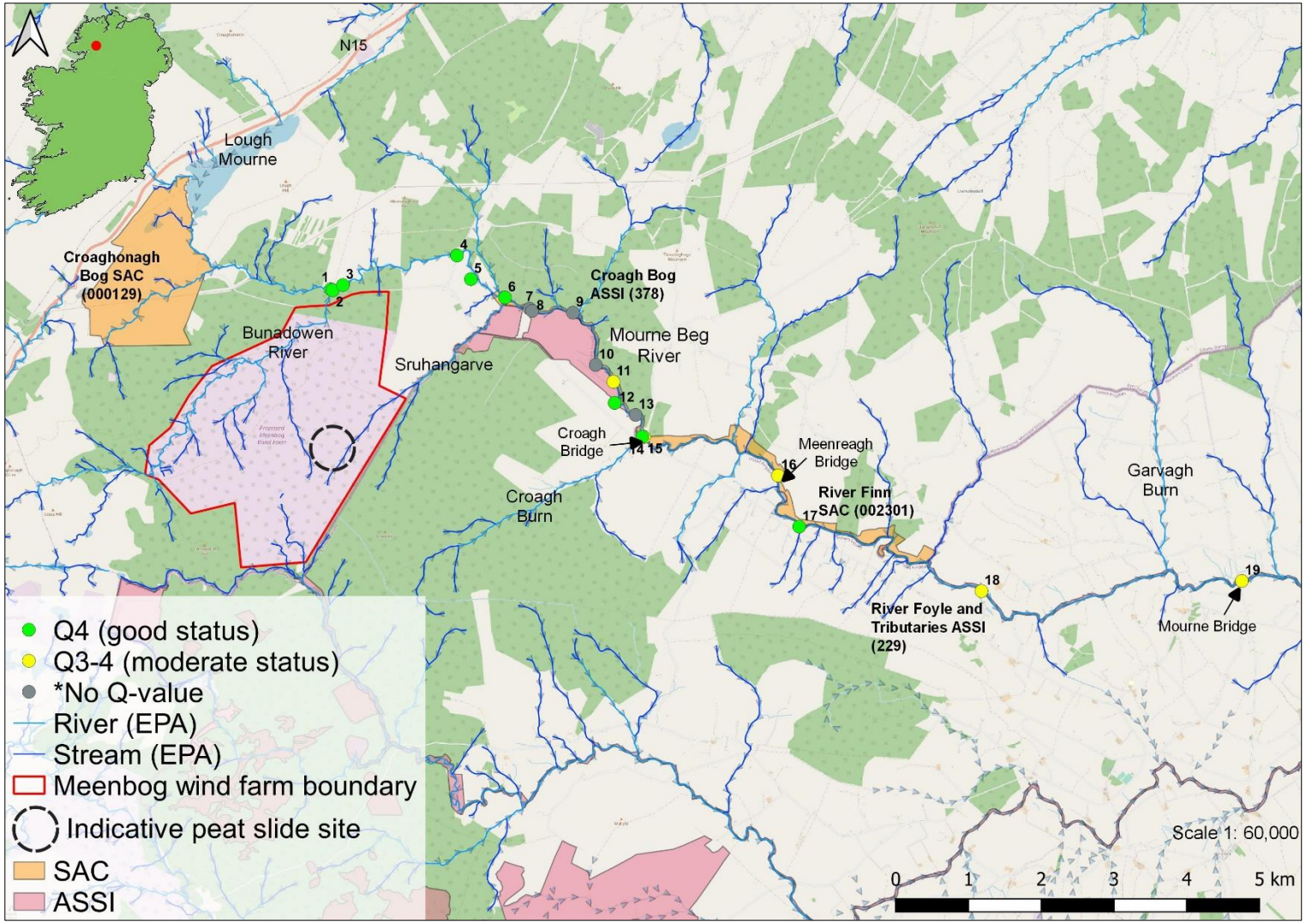

Figure 3.21 Biological water quality of the Mourne Beg River and Bunadowen River sampling stations (1-19), **December 2020** (MKO data) (*no Q-value calculation possible given absence or paucity of macro-invertebrates at time of sampling: MKO, 2020)

4. Discussion

The current study has examined and considered the implications of peat-related impacts for fish, macro-invertebrates including associated biological water quality, river hydromorphology and physical habitats within the Mourne Beg River and its tributary, the Sruhangarve. Whilst this study has identified clear deteriorations in the quality of aquatic habitat as a result of the November 2020 peat slide event, recovery of both fish and macro-invertebrate populations is evident from the results. Our results have also highlighted other pre-existing and ongoing synergistic pressures within the wider catchment, including afforestation and agricultural land use practices.

4.1 Influence of peat slide on salmonids

4.1.1 Salmonid populations

The negative impacts of sediment loading on salmonid populations are well documented and vary widely, from effects on fish physiology, reproductive success and migratory behaviour to epigenetics and habitat quality (see Kjelland et al., 2015; Chapman et al., 2014 for reviews). Sediment not only blocks interstitial spaces in substrata and limits oxygen supply to salmonid eggs (required for healthy embryonic development and successful hatching) but can also smother substrata, thus reducing available spawning habitat and impact macro-invertebrate communities on which salmonids feed (Kelly-Quinn et al., 2020; Davis et al., 2018; Conroy et al., 2016; Cocchiglia et al., 2012; Louhi et al., 2008, 2011; Walling et al., 2003; Soulsby et al., 2001).

With the Lough's Agency electro-fishing data from the same 7 no. survey sites pooled, there were evident temporal changes in salmonid fry abundance between September 2020 (pre-impact) and June 2021 (post-impact) (**Figures 3.10-3.13; Tables 3.1 & 3.2**). For Atlantic salmon, there was either no change or an increase in juvenile (0+ and 1+) fish abundance in 5 of these 7 survey sites in June 2021 compared with September 2020, with a **62% increase** in the total number of juvenile 0+ Atlantic salmon recorded in June 2021 (*n*=89) compared with September 2020 (*n*=55) (**Table 3.1; Figure 3.14**). In contrast, there was a reduction in overall numbers of brown trout in June 2021 compared with September 2020 (**Figure 3.15**), with an **81% decrease** in the total number of juvenile (0+) brown trout recorded in June 2021 (*n*=7) compared with September 2020 (*n*=37) (**Table 3.2**). There were less trout (0+, 1+ and total combined numbers, respectively) recorded at all survey sites downstream of the Sruhangarve confluence in June 2021.

Salmonid populations are subject to natural fluctuations due to temporal and stochastic environmental factors (Milner et al., 2003) and thus annual abundance data should be reviewed and interpreted with caution. Nevertheless, there has been a general positive trend in Atlantic salmon numbers on the Mourne Beg River in the 2015-2021 period (**Figure 3.14**), with the highest abundances recorded in June 2021 (after the peat slide event). Whilst there was a noticeable shift and restriction in spawning habitat utilisation after the peat slide (see section 4.1.2 below), the abundance of Atlantic salmon showed a general positive trend (increase) moving downstream along the Mourne Beg River (**Figure 3.10**). Despite the increase in utilisation of spawning areas upstream of the Sruhangarve confluence after the peat slide (winter 2020-21; **Figure 3.17; Appendix B**), electro-fishing data

suggests that, counter-intuitively, numbers of juvenile salmon remained low upstream of the impact zone. Upon emergence from redds, fry often disperse downstream in search of habitat optimal for their growth and development (Marsh et al., 2020). Furthermore, it is possible that Atlantic salmon dropped downstream due to density dependence (Armstrong, 2005) and occupied the niche space vacated by brown trout (see below), thus explaining the higher numbers recorded within the peat slide impact zone. Alternatively, given the suitable nursery conditions in these upstream areas (adjoining good to excellent-quality spawning habitat), it may be that other environmental stressors are influencing salmonid population dynamics in the upper catchment (see **section 4.5**).

In contrast to salmon, the brown trout population of the Mourne Beg River demonstrated a noticeable decline after the peat slide (comparing electro-fishing data between years) (**Figure 3.15**). Given the timing of the peat slide event (13th November 2020), it is possible that many of the Mourne Beg River adult brown trout population had already spawned and deposited eggs into redds (brown trout spawning can occur as early as October in Irish rivers; pers. obs.). Atlantic salmon typically spawn later than brown trout (November/December), including in the wider Foyle River system (Niven, 2008). Loughs Agency redd count data suggests that Atlantic salmon spawned after the peat slide event (December 2020 to January 2021). Therefore, salmon eggs laid in this period may have avoided the most severe after-effects of the peat slide (i.e. gross sedimentation and smothering of redds & eggs).

The early fry stage, when the fish change from endogenous to exogenous feeding, has a high mortality rate, typically due to limitations on food and available foraging habitat, and has been described as a "critical period" in survival of Atlantic salmon (Honkanen et al., 2019). The development of salmonid embryos in inter-gravel habitats of the hyporheic zone[2] depends strongly on the influences of temperature, flow velocity, permeability of the sediment (amount of fine sediment) and consumption by organic processes on oxygen concentrations (Smialek et al., 2021; Harrison et al., 2019; Greig et al., 2007, 2005; Malcolm et al., 2004; Crisp, 1990). The persistence of high concentrations of fine sediments in watercourse substrata lowers the oxygen concentration of water within interstitial spaces and decreases substratum permeability, leading to increased embryo mortality due to insufficient supply of water and oxygen (Sternecker et al., 2013a; Sear & DeVries, 2008; Chapman, 1988; Olsson & Persson, 1986). Deoxygenation is most problematic when a substantial proportion of the infiltrating sediments are organic, e.g. peat (Soulsby et al., 2001). Interstitial flows within the incubation zone may also be reduced due to excess sedimentation, impeding on the removal of metabolic waste products produced by developing embryos (Cardenas et al., 2016). High amounts of fine sediment also affect the macro-invertebrate community and can, therefore, reduce prey availability for juvenile salmonids (Suttle et al., 2004). It is considered likely that fry exposed to high sedimentation as developing embryos suffer a reduction in fitness (swimming performance), increasing their vulnerability at the transition stage from intra-gravel to open-water life and resulting in sub-lethal affects at subsequent life stages (Louhi et al., 2011). The conditions for egg and larval development can strongly influence subsequent growth, survival and reproductive fitness (Russell et al., 2012).

Thus, perhaps in contrast to Atlantic salmon, already-developing trout embryos may have been exposed to the full, immediate impact of the peat slide event (i.e. sedimentation) in the Mourne Beg

[2] the hyporheic zone is one of the key elements of river corridors, being the portion of sediments surrounding the stream that is permeated with stream water (Boano et al., 2014)

River, leading to a reduction in the numbers of 0+ juveniles observed during subsequent electro-fishing surveys (June 2021). Brown trout have a greater proclivity to deeper slower-flowing areas of habitat compared with Atlantic salmon parr (Armstrong et al., 2003). Thus, the reduction in numbers of ≥1+ trout captured in the Mourne Beg River after the peat slide event may be explained by higher mortality rates in those areas of channel supporting greater sediment loads (e.g. glide and pool).

With regards to the Sruhangarve, the large volume of peat evidently caused considerable negative impacts to instream habitats via gross siltation (colmation). An event of this magnitude would have also caused widespread fish mortality within the stream. Although fisheries data from before the peat slide is lacking, since the peat slide event (November 2020) the Sruhangarve is known to support European eel and a low density of ≥1+ brown trout (Loughs Agency data; Paul Johnston Associates, 2017). Atlantic salmon are not known to utilise the Sruhangarve. This fish community structure is typical of narrow, upland watercourses, with stream gradient known to be one of the principal determinants of juvenile salmonid production - medium gradient channels are most optimal in terms of successful recruitment and population persistence (Wood & Budy, 2009; O'Grady, 2006; Amiro, 1993). Despite its high gradient and flow velocities, siltation was moderate to severe in the Sruhangarve (especially in the lower reaches) and impacts to salmonid life stages are likely to continue for an indefinite period.

4.1.2 Salmonid spawning habitat (redd counts)

Whilst the field identification of salmonid redds is subjective, open to various error sources and influenced by environmental stochasticity (Gallagher et al., 2007; Roncoroni & Lane, 2019), it remains a useful technique in assessing adult salmonid populations and the distribution of spawning sites (Dauphin et al., 2010). The Loughs Agency redd data collated in this study indicates a considerable reduction in both the total number and distribution of salmonid redds on the Mourne Beg River in the first spawning season after the peat slide event (i.e. winter of 2020-21). Whilst salmonid redd formation and utilisation naturally fluctuates from year to year due to a multitude of factors, the observed marked restriction in spawning site distribution in the 2020-21 spawning period (**Table 3.3; Figure 3.16**) is clearly linked to sediment (peat) related impacts on the fish population.

The impacts on spawning salmon are supported in that the known spawning zone immediately downstream of the Sruhangarve confluence was not utilised by spawning salmonids in the 2020-21 period (no redds recorded), despite being used annually[3] before the peat slide (**Appendix B**). Similarly, no redds were identified in the known spawning areas downstream of Croagh Bridge and Meenreagh Bridge in the winter of 2020-21 (**Appendix B**). In contrast, there was a noticeable increase in the number of redds upstream of the Sruhangarve confluence (*n*=37) compared with the previous year (*n*=2; 2019-20) (**Table 3.3**). Whilst siltation was still evident upstream of the Sruhangarve (due to non-peat slide sources, see section 4.5), the percentage surface cover by siltation of riverine substrata and infiltration into same was considerably lower than downstream areas impacted by the peat slide (see section 4.2 below & **Appendix D**). It appears likely that Atlantic salmon (and to a lesser degree brown trout) selected habitat further up the Mourne Beg River than normal during the first spawning season after the peat slide in response to changing environmental conditions (i.e. severe siltation of annually

[3] Atlantic salmon are philopatric and tend to spawn in the same locations annually (Hendry et al., 2004)

utilised spawning areas). There is also the possibility that severe siltation on the Mourne Beg River downstream of the Sruhangarve confluence covered recently constructed redds and made them less visible to observers during this period. Continued annual monitoring of salmonid redds on the system will clarify any changes in spawning site selection building upon the work of Loughs Agency.

Episodic inputs of large volumes of sediment, such as that originating from the Meenbog peat slide, can reduce the quality and or extent of available spawning habitat (through colmation) and lead to the superimposition[4] of redds, which can damage or dislodge eggs, causing mortality, and have genetic implications for the wider population (Dudley, 2019). This could result in changes to salmonid population dynamics. The deposition of fine sediments may also form a physical barrier within redds to emerging fry with carry-over effects on timing of emergence, survival rate, and post-hatch growth of juvenile salmonids (Sternecker & Geist, 2010). During redd formation, adult salmonids physically remove significant amounts of fine sediment from the site of egg deposition (Cardenas et al., 2016) but the success of this behaviour on embryonic development and hatching will depend on numerous factors, including sediment resuspension which would be continually high during an extreme peat slippage event.

4.2 Influence of peat slide on riverbed condition (redox potential & siltation)

With only a few exceptions (e.g. section M5), there was a higher percentage loss in redox potential moving downstream along the Mourne Beg River (**Figure 3.4; Appendix C**). This clearly indicates long-distance sediment mobilisation and impacts, i.e. not only confined to near the Sruhangarve confluence. Indeed, examinations of rates of substrata compaction, siltation (% surface cover) and silt infiltration (substrate depth of 5cm) (see **section 3.2.2**) confirmed that severe siltation and embeddedness[5] was an issue throughout the Mourne Beg River survey area, extending to >14km downstream of the Sruhangarve confluence.

The observed pattern of gross siltation is likely reflective of the volume of material from the peat slide, in addition to the ongoing resuspension of fines from gravel bed "sinks" (Wharton et al., 2017). On a spate system such as the Mourne Beg, this process (also known as de-colmation) is exacerbated by freshets (heavy rainfall leading to floods) which cause the remobilisation of sediment downstream (Zimmermann & Laporte, 2005). Detailed observations made in June 2021 suggest that whilst shallower, faster-flowing areas of river may recover over time, the deep glide and depositional pool areas (salmonid holding habitat) supported significant sediment loads. Given the high volumes of sediment (peat) within the system, the longitudinal resuspension of fines downs the Sruhangarve and Mourne Beg River is anticipated to last, and cause impacts, in the medium term, e.g. covering/smothering of dug redds. However, peat stabilisation efforts including in channel and riparian remediation will help reduce the impacts of peat escapement from the source area in the Sruhangarve over time.

[4] defined as the creation of a redd on top of a previously established redd (Dudley, 2019)

[5] in stream habitat assessment, the extent of fine sediment accumulation around coarse-bed grains is described as embeddedness (Sennatt et al., 2006)

Over 80% of redox replicates on the Mourne Beg River downstream of the Sruhangarve demonstrated a substrata redox potential below 300mV, with a mean redox loss typically greater than 10% (up to 31% loss). This was in contrast to the upstream control area on the river, where approximately half of the replicates demonstrated a substrata redox potential below 300mV (**Appendix C**). Redox values below 300mV are indicative of anoxic conditions (Geist & Auerswald, 2007). A loss of redox potential between the water column and the sediment greater than 25% indicates oxygen depletion in the substrate (Gosselin et al., 2015), with losses in redox of over 30% generally indicative of a highly silted environment, severely depleted in interstitial oxygen to the point of anoxia (Moorkens & Killeen, 2020). Riverbed redox state is co-dependent with other factors such as deposition rate, organic matter flux, benthic faunal activities, and bottom water oxygen concentration (Sear et al., 2016). The presence of biological activity driven by organic matter (e.g. peat) can generate the formation of biofilms, that block the interstitial pores of gravels and decomposition of the organic matter restricts oxygen to incubating salmonid embryos (Smialek et al., 2021; Greig et al. 2005, 2007). Oxygen in a redd is consumed by the organic matter and biological communities within the sediments by the geochemical redox processes and by the developing embryos in the eggs (Sear et al, 2014).

High redox potentials of at least 400mV and oxygen concentrations of 6.9 mg/L are accepted as prerequisites for successful development of salmonid eggs and larvae (Sternecker et al., 2013a, 2013b, 2014; Geist & Auerswald, 2007; Armstrong et al., 2003). However, despite severe siltation and apparent impacts to redox potential, electro-fishing data indicates widespread successful reproduction of Atlantic salmon and (less so) brown trout in the Mourne Beg River since the peat slide. It should be noted that fluctuations in our substrata redox measurements may have been caused by photosynthetic activity (and oxygen production) by algae and microbial activity (Sondergaard, 2009), thus understating the true redox potential loss between the water column and river substrata.

The surface cover and silt infiltration rates in the Mourne Beg River upstream control areas (upstream of the Sruhangarve confluence) were considerably lower than downstream (**Figures 3.6 & 3.8**), reflecting the location of these areas upstream of the peat slide impact source. Redd count data for the first spawning season after the peat slide event (December 2020-January 2021) supported the presence and utilisation of now-superior spawning habitat in these upstream areas (see **section 4.1.2** above). Nevertheless, the areas upstream of the Sruhangarve (including the Bunadowen River) were evidently impacted by siltation, albeit from sources other than the peat slide (see section 4.5 for more).

4.3 Influence of peat slide on river hydromorphology (RHAT)

The existing (post peat slide) hydromorphology of the Mourne Beg River, Bunadowen River and Sruhangarve was assessed through the River Hydromorphology Assessment Technique (RHAT) to provide a baseline with which to compare future surveys. No RHAT data was available for the study area before the peat slide event.

It is apparent that the peat slide has had significant negative effects on river hydromorphology in the vicinity of the peat slide, particularly in terms of substrate diversity and condition. Siltation impacts were most evident on the Sruhangarve (origin of peat slide) although severe rates of siltation (up to 95% cover of riverine substrata) were observed >14km downstream of the Sruhangarve confluence.

Nonetheless, the majority of the 40 no. survey sections (*n*=29) were equivalent to **good WFD status** (hydromorph score ≥19.5) (**Figure 3.19**). All 5 no. upstream control sections on the Mourne Beg River (U1-U5), in addition to the Bunadowen survey section (B1), were also equivalent to good WFD status (**Figure 3.19**). This reflected the largely natural river channels with expected channel vegetation (for river type), a lack of barriers to continuity (and fish passage) and good flood plain connectivity. Scores were reduced due to evident heavy siltation (substrate diversity and condition), and to a lesser extent, riparian land use (i.e. agricultural lands, more so in the lower catchment) (**Appendix E**). Only survey section M4 achieved a RHAT score equivalent to **high WFD status.**

The upper survey sections on the Sruhangarve achieved RHAT scores equivalent to **poor WFD status** (S1) and **moderate WFD status** (S2 & S3) due to excessive siltation and impacts on hydromorphology of the channel. However, the lower 1km of the Sruhangarve channel (Sections S4 & S5) were considered of **good WFD status**, despite evident siltation impacts to instream and riparian habitats (**Appendix E; Figure 3.19**).

4.4 Influence of peat slide on biological water quality (macro-invertebrates)

Increases in suspended solids which move over the channel bed within watercourses can affect benthic invertebrates by subjecting them to abrasion and scouring (Bilotta & Brazier, 2008). This can dislodge organisms from the benthos making them more susceptible to predation or can damage exposed respiratory organs of the organisms (Langer, 1980). Increased suspended solids are associated with increases in up or down-channel migration of invertebrates (invertebrate drift), where increases in suspended solids of 40-80mgL^{-1} above background levels causing an increase of invertebrate drift of 25-90% (Gammon, 1970). Increases of suspended solids can also inhibit reattachment to the substratum, encouraging fauna to continue drifting (Suren & Jowett, 2001). Increases in suspended solids can clog feeding structures of filter feeding invertebrates, reducing feeding efficiency, affecting growth rates, which can stress and kill the organisms (Jones et al., 2012). Epilithic periphyton can trap clay-sized particulates reducing its attractiveness for grazing invertebrates (Graham, 1990). Changes in suspended solid concentrations that adversely affect algal growth, biomass, or species composition can impact on populations of grazing invertebrates which rely on periphyton for their energy and nutritional requirements (Newcombe & MacDonald, 1991). Changes in invertebrate abundance as a result of increases in suspended solids have knock-on effects higher up the food chain for example impacting fish, birds and bats that rely on invertebrate prey resources.

Increased fine sediment yield affects macro-invertebrates in many ways, including changing substrate suitability, deteriorating feeding conditions for filter feeders and prey organisms, causing respiratory impacts (lower dissolved oxygen) and increasing drift due to sedimentation or substrate instability (see Hauer et al., 2018 for review). Consequently, increased input of fine sediments leads to a decrease in diversity, abundance, and biomass of macro-invertebrates as well as to a shift in community structure (Leitner et al., 2015, 2021).

Salmonids in Ireland are known to feed primarily on both the larval and adult life stages of Ephemeroptera, Plecoptera and Trichoptera (EPT) taxa and Diptera (de Eyto et al., 2020; Lehane et al.,

2001). The percentage EPT ratios were high across all the invertebrate survey stations **(Appendix F)** supporting that there are no significant trends with regards to loss of EPT taxa for foraging salmonids based on the most recent October 2021 survey data. It was, however, clear that the previous December 2020 survey effort illustrated a dominance of Leuctrid mayflies in the samples with a low diversity of mayflies that would support indicate acidification pressures (Feeley et al., 2016). Significant drops in pH likely occurred on the Mourne Beg River and Sruhangarve following the immediate peat slide that had evidently impacted the invertebrate community that would have also been subject to sedimentation and enrichment pressure.

Stonefly species tolerant of acidification were also present within the October 2021 samples (i.e. *Leuctra hippopus* and *Protonemura meyeri*). However, the presence of co-occurrent mayfly species *Ecdyonurus venosus* and *Ecdyonurus dispar* in fair numbers (i.e. species that are highly intolerant of siltation, enrichment and acidification; Kelly-Quinn et al. 2012) indicated evident recovery in the study area. This was also supported by the Q-rating as all of the sampled sites, with exception of the Sruhangarve, achieved the target of good status (≥Q4) requirements of the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 and the Water Framework Directive (2000/60/EC). While the trend of improving biological water quality is positive, continued biological monitoring would be very beneficial to ensure water quality and associated fisheries status improves. It would also help detect unforeseen impacts associated with resuspension of trapped peat in sink depositional pool that may still impact invertebrate communities in the medium term.

4.5 Other catchment stressors to aquatic ecology

Clearly, the Sruhangarve and Mourne Beg River have been impacted by siltation (colmation) resulting from the Meenbog peat slide of November 2020. However, the available data indicates that there are other factors impacting the system that may act synergistically with the peat slippage event.

Notably, the upper Sruhangarve and Mourne Beg River are bordered by coniferous afforestation, the latter often extending to within <10m of the banktop. Afforestation of catchments is known to impact on the water chemistry of headwater streams, reducing pH and elevating aluminium, ammonia, dissolved organic carbon (DOC), turbidity and eutrophication (phosphorous) (Kelly-Quinn et al., 2016; Harrison et al., 2014), particularly in peat catchments such as the MourneBeg_SC_010 sub-catchment. Low pH is acutely toxic to freshwater fish species and episodic acidic events have a potentially large effect on the distribution of salmonid populations (Serrano, 2005). Eutrophication impacts (e.g. filamentous algal cover of riverine substrata) was observed within the study area during this study and also in the wider catchment during previous surveys (Triturus, 2021). Densities and biomass of juvenile salmonids are known to be significantly lower in watercourses draining afforested catchments and forestry-mediated acidification of streams (water chemistry effects) is a particular threat to Atlantic salmon populations in Ireland (Harrison et al., 2014). This may impact aquatic invertebrate communities and the sensitive developmental stages of salmonids (Finn, 2007; Giller & O'Halloran, 2004).

Additionally, siltation pressures were observed both upstream of the peat impact zone (upper Mourne Beg River and Bunadowen River) and in adjoining Mourne Beg tributaries (outside the zone of impact;

Triturus, 2021). Evidently, afforestation (upper catchment), degraded peatland habitats (upper catchment) and agricultural land use pressures (lower catchment) are contributing to the siltation of the wider catchment, acting synergistically with the peat slide event. Sedimentation of salmonid habitat (the effects of which are outlined in this discussion) is a particular problem in Irish rivers flowing through afforested and agricultural catchments (Evans et al., 2006). Both afforestation and agriculture have been identified as significant threats for the River Finn SAC (002301) (NPWS, 2014), which encompasses the upper Mourne Beg River, as well as the wider River Foyle and Tributaries ASSI (229) (DAERA, 2015).

4.6 Conclusions & recommendations

The primary impacts from the November 2020 peat slide event have occurred regarding salmonid spawning habitat and macro-invertebrate populations, chiefly through siltation (colmation) of riverine substrata. Whilst the decline in riverbed and aquatic habitat quality in the Sruhangarve and Mourne Beg River downstream of the Sruhangarve confluence is likely to impact fish and invert populations in the medium term, partial short-term recovery was evident from the survey results. Biological water quality (macro-invertebrates) has quickly returned (October 2021) to **≥Q4 (good status)** throughout much of the Mourne Beg River study area. However, the peat slide impacts on the Sruhangarve were more severe (closer proximity to peat slide) and the watercourse is likely to take longer to recover (**Q3-4 (moderate status)** in October 2021). Given the spate nature of the Sruhangarve and Mourne Beg River and resulting opportunity for riverine substrata de-colmation (longitudinal resuspension of sediment), the significant influx of fines from the peat slide may flush through the system over time (medium to longer-term).

The continued annual monitoring of fish populations and biological water quality will help elucidate the rate of recovery and assess whether the mitigation measures implemented are working effectively. This will require the cooperation of various agencies and stakeholders.

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6. Appendix A – Life Cycle Unit scores

Table 6.1 Life Cycle Unit scores for salmonid habitat in the *n*=197 survey sections, July 2021 (lower scores = superior habitat)

Section	Watercourse	Spawning	Nursery	Holding	Total score	Habitat value
M1_a	Mourne Beg River	3	3	1	**7**	Good
M1_b	Mourne Beg River	4	3	1	**8**	Good
M1_c	Mourne Beg River	4	3	1	**8**	Good
M1_d	Mourne Beg River	4	3	1	**8**	Good
M1_e	Mourne Beg River	4	2	2	**8**	Good
M2_a	Mourne Beg River	4	3	2	**9**	Moderate
M2_b	Mourne Beg River	3	2	2	**7**	Good
M2_c	Mourne Beg River	4	3	2	**9**	Moderate
M2_d	Mourne Beg River	4	3	2	**9**	Moderate
M2_e	Mourne Beg River	3	3	2	**8**	Good
M3_a	Mourne Beg River	3	3	2	**8**	Good
M3_b	Mourne Beg River	3	3	2	**8**	Good
M3_c	Mourne Beg River	4	3	2	**9**	Moderate
M3_d	Mourne Beg River	4	2	3	**9**	Moderate
M3_e	Mourne Beg River	3	2	2	**7**	Good
M4_a	Mourne Beg River	4	1	3	**8**	Good
M4_b	Mourne Beg River	4	1	4	**9**	Moderate
M4_c	Mourne Beg River	4	1	4	**9**	Moderate
M4_d	Mourne Beg River	4	1	4	**9**	Moderate
M4_e	Mourne Beg River	4	1	4	**9**	Moderate
M5_a	Mourne Beg River	4	1	4	**9**	Moderate
M5_b	Mourne Beg River	4	1	3	**8**	Good
M5_c	Mourne Beg River	4	1	4	**9**	Moderate
M5_d	Mourne Beg River	4	1	4	**9**	Moderate
M5_e	Mourne Beg River	4	1	4	**9**	Moderate
M6_a	Mourne Beg River	4	1	3	**8**	Good
M6_b	Mourne Beg River	4	1	4	**9**	Moderate
M6_c	Mourne Beg River	2	3	1	**6**	Good
M6_d	Mourne Beg River	4	3	2	**9**	Moderate
M6_e	Mourne Beg River	4	1	4	**9**	Moderate
M7_a	Mourne Beg River	3	3	3	**9**	Moderate
M7_b	Mourne Beg River	4	2	4	**10**	Moderate
M7_c	Mourne Beg River	4	2	4	**10**	Moderate
M7_d	Mourne Beg River	3	2	3	**8**	Good
M7_e	Mourne Beg River	3	2	3	**8**	Good
M8_a	Mourne Beg River	3	2	4	**9**	Moderate
M8_b	Mourne Beg River	2	2	2	**6**	Good
M8_c	Mourne Beg River	2	2	2	**6**	Good
M8_d	Mourne Beg River	4	3	2	**9**	Moderate
M8_e	Mourne Beg River	3	4	2	**9**	Moderate
M9_a	Mourne Beg River	3	2	4	**9**	Moderate
M9_b	Mourne Beg River	3	3	2	**8**	Good

Section	Watercourse	Spawning	Nursery	Holding	Total score	Habitat value
M9_c	Mourne Beg River	3	3	2	**8**	Good
M9_d	Mourne Beg River	1	2	3	**6**	Good
M9_e	Mourne Beg River	3	3	3	**9**	Moderate
M10_a	Mourne Beg River	3	2	3	**8**	Good
M10_b	Mourne Beg River	4	2	4	**10**	Moderate
M10_c	Mourne Beg River	4	2	4	**10**	Moderate
M10_d	Mourne Beg River	4	2	3	**9**	Moderate
M10_e	Mourne Beg River	4	2	4	**10**	Moderate
M11_a	Mourne Beg River	4	2	4	**10**	Moderate
M11_b	Mourne Beg River	4	2	3	**9**	Moderate
M11_c	Mourne Beg River	4	2	4	**10**	Moderate
M11_d	Mourne Beg River	4	2	3	**9**	Moderate
M11_e	Mourne Beg River	4	2	4	**10**	Moderate
M12_a	Mourne Beg River	4	2	4	**10**	Moderate
M12_b	Mourne Beg River	4	2	4	**10**	Moderate
M12_c	Mourne Beg River	4	2	4	**10**	Moderate
M12_d	Mourne Beg River	3	2	4	**9**	Moderate
M12_e	Mourne Beg River	4	2	3	**9**	Moderate
M13_a	Mourne Beg River	3	2	3	**8**	Good
M13_b	Mourne Beg River	3	2	3	**8**	Good
M13_c	Mourne Beg River	4	3	3	**10**	Moderate
M13_d	Mourne Beg River	4	3	2	**9**	Moderate
M13_e	Mourne Beg River	3	1	2	**6**	Good
M14_a	Mourne Beg River	4	3	2	**9**	Moderate
M14_b	Mourne Beg River	4	3	2	**9**	Moderate
M14_c	Mourne Beg River	4	2	2	**8**	Good
M14_d	Mourne Beg River	4	2	4	**10**	Moderate
M14_e	Mourne Beg River	4	2	4	**10**	Moderate
M15_a	Mourne Beg River	4	2	4	**10**	Moderate
M15_b	Mourne Beg River	4	2	4	**10**	Moderate
M15_c	Mourne Beg River	4	2	4	**10**	Moderate
M15_d	Mourne Beg River	4	2	3	**9**	Moderate
M15_e	Mourne Beg River	4	1	4	**9**	Moderate
M16_a	Mourne Beg River	4	1	4	**9**	Moderate
M16_b	Mourne Beg River	4	2	4	**10**	Moderate
M16_c	Mourne Beg River	4	2	3	**9**	Moderate
M16_d	Mourne Beg River	3	3	1	**7**	Good
M16_e	Mourne Beg River	4	3	2	**9**	Moderate
M17_a	Mourne Beg River	2	2	2	**6**	Good
M17_b	Mourne Beg River	4	3	1	**8**	Good
M17_c	Mourne Beg River	4	3	1	**8**	Good
M17_d	Mourne Beg River	4	3	1	**8**	Good
M17_e	Mourne Beg River	4	3	1	**8**	Good
M18_a	Mourne Beg River	4	3	1	**8**	Good
M18_b	Mourne Beg River	4	3	1	**8**	Good

Section	Watercourse	Spawning	Nursery	Holding	Total score	Habitat value
M18_c	Mourne Beg River	4	2	2	**8**	Good
M18_d	Mourne Beg River	4	2	2	**8**	Good
M18_e	Mourne Beg River	4	3	1	**8**	Good
M19_a	Mourne Beg River	4	3	1	**8**	Good
M19_b	Mourne Beg River	4	2	4	**10**	Moderate
M19_c	Mourne Beg River	4	2	4	**10**	Moderate
M19_d	Mourne Beg River	4	2	4	**10**	Moderate
M19_e	Mourne Beg River	4	2	3	**9**	Moderate
M20_a	Mourne Beg River	4	2	4	**10**	Moderate
M20_b	Mourne Beg River	4	2	4	**10**	Moderate
M20_c	Mourne Beg River	4	2	2	**8**	Good
M20_d	Mourne Beg River	4	1	2	**7**	Good
M20_e	Mourne Beg River	4	2	3	**9**	Moderate
M21_a	Mourne Beg River	4	2	3	**9**	Moderate
M21_b	Mourne Beg River	4	2	2	**8**	Good
M21_c	Mourne Beg River	4	1	4	**9**	Moderate
M21_d	Mourne Beg River	3	2	3	**8**	Good
M21_e	Mourne Beg River	3	1	1	**5**	Excellent
M22_a	Mourne Beg River	4	3	1	**8**	Good
M22_b	Mourne Beg River	4	3	1	**8**	Good
M22_c	Mourne Beg River	4	3	1	**8**	Good
M22_d	Mourne Beg River	4	3	1	**8**	Good
M22_e	Mourne Beg River	4	3	1	**8**	Good
M23_a	Mourne Beg River	4	3	1	**8**	Good
M23_b	Mourne Beg River	4	2	3	**9**	Moderate
M23_c	Mourne Beg River	4	2	2	**8**	Good
M23_d	Mourne Beg River	4	1	3	**8**	Good
M23_e	Mourne Beg River	4	1	3	**8**	Good
M24_a	Mourne Beg River	4	2	2	**8**	Good
M24_b	Mourne Beg River	4	3	1	**8**	Good
M24_c	Mourne Beg River	4	3	1	**8**	Good
M24_d	Mourne Beg River	4	3	1	**8**	Good
M24_e	Mourne Beg River	4	3	1	**8**	Good
M25_a	Mourne Beg River	4	3	1	**8**	Good
M25_b	Mourne Beg River	4	3	1	**8**	Good
M25_c	Mourne Beg River	4	3	2	**9**	Moderate
M25_d	Mourne Beg River	4	2	3	**9**	Moderate
M25_e	Mourne Beg River	4	1	4	**9**	Moderate
M26_a	Mourne Beg River	4	1	4	**9**	Moderate
M26_b	Mourne Beg River	4	1	4	**9**	Moderate
M26_c	Mourne Beg River	4	1	4	**9**	Moderate
M26_d	Mourne Beg River	4	3	2	**9**	Moderate
M26_e	Mourne Beg River	4	3	3	**10**	Moderate
M27_a	Mourne Beg River	2	3	2	**7**	Good
M27_b	Mourne Beg River	2	2	3	**7**	Good

Section	Watercourse	Spawning	Nursery	Holding	Total score	Habitat value
M27_c	Mourne Beg River	3	2	3	**8**	Good
M27_d	Mourne Beg River	4	3	1	**8**	Good
M27_e	Mourne Beg River	3	3	2	**8**	Good
M28_a	Mourne Beg River	4	3	1	**8**	Good
M28_b	Mourne Beg River	4	3	1	**8**	Good
M28_c	Mourne Beg River	4	3	1	**8**	Good
M28_d	Mourne Beg River	3	3	3	**9**	Moderate
M28_e	Mourne Beg River	4	3	1	**8**	Good
M29_a	Mourne Beg River	4	3	1	**8**	Good
M29_b	Mourne Beg River	4	3	1	**8**	Good
M29_c	Mourne Beg River	4	3	1	**8**	Good
M29_d	Mourne Beg River	4	3	2	**9**	Moderate
S1_a	Sruhangarve	4	3	3	**10**	Moderate
S1_b	Sruhangarve	4	3	3	**10**	Moderate
S1_c	Sruhangarve	4	3	3	**10**	Moderate
S1_d	Sruhangarve	4	3	3	**10**	Moderate
S1_e	Sruhangarve	4	3	3	**10**	Moderate
S2_a	Sruhangarve	4	4	2	**10**	Moderate
S2_b	Sruhangarve	4	3	2	**9**	Moderate
S2_c	Sruhangarve	4	2	3	**9**	Moderate
S2_d	Sruhangarve	4	2	2	**8**	Good
S2_e	Sruhangarve	4	2	2	**8**	Good
S3_a	Sruhangarve	4	2	2	**8**	Good
S3_b	Sruhangarve	4	4	2	**10**	Moderate
S3_c	Sruhangarve	3	2	2	**7**	Good
S3_d	Sruhangarve	3	2	2	**7**	Good
S3_e	Sruhangarve	4	2	2	**8**	Good
S4_a	Sruhangarve	4	2	2	**8**	Good
S4_b	Sruhangarve	4	2	2	**8**	Good
S4_c	Sruhangarve	4	2	2	**8**	Good
S4_d	Sruhangarve	4	3	3	**10**	Moderate
S4_e	Sruhangarve	4	2	2	**8**	Good
S5_a	Sruhangarve	3	2	2	**7**	Good
S5_b	Sruhangarve	4	3	2	**9**	Moderate
S5_c	Sruhangarve	3	3	2	**8**	Good
S5_d	Sruhangarve	4	4	2	**10**	Moderate
S5_e	Sruhangarve	4	4	2	**10**	Moderate
U1_a	Mourne Beg River	1	2	3	**6**	Good
U1_b	Mourne Beg River	3	3	1	**7**	Good
U1_c	Mourne Beg River	2	3	2	**7**	Good
U1_d	Mourne Beg River	3	3	2	**8**	Good
U1_e	Mourne Beg River	2	2	2	**6**	Good
U1_f	Mourne Beg River	2	2	3	**7**	Good
U2_a	Mourne Beg River	2	2	4	**8**	Good
U2_b	Mourne Beg River	3	2	3	**8**	Good

Section	Watercourse	Spawning	Nursery	Holding	Total score	Habitat value
U2_c	Mourne Beg River	2	3	3	**8**	Good
U2_d	Mourne Beg River	2	2	2	**6**	Good
U2_e	Mourne Beg River	3	2	2	**7**	Good
U2_f	Mourne Beg River	2	2	3	**7**	Good
U3_a	Mourne Beg River	2	2	2	**6**	Good
U3_b	Mourne Beg River	4	2	1	**7**	Good
U3_c	Mourne Beg River	4	2	4	**10**	Moderate
U3_d	Mourne Beg River	4	2	3	**9**	Moderate
U3_e	Mourne Beg River	4	2	2	**8**	Good
U4_a	Mourne Beg River	4	2	2	**8**	Good
U4_b	Mourne Beg River	4	2	2	**8**	Good
U4_c	Mourne Beg River	4	3	2	**9**	Moderate
U4_d	Mourne Beg River	4	2	2	**8**	Good
U4_e	Mourne Beg River	4	2	2	**8**	Good
U5_a	Mourne Beg River	2	2	2	**6**	Good
U5_b	Mourne Beg River	3	3	1	**7**	Good
U5_c	Mourne Beg River	3	2	1	**6**	Good
B1_a	Bunadowen River	4	2	1	**7**	Good
B1_b	Bunadowen River	3	2	3	**8**	Good
B1_c	Bunadowen River	2	2	2	**6**	Good

7. Appendix B – annual spawning redd distribution

Note: data not available for the Mourne Beg River in the 2013-14 period

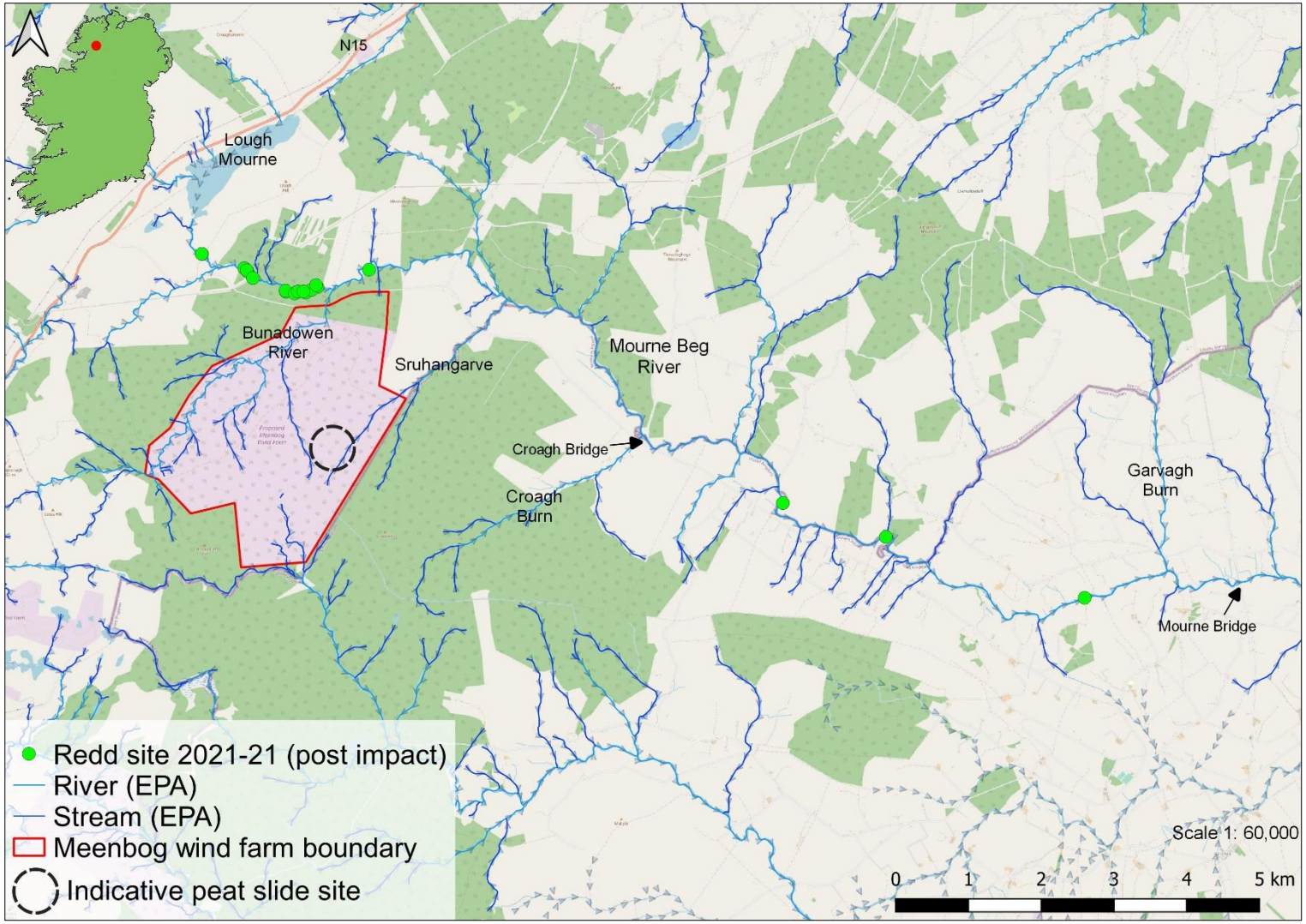

Figure 7.1 Distribution of salmonid spawning redds on the Mourne Beg River 2020-21 (source: Loughs Agency)

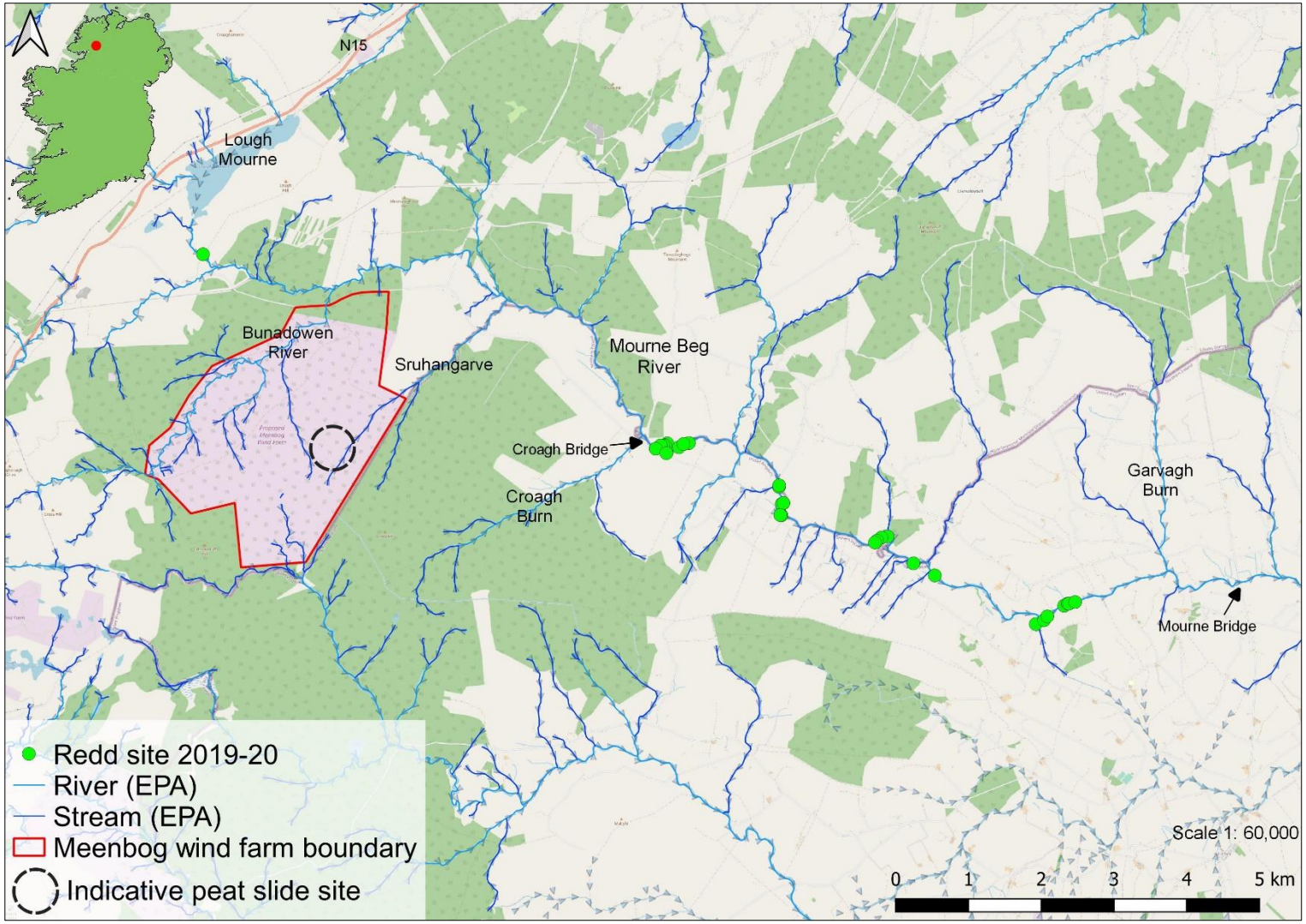

Figure 7.2 Distribution of salmonid spawning redds on the Mourne Beg River 2019-20 (source: Loughs Agency)

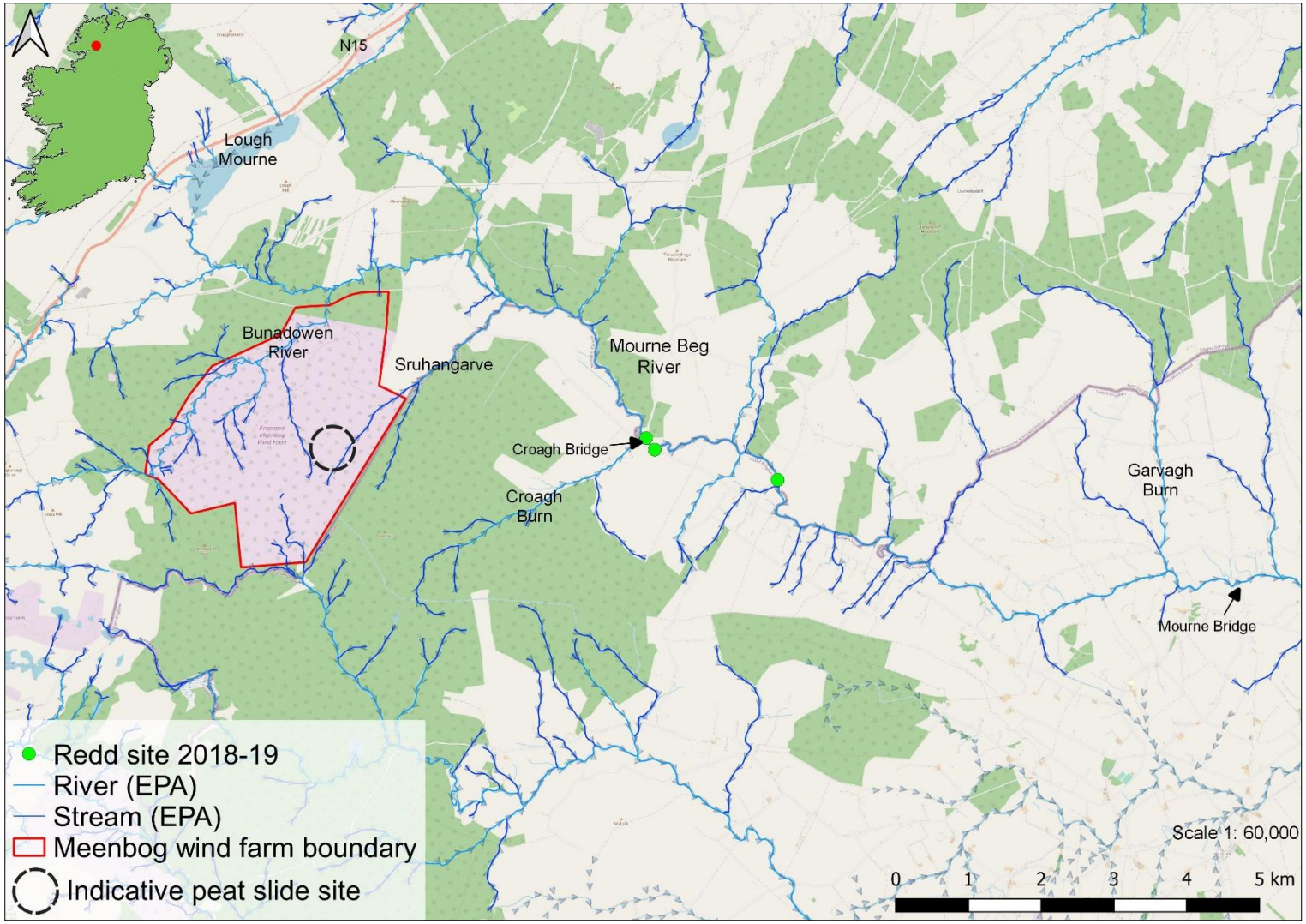

Figure 7.3 Distribution of salmonid spawning redds on the Mourne Beg River 2018-19 (source: Loughs Agency)

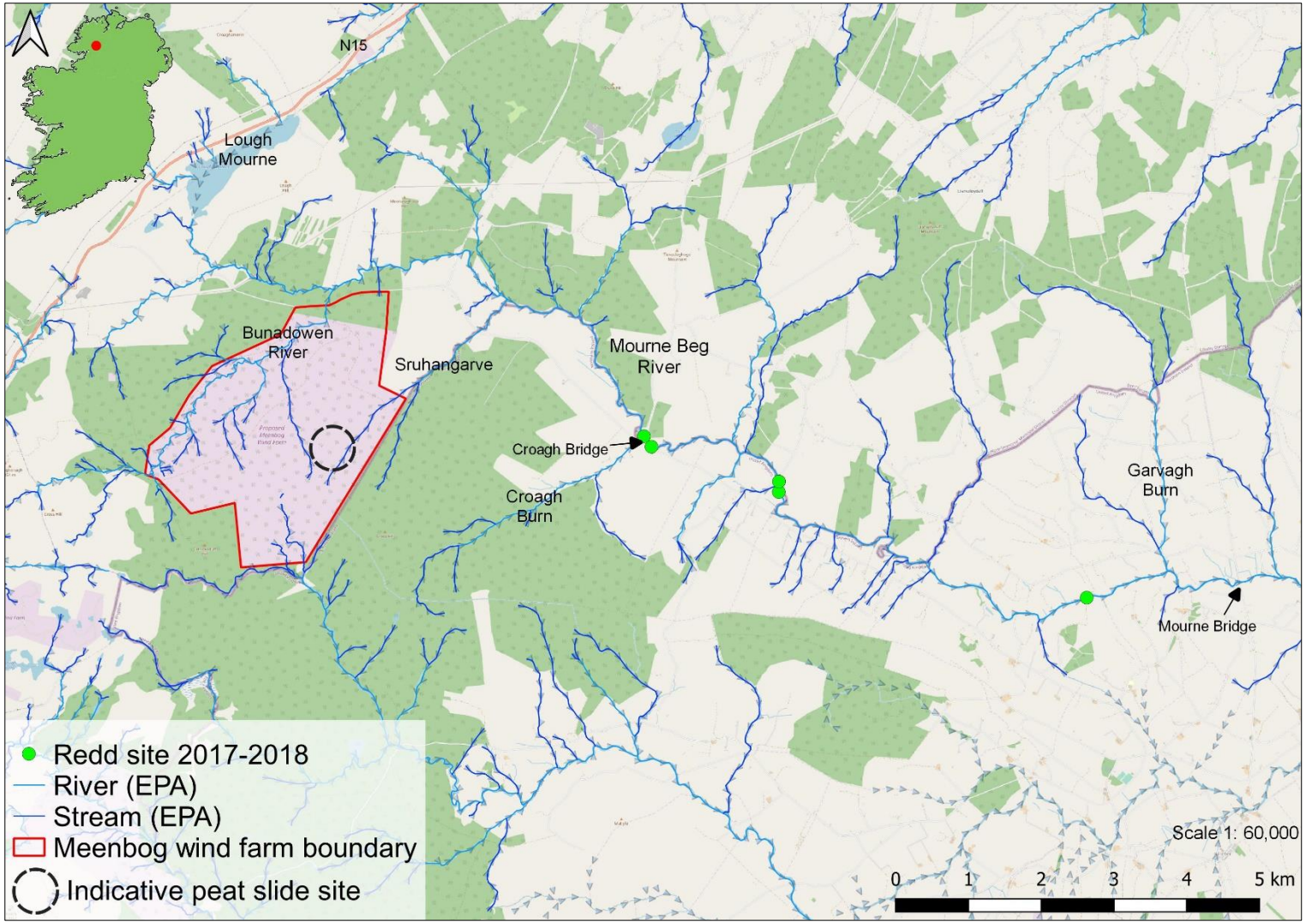

Figure 7.4 Distribution of salmonid spawning redds on the Mourne Beg River 2017-18 (source: Loughs Agency)

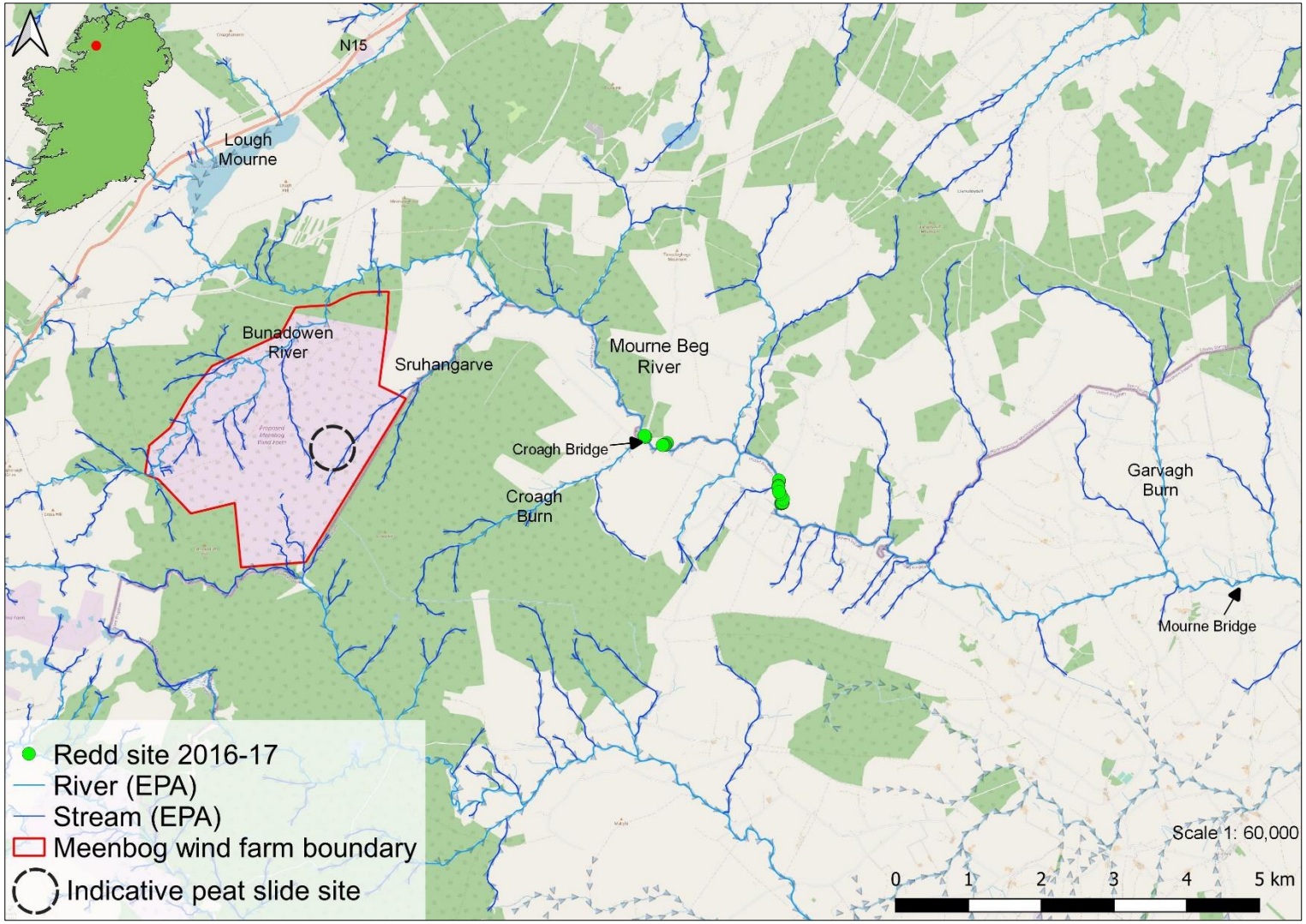

Figure 7.5 Distribution of salmonid spawning redds on the Mourne Beg River 2016-17 (source: Loughs Agency)

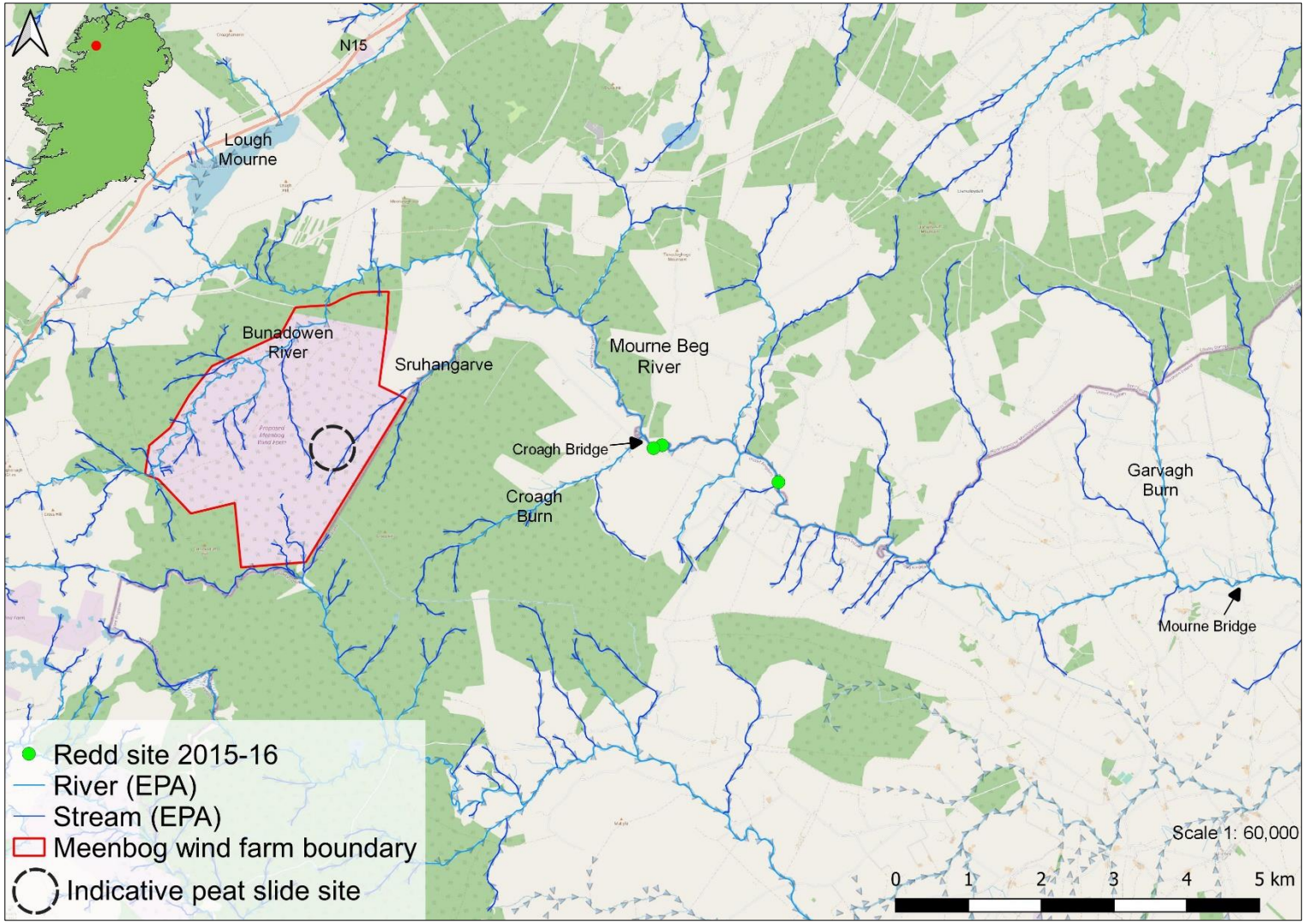

Figure 7.6 Distribution of salmonid spawning redds on the Mourne Beg River 2015-16 (source: Loughs Agency)

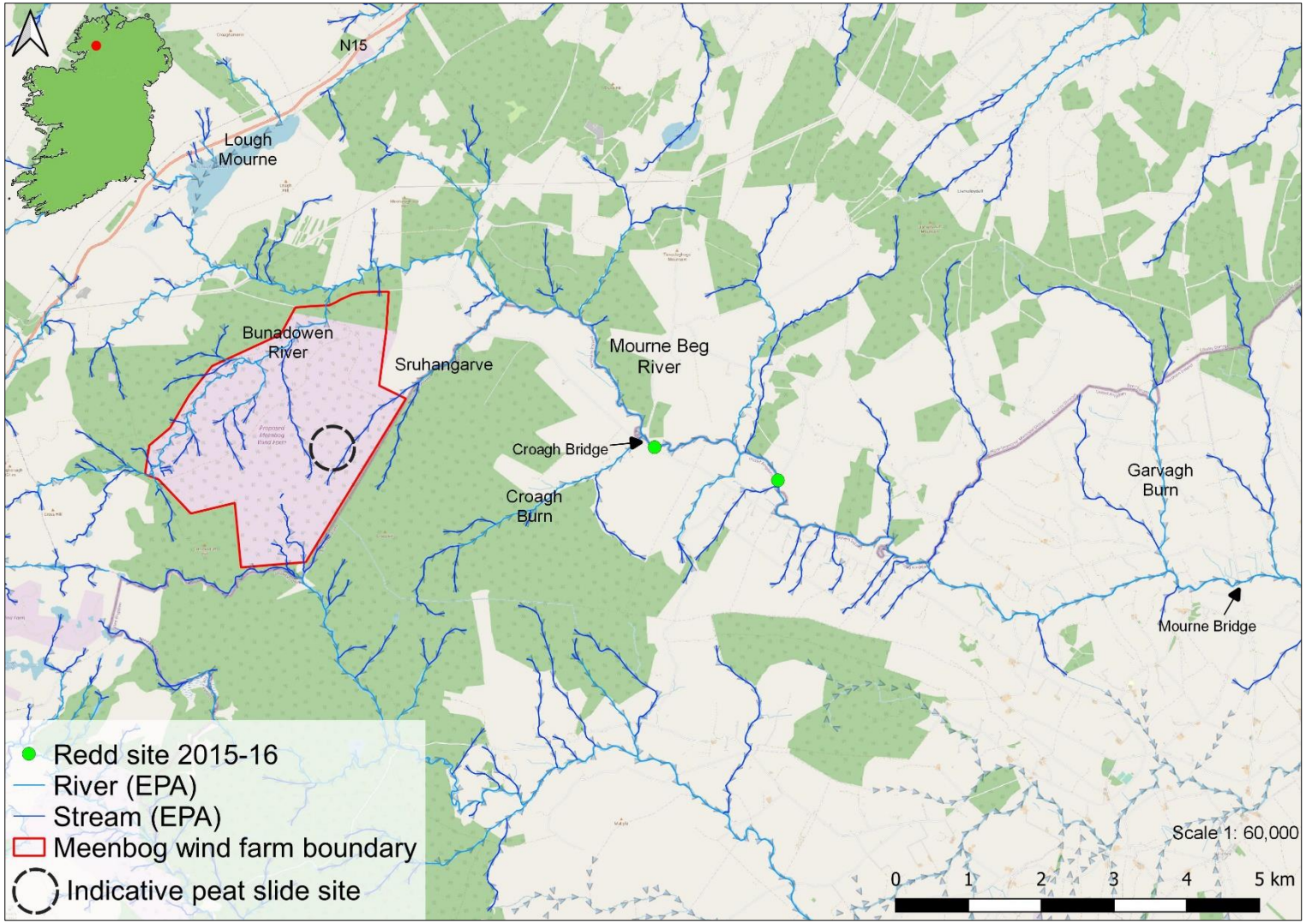

Figure 7.7 Distribution of salmonid spawning redds on the Mourne Beg River 2014-15 (source: Loughs Agency)

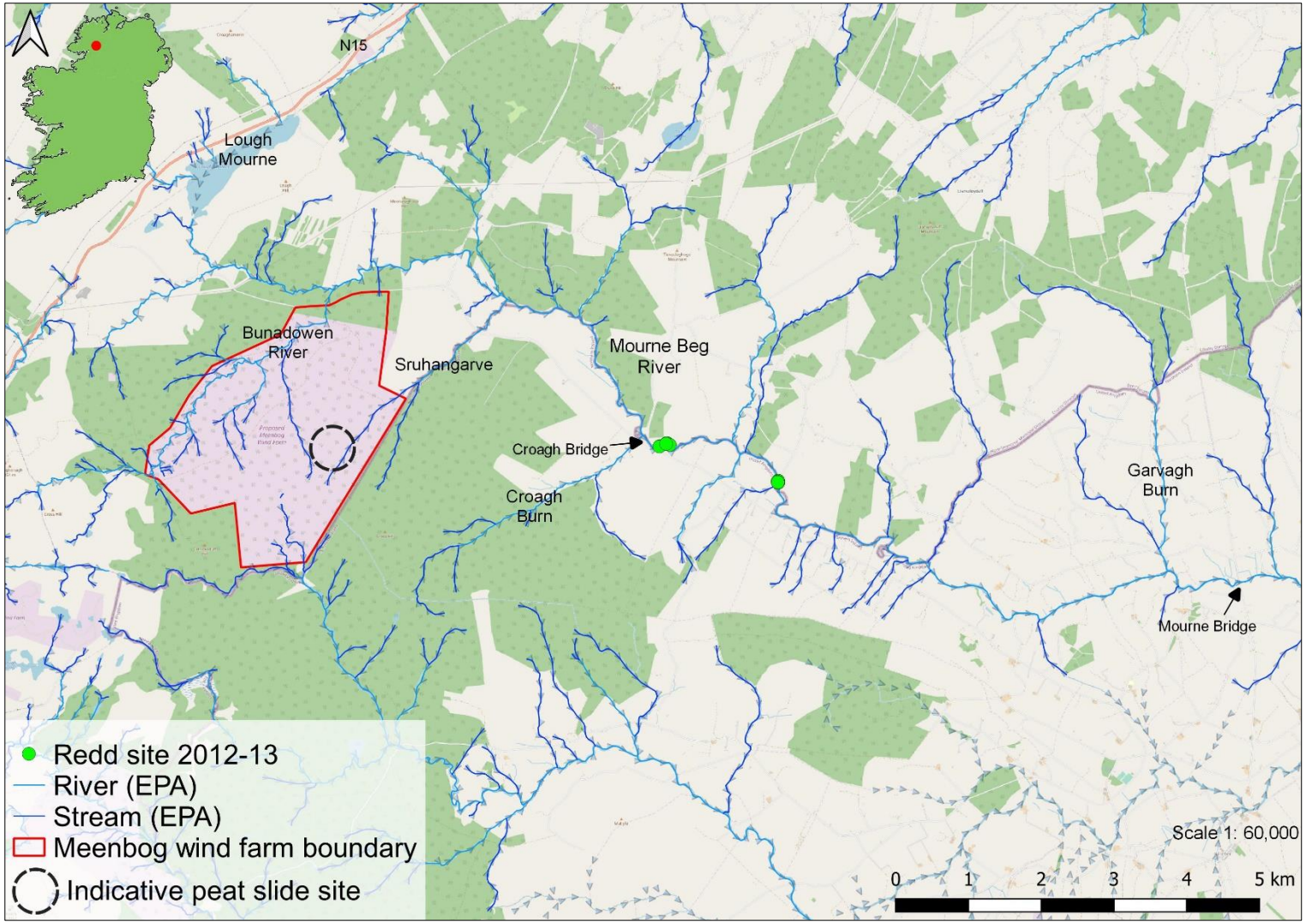

Figure 7.8 Distribution of salmonid spawning redds on the Mourne Beg River 2012-13 (source: Loughs Agency)

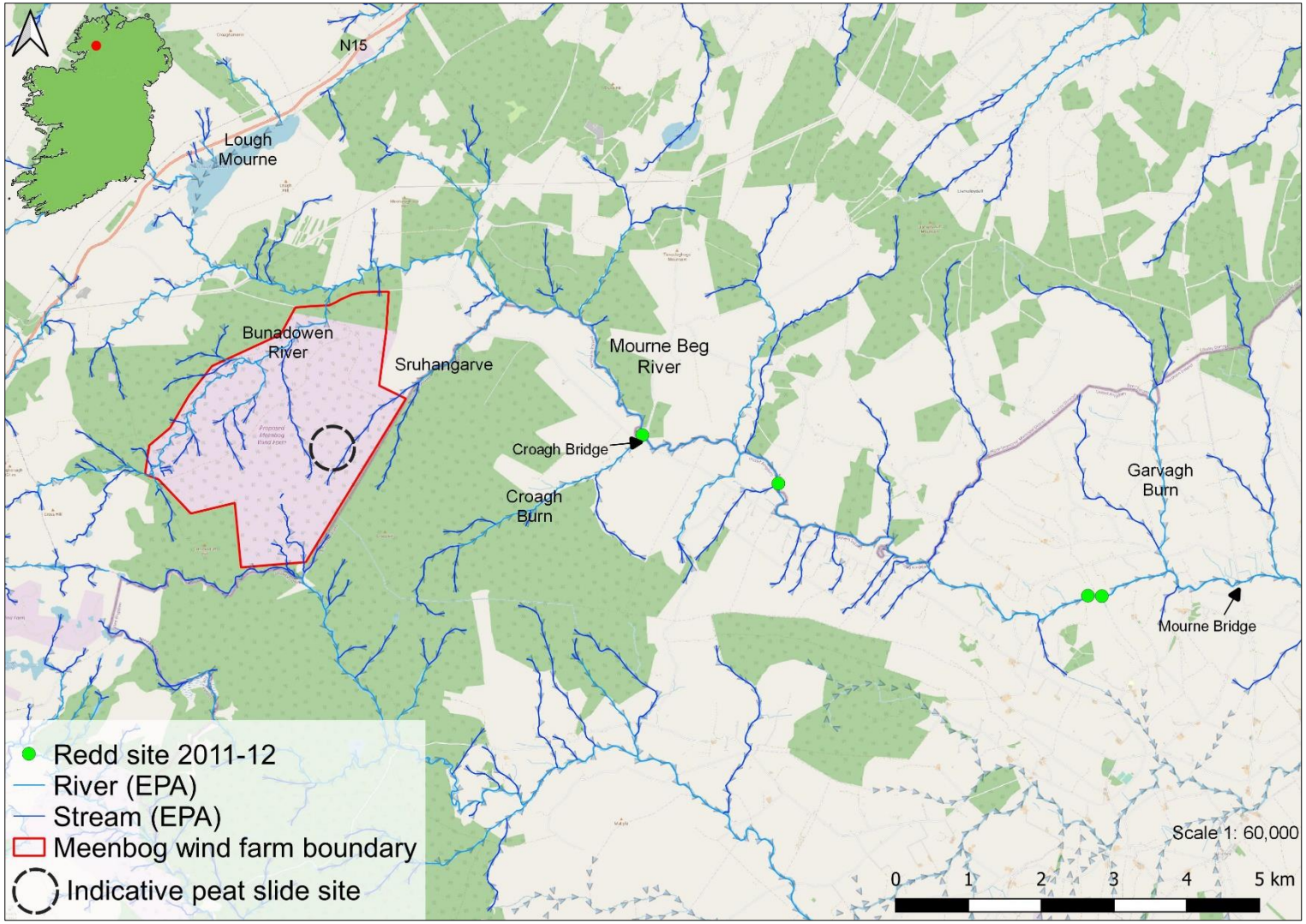

Figure 7.9 Distribution of salmonid spawning redds on the Mourne Beg River 2011-12 (source: Loughs Agency)

8. Appendix C – redox measurements

Table 8.1 Redox readings for the *n*=80 survey locations, July 2021. Greyed out values indicate sites where substrata readings were not possible due to compacted/bedrock substrata

			Water column (mV)				Substrata (mV) (5cm depth)				
Watercourse	Section	Sample ID	Reading 1	Reading 2	Reading 3	Mean	Reading 1	Reading 2	Reading 3	Mean	% loss
Mourne Beg River	U1	Redox_U1_a	359	369	347	**358**	352	362	333	**349**	-3%
Mourne Beg River	U1	Redox_U1_b	289	302	349	**313**	249	272	340	**287**	-8%
Mourne Beg River	U2	Redox_U2_a	303	291	294	**296**	249	229	263	**247**	-17%
Mourne Beg River	U2	Redox_U2_b	323	312	334	**323**	302	230	249	**260**	-19%
Mourne Beg River	U3	Redox_U3_a	184	225	220	**210**	277	108	291	**225**	7%
Mourne Beg River	U3	Redox_U3_b	256	280	208	**248**	254	295	307	**285**	15%
Mourne Beg River	U4	Redox_U4_a	279	290	289	**286**	305	300	334	**313**	9%
Mourne Beg River	U4	Redox_U4_b	275	272	272	**273**	297	356	325	**326**	19%
Mourne Beg River	U5	Redox_U5_a	255	243	263	**254**	317	333	326	**325**	28%
Mourne Beg River	M1	Redox_M1_a	322	317	334	**324**	255	302	256	**271**	-16%
Mourne Beg River	M1	Redox_M1_b	287	290	279	**285**	307	311	323	**314**	10%
Mourne Beg River	M2	Redox_M2_a	371	322	327	**340**	272	258	304	**278**	-18%
Mourne Beg River	M2	Redox_M2_b	261	312	323	**299**	226	292	265	**261**	-13%
Mourne Beg River	M3	Redox_M3_a	285	326	323	**311**	281	256	292	**276**	-11%
Mourne Beg River	M3	Redox_M3_b	305	352	362	**340**	264	287	315	**289**	-15%
Mourne Beg River	M4	Redox_M4_a	340	346	330	**339**	302	257	285	**281**	-17%
Mourne Beg River	M4	Redox_M4_b	330	325	347	**334**	286	250	314	**283**	-15%
Mourne Beg River	M5	Redox_M5_a	352	322	323	**332**	252	231	223	**235**	-29%
Mourne Beg River	M5	Redox_M5_b	316	226	321	**288**	276	328	301	**302**	5%
Mourne Beg River	M6	Redox_M6_a	326	316	330	**324**	288	302	302	**297**	-8%
Mourne Beg River	M6	Redox_M6_b	327	316	348	**330**	274	360	277	**304**	-8%
Mourne Beg River	M7	Redox_M7_a	324	210	327	**287**	296	283	278	**286**	0%
Mourne Beg River	M7	Redox_M7_b	292	305	339	**312**	255	286	245	**262**	-16%
Mourne Beg River	M8	Redox_M8_a	306	340	323	**323**	308	270	305	**294**	-9%
Mourne Beg River	M8	Redox_M8_b	319	301	309	**310**	283	265	293	**280**	-9%

			Water column (mV)				Substrata (mV) (5cm depth)				
Watercourse	Section	Sample ID	Reading 1	Reading 2	Reading 3	Mean	Reading 1	Reading 2	Reading 3	Mean	% loss
Mourne Beg River	M9	Redox_M9_a	356	331	366	**351**	313	313	333	**320**	-9%
Mourne Beg River	M9	Redox_M9_b	336	327	316	**326**	292	284	290	**289**	-12%
Mourne Beg River	M10	Redox_M10_a	326	320	351	**332**	302	282	325	**303**	-9%
Mourne Beg River	M10	Redox_M10_b	329	341	332	**334**	236	300	314	**283**	-15%
Mourne Beg River	M11	Redox_M11_a	309	336	351	**332**	263	284	299	**282**	-15%
Mourne Beg River	M11	Redox_M11_b	314	333	282	**310**	273	304	266	**281**	-9%
Mourne Beg River	M12	Redox_M12_a	327	318	365	**337**	290	298	262	**283**	-16%
Mourne Beg River	M12	Redox_M12_b	282	212	347	**280**	218	313	280	**270**	-4%
Mourne Beg River	M13	Redox_M13_a	331	355	333	**340**	310	274	281	**288**	-15%
Mourne Beg River	M13	Redox_M13_b	326	353	360	**346**	282	279	286	**282**	-18%
Mourne Beg River	M14	Redox_M14_a	356	347	351	**351**	252	310	292	**285**	-19%
Mourne Beg River	M14	Redox_M14_b	283	286	203	**257**	248	251	265	**255**	-1%
Mourne Beg River	M15	Redox_M15_a	348	314	358	**340**	278	281	335	**298**	-12%
Mourne Beg River	M15	Redox_M15_b	296	305	n/a	**301**	274	256	n/a	**265**	-12%
Mourne Beg River	M16	Redox_M16_a	343	348	n/a	**346**	291	268	n/a	**280**	-19%
Mourne Beg River	M16	Redox_M16_b	328	304	n/a	**316**	281	269	n/a	**275**	-13%
Mourne Beg River	M17	Redox_M17_a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Mourne Beg River	M17	Redox_M17_b	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Mourne Beg River	M18	Redox_M18_a	310	296	349	**318**	265	259	274	**266**	-16%
Mourne Beg River	M18	Redox_M18_b	351	307	356	**338**	258	262	259	**260**	-23%
Mourne Beg River	M19	Redox_M19_a	331	314	229	**291**	285	215	280	**260**	-11%
Mourne Beg River	M19	Redox_M19_b	336	331	n/a	**334**	272	280	n/a	**276**	-17%
Mourne Beg River	M20	Redox_M20_a	357	346	335	**346**	304	272	303	**293**	-15%
Mourne Beg River	M20	Redox_M20_b	317	354	348	**340**	214	272	267	**251**	-26%
Mourne Beg River	M21	Redox_M21_a	355	341	n/a	**348**	271	263	n/a	**267**	-23%
Mourne Beg River	M21	Redox_M21_b	347	365	251	**321**	268	284	271	**274**	-15%
Mourne Beg River	M22	Redox_M22_a	361	371	368	**367**	275	282	280	**279**	-24%
Mourne Beg River	M22	Redox_M22_b	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

			Water column (mV)				Substrata (mV) (5cm depth)				
Watercourse	Section	Sample ID	Reading 1	Reading 2	Reading 3	Mean	Reading 1	Reading 2	Reading 3	Mean	% loss
Mourne Beg River	M23	Redox_M23_a	327	330	319	**325**	251	253	239	**248**	-24%
Mourne Beg River	M23	Redox_M23_b	334	358	371	**354**	288	287	253	**276**	-22%
Mourne Beg River	M24	Redox_M24_a	319	351	360	**343**	294	264	274	**277**	-19%
Mourne Beg River	M24	Redox_M24_b	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Mourne Beg River	M25	Redox_M25_a	322	330	325	**326**	230	224	221	**225**	-31%
Mourne Beg River	M25	Redox_M25_b	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Mourne Beg River	M26	Redox_M26_a	292	295	274	**287**	264	267	255	**262**	-9%
Mourne Beg River	M26	Redox_M26_b	296	295	299	**297**	269	271	269	**270**	-9%
Mourne Beg River	M27	Redox_M27_a	302	330	322	**318**	255	221	233	**236**	-26%
Mourne Beg River	M27	Redox_M27_b	327	329	333	**330**	309	299	283	**297**	-10%
Mourne Beg River	M28	Redox_M28_a	314	325	n/a	**320**	273	270	n/a	**272**	-15%
Mourne Beg River	M28	Redox_M28_b	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Mourne Beg River	M29	Redox_M29_a	310	343	358	**337**	241	296	261	**266**	-21%
Bunadowen River	B1	Redox_B1_a	326	337	284	**316**	299	305	277	**294**	-7%
Sruhangarve	S1	Redox_S1_a	252	260	283	**265**	171	153	305	**210**	-21%
Sruhangarve	S1	Redox_S1_b	241	268	247	**252**	248	292	272	**271**	7%
Sruhangarve	S1	Redox_S1_c	252	224	260	**245**	138	94	141	**124**	-49%
Sruhangarve	S1	Redox_S1_d	229	213	n/a	**221**	168	89	n/a	**129**	-42%
Sruhangarve	S2	Redox_S2_a	297	298	297	**297**	277	369	276	**307**	3%
Sruhangarve	S2	Redox_S2_b	239	235	236	**237**	217	89	91	**132**	-44%
Sruhangarve	S3	Redox_S3_a	244	292	280	**272**	152	254	280	**229**	-16%
Sruhangarve	S3	Redox_S3_b	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sruhangarve	S4	Redox_S4_a	322	331	344	**332**	277	270	254	**267**	-20%
Sruhangarve	S4	Redox_S4_b	275	252	269	**265**	340	358	324	**341**	28%
Sruhangarve	S5	Redox_S5_a	229	270	286	**262**	160	150	170	**160**	-39%
Sruhangarve	S5	Redox_S5_b	265	274	382	**307**	277	290	312	**293**	-5%

9. Appendix D – siltation % cover & silt infiltration

Table 9.1 % silt cover and silt infiltration (to 5cm substrate depth) on the Mourne Beg River, Sruhangarve and Bunadowen River, June 2021 (following Moorkens & Killeen, 2020)

Replicate	Watercourse	Sediment character	% surface cover	Severity	Silt infiltration
U1_a	Mourne Beg River (u/s Sruhangarve)	Silt & peat	5%	Slight	Slight
U1_b	Mourne Beg River (u/s Sruhangarve)	Silt & peat	5%	Slight	Slight
U2_a	Mourne Beg River (u/s Sruhangarve)	Silt & peat	5%	Slight	Slight
U2_b	Mourne Beg River (u/s Sruhangarve)	Silt & peat	5%	Slight	Slight
U3_a	Mourne Beg River (u/s Sruhangarve)	Silt & peat	5%	Slight	Slight
U3_b	Mourne Beg River (u/s Sruhangarve)	Silt & peat	5%	Slight	Slight
U4_a	Mourne Beg River (u/s Sruhangarve)	Silt & peat	5%	Slight	Slight
U4_b	Mourne Beg River (u/s Sruhangarve)	Silt & peat	5%	Slight	Slight
U5_a	Mourne Beg River (u/s Sruhangarve)	Silt & peat	5%	Slight	Slight
U5_b	Mourne Beg River (u/s Sruhangarve)	Silt & peat	5%	Slight	Slight
M1_a	Mourne Beg River	Floc & peat	65%	Severe	Severe
M1_b	Mourne Beg River	Floc & peat	75%	Severe	Severe
M2_a	Mourne Beg River	Floc & peat	60%	Severe	Severe
M2_b	Mourne Beg River	Floc & peat	50%	Severe	Severe
M3_a	Mourne Beg River	Floc & peat	60%	Severe	Severe
M3_b	Mourne Beg River	Floc & peat	50%	Severe	Severe
M4_a	Mourne Beg River	Floc & peat	40%	Severe	Severe
M4_b	Mourne Beg River	Floc & peat	20%	Moderate	Moderate
M5_a	Mourne Beg River	Floc & peat	40%	Severe	Severe
M5_b	Mourne Beg River	Floc & peat	40%	Severe	Severe
M6_a	Mourne Beg River	Floc & peat	50%	Severe	Severe
M6_b	Mourne Beg River	Floc & peat	50%	Severe	Severe
M7_a	Mourne Beg River	Floc & peat	90%	Severe	Severe
M7_a	Mourne Beg River	Floc & peat	90%	Severe	Severe
M8_a	Mourne Beg River	Floc & peat	90%	Severe	Severe
M8_b	Mourne Beg River	Floc & peat	90%	Severe	Severe
M9_a	Mourne Beg River	Floc & peat	90%	Severe	Severe
M9_b	Mourne Beg River	Floc & peat	90%	Severe	Severe
M10_a	Mourne Beg River	Floc & peat	90%	Severe	Severe
M10_b	Mourne Beg River	Floc & peat	90%	Severe	Severe
M11_a	Mourne Beg River	Floc & peat	90%	Severe	Severe
M11_b	Mourne Beg River	Floc & peat	90%	Severe	Severe
M12_a	Mourne Beg River	Floc & peat	90%	Severe	Severe
M12_b	Mourne Beg River	Floc & peat	90%	Severe	Severe
M13_a	Mourne Beg River	Floc & peat	90%	Severe	Severe
M13_b	Mourne Beg River	Floc & peat	90%	Severe	Severe
M14_a	Mourne Beg River	Floc & peat	90%	Severe	Severe
M14_b	Mourne Beg River	Floc & peat	90%	Severe	Severe
M15_a	Mourne Beg River	Floc & peat	90%	Severe	Severe
M15_b	Mourne Beg River	Floc & peat	90%	Severe	Severe
M16_a	Mourne Beg River	Floc & peat	90%	Severe	Severe
M16_b	Mourne Beg River	Floc & peat	90%	Severe	Severe

Replicate	Watercourse	Sediment character	% surface cover	Severity	Silt infiltration
M17_a	Mourne Beg River	Floc & peat	95%	Severe	Severe
M17_b	Mourne Beg River	Floc & peat	95%	Severe	Severe
M18_a	Mourne Beg River	Floc & peat	90%	Severe	Severe
M18_b	Mourne Beg River	Floc & peat	90%	Severe	Severe
M19_a	Mourne Beg River	Floc & peat	20%	Moderate	Slight
M19_b	Mourne Beg River	Floc & peat	20%	Moderate	Slight
M20_a	Mourne Beg River	Floc & peat	30%	Moderate	Moderate
M20_b	Mourne Beg River	Floc & peat	30%	Moderate	Moderate
M21_a	Mourne Beg River	Bedrock	0%	None	None
M21_b	Mourne Beg River	Floc & peat	80%	Severe	Severe
M22_a	Mourne Beg River	Floc & silt	80%	Severe	Severe
M23_a	Mourne Beg River	Floc & silt	50%	Severe	Severe
M24_a	Mourne Beg River	Floc & peat	90%	Severe	Severe
M25_a	Mourne Beg River	Floc & peat	10%	Moderate	Slight
M26_a	Mourne Beg River	Floc	25%	Moderate	Slight
M27_a	Mourne Beg River	Floc	80%	Severe	Severe
M28_a	Mourne Beg River	Floc & peat	70%	Severe	Severe
M29_a	Mourne Beg River	Floc & peat	70%	Severe	Severe
B1_a	Bunadowen River	Silt & peat	5%	Slight	Slight
B1_b	Bunadowen River	Silt & peat	5%	Slight	Slight
S1_a	Sruhangarve	Peat & floc	80%	Severe	Severe
S2_a	Sruhangarve	Peat & floc	90%	Severe	Severe
S3_a	Sruhangarve	Peat & floc	30%	Severe	Severe
S4_a	Sruhangarve	Peat & floc	25%	Moderate	Moderate
S5_a	Sruhangarve	Peat & floc	100%	Severe	Severe

10. Appendix E – RHAT scores

Table 10.1 River Habitat Assessment Technique (RHAT) scores for the *n*=40 survey sections, July 2021 (after Murphy & Toland, 2014)

Watercourse	Section	Channel morphology	Channel vegetation	Substrate condition	Barriers	Bank structure & stability	Bank vegetation	Riparian land use	Floodplain interactions	Total score	Hydromorph score	WFD status
Bunadowen River	**B1**	3.5	2.5	3.5	3.5	3	1	0	4	**21**	0.7	Good
Mourne Beg River	**U1**	4	2.5	3	4	3.5	2	1.5	4	**24.5**	0.8	Good
Mourne Beg River	**U2**	4	2.5	3	4	3.5	2	1.5	4	**24.5**	0.8	Good
Mourne Beg River	**U3**	3	2.5	3.5	3.5	3	1.5	2	4	**23**	0.7	Good
Mourne Beg River	**U4**	4	2.5	3.5	4	3	2	3	4	**26**	0.8	Good
Mourne Beg River	**U5**	4	2.5	3.5	4	3	1.5	2	4	**24.5**	0.8	Good
Sruhangarve	**S1**	1	1	0	0	0	1	1	4	**8**	0.3	Poor
Sruhangarve	**S2**	4	2	0	4	1	1.5	0.5	4	**17**	0.5	Moderate
Sruhangarve	**S3**	4	2	0	4	1	1.5	0.5	4	**17**	0.5	Mod
Sruhangarve	**S4**	4	2.5	2	4	3	2	2	4	**23.5**	0.7	Good
Sruhangarve	**S5**	4	1	0	4	3	2	2	4	**20**	0.6	Good
Mourne Beg River	**M1**	4	2	2	4	4	2.5	1.5	4	**24**	0.8	Good
Mourne Beg River	**M2**	4	2	2	4	4	3	2.5	4	**25.5**	0.8	Good
Mourne Beg River	**M3**	4	2	2	4	4	3	2.5	4	**25.5**	0.8	Good
Mourne Beg River	**M4**	4	2.5	3	4	4	3	1.5	4	**26**	0.8	High
Mourne Beg River	**M5**	4	2.5	2	4	4	3	1.5	4	**25**	0.8	Good
Mourne Beg River	**M6**	4	2.5	2	4	4	3	1.5	4	**25**	0.8	Good
Mourne Beg River	**M7**	4	2	1	4	4	3	1.5	4	**23.5**	0.7	Good
Mourne Beg River	**M8**	3	2	1	4	3	1	1	3	**18**	0.6	Mod
Mourne Beg River	**M9**	4	2	1	4	3	1	2	4	**21**	0.7	Good
Mourne Beg River	**M10**	4	2	1	4	3	2	1.5	4	**21.5**	0.7	Good
Mourne Beg River	**M11**	4	2	1	4	3	2	2	4	**22**	0.7	Good
Mourne Beg River	**M12**	4	2	1	4	3	2	2	4	**22**	0.7	Good
Mourne Beg River	**M13**	2	2	1	4	3	3	1.5	3	**19.5**	0.6	Good
Mourne Beg River	**M14**	2	2	1	4	3	3	1.5	3	**19.5**	0.6	Good
Mourne Beg River	**M15**	4	2	1	4	3	2	1.5	4	**21.5**	0.7	Good

Watercourse	Section	Channel morphology	Channel vegetation	Substrate condition	Barriers	Bank structure & stability	Bank vegetation	Riparian land use	Floodplain interactions	Total score	Hydromorph score	WFD status
Mourne Beg River	**M16**	4	2	1	4	3	2	1.5	4	**21.5**	0.7	Good
Mourne Beg River	**M17**	0	0	0	4	1	2.5	1	2	**10.5**	0.3	Poor
Mourne Beg River	**M18**	1	1	0.5	4	2	1.5	1.5	2	**13.5**	0.4	Poor
Mourne Beg River	**M19**	3.5	2	2	4	3	3	2	2	**21.5**	0.7	Good
Mourne Beg River	**M20**	1	3	2	1	3	3	3	3	**19**	0.6	Moderate
Mourne Beg River	**M21**	3	3	2	1	3	3	2.5	1.5	**19**	0.6	Moderate
Mourne Beg River	**M22**	3	2	2	4	3	3	1	2	**20**	0.6	Good
Mourne Beg River	**M23**	3	3	2	4	2.5	3	2	2	**21.5**	0.7	Good
Mourne Beg River	**M24**	1	1	1	4	2.5	2	1	2	**14.5**	0.5	Moderate
Mourne Beg River	**M25**	3	2.5	2	4	3	3.5	1	3	**22**	0.7	Good
Mourne Beg River	**M26**	3	3	2	4	2.5	3	2	3	**22.5**	0.7	Good
Mourne Beg River	**M27**	3	3	2	4	3.5	2	2	2.5	**22**	0.7	Good
Mourne Beg River	**M28**	3	3	2	4	3.5	2	2	2.5	**22**	0.7	Good
Mourne Beg River	**M29**	3	3	2	4	3.5	2	2	2.5	**22**	0.7	Good

11. Appendix F – biological water quality

Table 11.1 Macro-invertebrate Q-sampling results for aquatic survey sites in the vicinity of Meenbog, October 2021 (continued on next page)

Group	Family	Species	M1	M2	M3	M4	M5	M6	M7	M8	B1	S1	EPA group
Ephemeroptera	Heptageniidae	*Heptagenia sulphurea*		11	4	3	10	53	25	22			A
Ephemeroptera	Heptageniidae	*Ecdyonurus venosus*		4									A
Ephemeroptera	Heptageniidae	*Ecdyonurus dispar*		10		1	3	8	5	13			A
Ephemeroptera	Heptageniidae	*Rhithrogena semicolorata*				1				1			A
Plecoptera	Perlodidae	*Isoperla grammatica*	2	36	14	11	3	4			10		A
Plecoptera	Nemouridae	*Protonemura meyeri*		4	1	2	2	7	8	1	50	49	A
Plecoptera	Chloroperlidae	*Siphonoperla torrentium*				1	4		1		4		A
Ephemeroptera	Leptophlebiidae	*Paraleptophlebia cincta*	1									2	B
Plecoptera	Leuctridae	*Leuctra hippopus*	2				2	1	1	1	5	8	B
Trichoptera	Hydroptilidae	*Oxyethria* sp.	1										B
Trichoptera	Lepidostomatidae	*Lepidostoma hirtum*							2		1		B
Trichoptera	Limnephilidae	Unidentified species				1			1				B
Trichoptera	Sericostomatidae	*Sericostoma personatum*							2				B
Hemiptera	Aphelochiridae	*Aphelocheirus aestivalis*							33	11			B
Ephemeroptera	Baetidae	*Baetis rhodani*	11	1	1	4	11	1	7	22	1		C
Ephemeroptera	Caenidae	*Caenis rivulorum*					1		1				C
Trichoptera	Hydropsychidae	*Hydropsyche siltalai*	15	29	10	11	7	2	4		11		C
Trichoptera	Hydropsychidae	*Hydropsyche instabilis*		2			13	41	9	4			C
Trichoptera	Polycentropodidae	*Polycentropus kingi*	3										C
Trichoptera	Polycentropodidae	*Plectrocnemia conspersa*	2									1	C
Trichoptera	Polycentropodidae	*Polycentropus flavomaculatus*		5	17	12	10	4	2	1	3		C
Trichoptera	Polycentropodidae	*Plectrocnemia geniculata*					2					2	C
Trichoptera	Rhyacophilidae	*Rhyacophila dorsalis*	1	9	1		1				7	3	C
Trichoptera	Rhyacophilidae	*Rhyacophila munda*				1							C
Coleoptera	Dytiscidae	*Ilybius ater*										1	C

Group	Family	Species	M1	M2	M3	M4	M5	M6	M7	M8	B1	S1	EPA group
Coleoptera	Elmidae	*Limnius volckmari*		14	19	23	12	6	7	7			C
Coleoptera	Elmidae	*Elmis aenea*		2			1			4			C
Coleoptera	Elmidae	*Esolus parallelepipedus*					2			1			C
Coleoptera	Gyrinidae	*Gyrinidae* larva		7	3	1	3	4	2	1			C
Diptera	Chironomidae	Unidentified species	2	2	1	4	1	2	1		1		C
Diptera	Pediciidae	*Dicranota* sp.				1	3		1	1			C
Diptera	Simuliidae	Unidentified species	34	7	8	10	13	4	8	9	5	3	C
Diptera	Tipuliidae	*Tipula* sp.	10	2		2	1						C
Gastropoda	Planorbidae	*Ancylus fluviatilis*							2				C
Crustacea	Gammaridae	*Gammarus duebeni*							33	26			C
Arachnida	Hydrachnidiae	Unidentified species				1	1	1		2			C
Annelida	Erpobdellidae	Erpobdellidae species						1					D
Hirudinidae	Glossiphoniidae	*Glossiphonia* sp.								4			D
Crustacea	Asellidae	*Asellus aquaticus*							1	4			D
Mollusca	Lymnaeidae	*Ampullacaeana (Radix) balthica*						2		4			D
Annelida	Naididae (Tubificidae)	Naididae (Tubificidae) larva			3	5	3		2	2			E
Annelida	Oligochaeta	Unidentified species	4	4	2	4						1	n/a
Total Abundance			**88**	**149**	**84**	**99**	**109**	**141**	**158**	**141**	**98**	**70**	
Ephemeroptera Plecoptera Trichoptera (EPT) taxonomic diversity *n*			**9**	**10**	**7**	**11**	**13**	**9**	**13**	**8**	**9**	**6**	
% EPT			**43.2**	**74.5**	**57.1**	**48.5**	**63.3**	**87.1**	**43**	**47.4**	**93.9**	**92.9**	
Q-rating			Q3-4	Q4	Q4	Q4-5	Q4-5	Q4	Q4	Q4	Q4	Q3-4	
WFD status			Mod	Good	Good	High	High	Good	Good	Good	Good	Mod	

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Aquatic baseline report for Meenbog wind farm, Co. Donegal

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April 2025

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1. Introduction

1.1 Background

Triturus Environmental Ltd. were commissioned by MKO to conduct baseline aquatic surveys to inform the Remedial Environmental Impact Assessment Report (rEIAR) for Meenbog wind farm located near Ballybofey, Co. Donegal (**Figure 2.1**).

Undertaken on a catchment-wide scale, this report provides a baseline assessment of the aquatic ecology including fisheries and biological water quality, as well as protected species and habitats in the vicinity of the development. Aquatic surveys were undertaken in July and September 2024 and would update catchment wide surveys previously completed by Triturus in July and October 2021 (Triturus, 2022).

2. Methodology

2.1 Selection of watercourses for assessment

All freshwater watercourses which could be affected directly or indirectly by the development and associated infrastructure were considered as part of the current assessment. A total of *n*=19 sites were selected for detailed aquatic assessment (see **Table 2.1, Figure 2.1 & 2.2** below). The courses and nomenclature for the watercourses surveyed followed Environmental Protection Agency (EPA) and Ordnance Survey of Northern Ireland (OSNI) mapping.

Riverine survey sites were present on the Croaghonagh River (01C31) and an unnamed tributary, Bunadowen River (01B01), Shruhangarve (01S26), Glendergan River (GBNI0100880), Mourne Beg River (01M01), Barrack Hill River (37B16) and Lowerymore River (37L01) (**Table 2.1**). Carrickaduff Lough (site L1) was also surveyed.

The survey area within the MourneBeg_SC_010 and MourneBeg_SC_020 river sub-catchments. The uppermost reaches of the Mourne Beg River (EPA code: 01M01), near Lough Mourne, forms part of the Croaghonagh Bog SAC (000129), a site designated for blanket bog habitat. From near the Sruhangarve confluence (within the Republic of Ireland), the Mourne Beg River is located within the River Finn SAC (002301), for which Atlantic salmon (*Salmo salar*) are listed as a qualifying interest (NPWS, 2014). The Mourne Beg River, from its confluence with the Sruhangarve, also forms part of the River Foyle and Tributaries ASSI (229), which is designated for, among other species, Atlantic salmon (DAERA, 2015). In the upper catchment, the river also forms a boundary with Croagh Bog ASSI (378) (no aquatic qualifying interests).

Please note this aquatic report should be read in conjunction with the final Remedial Environmental Impact Assessment Report (rEIAR) prepared for the wind farm development. More specific aquatic methodology is outlined below and in the appendices of this report.

2.2 Aquatic site surveys

Aquatic surveys were conducted on the 22nd, 23rd and 24th July and the 12th September 2024. Survey effort focused on both instream and riparian habitats at each aquatic sampling location and included a fisheries assessment (electro-fishing and or fisheries habitat appraisal), white-clawed crayfish survey, macrophyte and aquatic bryophyte survey and biological water quality sampling (Q-sampling) or macro-invertebrate sweep sampling (where applicable) (**Figure 2.1**). This holistic approach informed the overall aquatic ecological evaluation of each site/watercourse in context of the wind farm and ensured that any habitats and species of high conservation value would be detected to best inform mitigation.

In addition to the ecological characteristics of the site, a broad aquatic and riparian habitat assessment was conducted utilising elements of the methodology given in the Environment Agency's 'River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003' (EA, 2003) and the Irish Heritage Council's 'A Guide to Habitats in Ireland' (Fossitt, 2000). This broad characterisation helped define the watercourses' conformity or departure from naturalness. All sites were assessed in terms of:

- Physical watercourse/waterbody characteristics (i.e. width, depth, channel form) including associated evidence of historical drainage
- Substrate type and relative condition, listing substrate fractions in order of dominance (i.e. bedrock, boulder, cobble, gravel, sand, silt etc.)
- Flow type by proportion of riffle, glide and pool in the sampling area
- An appraisal of the macrophyte and aquatic bryophyte community at each site
- Riparian vegetation composition and bordering land use practices

Table 2.1 Location of *n*=19 aquatic survey sites in the vicinity of Meenbog wind farm, Co. Donegal

Site no.	Watercourse	EPA code	Location	X (ITM)	Y (ITM)
SP1	Unnamed stream	n/a	Croaghonagh	605010	887018
SP2	Croaghonagh River	01C31	Croaghonagh	606385	888005
SP3	Bunadowen River	01B01	Meenbog	605634	885263
SP4	Bunadowen River	01B01	Meenbog	606297	886277
SP5	Bunadowen River	01B01	Croaghonagh	608092	887606
SP6	Shruhangarve	01S26	Sruhangarve Bridge	610171	887234
SP7	Glendergan River	GBNI0100880	Slievedoo	607769	883831
SP8	Glendergan River	GBNI0100885	Killeteer Forest Park	608916	881721
SP9	Mourne Beg River	01M01	Croaghonagh	606421	888291
SP10	Mourne Beg River	01M01	Meenbog	608253	887857
SP11	Mourne Beg River	01M01	Meenbog	609865	888295
SP12	Mourne Beg River	01M01	Meenbog	610608	887660
SP13	Mourne Beg River	01M01	Croagh Bridge	612487	885772
SP14	Mourne Beg River	01M01	Meenreagh Bridge	614305	885180
SP15	Mourne Beg River	01M01	Laghtfoggy	618510	883578
SP16	Mourne Beg River	01M01	Mourne Bridge	620654	883800
SP17	Barrack Hill River	37B16	Croaghonagh	604010	887099
SP18	Lowerymore River	37L01	Biddy O'Barnes	601989	884625
L1	Carrickaduff Lough	9925	Meenbog	607570	885069

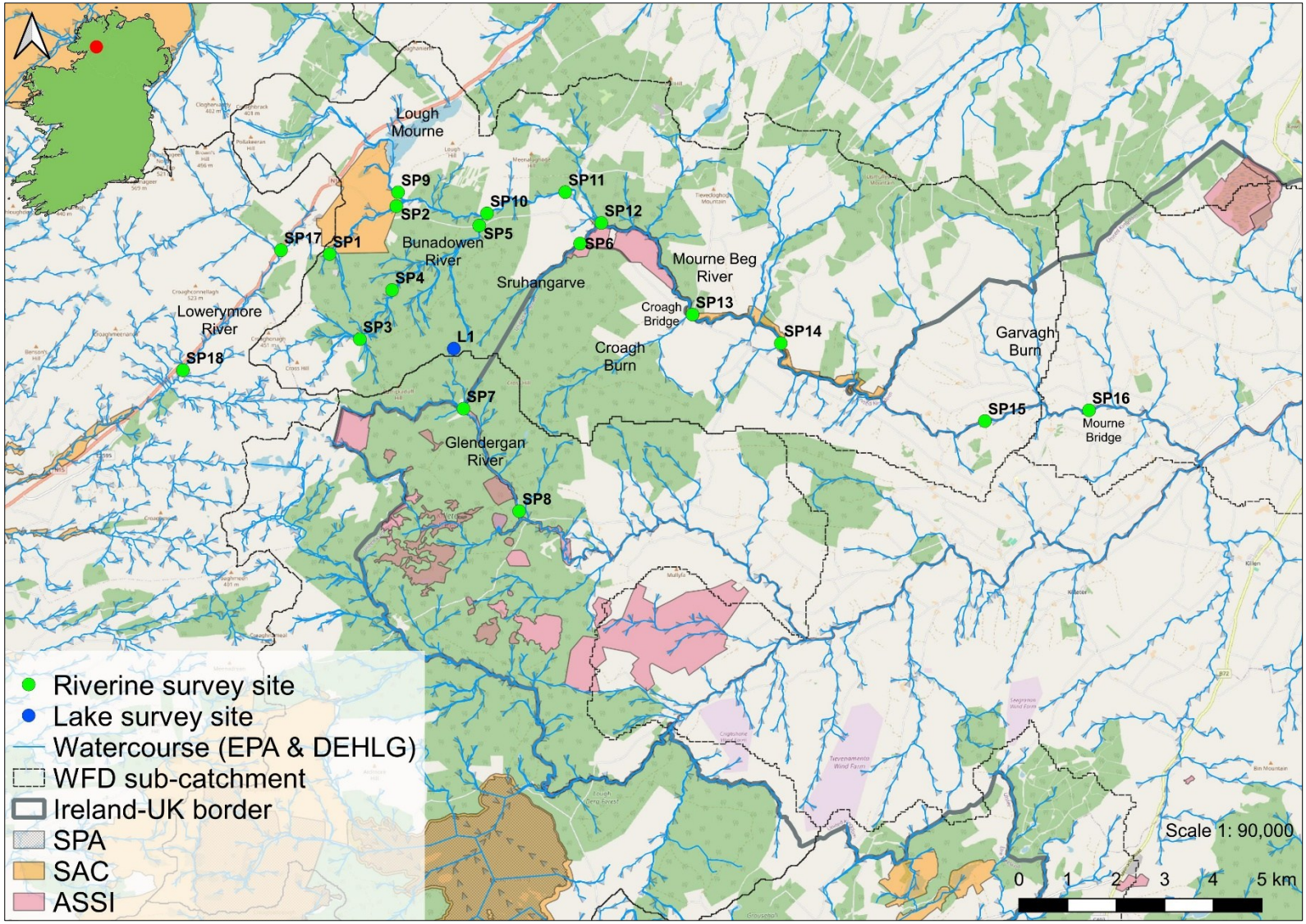

Figure 2.1 Overview of the aquatic survey sites in the vicinity of Meenbog wind farm, Co. Donegal

2.3 Fisheries assessment & habitat appraisal

A single anode Smith-Root LR24 backpack (12V DC input; 300V, 100W DC output) was used to electro-fish sites on riverine watercourses in the vicinity of the development in July and September[1] 2024 (**Table 2.1, Figure 2.1; Appendix A**), following notification to the Lough's Agency (under the conditions of a Section 69 permit) and Inland Fisheries Ireland (under the conditions of a Department of the Environment, Climate and Communications (DECC) licence). The survey was undertaken in accordance with best practice (CFB, 2008; CEN, 2003) and licencing requirements.

Furthermore, a fisheries habitat appraisal of all aquatic survey sites was undertaken to establish their importance for salmonid, lamprey, European eel and other fish species. The baseline assessment also considered the quality of spawning, nursery and holding habitat for salmonids and lamprey within the vicinity of the survey sites. For detailed survey methodology, please refer to accompanying fisheries assessment report in **Appendix A.**

2.4 White-clawed crayfish survey

White-clawed crayfish (*Austropotamobius pallipes*) surveys were undertaken at the aquatic survey sites in July 2024 under a National Parks and Wildlife (NPWS) open national licence (no. C20/2024), as prescribed by Sections 9, 23 and 34 of the Wildlife Act (1976-2023), to capture and release crayfish to their site of capture. As per Inland Fisheries Ireland aquatic biosecurity recommendations, the crayfish sampling started at the uppermost site(s) of the wind farm catchment/sub-catchments in the survey area to minimise the risk of transfer invasive propagules (including crayfish plague) in an upstream direction.

Hand-searching of instream refugia and sweep netting was undertaken according to Reynolds et al. (2010). An appraisal of white-clawed crayfish habitat at each site was conducted based on physical habitat attributes (Gammell et al., 2021; Peay, 2003), water chemistry and incidental records in mustelid spraint. Additionally, a desktop review of crayfish records within the wider survey area was completed.

2.5 Biological water quality (Q-sampling)

The 18 no. riverine survey sites were assessed for biological water quality through Q-sampling in July 2024 (**Table 2.1**). All samples were taken with a standard kick sampling hand net (250mm width, 500µm mesh size) from areas of riffle/glide utilising a 2-minute kick sample, as per Environmental Protection Authority (EPA) methodology (Feeley et al., 2020). Large cobble was also washed at each site for 1-minute (where present) to collect attached macro-invertebrates (as per Feeley et al., 2020). Samples were elutriated and fixed in 70% ethanol for subsequent laboratory identification to species level. Samples were converted to Q-ratings as per Toner et al. (2005) and assigned to WFD status classes (**Table 2.2**). Any rare invertebrate species were identified from the NPWS Red List publications for beetles (Foster et al., 2009), mayflies (Kelly-Quinn & Regan, 2012), stoneflies (Feeley et al., 2020) and other relevant taxa (i.e. Byrne et al., 2009; Nelson et al., 2011).

[1] Sites SP17 on the Barrack Hill River and SP18 on the Lowerymore River were surveyed in September 2024 at the request of Inland Fisheries Ireland

Table 2.2 Reference categories for EPA Q-ratings (Q1 to Q5) (Toner et al., 2005)

Q value	WFD status	Pollution status	Condition
Q5 or Q4-5	High status	Unpolluted	Satisfactory
Q4	Good status	Unpolluted	Satisfactory
Q3-4	Moderate status	Slightly polluted	Unsatisfactory
Q3 or Q2-3	Poor status	Moderately polluted	Unsatisfactory
Q2, Q1-2 or Q1	Bad status	Seriously polluted	Unsatisfactory

2.6 Lacustrine macro-invertebrate communities

The 1 no. lacustrine site (Carrickaduff Lough) was sampled for macro-invertebrates via sweep netting. A standard pond net (250mm width, mesh size 500µm) was used to sweep macrophytes to capture macro-invertebrates. The net was also moved along the lake bed to collect epibenthic and epiphytic invertebrates from the substratum (as per Cheal et al., 1993). A 3-minute sampling period was employed. To ensure appropriate habitat coverage, the sampling period was also divided amongst the range of meso-habitats present at the survey site to get a representative sample for sub-habitats.

2.7 Macrophytes and aquatic bryophytes

Surveys of the macrophyte and aquatic bryophyte community were conducted by instream wading at each of the survey sites, with specimens collected (by hand or via grapnel) for on-site identification. An assessment of the aquatic vegetation community helped to identify any rare macrophyte species listed under the Flora (Protection) Order, 2022, The Wildlife (Northern Ireland) Order 1985 (as amended), Schedule 8 of the Northern Ireland Priority Species list, the Irish Red list for vascular plants (Wyse-Jackson et al., 2016) and or the Irish Red list for aquatic bryophytes (Lockhart et al., 2012), or habitats corresponding to Annex I habitats, e.g., 'Water courses of plain to montane levels, with submerged or floating vegetation of the *Ranunculion fluitantis* and *Callitricho-Batrachion* (low water level during summer) or aquatic mosses [3260]' (more commonly referred to as 'floating river vegetation').

2.8 Otter signs

The presence of otter (*Lutra lutra*) was determined through the recording of otter signs within 150m radius of each survey site. Notes on the age and location of signs (ITM coordinates) were made, in addition to the quantity and visible constituents of spraint (i.e. remains of fish, crustaceans, molluscs etc.).

2.9 Aquatic ecological evaluation

The evaluation of aquatic ecological receptors contained within this report uses the geographic scale and criteria defined in the 'Guidelines for Assessment of Ecological Impacts of National Road Schemes' (NRA, 2009).

2.10 Biosecurity

A strict biosecurity protocol following IFI (2010) and the Check-Clean-Dry approach was adhered to during surveys for all equipment and PPE used. Disinfection of all equipment and PPE before and after use with Virkon™ was conducted to prevent the transfer of pathogens or invasive propagules between survey sites. Surveys were undertaken at sites in a downstream order to minimise the risk of upstream propagule mobilisation. Particular cognisance was given towards preventing the spread or introduction of highly virulent crayfish plague (*Aphanomyces astaci*). Furthermore, staff did not undertake any work in a known crayfish plague catchment for a period of <72hrs in advance of the survey. Where feasible, equipment was also thoroughly dried (through UV exposure) between survey areas. Any aquatic invasive species or pathogens recorded within or adjoining the survey areas were geo-referenced. All Triturus staff are certified in 'Good fieldwork practice: slowing the spread of invasive non-native species' by the University of Leeds.

3. Desktop review

3.1 Survey area description

Meenbog wind farm is located in an upland area, approximately 10km southwest of Ballybofey, Co. Donegal (**Figure 2.1**). The site is within the River Foyle catchment (GBNIIENW). The aquatic survey sites were located within the Mourne Beg_SC_010, Mourne Beg_SC_020, and Eske_SC_010 river sub-catchments. The site is primarily drained by Mourne Beg River (EPA code: 01M01) and its tributaries.

The watercourses in the vicinity of the wind farm are typically small, upland eroding channels (FW1; Fossitt, 2000) and drainage ditches (FW4) (see **section 4** for more details). Land use practices are predominantly coniferous forestry (CORINE 312) and transitional woodland-shrub (324) in more upland areas with lower altitudes dominated by peat bogs (412). The wider survey area featured land principally utilised as pastures (231). Predominantly, the watercourses flowed over areas of Neoproterozoic metasedimentary rocks of psammitic & pelitic schist, marble, amphibolite and diamictite with localised quartzite (Geological Survey of Ireland data).

3.2 Fisheries

The Mourne Beg River rises at Mourne Lough and flows, primarily through peatland areas, for approximately 26km before joining the River Derg 3.5km upstream of Castlederg, Co. Tyrone. The river is known to support Atlantic salmon (*Salmo salar*) and brown trout (*Salmo trutta*) in addition to European eel (*Anguilla anguilla*), minnow (*Phoxinus phoxinus*), stone loach (*Barbatula barbatula*), three-spined stickleback (*Gasterosteus aculeatus*) and pike (*Esox lucius*) (Triturus 2021 data; Loughs Agency 2011-2021 data). It its lower reaches, the river also supports *Lampetra* sp. (Niven & McAuley, 2013). Within the wider Foyle catchment, the Mourne Beg is an important spawning river for Atlantic salmon.

The Bunadowen River (01B01), a Mourne Beg tributary, is also known to support Atlantic salmon, brown trout and European eel (Triturus 2021 data; Loughs Agency 2020-21 data; Paul Johnston Associates, 2017). The Sruhangarve (01S26), another Mourne Beg River tributary, is known to support European eel and a low density of brown trout (Triturus 2021 data; Loughs Agency data, 2020-21; Paul Johnston Associates, 2017). The Croaghonagh River (also known as Mary Breen's Burn), a tributary of the Mourne Beg River, is known to support brown trout and European eel (Paul Johnston Associates, 2017).

The Glendergan River, a tributary of the River Derg, supports Atlantic salmon, brown trout, lamprey (*Lampetra* sp.), European eel and minnow (Niven & Donnelly, 2018).

In the Eske sub-catchment, the Lowerymore River (37L01) is a highly productive Atlantic salmon habitat often supporting very high densities of fry (e.g. IFI, 2011).

3.3 Protected aquatic species

A comprehensive desktop review of available data from the National Parks and Wildlife Service (NPWS), National Biodiversity Data Centre (NBDC), Inland Fisheries Ireland (IFI), Loughs Agency, Botanical Society of Britain and Ireland (BSBI), Environmental Protection Agency (EPA) and Triturus

databases for the 10km grid squares containing and adjoining the wind farm (i.e. H08, H18, H28) identified a low number of records for rare and or protected aquatic species within the vicinity of Meenbog wind farm.

A low number of contemporary Annex II otter (*Lutra lutra*) records (2002-2021) were available for the respective 10km grid squares. Most records were for the Mourne Beg River (including at Croagh Bridge, site S313) or River Derg. (**Figure 3.1**). Otter signs have also been recorded on the Corraffrin River and two other (unnamed) tributaries of the Mourne Beg River (squares H18 & H28) (Triturus 2021 data).

No records for macrophytes or aquatic bryophytes protected under the Flora (Protection) Order, 2022 or listed as Northern Ireland priority species were available for the respective grid squares. There were no freshwater pearl mussel (*Margaritifera margaritifera*) records available for the survey area or the H18, H18 and H28 10km grid squares.

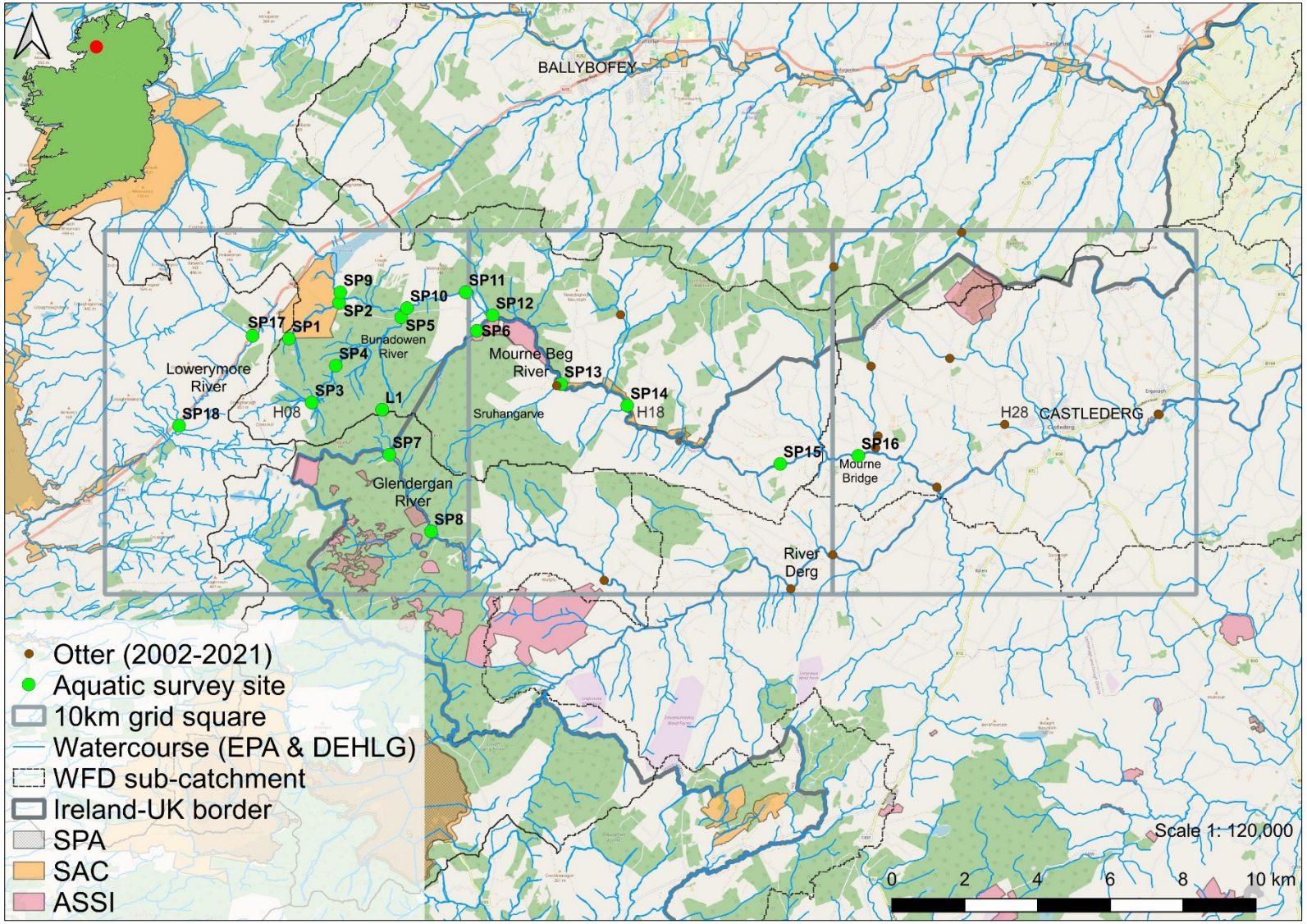

Figure 3.1 Otter records in the vicinity of Meenbog wind farm (source: Triturus, NPWS, EPA & NBDC data)

4. Results of aquatic surveys

The following section summarises each of the *n*=19 survey sites in terms of aquatic habitats, physical characteristics and overall value for fish and macrophyte/aquatic bryophyte communities. Please refer to **Appendix A** (fisheries assessment report) for more detailed fisheries results. Biological water quality (Q-sample) results are also summarised for each riverine sampling site and in **Appendix B**. A summary of the fish species recorded at each survey site is provided in **Table 4.1**. A summary of the aquatic species and habitats of high conservation concern recorded during the surveys is provided in **Table 4.3**. An evaluation of the aquatic ecological importance of each survey site based on these aquatic surveys is provided and summarised in **Table 4.3**. Habitat codes are according to Fossitt (2000). Scientific names are provided at first mention only. Sites were surveyed in July or September 2024.

4.1 Aquatic survey site results

4.1.1 Site SP1 – Unnamed stream, Croaghonagh

Site SP1 was located on the upper reaches of an unnamed tributary of the Mourne Beg River, at a forestry track access crossing (twin pipe culvert). The small upland eroding spate channel (FW1: Fossitt, 2000) flowed over a moderate gradient and was 1-1.5m wide and 0.1-0.3m deep, with locally deeper pool to 1m. The channel was incised in peat, resulting in several natural falls/cascades over peat. The profile comprised riffle and shallow glide with occasional pool. The substrata were dominated by mobile (rounded)boulder and cobble with frequent interstitial mixed gravels and sands. Siltation, despite considerable peat staining, was relatively low at the time of survey. Given the high energy conditions and high shading of the narrow channel, macrophytes were absent. However, bryophyte coverage was relatively high on more stable substrata with frequent *Marsupella marginata*. Filamentous algal cover was low but nonetheless present, indicating enrichment. The channel was heavily encouraged by terrestrial vegetation with abundant rushes (*Juncus* spp.), bramble (*Rubus fruticosus* agg.) and scattered grey willow (*Salix cinerea*). The site was bordered by upland blanket bog (PB2) with scattered mixed age sitka spruce (*Picea sitchensis*).

No fish were recorded via electro-fishing at site SP1 (**Appendix A**). Despite some physical suitability for a small salmonid population (i.e. pool, mixed gravels etc.), the narrow upland channel was not of value to resident fish given its location in the uppermost reaches of the watercourse and high natural gradients. There was no suitability for white-clawed crayfish. No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site SP1 was of **local importance (lower value) (Table 4.3).**

Plate 4.1 Representative image of site A1 on an unnamed Mourne Beg River tributary, July 2024

4.1.2 Site SP2 – Croaghonagh River, Croaghonagh

Site SP2 was located on the Croaghonagh River (01C31) at a local road crossing (single masonry arch, cobbled apron). The upland eroding spate tributary of the Mourne Beg River (FW1) was largely natural in character with a meandering profile over a moderate gradient featuring a series of fast-flowing glides and pools in a naturally incised channel. Riffle was scarce. The river was 2-2.5m wide and 0.2-0.5m deep, with locally deeper pool to 1.1m. Peat staining was high at the time of survey. The substrata of the high energy site were dominated by boulder and large cobble, most of which were bedded and angular. Siliceous bedrock was present locally. Only localised areas of mixed gravels were present in pool tailings. Macrophytes were limited to rare bulbous rush (*Juncus bulbosus*) with some lesser spearwort (*Ranunculus flammula*) along the littorals. However, cover of aquatic bryophytes was high with abundant *Scapania undulata*. *Racomitrium aciculare* was occasional on boulder tops. Cover of filamentous algae and floc was high, indicating significant enrichment. The banks were largely open and grass-dominated (e.g. *Molinia caerulea*). The riparian zones graded into wet grassland (GS4) and blanket bog (PB2) (much of which was degraded).

Atlantic salmon (*Salmo salar*) and brown trout (*Salmo trutta*) were the only fish species recorded via electro-fishing at site SP2 (**Appendix A**). The site was of moderate value as a salmonid habitat, supporting a low density of mixed cohort salmon and trout. The quality of spawning habitat was poor given the predominance of larger substrata in the narrow spate channel in addition to eutrophication pressures. Whilst instream refugia were abundant, the density of juvenile salmonids was low (moderate quality nursery). Frequent deep pools on meanders and bank scours offered some value to adult salmonids. Despite some moderate suitability for European eel, none were recorded. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location of the site within the Croaghonagh Bog SAC (000129), the aquatic ecological evaluation of site SP2 was of **international importance (Table 4.3).**

Plate 4.2 Representative image of site SP2 on the Croaghonagh River, July 2024

4.1.3 Site SP3 – Bunadowen River, Meenbog

Site SP3 was located on the upper reaches of the Bunadowen River (01B01), a tributary of the Mourne Beg River. The mostly natural upland eroding spate river (FW1) was 3m wide and 0.2-0.6m deep with 1m bank heights at grade with the adjoining hillside. The river flowed under a forestry access track via a large box culvert. Flowing in a shallow V-shaped valley, the profile comprised riffle, glide and pool sequences over high energy boulder-cascade reaches. The bed featured large boulder, cobble and scattered coarse angular gravels. The substrata were unbedded with moderate siltation (from peat). Floc cover was c.50% indicating eutrophication pressures. The high energy site did not support macrophytes but occasional *Racomitrium aciculare* and *Scapania undulata* were present on instream boulders. The riparian areas supported scattered grey willow and alder bordering sitka spruce plantations (WD4).

Brown trout and European eel (*Anguilla anguilla*) were the only fish species recorded via electro-fishing at site SP3 (**Appendix A**). The site was a good quality salmonid nursery supporting moderate numbers of juveniles in addition to mixed cohort adults. The quality was reduced somewhat due to high floc cover and siltation pressures (peat). Moderate quality spawning areas by way of mixed gravels were present locally in deeper pool. Deeper pool below boulder-cascade areas provided valuable holding areas for adult salmonids. The site was of too high a gradient to support significant

European eel populations but a single adult was recorded. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). Numerous otter spraints (mixed age) were present on the concrete ledges of the box culvert crossing (ITM 605634, 885267).

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids and Red-listed European eel, the aquatic ecological evaluation of site SP3 was of **local importance (higher value) (Table 4.3).**

Plate 4.3 Representative image of site SP3 on the upper reaches of the Bunadowen River, July 2024

4.1.4 Site SP4 – Bunadowen River, Meenbog

Site SP4 was located on the upper reaches of the Bunadowen River (01B01) within the wind farm site. The natural upland eroding spate river (FW1) was 4-6m wide and 0.2-1.3m deep with 1m bank heights at grade with the adjoining upland blanket bog (PB3). The profile comprised riffle, glide and pool sequences over high energy boulder-cascade reaches with regular steep gradient falls. The bed was composed of large boulder, cobble, localised angular gravels and peat. The substrata were moderately bedded with moderate siltation (peat). Floc cover was high c. 50% in addition to filamentous algae (c. 50%), indicating eutrophication pressures. The high energy site did not support macrophytes. Instream boulders supported occasional *Racomitrium aciculare*, *Scapania undulata* and *Marsupella emarginata*. *Fontinalis antipyretica* was recorded very locally on large boulders. The riparian areas supported scattered grey willow with pockets of scattered mature sitka spruce and lodgepole pine (*Pinus contorta*) on upland blanket bog. The site was bordered by extensive conifer plantations (WD4).

Brown trout was the only fish species recorded via electro-fishing at site SP4 (**Appendix A**). The site was a moderate quality salmonid nursery only given the very high energy characteristics in addition

to eutrophication and siltation pressures (peat). The site was of moderate value as a spawning habitat due to the paucity of clean gravels and supported only low numbers of juveniles (0+). Deeper pool below boulder-cascade areas provided valuable holding areas for adult salmonids. The site was of too high a gradient to support significant European eel populations and none were recorded. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids, the aquatic ecological evaluation of site SP4 was of **local importance (higher value) (Table 4.3).**

Plate 4.4 Representative image of site SP4 on the upper reaches of the Bunadowen River, July 2024

4.1.5 Site SP5 – Bunadowen River, Croaghonagh

Site SP5 was located on the lower reaches of the Bunadowen River (01B01) at a local road crossing (single masonry arch, cobbled apron), approximately 0.2km upstream of the Mourne Beg River confluence. The upland eroding spate channel (FW1) was largely natural in character and flowed over a moderate gradient. The profile comprised boulder cascades and fast-flowing glide with frequent small pools. The substrata were dominated by bedrock with bedded boulder. Cobbles were present locally with only sparse mixed gravels. Due to high flow rates, macrophytes were limited with some bulbous rush and lesser spearwort locally. The aquatic bryophyte coverage was high with abundant *Scapania undulata*. *Racomitrium aciculare* was present on boulder tops with *Marsupella emarginata* locally. The river in vicinity of the bridge was shaded by mature treelines of sycamore (*Acer psuedoplatanus*), rowan (*Sorbus aucuparia*) and grey willow with localised invasive rhododendron

(*Rhododendron ponticum*) and scrub. Downstream the banks graded into open heath/bog/wet grassland.

Atlantic salmon and brown trout were the only fish species recorded via electro-fishing at site SP5 (**Appendix A**). The site was of moderate value as a salmonid habitat, supporting a low density of mixed cohort trout and lower numbers of salmon. This reflected the compacted/bedrock bed (leading to poor spawning), high flow rates and poor prey resources (mostly allochthonous system). Whilst the site was of good physical suitability as a salmonid nursery, only a low density of fish were present (in contrast to the downstream-connecting Mourne Beg River). Widespread pool provided some good quality holding areas for migratory adult salmonids. Despite some moderate suitability for European eel, none were recorded. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). A recent otter spraint was recorded on a boulder adjoining the bridge abutment (ITM 608090, 887609).

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids (including Atlantic salmon) and utilisation by otter, the aquatic ecological evaluation of site SP5 was of **local importance (higher value) (Table 4.3).**

Plate 4.5 Representative image of site SP5 on the lower reaches of the Bunadowen River, July 2024

4.1.6 Site SP6 – Shruhangarve, Sruhangarve Bridge

Site SP6 was located on the Sruhangarve (01S26) at Sruhangarve Bridge approximately 0.7km upstream of the Mourne Beg River confluence. The high energy upland spate channel (FW1) flowed over a mostly steep gradient and was 2-2.5m wide and 0.2-0.6m deep (highly variable). The profile comprised steep boulder and bedrock cascades with frequent associated small pools. Regular gradient drops of up to 0.75m were present. Typical of such a high gradient channel, the substrata were dominated by angular boulder and large cobble, with a paucity of smaller substrata (highly localised only between boulder). Siltation was moderate despite high flow rates. Filamentous algae cover was high locally and indicative of upstream enrichment sources. Whilst macrophytes were absent, aquatic bryophyte coverage was relatively high with locally abundant *Scapania undulata* and *Marsupella emarginata*. *Racomitrium aciculare* was frequent on larger boulder. *Pellia* sp. liverwort was present on muddy sections of bank and along channel littorals. The open banks were exposed to low levels of sheep grazing (historically cleared) and were dominated by rushes (*Juncus* spp.). These areas graded into extensive degraded blanket bog. The site was bordered upstream by coniferous afforestation (WD4) and blanket bog (PB2).

Brown trout was the only fish species recorded via electro-fishing at site SP6 (**Appendix A**). The very high energy, high gradient river supported a low density of adult trout, with no juveniles recorded. This reflected the near total absence of suitable spawning habitat in the steep gradient channel. Abundant small plunge pools provided valuable flow refugia and holding habitat for adult trout. The site (and wider channel) was not suitable for Atlantic salmon given the paucity of suitable spawning substrata. Whilst European eel are known from the site (Triturus 2021 data), none were recorded in the current survey and suitability was low given the high energy conditions. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location of the site within the Croagh Bog ASSI (378), the aquatic ecological evaluation of site SP6 was of **national importance (Table 4.3).**

Plate 4.6 Representative image of site SP6 on the Sruhangarve, July 2024

4.1.7 Site SP7 – Glendergan River, Slievedoo

Site SP7 was located on the upper reaches of the Glendergan River (GBNI0100880) adjacent to the wind farm site. The upland eroding peatland river (FW1) was 1m wide and 0.3-1.4m deep with 1m bank heights. The sinuous U-shaped incised channel meandered through deep peat. The profile was dominated by deep glide with localised riffle and deeper pool. The bed comprised of bedded cobbles, gravels and exposed peat. The substrata were very heavily bedded and heavily silted (covered with peat). Eutrophication pressures were also evident with high cover of floc. The high turbidity (from peat) and shading precluded macrophyte growth or aquatic bryophyte growth. The riparian areas supported pockets of upland blanket bog (PB2) between mature sitka spruce plantations (WD4) with recent clear-fell upstream (WS5).

Brown trout was the only fish species recorded via electro-fishing at site SP7 (**Appendix A**). The upper reaches of the river at this location supported a low density of adult 1+ and 2+ trout, with no juveniles recorded. The site was a poor quality salmonid nursery given the small size, upland nature and high siltation pressures. The recent clear-fell and erosion of peat evidently impacted the nursery value. The spawning value was poor due to the heavily silted gravels and high floc cover. However, some good quality holding habitat was present locally for adult salmonids. The site was of too high a gradient to support significant European eel populations and none were recorded. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location of the site within the River Foyle and Tributaries ASSI (229), the aquatic ecological

evaluation of site SP7 was of **national importance (Table 4.3).**

Plate 4.7 Representative image of site SP7 on the Glendergan River, July 2024

4.1.8 Site SP8 – Glendergan River, Killeteer Forest Park

Site SP8 was located on the Glendergan River (GBNI0100885) at Killeteer Forest Park. The medium-sized upland eroding spate channel (FW1) had been locally modified historically but retained a good degree of naturalness despite bank modifications. The river was 5-8m and 0.2-0.6m deep, flowing over a moderate gradient in a natural V-shaped valley. The profile comprised boulder cascades with variable glide and frequent small pool up to 1m in depth. The substrata of the high energy site were dominated by angular (often large) boulder with locally abundant cobble. Mixed gravels were present interstitially but were small in extent. Large woody debris was present locally and contributed to habitat heterogeneity. Peat staining was very high at the time of survey. Given the site characteristics, macrophytes were not present. The aquatic bryophyte *Scapania undulata* was locally abundant with *Racomitrium aciculare* on boulder tops. The mature riparian zones and escarpments supported abundant grey willow, rowan, downy birch (*Betula pubescens*), wood rush (*Luzula* sp.) and self-seeded sitka spruce (*Picea sitchensis*). The site was bordered by maturing and mature coniferous plantations (WD4) with a relatively high degree of broad-leaved species such as sycamore.

Brown trout was the only fish species recorded via electro-fishing at site SP8 (**Appendix A**). The high energy spate channel was of relatively low value for salmonids given the predominance of large substrate, very high peat staining, siltation pressures and a poor prey resources (i.e. mostly allochthonous). Suitable spawning habitat was very limited and exposed to siltation. Whilst small areas of pool and deeper glide habitat were widespread, these supported only a very low density of adult trout. The absence of Atlantic salmon and European eel would indicate downstream barriers, in addition to poor habitat suitability. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location of the site within the River Foyle and Tributaries ASSI (229), the aquatic ecological evaluation of site SP8 was of **national importance (Table 4.3).**

Plate 4.8 Representative image of site SP8 on the Glendergan River, July 2024

4.1.9 Site SP9 – Mourne Beg River, Croaghonagh

Site SP9 was located on the upper reaches of the Mourne Beg River (01M01) at a local access crossing (clear-span bridge with rendered apron) approximately 0.7km downstream of Mourne Lough. The upland eroding spate channel (FW1) was largely natural in character with a meandering profile. The river flowed over a low gradient and was 3-6m wide and 0.1-0.3 deep, with locally deeper pool to >1.7m. The profile comprised shallow glide and abundant riffle with localised pool, some of which was deep. The substrata were dominated by cobble and small boulder with locally frequent mixed gravels. Sand accumulations were occasional along the littorals and in pools. Siltation was low overall although significant flocculent accumulations were present in depositing pools. The site featured a relatively high coverage of macrophytes with cobble/riffle areas and exposed bars supporting locally abundant bulbous rush and bog pondweed (*Potamogeton polygonifolius*). Heterophyllus lesser spearwort was abundant along channel margins and littoral areas. The filamentous rhodophyte *Torularia atrum* was abundant. Cover of filamentous algae was moderate, indicating enrichment from adjoining land use pressures (cutover bog). Aquatic bryophyte coverage was high with frequent *Scapania undulata*. The open banks graded into cutover bog (PB4) with abundant rushes (*Juncus* spp.), bog myrtle (*Myrica gale*), purple moor grass and heather (*Calluna vulgaris*).

Atlantic salmon, brown trout and European eel were recorded via electro-fishing at site SP9 (**Appendix A**). The site was of high value as a salmonid habitat, with abundant instream boulder/cobble supporting a high density of juvenile salmon and a lower number of trout. At the head of these shallow areas, mixed gravels and smaller clean cobbles provided high quality salmonid spawning habitat. Deeper pool, and to a lesser extent, bank scours, offered valuable flow refugia and holding habitat for adult salmonids The deep scour pool immediately below the bridge apron was particularly valuable as holding habitat for larger migratory salmonids. Suitability for European eel was good with a low density recorded. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). No otter signs were recorded in vicinity of the site (few marking opportunities present).

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location of the site within the Croaghonagh Bog SAC (000129), the aquatic ecological evaluation of site SP9 was of **international importance (Table 4.3).**

Plate 4.9 Representative image of site SP9 on the upper reaches of the Mourne Beg River, July 2024

4.1.10 Site SP10 – Mourne Beg River, Meenbog

Site SP10 was located on the Mourne Beg River (01M01) immediately downstream of the Bunadowen River confluence. The natural upland spate river (FW1) was 5-6m wide and 0.2-0.5m deep with low lying open banks. The profile comprised abundant and often homogenous shallow glide and riffle with localised pool, typically on meanders. The substrata were dominated by cobble and mixed gravels (often coarse) with only scattered boulder. Sands were frequent along channel littorals with some organic rich accumulations also present adjoining exposed bars. Siltation was low overall but flocculent peat was present throughout. Peat staining from the Bunadowen River was high. Upstream of the confluence, macrophyte coverage was high with abundant bulbous rush and frequent marginal

lesser spearwort. Alternate milfoil (*Myriophyllum alterniflorum*) was rare. However, downstream, the mobile bed typically precluded growth of macrophytes. Aquatic bryophyte coverage was locally high with *Scapania undulata* and *Racomitrium aciculare*. Filamentous algae and floc cover was relatively high, indicating significant enrichment (both upstream and downstream of confluence). The open banks supported rank grass vegetation and an absence of tree cover. The site was bordered by areas of wet grassland (GS4), grassland (GS2), immature coniferous plantation (WS5) and mature plantation (south bank) (WD4).

Atlantic salmon and brown trout were the only fish species recorded via electro-fishing at site SP10 (**Appendix A**). The site was of very high value for salmonids with abundant mobile cobble and macrophyte beds supporting a particularly high density of juvenile Atlantic salmon. High quality spawning habitat (especially for salmon) was present throughout given the presence of cobble and mixed gravels free of significant siltation (both upstream and downstream of confluence). Localised pools (e.g. 100m d/s) were of high value for migratory adult salmonids. Despite some moderate suitability for European eel, none were recorded although these would typically be confined to deeper pool areas. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). No otter signs were recorded in vicinity of the site (few marking opportunities present).

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids (including Atlantic salmon), the aquatic ecological evaluation of site SP10 was of **local importance (higher value) (Table 4.3).**

Plate 4.10 Representative image of site SP10 on the upper reaches of the Mourne Beg River, July 2024

4.1.11 Site SP11 – Mourne Beg River, Meenbog

Site SP11 was located on the Mourne Beg River (01M01) at a local road crossing. The natural upland spate river (FW1) was 7-10m wide and 0.2-0.5m deep with low lying open banks. The profile of the high energy site comprised shallow, fast-flowing glide and riffle with frequent small, shallow pool (mostly along bank scours). Deeper glide was present upstream with deeper pool (to 1m) located immediately downstream of the bridge apron. The substrata were dominated by mobile cobble with frequent boulder and localised bedrock. Mixed gravels were present in pool tailings and between boulders. Sand accumulations (with finer gravels) were largely confined to the channel margins. Peat staining was high resulting in sparse macrophyte growth. However, bulbous rush was locally frequent with rare alternate milfoil and highly localised bog pondweed in deeper glide areas. The bryophytes *Scapania undulata*, *Chiloscyphus polyanthos* and *Fontinalis antipyretica* were abundant, with some localised *Fontinalis squamosa*. *Racomitrium aciculare* was present on boulder tops. The open banks supported abundant rushes (*Juncus* spp.) and scattered bushy rowan, grey willow and broom (*Cytisus scoparius*), with almost no tree cover (low riparian shading). The site was bordered by wet grassland (GS4), wet heath (HH3) and coniferous afforestation (WD4).

Atlantic salmon and brown trout were the only fish species recorded via electro-fishing at site SP11 (**Appendix A**). The site was of high value for salmonids with abundant boulder, cobble and macrophyte beds supporting a relatively high density of juvenile Atlantic salmon and low numbers of trout. Mixed substrata provided good quality spawning habitat locally, with deeper glide and pool offering valuable holding habitat for adult salmonids. Despite some moderate suitability for European eel, none were recorded. Pike (*Esox lucius*) are known from the site (Triturus & Loughs Agency data) although none were recorded in the current survey. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). No otter signs were recorded in vicinity of the site (few marking opportunities present).

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids (including Atlantic salmon), the aquatic ecological evaluation of site SP11 was of **local importance (higher value) (Table 4.3).**

Plate 4.11 Representative image of site SP11 on the Mourne Beg River, July 2024

4.1.12 Site SP12 – Mourne Beg River, Meenbog

Site SP12 was located on the Mourne Beg River (01M01) at the Sruhangarve confluence. The natural upland spate river (FW1) was 12-16m wide and 0.2-0.8m deep with low lying open banks. The profile of the high energy site was dominated by deeper, slower-flowing glide and pool with localised riffles associated with natural bedrock and boulder islands. Riffle habitat was more frequent upstream of the confluence. The substrata were dominated by bedded boulder and cobble with frequent bedrock. However, localised areas of mobile cobble and coarse gravels were present at the heads and tails of pool areas. Sand accumulations (with finer gravels) were largely confined to the channel margins and often exposed (dry). Peat staining was high resulting in sparse macrophyte growth. Alternate milfoil and bulbous rush were present but rare. Aquatic bryophyte coverage was high with abundant *Fontinalis antipyretica* and *F. squamosa* in addition to more occasional *Chiloscyphus polyanthos*. *Racomitrium aciculare* dominated the tops of boulders and bedrock. The open (occasionally grazed) banks graded into degraded cutover bog (PB4) with characteristic sedges, bog myrtle, bog asphodel (*Narthecium ossifragum*) and purple moor grass. Mature (legacy) coniferous afforestation (WD4) with a lack of buffer areas was present to the bank top along the north bank.

Atlantic salmon and brown trout were the only fish species recorded via electro-fishing at site SP12 (**Appendix A**). Despite good physical suitability, including heterogenous habitat featuring riffle, glide and pool areas, the site supported an unusually low density of fish with the population dominated by moderate numbers of juvenile salmon. Notably, juvenile abundance was higher immediately upstream of the Sruhangarve confluence. Excellent quality holding areas were present by way of pools and bank scours but a paucity of adult salmonids was recorded. Good quality spawning areas were also present. Despite some good suitability for European eel, none were recorded. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). No otter signs were recorded in vicinity of the site, despite the presence of ample marking opportunities.

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location of the site within the River Finn SAC (002301), the aquatic ecological evaluation of site SP12 was of **international importance (Table 4.3).**

Plate 4.12 Representative image of site SP12 on the Mourne Beg River, July 2024

4.1.13 Site SP13 – Mourne Beg River, Croagh Bridge

Site SP13 was located on the Mourne Beg River (01M01) at Croagh Bridge. The large upland spate channel flowed over a low gradient and was natural in character, although historical bank clearance had occurred. The river was 12-15m wide and 0.2-0.4m deep. The profile comprised shallow glide and riffle with localised small shallow pool. Deeper glide predominated upstream and downstream of the bridge. The substrata were dominated by mobile cobble and coarse gravels with frequent boulder. Exposed cobble bars were present along the margins with some sand accumulations. Given the high energy conditions and high peart staining, macrophytes were limited to occasional bottle sedge (*Carex rostrata*), lesser spearwort and rare alternate milfoil. However, aquatic bryophyte coverage was relatively high with frequent *Rhynchostegium riparioides*, *Fontinalis antipyretica* and *Chiloscyphus polyanthos*. Drab brook moss (*Hygrohypnum luridum*) and *Fontinalis squamosa* was present but rare. Filamentous algal cover was locally high in open glide and riffle, indicating enrichment pressures. Floc cover was low but nonetheless present, with some iron-oxidising bacterial deposits in pool slacks. The fenced riparian areas supported scattered grey willow, alder (*Alnus glutinosa*) and gorse (*Ulex europa*eus) near the bridge but trees had been cleared elsewhere. The site was bordered by semi-improved grassland (GA1) with some wet grassland (GS4). Coniferous afforestation (WD4) and degraded blanket bog (PB3) was present upstream.

Atlantic salmon, brown trout, European eel and minnow (*Phoxinus phoxinus*) were recorded via

electro-fishing at site SP13 (**Appendix A**). The site was of very high value for salmonids, with excellent quality nursery and spawning habitat present upstream of the bridge. Shallow, bryophyte-rich, cobble-dominated areas supported relatively high densities of juvenile salmon. As per upstream, numbers of brown trout were very low, despite high physical suitability and the presence of frequent small pool and deeper glide for holding. European eel were present in low densities, with abundant instream refugia present. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location of the site within the River Finn SAC (002301), the aquatic ecological evaluation of site SP13 was of **international importance (Table 4.3).**

Plate 4.13 Representative image of site SP13 on the Mourne Beg River at Croagh Bridge, July 2024

4.1.14 Site SP14 – Mourne Beg River, Meenreagh Bridge

Site SP14 was located on the Mourne Beg River (01M01) at Meenreagh Bridge. The large upland spate channel (FW1) flowed over a low gradient and was natural in character, although historical bank clearance had occurred (with possible boulder removal). The river was 12-16m wide and 0.2-0.5m deep. The profile comprised shallow glide and riffle with localised small shallow pool and bank scours. Deeper glide predominated upstream and downstream of the bridge. The substrata were dominated by boulder with mobile cobble. Mixed gravels were present locally. Exposed cobble bars were present along the margins with some sand and finer gravel accumulations. Given the high energy conditions and high peart staining, macrophytes were limited to very occasional alternate milfoil lesser spearwort and marsh pennywort (*Caltha palustris*). However, aquatic bryophyte coverage was relatively high with frequent *Fontinalis squamosa* and *Chiloscyphus polyanthos*. *Hygrohypnum luridum* was present

locally with *Fontinalis antipyretica*. Filamentous algal cover was locally high in open glide and riffle, indicating enrichment pressures. Floc cover was low but nonetheless present. The riparian areas were open (sometimes fenced) with scattered grey willow providing highly valuable thermal shading to the channel. The site was bordered by semi-improved grassland (GA1) with wet grassland (GS4).

Atlantic salmon, brown trout, European eel and minnow were recorded via electro-fishing at site SP14 (**Appendix A**). The site was of high value for salmonids, with high quality nursery and spawning habitat present upstream of the bridge. However, densities of juvenile salmonids was lower than anticipated given the habitat and this likely reflected poor prey resources (as per upstream sites). As per upstream, numbers of brown trout were very low, despite high physical suitability and the presence of frequent small pool and deeper glide for holding. European eel were present in low densities, with abundant instream refugia present. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). A regular otter spraint site was recorded on a boulder underneath the bridge (ITM 614313, 885196). Spraint from invasive mink (*Neovison vison*) was recorded on boulder revetment adjoining the bridge abutment.

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location of the site within the River Finn SAC (002301), the aquatic ecological evaluation of site SP14 was of **international importance (Table 4.3).**

Plate 4.14 Representative image of site SP14 on the Mourne Beg River at Meenreagh Bridge, July 2024

4.1.15 Site SP15 – Mourne Beg River, Laghtfoggy

Site SP15 was located on the Mourne Beg River (01M01) at a ford crossing. The large upland spate channel flowed over a low gradient and was mostly natural in character, although historical bank clearance was widespread and boulder installations had occurred locally. The river was up to 20m wide and varied from 0.1m to 1m deep with a good habitat heterogeneity. Deeper glide and pool were present upstream of the ford crossing (too deep & volume too high to effectively fish). In slower-flowing glide, the substrata were dominated by boulder and cobble. However, shallower riffle areas featured a higher proportion of mixed gravels and smaller cobble. Fine gravels and sands were present locally (associated with macrophyte beds). Riffle zones supported frequent water crowfoot (*Ranunculus* sp.), alternate milfoil and bog pondweed. Reed canary grass (*Phalaris arundinacea*) grew on small instream islands/bars. Aquatic bryophyte coverage was high (especially boulder) with locally abundant *Fontinalis antipyretica*, frequent *F. squamosa* and *Chiloscyphus polyanthos*. Filamentous algal cover was locally high, indicating enrichment. The aquatic vegetation community was representative of Annex I floating river vegetation habitat (3260). The narrow riparian zones supported intermittent treelines of alder, ash (*Fraxinus excelsior*) and grey willow with abundant scrub vegetation. The site was bordered by improved pasture with areas of wet grassland (GS4).

Atlantic salmon, brown trout, European eel, minnow, stone loach (*Barbatula barbatula*) and three-spined stickleback (*Gasterosteus aculeatus*) were recorded via electro-fishing at site SP15 (**Appendix A**). The site was of high value for salmonids, supporting moderate densities of both juvenile and adult year classes. Shallow *Ranunculus* zones downstream of the ford were of particularly high value as salmonid nursery habitats, with cobble-dominated bed upstream of the ford offering excellent refugia. These areas were also of very high value for spawning salmonids. Despite the presence of high quality deeper glide and pool, the density of adult salmonids (trout) was low but nonetheless considerably higher than upstream - this reflected the increasingly calcareous influences and superior prey resources. Suitability for European eel was high given abundant instream refugia although only a low density were recorded. There was some localised spawning habitat for lamprey although ammocoete areas (soft sediment) were absent. There was no suitability for white-clawed crayfish (water chemistry). A regular (but old) otter spraint site was recorded on a mid-channel boulder at the ford crossing (ITM 618507, 883585).

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location of the site within the River Foyle and Tributaries ASSI (229), the aquatic ecological evaluation of site SP15 was of **national importance (Table 4.3).**

Plate 4.15 Representative image of site SP15 on the Mourne Beg River, July 2024

4.1.16 Site SP16 – Mourne Beg River, Mourne Bridge

Site SP16 was located on the Mourne Beg River (01M01) at Mourne Bridge. The large upland spate channel flowed over a low gradient and was natural in character, although historical bank clearance had occurred locally. The large river was 25-30m wide and 0.1-0.4m deep. The profile comprised shallow glide and riffle with frequent small pool. Deeper glide and pool was present upstream of the bridge. Whilst the substrata were dominated by boulder and larger cobble, the bed was highly variable with frequent small areas of mixed gravels and sands present in association with macrophyte beds and in the lee of larger boulders. Sand accumulations were frequent along depositing margins with silt accumulations present in deeper glide upstream. The site was heavily vegetated with locally abundant water crowfoot (*Ranunculus* sp.) and various-leaved pondweed (*Potamogeton gramineus*). Alternate milfoil was occasional with stands of water horsetail present along the margins of deeper glide upstream. Aquatic bryophyte coverage was also high with abundant *Fontinalis antipyretica* and rarer *F. squamosa* and *Chiloscyphus polyanthos*. Although not diverse, the aquatic vegetation community was considered representative of Annex I floating river vegetation habitat (3260). Filamentous algal cover was low overall but nonetheless present. The narrow riparian zones supported mature intermittent treelines of alder, ash and grey willow, with abundant bramble scrub. The site was bordered by low intensity improved grassland (GA1).

Atlantic salmon, brown trout, European eel and stone loach were recorded via electro-fishing at site SP16 (**Appendix A**). The site was of high value for salmonids, supporting relatively high densities of juvenile salmon and lower numbers of mixed cohort trout. The site was of greatest value as a salmonid nursery, with abundant instream refugia and macrophyte beds providing excellent quality habitat. These were also of high value for European eel which were recorded in low densities. Good quality spawning habitat for both salmonid and lamprey was present locally. Deeper glide upstream provided good holding habitat for migratory salmonids. Whilst beds of sand provided some low suitability for

lamprey ammocoetes, none were recorded (*Lampetra* sp. known to present in the lower reaches; Niven & McAuley, 2013). There was no suitability for white-clawed crayfish (water chemistry). An otter spraint site was recorded on a large piece of deadwood under the southernmost arch (ITM 620634, 883789).

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling. The aquatic form of the invasive New Zealand flatworm (*Arthurdendyus triangulatus*) was recorded at the site.

Given the location of the site within the River Foyle and Tributaries ASSI (229), the aquatic ecological evaluation of site SP16 was of **national importance (Table 4.3).**

Plate 4.16 Representative image of site SP16 on the Mourne Beg River at Mourne Bridge, July 2024

4.1.17 Site SP17 – Barrack Hill River, Croaghonagh

Site SP17 was located on the Barrack Hill River (37B16), a tributary of the Lowerymore River. The small upland eroding spate river (FW1) was 2-3m wide, 0.2-0.4m deep with 1m bank heights. The channel was situated in a steep V-shaped valley. The channel comprised of riffle, glide and pool sequences over high energy boulder-cascade reaches. The naturally sinuous channel had a bed of rounded boulder, cobble, mixed gravels and sand. The substrata were unbedded apart from boulder with light siltation. Eutrophication pressures were evident with filamentous green algae cover on c. 20% of the bed. The high energy site did not support macrophytes. Instream boulders supported occasional *Racomitrium aciculare*, *Chiloscyphus polyanthos* and *Scapania undulata*. The riparian areas supported scattered grey willow, Scot's pine (*Pinus sylvestris*) and grey willow with dry grassy understories.

Atlantic salmon and brown trout were the only fish species recorded via electro-fishing at site SP17 (**Appendix A**). The site was a very good quality salmonid nursery given the good hydromorphology

(rocky bed), broken flow patterns and limited siltation pressures. However, overall fish densities were low, with a very low density of Atlantic salmon despite some good physical suitability. Good quality salmonid spawning and holding habitat was present. Despite some low suitability for European eel, none were recorded. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids (including Atlantic salmon), the aquatic ecological evaluation of site SP17 was of **local importance (higher value) (Table 4.3).**

Plate 4.17 Representative image of site SP17 on the Barrack Hill River, September 2024

4.1.18 Site SP18 – Lowerymore River, Biddy O'Barnes

Site SP18 was located on the Lowerymore River (37L01). The large upland eroding spate river (FW1) was 10-12m wide and 0.2-1.1m deep with 1m bank heights. The channel had a semi-natural sinuous profile in a shallow V-shaped valley. The profile comprised riffle, glide and pool sequences over high energy boulder-cascade reaches. The substrata were dominated by bedded rounded boulder with frequent cobble, (mobile) mixed gravels and sand. Situation was light although eutrophication pressures were evident with filamentous green algae cover on c. 30% of the bed. The high energy site did not support macrophytes. The tops of boulders supported *Racomitrium aciculare* (recorded as rare) with very localised *Fontinalis squamosa* on submerged boulders. The riparian areas supported abundant mature downy birch, grey willow and alder that formed pockets of woodland with gorse and bramble in the understories. The open areas of bank supported upland blanket bog with typical species including heather, cross leaved heath (*Erica tetralix*), tormentil (*Potentilla erecta*), purple moor grass and rushes (*Juncus* sp.).

Atlantic salmon and European eel were the only fish species recorded via electro-fishing at site SP18 (**Appendix A**). The site was a good quality salmonid nursery given the good hydromorphology (rocky bed), broken flow patterns and limited siltation pressures. This provided ample refugia and oxygenated water for 0+ and 1+ salmonids. The absence of brown trout reflected the shallow, high energy nature of the site (species known to be present in the river). The site featured good quality spawning areas locally in deeper glide and pool with mixed coarse and medium gravels that had light siltation between large instream boulders. Good quality holding habitat for adult salmonids was present in deeper pool on meanders and beneath boulder-cascade areas. Whilst some good suitability for European eel existed only a single adult eel was recorded. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids (including Atlantic salmon), the aquatic ecological evaluation of site SP18 was of **local importance (higher value) (Table 4.3).**

Plate 4.18 Representative image of site SP18 on the Lowerymore River, September 2024

4.1.19 Site L1 – Carrickaduff Lough, Meenbog

Site L1 was located at Carrickaduff Lough, a small 0.5ha upland oligotrophic waterbody within the wind farm site. The lake was 1-4m deep and was heavily peat stained with quaking margins on the southwestern shore. These supported *Sphagnum* species including dominant *S. cuspidatum*. Bog pondweed was occasional with frequent white-water lily (*Nymphaea alba*). Floating bur-reed (*Sparganium angustifolium*), bulbous rush and bladderwort (*Utricularia* agg.) were occasional, mostly

in marginal areas. Lake littorals supported emergent bog cotton (*Eriophorum angustifolium*) and bog bean (*Menyanthes trifoliata*). The site was representative of Annex I natural dystrophic lake habitat (3160). The lake was surrounded by upland blanket bog (PB2) and semi-mature sitka spruce plantations (WD4).

Although the lacustrine conditions prevented backpack electro-fishing, a fisheries habitat appraisal was undertaken at the site. The small peatland lake was considered of moderate value for brown trout with a small number of trout observed surface feeding on insects during the site visit. The site had poor connectivity with downstream watercourses in the LeaghanyRiver_SC_010 sub-catchment (e.g. Glendergan River) and thus was of low suitability for European eel. There was no suitability for white-clawed crayfish (water chemistry). No otter signs were recorded in vicinity of the site.

No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via sweep sampling (**Appendix B**).

Given the presence of Annex I natural dystrophic lake habitat (3160), the aquatic ecological evaluation of site L1 was of **county importance** (**Table 4.3**).

Plate 4.19 Representative image of Carrickaduff Lough, July 2024

4.2 White-clawed crayfish survey

No white-clawed crayfish were recorded via hand-searching or sweep netting of instream refugia at any of the aquatic survey sites in July or September 2024. Furthermore, inspection of mustelid spraint on the Bunadowen River (2 no. sites) or Mourne Beg River (3 no. sites) did not reveal the presence of crayfish remains.

The absence of crayfish is largely reflective of unsuitable water chemistry as well as geographical isolation (Demers et al., 2005; Lucy & McGarrigle, 1987), with no records within the respective survey catchments.

4.3 Biological water quality & macro-invertebrates

No rare or protected macro-invertebrate species (according to national red lists) were recorded in the biological water quality or sweep samples taken from a total of 19 no. sites in July 2024 (**Appendix B**).

A total of 7 no. sites on an unnamed Croaghonagh River tributary (site SP1), Mourne Beg River (SP12, SP13, SP14, SP16), Barrack Hill River (SP17) and the Lowerymore River (SP18) achieved **Q4 (good status)** water quality and thus met the target good status (≥Q4) requirements of the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 and the Water Framework Directive (2000/60/EC) (**Figure 4.1**). This was given the presence of at least one group A taxa in fair numbers (5% of total abundance), such as the mayflies *Ecdyonurus dispar* and or *Electrogena lateralis,* or the stonefly *Isoperla grammatica* (**Appendix B**).

Sites SP10 and SP15 on the Mourne Beg River achieved **Q3-4 (moderate status)** water quality (**Figure 4.1**). Despite the presence of the EPA group A stonefly species *Protonemura* meyeri, these were only recorded in low numbers (<5% of total sample) and thus did not meet the qualifying criteria for good status as set out by Toner et al. (2005).

The remaining 9 no. sites (i.e. SP2, SP3, SP4, SP5, SP6, SP7, SP8, SP9 & SP11) achieved **Q3 (poor status)** based on an absence of group A species, low numbers of group B species and a dominance of group C species such as non-biting midge larvae (non-*Chironomus* sp.) and black fly larvae (Simuliidae) (**Appendix B**). Invertebrate numbers at these sites were often low.

Carrickaduff Lough (site L1) supported a low abundance of macro-invertebrate species (*n*=58, taxon richness = 18) commonly found in upland oligotrophic lakes including damselflies (Coenagrionidae), emperor dragonfly (*Anax imperator*), Dipteran larva and a low diversity of aquatic beetles (**Appendix B**).

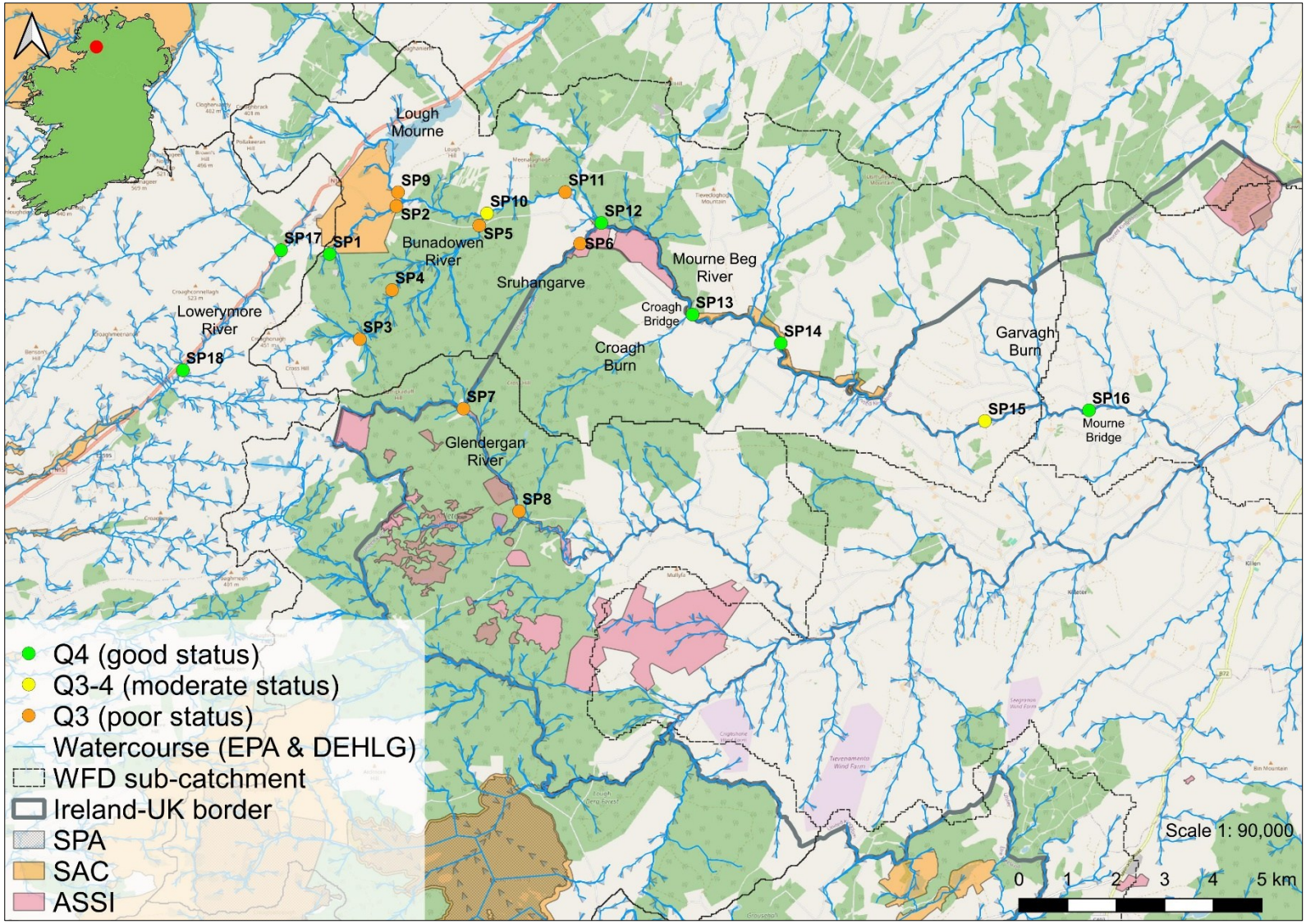

Figure 4.1 Overview of the biological water quality status in the vicinity of Meenbog wind farm, July 2024

Table 4.1 Relative abundance of fish species of higher conservation value recorded via **electro-fishing** in the vicinity of Meenbog wind farm, July or September 2024

Site	Watercourse	Atlantic salmon	Brown trout	European eel	Other species
SP1	Unnamed stream				No fish recorded
SP2	Croaghonagh River	Low	Low		
SP3	Bunadowen River		Medium	Low	
SP4	Bunadowen River		Low		
SP5	Bunadowen River	Low	Medium		
SP6	Shruhangarve		Low		
SP7	Glendergan River		Low		
SP8	Glendergan River		Low		
SP9	Mourne Beg River	High	Medium	Low	
SP10	Mourne Beg River	Very high	Low		
SP11	Mourne Beg River	High	Low		
SP12	Mourne Beg River	Medium	Low		
SP13	Mourne Beg River	Medium	Low	Low	Minnow
SP14	Mourne Beg River	Medium	Low	Low	Minnow
SP15	Mourne Beg River	Medium	Medium	Low	Minnow, stone loach, three-spined stickleback
SP16	Mourne Beg River	High	Medium	Low	Stone loach
SP17	Barrack Hill River	Low	Medium		
SP18	Lowerymore River	Medium		Low	
L1	Carrickaduff Lough				Fisheries appraisal only – brown trout observed

Table 4.2 Summary of aquatic species and habitats of higher conservation value recorded in the vicinity of Meenbog wind farm, July & September, 2024

Site	Watercourse	White-clawed crayfish	Otter signs[3]	Annex I aquatic habitats	Rare or protected macrophytes/ aquatic bryophytes	Rare or protected macro-invertebrates	Other species/habitats of high conservation value
SP1	Unnamed stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
SP2	Croaghonagh River	None recorded	No signs recorded	Not present	None recorded	None recorded	**Atlantic salmon**
SP3	Bunadowen River	None recorded	**Regular spraint site**	Not present	None recorded	None recorded	**European eel**
SP4	Bunadowen River	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
SP5	Bunadowen River	None recorded	**Spraint site**	Not present	None recorded	None recorded	**Atlantic salmon**
SP6	Shruhangarve	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
SP7	Glendergan River	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
SP8	Glendergan River	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
SP9	Mourne Beg River	None recorded	No signs recorded	Not present	None recorded	None recorded	**Atlantic salmon, European eel**
SP10	Mourne Beg River	None recorded	No signs recorded	Not present	None recorded	None recorded	**Atlantic salmon**
SP11	Mourne Beg River	None recorded	No signs recorded	Not present	None recorded	None recorded	**Atlantic salmon**
SP12	Mourne Beg River	None recorded	No signs recorded	Not present	None recorded	None recorded	**Atlantic salmon**
SP13	Mourne Beg River	None recorded	No signs recorded	Not present	None recorded	None recorded	**Atlantic salmon, European eel**
SP14	Mourne Beg River	None recorded	No signs recorded	Not present	None recorded	None recorded	**Atlantic salmon, European eel**
SP15	Mourne Beg River	None recorded	**Regular spraint site**	**Floating river vegetation (3260)**	None recorded	None recorded	**Atlantic salmon, European eel**
SP16	Mourne Beg River	None recorded	**Spraint site**	**Floating river vegetation (3260)**	None recorded	None recorded	**Atlantic salmon, European eel**
SP17	Barrack Hill River	None recorded	No signs recorded	Not present	None recorded	None recorded	**Atlantic salmon**
SP18	Lowerymore River	None recorded	No signs recorded	Not present	None recorded	None recorded	**Atlantic salmon, European eel**

Site	Watercourse	White-clawed crayfish	Otter signs[3]	Annex I aquatic habitats	Rare or protected macrophytes/ aquatic bryophytes	Rare or protected macro-invertebrates	Other species/habitats of high conservation value
L1	Carrickaduff Lough	None recorded	No signs recorded	Natural dystrophic lake habitat (3160)	None recorded	None recorded	None recorded

Conservation value: Eurasian otter (*Lutra lutra*) and Atlantic salmon (*Salmo salar*) are listed under Annex II and Annex V of the Directive on the Conservation of Natural Habitats of Wild Fauna and Flora (92/43/EEC) ('EU Habitats Directive'). Atlantic salmon are also protected under the Wild Salmon and Sea Trout Tagging Scheme (Amendment) Regulations. European eel are 'critically endangered' according to most recent ICUN red list (Pike et al., 2020) and listed as 'critically engendered' in Ireland (King et al., 2011).

[3] Otter signs within 150m of the survey site

Table 4.3 Aquatic ecological evaluation summary of the survey sites according to NRA (2009) criteria

Site no.	Watercourse	EPA code	Evaluation of importance	Rationale summary
SP1	Unnamed stream	n/a	Local importance (lower value)	No aquatic species or habitats of high conservation value
SP2	Croaghonagh River	01C31	**International importance**	Located within the Croaghonagh Bog SAC (000129)
SP3	Bunadowen River	01B01	**Local importance (higher value)**	Salmonids & Red-listed European eel recorded
SP4	Bunadowen River	01B01	**Local importance (higher value)**	Salmonids recorded
SP5	Bunadowen River	01B01	**Local importance (higher value)**	Salmonids & otter signs recorded
SP6	Shruhangarve	01S26	**National importance**	Located within Croagh Bog ASSI (378)
SP7	Glendergan River	GBNI0100880	**National importance**	Located within River Foyle and Tributaries ASSI (229)
SP8	Glendergan River	GBNI0100885	**National importance**	Located within River Foyle and Tributaries ASSI (229)
SP9	Mourne Beg River	01M01	**International importance**	Located within the Croaghonagh Bog SAC (000129)
SP10	Mourne Beg River	01M01	**Local importance (higher value)**	Salmonids (including Atlantic salmon) recorded
SP11	Mourne Beg River	01M01	**Local importance (higher value)**	Salmonids (including Atlantic salmon) recorded
SP12	Mourne Beg River	01M01	**International importance**	Located within the River Finn SAC (002301)
SP13	Mourne Beg River	01M01	**International importance**	Located within the River Finn SAC (002301)
SP14	Mourne Beg River	01M01	**International importance**	Located within the River Finn SAC (002301)
SP15	Mourne Beg River	01M01	**National importance**	Located within River Foyle and Tributaries ASSI (229)
SP16	Mourne Beg River	01M01	**National importance**	Located within River Foyle and Tributaries ASSI (229)
SP17	Barrack Hill River	37B16	**Local importance (higher value)**	Salmonids (including Atlantic salmon) recorded
SP18	Lowerymore River	37L01	**Local importance (higher value)**	Salmonids (including Atlantic salmon) recorded

Site no.	Watercourse	EPA code	Evaluation of importance	Rationale summary
L1	Carrickaduff Lough	9925	**County importance**	Annex I natural dystrophic lake habitat (3160) present

Conservation value: Eurasian otter (*Lutra lutra*) and Atlantic salmon (*Salmo salar*) are listed under Annex II and Annex V of the Directive on the Conservation of Natural Habitats of Wild Fauna and Flora (92/43/EEC) ('EU Habitats Directive'). Atlantic salmon are also protected under the Wild Salmon and Sea Trout Tagging Scheme (Amendment) Regulations. Apart from the Inland Fisheries Acts 1959 to 2017, non-anadromous brown trout and coarse fish species have no legal protection in Ireland.

5. Discussion

The watercourses in the vicinity of Meenbog wind farm were upland spate channels of varying size which retained good levels of naturalness despite some historical modifications locally. Siltation pressures (mostly from peat escapement) and eutrophication pressures were evident throughout much of the survey area, particularly on the Bunadowen, Mourne Beg and Glendergan rivers. These watercourses drain extensive areas of coniferous afforestation and peatland. Whilst evidence of impacts from a large scale peat slide in November 2020 on the Sruhangarve and Mourne Beg River remained, ongoing recovery was evident (e.g. presence of brown trout in the Sruhangarve).

However, a number of high conservation species and habitats were recorded during the surveys including Annex II Atlantic salmon and otter as well as Annex I floating river vegetation (3260) and dystrophic lake habitat (3160). With the exception of site SP1 on an unnamed Croaghonagh River tributary, all survey sites were evaluated as at least **local importance (higher value)** in terms of their aquatic ecology. The majority of survey sites were evaluated as being of **national or international importance** given their respective locations within ASSI or SAC sites (**Table 4.3**). Carrickaduff Lough (site L1) was of **county importance** given the site represented Annex I natural dystrophic lake habitat (3160) (see below). Broadly speaking, in addition to Carrickaduff Lough (Annex I 3160 habitat), the highest value watercourses in terms of aquatic ecology were the Mourne Beg River, Bunadowen River, Lowerymore River and, to a lesser degree, the Croaghonagh River.

No white-clawed crayfish or rare/protected macro-invertebrates, macrophytes or aquatic bryophytes were recorded during the surveys. Two examples of the rare submerged form of the high impact invasive New Zealand flatworm (*Arthurdendyus triangulatus*) was recorded via kick sampling at site SP16 on the Mourne Beg River (Mourne Bridge) (**Plate 5.1**). This normally terrestrial species has been recorded in a low number of water quality sampling surveys elsewhere in Ireland (pers. obs.).

Plate 5.1 Rare semi-aquatic form of the invasive New Zealand flatworm recorded during kick sampling at site SP16 on the Mourne Beg River at Mourne Bridge, July 2024 (in characteristic circular position)

5.1 Fisheries

A typical diversity of fish species for the Mourne Beg_SC_010, Mourne Beg_SC_020, and Eske_SC_010 river sub-catchments was recorded during the electro-fishing survey, with Atlantic salmon, brown trout, stone loach, minnow, three-spined stickleback and Red-listed European eel captured (**Table 4.1**).

Salmonid populations were widespread in vicinity of Meenbog wind farm, being present at all survey sites with the exception of SP1 (no fish recorded). Annex II Atlantic salmon were recorded from a total of 12 no. sites on the Croaghonagh River (site SP2), lower Bunadowen River (SP5), Barrack Hill River (SP17), Lowerymore River (SP18) and all survey sites on the Mourne Beg River (SP10, SP11, SP12, SP13, SP14, SP15 & SP16) (**Table 4.1**). The highest salmonid densities were recorded from the Mourne Beg River which represents the highest importance watercourse in vicinity of the wind farm (**Appendix A**). No lamprey ammocoetes (*Lampetra* sp.) were recorded, reflecting the poor habitat suitability across the survey area (**Appendix A**). Low densities of Red-listed European eel were recorded the Bunadowen River (SP3) and Lowerymore River (SP18) in addition to 5 no. sites on the Mourne Beg River (SP13, SP14, SP15 & SP16) (**Appendix A**). Siltation pressures (mostly from peat escapement) and eutrophication pressures (e.g. afforestation) were evident throughout much of the survey area, particularly on the Bunadowen, Mourne Beg and Glendergan rivers.

5.2 Otter

Despite widespread suitability at many survey sites in terms of foraging habitat, otter signs (spraint sites) were only recorded at 5 no. sites during the current survey. These were identified on the Bunadowen River (sites SP3, SP5) and the Mourne Beg River (SP14, SP15, SP16). Otters are also known to be present on other watercourses in the vicinity of Meenbog wind farm, including the Glendergan River (**Figure 3.1**) and are listed as a qualifying interest of the River Finn SAC (002301) and the River Foyle and Tributaries ASSI (229) with which a number of survey watercourses are located or share hydrological connectivity. No breeding (holts) or resting (couch) areas were identified in the vicinity of the survey sites in July or September 2024.

Fish are the main component of otter diet (Krawczyk et al., 2016; Reid et al., 2013) and otter signs were recorded at sites with greater fisheries value. Otter occurrence (and sign marking) is negatively associated with elevation[2] (Triturus data; Hong et al., 2020) with smaller, higher-gradient upland/spate watercourses (such as those in the survey area) often providing poor prey resources (Sittenthaler et al., 2019; Scorpio et al., 2016; Remonti et al., 2009). Utilisation of such watercourse is often highly seasonal and dependent on the presence of migratory fish species such as Atlantic salmon or European eel (pers. obs.).

Scat of invasive mink (*Neovison vison*) was recorded at site SP14 on the Mourne Beg River at Meenreagh Bridge. The impact on otter populations in the survey area is unknown given that the nuances of inter-specific competition between these two species are not yet fully understood, with both impacts to otter but more often otter dominance hypothesised (Harrington et al., 2020; García et al., 2020; Melero et al., 2012; Harrington et al., 2009; McDonald et al., 2007; Bonesi et al., 2004).

[2] Otter signs ranged from 59-230m ASL in the current survey

Plate 5.2 Regular otter spraint site on a marginal boulder under Meenreagh Bridge on the Mourne Beg River, July 2024

5.3 Annex I aquatic habitats

Although not diverse examples, the Annex I habitat 'Water courses of plain to montane levels, with submerged or floating vegetation of the *Ranunculion fluitantis* and *Callitricho-Batrachion* (low water level during summer) or aquatic mosses (3260)' (aka floating river vegetation) was present on the Mourne Beg River at sits SP15 and S616. Here, several indicator species (EC, 2013) were present including water crowfoot (*Ranunculus* sp.), various-leaved pondweed (*Potamogeton gramineus*), alternate milfoil (*Myriophyllum alterniflorum*) and well developed aquatic bryophytes communities supporting *Fontinalis antipyretica*, *Fontinalis squamosa* and *Chiloscyphus polyanthos*.

Carrickaduff Lough (site L1), located within the footprint of Meenbog wind farm, represented the Annex I habitat 'Natural dystrophic lakes and ponds (3160)'. Annex I acid oligotrophic lakes are typically associated with small lakes and ponds in Atlantic and upland blanket bog, and wet heath (Gray et al., 2022; O'Connor, 2015), such as that present at Meenbog. Annex I (3160) habitats are considered species-poor botanically with a community characterised by bryophytes of the genus *Sphagnum* and sustain the *Utricularietalia* phytosociological order (EC, 2013). In Ireland, this lake habitat has been broadly interpreted as "species poor lake and pond systems dominated by *Sphagnum* mosses and restricted to blanket bogs and wet heaths" (O'Connor, 2015). Carrickaduff Lough was dominated by *Sphagnum* species such as *S. cuspidatum*, with common associates for 3160 habitat such as floating bur-reed (*Sparganium angustifolium*), bulbous rush (*Juncus bulbosus*) and bladderwort (*Ultricularia* agg.).

5.4 Biological water quality & pressures

No rare or protected macro-invertebrate species (according to national red lists) were recorded in the biological water quality or sweep samples taken from a total of 19 no. sites in July 2024 (**Appendix B**), i.e. none of greater than Least Concern.

Although 7 no. sites on an unnamed Croaghonagh River tributary (site SP1), Mourne Beg River (SP12, SP13, SP14, SP16), Barrack Hill River (SP17) and the Lowerymore River (SP18) achieved **Q4 (good status)** water quality, all other riverine sites failed to meet the target good status (≥Q4) requirements of the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 and the Water Framework Directive (2000/60/EC) (**Figure 4.1**).

Both eutrophication (primarily from coniferous afforestation) and peat escapement (siltation) pressures were evident throughout the survey area. Previous studies have concluded that water quality impacts from the November 2020 peat slide event in the Mourne Beg River catchment (i.e. temporary loss of invertebrate communities) acted synergistically with other catchment pressures including afforestation (upper catchment), degraded peatland habitats (upper catchment) and agricultural land use (lower catchment) (Triturus, 2022). Both afforestation and agriculture have been identified as significant threats for the River Finn SAC (002301) (NPWS, 2014), which encompasses the upper Mourne Beg River, as well as the wider River Foyle and Tributaries ASSI (229) (DAERA, 2015) and Eske_SC_010 river sub-catchment (EPA data).

A swift recovery in biological water quality (mostly to Q4) of the Mourne Beg River occurred following the peat slide event and, despite other ongoing impacts, much of the watercourse is currently achieving good status (July 2024; **Figure 4.1**). In contrast, the Sruhangarve, where peat slide impacts were most severe, was failing to meet Q4 (good status) thresholds in October 2021 (Triturus, 2022) and this was still the case in July 2024 (Q3, poor status). Nonetheless, the ongoing, albeit slow, recovery of the Sruhangarve invertebrate population was clear (**Appendix B**).

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7. Appendix A – Fisheries assessment report

Please see accompanying fisheries assessment report

8. Appendix B – Macro-invertebrates (biological water quality)

Table 8.1 Macro-invertebrate Q-sampling results for the Meenbog wind farm sites, July 2024

Group	Family	Species	SP1	SP2	SP3	SP4	SP5	SP6	SP7	SP8	SP9	SP10	SP11	SP12	SP13	SP14	SP15	SP16	SP17	SP18	EPA group
Ephemeroptera	Heptageniidae	*Ecdyonurus dispar*																	17	3	**A**
Ephemeroptera	Heptageniidae	*Ecdyonurus* sp.																3			**A**
Ephemeroptera	Heptageniidae	*Electrogena lateralis*													4	2				2	**A**
Ephemeroptera	Heptageniidae	sp. indet.																4			**A**
Plecoptera	Chloroperlidae	*Siphonoperla torrentium*														2					**A**
Plecoptera	Nemouridae	*Nemoura* sp.	2																		**A**
Plecoptera	Nemouridae	*Protonemura meyeri*										1					1			1	**A**
Plecoptera	Perlodidae	*Isoperla grammatica*												4							**A**
Trichoptera	Cased caddis pupa	sp. indet.	8	4				2		1	1		1		1	2	1				**B**
Trichoptera	Lepidostomatidae	*Lepidostoma hirtum*															2	2			**B**
Trichoptera	Leptoceridae	*Athripsodes aterrimus*															1				**B**
Trichoptera	Limnephilidae	*Micropterna* sp.				1		3													**B**
Trichoptera	Limnephilidae	*Potamophylax cingulatus*											1	4							**B**
Trichoptera	Limnephilidae	*Halesus radiatus*											1				5	6			**B**
Trichoptera	Limnephilidae	sp. indet.																2			**B**
Trichoptera	Sericostomatidae	*Sericostoma personatum*											3			1		4			**B**
Plecoptera	Leuctridae	*Leuctra fusca*	6		10	2	8		3	7	13	52	29	17	16	8	8		17	10	**B**
Plecoptera	Leuctridae	*Leuctra hippopus*																	4		**B**
Hemiptera	Aphelocheiridae	*Aphelocheirus aestivalis*															12	8			**B**
Ephemeroptera	Baetidae	*Baetis rhodani*		9								7	4	9	1	5	16	13	7	1	**C**
Ephemeroptera	Ephemerellidae	*Serratella ignita*									14	26	19	9	2	2	14	18	81	28	**C**
Trichoptera	Hydropsychidae	*Diplectrona felix*														1					**C**
Trichoptera	Hydropsychidae	*Hydropsyche instabilis*										2					3			3	**C**
Trichoptera	Hydropsychidae	*Hydropsyche siltalai*									22	9	4				10	10	2		**C**
Trichoptera	Polycentropodidae	*Plectrocnemia conspersa*	10		2			2					1						1		**C**

Group	Family	Species	SP1	SP2	SP3	SP4	SP5	SP6	SP7	SP8	SP9	SP10	SP11	SP12	SP13	SP14	SP15	SP16	SP17	SP18	EPA group
Trichoptera	Polycentropodidae	*Polycentropus kingi*			6						2				3	1			1		**C**
Trichoptera	Rhyacophilidae	*Rhyacophila dorsalis*							2	5	3		1	4		3	4	1	4	2	**C**
Crustacea	Gammaridae	*Gammarus duebeni*															24	28			**C**
Gastropoda	Planorbidae	*Ancylus fluviatilis*																1			**C**
Coleoptera	Dytiscidae	Dytiscidae larva	2																		**C**
Coleoptera	Dytiscidae	*Hydroporus* sp.						2	1									1			**C**
Coleoptera	Dytiscidae	*Oreodytes sanmarkii*																	3		**C**
Coleoptera	Elmidae	*Esolus parallelepipedus*		5				5			10		1		2						**C**
Coleoptera	Elmidae	*Limnius volckmari*		1		1	2	1		2	3	14	4	9	4	9	4	8	2	1	**C**
Diptera	Chironomidae	Non-*Chironomus* spp.	4	1	2		6	1	1	11	2	13		11	12	6	25			3	**C**
Diptera	Pediciidae	*Dicranota* sp.	1									1							3		**C**
Diptera	Simuliidae	sp. indet.			8		6	1	2	8	49	11					1	2	7	1	**C**
Diptera	Tipuliidae	sp. indet.										2			1			1			**C**
Hemiptera	Veliidae	*Veliidae nymph*	1																		**C**
Platyhelminthes	Tricladida	*Arthurdendyus triangulatus*																2			**C**
Arachnida	Hydrachnidiae	sp. indet.		1						2			3	4			1	4	1		**C**
Hirudinidae	Glossiphoniidae	sp. indet.																1			**D**
Diptera	Chironomidae	*Chironomus* spp.		1		2	2									2	1			1	**E**
Oligochaeta		sp. indet.		11								6	6	4	6	8	6	2			**n/a**
Abundance			**34**	**33**	**28**	**6**	**24**	**17**	**9**	**36**	**119**	**144**	**78**	**75**	**52**	**52**	**139**	**121**	**150**	**56**	
Q-rating			Q4	Q3	Q3	Q3	Q3	Q3	Q3	Q3	Q3	Q3-4	Q3	Q4	Q4	Q4	Q3-4	Q4	Q4	Q4	
WFD status			Good	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Mod	Poor	Good	Good	Good	Mod	Good	Good	Good	

Table 8.2 Macro-invertebrate sweep sampling results for Carrickaduff Lough, July 2024

Group	Family	Species	L1
Odonata	Coenagrionidae	sp. indet.	23
Odonata	Aeshnidae	*Anax imperator*	8
Coleoptera	Dytiscidae	Dytiscidae larva	4
Hemiptera	Notonectidae	Notonectidae nymph	4
Diptera	Chironomidae	*Chironomus* spp.	3
Diptera	Chironomidae	Non-*Chironomus* spp.	2
Odonata	Lestidae	*Lestes sponsa*	2
Odonata	Libellulidae	*Sympetrum* sp.	2
Arachnida	Hydrachnidiae	sp. indet.	1
Coleoptera	Dytiscidae	*Acilius sulcatus*	1
Coleoptera	Dytiscidae	*Ilybius ater*	1
Coleoptera	Dytiscidae	*Rhantus exsoletus*	1
Coleoptera	Gyrinidae	*Gyrinus substriatus*	1
Coleoptera	Haliplidae	*Haliplus flavicollis*	1
Diptera	Chaoboridae	Chaoboridae pupa	1
Hemiptera	Corixidae	Corixidae nymph	1
Trichoptera	Polycentropodidae	*Plectrocnemia conspersa*	1
Hemiptera	Gerridae	Gerridae nymph	1
Abundance			**58**
Taxon richness			18

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Fisheries assessment for Meenbog wind farm, Co. Donegal

Prepared by Triturus Environmental Ltd. for MKO

April 2025

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1. Introduction

1.1 Background

Triturus Environmental Ltd. were commissioned by MKO to undertake a baseline fisheries assessment of numerous watercourses in the vicinity of Meenbog wind farm, located near Ballybofey, Co. Donegal. The survey was undertaken to establish baseline fisheries data used to inform the Remedial Environmental Impact Assessment Report (rEIAR) for Meenbog wind farm.

In order to gain an accurate overview of the existing and potential fisheries value of the riverine watercourses within the vicinity of the development, a catchment-wide electro-fishing survey across *n*=18 riverine sites was undertaken (**Table 2.1; Figure 2.1**). Electro-fishing helped to identify the importance of the watercourses as nurseries and habitats for salmonids, lamprey (*Lampetra* sp.) and European eel (*Anguilla anguilla*). Other species of lower conservation value were also recorded. A small lake in vicinity of the wind farm, Carrickaduff Lough, was also surveyed. The presence and or absence of fish populations and or associated supporting habitat would help inform impact assessment and any subsequent mitigation for the development. The surveys were undertaken in July and September 2024.

1.2 Fisheries (desktop review)

The Mourne Beg River rises at Mourne Lough and flows, primarily through peatland areas, for approximately 26km before joining the River Derg 3.5km upstream of Castlederg, Co. Tyrone. The river is known to support Atlantic salmon (*Salmo salar*) and brown trout (*Salmo trutta*) in addition to European eel (*Anguilla anguilla*), minnow (*Phoxinus phoxinus*), stone loach (*Barbatula barbatula*), three-spined stickleback (*Gasterosteus aculeatus*) and pike (*Esox lucius*) (Triturus 2021 data; Loughs Agency 2011-2021 data). It its lower reaches, the river also supports *Lampetra* sp. (Niven & McAuley, 2013). Within the wider Foyle catchment, the Mourne Beg is an important spawning river for Atlantic salmon.

The Bunadowen River (01B01), a Mourne Beg tributary, is also known to support Atlantic salmon, brown trout and European eel (Triturus 2021 data; Loughs Agency 2020-21 data; Paul Johnston Associates, 2017). The Sruhangarve (01S26), another Mourne Beg River tributary, is known to support European eel and a low density of brown trout (Triturus 2021 data; Loughs Agency data, 2020-21; Paul Johnston Associates, 2017). The Croaghonagh River (also known as Mary Breen's Burn), a tributary of the Mourne Beg River, is known to support brown trout and European eel (Paul Johnston Associates, 2017).

The Glendergan River, a tributary of the River Derg, supports Atlantic salmon, brown trout, lamprey (*Lampetra* sp.), European eel and minnow (Niven & Donnelly, 2018).

In the Eske sub-catchment, the Lowerymore River (37L01) is a highly productive Atlantic salmon habitat often supporting very high densities of fry (e.g. IFI, 2011).

No contemporary fisheries data was available for the Barrack Hill River prior to this survey.

2. Methodology

2.1 Fisheries assessment (electro-fishing)

A single anode Smith-Root LR24 backpack (12V DC input; 300V, 100W DC output) was used to electro-fish sites on watercourses in the vicinity of Meenbog wind farm on the 22nd, 23rd and 24th July and the 12th September 2024 (sites SP17 & SP18 only), following notification to the Lough's Agency (under the conditions of a Section 69 permit) and Inland Fisheries Ireland (under the conditions of a Department of the Environment, Climate and Communications (DECC) licence). The electro-fishing survey was undertaken across 18 no. riverine sites (see **Table 2.1, Figure 2.1**).

Both river and holding tank water temperature was monitored continually throughout the survey to ensure temperatures of 20°C were not exceeded, thus minimising stress to the captured fish due to low dissolved oxygen levels. A portable battery-powered aerator was also used to further reduce stress to any captured fish contained in the holding tank. Salmonids, European eel and other captured fish species were transferred to a holding container with oxygenated fresh river water following capture. To reduce fish stress levels, anaesthesia was not applied to captured fish. All fish were measured to the nearest millimetre and released in-situ following a suitable recovery period.

As three primary species groups were targeted during the survey, i.e., salmonids, lamprey, and eel, the electro-fishing settings were tailored for each species. By undertaking electro-fishing using the rapid electro-fishing technique (see methodology below), the broad characterisation of the fish community at each sampling reach could be determined as a longer representative length of channel was surveyed. Electro-fishing methodology followed accepted European standards (CEN, 2003) and adhered to best practice (e.g., CFB, 2008).

2.1.1 Salmonids and European eel

For salmonid species and European eel, as well as all other incidental species, electro-fishing was carried out in an upstream direction for a 10-minute CPUE, an increasingly common standard approach for wadable streams (Matson et al., 2018). A total of approximately 30-75m channel length was surveyed at each site, where feasible, in order to gain a better representation of fish stock assemblages.

Relative conductivity of the water at each site was checked in-situ with a conductivity meter and the electro-fishing backpack was energised with the appropriate voltage and frequency to provide enough draw to attract salmonids and European eel to the anode without harm. For the low conductivity waters of the sites a voltage of 300-400v, frequency of 35-45Hz and pulse duration of 3.5-4ms was utilised to draw fish to the anode without causing physical damage.

2.1.2 Lamprey

Electro-fishing for lamprey ammocoetes was conducted using targeted quadrat-based electro-fishing (as per Harvey & Cowx, 2003) in objectively suitable areas of sand/silt, where encountered. As lamprey take longer to emerge from silts and require a more persistent approach, they were targeted at a lower frequency (30Hz) burst DC pulse setting which also allowed detection of European eel in sediment, if present. Settings for lamprey followed those recommended and used by Harvey & Cowx

(2003), APEM (2004) and Niven & McAuley (2013). Using this approach, the anode was placed under the water's surface, approximately 10-15cm above the sediment, to prevent immobilising lamprey ammocoetes within the sediment. The anode was energised with 100V of pulsed DC for 15-20 seconds and then turned off for approximately five seconds to allow ammocoetes to emerge from their burrows. The anode was switched on and off in this way for approximately two minutes. Immobilised ammocoetes were collected by a second operator using a fine-mesh hand net as they emerged.

Lamprey species were identified to species level, where possible, with the assistance of a hand lens, through external pigmentation patterns and trunk myomere counts as described by Potter & Osborne (1975) and Gardiner (2003).

2.2 Fisheries habitat

A fisheries habitat appraisal of all 19 no. sites was undertaken to establish the importance of the supporting habitats as nursery, spawning and or holding habitats. The appraisal surveys focused on evaluating the spawning, nursery and or holding habitat for salmonids and lamprey species but also considered European eel and other fish species. The appraisals of salmonids and lamprey were cognisant of species-specific habitat requirements and preferences as outlined in O'Grady (2006), Hendry et al. (2003), Armstrong et al. (2003), Harvey & Cowx (2003), Maitland (2003) and Hendry & Cragg-Hine (1997). River habitat surveys and fisheries assessments were also carried out utilising elements of the approaches in the River Habitat Survey Methodology (EA, 2003) and Fishery Assessment Methodology (O'Grady, 2006) to broadly characterise the riverine sites (i.e., channel profiles, substrata etc.).

2.3 Biosecurity

A strict biosecurity protocol following IFI (2010) and the Check-Clean-Dry approach was adhered to during surveys for all equipment and PPE used. Disinfection of all equipment and PPE before and after use with Virkon™ was conducted to prevent the transfer of pathogens or invasive propagules between survey sites. Surveys were undertaken at sites in a downstream order to minimise the risk of upstream propagule mobilisation. Where feasible, equipment was also thoroughly dried (through UV exposure) between survey areas. Any aquatic invasive species or pathogens recorded within or adjoining the survey areas were geo-referenced. All Triturus staff are certified in 'Good fieldwork practice: slowing the spread of invasive non-native species' by the University of Leeds.

Table 2.1 Location of *n*=19 fisheries survey sites in the vicinity of Meenbog wind farm, Co. Donegal

Site no.	Watercourse	EPA code	Location	X (ITM)	Y (ITM)
SP1	Unnamed stream	n/a	Croaghonagh	605010	887018
SP2	Croaghonagh River	01C31	Croaghonagh	606385	888005
SP3	Bunadowen River	01B01	Meenbog	605634	885263
SP4	Bunadowen River	01B01	Meenbog	606297	886277
SP5	Bunadowen River	01B01	Croaghonagh	608092	887606
SP6	Shruhangarve	01S26	Sruhangarve Bridge	610171	887234
SP7	Glendergan River	GBNI0100880	Slievedoo	607769	883831
SP8	Glendergan River	GBNI0100885	Killeteer Forest Park	608916	881721
SP9	Mourne Beg River	01M01	Croaghonagh	606421	888291
SP10	Mourne Beg River	01M01	Meenbog	608253	887857
SP11	Mourne Beg River	01M01	Meenbog	609865	888295
SP12	Mourne Beg River	01M01	Meenbog	610608	887660
SP13	Mourne Beg River	01M01	Croagh Bridge	612487	885772
SP14	Mourne Beg River	01M01	Meenreagh Bridge	614305	885180
SP15	Mourne Beg River	01M01	Laghtfoggy	618510	883578
SP16	Mourne Beg River	01M01	Mourne Bridge	620654	883800
SP17	Barrack Hill River	37B16	Croaghonagh	604010	887099
SP18	Lowerymore River	37L01	Biddy O'Barnes	601989	884625
L1*	Carrickaduff Lough	9925	Meenbog	607570	885069

* fisheries habitat appraisal only

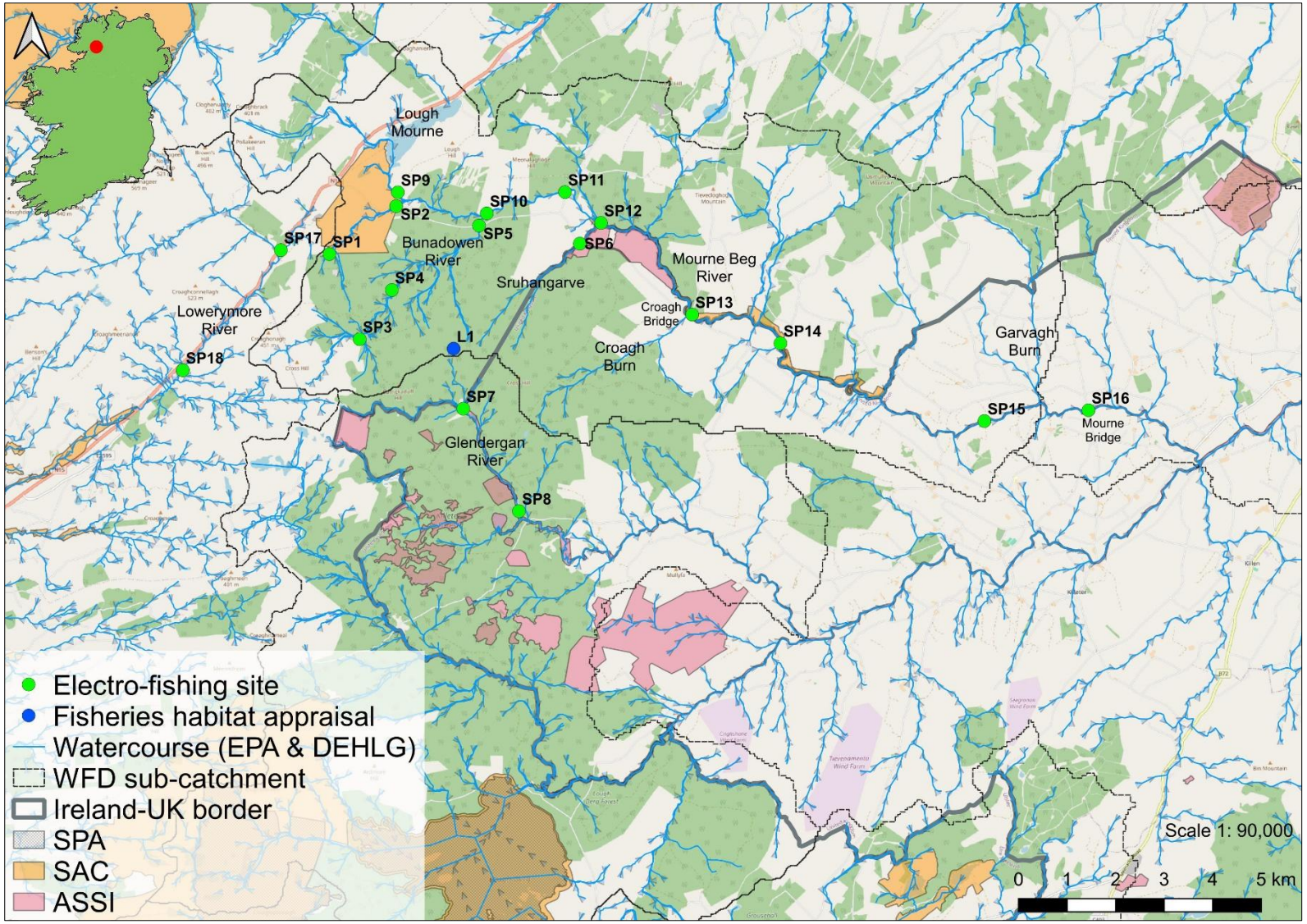

Figure 2.1 Overview of the *n*=19 electro-fishing & fisheries habitat appraisal survey site locations at Meenbog wind farm, Co. Donegal

3. Results

A catchment-wide fisheries survey of 18 no. riverine sites and 1 no. lake site in the vicinity of Meenbog wind farm was conducted 22nd, 23rd and 24th July and the 12th September 2024 (sites SP17 & SP18 only) following notification to Inland Fisheries Ireland. The results of the survey are discussed below in terms of fish population structure, population size and the suitability and value of the surveyed areas as nursery and spawning habitat for salmonids, European eel and lamprey species. Scientific names are provided at first mention only.

3.1 Fisheries assessment & appraisal

3.1.1 Site SP1 – Unnamed stream, Croaghonagh

No fish were recorded via electro-fishing at site SP1 on the upper reaches of an unnamed tributary of the Mourne Beg River, at a forestry track access crossing (twin pipe culvert). Despite some physical suitability for a small salmonid population (i.e. pool, mixed gravels etc.), the narrow upland channel was not of value to resident fish given its location in the uppermost reaches of the watercourse and high natural gradients.

Plate 3.1 Representative image of site A1 on an unnamed Mourne Beg River tributary, July 2024

3.1.2 Site SP2 – Croaghonagh River, Croaghonagh

Atlantic salmon (*Salmo salar*) (*n*=9) and brown trout (*Salmo trutta*) (*n*=9) were the only fish species recorded via electro-fishing at site SP2 on the Croaghonagh River (01C31) at a local road crossing (**Figure 3.1**).

The site was of moderate value as a salmonid habitat, supporting a low density of mixed cohort salmon and trout. The quality of spawning habitat was poor given the predominance of larger substrata in the

narrow spate channel in addition to eutrophication pressures. Whilst instream refugia were abundant, the density of juvenile salmonids was low (moderate quality nursery). Frequent deep pools on meanders and bank scours offered some value to adult salmonids. Despite some moderate suitability for European eel, none were recorded.

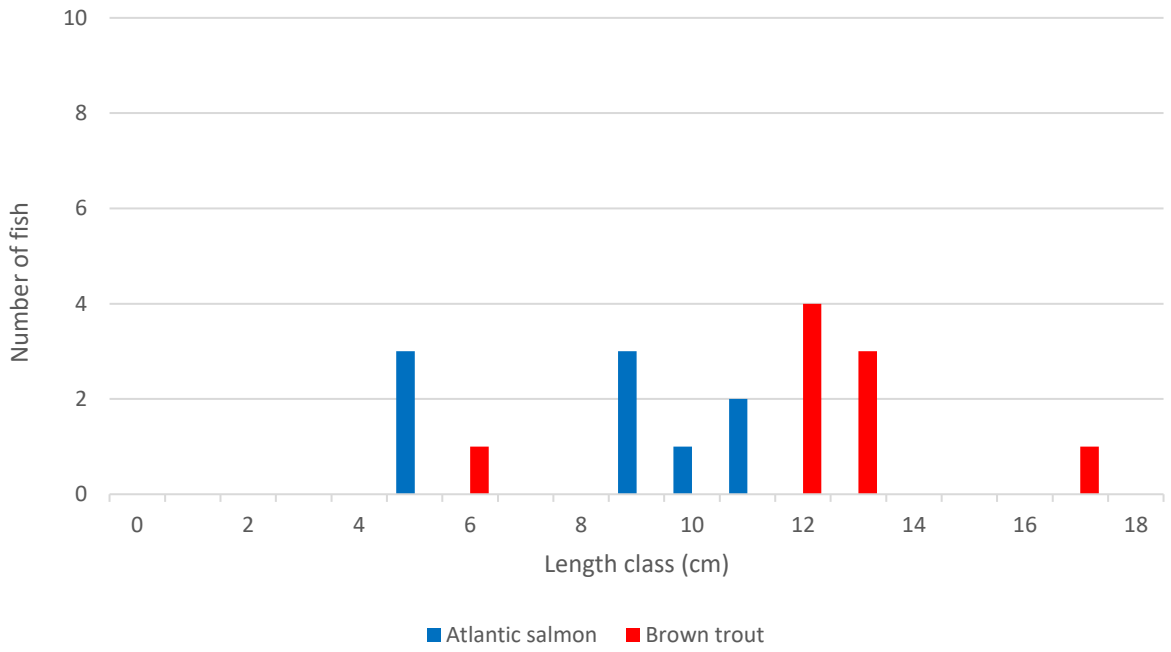

Figure 3.1 Length frequency distribution recorded via electro-fishing at SP2 on the Croaghonagh River, July 2024

Plate 3.2 Juvenile salmonids recorded at site SP2 on the Croaghonagh River, July 2024

3.1.3 Site SP3 – Bunadowen River, Meenbog

Brown trout (*n*=26) and European eel (*Anguilla anguilla*) (*n*=1) were the only fish species recorded via electro-fishing at site SP3 on the upper reaches of the Bunadowen River (01B01), a tributary of the Mourne Beg River (**Figure 3.2**).

The site was a good quality salmonid nursery supporting moderate numbers of juveniles in addition to mixed cohort adults. The quality was reduced somewhat due to high floc cover and siltation pressures (peat). Moderate quality spawning areas by way of mixed gravels were present locally in deeper pool. Deeper pool below boulder-cascade areas provided valuable holding areas for adult salmonids. The site was of too high a gradient to support significant European eel populations but a single adult was recorded. There was no suitability for lamprey.

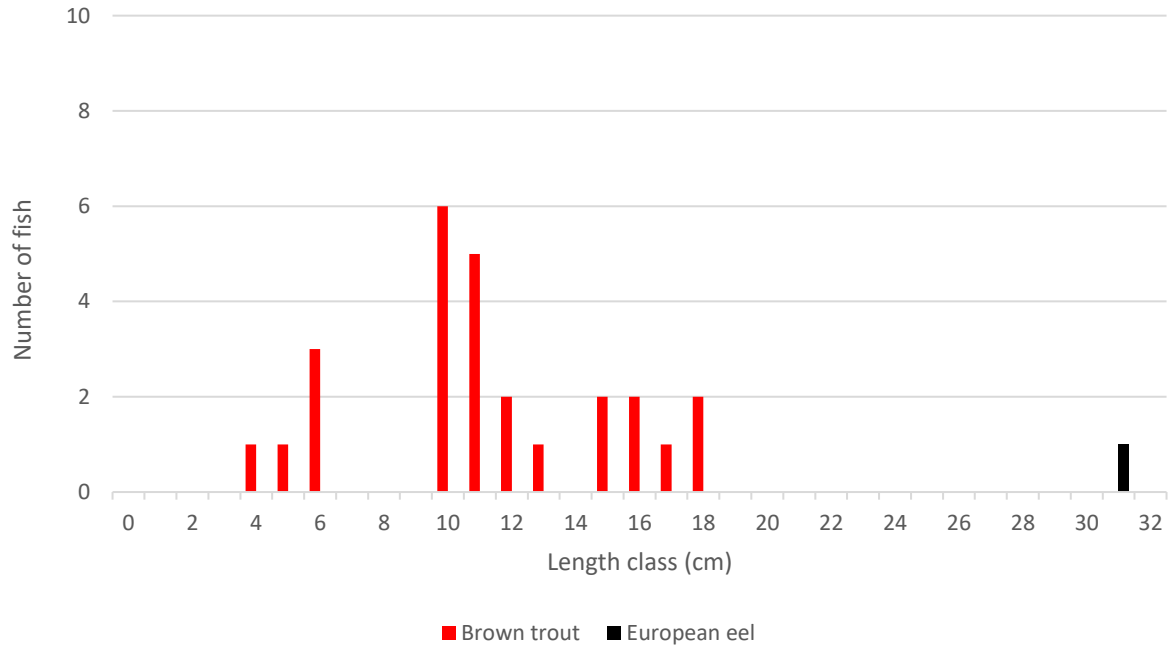

Figure 3.2 Length frequency distribution recorded via electro-fishing at SP2 on the Croaghonagh River, July 2024

Plate 3.3 European eel recorded at site SP3 on the upper reaches of the Bunadowen River, July 2024

3.1.4 Site SP4 – Bunadowen River, Meenbog

Brown trout (*n*=13) was the only fish species recorded via electro-fishing at site SP4 on the upper reaches of the Bunadowen River (01B01) within the wind farm site (**Figure 3.3**).

The site was a moderate quality salmonid nursery only given the very high energy characteristics in addition to eutrophication and siltation pressures (peat). The site was of moderate value as a spawning habitat due to the paucity of clean gravels and supported only low numbers of juveniles (0+). Deeper pool below boulder-cascade areas provided valuable holding areas for adult salmonids. The site was of too high a gradient to support significant European eel populations and none were recorded. There was no suitability for lamprey.

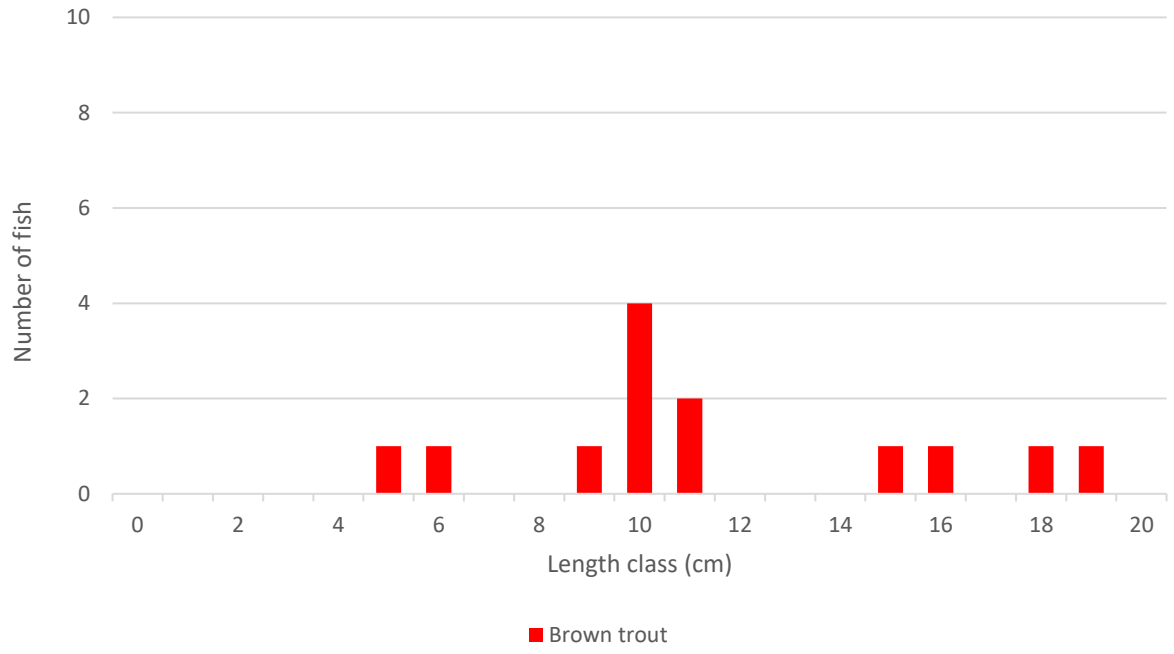

Figure 3.3 Length frequency distribution recorded via electro-fishing at SP2 on the Croaghonagh River, July 2024

Plate 3.4 Adult brown trout recorded at site SP4 on the upper reaches of the Bunadowen River, July 2024

3.1.5 Site SP5 – Bunadowen River, Croaghonagh

Atlantic salmon (*n*=6) and brown trout (*n*=22) were the only fish species recorded via electro-fishing at site SP5 on the lower reaches of the Bunadowen River (01B01), approximately 0.2km upstream of the Mourne Beg River confluence (**Figure 3.4**).

The site was of moderate value as a salmonid habitat, supporting a low density of mixed cohort trout and lower numbers of salmon. This reflected the compacted/bedrock bed (leading to poor spawning), high flow rates and poor prey resources (mostly allochthonous system). Whilst the site was of good physical suitability as a salmonid nursery, only a low density of fish were present (in contrast to the downstream-connecting Mourne Beg River). Widespread pool provided some good quality holding areas for migratory adult salmonids. Despite some moderate suitability for European eel, none were recorded. There was no suitability for lamprey.

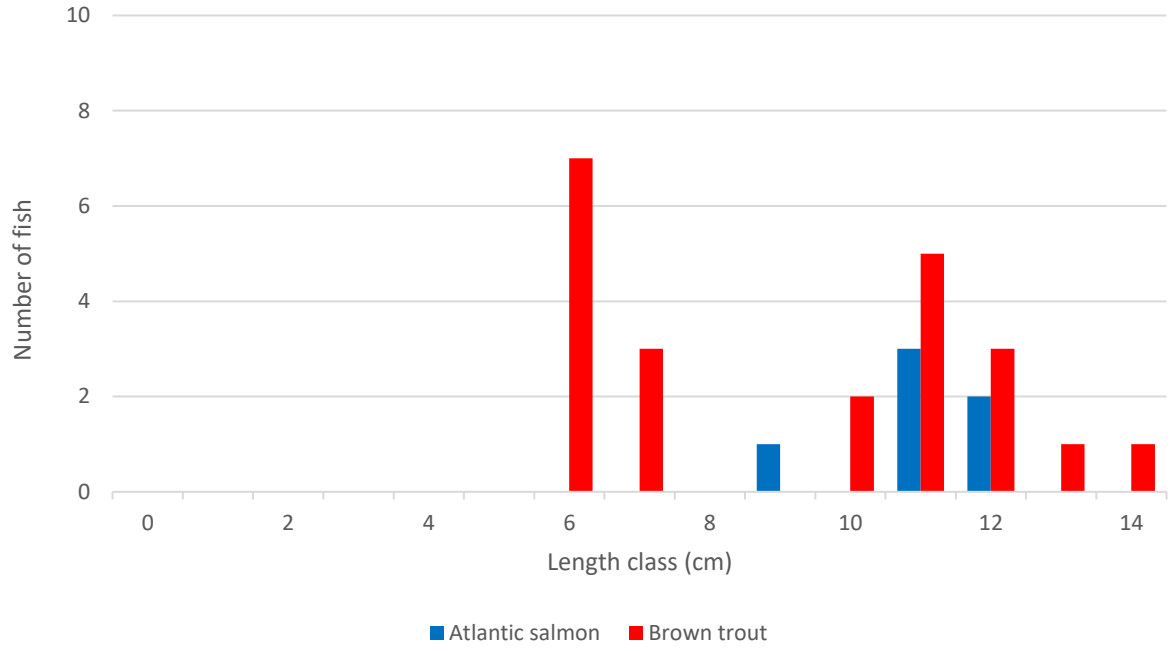

Figure 3.4 Length frequency distribution recorded via electro-fishing at SP5 on the Bunadowen River, July 2024

Plate 3.5 Mixed cohort brown trout recorded at site SP5 on the lower reaches of the Bunadowen River, July 2024

3.1.6 Site SP6 – Shruhangarve, Sruhangarve Bridge

Brown trout (*n*=11) was the only fish species recorded via electro-fishing at site SP6 on the Sruhangarve (01S26) at Sruhangarve Bridge (**Figure 3.5**).

The very high energy, high gradient river supported a low density of adult trout, with no juveniles recorded. This reflected the near total absence of suitable spawning habitat in the steep gradient channel. Abundant small plunge pools provided valuable flow refugia and holding habitat for adult trout. The site (and wider channel) was not suitable for Atlantic salmon given the paucity of suitable spawning substrata. Whilst European eel are known from the site (Triturus 2021 data), none were recorded in the current survey and suitability was low given the high energy conditions. There was no suitability for lamprey.

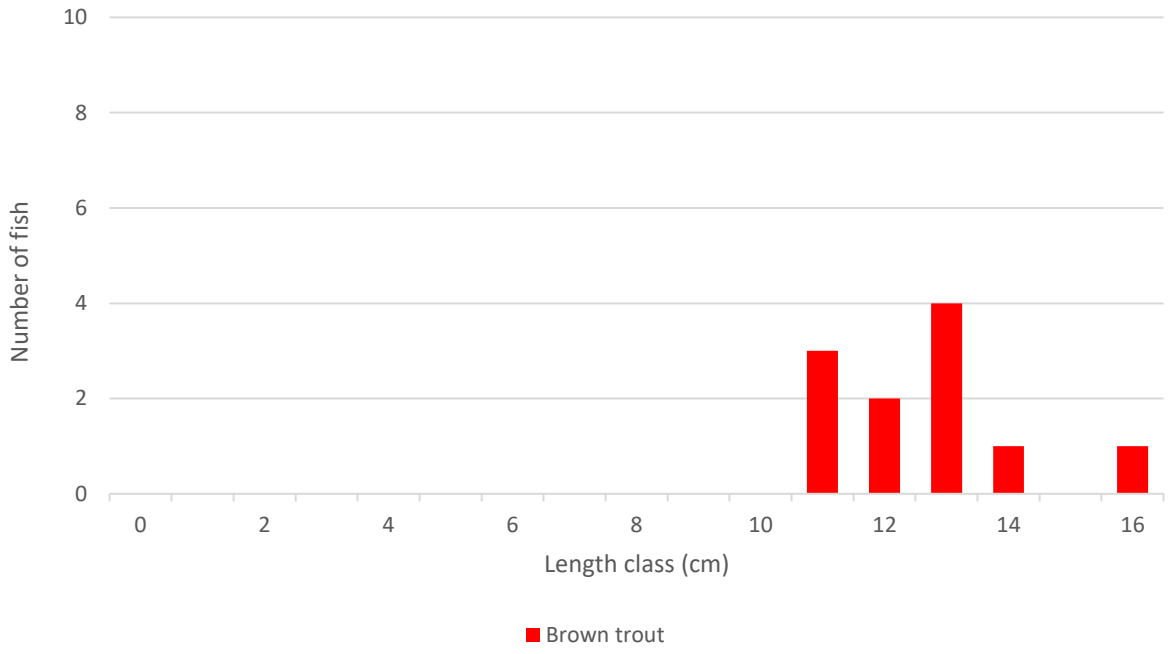

Figure 3.5 Length frequency distribution recorded via electro-fishing at SP6 on the Sruhangarve, July 2024

Plate 3.6 Brown trout recorded at site SP6 on the Sruhangarve, July 2024

3.1.7 Site SP7 – Glendergan River, Slievedoo

Brown trout (*n*=3) was the only fish species recorded via electro-fishing at site SP7 on the upper reaches of the Glendergan River (GBNI0100880) adjacent to the wind farm site (**Figure 3.6**).

The upper reaches of the river at this location supported a low density of adult 1+ and 2+ trout, with

no juveniles recorded. The site was a poor quality salmonid nursery given the small size, upland nature and high siltation pressures. The recent clear-fell and erosion of peat evidently impacted the nursery value. The spawning value was poor due to the heavily silted gravels and high floc cover. However, some good quality holding habitat was present locally for adult salmonids. The site was of too high a gradient to support significant European eel populations and none were recorded. There was no suitability for lamprey.

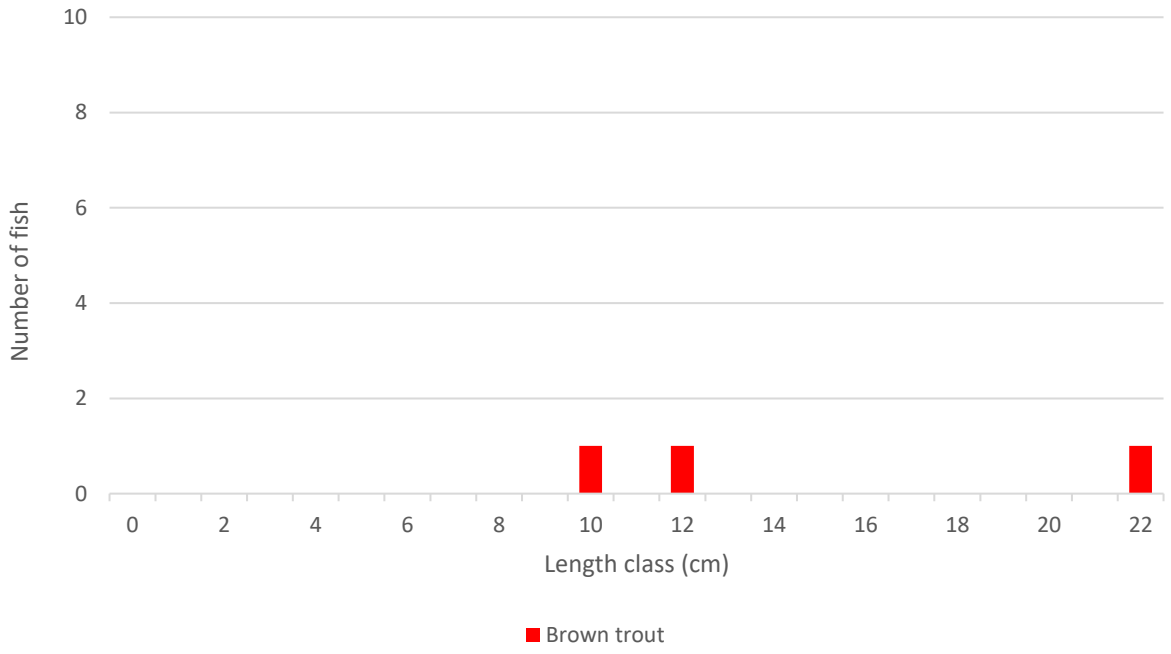

Figure 3.6 Length frequency distribution recorded via electro-fishing at SP7 on the Glendergan River, July 2024

Plate 3.7 Adult brown trout recorded at site SP7 on the Glendergan River, July 2024

3.1.8 Site SP8 – Glendergan River, Killeteer Forest Park

Brown trout (*n*=4) was the only fish species recorded via electro-fishing at site SP8 on the Glendergan River (GBNI0100885) at Killeteer Forest Park (**Figure 3.7**).

The high energy spate channel was of relatively low value for salmonids given the predominance of large substrate, very high peat staining, siltation pressures and a poor prey resources (i.e. mostly allochthonous). Suitable spawning habitat was very limited and exposed to siltation. Whilst small areas of pool and deeper glide habitat were widespread, these supported only a very low density of adult trout. The absence of Atlantic salmon and European eel would indicate downstream barriers, in addition to poor habitat suitability. There was no suitability for lamprey.

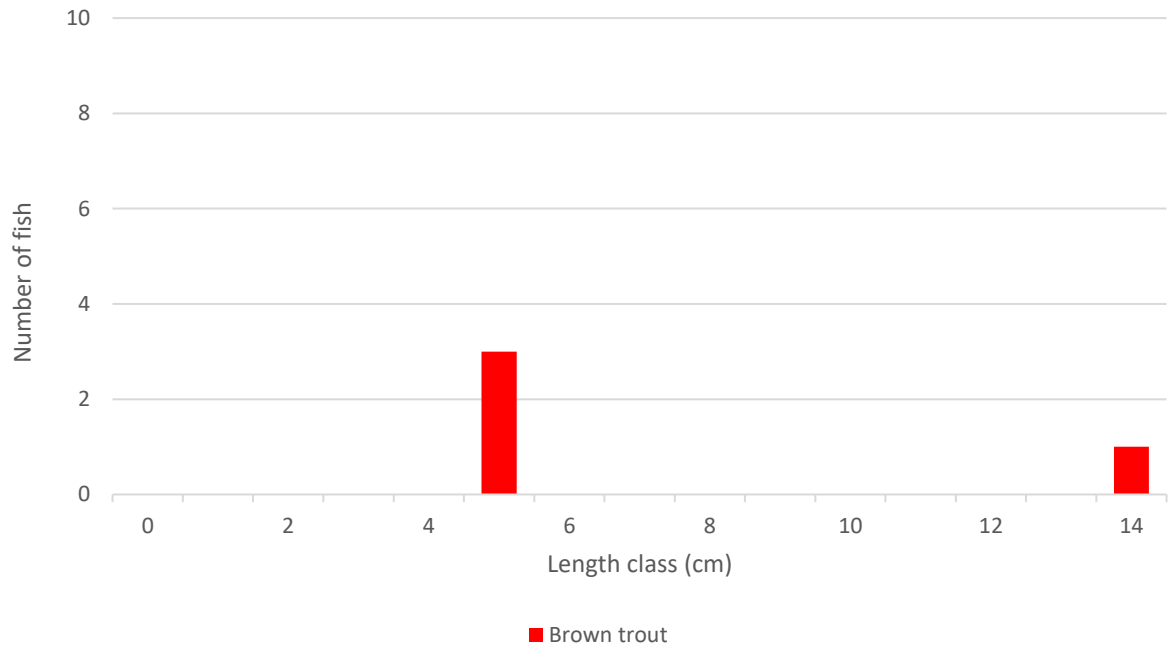

Figure 3.7 Length frequency distribution recorded via electro-fishing at SP8 on the Glendergan River, July 2024

Plate 3.8 Representative image of site SP8 on the Glendergan River, July 2024

3.1.9 Site SP9 – Mourne Beg River, Croaghonagh

Atlantic salmon (*n*=53), brown trout (*n*=20) and European eel (*n*=1) were recorded via electro-fishing at site SP9 on the upper reaches of the Mourne Beg River (01M01) approximately 0.7km downstream of Mourne Lough (**Figure 3.8**).

The site was of high value as a salmonid habitat, with abundant instream boulder/cobble supporting a high density of juvenile salmon and a lower number of trout. At the head of these shallow areas, mixed gravels and smaller clean cobbles provided high quality salmonid spawning habitat. Deeper pool, and to a lesser extent, bank scours, offered valuable flow refugia and holding habitat for adult salmonids The deep scour pool immediately below the bridge apron was particularly valuable as holding habitat for larger migratory salmonids. Suitability for European eel was good with a low density recorded. There was no suitability for lamprey.

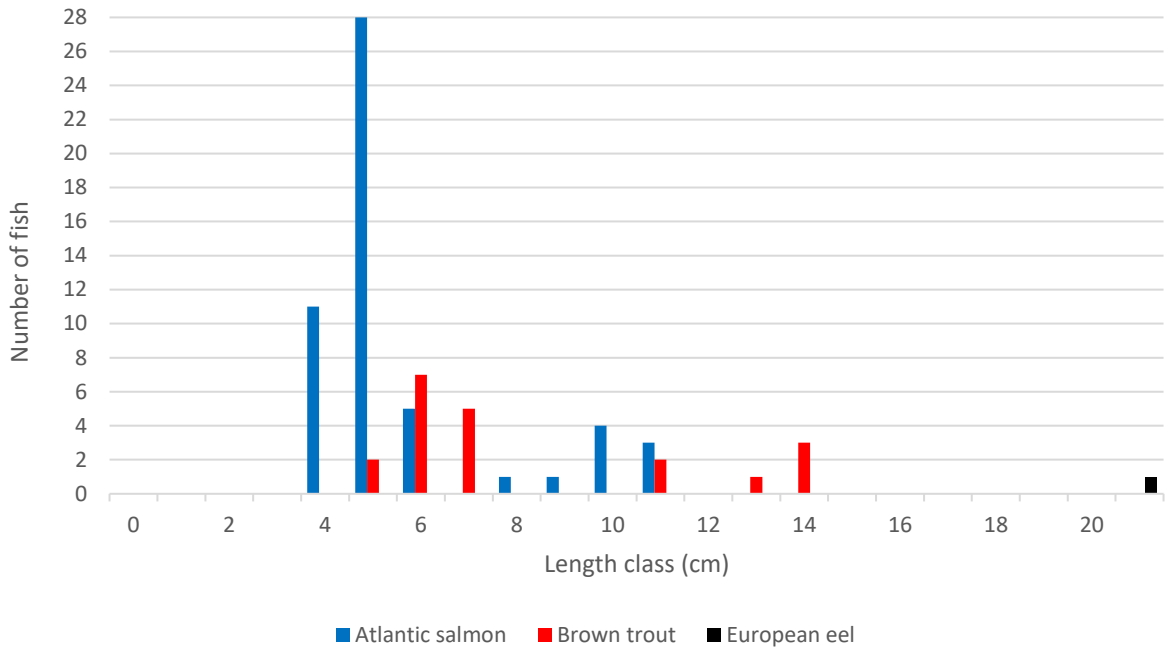

Figure 3.8 Length frequency distribution recorded via electro-fishing at SP9 on the Mourne Beg River, July 2024

Plate 3.9 Atlantic salmon parr (top) and brown trout recorded at SP9 on the upper reaches of the Mourne Beg River, July 2024

3.1.10 Site SP10 – Mourne Beg River, Meenbog

Atlantic salmon (*n*=73) and brown trout (*n*=11) were the only fish species recorded via electro-fishing at site SP10 on the Mourne Beg River (01M01) immediately downstream of the Bunadowen River confluence (**Figure 3.9**).

The site was of very high value for salmonids with abundant mobile cobble and macrophyte beds supporting a particularly high density of juvenile Atlantic salmon. High quality spawning habitat (especially for salmon) was present throughout given the presence of cobble and mixed gravels free of significant siltation (both upstream and downstream of confluence). Localised pools (e.g. 100m d/s) were of high value for migratory adult salmonids. Despite some moderate suitability for European eel, none were recorded although these would typically be confined to deeper pool areas. There was no suitability for lamprey.

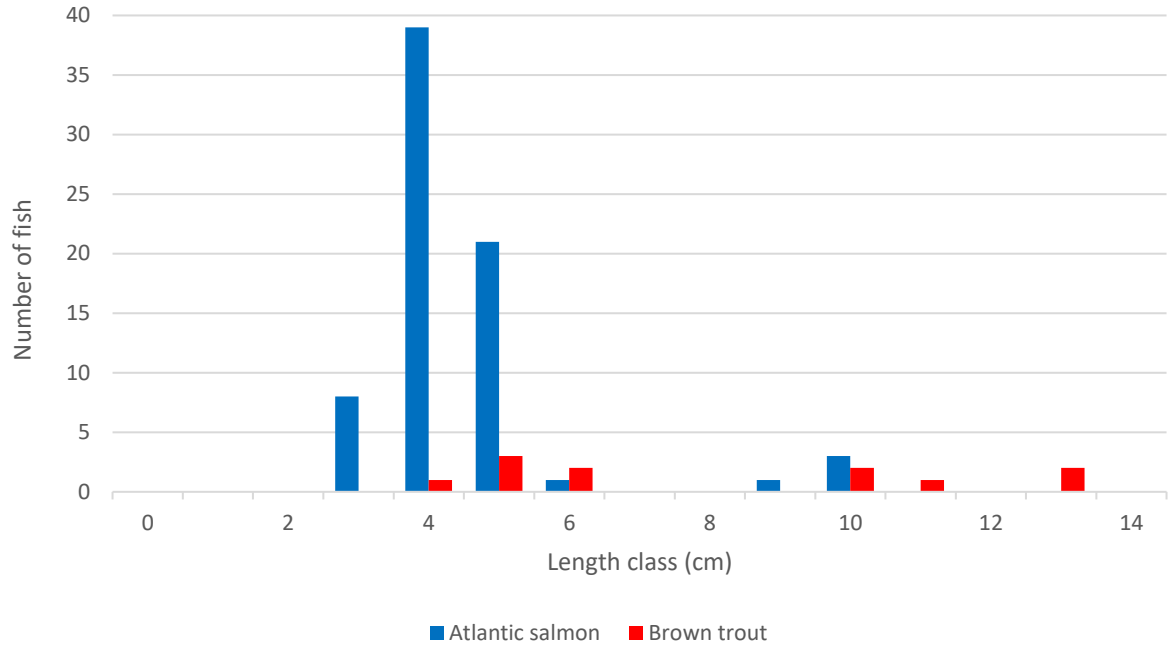

Figure 3.9 Length frequency distribution recorded via electro-fishing at SP10 on the Mourne Beg River, July 2024

Plate 3.10 Mixed cohort Atlantic salmon recorded at SP10 on the upper reaches of the Mourne Beg River, July 2024

3.1.11 Site SP11 – Mourne Beg River, Meenbog

Atlantic salmon (*n*=55) and brown trout (*n*=16) were the only fish species recorded via electro-fishing at site SP11 (**Figure 3.10**).

The site was of high value for salmonids with abundant boulder, cobble and macrophyte beds supporting a relatively high density of juvenile Atlantic salmon and low numbers of trout. Mixed substrata provided good quality spawning habitat locally, with deeper glide and pool offering valuable holding habitat for adult salmonids. Despite some moderate suitability for European eel, none were recorded. Pike (*Esox lucius*) are known from the site (Triturus & Loughs Agency data) although none were recorded in the current survey. There was no suitability for lamprey.

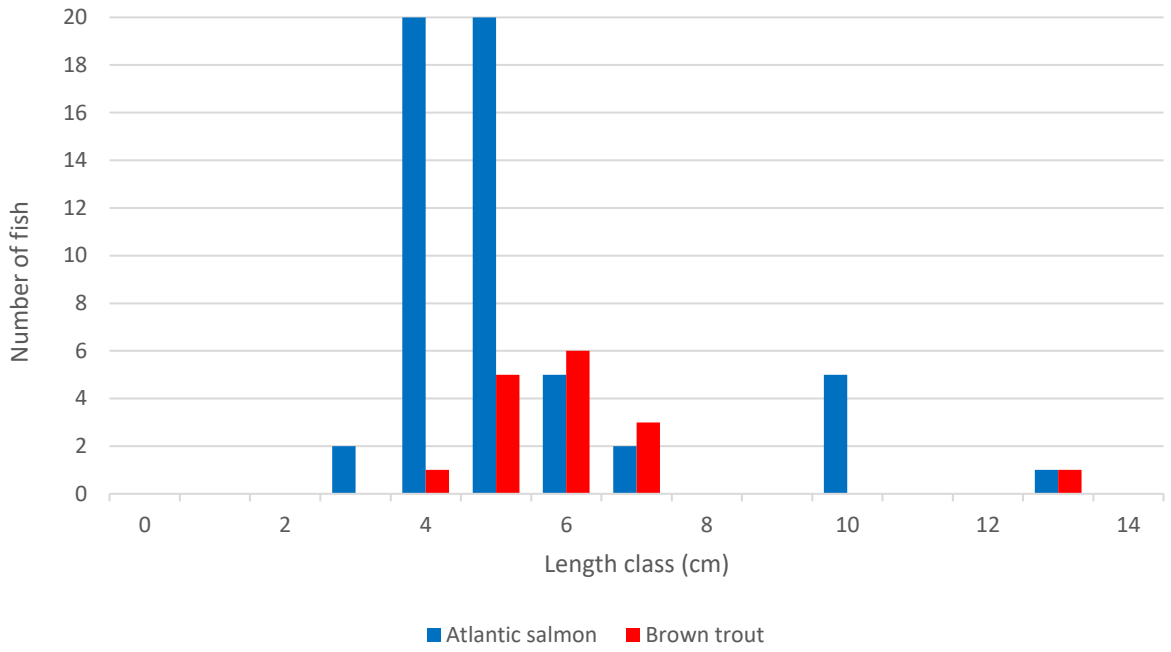

Figure 3.10 Length frequency distribution recorded via electro-fishing at SP11 on the Mourne Beg River, July 2024

Plate 3.11 Representative image of site SP11 on the Mourne Beg River, July 2024

3.1.12 Site SP12 – Mourne Beg River, Meenbog

Atlantic salmon (*n*=31) and brown trout (*n*=7) were the only fish species recorded via electro-fishing at site SP12 on the Mourne Beg River (01M01) at the Sruhangarve confluence (**Figure 3.11**).

Despite good physical suitability, including heterogenous habitat featuring riffle, glide and pool areas,

the site supported an unusually low density of fish with the population dominated by moderate numbers of juvenile salmon. Notably, juvenile abundance was higher immediately upstream of the Sruhangarve confluence. Excellent quality holding areas were present by way of pools and bank scours but a paucity of adult salmonids was recorded. Good quality spawning areas were also present. Despite some good suitability for European eel, none were recorded. There was no suitability for lamprey.

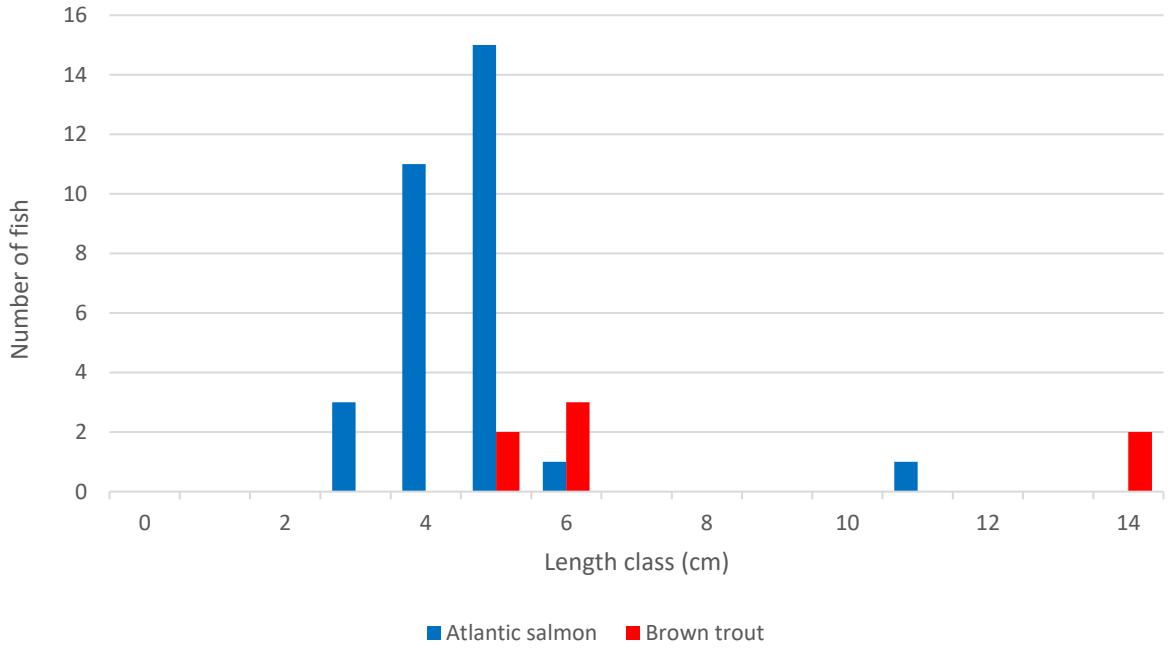

Figure 3.11 Length frequency distribution recorded via electro-fishing at SP12 on the Mourne Beg River, July 2024

Plate 3.12 Young-of-the-year salmonids recorded at site SP12 on the Mourne Beg River, July 2024

3.1.13 Site SP13 – Mourne Beg River, Croagh Bridge

Atlantic salmon (*n*=43), brown trout (*n*=2) European eel (*n*=1) and minnow (*Phoxinus phoxinus*) (*n*=19) were recorded via electro-fishing at site SP13 on the Mourne Beg River (01M01) at Croagh Bridge (**Figure 3.12**).

The site was of very high value for salmonids, with excellent quality nursery and spawning habitat present upstream of the bridge. Shallow, bryophyte-rich, cobble-dominated areas supported relatively high densities of juvenile salmon. As per upstream, numbers of brown trout were very low, despite high physical suitability and the presence of frequent small pool and deeper glide for holding. European eel were present in low densities, with abundant instream refugia present. There was no suitability for lamprey.

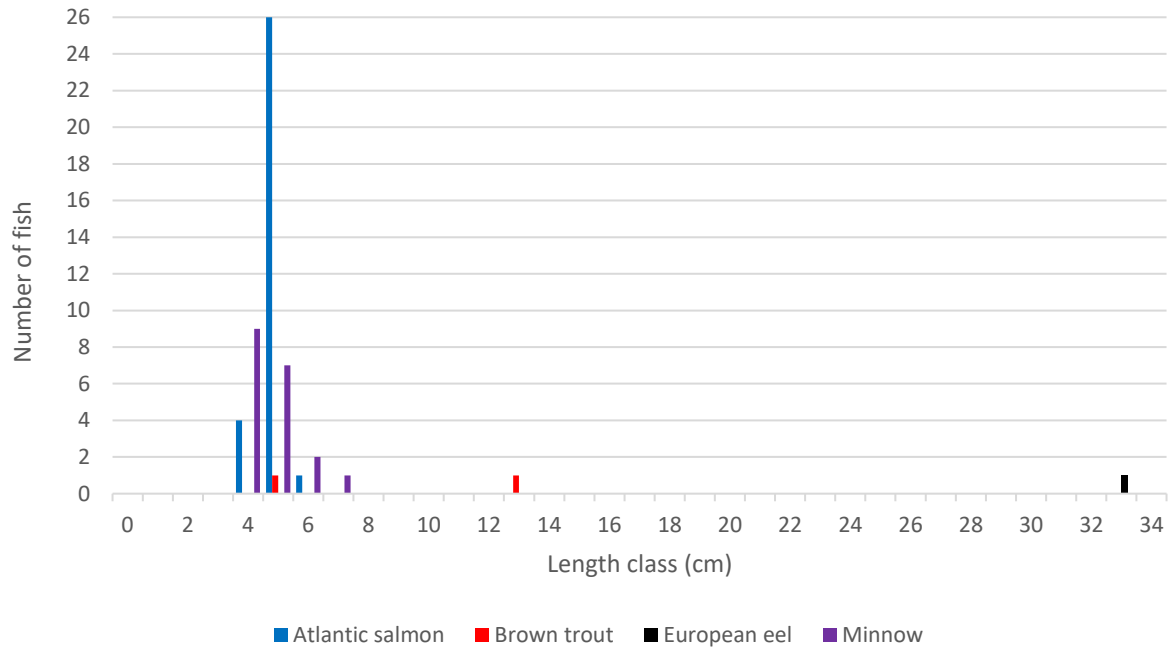

Figure 3.12 Length frequency distribution recorded via electro-fishing at SP13 on the Mourne Beg River, July 2024

Plate 3.13 Atlantic salmon fry and minnow recorded at SP13 on the Mourne Beg River at Croagh Bridge, July 2024

3.1.14 Site SP14 – Mourne Beg River, Meenreagh Bridge

Atlantic salmon (*n*=43), brown trout (*n*=2) European eel (*n*=1) and minnow (*n*=19) were recorded via electro-fishing at site SP14 on the Mourne Beg River (01M01) at Meenreagh Bridge (**Figure 3.13**).

The site was of high value for salmonids, with high quality nursery and spawning habitat present upstream of the bridge. However, densities of juvenile salmonids was lower than anticipated given the habitat and this likely reflected poor prey resources (as per upstream sites). As per upstream, numbers of brown trout were very low, despite high physical suitability and the presence of frequent small pool and deeper glide for holding. European eel were present in low densities, with abundant instream refugia present. There was no suitability for lamprey.

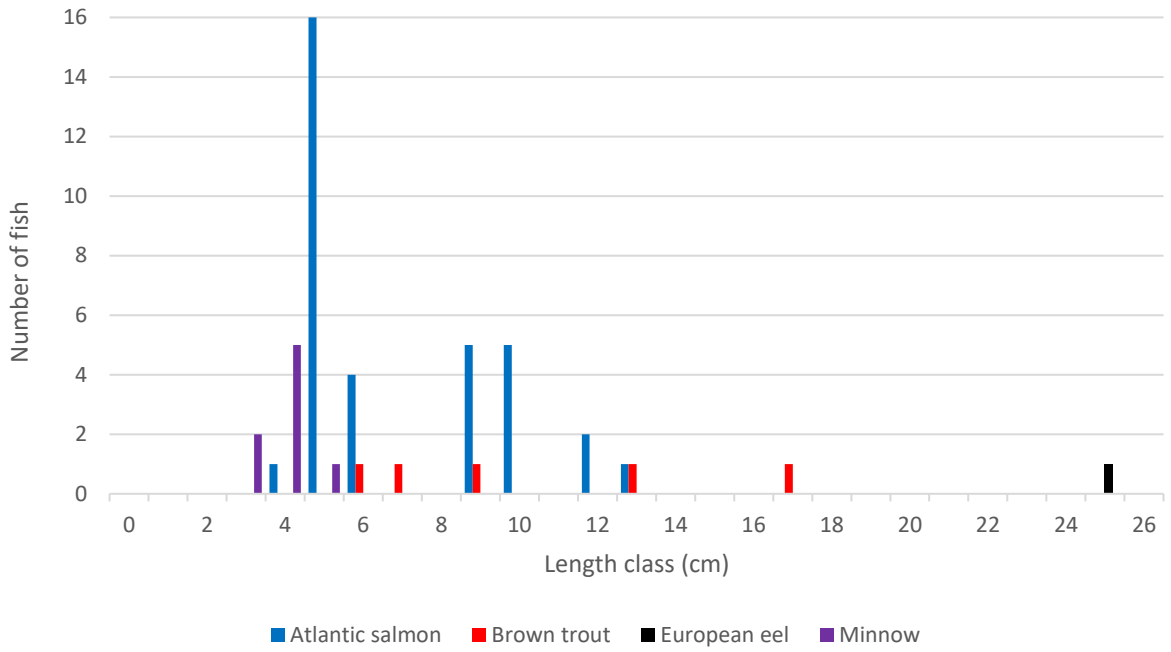

Figure 3.13 Length frequency distribution recorded via electro-fishing at SP14 on the Mourne Beg River, July 2024

Plate 3.14 Representative image of site SP14 on the Mourne Beg River at Meenreagh Bridge, July 2024

3.1.15 Site SP15 – Mourne Beg River, Laghtfoggy

Atlantic salmon (*n*=17), brown trout (*n*=37), European eel (*n*=2), minnow (*n*=30), stone loach (*Barbatula barbatula*) (*n*=8) and three-spined stickleback (*Gasterosteus aculeatus*) (*n*=13) were recorded via electro-fishing at site SP15 on the Mourne Beg River (01M01) at a ford crossing (**Figure 3.14**).

The site was of high value for salmonids, supporting moderate densities of both juvenile and adult year classes. Shallow *Ranunculus* zones downstream of the ford were of particularly high value as salmonid nursery habitats, with cobble-dominated bed upstream of the ford offering excellent refugia. These areas were also of very high value for spawning salmonids. Despite the presence of high quality deeper glide and pool, the density of adult salmonids (trout) was low but nonetheless considerably higher than upstream - this reflected the increasingly calcareous influences and superior prey resources. Suitability for European eel was high given abundant instream refugia although only a low density were recorded. There was some localised spawning habitat for lamprey although ammocoete areas (soft sediment) were absent.

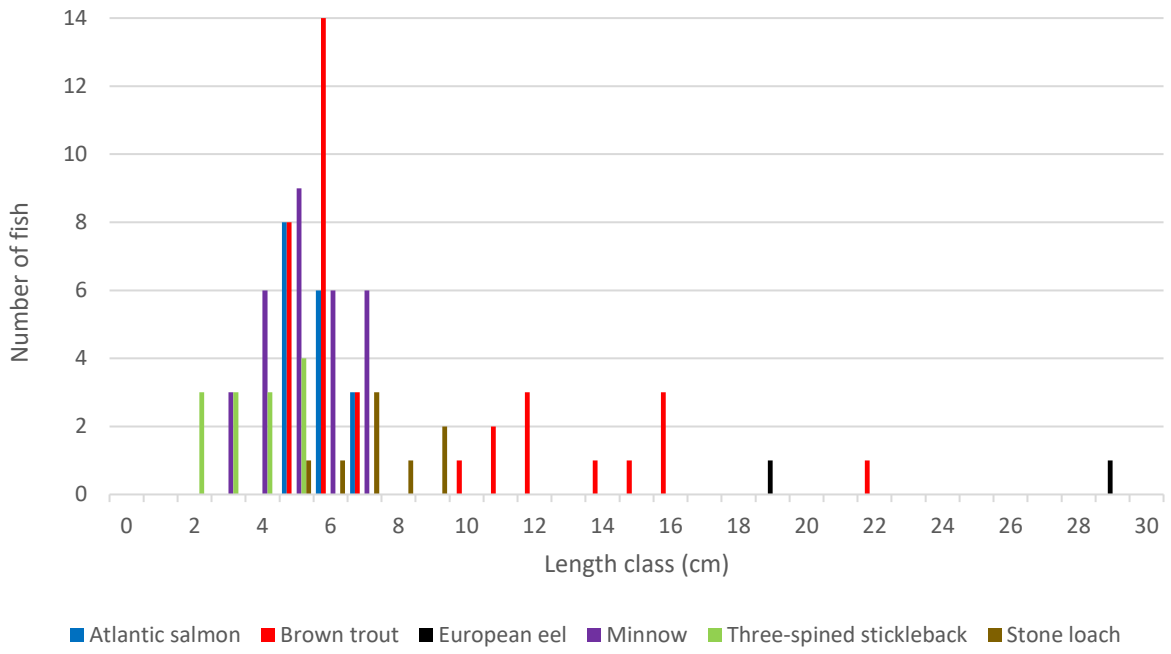

Figure 3.14 Length frequency distribution recorded via electro-fishing at SP15 on the Mourne Beg River, July 2024

Plate 3.15 Adult brown trout recorded at site SP15 on the Mourne Beg River, July 2024

3.1.16 Site SP16 – Mourne Beg River, Mourne Bridge

Atlantic salmon (*n*=65), brown trout (*n*=17), European eel (*n*=2) and stone loach (*n*=3) were recorded via electro-fishing at site SP16 on the Mourne Beg River (01M01) at Mourne Bridge (**Figure 3.15**).

The site was of high value for salmonids, supporting relatively high densities of juvenile salmon and lower numbers of mixed cohort trout. The site was of greatest value as a salmonid nursery, with abundant instream refugia and macrophyte beds providing excellent quality habitat. These were also of high value for European eel which were recorded in low densities. Good quality spawning habitat for both salmonid and lamprey was present locally. Deeper glide upstream provided good holding habitat for migratory salmonids. Whilst beds of sand provided some low suitability for lamprey ammocoetes, none were recorded (*Lampetra* sp. known to present in the lower reaches; Niven & McAuley, 2013).

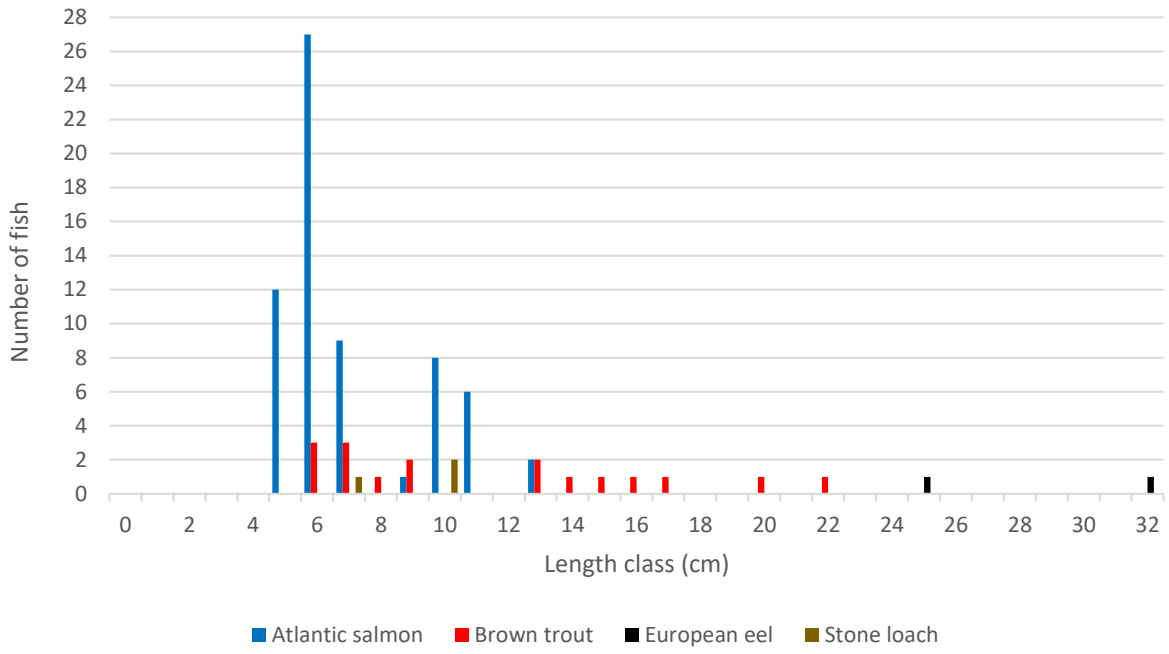

Figure 3.15 Length frequency distribution recorded via electro-fishing at SP16 on the Mourne Beg River, July 2024

Plate 3.16 (from top) Stone loach, Atlantic salmon and brown trout recorded at site SP16 on the Mourne Beg River at Mourne Bridge, July 2024

3.1.17 Site SP17 – Barrack Hill River, Croaghonagh

Atlantic salmon (*n*=1) and brown trout (*n*=22) were the only fish species recorded via electro-fishing at site SP17 on the Barrack Hill River (37B16), a tributary of the Lowerymore River (**Figure 3.16**).

The site was a very good quality salmonid nursery given the good hydromorphology (rocky bed), broken flow patterns and limited siltation pressures. However, overall fish densities were low, with a very low density of Atlantic salmon despite some good physical suitability. Good quality salmonid spawning and holding habitat was present. Despite some low suitability for European eel, none were recorded. There was no suitability for lamprey.

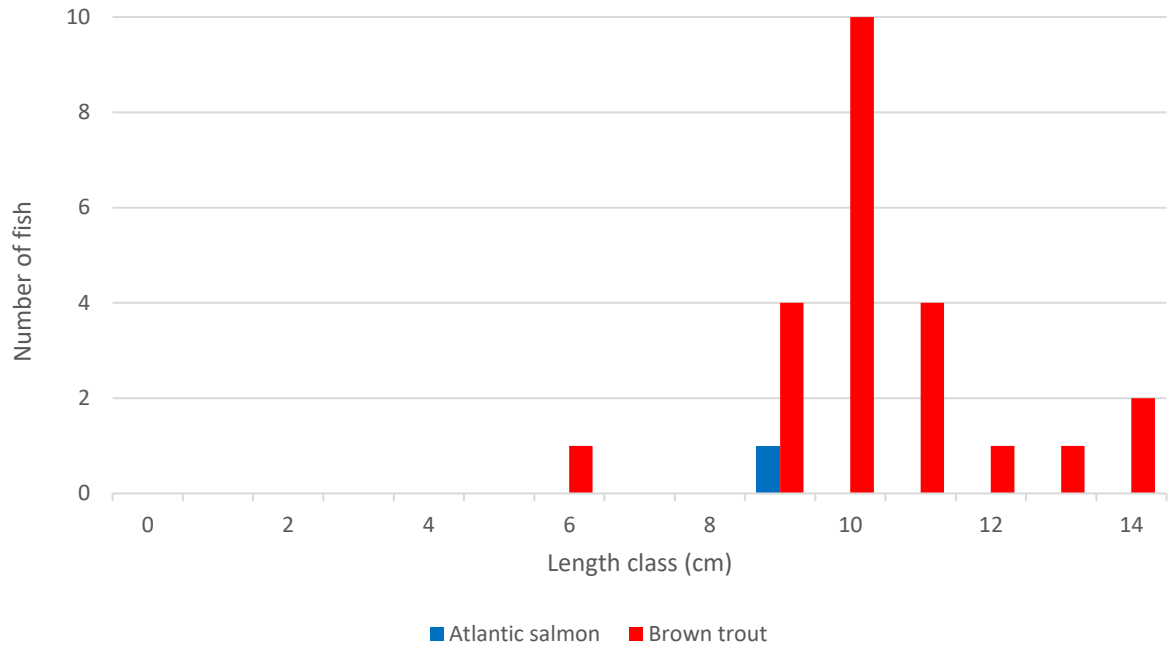

Figure 3.16 Length frequency distribution recorded via electro-fishing at SP17 on the Barrack Hill River, September 2024

Plate 3.17 Representative image of site SP17 on the Barrack Hill River, September 2024

3.1.18 Site SP18 – Lowerymore River, Biddy O'Barnes

Atlantic salmon (*n*=29) and European eel (*n*=1) were the only fish species recorded via electro-fishing at site SP18 on the Lowerymore River (37L01) (**Figure 3.17**).

The site was a good quality salmonid nursery given the good hydromorphology (rocky bed), broken flow patterns and limited siltation pressures. This provided ample refugia and oxygenated water for 0+ and 1+ salmonids. The absence of brown trout reflected the shallow, high energy nature of the site (species known to be present in the river). The site featured good quality spawning areas locally in deeper glide and pool with mixed coarse and medium gravels that had light siltation between large instream boulders. Good quality holding habitat for adult salmonids was present in deeper pool on meanders and beneath boulder-cascade areas. Whilst some good suitability for European eel existed only a single adult eel was recorded. There was no suitability for lamprey.

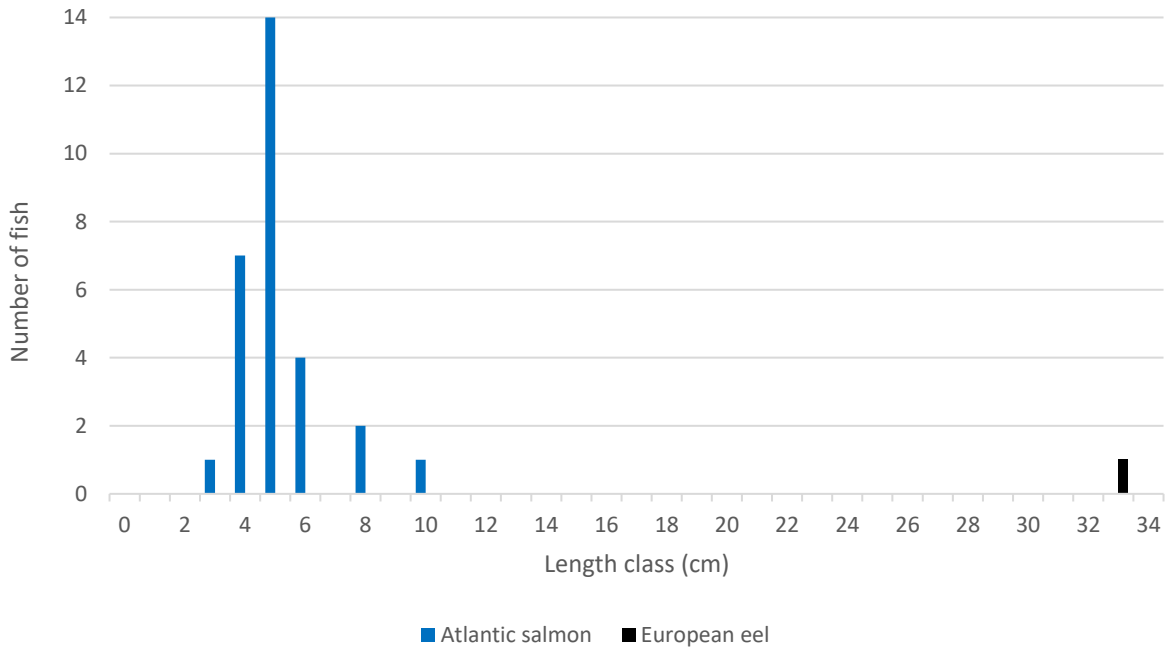

Figure 3.17 Length frequency distribution recorded via electro-fishing at SP18 on the Lowerymore River, September 2024

Plate 3.18 Atlantic salmon fry (0+) recorded at site SP18 on the Lowerymore River, September 2024

3.1.19 Site L1 – Carrickaduff Lough, Meenbog

Site L1 was located at Carrickaduff Lough, a small 0.5ha upland oligotrophic waterbody within the wind farm site. Although the lacustrine conditions prevented backpack electro-fishing, a fisheries habitat appraisal was undertaken at the site. The small, shallow (1-4m) peatland lake was considered of moderate value for brown trout with a small number of trout observed surface feeding on insects during the site visit. The site had poor connectivity with downstream watercourses in the LeaghanyRiver_SC_010 sub-catchment (e.g. Glendergan River) and thus was of low suitability for European eel.

Plate 3.19 Representative image of Carrickaduff Lough, July 2024

Table 3.1 Fish species densities per m^2 recorded at sites in the vicinity of Meenbog wind farm via electro-fishing in July and September 2024 (values in **bold** represent the highest densities recorded for each species, respectively)

Site	Watercourse	CPUE (elapsed time)	Approx. area fished (m^2)	Fish density per m^2					
				Atlantic salmon	Brown trout	European eel	Minnow	Stone loach	Three-spined stickleback
SP1	Unnamed stream	5	55	0.000	0.000	0.000	0.000	0.000	0.000
SP2	Croaghonagh River	10	175	0.051	0.051	0.000	0.000	0.000	0.000
SP3	Bunadowen River	10	250	0.000	0.104	0.004	0.000	0.000	0.000
SP4	Bunadowen River	10	275	0.000	0.047	0.000	0.000	0.000	0.000
SP5	Bunadowen River	10	300	0.020	0.073	0.000	0.000	0.000	0.000
SP6	Shruhangarve	10	200	0.000	0.055	0.000	0.000	0.000	0.000
SP7	Glendergan River	10	300	0.000	0.010	0.000	0.000	0.000	0.000
SP8	Glendergan River	10	360	0.000	0.014	0.000	0.000	0.000	0.000
SP9	Mourne Beg River	10	260	0.204	0.077	0.004	0.000	0.000	0.000
SP10	Mourne Beg River	10	225	**0.324**	0.049	0.000	0.000	0.000	0.000
SP11	Mourne Beg River	10	400	0.138	0.040	0.000	0.000	0.000	0.000
SP12	Mourne Beg River	10	450	0.069	0.016	0.000	0.000	0.000	0.000
SP13	Mourne Beg River	10	360	0.119	0.006	0.003	**0.053**	0.000	0.000
SP14	Mourne Beg River	10	420	0.081	0.012	0.002	0.019	0.000	0.000
SP15	Mourne Beg River	10	400	0.043	0.093	0.005	0.075	**0.020**	**0.033**
SP16	Mourne Beg River	10	375	0.173	0.043	**0.005**	0.000	0.008	0.000

Site	Watercourse	CPUE (elapsed time)	Approx. area fished (m^2)	Fish density per m^2					
				Atlantic salmon	Brown trout	European eel	Minnow	Stone loach	Three-spined stickleback
SP17	Barrack Hill River	10	200	0.005	**0.110**	0.000	0.000	0.000	0.000
SP18	Lowerymore River	10	350	0.083	0.000	0.003	0.000	0.000	0.000

Table 3.2 Relative abundance of fish species of higher conservation value recorded via **electro-fishing** in the vicinity of Meenbog wind farm, July or September 2024

Site	Watercourse	Atlantic salmon	Brown trout	European eel	Other species
SP1	Unnamed stream				No fish recorded
SP2	Croaghonagh River	Low	Low		
SP3	Bunadowen River		Medium	Low	
SP4	Bunadowen River		Low		
SP5	Bunadowen River	Low	Medium		
SP6	Shruhangarve		Low		
SP7	Glendergan River		Low		
SP8	Glendergan River		Low		
SP9	Mourne Beg River	High	Medium	Low	
SP10	Mourne Beg River	Very high	Low		
SP11	Mourne Beg River	High	Low		
SP12	Mourne Beg River	Medium	Low		
SP13	Mourne Beg River	Medium	Low	Low	Minnow
SP14	Mourne Beg River	Medium	Low	Low	Minnow
SP15	Mourne Beg River	Medium	Medium	Low	Minnow, stone loach, three-spined stickleback
SP16	Mourne Beg River	High	Medium	Low	Stone loach
SP17	Barrack Hill River	Low	Medium		
SP18	Lowerymore River	Medium		Low	
L1	Carrickaduff Lough				Fisheries appraisal only – brown trout observed

Conservation value: Atlantic salmon (*Salmo salar*) are listed under Annex II and V of the Habitats Directive [92/42/EEC]. European eel are 'critically endangered' according to most recent ICUN red list (Pike et al., 2020) and listed as 'critically engendered' in Ireland (King et al., 2011). With the exception of the Inland Fisheries Acts 1959 to 2017, brown trout and coarse fish species have no legal protection in Ireland.

4. Discussion

The watercourses in the vicinity of Meenbog wind farm were upland spate channels which retained good levels of naturalness despite some historical modifications locally. Siltation pressures (mostly from peat escapement) and eutrophication pressures (e.g. afforestation) were evident throughout much of the survey area, particularly on the Bunadowen, Mourne Beg and Glendergan rivers. However, many of the watercourses were of high value for salmonids, particularly the larger channels surveyed. A typical diversity of fish species for the Mourne Beg_SC_010, Mourne Beg_SC_020, and Eske_SC_010 river sub-catchments was recorded during the electro-fishing survey, with Atlantic salmon, brown trout, European eel, stone loach, minnow and three-spined stickleback captured (**Table 3.1, 3.2**).

A large scale peat slide event occurred in November 2020, significantly damaging habitats and causing fish mortalities on the Sruhangarve and downstream connecting Mourne Beg River. However, a swift recovery of fisheries habitats occurred (Triturus, 2022) and, evidently, has continued to do so in the interim period. Whilst evidence of impacts are still apparent, European eel and a recruiting population of brown trout are again present in the Sruhangarve (which likely lost all fish due to the peat slide), and the Mourne Beg River remains a highly important and productive habitat for Atlantic salmon.

Salmonid populations were widespread in vicinity of Meenbog wind farm. With the exception of site SP1 (located in the uppermost reaches of a small low order tributary), salmonids were recorded at all riverine survey sites. Brown trout were also observed at Carrickaduff Lough (site L1), a small oligotrophic lake within the wind farm site. Annex II Atlantic salmon were recorded from a total of 12 no. sites on the Croaghonagh River (site SP2), lower Bunadowen River (SP5), Barrack Hill River (SP17), Lowerymore River (SP18) and all survey sites on the Mourne Beg River (SP10, SP11, SP12, SP13, SP14, SP15 & SP16) (**Table 3.2**). The highest salmonid densities were recorded from the Mourne Beg River (**Table 3.1**), reflecting the superior quality spawning and nursery habitats present. The Lowerymore is also regionally important salmon spawning and nursery habitat, with the value of the upper reaches (including the current survey area) increasing considerably following instream works to address fish passage issues at the White Goat's Island falls (2006), the seeding with unfed salmon fry in the upper reaches in the early 2000s and riparian enhancement (IFI, 2011). Smaller watercourses such as the Sruhangarve, Barrack Hill River, upper Bunadowen River and upper Glendergan River[1] are not of significant value for Atlantic salmon but do support smaller brown trout populations, as would be anticipated for such upland channel types (Wood & Budy, 2009; O'Grady, 2006; Amiro, 1993; Richardson, 1993).

In support of previous surveys and data, no lamprey ammocoetes (*Lampetra* sp.) were recorded during targeted electro-fishing at the 18 no. riverine sites (**Table 3.1, 3.2**). The majority of the survey sites were inimical to lamprey given their upland, eroding/cascading/high-energy nature. Naturally, such sites do not encourage the deposition of fine, organic rich sediment required by larval lamprey and are dominated by larger substrata not suitable for spawning (Goodwin et al., 2008; Aronsuu & Virkkala, 2014). Furthermore, where present, sediment accumulations were dominated by peat (humic) deposits which are not suitable for larval lamprey. However, the Mourne Beg River is known to support *Lampetra* sp. in its lower reaches (Niven & McAuley, 2013), where conditions more favourable to the

[1] Atlantic salmon, brown trout, lamprey (*Lampetra* sp.), European eel and minnow are known from the lower reaches of the Glendergan River (Niven & Donnelly, 2018)

species become more common (i.e. slower-flowing water, higher proportion of small substrata for spawning, greater frequency of soft sediment areas for larval burial etc.).

European eel are Red-listed in Ireland (King et al., 2011) and are classed as 'critically endangered' on a global scale (Pike et al., 2020). As would be expected for upland spate channels, recorded densities of European eel were low in the current survey, with the species recorded from single sites on the Bunadowen River (SP3) and Lowerymore River (SP18) in addition to 5 no. sites on the Mourne Beg River (SP13, SP14, SP15 & SP16) (**Table 3.1, 3.2**). The absence of eel from other physically suitable sites (e.g. ample boulder refugia) primarily reflects the upland nature of the surveyed watercourses, which provide sub-optimal eel habitat (Matondo et al., 2021; Chadwick et al., 2007; Laffaille et al., 2003). Furthermore, eel abundance naturally decreases with gradient and distance from marine habitats (Harwood et al., 2022; Degerman et al., 2019).

Although previously recorded in the upper reaches of the Mourne Beg River (Triturus & Loughs Agency 2021 data), no pike (*Esox lucius*) were recorded in the current survey. Whilst genetic analysis has revealed pike to be native to Ireland (Pedreschi et al., 2014), the species is not native to the Mourne Beg system. Pike are known to be present in Lough Mourne (Loughs Agency pers. comm.), from which the Mourne Beg River emanates, and it would appear that the species naturally migrated downstream from this location. However, whether this was an isolated event or is ongoing is unclear. In light of poor habitat suitability in the upper Mourne Beg River, a pike population may have failed to establish in the watercourse.

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Aquatic baseline report for Meenbog wind farm, Co. Donegal (2025)

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October 2025

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1. Introduction

1.1 Background

Triturus Environmental Ltd. were commissioned by MKO to conduct baseline aquatic surveys to inform the Remedial Environmental Impact Assessment Report (rEIAR) for Meenbog wind farm located near Ballybofey, Co. Donegal (**Figure 2.1**).

Undertaken on a catchment-wide scale, this report provides a baseline assessment of the aquatic ecology including fisheries and biological water quality, as well as protected species and habitats in the vicinity of the development. Aquatic surveys were undertaken in July 2025 and would update catchment wide surveys previously completed by Triturus in July and September 2024 (Triturus, 2025a), thus ensuring temporal data validity.

2. Methodology

2.1 Selection of watercourses for assessment

All freshwater watercourses which could be affected directly or indirectly by the development and associated infrastructure were considered as part of the current assessment. Thus, a total of 18 no. riverine sites and 1 no. lake site were selected for detailed aquatic assessment (**Table 2.1, Figure 2.1**). The courses and nomenclature for the watercourses surveyed followed Environmental Protection Agency (EPA) and Ordnance Survey of Northern Ireland (OSNI) mapping.

Riverine survey sites were present on the Croaghonagh River (01C31) and an unnamed tributary, Bunadowen River (01B01), Shruhangarve (01S26), Glendergan River (GBNI0100880), Mourne Beg River (01M01), Barrack Hill River (37B16) and Lowerymore River (37L01) (**Table 2.1**). Carrickaduff Lough (site L1) was also surveyed.

The survey area within the MourneBeg_SC_010 and MourneBeg_SC_020 river sub-catchments. The uppermost reaches of the Mourne Beg River (EPA code: 01M01), near Lough Mourne, forms part of the Croaghonagh Bog SAC (000129), a site designated for blanket bog habitat. From near the Sruhangarve River confluence (within the Republic of Ireland), the Mourne Beg River is located within the River Finn SAC (002301), for which Atlantic salmon (*Salmo salar*) are listed as a qualifying interest (NPWS, 2014). The Mourne Beg River, from its confluence with the Sruhangarve, also forms part of the River Foyle and Tributaries ASSI (229), which is designated for, among other species, Atlantic salmon (DAERA, 2015). In the upper catchment, the river also forms a boundary with Croagh Bog ASSI (378) (no aquatic qualifying interests).

Please note this aquatic report should be read in conjunction with the Remedial Environmental Impact Assessment Report (rEIAR) prepared for the wind farm development. More specific aquatic methodology is outlined below and in the appendices of this report.

2.2 Aquatic site surveys

Aquatic surveys were conducted on the 28th, 29th, 30th and 31st July 2025. Survey effort focused on both instream and riparian habitats at each aquatic sampling location and included a fisheries assessment (electro-fishing and or fisheries habitat appraisal), white-clawed crayfish survey, macrophyte and aquatic bryophyte survey and biological water quality sampling (Q-sampling) or macro-invertebrate sweep sampling (where applicable) (**Figure 2.1**). This holistic approach informed the overall aquatic ecological evaluation of each site/watercourse in context of the wind farm and ensured that any habitats and species of high conservation value would be detected to best inform mitigation.

In addition to the ecological characteristics of the site, a broad aquatic and riparian habitat assessment was conducted utilising elements of the methodology given in the Environment Agency's 'River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003' (EA, 2003) and the Irish Heritage Council's 'A Guide to Habitats in Ireland' (Fossitt, 2000). This broad characterisation helped define the watercourses' conformity or departure from naturalness. All sites were assessed in terms of:

- Physical watercourse/waterbody characteristics (i.e. width, depth, channel form) including associated evidence of historical drainage
- Substrate type and relative condition, listing substrate fractions in order of dominance (i.e. bedrock, boulder, cobble, gravel, sand, silt etc.)
- Flow type by proportion of riffle, glide and pool in the sampling area
- An appraisal of the macrophyte and aquatic bryophyte community at each site
- Riparian vegetation composition and bordering land use practices

Table 2.1 Location of *n*=19 aquatic survey sites in the vicinity of Meenbog wind farm, Co. Donegal

Site no.	Watercourse	EPA code	Location	X (ITM)	Y (ITM)
SP1	Unnamed stream	n/a	Croaghonagh	605010	887018
SP2	Croaghonagh River	01C31	Croaghonagh	606385	888005
SP3	Bunadowen River	01B01	Meenbog	605634	885263
SP4	Bunadowen River	01B01	Meenbog	606297	886277
SP5	Bunadowen River	01B01	Croaghonagh	608092	887606
SP6	Shruhangarve River	01S26	Sruhangarve Bridge	610171	887234
SP7	Glendergan River	GBNI0100880	Slievedoo	607769	883831
SP8	Glendergan River	GBNI0100885	Killeteer Forest Park	608916	881721
SP9	Mourne Beg River	01M01	Croaghonagh	606421	888291
SP10	Mourne Beg River	01M01	Meenbog	608253	887857
SP11	Mourne Beg River	01M01	Meenbog	609865	888295
SP12	Mourne Beg River	01M01	Meenbog	610608	887660
SP13	Mourne Beg River	01M01	Croagh Bridge	612487	885772
SP14	Mourne Beg River	01M01	Meenreagh Bridge	614305	885180
SP15	Mourne Beg River	01M01	Laghtfoggy	618510	883578
SP16	Mourne Beg River	01M01	Mourne Bridge	620654	883800
SP17	Barrack Hill River	37B16	Croaghonagh	604010	887099
SP18	Lowerymore River	37L01	Biddy O'Barnes	601989	884625
L1	Carrickaduff Lough	9925	Meenbog	607570	885069

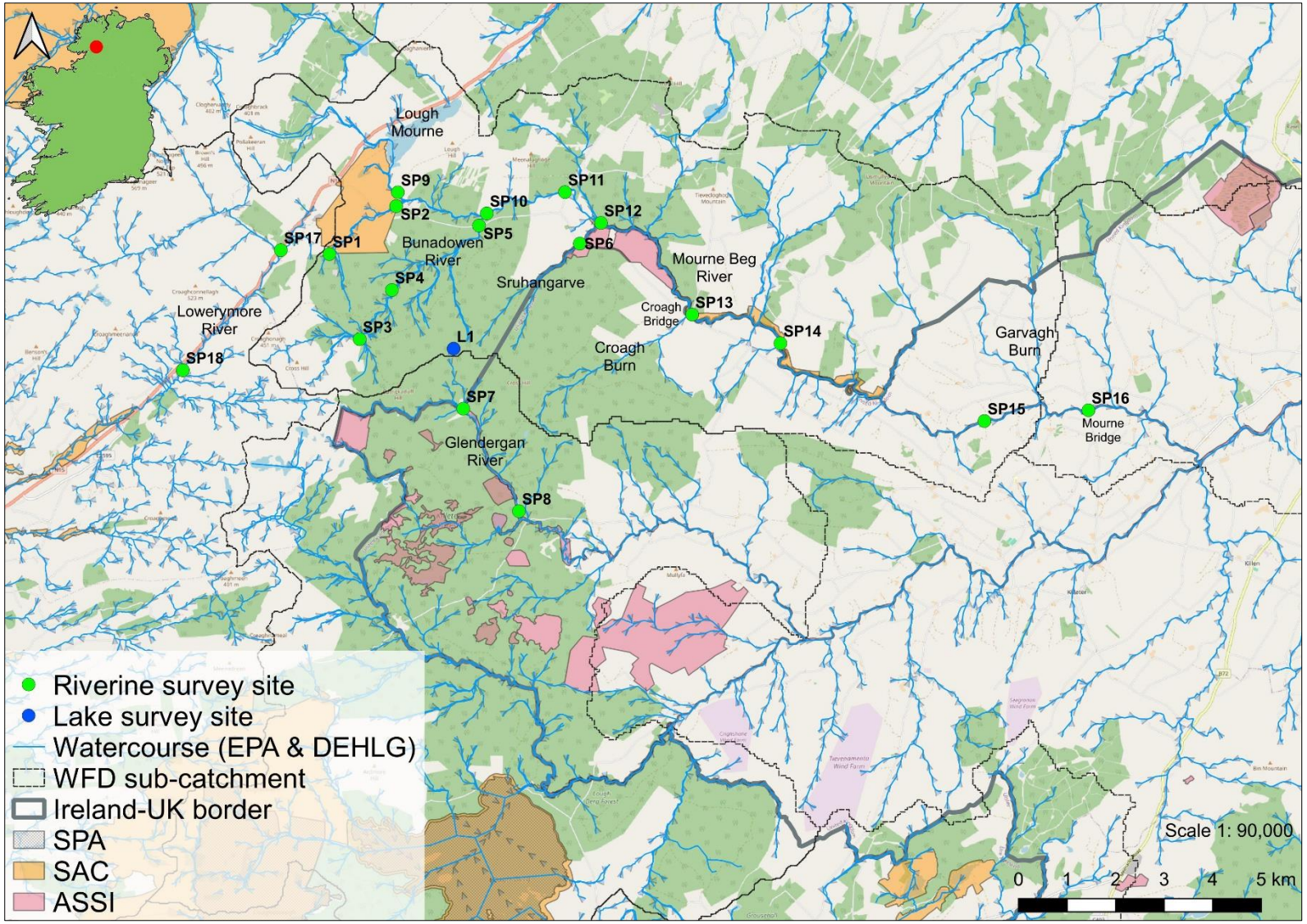

Figure 2.1 Overview of the aquatic survey sites in the vicinity of Meenbog wind farm, July 2025

2.3 Fisheries assessment & habitat appraisal

A single anode Smith-Root LR24 backpack (12V DC input; 300V, 100W DC output) was used to electro-fish sites on riverine watercourses in the vicinity of the development in July 2025 (**Table 2.1, Figure 2.1**), following notification to the Lough's Agency (under the conditions of a Section 69 permit) and Inland Fisheries Ireland (under the conditions of a Department of Climate, Energy and the Environment (DCEE) licence). The survey was undertaken in accordance with best practice (CFB, 2008; CEN, 2003) and licencing requirements.

Furthermore, a fisheries habitat appraisal of all aquatic survey sites was undertaken to establish their importance for salmonid, lamprey, European eel and other fish species. The baseline assessment also considered the quality of fisheries habitats within the vicinity of the survey sites. For detailed survey methodology, please refer to accompanying fisheries assessment report in **Appendix A.**

2.4 White-clawed crayfish survey

White-clawed crayfish (*Austropotamobius pallipes*) surveys were undertaken at the aquatic survey sites in July 2025 under a National Parks and Wildlife (NPWS) open national licence (C164/2025) as prescribed by Sections 9, 23 and 34 of the Wildlife Act (1976-2023), to capture and release crayfish to their site of capture. As per Inland Fisheries Ireland aquatic biosecurity recommendations, the crayfish sampling started at the uppermost site(s) of the wind farm catchment/sub-catchments in the survey area to minimise the risk of transfer invasive propagules (including crayfish plague) in an upstream direction.

Hand-searching of instream refugia and sweep netting was undertaken according to Reynolds et al. (2010). An appraisal of white-clawed crayfish habitat at each site was conducted based on physical habitat attributes (Gammell et al., 2021; Peay, 2003), water chemistry and incidental records in mustelid spraint. Additionally, a desktop review of crayfish records within the wider survey area was completed.

2.5 Biological water quality (Q-sampling)

The 18 no. riverine survey sites were assessed for biological water quality through Q-sampling in July 2025 (**Table 2.1**). All samples were taken with a standard kick sampling hand net (250mm width, 500µm mesh size) from areas of riffle/glide utilising a 2-minute kick sample, as per Environmental Protection Authority (EPA) methodology (Feeley et al., 2020). Large cobble was also washed at each site for 1-minute (where present) to collect attached macro-invertebrates (as per Feeley et al., 2020). Samples were elutriated and fixed in 70% ethanol for subsequent laboratory identification to species level. Samples were converted to Q-ratings as per Toner et al. (2005) and assigned to WFD status classes (**Table 2.2**). Any rare invertebrate species were identified from the NPWS Red List publications for beetles (Foster et al., 2009), mayflies (Kelly-Quinn & Regan, 2012), stoneflies (Feeley et al., 2020) and other relevant taxa (i.e. Byrne et al., 2009; Nelson et al., 2011).

Table 2.2 Reference categories for EPA Q-ratings (Q1 to Q5) (Toner et al., 2005)

Q value	WFD status	Pollution status	Condition
Q5 or Q4-5	High status	Unpolluted	Satisfactory
Q4	Good status	Unpolluted	Satisfactory
Q3-4	Moderate status	Slightly polluted	Unsatisfactory
Q3 or Q2-3	Poor status	Moderately polluted	Unsatisfactory
Q2, Q1-2 or Q1	Bad status	Seriously polluted	Unsatisfactory

2.6 Lacustrine macro-invertebrate communities

Lake site L1 (Carrickaduff Lough) was sampled for macro-invertebrates via sweep netting. A standard pond net (250mm width, mesh size 500µm) was used to sweep macrophytes to capture macro-invertebrates. The net was also moved along the lake bed to collect epibenthic and epiphytic invertebrates from the substratum (as per Cheal et al., 1993). A 3-minute sampling period was employed. To ensure appropriate habitat coverage, the sampling period was also divided amongst the range of meso-habitats present at the survey site to get a representative sample for sub-habitats.

2.7 Macrophytes and aquatic bryophytes

Surveys of the macrophyte and aquatic bryophyte community were conducted by instream wading at each of the survey sites, with specimens collected (by hand or via grapnel) for on-site identification. An assessment of the aquatic vegetation community helped to identify any rare macrophyte species listed under the Flora (Protection) Order, 2022, The Wildlife (Northern Ireland) Order 1985 (as amended), Schedule 8 of the Northern Ireland Priority Species list, the Irish Red list for vascular plants (Wyse-Jackson et al., 2016) and or the Irish Red list for aquatic bryophytes (Lockhart et al., 2012), or habitats corresponding to Annex I habitats, e.g., 'Water courses of plain to montane levels, with submerged or floating vegetation of the *Ranunculion fluitantis* and *Callitricho-Batrachion* (low water level during summer) or aquatic mosses (3260)', more commonly referred to as 'floating river vegetation'.

2.8 Otter signs

The presence of otter (*Lutra lutra*) was determined through the recording of otter signs within 150m radius of each survey site. Notes on the age and location of signs (ITM coordinates) were made, in addition to the quantity and visible constituents of spraint (i.e. remains of fish, crustaceans, molluscs etc.).

2.9 Aquatic ecological evaluation

The evaluation of aquatic ecological receptors contained within this report uses the geographic scale and criteria defined in the 'Guidelines for Assessment of Ecological Impacts of National Road Schemes' (NRA, 2009).

2.10 Biosecurity

A strict biosecurity protocol following IFI (2010) and the Check-Clean-Dry approach was adhered to during surveys for all equipment and PPE used. Disinfection of all equipment and PPE before and after use with Virkon™ was conducted to prevent the transfer of pathogens or invasive propagules between survey sites. Surveys were undertaken at sites in a downstream order to minimise the risk of upstream propagule mobilisation. Particular cognisance was given towards preventing the spread or introduction of highly virulent crayfish plague. Any aquatic invasive species or pathogens recorded within or adjoining the survey areas were geo-referenced. All Triturus staff are certified in 'Good fieldwork practice: slowing the spread of invasive non-native species' by the University of Leeds.

3. Desktop review

3.1 Survey area description

Meenbog wind farm is located in an upland area, approximately 10km southwest of Ballybofey, Co. Donegal (**Figure 2.1**). The site is within the River Foyle catchment (GBNIIENW). The aquatic survey sites were located within the Mourne Beg_SC_010, Mourne Beg_SC_020, and Eske_SC_010 river sub-catchments. The site is primarily drained by Mourne Beg River (EPA code: 01M01) and its tributaries.

The watercourses in the vicinity of the wind farm are typically small, upland eroding channels (FW1; Fossitt, 2000) and drainage ditches (FW4) (see **section 4** for more details). Land use practices are predominantly coniferous forestry (CORINE 312) and transitional woodland-shrub (324) in more upland areas with lower altitudes dominated by peat bogs (412). The wider survey area featured land principally utilised as pastures (231). Predominantly, the watercourses flowed over areas of Neoproterozoic metasedimentary rocks of psammitic & pelitic schist, marble, amphibolite and diamictite with localised quartzite (Geological Survey of Ireland data).

3.2 Fisheries

The Mourne Beg River rises at Mourne Lough and flows, primarily through peatland areas, for approximately 26km before joining the River Derg 3.5km upstream of Castlederg, Co. Tyrone. The river is known to support Atlantic salmon (*Salmo salar*) and brown trout (*Salmo trutta*) in addition to European eel (*Anguilla anguilla*), minnow (*Phoxinus phoxinus*), stone loach (*Barbatula barbatula*), three-spined stickleback (*Gasterosteus aculeatus*) and pike (*Esox lucius*) (Triturus 2021 & 2024 data; Loughs Agency 2011-2021 data). It its lower reaches, the river also supports *Lampetra* sp. (Niven & McAuley, 2013). Within the wider Foyle catchment, the Mourne Beg is an important spawning river for Atlantic salmon.

The Bunadowen River (01B01), a Mourne Beg tributary, is also known to support Atlantic salmon, brown trout and European eel (Triturus 2021 & 2024 data; Loughs Agency 2020-21 data; Paul Johnston Associates, 2017). The Sruhangarve River (01S26), another Mourne Beg River tributary, is known to support European eel and a low density of brown trout (Triturus 2021 & 2024 data; Loughs Agency data, 2020-21; Paul Johnston Associates, 2017). The Croaghonagh River (also known as Mary Breen's Burn), a tributary of the Mourne Beg River, is known to support Atlantic salmon, brown trout and European eel (Triturus 2021 & 2024 data; Paul Johnston Associates, 2017).

The Glendergan River, a tributary of the River Derg, supports Atlantic salmon, brown trout, lamprey (*Lampetra* sp.), European eel and minnow (Triturus 2021 & 2024 data; Niven & Donnelly, 2018).

In the Eske sub-catchment, the Lowerymore River (37L01) is a highly productive Atlantic salmon habitat often supporting very high densities of fry (e.g. IFI, 2011), with European eel also present (Triturus 2021 & 2024 data). A tributary, the Barrack Hill River, supports Atlantic salmon and brown trout (Triturus 2021 & 2024 data).

3.3 Protected aquatic species

A comprehensive desktop review of available data from the National Parks and Wildlife Service (NPWS), National Biodiversity Data Centre (NBDC), Inland Fisheries Ireland (IFI), Loughs Agency, Botanical Society of Britain and Ireland (BSBI), Environmental Protection Agency (EPA) and Triturus databases for the 10km grid squares containing and adjoining the wind farm (i.e. H08, H18, H28) identified a low number of records for rare and or protected aquatic species within the vicinity of Meenbog wind farm.

A low number of contemporary Annex II otter (*Lutra lutra*) records (2002-2021) were available for the respective 10km grid squares. Most records were for the Mourne Beg River (including at Croagh Bridge, site S313) or River Derg. (**Figure 3.1**). Otter signs have also been recorded on the Corraffrin River and two other (unnamed) tributaries of the Mourne Beg River (squares H18 & H28) (Triturus 2021 data). The previous 2024 surveys (Triturus, 2025a) identified otter signs on the Bunadowen River (sites SP3, SP5) and the Mourne Beg River (SP14, SP15, SP16). Otters are also known to be present on other watercourses in the vicinity of Meenbog wind farm, including the Glendergan River (**Figure 3.1**) and are listed as a qualifying interest of the River Finn SAC (002301) and the River Foyle and Tributaries ASSI (229) with which a number of survey watercourses are located or share hydrological connectivity. No breeding (holts) or resting (couch) areas were identified in the vicinity of the survey sites in July or September 2024.

No records for macrophytes or aquatic bryophytes protected under the Flora (Protection) Order, 2022 or listed as Northern Ireland priority species were available for the respective grid squares. There were no freshwater pearl mussel (*Margaritifera margaritifera*) records available for the survey area or the H18, H18 and H28 10km grid squares.

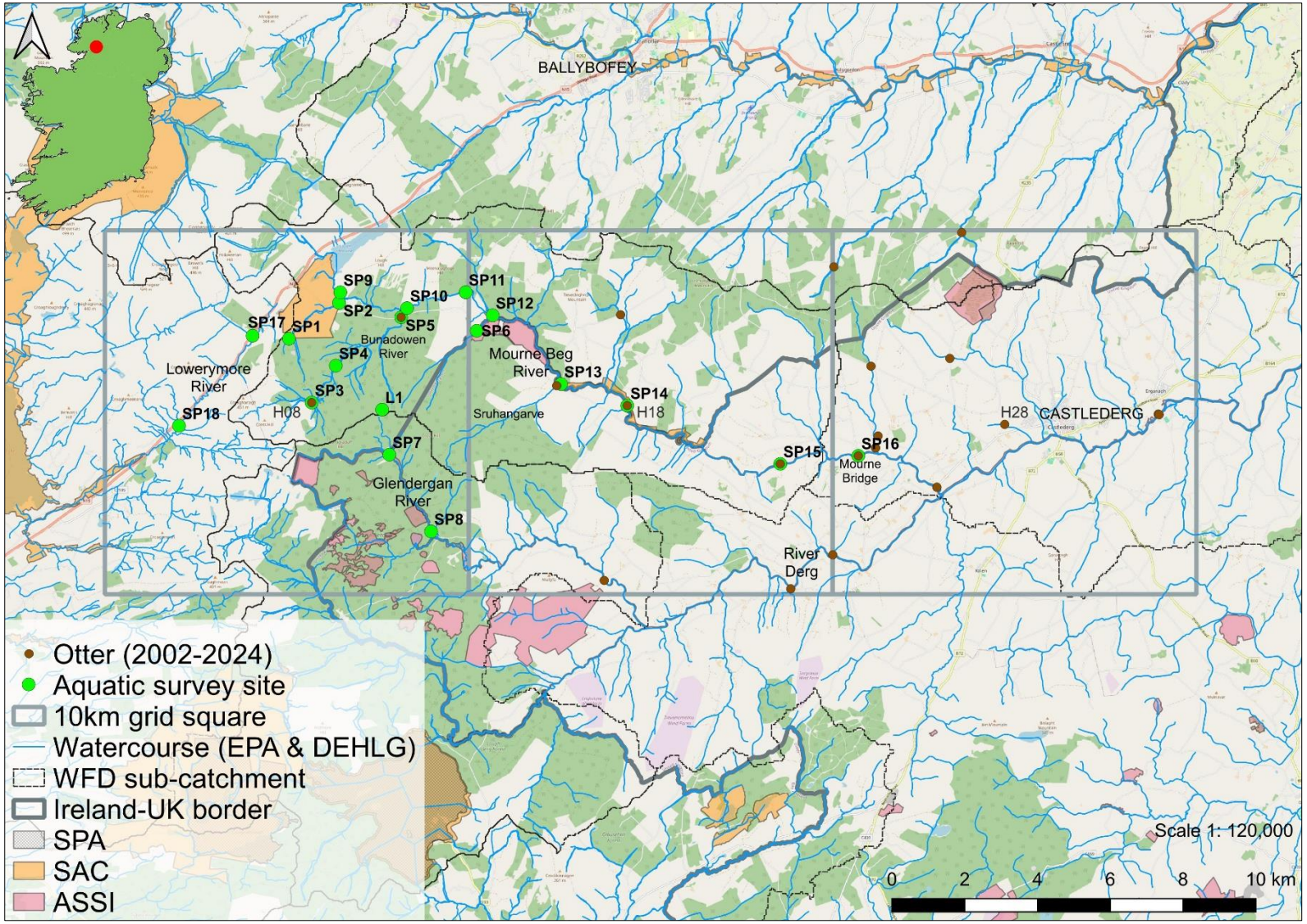

Figure 3.1 Otter records in the vicinity of Meenbog wind farm (source: Triturus, NPWS, EPA & NBDC data)

4. Results of aquatic surveys

The following section summarises each of the 19 no. survey sites in terms of aquatic habitats, physical characteristics and overall value for fish and macrophyte/aquatic bryophyte communities. Please refer to **Appendix A** (fisheries assessment report) for more detailed fisheries results. Biological water quality (Q-sample) results are also summarised for each riverine sampling site and in **Appendix B**. A summary of the fish species recorded at each survey site is provided in **Table 4.1**. A summary of the aquatic species and habitats of high conservation concern recorded during the surveys is provided in **Table 4.3**. An evaluation of the aquatic ecological importance of each survey site based on these aquatic surveys is provided and summarised in **Table 4.3**. Habitat codes are according to Fossitt (2000). Scientific names are provided at first mention only. Sites were surveyed in July 2025.

4.1 Aquatic survey site results

4.1.1 Site SP1 – Unnamed stream, Croaghonagh

Site SP1 was located on the upper reaches of an unnamed tributary of the Mourne Beg River, at a forestry track access crossing (twin pipe culvert). The small upland eroding spate channel (FW1: Fossitt, 2000) flowed over a moderate gradient and was 1-1.5m wide and 0.1-0.3m deep, with locally deeper pool to 1m. The incised channel featured regular natural falls/cascades over peat. The profile comprised riffle and shallow glide with occasional pool. The substrata were dominated by mobile (rounded) boulder and cobble with frequent interstitial mixed gravels and sands. Siltation, despite high peat staining, was relatively low. Given the high energy conditions and high shading of the narrow channel, macrophytes were absent. However, aquatic bryophyte coverage was locally high on stable substrata with frequent *Marsupella emarginata*. Filamentous algal cover was low but nonetheless present, indicating enrichment. The channel was heavily encroached by terrestrial vegetation with abundant rushes (*Juncus* spp.), bramble (*Rubus fruticosus* agg.), gorse (*Ulex europaeus*), heather (*Calluna vulgaris*), bog myrtle (*Myrica gale*) and scattered grey willow (*Salix cinerea*). The site was bordered by upland blanket bog (PB2) with scattered mixed age sitka spruce (*Picea sitchensis*).

No fish were recorded via electro-fishing at site SP1 (**Appendix A**). Despite some physical suitability for a small salmonid population (i.e. pool, mixed gravels etc.), the narrow upland channel was not of value to resident fish given its location in the uppermost reaches of the watercourse and high natural gradients. There was no suitability for white-clawed crayfish. No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site SP1 was of **local importance (lower value)** (**Table 4.4**).

Plate 4.1 Representative image of site SP1 on an unnamed Mourne Beg River tributary, July 2025

4.1.2 Site SP2 – Croaghonagh River, Croaghonagh

Site SP2 was located on the Croaghonagh River (01C31) at a local road crossing. The upland eroding spate tributary of the Mourne Beg River (FW1) crossed under a single arch masonry bridge over a cobbled apron but was largely natural in character with a meandering profile over a moderate gradient. The profile comprised glides and pools in a naturally incised channel. Riffle habitat was scarce. The river was 2-2.5m wide and 0.2-0.5m deep, with locally deeper pool to 1m. Peat staining was high at the time of survey. The substrata of the high energy site were dominated by boulder and large cobble, most of which were bedded and angular. Siliceous bedrock was present locally. Only localised areas of mixed gravels were present in pool tailings. Macrophytes were limited to rare bulbous rush (*Juncus bulbosus*) with some lesser spearwort (*Ranunculus flammula*) along the littorals. However, cover of aquatic bryophytes was high with abundant *Scapania undulata*. *Racomitrium aciculare* was occasional on boulder tops. Cover of filamentous algae and floc was very high, indicating significant enrichment. The banks were largely open and grass-dominated (e.g. *Molinia caerulea*). The riparian zones graded into wet grassland (GS4) and blanket bog (PB2), much of which was degraded.

Atlantic salmon (*Salmo salar*) and brown trout (*Salmo trutta*) were the only fish species recorded via electro-fishing at site SP2 (**Appendix A**). The site was of moderate value as a salmonid habitat, supporting a low density of mixed cohort salmon and trout. The quality of spawning habitat was poor given the predominance of larger substrata in the narrow spate channel in addition to eutrophication pressures. Whilst instream refugia were abundant, the density of juvenile salmonids was low (i.e. a moderate quality nursery). Frequent deep pools on meanders and at bank scours offered some value to adult salmonids. Despite some moderate suitability for European eel, none were recorded. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location of the site within the Croaghonagh Bog SAC (000129), the aquatic ecological evaluation of site SP2 was of **international importance (Table 4.4).**

Plate 4.2 Representative image of site SP2 on the Croaghonagh River, July 2025

4.1.3 Site SP3 – Bunadowen River, Meenbog

Site SP3 was located on the upper reaches of the Bunadowen River (01B01), a tributary of the Mourne Beg River. The largely natural upland eroding spate river (FW1) was 3m wide and 0.2-0.6m deep with 1m bank heights at grade with the adjoining hillside. The river flowed under a forestry access track via a large rendered box culvert. The profile comprised riffle, glide and pool sequences over high energy boulder-cascade reaches. The bed featured large boulder, cobble and scattered coarse angular gravels. The substrata were unbedded with moderate siltation (from peat). Floc cover was high, indicating water quality pressures. The high energy site did not support macrophytes but occasional *Racomitrium aciculare* and *Scapania undulata* were present on instream boulders. The riparian areas supported scattered grey willow and alder bordering sitka spruce plantations (WD4).

Brown trout and European eel (*Anguilla anguilla*) were the only fish species recorded via electro-fishing at site SP3 (**Appendix A**). The site was a good quality salmonid nursery supporting moderate numbers of juveniles and mixed cohort adults. The quality was reduced somewhat due to high floc cover and siltation pressures (peat). Moderate quality spawning areas by way of mixed gravels were present locally in deeper pool. These areas also provided valuable holding areas for adult salmonids. The high energy site was sub-optimal for European eel but a low number were recorded. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). Several otter spraints

(mixed age) were present on the concrete ledges of the box culvert crossing (ITM 605632, 885266)

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids and Red-listed European eel, the aquatic ecological evaluation of site SP3 was of **local importance (higher value)** (**Table 4.4**).

Plate 4.3 Representative image of site SP3 on the upper reaches of the Bunadowen River, July 2025

4.1.4 Site SP4 – Bunadowen River, Meenbog

Site SP4 was located on the upper reaches of the Bunadowen River (01B01) within the wind farm site. The natural upland eroding spate river (FW1) was 3-6m wide and 0.2-1.2m deep with 1m bank heights at grade with the adjoining upland blanket bog (PB3). The profile comprised riffle, glide and pool sequences over high energy boulder-cascade reaches with regular falls. The substrata comprised bedrock, large boulder and cobble with localised angular gravels and peat. The substrata were moderately bedded with moderate siltation (peat). Floc and filamentous algal cover was high, indicating significant eutrophication pressures. The high energy site did not support macrophytes. Instream boulders supported occasional *Racomitrium aciculare*, *Scapania undulata* and *Marsupella emarginata*. *Fontinalis antipyretica* was rare on large boulders. The riparian areas supported scattered grey willow with pockets of scattered mature sitka spruce and lodgepole pine (*Pinus contorta*). The site was bordered by extensive conifer plantations (WD4).

Brown trout was the only fish species recorded via electro-fishing at site SP4 (**Appendix A**). The site was a moderate quality salmonid nursery only given the very high energy characteristics in addition to eutrophication and siltation pressures (peat). The site was of moderate value as a spawning habitat due to the paucity of clean gravels and supported only low numbers of juveniles (0+). Deeper plunge

pools associated with cascades provided valuable holding areas for adult salmonids. The high energy site was sub-optimal for European eel and none were recorded. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids, the aquatic ecological evaluation of site SP4 was of **local importance (higher value)** (**Table 4.4**).

Plate 4.4 Representative image of site SP4 on the upper reaches of the Bunadowen River, July 2025

4.1.5 Site SP5 – Bunadowen River, Croaghonagh

Site SP5 was located on the lower reaches of the Bunadowen River (01B01) at a local road crossing c. 200m upstream of the Mourne Beg River confluence. The upland eroding spate channel (FW1) was largely natural in character and flowed over a moderate gradient and under the single arch masonry bridge over a cobbled apron. The profile comprised boulder cascades and fast-flowing glide with frequent small pools. The substrata were dominated by bedrock with bedded boulder. Cobbles were present locally with only highly localised mixed gravels. Due to high flow rates, macrophytes were limited with some bulbous rush and lesser spearwort locally. The aquatic bryophyte coverage was high with abundant *Scapania undulata*. *Racomitrium aciculare* was present on boulder tops with occasional *Marsupella emarginata*. The river in vicinity of the bridge was shaded by mature treelines of sycamore (*Acer psuedoplatanus*), rowan (*Sorbus aucuparia*) and grey willow with localised invasive rhododendron (*Rhododendron ponticum*) and scrub. Invasive juvenile rhododendron was scattered

along the banks. Downstream the banks graded into open heath/bog/wet grassland. The site was bordered by conifer plantations (WD4) and recent clear-fell (WS5).

Atlantic salmon and brown trout were the only fish species recorded via electro-fishing at site SP5 (**Appendix A**). The site was of moderate value as a salmonid habitat, supporting a low density of mixed cohort trout and lower numbers of salmon. This reflected the compacted/bedrock bed (leading to poor spawning), high flow rates and poor invertebrate prey resources (a mostly allochthonous system). Whilst the site was of good physical suitability as a salmonid nursery, only a low density of fish were present (in contrast to the downstream-connecting Mourne Beg River). Frequent pool areas provided some good quality holding areas for migratory adult salmonids. Despite some moderate suitability for European eel, none were recorded. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids (including Atlantic salmon), the aquatic ecological evaluation of site SP5 was of **local importance (higher value)** (**Table 4.4**).

Plate 4.5 Representative image of site SP5 on the lower reaches of the Bunadowen River, July 2025

4.1.6 Site SP6 – Shruhangarve River, Sruhangarve Bridge

Site SP6 was located on the Sruhangarve River (01S26) at Sruhangarve Bridge approximately 0.7km upstream of the Mourne Beg River confluence. The high energy upland spate channel (FW1) flowed over a mostly steep gradient and was 2-2.5m wide and highly variable in depth ranging from 0.1m to 0.6m. The profile comprised steep boulder and bedrock cascades with frequent associated small

plunge pools. Regular gradient falls of up to 0.75m were present. Typical of such a high gradient channel, the substrata were dominated by bedrock, angular boulder and large cobble, with a paucity of smaller substrata. Siltation was moderate despite high flow rates with high levels of peat staining. Filamentous algae cover was high locally and indicative of upstream eutrophication sources. Whilst macrophytes were absent, aquatic bryophyte coverage was relatively high with locally abundant *Scapania undulata* and *Marsupella emarginata*. *Racomitrium aciculare* was frequent on larger boulder. *Pellia* sp. liverwort was present on muddy sections of bank and along channel littorals. The open banks were exposed to low levels of sheep grazing (historically cleared) and were dominated by rushes (*Juncus* spp.). These areas graded into extensive degraded blanket bog. The site was bordered upstream by coniferous plantations (WD4) and blanket bog (PB2).

Brown trout and European eel were the only fish species recorded via electro-fishing at site SP6 (**Appendix A**). The very high energy, high gradient river supported a low density of adult trout, with no juveniles recorded. This reflected the near total absence of suitable spawning habitat in the steep gradient channel. Abundant small plunge pools provided valuable flow refugia and holding habitat for adult trout. The site (and wider channel) was not suitable for Atlantic salmon given the paucity of suitable spawning substrata. The high energy site was sub-optimal for European eel although a single eel was recorded. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). A regular otter spraint site (mostly old) was recorded on a boulder under the bridge (ITM 610173, 887230).

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location of the site within the Croagh Bog ASSI (378), the aquatic ecological evaluation of site SP6 was of **national importance** (**Table 4.4**).

Plate 4.6 Representative image of site SP6 on the Sruhangarve River, July 2025

4.1.7 Site SP7 – Glendergan River, Slievedoo

Site SP7 was located on the upper reaches of the Glendergan River (GBNI0100880) adjacent to the wind farm site. The upland eroding peatland river (FW1) was 1m wide and 0.3-1.2m deep with 1m bank heights. The sinuous U-shaped incised channel meandered through deep peat. The profile was dominated by deep glide with localised riffle and deeper pool. The substrata comprised bedded cobbles, gravels and exposed peat. The substrata were very heavily silted (covered with peat). Eutrophication pressures were also evident with high cover of floc. The high turbidity (from peat) and shading precluded macrophyte or aquatic bryophyte growth. The riparian areas supported pockets of upland blanket bog (PB2) between mature sitka spruce plantations (WD4) with recent clear-fell upstream (WS5).

Brown trout was the only fish species recorded via electro-fishing at site SP7 (**Appendix A**). The site supported a low density of adult trout with no juveniles recorded. The site was a poor quality salmonid nursery given the depth profile and high siltation pressures. The spawning value was poor due to the heavily silted gravels and high floc cover. However, some good quality holding habitat was present locally for adult salmonids. The site was sub-optimal for European eel (limited refugia) and none were recorded. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location of the site within the River Foyle and Tributaries ASSI (229), the aquatic ecological evaluation of site SP7 was of **national importance** (**Table 4.4**).

Plate 4.7 Representative image of site SP7 on the upper reaches of the Glendergan River, July 2025

4.1.8 Site SP8 – Glendergan River, Killeteer Forest Park

Site SP8 was located on the Glendergan River (GBNI0100885) at Killeteer Forest Park. The medium-sized upland eroding spate channel (FW1) had been locally modified historically but retained a good degree of naturalness despite bank modifications. The river was 3-5m wide and 0.2-0.6m deep, flowing over a moderate gradient in a natural V-shaped valley. The profile comprised boulder cascades with variable glide and frequent small pool up to 1m in depth. The substrata of the high energy site were dominated by angular (often large) boulder with locally abundant cobble. Mixed gravels were present interstitially but limited. Large woody debris was present locally and contributed to habitat heterogeneity. Peat staining was very high at the time of survey. Given the site characteristics, macrophytes were not present. The aquatic bryophyte *Scapania undulata* was locally abundant with *Racomitrium aciculare* on boulder tops. The mature riparian zones and escarpments supported abundant grey willow, rowan, downy birch (*Betula pubescens*), wood rush (*Luzula* sp.) and self-seeded sitka spruce. The site was bordered by maturing and mature coniferous plantations (WD4) with frequent broad-leaved species such as sycamore.

Brown trout was the only fish species recorded via electro-fishing at site SP8 (**Appendix A**). The high energy spate channel was of relatively low value for salmonids given the predominance of large substrata, high peat staining, siltation pressures and a poor prey invertebrate resources (i.e. mostly allochthonous). Suitable spawning habitat was very limited and exposed to siltation. Whilst small areas of pool and deeper glide habitat were widespread, these supported only a very low density of adult trout. The absence of Atlantic salmon and European eel would indicate downstream barriers, in addition to poor habitat suitability. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location of the site within the River Foyle and Tributaries ASSI (229), the aquatic ecological evaluation of site SP8 was of **national importance** (**Table 4.4**).

Plate 4.8 Representative image of site SP8 on the Glendergan River, July 2025

4.1.9 Site SP9 – Mourne Beg River, Croaghonagh

Site SP9 was located on the upper reaches of the Mourne Beg River (01M01) at a local access crossing c. 0.7km downstream of Mourne Lough. The upland eroding spate channel (FW1) was largely natural in character with a meandering profile and flowed under a clear-span bridge with a rendered apron. The low gradient river was 3-6m wide and 0.1-0.3m deep, with locally deeper pool to >1.5m. The profile comprised shallow glide and abundant riffle with localised pool. The substrata were dominated by cobble and small boulder with locally frequent mixed gravels. Sand accumulations were occasional along the littorals and in pools. Siltation was low overall although significant flocculent accumulations were present in depositing pools. The site featured a relatively high coverage of macrophytes with cobble/riffle areas and exposed bars supporting locally abundant bulbous rush and bog pondweed (*Potamogeton polygonifolius*). Heterophyllus lesser spearwort was abundant along channel margins and littoral areas. Mucilaginous cyanobacteria and the filamentous rhodophyte *Torularia atrum* were abundant. Cover of filamentous algae was moderate, indicating enrichment from adjoining land use pressures (cutover bog). Aquatic bryophyte coverage was high with frequent *Scapania undulata*. The open banks graded into cutover bog (PB4) with abundant rushes (*Juncus* spp.), bog myrtle, purple moor grass and heather.

Atlantic salmon and brown trout were recorded via electro-fishing at site SP9 (**Appendix A**). The site was of high value as a salmonid habitat, with abundant instream boulder/cobble supporting a high density of juvenile salmon and a lower number of trout. At the head of these shallow areas, mixed gravels and smaller clean cobbles provided high quality salmonid spawning habitat. Deeper pool, and to a lesser extent, bank scours, offered valuable flow refugia and holding habitat for adult salmonids. Suitability for European eel was good although none were recorded. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). No otter signs were recorded in vicinity of the site (few marking opportunities present).

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location of the site within the Croaghonagh Bog SAC (000129), the aquatic ecological evaluation of site SP9 was of **international importance** (**Table 4.4**).

Plate 4.9 Representative image of site SP9 on the upper reaches of the Mourne Beg River, July 2025

4.1.10 Site SP10 – Mourne Beg River, Meenbog

Site SP10 was located on the Mourne Beg River (01M01) immediately downstream of the Bunadowen River confluence. The natural upland spate river (FW1) was 5-6m wide and 0.2-0.5m deep with low lying open banks. The profile comprised abundant and often homogenous shallow glide and riffle with localised pool, typically on meanders. The substrata were dominated by cobble and mixed gravels (often coarse) with only scattered boulder. Sands were frequent along channel littorals with some organic rich accumulations also present adjoining exposed bars. Siltation was low overall but flocculent peat was present throughout. Peat staining from the Bunadowen River was high. Upstream of the confluence, macrophyte coverage was high with abundant bulbous rush and frequent marginal lesser spearwort. Alternate milfoil (*Myriophyllum alterniflorum*) was rare. However, downstream, the mobile bed typically precluded growth of macrophytes. Aquatic bryophyte coverage was locally high with *Scapania undulata* and *Racomitrium aciculare*. Filamentous algae and floc cover was relatively high, indicating significant enrichment (both upstream and downstream of confluence). The open banks supported rank grass vegetation with an absence of tree cover. The site was bordered by areas of species-poor wet grassland (GS4), immature coniferous plantations (WS2) and mature conifer plantations (WD4). Further clear-felling had occurred along the south bank since the 2024 survey.

Atlantic salmon, brown trout, sea trout and European eel were recorded via electro-fishing at site SP10 (**Appendix A**). The site was of very high value for salmonids with abundant mobile cobble and

macrophyte beds supporting a relatively high density of juvenile Atlantic salmon. High quality spawning habitat (especially for salmon) was present throughout given the presence of cobble and mixed gravels free of significant siltation (both upstream and downstream of confluence). Localised pools were of high value for migratory adult salmonids, including anadromous sea trout (of which one example was recorded). There was some moderate suitability for European eel, with a single example recorded. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). No otter signs were recorded in vicinity of the site (few marking opportunities present).

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids (including Atlantic salmon) and Red-listed European eel, the aquatic ecological evaluation of site SP10 was of **local importance (higher value)** (**Table 4.4**).

Plate 4.10 Representative image of site SP10 on the upper reaches of the Mourne Beg River, July 2025

4.1.11 Site SP11 – Mourne Beg River, Meenbog

Site SP11 was located on the Mourne Beg River (01M01) at a local road crossing. The natural upland spate river (FW1) was 7-10m wide and 0.2-0.5m deep with low lying open banks. The profile of the high energy site comprised shallow, fast-flowing glide and riffle with frequent small, shallow pool (mostly along bank scours). Deeper glide was present upstream with deeper pool (to 1m) located immediately downstream of the bridge apron. The substrata were dominated by mobile cobble with frequent boulder and localised bedrock. Mixed gravels were present in pool tailings and between boulders. Sand accumulations (with finer gravels) were largely confined to the channel margins. Peat staining was high resulting in sparse macrophyte growth. However, bulbous rush was locally frequent with rare alternate milfoil and highly localised bog pondweed in deeper glide areas. The bryophytes *Scapania undulata*, *Chiloscyphus polyanthos* and *Fontinalis antipyretica* were abundant, with some

localised *Fontinalis squamosa*. *Racomitrium aciculare* was present on boulder tops. Cover of filamentous algae was high. Indicating significant eutrophication. The open banks supported abundant rushes (*Juncus* spp.) and scattered rowan, grey willow and broom (*Cytisus scoparius*), with almost no tree cover (low riparian shading). The site was bordered by wet grassland (GS4), wet heath (HH3) and coniferous afforestation (WD4).

Atlantic salmon, brown trout and European eel were recorded via electro-fishing at site SP11 (**Appendix A**). The site was of high value for salmonids with abundant boulder, cobble and macrophyte beds supporting a relatively high density of juvenile Atlantic salmon and low numbers of mixed cohort trout. Mixed substrata provided good quality spawning habitat locally, with deeper glide and pool offering valuable holding habitat for adult salmonids. There was some moderate suitability for European eel, with a single example recorded. Pike (*Esox lucius*), originating from the upstream Lough Mourne, are known from the site (Triturus & Loughs Agency data) although none were recorded in the current survey. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). No otter signs were recorded in vicinity of the site (few marking opportunities present).

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids (including Atlantic salmon) and Red-listed European eel, the aquatic ecological evaluation of site SP11 was of **local importance (higher value)** (**Table 4.4**).

Plate 4.11 Representative image of site SP11 on the Mourne Beg River, July 2025

4.1.12 Site SP12 – Mourne Beg River, Meenbog

Site SP12 was located on the Mourne Beg River (01M01) at the Sruhangarve River confluence. The natural upland spate river (FW1) was 12-15m wide and varied from 0.2m to 1.2m in depth with low lying open banks. The profile of the high energy site was dominated by deeper, slower-flowing glide and pool with localised riffles associated with natural bedrock and boulder islands. Riffle habitat was more frequent upstream of the confluence. The substrata were dominated by bedded boulder and cobble with frequent bedrock. However, localised areas of mobile cobble and coarse gravels were present at the heads and tails of pool areas. Sand accumulations (with finer gravels) were largely confined to the channel margins and often exposed (dry). Peat staining was high resulting in sparse macrophyte growth. Alternate milfoil and bulbous rush were present but rare. Aquatic bryophyte coverage was high with abundant *Fontinalis antipyretica* and *Fontinalis squamosa* in addition to more occasional *Chiloscyphus polyanthos*. *Racomitrium aciculare* was frequent on the tops of boulders and bedrock. The open banks were exposed to low intensity sheep grazing and graded into degraded cutover bog (PB4) with characteristic sedges, bog myrtle, bog asphodel (*Narthecium ossifragum*) and purple moor grass. Mature coniferous afforestation (WD4) with a lack of buffer zone was present to the bank top along the north bank.

Atlantic salmon and brown trout were the only fish species recorded via electro-fishing at site SP12 (**Appendix A**). Despite good physical suitability, including heterogenous habitat featuring riffle, glide and pool areas, the site supported a relatively low fish density. As noted in previous surveys, juvenile abundance was higher immediately upstream of the Sruhangarve River confluence. Excellent quality holding areas were present by way of pools and bank scours but a paucity of adult salmonids was recorded. Good quality spawning areas were also present. Despite some good suitability for European eel, none were recorded. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). No otter signs were recorded in vicinity of the site, despite the presence of ample marking opportunities.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location of the site within the River Finn SAC (002301), the aquatic ecological evaluation of site SP12 was of **international importance** (**Table 4.4**).

Plate 4.12 Representative image of site SP12 on the Mourne Beg River, July 2025

4.1.13 Site SP13 – Mourne Beg River, Croagh Bridge

Site SP13 was located on the Mourne Beg River (01M01) at Croagh Bridge. The large upland spate channel flowed over a low gradient and was natural in character, although historical bank clearance had occurred near the bridge. The river was 12-15m wide and 0.2-0.4m deep. The profile comprised shallow glide and riffle with localised small shallow pool. Deeper glide predominated upstream and downstream of the bridge. The substrata were dominated by mobile cobble and coarse gravels with frequent boulder. Exposed cobble bars were present along the margins with some sand accumulations. Given the high energy conditions and high peat staining, macrophytes were limited to rare alternate milfoil with some littoral bottle sedge (*Carex rostrata*) and lesser spearwort. Aquatic bryophyte coverage was relatively high with frequent *Rhynchostegium riparioides*, *Fontinalis antipyretica* and *Chiloscyphus polyanthos*. *Hygrohypnum luridum* and *Fontinalis squamosa* was present but rare. Filamentous algal cover was locally high in open glide and riffle, indicating enrichment pressures. Floc cover was low but nonetheless present, with some iron-oxidising bacteria (*Leptothrix ocrachea*) in pool slacks. The fenced riparian areas supported scattered grey willow, alder (*Alnus glutinosa*) and gorse near the bridge but trees had been cleared elsewhere. The site was bordered by semi-improved grassland (GA1) with some wet grassland (GS4). Coniferous afforestation (WD4) and degraded blanket bog (PB3) was present upstream.

Atlantic salmon, brown trout, European eel, minnow (*Phoxinus phoxinus*) and three-spined stickleback (*Gasterosteus aculeatus*) were recorded via electro-fishing at site SP13 (**Appendix A**). The site was of high value for salmonids, with excellent quality nursery and spawning habitat present upstream of the bridge. Shallow, bryophyte-rich, cobble-dominated areas supported relatively high densities of juvenile salmon. As per upstream, numbers of brown trout were low, despite high physical suitability and the presence of frequent small pool and deeper glide for holding. European eel were present in low densities, with abundant instream refugia present. There was no suitability for lamprey (habitat)

or white-clawed crayfish (water chemistry). Spraint from invasive mink (*Neovison vison*) was recorded on bedrock under the bridge.

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location of the site within the River Finn SAC (002301), the aquatic ecological evaluation of site SP13 was of **international importance (Table 4.3).**

Plate 4.13 Representative image of site SP13 on the Mourne Beg River at Croagh Bridge, July 2025

4.1.14 Site SP14 – Mourne Beg River, Meenreagh Bridge

Site SP14 was located on the Mourne Beg River (01M01) at Meenreagh Bridge. The large upland spate channel (FW1) flowed over a low gradient and was natural in character, although historical bank clearance had occurred (with possible boulder removal). The river was 12-16m wide and 0.2-0.5m deep. The profile comprised shallow glide and riffle with localised small shallow pool and bank scours. Deeper glide predominated upstream and downstream of the bridge. The substrata were dominated by boulder with mobile cobble. Mixed gravels were present locally. Exposed cobble bars were present along the margins with some sand and finer gravel accumulations. Given the high energy conditions and high peart staining, macrophytes were limited to very occasional alternate milfoil with lesser spearwort and marsh pennywort (*Caltha palustris*) along the margins. Aquatic bryophyte coverage was relatively high with frequent *Fontinalis squamosa* and *Chiloscyphus polyanthos*. *Hygrohypnum luridum* was present locally with *Fontinalis antipyretica*. Filamentous algal cover was locally high in open glide and riffle, indicating eutrophication pressures. Floc cover was low but nonetheless present. The riparian areas were open (sometimes fenced) with scattered grey willow providing highly valuable thermal shading to the channel. The site was bordered by semi-improved grassland (GA1) with wet grassland (GS4).

Atlantic salmon, brown trout, minnow and three-spined stickleback were recorded via electro-fishing at site SP14 (**Appendix A**). The site was of high value for salmonids, with very good quality nursery and spawning habitat present upstream of the bridge. However, densities of juvenile salmonids was lower than anticipated given the quality habitat and this likely reflected poor invertebrate prey resources. As per upstream, numbers of brown trout were very low, despite high physical suitability and the presence of frequent small pool and deeper glide for holding. Despite good suitability by way of abundant instream refugia, no European eel were recorded. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location of the site within the River Finn SAC (002301), the aquatic ecological evaluation of site SP14 was of **international importance** (**Table 4.4**).

Plate 4.14 Representative image of site SP14 on the Mourne Beg River at Meenreagh Bridge, July 2025

4.1.15 Site SP15 – Mourne Beg River, Laghtfoggy

Site SP15 was located on the Mourne Beg River (01M01) at a ford crossing. The large upland spate channel flowed over a low gradient and was mostly natural in character, although historical bank clearance was widespread and boulder installations had occurred locally. The river was up to 20m wide and varied from 0.1m to 1m deep with a good habitat heterogeneity downstream of the ford. Deeper glide and pool were present upstream. In slower-flowing glide, the substrata were dominated by boulder and cobble. However, shallower riffle areas featured a higher proportion of mixed gravels and smaller cobble. Fine gravels and sands were present locally (associated with macrophyte beds). Riffle zones supported frequent water crowfoot (*Ranunculus* sp.), alternate milfoil and bog pondweed.

Reed canary grass (*Phalaris arundinacea*) grew on small instream islands/bars. Aquatic bryophyte coverage was high with locally abundant *Fontinalis antipyretica* and *Sciuro-hypnum plumosum* and frequent *Fontinalis squamosa* and *Chiloscyphus polyanthos*. The aquatic vegetation community was representative of Annex I floating river vegetation habitat (3260). Filamentous algal cover was high, indicating significant eutrophication pressures. The narrow riparian zones supported intermittent treelines of alder, ash (*Fraxinus excelsior*) and grey willow with abundant scrub vegetation. The site was bordered by improved pasture (GA1) with areas of wet grassland (GS4).

Atlantic salmon, brown trout, European eel, minnow, stone loach (*Barbatula barbatula*) and three-spined stickleback were recorded via electro-fishing at site SP15 (**Appendix A**). The site was of high value for salmonids, supporting good densities of both juvenile and adult year classes. Shallow *Ranunculus* zones downstream of the ford were of particularly high value as salmonid nursery habitats, with cobble-dominated bed upstream of the ford offering excellent refugia. These areas were also of very high value for spawning salmonids. Despite the presence of high quality deeper glide and pool, the density of adult salmonids (trout) was low but nonetheless considerably higher than upstream - this reflected increasing base-rich influences and superior prey resources. Suitability for European eel was high given abundant instream refugia although only a low density were recorded. There was some localised spawning habitat for lamprey although ammocoete areas (soft sediment) were absent. There was no suitability for white-clawed crayfish (water chemistry). No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location of the site within the River Foyle and Tributaries ASSI (229), the aquatic ecological evaluation of site SP15 was of **national importance** (**Table 4.4**).

Plate 4.15 Representative image of site SP15 on the Mourne Beg River, July 2025

4.1.16 Site SP16 – Mourne Beg River, Mourne Bridge

Site SP16 was located on the Mourne Beg River (01M01) at Mourne Bridge. The large upland spate channel flowed over a low gradient and was natural in character, although historical bank clearance had occurred locally. The large river was 25-30m wide and 0.1-0.4m deep. The profile comprised shallow glide and riffle with frequent small pool. Deeper glide and pool was present upstream of the bridge. Whilst the substrata were dominated by boulder and larger cobble, the bed was highly variable with frequent small areas of mixed gravels and sands present in association with macrophyte beds and in the lee of larger boulders. Sand accumulations were frequent along depositing margins with silt accumulations present in deeper glide upstream. The site was heavily vegetated with locally abundant water crowfoot (*Ranunculus* sp.) and various-leaved pondweed (*Potamogeton gramineus*). Alternate milfoil was occasional with stands of water horsetail (*Equisetum fluviatile*) present along the margins of deeper glide upstream. Aquatic bryophyte coverage was also high with abundant *Fontinalis antipyretica* and rarer *Fontinalis squamosa* and *Chiloscyphus polyanthos*. Although not diverse, the aquatic vegetation community was considered representative of Annex I floating river vegetation habitat (3260). Iron-oxidising bacteria (*Leptothrix ocrachea*) were abundant in pool slacks. Filamentous algal cover was low overall but nonetheless present. The narrow riparian zones supported mature intermittent treelines of alder, ash and grey willow, with abundant bramble scrub. The site was bordered by low intensity improved pasture (GA1).

Atlantic salmon, brown trout, European eel, minnow, stone loach and three-spined stickleback were recorded via electro-fishing at site SP16 (**Appendix A**). The site was of high value for salmonids, supporting relatively high densities of juvenile salmon and lower numbers of mixed cohort trout. The site was of greatest value as a salmonid nursery, with abundant instream refugia and macrophyte beds providing excellent quality habitat. These were also of high value for European eel which were recorded in low numbers. Good quality spawning habitat for both salmonid and lamprey was present

locally. Deeper glide upstream provided good holding habitat for migratory salmonids. Whilst beds of sand provided some low suitability for lamprey ammocoetes, none were recorded (*Lampetra* sp. known to present in the lower reaches; Niven & McAuley, 2013). There was no suitability for white-clawed crayfish (water chemistry). A regular otter spraint site with associated prints in sand was recorded on boulders underneath the bridge (ITM 620633, 883821).

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location of the site within the River Foyle and Tributaries ASSI (229), the aquatic ecological evaluation of site SP16 was of **national importance** (**Table 4.4**).

Plate 4.16 Representative image of site SP16 on the Mourne Beg River at Mourne Bridge, July 2025

4.1.17 Site SP17 – Barrack Hill River, Croaghonagh

Site SP17 was located on the Barrack Hill River (37B16), a tributary of the Lowerymore River. The small upland eroding spate river (FW1) was 2-3m wide, 0.2-0.4m deep with 1m bank heights. The channel was situated in a steep V-shaped valley. The profile comprised riffle, glide and pool sequences over high energy boulder-cascade reaches. The naturally sinuous channel had a bed of rounded boulder, cobble, mixed gravels and sand. The substrata were unbedded with light siltation. Eutrophication pressures were evident with filamentous green algae cover on c. 20% of the bed. The high energy site did not support macrophytes. Instream boulders supported occasional *Racomitrium aciculare*, *Chiloscyphus polyanthos* and *Scapania undulata*. The riparian areas supported scattered grey willow, alder, Scot's pine (*Pinus sylvestris*) and grey willow with understories supporting herbaceous vegetation and rank grasses.

Brown trout was the only fish species recorded via electro-fishing at site SP17 (**Appendix A**). The site

was a very good quality salmonid nursery given the good hydromorphology (rocky bed), broken flow patterns and limited siltation pressures. However, overall fish densities were low. Despite being recorded previously in 2024, no Atlantic salmon were recorded despite some good physical suitability. Good quality salmonid spawning and holding habitat was present. Despite some low suitability for European eel, none were recorded. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids, the aquatic ecological evaluation of site SP17 was of **local importance (higher value)** (**Table 4.4**).

Plate 4.17 Representative image of site SP17 on the Barrack Hill River, July 2025

4.1.18 Site SP18 – Lowerymore River, Biddy O'Barnes

Site SP18 was located on the Lowerymore River (37L01). The large upland eroding spate river (FW1) was 10-12m wide and 0.2-1.1m deep with 1m bank heights. The channel had a semi-natural sinuous profile of riffle, glide and pool sequences over high energy boulder-cascade reaches. The substrata were dominated by bedded, rounded boulder with frequent cobble, mobile mixed gravels and sand. Situation was light although eutrophication pressures were evident with a relatively high cover of filamentous algae. The high energy site did not support macrophytes. Boulder tops supported *Racomitrium aciculare* with very localised *Fontinalis squamosa* on submerged boulders. The riparian areas supported abundant mature downy birch, grey willow and alder that formed pockets of woodland with gorse and bramble in the understories. The site was bordered by wet grassland (GS4) and amenity grassland (GA2).

Atlantic salmon, brown trout and three-spined stickleback were recorded via electro-fishing at site SP18 (**Appendix A**). The site was a good quality salmonid nursery given an abundance of instream refugia and supported relatively high densities of juveniles (mostly salmon). Low numbers of mixed cohort brown trout were recorded reflecting the shallow, high energy nature of the site. Good quality salmonid spawning areas of mixed gravels were present in deeper glide and pool. Good quality holding habitat for adult salmonids was present in deeper pool on meanders and beneath boulder-cascade areas. Whilst there was some good suitability for European eel, none were recorded. There was no suitability for lamprey (habitat) or white-clawed crayfish (water chemistry). No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids (including Atlantic salmon), the aquatic ecological evaluation of site SP18 was of **local importance (higher value)** (**Table 4.4**).

Plate 4.18 Representative image of site SP18 on the Lowerymore River, July 2025

4.1.19 Site L1 – Carrickaduff Lough, Meenbog

Site L1 was located at Carrickaduff Lough, a small 0.5ha upland oligotrophic waterbody within the wind farm site. The lake was 1-4m deep and was heavily peat stained with quaking margins on the southwestern shore. These supported *Sphagnum* species including dominant *S. cuspidatum*. Bog pondweed was occasional with frequent white water lily (*Nymphaea alba*). Floating bur-reed (*Sparganium angustifolium*), bog bean (*Menyanthes trifoliata*), bulbous rush and bladderwort (*Utricularia* agg.) were occasional, mostly in marginal areas. Lake littorals supported bog cotton (*Eriophorum angustifolium*). The site was representative of Annex I natural dystrophic lake habitat

(3160). The lake was surrounded by upland blanket bog (PB2) and semi-mature sitka spruce plantations (WD4).

Although the lacustrine conditions prevented backpack electro-fishing, a fisheries habitat appraisal was undertaken. The small peatland lake was considered of moderate value for brown trout with a small number of trout observed surface feeding on insects during the site visit. The site had poor connectivity with downstream watercourses in the LeaghanyRiver_SC_010 sub-catchment (e.g. Glendergan River) and thus was of low accessibility and suitability for European eel. There was no suitability for white-clawed crayfish (water chemistry). No otter signs were recorded in vicinity of the site.

No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via sweep sampling (**Appendix B**).

Given the presence of Annex I natural dystrophic lake habitat (3160), the aquatic ecological evaluation of site L1 was of **county importance** (**Table 4.4**).

Plate 4.19 Representative image of Carrickaduff Lough, July 2025

4.2 White-clawed crayfish survey

In support of previous surveys, no white-clawed crayfish were recorded via hand-searching or sweep netting of instream refugia at any of the aquatic survey sites in July 2025. Furthermore, inspection of mustelid spraint on the Bunadowen River (site SP3), Sruhangarve River (SP6) or Mourne Beg River (Sp13, SP16) did not reveal the presence of crayfish remains.

The absence of crayfish is largely reflective of unsuitable water chemistry as well as geographical isolation (Demers et al., 2005; Lucy & McGarrigle, 1987), with no records within the respective survey catchments.

4.3 Biological water quality & macro-invertebrates

No rare or protected macro-invertebrate species (according to national red lists) were recorded in the biological water quality or sweep samples taken from a total of 19 no. sites in July 2025 (**Appendix B**).

A total of 8 no. sites on an unnamed Croaghonagh River tributary (site SP1), Mourne Beg River (SP10, SP13, SP14, SP15, SP16), Barrack Hill River (SP17) and the Lowerymore River (SP18) achieved **Q4 (good status)** water quality (**Figure 4.1**). This was given the presence of at least one group A taxa in fair numbers (5% of total abundance), such as the mayflies *Ecdyonurus dispar* and or *Heptagenia sulphurea* (**Appendix B**). The stonefly species *Siphonoperla torrentium*, *Nemurella picteti*, *Protonemura meyeri* and or *Perla bipunctata* were also present at these sites.

Sites SP6 on the Sruhangarve River and SP11 on the Mourne Beg River achieved **Q3-4 (moderate status)** water quality (**Figure 4.1**). Despite the presence of the EPA group A stonefly species *Siphonoperla torrentium* and *Protonemura meyeri*, respectively, these were only recorded in low numbers (<5% of total sample) and thus did not meet the qualifying criteria for good status as set out by Toner et al. (2005).

The remaining no. sites (i.e. SP2, SP3, SP4, SP5, SP7, SP8, SP9 & SP12) achieved **Q3 (poor status)** based on an absence of group A species, low numbers of group B species and a dominance of group C species such as non-biting midge larvae (non-*Chironomus* sp.) and Polycentropodidae caddis (**Appendix B**).

Carrickaduff Lough (site L1) supported a low abundance of macro-invertebrate species (*n*=79, taxon richness = 15) commonly found in upland oligotrophic lakes including damselflies (Coenagrionidae), dragonflies (Aeshnidae), water boatmen (including the rare *Hesperocorixa moesta*), Dipteran larva and a low diversity of aquatic beetles (**Appendix B**). The macro-invertebrate community was similar to that recorded in July 2024.

Table 4.1 Comparison of 2024 and 2025 biological water quality (Q-ratings) at sites in vicinity of Meenbog wind farm

Site no.	Watercourse	EPA code	July 2024		July 2025	
			Q-rating	WFD status	Q-rating	WFD status
SP1	Unnamed stream	n/a	**Q4**	Good	**Q4**	Good
SP2	Croaghonagh River	01C31	**Q3**	Poor	**Q3**	Poor
SP3	Bunadowen River	01B01	**Q3**	Poor	**Q3**	Poor
SP4	Bunadowen River	01B01	**Q3**	Poor	**Q3**	Poor
SP5	Bunadowen River	01B01	**Q3**	Poor	**Q3**	Poor
SP6	Shruhangarve River	01S26	**Q3**	Poor	**Q3-4**	Mod.
SP7	Glendergan River	GBNI0100880	**Q3**	Poor	**Q3**	Poor
SP8	Glendergan River	GBNI0100885	**Q3**	Poor	**Q3**	Poor
SP9	Mourne Beg River	01M01	**Q3**	Poor	**Q3**	Poor
SP10	Mourne Beg River	01M01	**Q3-4**	Mod.	**Q4**	Good
SP11	Mourne Beg River	01M01	**Q3**	Poor	**Q3-4**	Mod.
SP12	Mourne Beg River	01M01	**Q4**	Good	**Q3**	Poor
SP13	Mourne Beg River	01M01	**Q4**	Good	**Q4**	Good
SP14	Mourne Beg River	01M01	**Q4**	Good	**Q4**	Good
SP15	Mourne Beg River	01M01	**Q3-4**	Mod.	**Q4**	Good
SP16	Mourne Beg River	01M01	**Q4**	Good	**Q4**	Good
SP17	Barrack Hill River	37B16	**Q4**	Good	**Q4**	Good
SP18	Lowerymore River	37L01	**Q4**	Good	**Q4**	Good

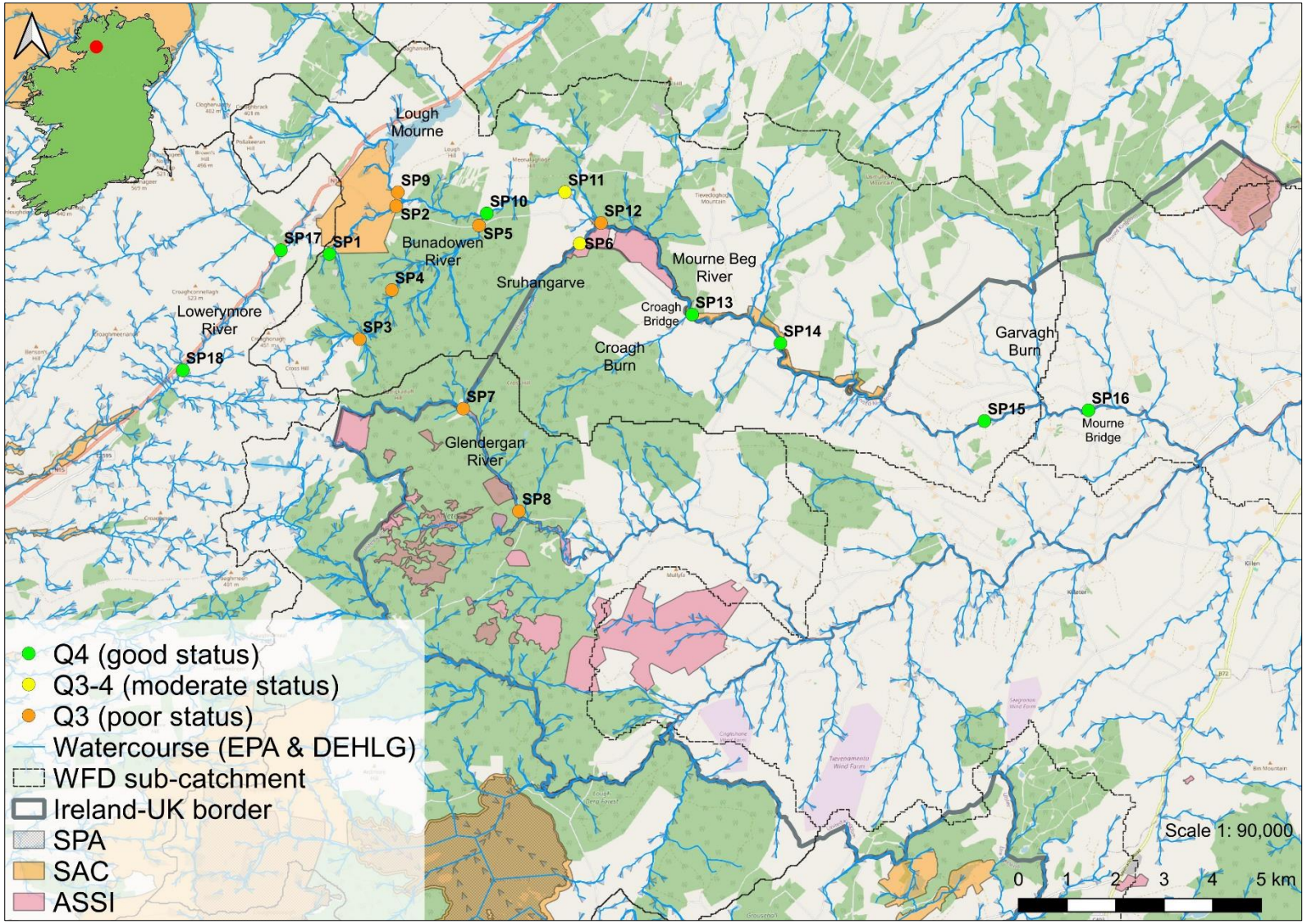

Figure 4.1 Overview of the biological water quality status in the vicinity of Meenbog wind farm, July 2025

Table 4.2 Relative abundance of fish species of higher conservation value recorded via **electro-fishing** in the vicinity of Meenbog wind farm, July 2025 (blank cell = none recorded)

Site	Watercourse	Atlantic salmon	Brown trout	European eel	Other species
SP1	Unnamed stream	No fish recorded			
SP2	Croaghonagh River	Low	Medium		
SP3	Bunadowen River		Medium	Low	
SP4	Bunadowen River		Low		
SP5	Bunadowen River	Low	Medium		
SP6	Shruhangarve River		Low	Low	
SP7	Glendergan River		Low		
SP8	Glendergan River		Low		
SP9	Mourne Beg River	High	Medium		
SP10	Mourne Beg River	Very high	Medium	Low	Sea trout
SP11	Mourne Beg River	High	Medium	Low	
SP12	Mourne Beg River	Medium	Medium		
SP13	Mourne Beg River	High	Low	Low	Minnow, three-spined stickleback
SP14	Mourne Beg River	Medium	Low		Minnow, three-spined stickleback
SP15	Mourne Beg River	Medium	High	Low	Minnow, stone loach, three-spined stickleback
SP16	Mourne Beg River	High	Medium	Low	Minnow, stone loach, three-spined stickleback
SP17	Barrack Hill River		High		
SP18	Lowerymore River	High	Low		Three-spined stickleback
L1	Carrickaduff Lough	Fisheries appraisal only – brown trout observed			

Table 4.3 Summary of aquatic species and habitats of higher conservation value recorded in the vicinity of Meenbog wind farm, July 2025

Site	Watercourse	White-clawed crayfish	Otter signs[3]	Annex I aquatic habitats	Rare or protected macrophytes/ aquatic bryophytes	Rare or protected macro-invertebrates	Other species/habitats of high conservation value
SP1	Unnamed stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
SP2	Croaghonagh River	None recorded	No signs recorded	Not present	None recorded	None recorded	**Atlantic salmon**
SP3	Bunadowen River	None recorded	**Regular spraint site**	Not present	None recorded	None recorded	**European eel**
SP4	Bunadowen River	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
SP5	Bunadowen River	None recorded	No signs recorded	Not present	None recorded	None recorded	**Atlantic salmon**
SP6	Shruhangarve River	None recorded	**Regular spraint site**	Not present	None recorded	None recorded	None recorded
SP7	Glendergan River	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
SP8	Glendergan River	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
SP9	Mourne Beg River	None recorded	No signs recorded	Not present	None recorded	None recorded	**Atlantic salmon, European eel**
SP10	Mourne Beg River	None recorded	No signs recorded	Not present	None recorded	None recorded	**Atlantic salmon**
SP11	Mourne Beg River	None recorded	No signs recorded	Not present	None recorded	None recorded	**Atlantic salmon**
SP12	Mourne Beg River	None recorded	No signs recorded	Not present	None recorded	None recorded	**Atlantic salmon**
SP13	Mourne Beg River	None recorded	No signs recorded	Not present	None recorded	None recorded	**Atlantic salmon, European eel**
SP14	Mourne Beg River	None recorded	No signs recorded	Not present	None recorded	None recorded	**Atlantic salmon, European eel**
SP15	Mourne Beg River	None recorded	**Regular spraint site**	**Floating river vegetation (3260)**	None recorded	None recorded	**Atlantic salmon, European eel**
SP16	Mourne Beg River	None recorded	**Spraint site**	**Floating river vegetation (3260)**	None recorded	None recorded	**Atlantic salmon, European eel**
SP17	Barrack Hill River	None recorded	No signs recorded	Not present	None recorded	None recorded	**Atlantic salmon**
SP18	Lowerymore River	None recorded	No signs recorded	Not present	None recorded	None recorded	**Atlantic salmon, European eel**

Site	Watercourse	White-clawed crayfish	Otter signs[3]	Annex I aquatic habitats	Rare or protected macrophytes/ aquatic bryophytes	Rare or protected macro-invertebrates	Other species/habitats of high conservation value
L1	Carrickaduff Lough	None recorded	No signs recorded	**Natural dystrophic lake habitat (3160)**	None recorded	None recorded	None recorded

Conservation value: Eurasian otter (*Lutra lutra*) and Atlantic salmon (*Salmo salar*) are listed under Annex II and Annex V of the Directive on the Conservation of Natural Habitats of Wild Fauna and Flora (92/43/EEC) ('EU Habitats Directive'). Atlantic salmon are also protected under the Wild Salmon and Sea Trout Tagging Scheme (Amendment) Regulations. European eel are 'critically endangered' according to most recent ICUN red list (Pike et al., 2020) and listed as 'critically engendered' in Ireland (King et al., 2011).

[3] Otter signs within 150m of the survey site

Table 4.4 Aquatic ecological evaluation summary of the survey sites according to NRA (2009) criteria

Site no.	Watercourse	EPA code	Evaluation of importance	Rationale summary
SP1	Unnamed stream	n/a	Local importance (lower value)	No aquatic species or habitats of high conservation value
SP2	Croaghonagh River	01C31	**International importance**	Located within the Croaghonagh Bog SAC (000129)
SP3	Bunadowen River	01B01	**Local importance (higher value)**	Salmonids, otter & Red-listed European eel recorded
SP4	Bunadowen River	01B01	**Local importance (higher value)**	Salmonids recorded
SP5	Bunadowen River	01B01	**Local importance (higher value)**	Salmonids recorded
SP6	Shruhangarve River	01S26	**National importance**	Located within Croagh Bog ASSI (378)
SP7	Glendergan River	GBNI0100880	**National importance**	Located within River Foyle and Tributaries ASSI (229)
SP8	Glendergan River	GBNI0100885	**National importance**	Located within River Foyle and Tributaries ASSI (229)
SP9	Mourne Beg River	01M01	**International importance**	Located within the Croaghonagh Bog SAC (000129)
SP10	Mourne Beg River	01M01	**Local importance (higher value)**	Salmonids (including Atlantic salmon) & Red-listed European eel recorded
SP11	Mourne Beg River	01M01	**Local importance (higher value)**	Salmonids (including Atlantic salmon) & Red-listed European eel recorded
SP12	Mourne Beg River	01M01	**International importance**	Located within the River Finn SAC (002301)
SP13	Mourne Beg River	01M01	**International importance**	Located within the River Finn SAC (002301)
SP14	Mourne Beg River	01M01	**International importance**	Located within the River Finn SAC (002301)
SP15	Mourne Beg River	01M01	**National importance**	Located within River Foyle and Tributaries ASSI (229)
SP16	Mourne Beg River	01M01	**National importance**	Located within River Foyle and Tributaries ASSI (229)
SP17	Barrack Hill River	37B16	**Local importance (higher value)**	Salmonids recorded
SP18	Lowerymore River	37L01	**Local importance (higher value)**	Salmonids (including Atlantic salmon) recorded

Site no.	Watercourse	EPA code	Evaluation of importance	Rationale summary
L1	Carrickaduff Lough	9925	**County importance**	Annex I natural dystrophic lake habitat (3160) present

Conservation value: Eurasian otter (*Lutra lutra*) and Atlantic salmon (*Salmo salar*) are listed under Annex II and Annex V of the Directive on the Conservation of Natural Habitats of Wild Fauna and Flora (92/43/EEC) ('EU Habitats Directive'). Atlantic salmon are also protected under the Wild Salmon and Sea Trout Tagging Scheme (Amendment) Regulations. European eel are 'critically endangered' according to most recent ICUN red list (Pike et al., 2020) and listed as 'critically engendered' in Ireland (King et al., 2011). Apart from the Inland Fisheries Acts 1959 to 2017, non-anadromous brown trout and coarse fish species have no legal protection in Ireland.

5. Discussion

The watercourses in the vicinity of Meenbog wind farm were upland spate channels of varying size which retained good levels of naturalness despite some historical modifications locally. Siltation pressures (mostly from peat escapement) and eutrophication pressures were evident throughout much of the survey area, particularly on the Bunadowen, Mourne Beg and Glendergan rivers. These watercourses drain extensive areas of coniferous afforestation and peatland. Whilst some evidence of impacts from a large scale peat slide in November 2020 on the Sruhangarve River and Mourne Beg River remained, ongoing ecological and fisheries recovery was again evident in 2025 with a slight upward trend in biological water quality (**Table 4.1**).

The findings were similar to the previous 2024 surveys (Triturus, 2025a) with a number of high conservation species and habitats were recorded during the surveys including Annex II Atlantic salmon and otter as well as Annex I floating river vegetation (3260) and dystrophic lake habitat (3160). With the exception of site SP1 on an unnamed Croaghonagh River tributary, all survey sites were evaluated as at least **local importance (higher value)** in terms of their aquatic ecology. The majority of survey sites were evaluated as being of **national or international importance** given their respective locations within ASSI or SAC sites (**Table 4.4**). Carrickaduff Lough (site L1) was of **county importance** given the site represented Annex I natural dystrophic lake habitat (3160) (see below). Broadly speaking, in addition to Carrickaduff Lough (Annex I 3160 habitat), the highest value watercourses in terms of aquatic ecology were the Mourne Beg River, Bunadowen River, Lowerymore River and, to a lesser degree, the Croaghonagh River.

In keeping with previous survey data, no white-clawed crayfish, rare/protected macro-invertebrates or rare/protected macrophytes and aquatic bryophytes were recorded during the surveys.

5.1 Fisheries

A typical diversity of fish species for the Mourne Beg_SC_010, Mourne Beg_SC_020, and Eske_SC_010 river sub-catchments was recorded during the electro-fishing survey, with Atlantic salmon, brown trout, stone loach, minnow, three-spined stickleback and Red-listed European eel captured (**Table 4.1**). In contrast to previous surveys, an anadromous sea trout (also *Salmo trutta*) was also recorded at site SP10 on the upper reaches of the Mourne Beg River.

Salmonid populations were widespread in vicinity of Meenbog wind farm, being present at all survey sites with the exception of SP1 (no fish recorded). Annex II Atlantic salmon were recorded from a total of 11 no. sites on the Croaghonagh River (site SP2), lower Bunadowen River (SP5), Lowerymore River (SP18) and all survey sites on the Mourne Beg River (SP9, SP10, SP11, SP12, SP13, SP14, SP15 & SP16) (**Table 4.1**).

The highest salmonid densities were again recorded from the Mourne Beg River which represents the most valuable salmonid watercourse in vicinity of the wind farm (**Appendix A**). As per previous surveys, no lamprey ammocoetes (*Lampetra* sp.) were recorded, reflecting the poor habitat suitability across the survey area (**Appendix A**). Low densities of Red-listed European eel were recorded the Bunadowen River (SP3) and Sruhangarve River (SP6) in addition to 5 no. sites on the Mourne Beg River (SP10, SP11, SP13, SP15 & SP16) (**Appendix A**). Siltation pressures (mostly from peat escapement) and eutrophication pressures (e.g. afforestation) were evident throughout much of the survey area,

particularly on the Bunadowen, Mourne Beg and Glendergan rivers, and were impacting the quality of fisheries habitat.

5.2 Otter

Despite widespread suitability at many survey sites in terms of foraging habitat, otter signs (spraint sites or prints) were only recorded at 4 no. sites during the current survey. These were identified on the Bunadowen River (site SP3) and the Mourne Beg River (SP15, SP16) but also on the Sruhangarve River (SP6). The presence of a regular spraint site at Sruhangarve Bridge (**Plate 5.1**) is further indication of the ecological recovery of the watercourse following the peat slide of 2020. Otters are also known to be present on other watercourses in the vicinity of Meenbog wind farm, including the Glendergan River (**Figure 3.1**) and are listed as a qualifying interest of the River Finn SAC (002301) and the River Foyle and Tributaries ASSI (229) with which a number of survey watercourses are located or share hydrological connectivity. As per previous surveys, no breeding (holts) or resting (couch) areas were identified in the vicinity of the survey sites in July 2025.

Fish are the main component of otter diet (Krawczyk et al., 2016; Reid et al., 2013) and otter signs were recorded at sites with greater fisheries value. Otter occurrence (and sign marking) is negatively associated with elevation[1] (Triturus data; Hong et al., 2020) with smaller, higher-gradient upland/spate watercourses (such as those in the survey area) often providing poor prey resources (Sittenthaler et al., 2019; Scorpio et al., 2016; Remonti et al., 2009). Utilisation of such watercourse is often highly seasonal and dependent on the presence of migratory fish species such as Atlantic salmon or European eel (pers. obs.).

Scat of invasive mink (*Neovison vison*) was recorded at site SP13 on the Mourne Beg River at Croagh Bridge. Mink scat was also recorded further downstream at Meenreagh Bridge (SP14) in July 2024. The impact on otter populations in the survey area is unknown given that the nuances of inter-specific competition between these two species are not yet fully understood, with both impacts to otter but more often otter dominance hypothesised (Harrington et al., 2020; García et al., 2020; Melero et al., 2012; Harrington et al., 2009; McDonald et al., 2007; Bonesi et al., 2004).

[1] Otter signs ranged from 59-230m ASL in both the current survey and 2024 survey

Plate 5.1 Regular otter spraint site on a boulder under Sruhangarve Bridge on the Sruhangarve River, July 2025

5.3 Annex I aquatic habitats

Although not diverse examples, the Annex I habitat 'Water courses of plain to montane levels, with submerged or floating vegetation of the *Ranunculion fluitantis* and *Callitricho-Batrachion* (low water level during summer) or aquatic mosses (3260)' (aka floating river vegetation) was present on the Mourne Beg River at sites SP15 and S6P16. Here, several indicator species (EC, 2013) were present including water crowfoot (*Ranunculus* sp.), various-leaved pondweed (*Potamogeton gramineus*), alternate milfoil (*Myriophyllum alterniflorum*) and well developed aquatic bryophytes communities supporting *Fontinalis antipyretica*, *Fontinalis squamosa* and *Chiloscyphus polyanthos*. These sites also supported 3260 habitat in July 2024.

Carrickaduff Lough (site L1), located within the footprint of Meenbog wind farm, represented the Annex I habitat 'Natural dystrophic lakes and ponds (3160)'. Annex I acid oligotrophic lakes are typically associated with small lakes and ponds in Atlantic and upland blanket bog and wet heath (Gray et al., 2022; O'Connor, 2015), such as that present at Meenbog. Annex I (3160) habitats are considered species-poor botanically with a community characterised by bryophytes of the genus *Sphagnum* and sustain the *Utricularietalia* phytosociological order (EC, 2013). In Ireland, this lake habitat has been broadly interpreted as "*species poor lake and pond systems dominated by Sphagnum mosses and restricted to blanket bogs and wet heaths*" (O'Connor, 2015). As per the previous survey, Carrickaduff Lough was dominated by *Sphagnum* species such as *S. cuspidatum*, with common associates for 3160 habitat such as floating bur-reed (*Sparganium angustifolium*), bog bean (*Menyanthes trifoliata*), bulbous rush (*Juncus bulbosus*) and bladderwort (*Ultricularia* agg.) (EC, 2013).

5.4 Biological water quality & macro-invertebrates

No rare or protected macro-invertebrate species (according to national red lists) were recorded in the biological water quality or sweep samples taken from a total of 19 no. sites in July 2025 (**Appendix B**), i.e. none of greater than Least Concern. The water boatmen *Hesperocorixa moesta* was recorded in moderate numbers from Carrickaduff Lough (site L1) (**Appendix B**). Whilst not protected or Red-listed, this is a rare and poorly understood corixid species in Ireland (Mantell & Anderson, 2020) with a paucity of records (NBDC data). It was not recorded during the 2024 surveys.

Biological water quality was similar to the previous 2024 surveys (**Table 4.1**) with a slight overall upward trend observed in the Mourne Beg River downstream of the Sruhangarve confluence, as well as an improvement in the Sruhangarve River itself at site SP6. Although 8 no. sites on an unnamed Croaghonagh River tributary (site SP1), Mourne Beg River (SP10, SP13, SP14, SP15, SP16), Barrack Hill River (SP17) and the Lowerymore River (SP18) achieved **Q4 (good status)** water quality all other riverine sites failed to meet the target good status (≥Q4) requirements of the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 and the Water Framework Directive (2000/60/EC) (**Figure 4.1**).

Macro-invertebrate abundance, species diversity and taxon richness per site was broadly similar to the 2024 surveys. A swift recovery in biological water quality (mostly to Q4) of the Mourne Beg River occurred following the 2020 peat slide event and, despite other ongoing impacts, much of the watercourse is currently achieving good status as of July 2025 (**Figure 4.1**). In contrast, the Sruhangarve River, where peat slide impacts were most severe, was failing to meet Q4 (good status) thresholds in October 2021 (Triturus, 2022) and in July 2024 (Triturus, 2025a). However, the macro-invertebrate community has continued to recover in the interim period, with a greater proportion of pollution sensitive species present in 2025, including the EPA group A stonefly species *Protonemura meyeri* and group B mayfly *Paraleptophlebia cincta*[2] which were both absent in 2024 (**Appendix B**). The biological water quality of site SP6 had improved to Q3-4 (moderate status) in July 2025.

As per previous surveys (2021 and 2024), both eutrophication (primarily from coniferous afforestation) and peat escapement (siltation) pressures were evident throughout the survey area. Clear-felling activities had occurred along the Mourne Beg River (near site SP10) since the previous survey, likely leading to nutrient escapement to the watercourse. Previous studies have concluded that water quality impacts from the November 2020 peat slide event in the Mourne Beg River catchment (i.e. temporary loss of invertebrate communities) acted synergistically with other catchment pressures including afforestation (upper catchment), degraded peatland habitats (upper catchment) and agricultural land use (lower catchment) (Triturus, 2022). Both afforestation and agriculture have been identified as significant threats for the River Finn SAC (002301) (NPWS, 2014), which encompasses the upper Mourne Beg River, as well as the wider River Foyle and Tributaries ASSI (229) (DAERA, 2015) and Eske_SC_010 river sub-catchment (EPA data).

[2] A species tolerant of eutrophication but highly sensitive to siltation (Kelly-Quinn & Regan, 2011)

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7. Appendix A – Fisheries assessment report

Please see accompanying fisheries assessment report

Fisheries assessment for Meenbog wind farm, Co. Donegal (2025)

Prepared by Triturus Environmental Ltd. for MKO

October 2025

Please cite as:

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1. Introduction

1.1 Background

Triturus Environmental Ltd. were commissioned by MKO to undertake a baseline fisheries assessment of numerous watercourses in the vicinity of Meenbog wind farm, located near Ballybofey, Co. Donegal. The survey was undertaken to establish baseline fisheries data used to inform the Remedial Environmental Impact Assessment Report (rEIAR) for Meenbog wind farm.

In order to gain an accurate overview of the existing and potential fisheries value of the riverine watercourses within the vicinity of the development, a catchment-wide electro-fishing survey across *n*=18 riverine sites was undertaken (**Table 2.1; Figure 2.1**). Electro-fishing helped to identify the importance of the watercourses as nurseries and habitats for salmonids, lamprey (*Lampetra* sp.) and European eel (*Anguilla anguilla*). Other species of lower conservation value were also recorded. The fisheries habitat of a small lake in vicinity of the wind farm, Carrickaduff Lough, was also assessed. The presence and or absence of fish populations and or associated supporting habitat would help inform impact assessment and any subsequent mitigation for the development. The surveys were undertaken in July 2025 and would update catchment-wide surveys previously completed by Triturus in July and September 2024 (Triturus, 2025a), thus ensuring temporal data validity.

1.2 Fisheries (desktop review)

The Mourne Beg River rises at Mourne Lough and flows, primarily through peatland areas, for approximately 26km before joining the River Derg 3.5km upstream of Castlederg, Co. Tyrone. The river is known to support Atlantic salmon (*Salmo salar*) and brown trout (*Salmo trutta*) in addition to European eel (*Anguilla anguilla*), minnow (*Phoxinus phoxinus*), stone loach (*Barbatula barbatula*), three-spined stickleback (*Gasterosteus aculeatus*) and pike (*Esox lucius*) (Triturus 2021 & 2024 data; Loughs Agency 2011-2021 data). It its lower reaches, the river also supports *Lampetra* sp. (Niven & McAuley, 2013). Within the wider Foyle catchment, the Mourne Beg is an important spawning river for Atlantic salmon.

The Bunadowen River (01B01), a Mourne Beg tributary, is also known to support Atlantic salmon, brown trout and European eel (Triturus 2021 & 2024 data; Loughs Agency 2020-21 data; Paul Johnston Associates, 2017). The Sruhangarve River (01S26), another Mourne Beg River tributary, is known to support European eel and a low density of brown trout (Triturus 2021 & 2024 data; Loughs Agency data, 2020-21; Paul Johnston Associates, 2017). The Croaghonagh River (also known as Mary Breen's Burn), a tributary of the Mourne Beg River, is known to support Atlantic salmon, brown trout and European eel (Triturus 2021 & 2024 data; Paul Johnston Associates, 2017).

The Glendergan River, a tributary of the River Derg, supports Atlantic salmon, brown trout, lamprey (*Lampetra* sp.), European eel and minnow (Triturus 2021 & 2024 data; Niven & Donnelly, 2018).

In the Eske sub-catchment, the Lowerymore River (37L01) is a highly productive Atlantic salmon habitat often supporting very high densities of fry (e.g. IFI, 2011), with European eel also present (Triturus 2021 & 2024 data). A tributary, the Barrack Hill River, supports Atlantic salmon and brown trout (Triturus 2021 & 2024 data).

2. Methodology

2.1 Fisheries assessment (electro-fishing)

A single anode Smith-Root LR24 backpack (12V DC input; 300V, 100W DC output) was used to electro-fish sites on watercourses in the vicinity of Meenbog wind farm on the the 28th, 29th, 30th and 31st July 2025 following notification to the Loughs Agency (under the conditions of a Section 69 permit) and Inland Fisheries Ireland (under the conditions of a Department of Climate, Energy and the Environment (DCEE) licence). The electro-fishing survey was undertaken across 18 no. riverine sites (see **Table 2.1, Figure 2.1**).

Both river and holding tank water temperature was monitored continually throughout the survey to ensure temperatures of 20°C were not exceeded, thus minimising stress to the captured fish due to low dissolved oxygen levels. A portable battery-powered aerator was also used to further reduce stress to any captured fish contained in the holding tank. Salmonids, European eel and other captured fish species were transferred to a holding container with oxygenated fresh river water following capture. To reduce fish stress levels, anaesthesia was not applied to captured fish. All fish were measured to the nearest millimetre and released in-situ following a suitable recovery period.

As three primary species groups were targeted during the survey, i.e., salmonids, lamprey, and eel, the electro-fishing settings were tailored for each species. By undertaking electro-fishing using the rapid electro-fishing technique (see methodology below), the broad characterisation of the fish community at each sampling reach could be determined as a longer representative length of channel was surveyed. Electro-fishing methodology followed accepted European standards (CEN, 2003) and adhered to best practice (e.g., CFB, 2008).

2.1.1 Salmonids and European eel

For salmonid species and European eel, as well as all other incidental species, electro-fishing was carried out in an upstream direction for a 10-minute CPUE, an increasingly common standard approach for wadable streams (Matson et al., 2018). A total of approximately 30-75m channel length was surveyed at each site, where feasible, in order to gain a better representation of fish stock assemblages.

Relative conductivity of the water at each site was checked in-situ with a conductivity meter and the electro-fishing backpack was energised with the appropriate voltage and frequency to provide enough draw to attract salmonids and European eel to the anode without harm. For the low conductivity waters of the sites a voltage of 350-450v, frequency of 35-45Hz and pulse duration of 3.5-4ms was utilised to draw fish to the anode without causing physical damage.

2.1.2 Lamprey

Electro-fishing for lamprey ammocoetes was conducted using targeted quadrat-based electro-fishing (as per Harvey & Cowx, 2003) in objectively suitable areas of sand/silt, where encountered. As lamprey take longer to emerge from silts and require a more persistent approach, they were targeted at a lower frequency (30Hz) burst DC pulse setting which also allowed detection of European eel in sediment, if present. Settings for lamprey followed those recommended and used by Harvey & Cowx

(2003), APEM (2004) and Niven & McAuley (2013). Using this approach, the anode was placed under the water's surface, approximately 10-15cm above the sediment, to prevent immobilising lamprey ammocoetes within the sediment. The anode was energised with 100V of pulsed DC for 15-20 seconds and then turned off for approximately five seconds to allow ammocoetes to emerge from their burrows. The anode was switched on and off in this way for approximately two minutes. Immobilised ammocoetes were collected by a second operator using a fine-mesh hand net as they emerged.

Lamprey species were identified to species level, where possible, with the assistance of a hand lens, through external pigmentation patterns and trunk myomere counts as described by Potter & Osborne (1975) and Gardiner (2003).

2.2 Fisheries habitat

A fisheries habitat appraisal of all 19 no. sites was undertaken to establish the importance of the supporting habitats as nursery, spawning and or holding habitats. The appraisal surveys focused on evaluating the spawning, nursery and or holding habitat for salmonids and lamprey species but also considered European eel and other fish species. The appraisals of salmonids and lamprey were cognisant of species-specific habitat requirements and preferences as outlined in O'Grady (2006), Hendry et al. (2003), Armstrong et al. (2003), Harvey & Cowx (2003), Maitland (2003) and Hendry & Cragg-Hine (1997). River habitat surveys and fisheries assessments were also carried out utilising elements of the approaches in the River Habitat Survey Methodology (EA, 2003) and Fishery Assessment Methodology (O'Grady, 2006) to broadly characterise the riverine sites (i.e., channel profiles, substrata etc.).

2.3 Biosecurity

A strict biosecurity protocol following IFI (2010) and the Check-Clean-Dry approach was adhered to during surveys for all equipment and PPE used. Disinfection of all equipment and PPE before and after use with Virkon™ was conducted to prevent the transfer of pathogens or invasive propagules between survey sites. Surveys were undertaken at sites in a downstream order to minimise the risk of upstream propagule mobilisation. Where feasible, equipment was also thoroughly dried (through UV exposure) between survey areas. Any aquatic invasive species or pathogens recorded within or adjoining the survey areas were geo-referenced. All Triturus staff are certified in 'Good fieldwork practice: slowing the spread of invasive non-native species' by the University of Leeds.

Table 2.1 Location of 19 no. fisheries survey sites in the vicinity of Meenbog wind farm, Co. Donegal

Site no.	Watercourse	EPA code	Location	X (ITM)	Y (ITM)
SP1	Unnamed stream	n/a	Croaghonagh	605010	887018
SP2	Croaghonagh River	01C31	Croaghonagh	606385	888005
SP3	Bunadowen River	01B01	Meenbog	605634	885263
SP4	Bunadowen River	01B01	Meenbog	606297	886277
SP5	Bunadowen River	01B01	Croaghonagh	608092	887606
SP6	Shruhangarve River	01S26	Sruhangarve Bridge	610171	887234
SP7	Glendergan River	GBNI0100880	Slievedoo	607769	883831
SP8	Glendergan River	GBNI0100885	Killeteer Forest Park	608916	881721
SP9	Mourne Beg River	01M01	Croaghonagh	606421	888291
SP10	Mourne Beg River	01M01	Meenbog	608253	887857
SP11	Mourne Beg River	01M01	Meenbog	609865	888295
SP12	Mourne Beg River	01M01	Meenbog	610608	887660
SP13	Mourne Beg River	01M01	Croagh Bridge	612487	885772
SP14	Mourne Beg River	01M01	Meenreagh Bridge	614305	885180
SP15	Mourne Beg River	01M01	Laghtfoggy	618510	883578
SP16	Mourne Beg River	01M01	Mourne Bridge	620654	883800
SP17	Barrack Hill River	37B16	Croaghonagh	604010	887099
SP18	Lowerymore River	37L01	Biddy O'Barnes	601989	884625
L1*	Carrickaduff Lough	9925	Meenbog	607570	885069

* fisheries habitat appraisal only

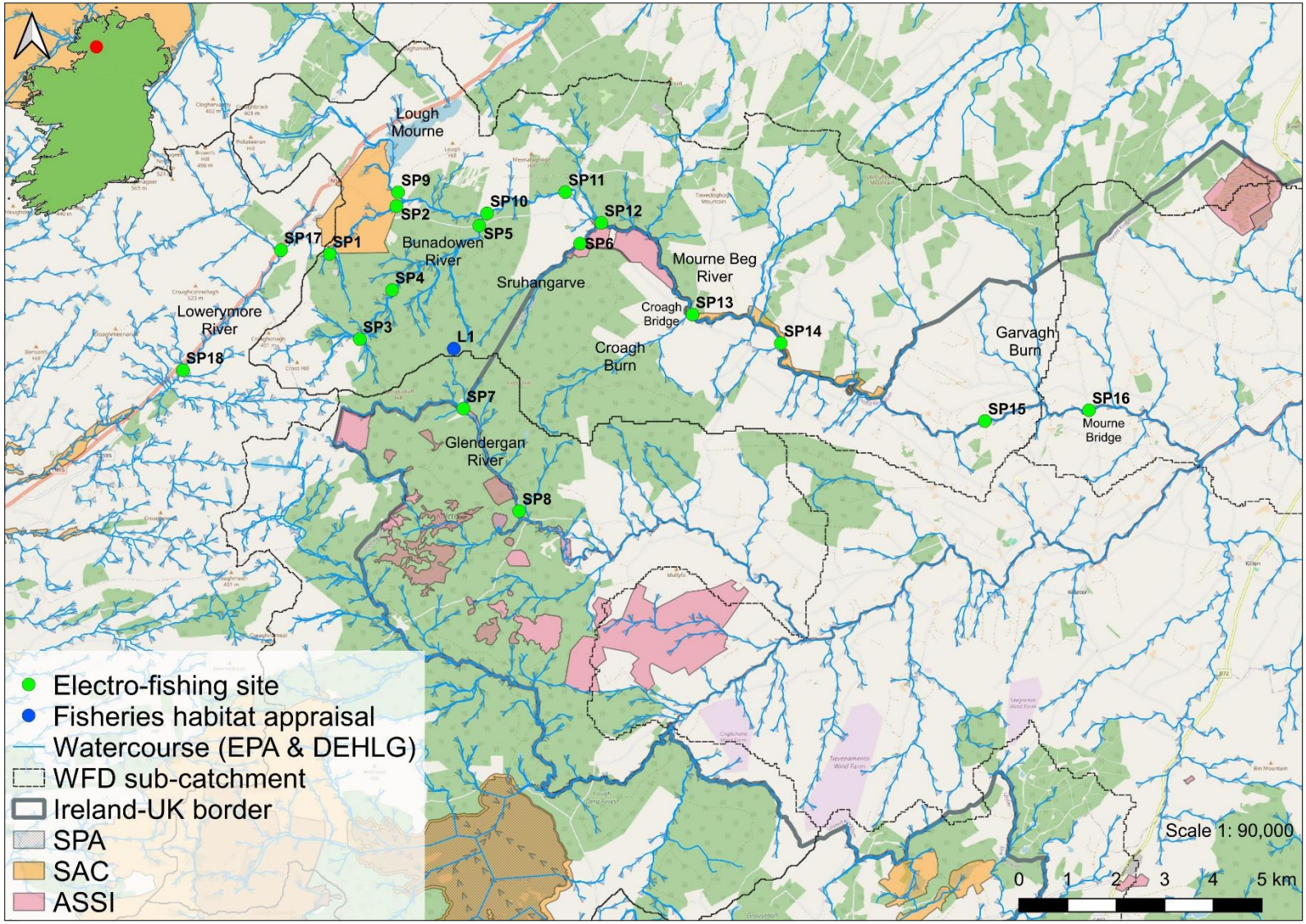

Figure 2.1 Overview of the 19 no. electro-fishing & fisheries habitat appraisal survey site locations

3. Results

A catchment-wide fisheries survey of 18 no. riverine sites and 1 no. lake site in the vicinity of Meenbog wind farm was conducted 28th, 29th, 30th and 31st July 2025 following notification to the Loughs Agency Inland Fisheries Ireland. The results of the survey are discussed below in terms of fish population structure, population size and the suitability and value of the surveyed areas as nursery and spawning habitat for salmonids, European eel and lamprey species. Scientific names are provided at first mention only.

3.1 Fisheries assessment & appraisal

3.1.1 Site SP1 – Unnamed stream, Croaghonagh

No fish were recorded via electro-fishing at site SP1 on the upper reaches of an unnamed tributary of the Mourne Beg River. Despite some physical suitability for a small salmonid population (i.e. pool, mixed gravels etc.), the narrow upland channel was not of value to resident fish given its location in the uppermost reaches of the watercourse and high natural gradients.

Plate 3.1 Representative image of site SP1 on an unnamed Mourne Beg River tributary, July 2025

3.1.2 Site SP2 – Croaghonagh River, Croaghonagh

Brown trout (*Salmo trutta*) (*n*=13) and Atlantic salmon (*Salmo salar*) (*n*=7) were the only fish species recorded via electro-fishing at site SP2 on the Croaghonagh River (01C31) at a local road crossing (**Figure 3.1**).

The site was of moderate value as a salmonid habitat, supporting a low density of mixed cohort salmon and trout. The quality of spawning habitat was poor given the predominance of larger substrata in the narrow spate channel in addition to eutrophication pressures. Whilst instream refugia were abundant,

the density of juvenile salmonids was low (i.e. a moderate quality nursery). Frequent deep pools on meanders and at bank scours offered some value to adult salmonids. Despite some moderate suitability for European eel, none were recorded.

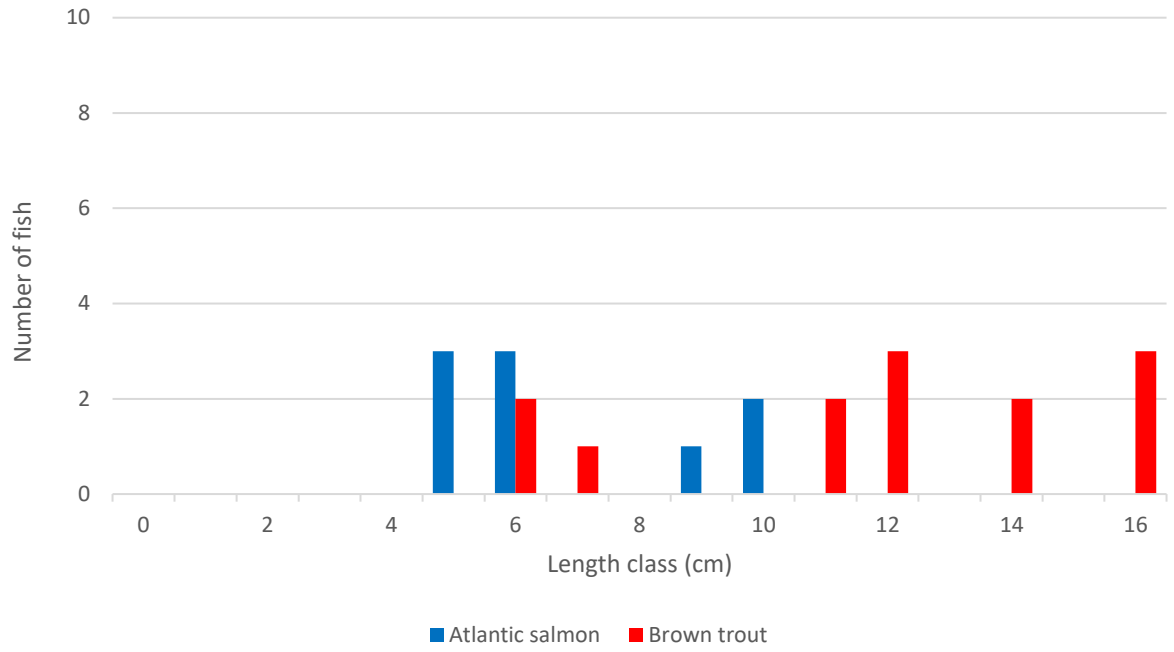

Figure 3.1 Length frequency distribution recorded via electro-fishing at site SP2 on the Croaghonagh River, July 2025

Plate 3.2 Adult brown trout recorded at site SP2 on the Croaghonagh River, July 2025

3.1.3 Site SP3 – Bunadowen River, Meenbog

Brown trout (*n*=19) and European eel (*Anguilla anguilla*) (*n*=2) were the only fish species recorded via electro-fishing at site SP3 on the upper reaches of the Bunadowen River (01B01), a tributary of the Mourne Beg River (**Figure 3.2**).

The site was a good quality salmonid nursery supporting moderate numbers of juveniles and mixed cohort adults. The quality was reduced somewhat due to high floc cover and siltation pressures (peat). Moderate quality spawning areas by way of mixed gravels were present locally in deeper pool. These areas also provided valuable holding areas for adult salmonids. The high energy site was sub-optimal for European eel but a low number were recorded. There was no suitability for lamprey.

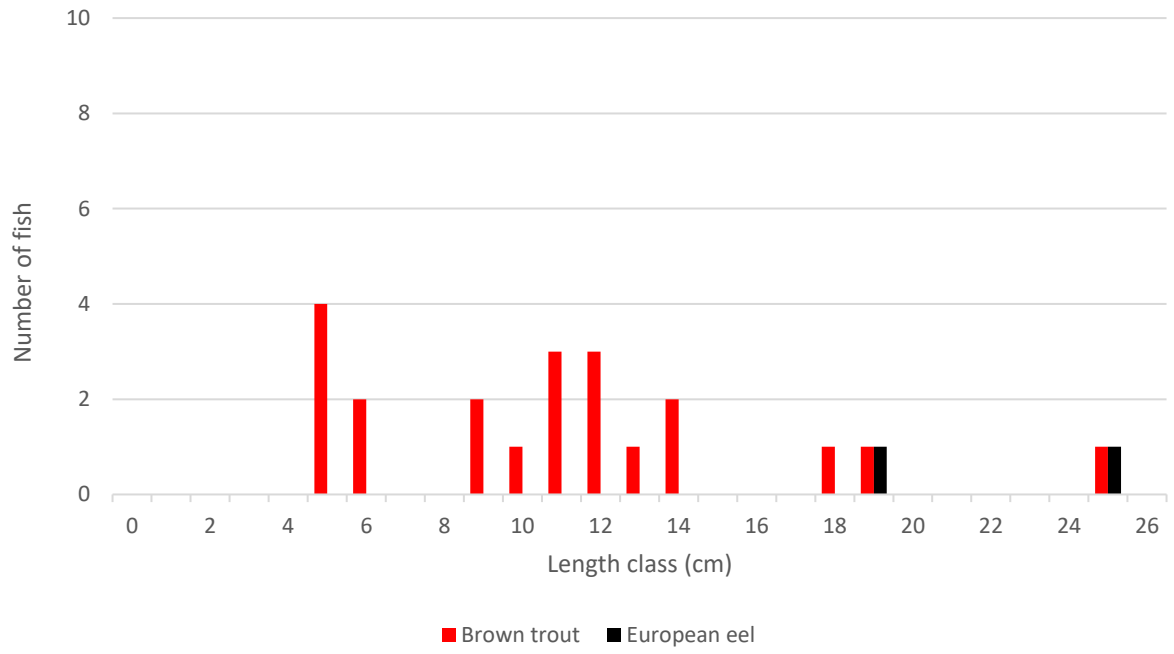

Figure 3.2 Length frequency distribution recorded via electro-fishing at site SP3 on the Bunadowen River, July 2025

Plate 3.3 Brown trout recorded at SP3 on the upper reaches of the Bunadowen River, July 2025

3.1.4 Site SP4 – Bunadowen River, Meenbog

Brown trout (*n*=9) was the only fish species recorded via electro-fishing at site SP4 on the upper reaches of the Bunadowen River (01B01) (**Figure 3.3**).

The site was a moderate quality salmonid nursery only given the very high energy characteristics in addition to eutrophication and siltation pressures (peat). The site was of moderate value as a spawning habitat due to the paucity of clean gravels and supported only low numbers of juveniles (0+). Deeper plunge pools associated with cascades provided valuable holding areas for adult salmonids. The high energy site was sub-optimal for European eel and none were recorded (but are known from the site; Triturus, 2025a). There was no suitability for lamprey.

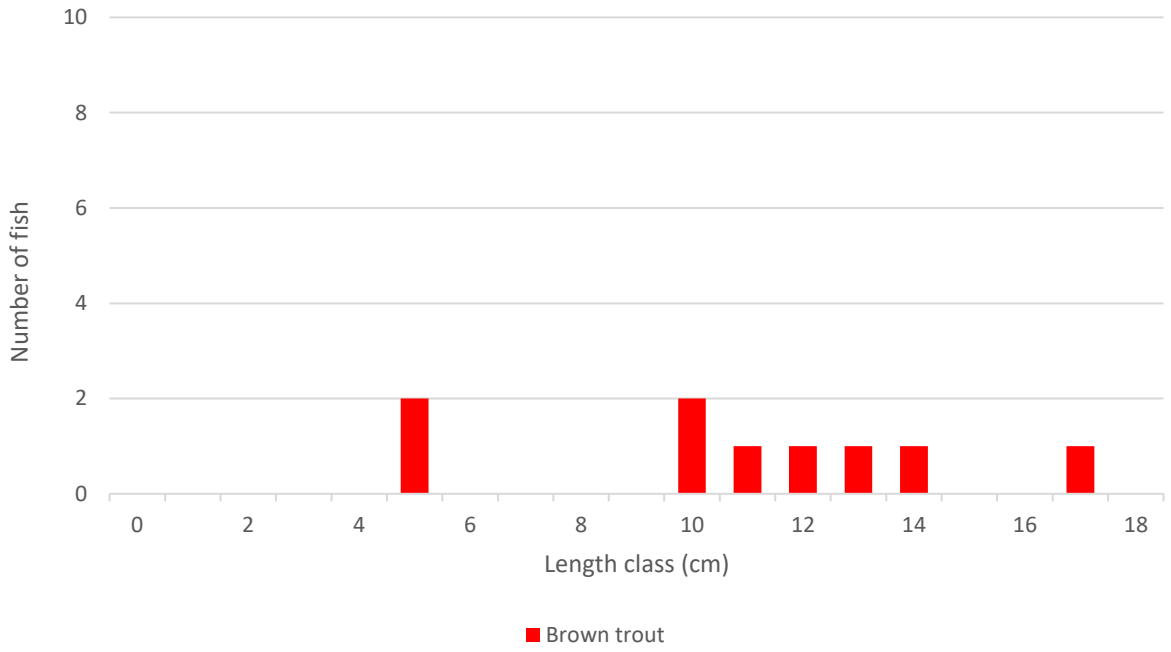

Figure 3.3 Length frequency distribution recorded via electro-fishing at site SP4 on the Bunadowen River, July 2025

Plate 3.4 Representative image of site SP4 on the upper reaches of the Bunadowen River, July 2025

3.1.5 Site SP5 – Bunadowen River, Croaghonagh

Site SP5 was located at a local road crossing c. 200m upstream of the Mourne Beg River confluence. The upland eroding spate channel (FW1) was largely natural in character and flowed over a moderate gradient and under the single arch masonry bridge over a cobbled apron. The profile comprised boulder cascades and fast-flowing glide with frequent small pools. The substrata were dominated by

bedrock with bedded boulder. Cobbles were present locally with only highly localised mixed gravels. Due to high flow rates, macrophytes were limited with some bulbous rush and lesser spearwort locally. The aquatic bryophyte coverage was high with abundant *Scapania undulata*. *Racomitrium aciculare* was present on boulder tops with occasional *Marsupella emarginata*. The river in vicinity of the bridge was shaded by mature treelines of sycamore (*Acer psuedoplatanus*), rowan (*Sorbus aucuparia*) and grey willow with localised invasive rhododendron (*Rhododendron ponticum*) and scrub. Invasive juvenile rhododendron was scattered along the banks. Downstream the banks graded into open heath/bog/wet grassland. The site was bordered by conifer plantations (WD4) and recent clear-fell (WS5).

Brown trout (*n*=14) and Atlantic salmon (*n*=2) and were the only fish species recorded via electro-fishing at site SP5 on the lower reaches of the Bunadowen River (01B01) (**Figure 3.4**).

The site was of moderate value as a salmonid habitat, supporting a low density of mixed cohort trout and lower numbers of salmon. This reflected the compacted/bedrock bed (leading to poor spawning), high flow rates and poor invertebrate prey resources (a mostly allochthonous system). Whilst the site was of good physical suitability as a salmonid nursery, only a low density of fish were present (in contrast to the downstream-connecting Mourne Beg River). Frequent pool areas provided some good quality holding areas for migratory adult salmonids. Despite some moderate suitability for European eel, none were recorded. There was no suitability for lamprey.

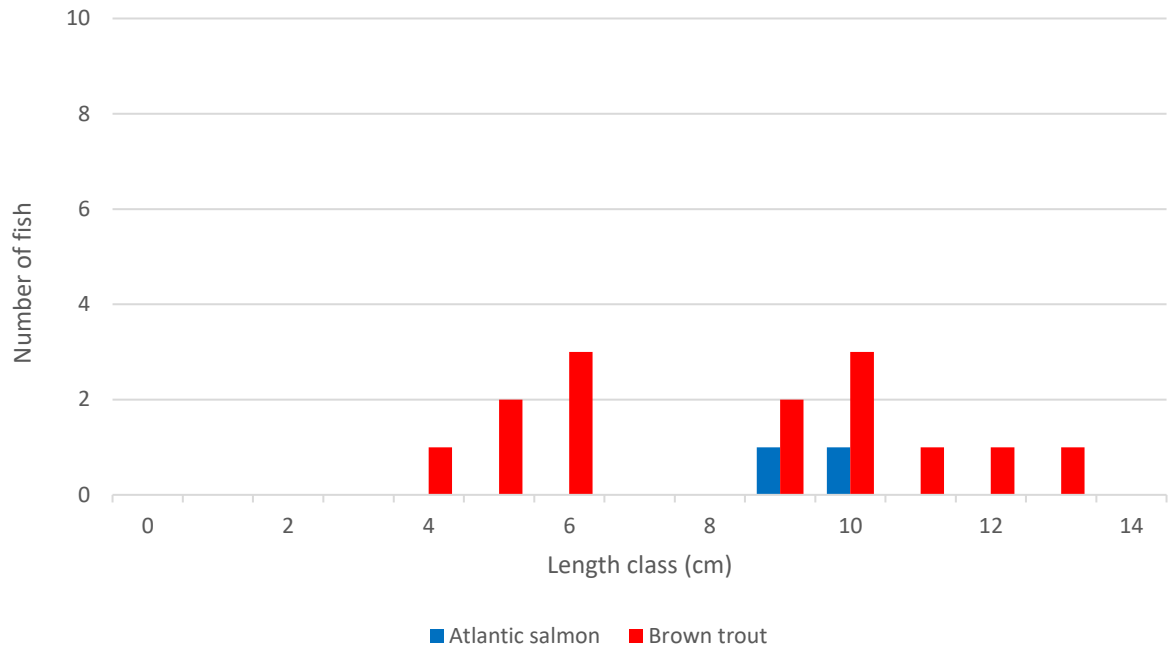

Figure 3.4 Length frequency distribution recorded via electro-fishing at site SP5 on the Bunadowen River, July 2025

Plate 3.5 0+ Atlantic salmon parr recorded at site SP5 on the lower reaches of the Bunadowen River, July 2025

3.1.6 Site SP6 – Shruhangarve River, Sruhangarve Bridge

Brown trout (*n*=8) and European eel (*n*=1) were the only fish species recorded via electro-fishing at site SP6 on the Sruhangarve River (01S26) at Sruhangarve Bridge (**Figure 3.5**).

The very high energy, high gradient river supported a low density of adult trout, with no juveniles recorded. This reflected the near total absence of suitable spawning habitat in the steep gradient channel. Abundant small plunge pools provided valuable flow refugia and holding habitat for adult trout. The site (and wider channel) was not suitable for Atlantic salmon given the paucity of suitable spawning substrata. The high energy site was sub-optimal for European eel although a single eel was recorded. There was no suitability for lamprey.

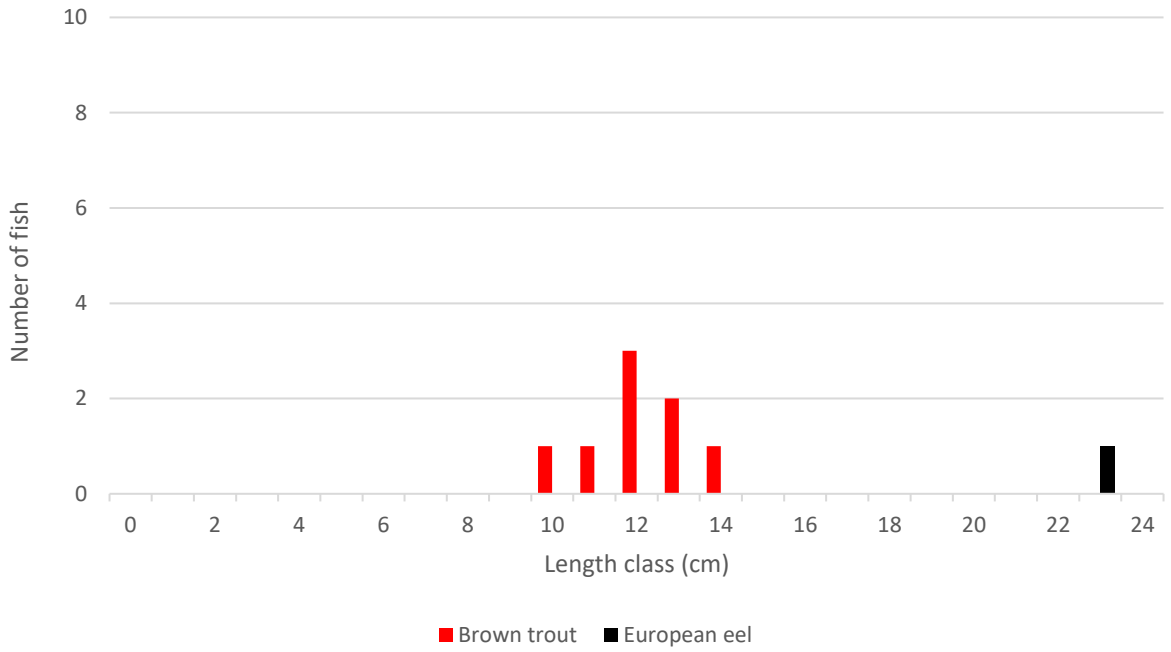

Figure 3.5 Length frequency distribution recorded via electro-fishing at site SP6 on the Sruhangarve River, July 2026

Plate 3.6 Brown trout recorded at site SP6 on the Sruhangarve River, July 2025

3.1.7 Site SP7 – Glendergan River, Slievedoo

Brown trout (*n*=6) was the only fish species recorded via electro-fishing at site SP7 on the upper reaches of the Glendergan River (GBNI0100880) (**Figure 3.6**).

The site supported a low density of adult trout with no juveniles recorded. The site was a poor quality

salmonid nursery given the depth profile and high siltation pressures. The spawning value was poor due to the heavily silted gravels and high floc cover. However, some good quality holding habitat was present locally for adult salmonids. The site was sub-optimal for European eel (limited refugia) and none were recorded. There was no suitability for lamprey.

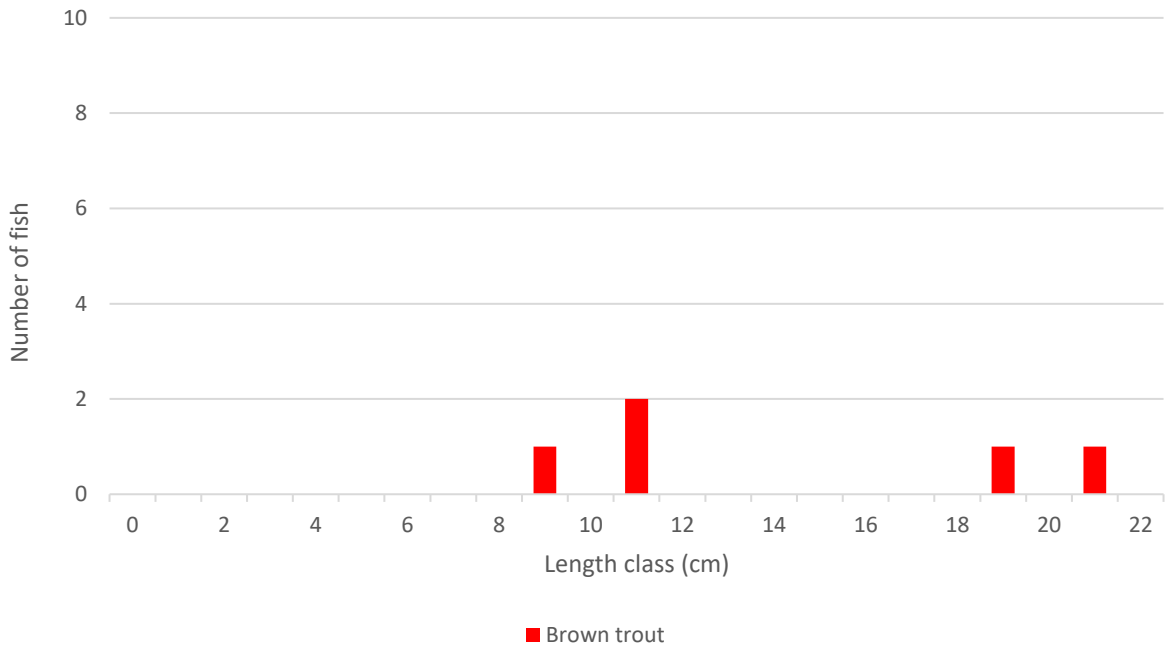

Figure 3.6 Length frequency distribution recorded via electro-fishing at site SP7 on the Glendergan River, July 2025

Plate 3.7 Representative image of site SP7 on the upper reaches of the Glendergan River, July 2025

3.1.8 Site SP8 – Glendergan River, Killeteer Forest Park

Brown trout (*n*=8) was the only fish species recorded via electro-fishing at site SP8 on the Glendergan River (GBNI0100885) at Killeteer Forest Park (**Figure 3.7**).

The high energy spate channel was of relatively low value for salmonids given the predominance of large substrata, high peat staining, siltation pressures and a poor prey invertebrate resources (i.e. mostly allochthonous). Suitable spawning habitat was very limited and exposed to siltation. Whilst small areas of pool and deeper glide habitat were widespread, these supported only a very low density of adult trout. The absence of Atlantic salmon and European eel would indicate downstream barriers, in addition to poor habitat suitability. There was no suitability for lamprey.

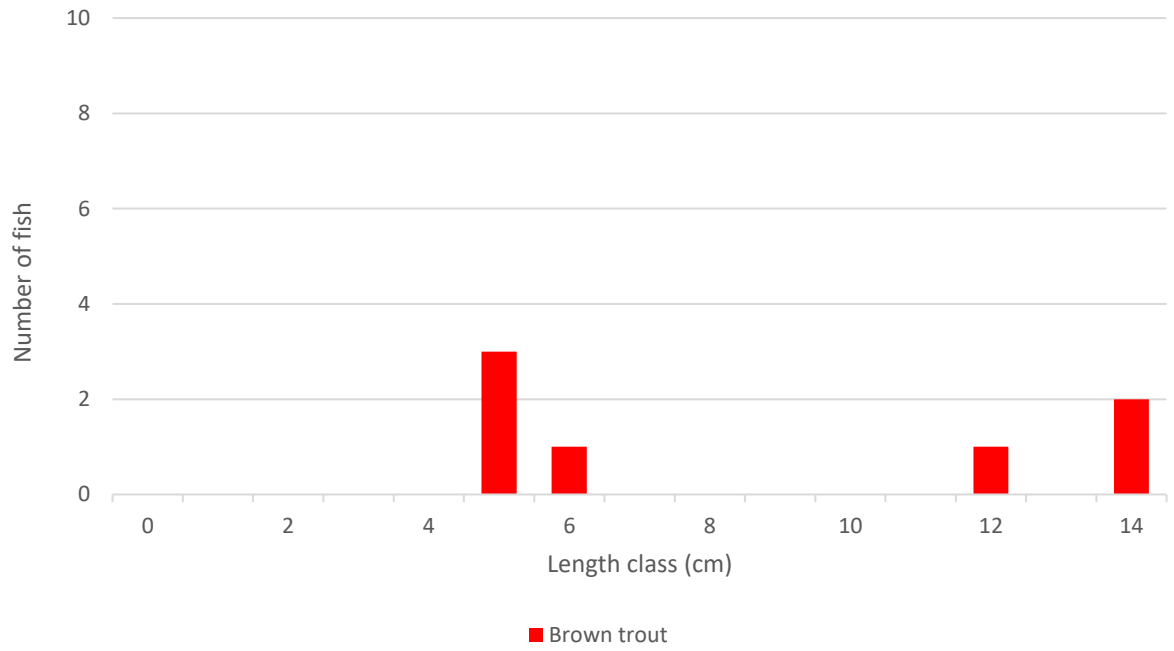

Figure 3.7 Length frequency distribution recorded via electro-fishing at site SP8 on the Glendergan River, July 2025

Plate 3.8 Juvenile brown trout recorded at site SP8 on the Glendergan River, July 2025

3.1.9 Site SP9 – Mourne Beg River, Croaghonagh

Atlantic salmon (*n*=32) and brown trout (*n*=21) were recorded via electro-fishing at site SP9 (on the upper reaches of the Mourne Beg River (01M01) (**Figure 3.8**).

The site was of high value as a salmonid habitat, with abundant instream boulder/cobble supporting a high density of juvenile salmon and a lower number of trout. At the head of these shallow areas, mixed gravels and smaller clean cobbles provided high quality salmonid spawning habitat. Deeper pool, and to a lesser extent, bank scours, offered valuable flow refugia and holding habitat for adult salmonids. Suitability for European eel was good although none were recorded. There was no suitability for lamprey.

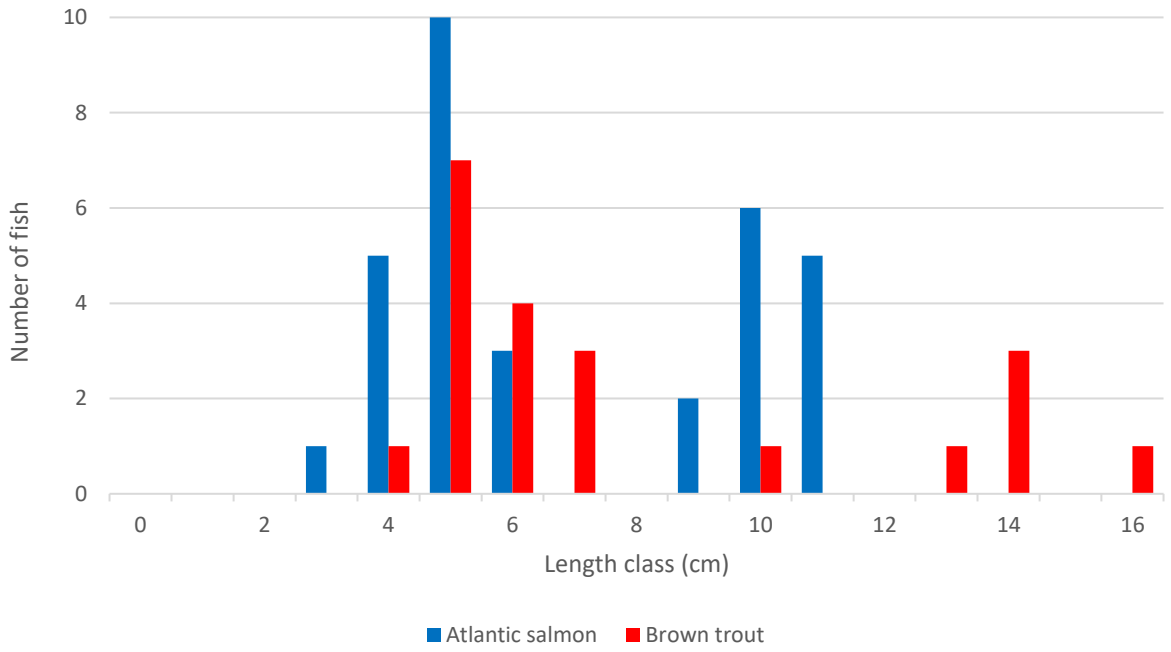

Figure 3.8 Length frequency distribution recorded via electro-fishing at site SP9 on the Mourne Beg River, July 2025

Plate 3.9 Representative image of site SP9 on the upper reaches of the Mourne Beg River, July 2025

3.1.10 Site SP10 – Mourne Beg River, Meenbog

Atlantic salmon (*n*=52), brown trout (*n*=12), sea trout (*n*=1) and European eel (*n*=1) were recorded via electro-fishing at site SP10 on the Mourne Beg River (01M01) immediately downstream of the Bunadowen River confluence (**Figure 3.9**).

The site was of very high value for salmonids with abundant mobile cobble and macrophyte beds supporting a relatively high density of juvenile Atlantic salmon. High quality spawning habitat (especially for salmon) was present throughout given the presence of cobble and mixed gravels free of significant siltation (both upstream and downstream of confluence). Localised pools were of high value for migratory adult salmonids, including anadromous sea trout (of which one example was recorded). There was some moderate suitability for European eel, with a single example recorded. There was no suitability for lamprey.

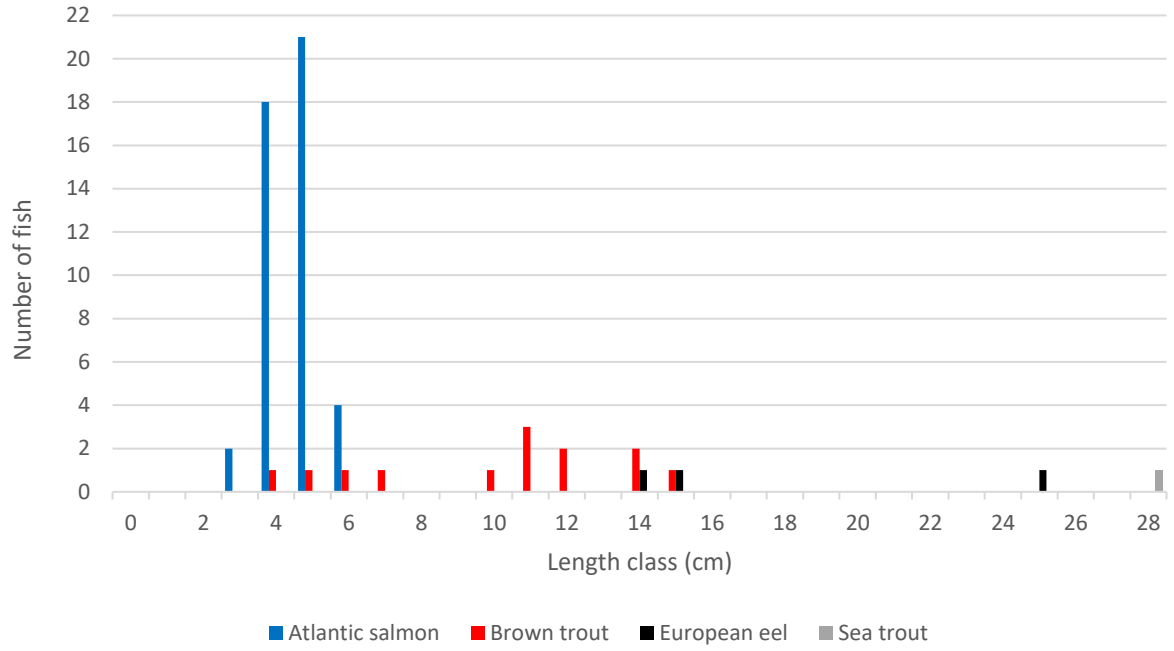

Figure 3.9 Length frequency distribution recorded via electro-fishing at site SP10, July 2025

Plate 3.10 Representative image of site SP10 on the upper reaches of the Mourne Beg River, July 2025

3.1.11 Site SP11 – Mourne Beg River, Meenbog

Atlantic salmon (*n*=47), brown trout (*n*=18) and European eel (*n*=1) were recorded via electro-fishing at site SP11 on the Mourne Beg River (01M01) at a local road crossing (**Figure 3.10**).

The site was of high value for salmonids with abundant boulder, cobble and macrophyte beds supporting a relatively high density of juvenile Atlantic salmon and low numbers of mixed cohort trout. Mixed substrata provided good quality spawning habitat locally, with deeper glide and pool offering valuable holding habitat for adult salmonids. There was some moderate suitability for European eel, with a single example recorded. Pike (*Esox lucius*), originating from the upstream Lough Mourne, are known from the site (Triturus & Loughs Agency data) although none were recorded in the current survey. There was no suitability for lamprey.

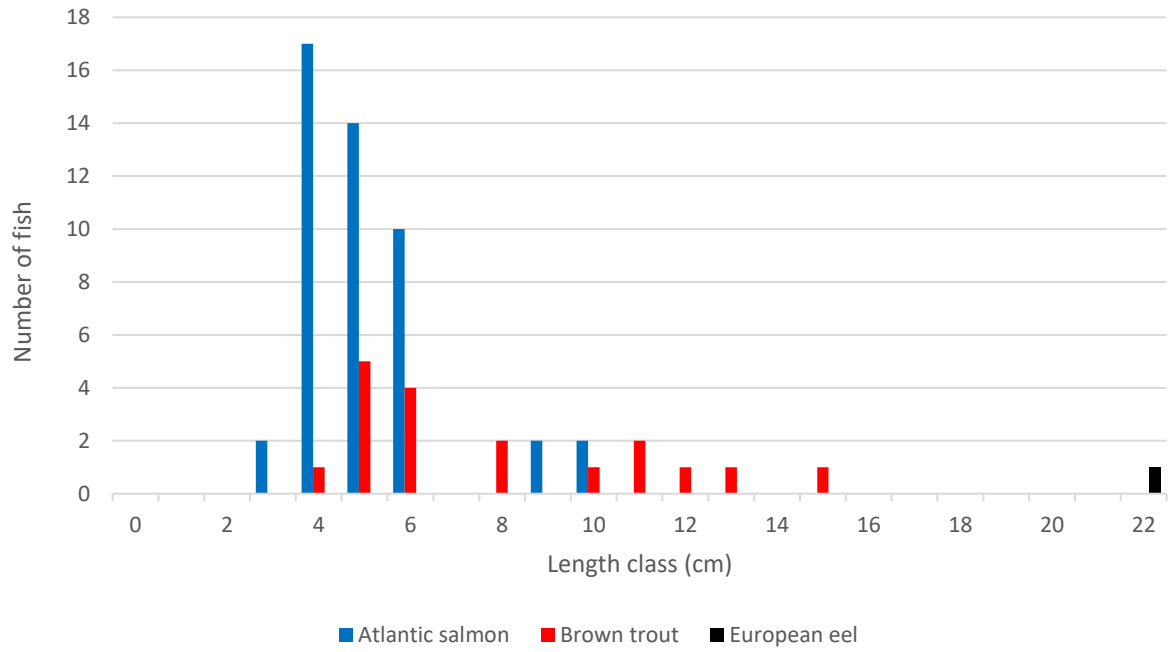

Figure 3.10 Length frequency distribution recorded via electro-fishing at site SP11 on the Mourne Beg River, July 2025

Plate 3.11 Representative image of site SP11 on the Mourne Beg River, July 2025

3.1.12 Site SP12 – Mourne Beg River, Meenbog

Atlantic salmon (*n*=23) and brown trout (*n*=14) were the only fish species recorded via electro-fishing at site SP12 on the Mourne Beg River (01M01) at the Sruhangarve River confluence (**Figure 3.11**).

Despite good physical suitability, including heterogenous habitat featuring riffle, glide and pool areas, the site supported a relatively low fish density. As noted in previous surveys, juvenile abundance was higher immediately upstream of the Sruhangarve River confluence. Excellent quality holding areas were present by way of pools and bank scours but a paucity of adult salmonids was recorded. Good quality spawning areas were also present. Despite some good suitability for European eel, none were recorded. There was no suitability for lamprey.

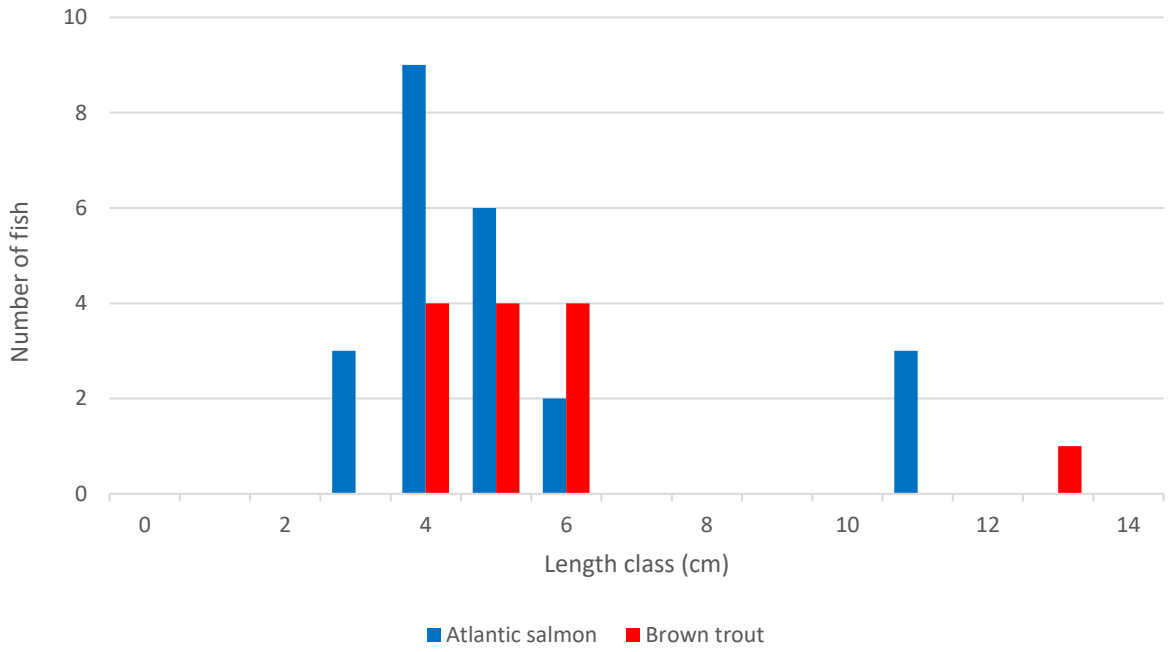

Figure 3.11 Length frequency distribution recorded via electro-fishing at site SP12 on the Mourne Beg River, July 2025

Plate 3.12 Juvenile salmonids recorded at site SP12 on the Mourne Beg River, July 2025

3.1.13 Site SP13 – Mourne Beg River, Croagh Bridge

Atlantic salmon (*n*=37), minnow (*Phoxinus phoxinus*) (*n*=21), brown trout (*n*=10), three-spined stickleback (*Gasterosteus aculeatus*) (*n*=4) and European eel (*n*=2), were recorded via electro-fishing at site SP13 on the Mourne Beg River (01M01) at Croagh Bridge (**Figure 3.12**).

The site was of high value for salmonids, with excellent quality nursery and spawning habitat present upstream of the bridge. Shallow, bryophyte-rich, cobble-dominated areas supported relatively high densities of juvenile salmon. As per upstream, numbers of brown trout were low, despite high physical suitability and the presence of frequent small pool and deeper glide for holding. European eel were present in low densities, with abundant instream refugia present. There was no suitability for lamprey.

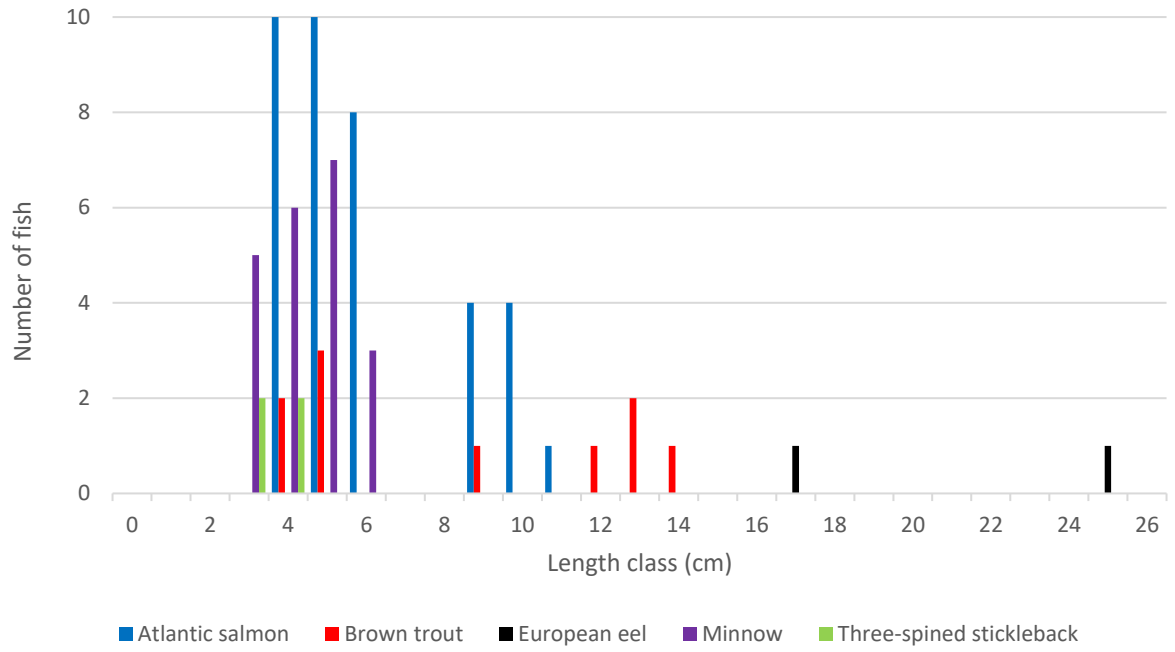

Figure 3.12 Length frequency distribution recorded via electro-fishing at site SP13 on the Mourne Beg River, July 2025

Plate 3.13 European eel recorded at site SP13 on the Mourne Beg River at Croagh Bridge, July 2025

3.1.14 Site SP14 – Mourne Beg River, Meenreagh Bridge

Atlantic salmon (*n*=26), minnow (*n*=17), brown trout (*n*=7) and three-spined stickleback (*n*=2) were recorded via electro-fishing at site SP14 on the Mourne Beg River (01M01) at Meenreagh Bridge (**Figure 3.13**).

The site was of high value for salmonids, with very good quality nursery and spawning habitat present upstream of the bridge. However, densities of juvenile salmonids was lower than anticipated given the quality habitat and this likely reflected poor invertebrate prey resources. As per upstream, numbers of brown trout were very low, despite high physical suitability and the presence of frequent small pool and deeper glide for holding. Despite good suitability by way of abundant instream refugia, no European eel were recorded. There was no suitability for lamprey.

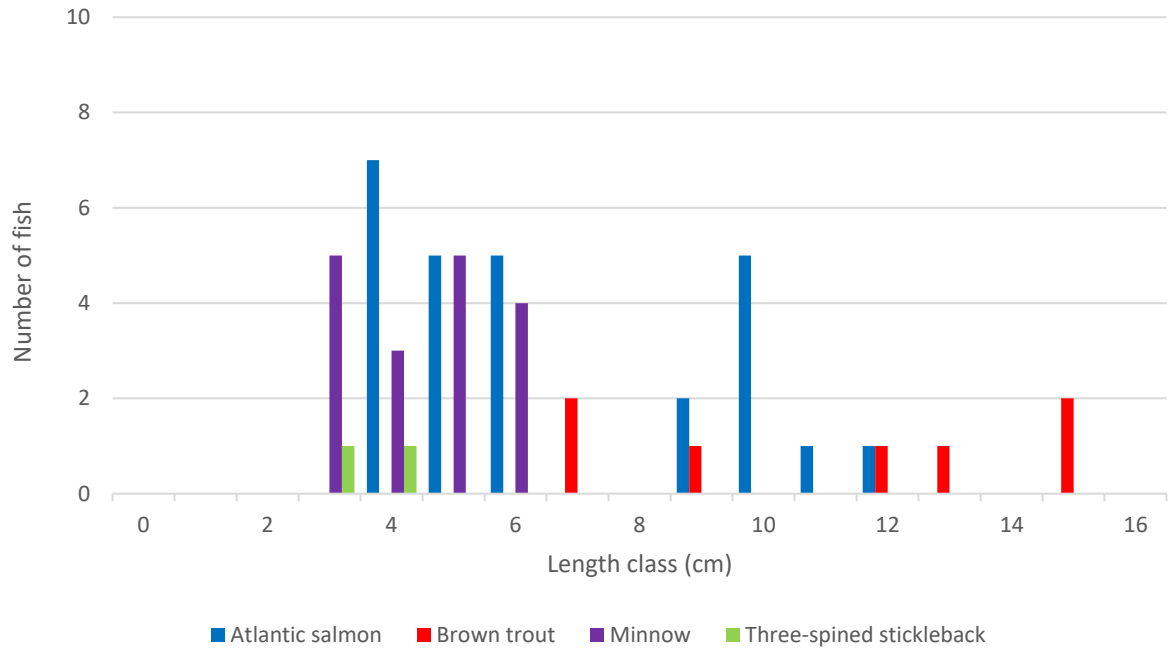

Figure 3.13 Length frequency distribution recorded via electro-fishing at site SP14 on the Mourne Beg River, July 2025

Plate 3.14 Mixed cohort Atlantic salmon recorded at site SP14 on the Mourne Beg River at Meenreagh Bridge, July 2025

3.1.15 Site SP15 – Mourne Beg River, Laghtfoggy

Atlantic salmon (*n*=38), brown trout (*n*=36), minnow (*n*=26), three-spined stickleback (*n*=11), stone loach (*Barbatula barbatula*) (*n*=9) and European eel (*n*=2) were recorded via electro-fishing at site SP15 on the Mourne Beg River (01M01) at a ford crossing (**Figure 3.14**).

The site was of high value for salmonids, supporting good densities of both juvenile and adult year classes. Shallow *Ranunculus* zones downstream of the ford were of particularly high value as salmonid nursery habitats, with cobble-dominated bed upstream of the ford offering excellent refugia. These areas were also of very high value for spawning salmonids. Despite the presence of high quality deeper glide and pool, the density of adult salmonids (trout) was low but nonetheless considerably higher than upstream - this reflected increasing base-rich influences and superior prey resources. Suitability for European eel was high given abundant instream refugia although only a low density were recorded. There was some localised spawning habitat for lamprey although ammocoete areas (soft sediment) were absent.

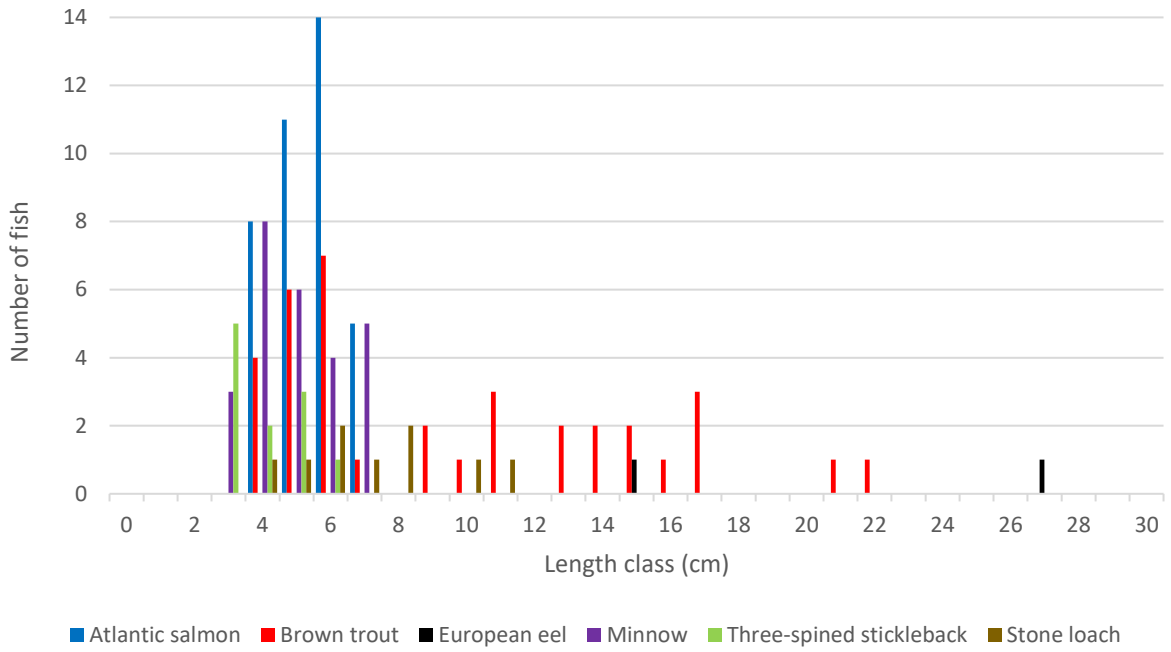

Figure 3.14 Length frequency distribution recorded via electro-fishing at site SP15 on the Mourne Beg River, July 2025

Plate 3.15 Adult brown trout recorded at site SP15 on the Mourne Beg River, July 2025

3.1.16 Site SP16 – Mourne Beg River, Mourne Bridge

Atlantic salmon (*n*=52), brown trout (*n*=23), minnow (*n*=13), stone loach (*n*=4), three-spined stickleback (*n*=4) and European eel (*n*=1) were recorded via electro-fishing at site SP16 on the Mourne Beg River (01M01) at Mourne Bridge (**Figure 3.15**).

The site was of high value for salmonids, supporting relatively high densities of juvenile salmon and lower numbers of mixed cohort trout. The site was of greatest value as a salmonid nursery, with abundant instream refugia and macrophyte beds providing excellent quality habitat. These were also of high value for European eel which were recorded in low numbers. Good quality spawning habitat for both salmonid and lamprey was present locally. Deeper glide upstream provided good holding habitat for migratory salmonids. Whilst beds of sand provided some low suitability for lamprey ammocoetes, none were recorded (*Lampetra* sp. known to present in the lower reaches; Niven & McAuley, 2013).

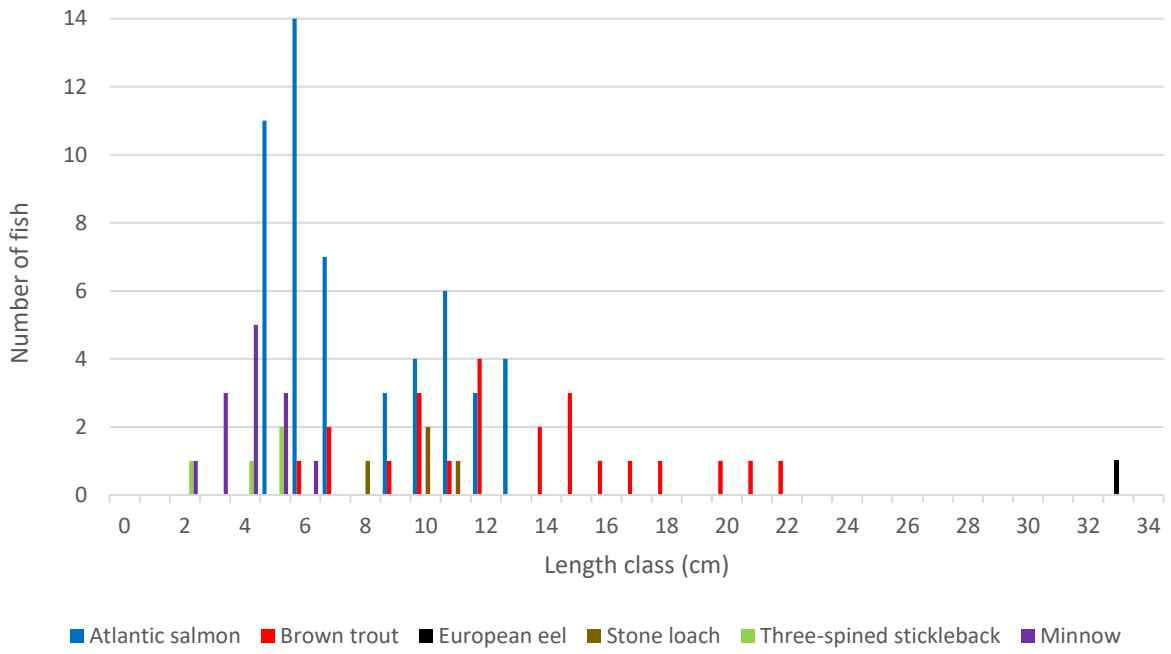

Figure 3.15 Length frequency distribution recorded via electro-fishing at site SP16 on the Mourne Beg River, July 2025

Plate 3.16 Stone loach and brown trout recorded at site SP16 on the Mourne Beg River at Mourne Bridge, July 2025

3.1.17 Site SP17 – Barrack Hill River, Croaghonagh

Brown trout (*n*=32) was the only fish species recorded via electro-fishing at site SP17 on the Barrack Hill River (37B16), a tributary of the Lowerymore River (**Figure 3.16**).

The site was a very good quality salmonid nursery given the good hydromorphology (rocky bed), broken flow patterns and limited siltation pressures. However, overall fish densities were low. Despite being recorded previously in 2024, no Atlantic salmon were recorded despite some good physical suitability. Good quality salmonid spawning and holding habitat was present. Despite some low suitability for European eel, none were recorded. There was no suitability for lamprey.

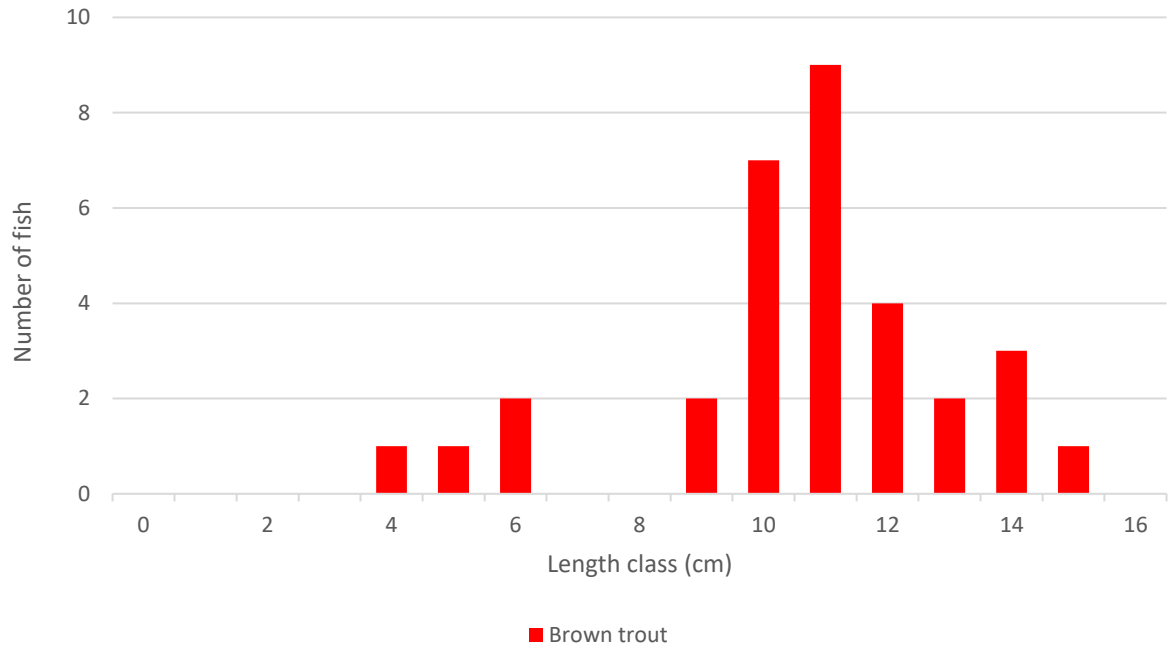

Figure 3.16 Length frequency distribution recorded via electro-fishing at site SP17 on the Barrack Hill River, July 2025

Plate 3.17 Representative image of site SP17 on the Barrack Hill River, July 2025

3.1.18 Site SP18 – Lowerymore River, Biddy O'Barnes

Atlantic salmon (*n*=52), brown trout (*n*=5) and three-spined stickleback (*n*=1) were recorded via electro-fishing at site SP18 on the Lowerymore River (37L01) (**Figure 3.17**).

The site was a good quality salmonid nursery given an abundance of instream refugia and supported relatively high densities of juveniles (mostly salmon). Low numbers of mixed cohort brown trout were

recorded reflecting the shallow, high energy nature of the site. Good quality salmonid spawning areas of mixed gravels were present in deeper glide and pool. Good quality holding habitat for adult salmonids was present in deeper pool on meanders and beneath boulder-cascade areas. Whilst there was some good suitability for European eel, none were recorded. There was no suitability for lamprey.

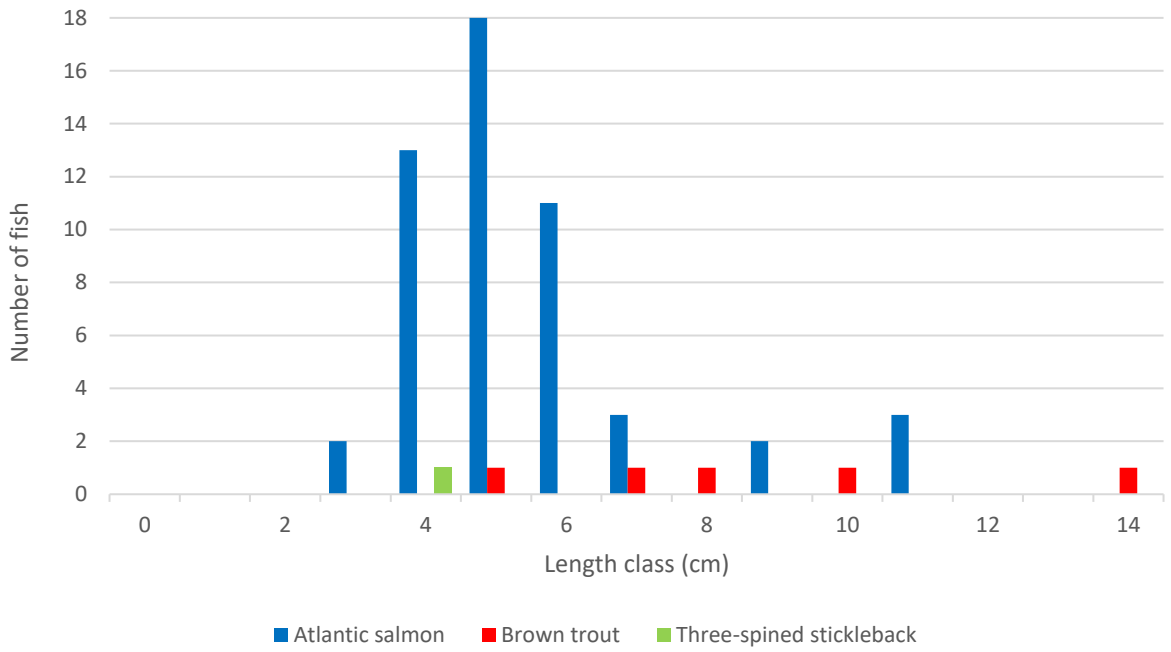

Figure 3.17 Length frequency distribution recorded via electro-fishing at site SP18 on the Lowerymore River, July 2025

Plate 3.18 0+ Atlantic salmon recorded at site SP18 on the Lowerymore River, July 2025

3.1.19 Site L1 – Carrickaduff Lough, Meenbog

Site L1 was located at Carrickaduff Lough, a small 0.5ha upland oligotrophic waterbody within the wind farm site. Although the lacustrine conditions prevented backpack electro-fishing, a fisheries habitat appraisal was undertaken. The small peatland lake was considered of moderate value for brown trout with a small number of trout observed surface feeding on insects during the site visit. The site had poor connectivity with downstream watercourses in the LeaghanyRiver_SC_010 sub-catchment (e.g. Glendergan River) and thus was of low accessibility and suitability for European eel.

Plate 3.19 Representative image of Carrickaduff Lough, July 2025

Table 3.1 Comparison of fish recorded via electro-fishing in 2024 and 2025 at sites in vicinity of Meenbog wind farm

Site no.	Watercourse	EPA code	July/Sept 2024	July 2025
SP1	Unnamed stream	n/a	No fish recorded	No fish recorded
SP2	Croaghonagh River	01C31	Atlantic salmon, brown trout	Atlantic salmon, brown trout
SP3	Bunadowen River	01B01	Brown trout, European eel	Brown trout, European eel
SP4	Bunadowen River	01B01	Brown trout	Brown trout
SP5	Bunadowen River	01B01	Atlantic salmon, brown trout	Atlantic salmon, brown trout
SP6	Shruhangarve River	01S26	Brown trout	Brown trout, European eel
SP7	Glendergan River	GBNI0100 880	Brown trout	Brown trout
SP8	Glendergan River	GBNI0100 885	Brown trout	Brown trout
SP9	Mourne Beg River	01M01	Atlantic salmon, brown trout, European eel	Atlantic salmon, brown trout
SP10	Mourne Beg River	01M01	Atlantic salmon, brown trout	Atlantic salmon, sea trout, brown trout, European eel
SP11	Mourne Beg River	01M01	Atlantic salmon, brown trout	Atlantic salmon, brown trout, European eel
SP12	Mourne Beg River	01M01	Atlantic salmon, brown trout	Atlantic salmon, brown trout
SP13	Mourne Beg River	01M01	Atlantic salmon, brown trout, European eel, minnow	Atlantic salmon, brown trout, European eel, minnow, three-spined stickleback
SP14	Mourne Beg River	01M01	Atlantic salmon, brown trout, European eel, minnow	Atlantic salmon, brown trout, minnow, three-spined stickleback
SP15	Mourne Beg River	01M01	Atlantic salmon, brown trout, European eel, minnow, stone loach, three-spined stickleback	Atlantic salmon, brown trout, European eel, minnow, stone loach, three-spined stickleback
SP16	Mourne Beg River	01M01	Atlantic salmon, brown trout, European eel, stone loach	Atlantic salmon, brown trout, European eel, minnow, stone loach, three-spined stickleback
SP17	Barrack Hill River	37B16	Atlantic salmon, brown trout	Brown trout
SP18	Lowerymore River	37L01	Atlantic salmon, European eel	Atlantic salmon, brown trout, three-spined stickleback
L1	Carrickaduff Lough	9925	Fisheries appraisal only	Fisheries appraisal only

Table 3.2 Relative abundance of fish species of higher conservation value recorded via **electro-fishing** in the vicinity of Meenbog wind farm, July or September 2024 (blank cell = none recorded)

Site	Watercourse	Atlantic salmon	Brown trout	European eel	Other species
SP1	Unnamed stream				No fish recorded
SP2	Croaghonagh River	Low	Low		
SP3	Bunadowen River		Medium	Low	
SP4	Bunadowen River		Low		
SP5	Bunadowen River	Low	Medium		
SP6	Shruhangarve		Low		
SP7	Glendergan River		Low		
SP8	Glendergan River		Low		
SP9	Mourne Beg River	High	Medium	Low	
SP10	Mourne Beg River	Very high	Low		
SP11	Mourne Beg River	High	Low		
SP12	Mourne Beg River	Medium	Low		
SP13	Mourne Beg River	Medium	Low	Low	Minnow
SP14	Mourne Beg River	Medium	Low	Low	Minnow
SP15	Mourne Beg River	Medium	Medium	Low	Minnow, stone loach, three-spined stickleback
SP16	Mourne Beg River	High	Medium	Low	Stone loach
SP17	Barrack Hill River	Low	Medium		
SP18	Lowerymore River	Medium		Low	
L1	Carrickaduff Lough				Fisheries appraisal only – brown trout observed

Conservation value: Atlantic salmon (*Salmo salar*) are listed under Annex II and V of the Habitats Directive [92/42/EEC]. European eel are 'critically endangered' according to most recent ICUN red list (Pike et al., 2020) and listed as 'critically engendered' in Ireland (King et al., 2011). With the exception of the Inland Fisheries Acts 1959 to 2017, brown trout and coarse fish species have no legal protection in Ireland.

Table 3.3 Fish species densities per m^2 recorded at sites in the vicinity of Meenbog wind farm via electro-fishing in July and September 2024 (values in **bold** represent the highest densities recorded for each species, respectively)

Site	Watercourse	CPUE (elapsed time)	Approx. area fished (m^2)	Atlantic salmon	Brown trout	Sea trout	European eel	Minnow	Stone loach	Three-spined stickleback
SP1	Unnamed stream	5	50	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SP2	Croaghonagh River	10	160	0.044	0.081	0.000	0.000	0.000	0.000	0.000
SP3	Bunadowen River	10	220	0.000	0.086	0.000	**0.009**	0.000	0.000	0.000
SP4	Bunadowen River	10	250	0.000	0.036	0.000	0.000	0.000	0.000	0.000
SP5	Bunadowen River	10	275	0.007	0.051	0.000	0.000	0.000	0.000	0.000
SP6	Shruhangarve River	10	220	0.000	0.036	0.000	0.005	0.000	0.000	0.000
SP7	Glendergan River	10	280	0.000	0.021	0.000	0.000	0.000	0.000	0.000
SP8	Glendergan River	10	340	0.000	0.024	0.000	0.000	0.000	0.000	0.000
SP9	Mourne Beg River	10	220	0.145	0.095	0.000	0.000	0.000	0.000	0.000
SP10	Mourne Beg River	10	250	**0.208**	0.048	**0.004**	0.004	0.000	0.000	0.000
SP11	Mourne Beg River	10	320	0.147	0.056	0.000	0.003	0.000	0.000	0.000
SP12	Mourne Beg River	10	350	0.066	0.040	0.000	0.000	0.000	0.000	0.000
SP13	Mourne Beg River	10	300	0.123	0.033	0.000	0.007	0.070	0.000	0.013
SP14	Mourne Beg River	10	300	0.087	0.023	0.000	0.000	0.057	0.000	0.007
SP15	Mourne Beg River	10	320	0.119	0.113	0.000	0.006	**0.081**	**0.028**	**0.034**
SP16	Mourne Beg River	10	280	0.186	0.082	0.000	0.004	0.046	0.014	0.014
SP17	Barrack Hill River	10	250	0.000	**0.128**	0.000	0.000	0.000	0.000	0.000
SP18	Lowerymore River	10	300	0.173	0.017	0.000	0.000	0.000	0.000	0.003

4. Discussion

The watercourses in the vicinity of Meenbog wind farm were upland spate channels which retained good levels of naturalness despite some historical modifications locally. Siltation pressures (mostly from peat escapement) and eutrophication pressures (e.g. afforestation) were evident throughout much of the survey area, particularly on the Bunadowen, Mourne Beg and Glendergan rivers. However, many of the watercourses were of high value for salmonids, particularly the larger channels surveyed.

A typical diversity of fish species for the Mourne Beg_SC_010, Mourne Beg_SC_020, and Eske_SC_010 river sub-catchments was recorded during the electro-fishing survey, with Atlantic salmon, brown trout, European eel, stone loach, minnow and three-spined stickleback captured (**Table 3.2, 3.3**). In contrast to previous surveys, an anadromous sea trout (also *Salmo trutta*) was also recorded at site SP10 on the upper reaches of the Mourne Beg River (**Plate 3.10**). With the exception of sea trout, the fish community recorded was the same as 2024 (**Table 3.1**) with fish abundances and site diversity broadly similar.

A large scale peat slide event occurred in November 2020, significantly damaging habitats and causing fish mortalities on the Sruhangarve and downstream connecting Mourne Beg River. However, a swift recovery of fisheries habitats occurred (Triturus, 2022) and, evidently, has continued to do so in the interim period. Whilst some evidence of impacts are still apparent, European eel and a small but recruiting population of brown trout have re-established in the Sruhangarve River (which likely lost all fish due to the peat slide), and the Mourne Beg River remains a highly important and productive habitat for Atlantic salmon with lower numbers of brown trout and eel.

Salmonid populations were widespread in vicinity of Meenbog wind farm. With the exception of site SP1 (located in the uppermost reaches of a small low order tributary), salmonids were recorded at all riverine sites. Brown trout were also observed at Carrickaduff Lough (site L1), a small oligotrophic lake within the wind farm site. Annex II Atlantic salmon were recorded from a total of 11 no. sites on the Croaghonagh River (site SP2), lower Bunadowen River (SP5), Lowerymore River (SP18) and all survey sites on the Mourne Beg River (SP9, SP10, SP11, SP12, SP13, SP14, SP15 & SP16) (**Table 3.2**). No salmon parr were recorded from the Barrack Hill River at SP17 where low densities were captured in July 2024. The highest salmonid densities were again recorded from the Mourne Beg River (**Table 3.1**), reflecting the superior quality spawning and nursery habitats present. The Lowerymore is also regionally important salmon spawning and nursery habitat, with the value of the upper reaches (including the current survey area) increasing considerably following instream works to address fish passage issues at the White Goat's Island falls (2006), the seeding with unfed salmon fry in the upper reaches in the early 2000s and riparian enhancement (IFI, 2011). Smaller higher gradient watercourses such as the Sruhangarve River, Barrack Hill River, upper Bunadowen River and upper Glendergan River[1] are not of significant value for Atlantic salmon but do support smaller brown trout populations, as would be anticipated for such upland channel types (Wood & Budy, 2009; O'Grady, 2006; Amiro, 1993; Richardson, 1993).

[1] Atlantic salmon, brown trout, lamprey (*Lampetra* sp.), European eel and minnow are known from the lower reaches of the Glendergan River (Niven & Donnelly, 2018)

In support of previous surveys and data, no lamprey ammocoetes (*Lampetra* sp.) were recorded during targeted electro-fishing at the 18 no. riverine sites (**Table 3.1, 3.2**). The majority of the survey sites were inimical to lamprey given their upland eroding/cascading/high-energy nature. Naturally, such sites do not encourage the deposition of fine, organic rich sediment required by larval lamprey and are dominated by larger substrata not suitable for spawning (Goodwin et al., 2008; Aronsuu & Virkkala, 2014). Furthermore, where present, sediment accumulations were dominated by peat (humic) deposits which are not suitable for larval lamprey. However, the Mourne Beg River is known to support *Lampetra* sp. in its lower reaches (Niven & McAuley, 2013), where conditions more favourable to the species become more common (i.e. slower-flowing water, higher proportion of small substrata for spawning, greater frequency of soft sediment areas for larval burial etc.).

European eel are Red-listed in Ireland (King et al., 2011) and are classed as 'critically endangered' on a global scale (Pike et al., 2020). As predicted from previous data, recorded densities of European eel were low in the current survey, with the species recorded from single sites on the Bunadowen River (SP3) and Sruhangarve River (SP6) in addition to 5 no. sites on the Mourne Beg River (SP10, SP11, SP13, SP15 & SP16) (**Table 3.2, 3.3**). This distribution was broadly similar to previous surveys. The recurrent absence of eel from sites on other watercourses like the Croaghonagh River and Glendergan River primarily reflects the upland nature of the surveyed watercourses, which provide sub-optimal eel habitat (Matondo et al., 2021; Chadwick et al., 2007; Laffaille et al., 2003). Furthermore, eel abundance naturally decreases with gradient and distance from marine habitats (Harwood et al., 2022; Degerman et al., 2019).

Although previously recorded in the upper reaches of the Mourne Beg River (Triturus & Loughs Agency 2021 data), no pike (*Esox lucius*) were recorded in the current survey. Whilst genetic analysis has revealed pike to be native to Ireland (Pedreschi et al., 2014), the species is not native to the Mourne Beg system. Pike are known to be present in Lough Mourne (Loughs Agency pers. comm.), from which the Mourne Beg River emanates, and it would appear that the species naturally migrated downstream from this location. However, whether this was an isolated event or is ongoing is unclear. In light of poor habitat suitability in the upper Mourne Beg River, a pike population may have failed to establish in the watercourse with the species not recorded in July 2024 or July 2025 surveys.

5. References

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8. Appendix B – Biological water quality & macro-invertebrate communities

Table 8.1 Macro-invertebrate Q-sampling results for the Meenbog wind farm sites, July 2025

Group	Family	Species	SP1	SP2	SP3	SP4	SP5	SP6	SP7	SP8	SP9	SP10	SP11	SP12	SP13	SP14	SP15	SP16	SP17	SP18	EPA group
Ephemeroptera	Heptageniidae	*Electrogena lateralis*										5							5		**A**
Ephemeroptera	Heptageniidae	*Heptagenia sulphurea*														6	8	3			**A**
Plecoptera	Chloroperlidae	*Siphonoperla torrentium*										1	1			1				2	**A**
Plecoptera	Nemouridae	*Nemurella pictetii*	5																		**A**
Plecoptera	Nemouridae	*Protonemura meyeri*						1				1			1						**A**
Plecoptera	Perlidae	*Perla bipunctata*													1						**A**
Ephemeroptera	Baetidae	*Centroptilum luteolum*										1									**B**
Ephemeroptera	Baetidae	*Cloeon simile*									1										**B**
Ephemeroptera	Leptophlebiidae	*Paraleptophlebia cincta*						1													**B**
Plecoptera	Leuctridae	*Leuctra fusca*	1		14	17	16	2	4	9	3	34	34	55	27	21	10	3	3		**B**
Trichoptera	Cased caddis pupa	sp. indet.			1						1			1		1					**B**
Trichoptera	Limnephilidae	*Halesus radiatus*	1															1			**B**
Trichoptera	Limnephilidae	*Potamophylax cingulatus*							1												**B**
Hemiptera	Aphelocheiridae	*Aphelocheirus aestivalis*															37	20			**B**
Odonata	Coenagrionidae	sp. indet.							3												**B**
Ephemeroptera	Baetidae	*Baetis rhodani*	1	12								25				4	8	5	27		**C**
Ephemeroptera	Ephemerellidae	*Serratella ignita*									5	2	2	1			8	10	42	8	**C**
Trichoptera	Hydropsychidae	*Hydropsyche instabilis*										1				6	1	2	1		**C**
Trichoptera	Hydropsychidae	*Hydropsyche siltalai*									3			1		1					**C**
Trichoptera	Polycentropodidae	*Plectrocnemia conspersa*	9		1	3	2	6	2		2	1									**C**
Trichoptera	Polycentropodidae	*Polycentropus kingi*			1	4			6	2	3	2	11	13	4	1					**C**
Trichoptera	Rhyacophilidae	*Rhyacophila dorsalis*					1				1	3				4	1	3	5		**C**
Trichoptera	Rhyacophilidae	*Rhyacophila munda*																1			**C**
Arachnida	Hydrachnidiae	sp. indet.		1	1	1	1	1					1		1		4	1		3	**C**
Coleoptera	Dytiscidae	Dytiscidae larva	1																1		**C**

Group	Family	Species	SP1	SP2	SP3	SP4	SP5	SP6	SP7	SP8	SP9	SP10	SP11	SP12	SP13	SP14	SP15	SP16	SP17	SP18	EPA group
Coleoptera	Dytiscidae	*Oreodytes sanmarkii*		1																18	**C**
Coleoptera	Dytiscidae	*Oreodytes septentrionalis*																		2	**C**
Coleoptera	Dytiscidae	*Stictotarsus duodecimpustulatus*												2	1		2				**C**
Coleoptera	Elmidae	*Elmis aenea*										1			1						**C**
Coleoptera	Elmidae	*Esolus parallelepipedus*					1					1						2	1		**C**
Coleoptera	Elmidae	*Limnius volckmari*									1	10	7	4	1	13	3	3	6	6	**C**
Coleoptera	Halipliidae	sp. indet.								1											**C**
Coleoptera	Hydraenidae	*Hydraena gracilis*										1									**C**
Coleoptera	Hydrophilidae	*Laccobius bipunctatus*	1																		**C**
Crustacea	Gammaridae	*Gammarus duebeni*															31	2			**C**
Diptera	Chironomidae	Non-*Chironomus* spp.	5	3	1	19	4	10	7	4	4	14	12	6	7	4		2	6	2	**C**
Diptera	Culicidae	sp. indet.				2	1					1		1	1						**C**
Diptera	Pediciidae	*Dicranota* sp.	2		1							1					1			3	**C**
Diptera	Simuliidae	sp. indet.			1			1	1	1	7	3		1	1				1		**C**
Diptera	Tipuliidae	sp. indet.											1						2	1	**C**
Hemiptera	Gerridae	*Gerris* sp.									2										**C**
Hemiptera	Veliidae	*Velia caprai*	7					2				1									**C**
Crustacea	Asellidae	*Asellus aquaticus*																2			**D**
Hirudinidae	Glossiphoniidae	sp. indet.											1								**D**
Megaloptera	Sialidae	*Sialis lutaria*									1										**D**
Diptera	Chironomidae	*Chironomus* spp.	3			2	2	1			3	2	2	1	2		3			1	**E**
Annelidae	Oligochaeta	sp. indet.	1	5					2		2		4	4	1					1	**n/a**
Abundance			**37**	**22**	**21**	**48**	**28**	**25**	**26**	**17**	**39**	**111**	**76**	**90**	**49**	**62**	**117**	**60**	**100**	**47**	
Q-rating			**Q4**	**Q3**	**Q3**	**Q3**	**Q3**	**Q3-4**	**Q3**	**Q3**	**Q3**	**Q4**	**Q3-4**	**Q3**	**Q4**	**Q4**	**Q4**	**Q4**	**Q4**	**Q4**	
WFD status			Good	Poor	Poor	Poor	Poor	Mod	Poor	Poor	Poor	Good	Mod	Poor	Good	Good	Good	Good	Good	Good	

Table 8.2 Macro-invertebrate sweep sampling results for Carrickaduff Lough, July 2025

Group	Family	Species	L1
Odonata	Aeshnidae	sp. indet.	17
Hemiptera	Corixidae	Corixidae nymph	14
Odonata	Coenagrionidae	sp. indet.	14
Hemiptera	Corixidae	*Hesperocorixa moesta*	9
Coleoptera	Dytiscidae	Dytiscidae larva	5
Diptera	Chironomidae	Non-*Chironomus* spp.	5
Odonata	Aeshnidae	*Anax imperator*	5
Diptera	Chironomidae	*Chironomus* spp.	2
Hemiptera	Notonectidae	Notonectidae nymph	2
Arachnida	Hydrachnidiae	sp. indet.	1
Coleoptera	Dytiscidae	*Ilybius ater*	1
Diptera	Chaoboridae	Chaoboridae pupa	1
Hemiptera	Corixidae	*Hesperocorixa linnaei*	1
Hemiptera	Gerridae	Gerridae nymph	1
Odonata	Libellulidae	*Sympetrum* sp.	1
Abundance			**79**
Taxon richness			15

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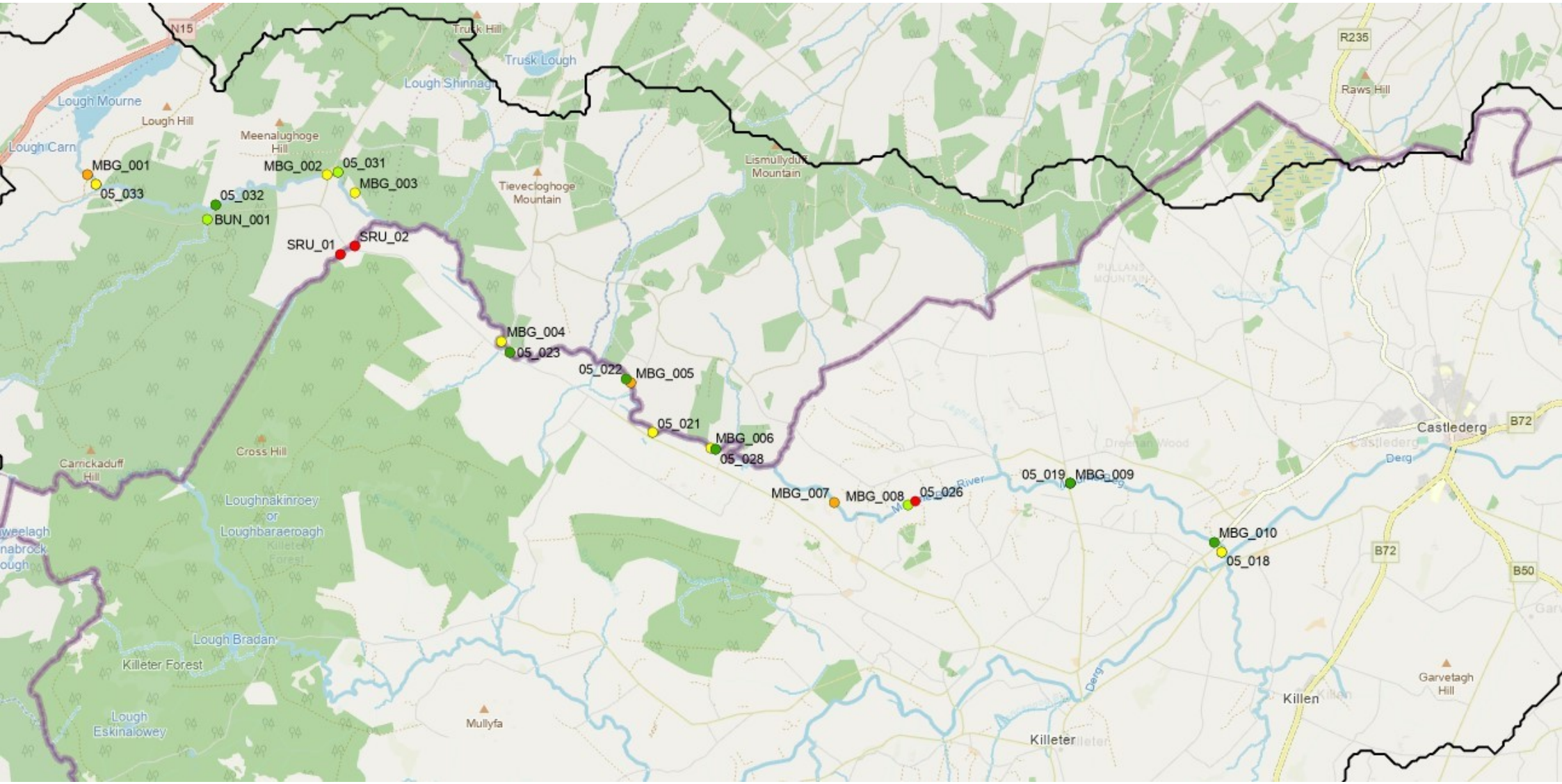
Loughs Agency Data

Electrofishing

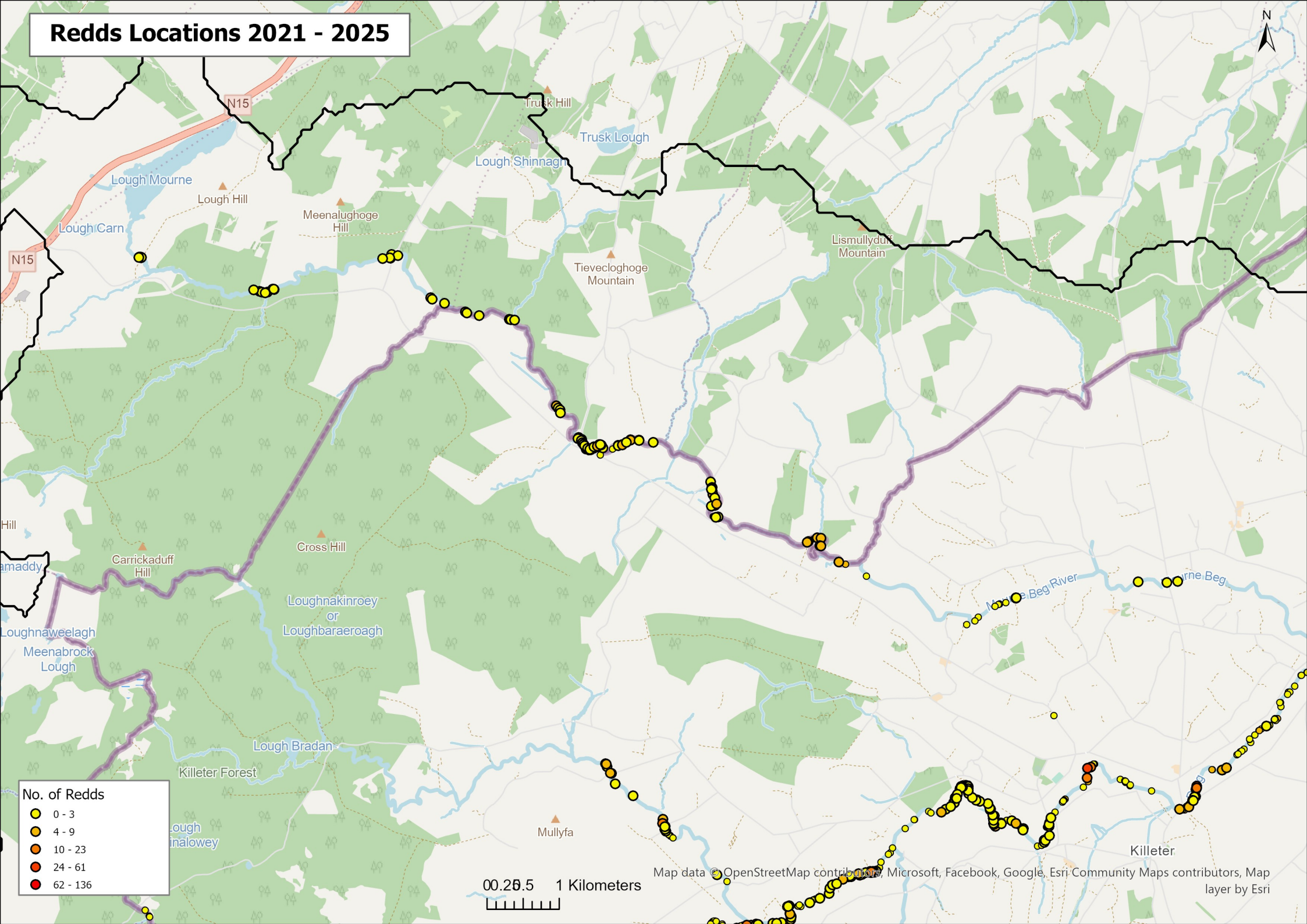
Site ID	River	Catchment	Date of Electrofishing	Trout 0+	Trout 1+	Salmon 0+	Salmon 1+	Year
MBG_001	Mournebeg River	Derg	2021-06-22 10:13:00	3	4	0	0	2021
BUN_001	Mournebeg River	Derg	2021-06-22 10:55:00	0	7	2	1	2021
MBG_002	Mournebeg River	Derg	2021-06-22 10:58:00	1	2	13	6	2021
MBG_003	Mournebeg River	Derg	2021-06-22 12:48:00	5	2	12	1	2021
MBG_004	Mournebeg River	Derg	2021-06-22 13:41:00	2	0	11	0	2021
MBG_005	Mournebeg River	Derg	2021-06-22 14:19:00	1	4	3	0	2021
MBG_010	Mournebeg River	Derg	2021-06-23 9:54:00	0	1	39	11	2021
MBG_009	Mournebeg River	Derg	2021-06-23 11:03:00	2	4	21	15	2021
MBG_008	Mournebeg River	Derg	2021-06-23 12:51:00	3	5	10	11	2021
MBG_007	Mournebeg River	Derg	2021-06-23 13:50:00	0	3	2	5	2021
MBG_006	Mournebeg River	Derg	2021-06-23 15:17:00	0	1	7	0	2021
SRU_02	Sruhangarve	Derg	2021-06-23 15:31:00	0	0	0	0	2021
SRU_01	Sruhangarve	Derg	2021-06-23 15:52:00	0	1	0	0	2021
MBG_001	Mournebeg River	Derg	2022-06-16 10:48:00	11	4	1	3	2022
BUN_001	Mournebeg River	Derg	2022-06-16 11:34:00	0	5	17	7	2022
MBG_002	Mournebeg River	Derg	2022-06-16 12:41:43	0	0	6	1	2022
MBG_003	Mournebeg River	Derg	2022-06-21 10:54:00	1	0	7	0	2022
MBG_004	Mournebeg River	Derg	2022-06-16 13:40:00	0	0	9	1	2022
MBG_005	Mournebeg River	Derg	2022-06-16 14:33:00	0	0	4	2	2022
MBG_010	Mournebeg River	Derg	2022-06-15 11:51:00	0	0	26	5	2022
MBG_009	Mournebeg River	Derg	2022-06-15 12:52:00	0	0	63	5	2022
MBG_008	Mournebeg River	Derg	2022-06-15 13:57:00	0	0	21	0	2022
MBG_007	Mournebeg River	Derg	2022-06-21 14:08:00	0	1	3	5	2022
MBG_006	Mournebeg River	Derg	2022-06-21 13:54:00	0	1	11	9	2022
SRU_02	Sruhangarve	Derg	2022-06-21 12:36:00	0	0	0	0	2022
SRU_01	Sruhangarve	Derg	2022-06-21 10:22:00	0	0	0	0	2022
05_021	Mournebeg	Derg	2023-10-12 12:49:22	9	14	8	0	2023
05_022	Mournebeg	Derg	2023-10-12 11:47:00	15	12	5	0	2023
05_023	Mournebeg	Derg	2023-10-12 11:25:00	18	6	0	0	2023
05_031	Mournebeg	Derg	2023-10-12 10:55:00	11	8	0	0	2023
05_032	Mournebeg	Derg	2023-10-12 10:25:00	5	10	0	0	2023
05_033	Mournebeg	Derg	2023-10-12 10:00:00	11	10	0	0	2023
05_018	Mournebeg	Derg	2023-10-16 13:08:55	0	0	0	0	2023
05_019	Mournebeg	Derg	2023-10-16 13:09:07	0	0	0	0	2023
05_026	Mournebeg	Derg	2023-10-12 13:30:00	0	0	0	0	2023
05_028	Mournebeg	Derg	2023-10-12 12:16:00	15	12	10	0	2023
05_021	Mournebeg	Derg	2024-09-20 10:27:00	11	3	13	2	2024
05_023	Mournebeg	Derg	2024-09-20 10:12:17	0	0	6	0	2024
05_031	Mournebeg	Derg	2024-09-20 9:56:08	19	6	21	12	2024
05_032	Mournebeg	Derg	2024-09-20 9:45:29	14	3	21	6	2024
05_033	Mournebeg	Derg	2024-08-08 11:30:24	13	7	0	0	2024
05_018	Mournebeg	Derg	2024-09-20 12:05:01	19	12	27	14	2024
05_019	Mournebeg	Derg	2024-09-20 14:00:12	18	14	28	18	2024
05_028	Mournebeg	Derg	2024-09-20 10:49:44	8	8	26	18	2024
05_021	Mournebeg	Derg	2025-08-23 11:57:13	7	7	13	7	2025
05_022	Mournebeg	Derg	2025-08-23 9:34:47	19	6	32	10	2025
05_023	Mournebeg	Derg	2025-08-23 9:20:08	19	9	26	11	2025
05_031	Mournebeg	Derg	2025-08-23 8:07:15	11	9	15	6	2025
05_032	Mournebeg	Derg	2025-08-23 12:52:31	17	9	26	9	2025
05_033	Mournebeg	Derg	2025-08-23 7:39:21	8	2	14	9	2025
05_018	Mournebeg	Derg	2025-08-23 10:53:53	16	8	12	21	2025
05_019	Mournebeg	Derg	2025-08-23 11:16:32	19	3	26	14	2025
05_028	Mournebeg	Derg	2025-08-23 11:48:00	14	6	29	9	2025


N15
Trusk Hill
Trusk Lough
Lough Shinnagh
Lough Mourne
Lough Hill
Lough Carn
Meenalughoge Hill
MBG_001
05_033
MBG_002
05_031
MBG_003
05_032
BUN_001
SRU_01
SRU_02
Tievecloghoge Mountain
Lismullyduff Mountain
R235
Raws Hill
MBG_004
05_023
05_022
MBG_005
05_021
MBG_006
05_028
Carnickaduff Hill
Cross Hill
Loughnakinroey or Loughbaraeroagh
Killeter Forest
MBG_007
MBG_008
05_026
05_019
MBG_009
Castlederg
B72
Derg
MBG_010
05_018
B50
Lough Bradan
Killeter Forest
Lough Eskinalowey
Mullyfa
Killeter
Killen
Garvetagh Hill

Loughs Agency Data

Redds

Year	Mournebeg redd numbers
Dec-21	74
Dec-22	83
Dec-23	56
Dec-24	24


Redds Locations 2021 - 2025
N
N15
N15
Trusk Hill
Trusk Lough
Lough Shinnagh
Lough Mourne
Lough Hill
Meenalughoge Hill
Lough Carn
Tievecloghoge Mountain
Lismullyduff Mountain
Carrickaduff Hill
Cross Hill
Loughnakinroey or Loughbaraeroagh
Loughnaweelagh
Meenabrock Lough
Lough Bradan
Killeter Forest
Mullyfa
Killeter
No. of Redds
0 - 3
4 - 9
10 - 23
24 - 61
62 - 136
0 0.25 0.5 1 Kilometers
Map data © OpenStreetMap contributors, Microsoft, Facebook, Google, Esri Community Maps contributors, Map layer by Esri